Redwood Coast Energy Authority
633 3rd Street, Eureka, CA 95501
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BOARD OF DIRECTORS MEETING AGENDA

Humboldt Bay Municipal Water District Office **November 21, 2019**
828 7th Street, Eureka, CA 95501 **Thursday, 3:30 p.m.**

In compliance with the Americans with Disabilities Act, if you need assistance to participate in this meeting, please contact the Clerk of the Board at the phone number, email or physical address listed above at least 72 hours in advance.

Pursuant to Government Code section 54957.5, all writings or documents relating to any item on this agenda which have been provided to a majority of the Board of Directors, including those received less than 72 hours prior to the RCEA Board meeting, will be made available to the public in the agenda binder located in the RCEA lobby during normal business hours, and at *https://redwoodenergy.org/about/board-of-directors/*.

PLEASE NOTE: Speakers wishing to distribute materials to the Board at the meeting are asked to provide 12 copies to the Clerk of the Board.

OPEN SESSION Call to Order

1. REPORTS FROM MEMBER ENTITIES

2. ORAL COMMUNICATIONS

This time is provided for people to address the Board or submit written communications on matters not on the agenda. At the conclusion of all oral communications, the Board may respond to statements. Any request that requires Board action will be set by the Board for a future agenda or referred to staff.

3. CONSENT CALENDAR

All matters on the Consent Calendar are considered to be routine by the Board and are enacted in one motion. There is no separate discussion of any of these items. If discussion is required, that item is removed from the Consent Calendar and considered separately. At the end of the reading of the Consent Calendar, Board members or members of the public can request that an item be removed for separate discussion.

3.1 Approve Minutes of October 24, 2019, Board Meeting.
3.2 Approve Disbursements Report.
3.3 Accept Financial Reports.

4. REMOVED FROM CONSENT CALENDAR ITEMS

Items removed from the Consent Calendar will be heard under this section.

5. OLD BUSINESS

5.1 Electric Vehicle Charging Network Upgrades

Authorize staff to solicit bids and secure construction at all listed sites as appropriate, for a total aggregate budget not to exceed $144,000, and to seek reimbursement through the CALeVIP program.

5.2 Airport Microgrid Project Site Preparation Coordination and Reimbursement

1) Authorize reimbursement to County for: a) brush removal and site work in preparation for fence installation; and/or b) fence installation; and/or c) tree removal.

2) Authorize RCEA Executive Director to sign an Access and Reimbursement Agreement with County.

5.3 Humboldt County Islanding During Public Safety Power Shutoffs – Information only

5.4 Review Updated RePower Humboldt/Comprehensive Action Plan for Energy Planning Document Draft

Provide staff with input on final draft of 2019 CAPE.

6. NEW BUSINESS

6.1 Letter to California Public Utilities Commission Regarding PG&E Ownership

Discuss and potentially take action to have RCEA sign on to a letter calling on the California Public Utilities Commission to make PG&E a customer-owned utility.

6.2 PG&E Energy Watch 2020 Contract Work Authorization

Approve Draft PG&E Energy Watch Contract Work Authorization and authorize the Executive Director to execute the final agreement and any associated documents contingent on final review and approval of any revisions by RCEA legal counsel.

COMMUNITY CHOICE ENERGY (CCE) BUSINESS (Confirm CCE Quorum)

Items under this section of the agenda relate to CCE-specific business matters that fall under RCEA's CCE voting provisions, with only CCE-participating jurisdictions voting on these matters with weighted voting as established in the RCEA joint powers agreement.

7. OLD CCE BUSINESS

7.1. Renewable Long-Term Power Purchase Agreement Negotiation

Authorize staff to negotiate a power purchase agreement with EDP Renewables North America LLC for 50 MW of solar, to present to the Board for final approval.

8. NEW CCE BUSINESS

8.1. Customer Rate Update – Information only

END OF COMMUNITY CHOICE ENERGY (CCE) BUSINESS

9. STAFF REPORTS – None.

10. FUTURE AGENDA ITEMS

Any request that requires Board action will be set by the Board for a future agenda or referred to staff.

11. CLOSED SESSION

11.1. Public Employee Performance Evaluation, pursuant to Government Code Section 54957(b)(1): Executive Director.

12. RECONVENE TO OPEN SESSION

13. CLOSED SESSION REPORT

14. ADJOURNMENT

NEXT REGULAR MEETING
Thursday, December 19, 2019, 3:30 p.m.
Humboldt Bay Municipal Water District Office
828 7th Street, Eureka, CA 95501

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DRAFT BOARD OF DIRECTORS MEETING MINUTES

Humboldt Bay Municipal Water District Office **October 24, 2019**
828 7th Street, Eureka, CA 95501 **Thursday, 3:30 p.m.**

Chair Michael Winkler called a regular meeting of the Board of Directors of the Redwood Coast Energy Authority to order on the above date at 3:30 p.m. Notice of this meeting was posted on October 18, 2019. PRESENT: Vice Chair Austin Allison, Alternate Director Chris Curran, Estelle Fennell, Dean Glaser, Dwight Miller, Robin Smith, Frank Wilson, Chair Michael Winkler, Sheri Woo. ABSENT: None. STAFF PRESENT: General Counsel Nancy Diamond, Power Resources Director Richard Engel, The Energy Authority Client Services Specialist Jaclyn Harr, Executive Director Matthew Marshall, Clerk of the Board Lori Taketa.

Staff Director Engel stated there was a need for an emergency item requiring immediate action to be placed on this agenda, that staff was made aware of the need after agenda posting, and that a 2/3 vote of the Board is required to place the item on the agenda.

M/S: Fennell, Miller: Add emergency power procurement item to the meeting agenda.

The motion passed on a unanimous voice vote. Ayes: Allison, Curran, Fennell, Glaser, Miller, Smith, Wilson, Winkler, Woo. Absent: None.

REPORTS FROM MEMBER ENTITIES

Director Fennell stated that PG&E's Public Safety Power Shutoff raised questions for Humboldt County regarding future energy resilience.

Director Woo reported that Humboldt Bay Municipal Water District and the municipal agencies addressed water supply and pressure issues well during the power shutoff.

ORAL COMMUNICATIONS

Chair Winkler invited public comment. No one came forward to speak. Chair Winkler closed public comment.

CONSENT CALENDAR

3.1 Approve Minutes of September 26, 2019, Board Meeting.
3.2 Approve Disbursements Report.
3.3 Accept Financial Reports.
3.4 Approve Transaction by The Energy Authority, Inc. with NRG Power Marketing, LLC, for an Amount Above the Authorized Staff Transaction Execution Limit of $2 Million for 2020 Resource Adequacy.

Chair Winkler invited public comment. No one came forward to speak. Chair Winkler closed public comment.

M/S: Allison, Fennell: Approve consent calendar items.

The motion passed on a unanimous voice vote. Ayes: Allison, Curran, Fennell, Glaser, Miller, Smith, Wilson, Winkler, Woo. Absent: None.

EMERGENCY AGENDA ITEM – Resource Adequacy Transactions

Power Resources Director Engel reported that the California Public Utilities Commission recently changed rules to require Community Choice Aggregators to purchase resource adequacy for the next three years by October 31. The Energy Authority, which procures resource adequacy (RA) on RCEA's behalf, informed staff after the October 18 agenda publication date that RA has become increasingly expensive and difficult to procure, and that RA purchases above staff price authorization and term length limits must be approved by the Board prior to the next regular meeting. Failure to obtain the required RA would result in substantial financial penalties and bolster the argument for a central buyer, undermining Community Choice Aggregator and ratepayer interests.

The directors discussed current RA procurement methods; the timing of determining compliance requirements; and the new, difficult requirement to procure local RA outside of Humboldt County.

Chair Winkler invited public comment. No one came forward to speak. Chair Winkler closed public comment.

M/S: Miller, Allison: 1) Authorize Executive Director to approve resource adequacy transactions with The Energy Authority, Inc. for amounts above the authorized staff transaction value, term, and maturity limits until the 2020 compliance deadline of October 31, 2019, and 2) Require Board Finance Subcommittee authorization should the transaction amount exceed 125% of the CPUC fine for RCEA's non-compliance.

The motion passed on a unanimous voice vote. Ayes: Allison, Curran, Fennell, Glaser, Miller, Smith, Wilson, Winkler, Woo. Absent: None.

OLD BUSINESS

5.1 Comprehensive Action Plan for Energy Update – Information only

Executive Director Marshall reported on Comprehensive Action Plan for Energy public workshop progress, presented draft goals from RePower Humboldt, the revised title of RCEA's planning document, and summarized public comment to date. The Board will have the opportunity to do a final draft review at the November meeting and may consider plan approval in December.

The Directors described the public engagement process as thorough, inquired whether agency resources were adequate to fulfil the goals, stated how Community Choice Energy

enables more public engagement, and the need for resiliency and goals that can be accomplished.

Chair Winkler invited public comment.

Member of the public Daniel Chandler stated that biomass produces more greenhouse gas (GHG) emissions than coal and requested the Board not commit RCEA to long biomass contracts and do a life cycle analysis for alternative uses of mill waste.

Member of the public Rick Pelren described the 2025 goal as potentially dangerous because it forces acceptance of Terra Gen's wind farm as the first option presented. Mr. Pelren stated the project would produce 40% less energy than advertised due to line loss.

Member of the public Anna stated that biomass is not carbon neutral and that Humboldt County redwoods should be used as a carbon sink.

Member of the public Ken Miller requested electric vehicle promotion through home solar panel installation and stated that vehicle to grid electricity could provide mobile energy storage and supply.

Pat Kanzlen of Move to Amend and National Nurses United stated her opposition to biomass due to negative health impacts, requested that RCEA focus on solar energy and stated that solar panels should be put onto rental units.

Member of the public and Schatz Energy Research Center Managing Research Engineer Jim Zoellick stated his support for biomass, onshore and offshore wind, and aggressive solar energy increase plans. He requested a study on islanding Humboldt County, energy storage target additions and public energy education for informed decision-making engagement.

Member of the public Nancy Ihara presented a petition to the Board signed by Humboldt county residents who consider biomass to be unclean.

Member of the public Wendy Ring stated that if this CAPE revision does not lessen biomass' GHG impacts, there will be no time to correct impacts before the 2030 point of no return.

Member of the public Walt Paniak stated his opposition to biomass due to higher costs than solar and wind energy and that RCEA should not subsidize timber industry waste disposal.

Trinidad resident Ellen Golla stated that burning wood releases more carbon than burning gas, that EPA Title V plant energy use goes against what RCEA stands for, and expressed disappointment that the revised plan does not include residential wood burning limits.

HSU student and Arcata resident Noel requested a biomass GHG emission study and reduction of biomass energy use. Noel expressed support for energy education, local ownership of renewable energy projects, respect for local tribes and opposition for the Terra Gen project.

Fifth District Humboldt County Supervisor Steve Madrone stated the need for updated equipment if biomass power purchase agreements continue and for distributed biomass

development. Supervisor Madrone expressed that large companies leave when profits drop, and that new facilities with overhead lines through high fire risk areas are not good.

Member of the public Jesse Noelle stated that RCEA's biomass energy and Terra Gen's solar energy are too expensive compared to solar and that GHG emissions by wind farm construction and biomass burning sets off destructive positive feedback loops.

Humboldt State University student Portia Herger read a letter signed by national health organizations stating that biomass' small particle air pollution harms people's health. Ms. Herger stated that Humboldt County should set a positive example for the state.

Arcata resident Olivia Brock stated her support for CAPE targets other than biomass and requested solar on every house. Ms. Brock stated her opposition to the Terra Gen wind farm's continued colonization of indigenous lands and to biomass.

Arcata resident John Schaefer praised RCEA's public process, opposed long term biomass contracts given current plant conditions, requested GHG research on the biomass plants, expressed support of the Terra Gen project and stated that offshore wind would never be successful. Mr. Schaefer stated that PG&E's natural gas-powered plant produces less pollution than current biomass plants and inquired whether RCEA could support economical battery storage.

Arcata resident Diane Ryerson thanked RCEA for a public process enabling more public control of energy and requested that RCEA offer a biomass-free energy option. Ms. Ryerson expressed support for offshore wind, solar energy, vehicle to grid, islanding and use of ratepayer funds to leverage microgrid loans.

McKinleyville resident Fhyre Phoenix requested that every dollar and man hour currently used to pursue biomass energy be used to obtain solar or other cleaner energy forms.

Manila resident Linda Lee stated that with education and incentives Humboldt County residents can become part of a new energy movement and asked RCEA not to expend more than transitional energy for biomass.

Chair Winkler closed public comment.

The directors expressed appreciation for the public's participation and discussed battery manufacturing's environmental impacts, storing wood in homes as a carbon sink while fulfilling California Housing Authority building goals, partnering with Humboldt County Association of Governments on solar and electric vehicle initiatives, the need for agency focus on energy storage and supporting biomass workers' transition to alternative energy industries to lessen economic dependence on biomass.

5.2 Long-Term Renewable Energy Solicitation Update

Vice Chair Allison left at 5:34 p.m. Director Woo recused herself from discussion of agenda item 5.2 due to a remote conflict of interest and left the room at 5:35 p.m. Director Woo's conflict arises from her employment at SHN Engineers and Geologists, which performed work for Terra-Gen, of which Humboldt Wind, LLC is a subsidiary.

Power Resources Director Engel presented a staff report on suspension of negotiations with Candela Renewables due to project slowdowns. RCEA staff continue power purchase negotiations with Terra Gen/Humboldt Wind, LLC, and the project is moving through the County conditional use permit and environmental impact statement processes.

The Board agreed by consensus to have RCEA staff attend Humboldt County Planning Commission public hearings and provide information if asked about matters regarding the Humboldt Wind Project that are within the agency's scope of work and expertise.

Chair Winkler invited public comment.

Wiyot Tribal Botanist, GIS and Cultural Assistant Adam Cantor read a letter opposing the Terra Gen Wind Project for its negative impacts on Tsakiyuwit, or Bear River Ridge, and the Cape Mendocino ecological transect.

Rio Dell resident Suzanne Nesson expressed opposition to the Humboldt Wind Project and her desire to see Humboldt County's character preserved for her children.

Elk River resident Jesse Noell opposed the Humboldt Wind Project because of its persistent GHG emission development impacts, for which RCEA has a fiduciary responsibility.

Member of the public Rick Pelren stated his opposition to the Humboldt Wind Project because the production of 72 MW after line loss does not justify the destruction of 1,000 forest acres. Mr. Pelren expressed support for ocean wind farms.

Member of the public Ken Miller requested disclosure of the Terra Gen power purchase agreement terms and stated the importance of informing the County Planning Commission of public opposition to the project during the Comprehensive Action Plan for Energy meetings.

Chair Winkler closed public comment.

Director Fennell left at 6 p.m. Director Woo returned to the dais at 6:02 p.m.

5.3 RCEA Office Space Update – Information only

Staff reported that the search for suitable office space continues. The directors expressed willingness to consider building purchase and partnering with another agency in a larger building should these options prove to be fiscally prudent.

Chair Winkler invited public comment. No one came forward to speak. Chair Winkler closed public comment.

NEW BUSINESS

6.1. PG&E Public Safety Power Shutoff Event

Chair Winkler explained that he requested this agenda item because PG&E tried to operate Humboldt Bay Power Station during the recent public safety power shutoffs and disconnect Humboldt County from the grid but was unable to do so.

The directors discussed subcommittee formation, quarterly subcommittee reports, and a report from a technically-knowledgeable PG&E representative to the full Board during the January 2020 Board meeting on why PG&E was unable to island Humboldt County.

Chair Winkler invited public comment.

A member of the public advised using the historic Midwest to East Coast blackout as a possible islanding solution source.

Member of the public Ken Miller requested that RCEA promote solar generators to counter greenhouse gas (GHG) emissions from fossil fuel generators purchased and operated during the public safety power shutoff. Dr. Miller proposed promotion of local energy self-sufficiency through distributed energy rather than relying on PG&E or the grid.

Member of the public Walt Paniak advised recruiting allies with technical expertise to ensure productive interactions with PG&E.

Member of the public Ellen Golla expressed appreciation for acknowledging medically vulnerable peoples' needs during future power shutoffs.

Chair Winkler closed public comment.

M/S: Wilson, Glaser: Form an ad hoc Public Safety Power Shutoff Subcommittee comprised of Directors Fennell, Miller, Wilson and Chair Winkler to work with staff and PG&E to pursue a process to develop, test, and execute a plan to provide more advance notice and provisions for people with medical needs and to investigate whether it is possible by September 2020 for Humboldt County to operate as a mini-grid disconnected from the greater grid and continue electrical service if there is no fire danger within Humboldt County.

The motion passed. Ayes: Curran, Glaser, Miller, Smith, Wilson, Winkler, Woo. Absent: Allison, Fennell.

6.2. Redwood Coast Airport Microgrid Project Site Tree Removal Request for Proposals

Executive Director Marshall reported on the airport solar energy storage microgrid project construction, which will be four times larger than the Blue Lake Rancheria microgrid. A row of trees that will significantly shade the panels is slated for removal.

Chair Winkler invited public comment.

Member of the public Ellen Golla requested finding a use for the wood other than donating it to low-income seniors as wood burning increases the entire community's medical expenses.

Another member of the public requested planting 100 trees for each tree removed.

Chair Winkler closed public comment.

M/S: Glaser, Woo: Authorize staff, after securing authorization of site control from the County, to issue a request for proposals for removing trees along the southern boundary of the microgrid project site at the California Redwood Coast-Humboldt County Airport.

The motion passed on a unanimous voice vote. Ayes: Curran, Glaser, Miller, Smith, Wilson, Winkler, Woo. Absent: Allison, Fennell.

COMMUNITY CHOICE ENERGY (CCE) BUSINESS

A quorum was not present to conduct Community Choice Energy business.

M/S: Woo, Glaser: Move agenda item 7.1 – Energy Risk Management Quarterly Report to the Non-CCE New Business portion of the agenda.

The motion passed. Ayes: Curran, Glaser, Miller, Smith, Wilson, Winkler, Woo. Absent: Allison, Fennell.

NEW BUSINESS (continued)

6.3. Energy Risk Management Quarterly Report (Information only)

The Energy Authority Client Services Specialist Jaclyn Harr presented the Energy Risk Management Quarterly report. Ms. Harr warned that TEA may not be able to buy enough affordable carbon free energy to meet the CCE program's targets in 2020 and beyond and stated that renewable solar and wind cost less than current Pacific Northwest carbon-free large hydropower. TEA asked the Board to consider alternatives, including new, green, potentially local, power sources that can be added to the grid, displacing some natural gas. Staff will bring some choices for 2020 back to the Board for consideration in November.

Chair Winkler invited public comment. No one came forward to speak. Chair Winkler closed public comment.

CLOSED SESSION

Counsel Diamond stated there were no action items for the closed session meeting with legal counsel per Government Code Section 54956.9(d)(4), in re PG&E, Bankruptcy Court, 19-30088, Northern District of California, and that, due to the late hour, discussion could be postponed until the following meeting.

Chair Winkler adjourned the meeting at 6:56 p.m.

Respectfully submitted,

Lori Taketa
Clerk of the Board

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Accrual Basis

Redwood Coast Energy Authority
Disbursements Report
As of September 30, 2019

Type	Date	Num	Name	Memo	Amount
Check	09/01/2019	ACH	CoPower	Premium	-353.20
Check	09/01/2019	9515	CoPower	VOID: Premium	0.00
Bill Pmt -Check	09/04/2019	ACH	NextEra	Tradable RECs - Category 2.	-18,200.00
Liability Check	09/05/2019	E-pay	EDD	499-0864-3 QB Tracking # 2012321030	-3,882.84
Liability Check	09/05/2019	E-pay	Internal Revenue Service	74-3104616 QB Tracking # 2012379030	-20,047.56
Liability Check	09/05/2019	E-pay	EDD	499-0864-3 QB Tracking # 2012409030	-115.22
Paycheck	09/06/2019	9930	Employee	Paycheck	-549.05
Paycheck	09/10/2019	9929	Employee	Paycheck	-2,655.37
Check	09/10/2019	9931-42	NEM Customers	NEM Customer Payments	-721.38
Check	09/10/2019	9941	EUC Customer	EUC Assessment: Larson	-500.00
Check	09/10/2019	9942	EUC Customer	EUC Assessment Refund: Alfkin	-500.00
Bill Pmt -Check	09/10/2019	9943	City of Arcata	August Utility User Tax	-9,522.04
Bill Pmt -Check	09/10/2019	9944	City of Arcata	August High Energy Use Tax	-3,455.64
Bill Pmt -Check	09/10/2019	9945	HCOE	Glen Paul School self-install rebate/Audit 5925	-4,326.32
Bill Pmt -Check	09/10/2019	9946	ABC Office Equipment	August print/copying services	-1,995.69
Bill Pmt -Check	09/10/2019	9947	American Public Power Association	Registration: L. Biondini, Business & Financial Confe	-1,635.00
Bill Pmt -Check	09/10/2019	9948	Avcollie, M.	August mileage reimbursement	-88.16
Bill Pmt -Check	09/10/2019	9949	Backwoods Solar	EV Charging station equipment	-8,580.00
Bill Pmt -Check	09/10/2019	9950	Boudreau, D.	Travel reimbursement: Sacramento, 8/26-8/28/19	-414.29
Bill Pmt -Check	09/10/2019	9951	Boutin Jones	CCE Legal Services	-551.65
Bill Pmt -Check	09/10/2019	9952	Braun Blaising Smith Wynne	Legal Services	-38,236.06
Bill Pmt -Check	09/10/2019	9953	City of Arcata	Larson Park self-install rebate/Audit 5635	-3,847.87
Bill Pmt -Check	09/10/2019	9954	City of Blue Lake	August Utility User Tax	-857.20
Bill Pmt -Check	09/10/2019	9955	City of Eureka-Water	Water service, 7/25-8/26/19	-182.02
Bill Pmt -Check	09/10/2019	9956	Developed Employment Services, LLC.	Facilities maintenance work	-38.81
Bill Pmt -Check	09/10/2019	9957	Diamond, Nancy	Legal Services	-12,405.30
Bill Pmt -Check	09/10/2019	9958	Enterprise	Car Rentals	-318.13
Bill Pmt -Check	09/10/2019	9959	Eureka Public Marina	Venue rental / Offshore Wind meeting	-370.00
Bill Pmt -Check	09/10/2019	9960	Eureka Rubber Stamp	Employee Appreciation Plaque	-37.38
Bill Pmt -Check	09/10/2019	9961	FedEx	Residential box mailing	-15.25
Bill Pmt -Check	09/10/2019	9962	Ferndale USD	Audit Rebates	-340.00
Bill Pmt -Check	09/10/2019	9963	Freshwater School District	Freshwater School self-install rebate/Audit 5591	-890.19
Bill Pmt -Check	09/10/2019	9964	Gwynn, J.	Aug & Sept travel reimbursements	-113.18
Bill Pmt -Check	09/10/2019	9965	HCOE	Business Card Printing	-42.00
Bill Pmt -Check	09/10/2019	9966	Hilson, D.	August mileage reimbursement	-110.95
Bill Pmt -Check	09/10/2019	9967	HireRight	Background Check: new hires	-167.62
Bill Pmt -Check	09/10/2019	9968	Humboldt Bay Coffee Co.	Office Supply	-34.60
Bill Pmt -Check	09/10/2019	9969	Klamath River Cuisine	CAPE public meeting supplies	-100.00
Bill Pmt -Check	09/10/2019	9970	Local Government Commission	CivicSpark Services	-4,636.38
Bill Pmt -Check	09/10/2019	9971	Local Worm Guy	Weekly compost pickup	-30.00
Bill Pmt -Check	09/10/2019	9972	Loleta Market	VOID: Ponci's Diesel self-install rebate/Audit 5714	0.00
Bill Pmt -Check	09/10/2019	9973	Lost Coast Communications	Media Outreach	-806.00
Bill Pmt -Check	09/10/2019	9974	Mad River Union	A1 Ad	-121.00
Bill Pmt -Check	09/10/2019	9975	Marshall, M.	July travel reimbursement: TEA partners mtg	-852.45
Bill Pmt -Check	09/10/2019	9976	McMahon, J.	August mileage reimbursement	-120.00
Bill Pmt -Check	09/10/2019	9977	Means, M.	August mileage	-9.57
Bill Pmt -Check	09/10/2019	9978	Mission Uniform & Linen	Sept. mat service, janitorial supplies	-170.14
Bill Pmt -Check	09/10/2019	9979	NGI, Inc.	Contractor Rebate	-2,497.93
Bill Pmt -Check	09/10/2019	9980	North Coast Cleaning	August monthly cleaning service	-438.00
Bill Pmt -Check	09/10/2019	9981	Pacific Paper Company	Misc. office supplies.	-12.37
Bill Pmt -Check	09/10/2019	9982	PG&E EV Account	EV stations July	-424.08
Bill Pmt -Check	09/10/2019	9983	PG&E Utility Account	July utilities & lighting upgrade payment	-782.14
Bill Pmt -Check	09/10/2019	9984	Platt/Rexel	PO #B0013 Bulbs	-1,865.44
Bill Pmt -Check	09/10/2019	9985	Scrapper's Edge	Printing Services	-287.76

Accrual Basis

Redwood Coast Energy Authority
Disbursements Report
As of September 30, 2019

Type	Date	Num	Name	Memo	Amount
Bill Pmt -Check	09/10/2019	9986	SDRMA Dental	September Premium	-1,246.73
Bill Pmt -Check	09/10/2019	9987	SDRMA Medical	August Premium	-20,049.12
Bill Pmt -Check	09/10/2019	9994	SDRMA Medical	October Premium	-25,483.68
Bill Pmt -Check	09/10/2019	9995	Shred Aware	Shredding Services	-130.00
Bill Pmt -Check	09/10/2019	9996	Stephenson, Nancy	August and September reimbursements	-355.75
Bill Pmt -Check	09/10/2019	9997	Terry, P.	August Mileage	-122.50
Bill Pmt -Check	09/10/2019	9998	The Independent	Print Advertising: CAPE workshop	-232.81
Bill Pmt -Check	09/10/2019	10019	Times Printing Company	Printing Services	-2,554.22
Bill Pmt -Check	09/10/2019	10020	Verizon Wireless	August tablet/cell service for field staff/mobile broadb	-228.90
Paycheck	09/10/2019	ACH	Employees	Payroll - August	-51,493.47
Bill Pmt -Check	09/13/2019	ACH	Staples Charge Account	August Statement - office supplies	-790.34
Bill Pmt -Check	09/13/2019	10021	CA Dept. of Tax & Fee Administration	Electrical Energy Surcharge adjustment 31-0003366	-2,007.02
Bill Pmt -Check	09/13/2019	10022	CalCCA	Operational Member dues Q1 19/20	-27,240.00
Bill Pmt -Check	09/13/2019	10023	California Coastal Endeavors	REISSUE: Get Real Ventures self-install rebate/Audit	-555.42
Bill Pmt -Check	09/13/2019	10024	Developed Employment Services, LLC.	Facilities maintenance work	-69.68
Bill Pmt -Check	09/13/2019	10025	Local Government Commission	CvicSpark Services and Annual Membership Fee	-4,918.20
Bill Pmt -Check	09/13/2019	10026	Recology	Garbage Services	-181.44
Bill Pmt -Check	09/13/2019	10027	Suddenlink Communications	Phone & Internet services - July/August	-2,112.74
Bill Pmt -Check	09/13/2019	10028	WREGIS	WREGIS "Retired" fees adjustment	-707.50
Liability Check	09/19/2019	E-pay	EDD	499-0864-3 QB Tracking # -1743986266	-3,871.79
Liability Check	09/19/2019	E-pay	Internal Revenue Service	74-3104616 QB Tracking # -1743962266	-19,405.84
Liability Check	09/19/2019	E-pay	EDD	499-0864-3 QB Tracking # -1743944266	-141.88
Liability Check	09/19/2019	10030	Calvert	SIMPLE IRA	-12,495.06
Liability Check	09/19/2019	10031	Calvert	SIMPLE IRA - final paycheck	-99.70
Liability Check	09/19/2019	10032	Umpqua Bank	HSA Contribution	-698.72
Bill Pmt -Check	09/24/2019	ACH	CalPine Corporation	Calpine August 2019 Costs	-73,688.55
Bill Pmt -Check	09/24/2019	ACH	DG Fairhaven	DG Fairhaven August 2019	-374,889.02
Bill Pmt -Check	09/24/2019	ACH	Humboldt Redwood Company	Humboldt Redwood CO. August 2019	-720,315.02
Paycheck	09/25/2019	10029	Employee	Paycheck	-2,655.36
Check	09/25/2019	10033-46	NEM Customers	NEM Payments	-666.38
Bill Pmt -Check	09/25/2019	10047	Best Cleaners	Coverall & linens laundering	-10.00
Bill Pmt -Check	09/25/2019	10048	Bicoastal Media, LLC	Radio Ads	-750.00
Bill Pmt -Check	09/25/2019	10049	Bithell, M.	May & Sept. Reimbursements	-48.45
Bill Pmt -Check	09/25/2019	10050	Brant Electric	Baywood COuntry Club Rebate / Audit 5245	-972.99
Bill Pmt -Check	09/25/2019	10051	Brennan, K.	August mileage reimbursement - EW	-19.37
Bill Pmt -Check	09/25/2019	10052	CoPower	October premium	-353.20
Bill Pmt -Check	09/25/2019	10053	David L. Moonie & Co., LLP	Annual accounting records close, auditing.	-105.00
Bill Pmt -Check	09/25/2019	10054	Developed Employment Services, LLC.	Facilities maintenance work	-67.42
Bill Pmt -Check	09/25/2019	10055	Engel, R.	September Mileage: R. Engel	-75.40
Bill Pmt -Check	09/25/2019	10056	FedEx	Residential box mailing	-15.63
Bill Pmt -Check	09/25/2019	10057	HCOE	Business Card Printing - S. Valenzuela	-21.00
Bill Pmt -Check	09/25/2019	10058	Humboldt Bay Coffee Co.	Office Supply	-34.60
Bill Pmt -Check	09/25/2019	10059	McMahon, J.	August mileage reimbursement	-48.66
Bill Pmt -Check	09/25/2019	10060	Mission Uniform & Linen	Mat and cleaning services	-60.14
Bill Pmt -Check	09/25/2019	10061	Mitch Trachtenberg	Public meeting facilitation: CAPE workshops	-380.00
Bill Pmt -Check	09/25/2019	10062	North Coast Journal	Print Media	-858.00
Bill Pmt -Check	09/25/2019	10063	NYLEX.net, Inc.	Onsite network support services - October	-3,200.00
Bill Pmt -Check	09/25/2019	10064	PG&E CCA	August CCE Charges	-22,160.18
Bill Pmt -Check	09/25/2019	10065	Platt/Rexel	Bulb orders	-14,642.99
Bill Pmt -Check	09/25/2019	10066	Ray Morgan Company	Printer Delivery & Installation	-5,070.02
Bill Pmt -Check	09/25/2019	10067	Redwood Community Radio	Underwriting: CAPE workshops	-780.00
Bill Pmt -Check	09/25/2019	10068	Scrapper's Edge	Wide Format printing: CAPE workshops	-305.54
Bill Pmt -Check	09/25/2019	10069	SDRMA Dental	October Premium	-1,556.39
Bill Pmt -Check	09/25/2019	10070	Suddenlink Communications	Phone & Internet access - September	-1,105.48

Accrual Basis

Redwood Coast Energy Authority
Disbursements Report
As of September 30, 2019

Type	Date	Num	Name	Memo	Amount
Bill Pmt -Check	09/25/2019	10071	Times Printing Company	Mailing services	-1,521.44
Bill Pmt -Check	09/25/2019	10072	Winzler, John	Office Lease - October	-4,524.00
Bill Pmt -Check	09/25/2019	10073	HCOE	Educational Resource Center: self-install rebate/Audi	-206.64
Bill Pmt -Check	09/25/2019	10074	HCOE	Franklin Site: self-install rebate/Audit 5919	-939.39
Bill Pmt -Check	09/25/2019	10075	Platt/Rexel	Bulb orders	-1,348.63
Paycheck	09/25/2019	ACH	Employees	Payroll - September	-48,908.55
Paycheck	09/30/2019	10076	Employee	Final Paycheck	-355.32
Paycheck	09/30/2019	10077	Employee	Final Paycheck	-6,231.45
TOTAL					**-1,615,335.95**

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Redwood Coast Energy Authority
Balance Sheet
As of September 30, 2019

	Sep 30, 19
ASSETS	
Current Assets	
Checking/Savings	
1010 · Petty Cash	414.35
1050 · GRANTS & DONATIONS 3840	15,204.58
1060 · Umpqua Checking Acct 0560	-30,484.31
1071 · Umpqua Deposit Cntrol Acct 8215	3,371,319.05
1075 · Umpqua Reserve Account 2300	2,000,000.00
8413 · COUNTY TREASURY 3839	5,065.52
Total Checking/Savings	5,361,519.19
Total Accounts Receivable	248,207.06
Other Current Assets	
1101 · Allowance for Doubtful Accounts	-340,915.54
1103 · Accounts Receivable-Other	8,615,339.97
1120 · Inventory Asset	21,715.00
1202 · Prepaid Expenses	-34,662.11
1210 · Retentions Receivable	8,738.37
1499 · Undeposited Funds	5,495.57
Total Other Current Assets	8,275,711.26
Total Current Assets	13,885,437.51
Total Fixed Assets	151,725.39
Total Other Assets	-145,900.00
TOTAL ASSETS	**13,891,262.90**
LIABILITIES & EQUITY	
Liabilities	
Current Liabilities	
Total Accounts Payable	5,050,338.22
Total Credit Cards	0.00
Total Other Current Liabilities	625,296.15
Total Current Liabilities	5,675,634.37
Long Term Liabilities	
2700 · Long-Term Debt	
2701 · Lighting Upgrade	318.15
Total 2700 · Long-Term Debt	318.15
2703 · TEA Phase I & II	63,787.06
Total Long Term Liabilities	64,105.21
Total Liabilities	5,739,739.58
Equity	
2320 · Investment in Capital Assets	151,407.23
3203 · LTD - TEA Phase I & II	-63,787.06
3900 · Fund Balance	6,329,032.55
Net Income	1,734,870.60
Total Equity	8,151,523.32
TOTAL LIABILITIES & EQUITY	**13,891,262.90**

Redwood Coast Energy Authority
Profit & Loss Budget vs. Actual
July through September 2019

	Jul - Sep 19	Budget	% of Budget
Ordinary Income/Expense			
Income			
Total 4 GRANTS AND DONATIONS	270.00		
5 REVENUE EARNED			
Total 5000 · Revenue - government agencies	10,409.19	125,000.00	8.33%
Total 5100 · Revenue - program related sales	7,471.35	16,000.00	46.7%
Total 5400 · Revenue-nongovernment agencies	302,237.97	2,576,300.00	11.73%
Total 5500 · Revenue - Electricity Sales	14,706,348.40	53,482,965.00	27.5%
Total 5 REVENUE EARNED	15,026,466.91	56,200,265.00	26.74%
9500 Debt Proceeds	0.00	2,730,300.00	0.0%
Total Income	15,026,736.91	58,930,565.00	25.5%
Gross Profit	15,026,736.91	58,930,565.00	25.5%
Expense			
Total 6 WHOLESALE POWER SUPPLY	10,195,308.74	42,295,190.00	24.11%
Total 7 PERSONNEL EXPENSES	599,022.03	3,026,492.00	19.79%
Total 8.1 FACILITIES AND OPERATIONS	1,522,038.18	4,539,920.00	33.53%
Total 8.2 COMMUNICATIONS AND OUTREACH	42,305.24	115,000.00	36.79%
Total 8.3 TRAVEL AND MEETINGS	18,758.05	68,000.00	27.59%
8.4 PROFESSIONAL & PROGRAM SRVS			
8400 · Regulatory	49,458.90	184,000.00	26.88%
Total 8410 · Contracts - Program Related Ser	30,359.45	435,000.00	6.98%
8420 · Accounting	105.00	68,950.00	0.15%
8430 · Legal	33,968.16	125,000.00	27.18%
8450 · Wholesale Services - TEA	149,851.05	602,401.00	24.88%
8460 · Procurement Credit - TEA	160,454.41	753,809.00	21.29%
8470 · Data Management - Calpine	220,280.56	882,348.00	24.97%
Total 8.4 PROFESSIONAL & PROGRAM SRVS	644,477.53	3,051,508.00	21.12%
Total 8.5 PROGRAM EXPENSES	159,933.02	555,786.00	28.78%
Total 8.6 INCENTIVES & REBATES	94,652.34	881,500.00	10.74%
Total 9 NON OPERATING COSTS	15,371.18	169,518.00	9.07%
Total Expense	13,291,866.31	54,702,914.00	24.3%
Net Ordinary Income	1,734,870.60	4,227,651.00	41.04%
Net Income	**1,734,870.60**	**4,227,651.00**	**41.04%**

REDWOOD COAST EnergyAuthority

STAFF REPORT

Agenda Item # 5.1

AGENDA DATE:	November 21, 2019
TO:	Board of Directors
PREPARED BY:	Dana Boudreau, Director of Operations
SUBJECT:	EV Charging Network upgrades through CALeVIP grant funds

SUMMARY

In May 2019 the Redwood Coast Energy Authority applied to receive grant funds through the state CALeVIP program. The funds are meant to upgrade electric vehicle charging equipment in our charging network that have prohibitive maintenance costs or are reaching end of life. As of October the CALeVIP program has reserved $120,000 for reimbursable expenses at eight of our sites to date, and we have until July 2020 to complete all work and receive reimbursement for these locations; see table below.

EV Charger Site	Amount Requested	Status
St. Joseph Hospital	$24,000	Reserved
McKinleyville	$12,000	Reserved
Arcata Technology Center	$12,000	Reserved
Arcata F St Parking Lot	$12,000	Reserved
Rio Dell	$12,000	Reserved
Willow Creek	$24,000	Reserved
North Coast Unified AQMD	$12,000	Reserved
Trinidad	$12,000	Reserved
Ferndale	$12,000	Pending

RCEA seeks to solicit bids from qualified contractors to remove existing EV charging hardware and install new hardware. Although our preference is to combine all sites into a single contract, some sites, such St. Joseph Hospital, will likely require separate bid processes to address unique site characteristics. RCEA will purchase the hardware at a substantial discount through pre-approved equipment vendor ChargePoint. No changes are required for electric service, but site modification may be required at selected sites to meet ADA compliance.

Our Ferndale site is still pending potential reservations. If reservations are secured, staff proposes to bundle it into this bid process, or to pursue a separate bid process depending on schedule and other constraints. The proposed budget below assumes that we secure reserved funds for all sites in the above table.

Staff recommends a working project budget of $158,400, composed of $120,000 in reserved grant funds, an additional $12,000 in pending grant reservations, and $26,400 (20% contingency of $132,000) from previously approved RCEA transportation project funds.

RCEA has also applied for an additional $120,000 at three other locations. These are a new site in an Old Town Eureka city public parking lot, a new site at the Arcata Community Center, and the existing

Fortuna location across from the City Hall. The Fortuna location was confirmed late in the first-come-first-served application process and as a result is lower in the queue. CALeVIP funds are currently fully subscribed for our region, but these projects are next in queue should funds become available. Since the sites are waitlisted, they will be handled through a future approval process if they receive reservations.

EV Charger Site	Amount Requested	Status
621 3rd Street, Eureka	$60,000	Waitlist
321 Dr Martin Luther King Jr Pkwy Arcata, CA	$48,000	Waitlist
633 3rd Street Fortuna, CA 95540	$12,000	Waitlist

FINANCIAL IMPACTS

Financial impacts will be a net gain of approximately $120,000 in CALeVIP grant funds, potentially up to $120,000 to $132,000. Staff expects that the CALeVIP funds will cover most if not all costs at the selected sites. Since CALeVIP operates on a reimbursement basis, there will be a small financial cost to float reimbursable expenses for roughly 270 days.

Based on the loss of Verizon 3G network service on December 31, 2019 and delays in the CALeVIP reservation process, some or all affected EV chargers will likely lose network connectivity before upgrades are complete. To keep EV charging available to the public, staff recommends operating the stations at no cost to the public. This will result in a revenue loss of approximately $1,400/month. Our expected duration in this mode is two months.

RECOMMENDED ACTIONS

1. Authorize staff to solicit bids and secure construction at all listed sites as appropriate, for a total aggregate budget not to exceed $144,000, and to seek reimbursement through the CALeVIP program.

REDWOOD COAST EnergyAuthority

STAFF REPORT

Agenda Item # 5.2 - REVISED

AGENDA DATE:	November 21, 2019
TO:	Board of Directors
PREPARED BY:	Dana Boudreau, Director of Operations
SUBJECT:	Airport Microgrid Project Site Preparation Coordination and Reimbursement

SUMMARY

Redwood Coast Energy Authority is partnering with Humboldt State University's Schatz Energy Research Center (SERC), PG&E, and the County of Humboldt to build a 7-acre, 2.5 MW solar array and battery energy storage system at the California Redwood Coast – Humboldt County Airport.

The site requires a new fence to secure the project site from the Air Operations Area at the start of construction efforts and through the life of the project and removing trees and brush along the southern perimeter fence line to prevent an 11% reduction in annual energy production.

In recent project partner conversations between RCEA and County staff, the County offered to conduct brush clearing, tree removal, and possibly fence installation, subject to cost reimbursement by RCEA. Completing these activities through the County's bid process will allow the project construction milestones to stay on schedule.

FISCAL IMPACT

Not calculated, but will be a net positive gain for the project overall based on lower costs of the County informal bid process.

RECOMMENDED ACTIONS

1) Authorize reimbursement to County for: a) brush removal and site work in preparation for fence installation; and/or b) fence installation; and/or c) tree removal.

2) Authorize RCEA Executive Director to sign an Access and Reimbursement Agreement with County.

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REDWOOD COAST EnergyAuthority

STAFF REPORT

Agenda Item # 5.3

AGENDA DATE:	November 21, 2019
TO:	Board of Directors
FROM:	Matthew Marshall, Executive Director
PREPARED BY:	Lori Taketa, Executive Support Specialist
SUBJECT:	Public Safety Power Shutoffs in Humboldt County

SUMMARY

At the October 24 RCEA Board meeting, the directors decided to form an ad hoc Public Safety Power Shutoff Subcommittee comprised of Directors Fennell, Miller, Wilson and Chair Winkler to work with staff and PG&E to pursue a process to develop, test, and execute a plan to provide more advance notice and provisions for people with medical needs. The Board's primary direction to the subcommittee and staff was to work with PG&E to investigate whether it is possible by September 2020 for Humboldt County to operate as a mini-grid disconnected from the greater grid and continue electrical service if there is no fire danger within Humboldt County. This independent electrical operation where a distributed generator continues to feed the load even when the electrical grid supply is disconnected is referred to as "islanding."

Staff will provide the directors with current information on islanding Humboldt County at the November 21 meeting.

RECOMMENDED ACTIONS

None - information only.

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REDWOOD COAST EnergyAuthority

STAFF REPORT

Agenda Item # 5.4

AGENDA DATE:	November 21, 2019
TO:	Board of Directors
PREPARED BY:	Matthew Marshall, Executive Director
SUBJECT:	Comprehensive Action Plan for Energy Update

SUMMARY

Draft 3.0 of the RePower Humboldt - Comprehensive Action Plan for Energy 2019 update is attached for the Board's review and input, with the goal of final adoption at the December 19 Board meeting. Attached to the current draft are two supporting technical appendices providing additional details on A) the quantitative targets included in the plan, including forecasted local renewable energy generation potential by 2030, and B) information on the assumptions and methodologies behind the quantitative targets.

In total there were 221 participants at the six workshops held in August, September, and October (that total double counts any individuals who attended more than one workshop). RCEA has as of November 8 also received a total of 1,200 written comments. All comments are available on RCEA's website, and below is staff's high-level categorization of comments received. Note that some comments addressed multiple topics so the total number of individual commenters is less than 1,200. Also note that many individuals that attended workshops also submitted written comments.

Overall summary

Topic Commented On	Number of Comments
Energy efficiency	6
General	6
Electricity Generation	1171
Planning	5
Process	7
Transportation	5

Breakdown of 1171 written comments on electricity generation

Generation category	Total	Support	Against	Mixed
Biomass	**1111**	358	742	11
Onshore wind	**14**	5	19	3
Offshore wind	**1**	2	0	0
Solar	**12**	12	0	0
General power resources	**8**			
Distributed generation	**7**			
Rates and tariffs	**3**			
Infrastructure	**1**			

The above tables illustrate that the topic that generated by far the most input (both positive and negative) is the inclusion of local biomass power in RCEA's electricity mix. On October 18 RCEA conducted a "Forests, Energy, and Environment" workshop on the topic of local biomass utilization benefits and impacts. There were 74 participants at the workshop, and RCEA hired professional videographers to capture the panel discussion and public comments; the recoding of the workshop is available on RCEA's website and will also be aired on Access Humboldt.

At the Board meeting Michael Furniss, RCEA's climate and forests consultant who led the October 18 workshop, will provide a report summarizing the workshop, consultations, and research on biomass power in Humboldt County. Additional perspective on the concerns and benefits associated with local biomass power generation will also be provided through short presentations by local climate and health activist Dr. Wendy Ring and University of California Cooperative Extension Forest Advisor and Humboldt County Director Yana Valachovic.

RECOMMENDED ACTION:

Provide staff with input on final draft of 2019 CAPE.

ATTACHMENTS:

Clean and red-line versions of Draft 3.0 of the Comprehensive Action Plan for Energy.

RePower Humboldt

The Redwood Coast Energy Authority's Comprehensive Action Plan for Energy

2019 UPDATE – DRAFT 3.0

11-15-19

REDWOOD COAST
EnergyAuthority

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TABLE OF CONTENTS

Executive Summary

Consistent with Humboldt County's General Plan, the County of Humboldt recognizes the Redwood Coast Energy Authority (RCEA) as the regional energy authority to foster, coordinate, and facilitate countywide strategic energy planning, implementation, and education through RePower Humboldt, RCEA's comprehensive action plan for energy. This action plan consists of implementation measures specific to the functions of RCEA as the regional energy authority for Humboldt County and in alignment with the mission and purpose in RCEA's Joint Powers Agreement, which is to:

> Develop and implement sustainable energy initiatives that reduce energy demand, increase energy efficiency, and advance the use of clean, efficient and renewable resources available in the region.

The strategies within this 2019 update of the RePower Humboldt strategic plan will be implemented between 2020-2030 to achieve the goals listed below. Reduction targets are from a baseline year of 2018, unless otherwise stated. While this plan has a ten-year time horizon, RCEA will revisit it regularly during that period to keep it updated and reflective of changes to our community's needs and energy market trends.

REGIONAL PLANNING AND COORDINATION

RCEA will take a leadership role to develop and advance strategic regional energy goals through economic development, funding, planning efforts, and education. This work will be done in coordination with RCEA's member governments, other local public agencies, local tribes, and other public and private stakeholders.

Goals: Achieve net-zero greenhouse gas emissions county-wide by 2030.

By 2030 fully establish Humboldt County as an energy secure community that can affordably and reliably meet its local energy needs with local renewable resources and has the robust local capabilities and infrastructure necessary to effectively respond to energy emergencies or disruptions in energy supply.

Build the clean energy sector into a cornerstone of the local economy through a breadth of strategies that include innovation, research and development, local energy-related business development, and establishing Humboldt Bay as the primary west coast hub for the offshore wind energy industry.

INTEGRATED DEMAND SIDE MANAGEMENT

RCEA will use an Integrated Demand Side Management approach to develop distributed energy resources and reduce energy consumption in the residential, commercial, industrial, agricultural, and government sectors and to align customer energy use with variable clean and renewable energy supplies. RCEA will prioritize efforts that enhance local energy resiliency and independence.

Goals: Support the wide-spread installation of customer solar photovoltaic energy systems, with a target to increase installations to a rate of one system every day for the next decade and reach 30MW of customer solar installed by 2025 and 50MW installed by 2030.

Make energy efficiency and conservation services available to every household and business in the county by 2030.

Expand existing energy efficiency, conservation and electrification programs to reduce greenhouse gas emissions from fossil fuel use in buildings by 20% by 2030 and maintain a trajectory to reduce emission from natural gas by 90% by 2050.

Develop a network of community microgrids and renewable-energy back-up power systems across the county to reduce greenhouse gas emissions and to provide energy resiliency and long-duration emergency energy supply at all critical facilities by 2030.

LOW-CARBON TRANSPORTATION

RCEA will decarbonize regional transportation through efforts to reduce vehicle miles travelled, increase advanced fuel vehicles adoption and fuel efficiency, and expand advanced fuel infrastructure.

Goals: Accelerate the adoption of electric vehicles, with a target of over 6,000 electric vehicles on the road in Humboldt County by 2025 and 22,000 vehicles by 2030. Develop public, workplace, and residential electric vehicle charging infrastructure necessary to support these county-wide electric vehicle targets.

Work with other local public entities to reduce vehicle miles traveled in Humboldt County by at least 25% by 2030.

By 2030 reduce greenhouse gas emissions from transportation by over 65% through reductions in vehicle miles traveled, improved vehicle efficiency, the adoption of electric vehicles, and, where determined to be an effective emissions-reduction strategy, the use of biofuels as a bridge to a full transition to zero-emissions vehicles. Maintain a trajectory of emissions reduction to eliminate the use of fossil fuels by 2050.

ENERGY GENERATION AND UTILITY SERVICES

RCEA will address Humboldt County's supply-side energy needs through its existing Community Choice Energy (CCE) program and development of new programs and initiatives.

Goals: By 2025 100% of RCEA's power mix will be from a combination of state-designated renewable energy sources—solar, wind, biomass, small hydroelectric, and geothermal—and state-designated net-zero-carbon-emission existing large hydroelectric facilities.

By 2030 Humboldt County will be a net exporter of renewable electricity and RCEA's power mix will consist of 100% local, net-zero-carbon-emission renewable sources.

Humboldt County can effectively respond to regional and local disruptions to energy supply and distribution systems through modernization of the local electric grid, the

deployment of local distributed energy resources, and the development of community microgrids.

Introduction

ENERGY FUELS OUR EVERYDAY LIVES

With the impending consequences of global climate change on the horizon, it's never been a more important time to significantly reduce greenhouse gas emissions. It's imperative that Humboldt County does its part to reduce emissions within the next ten years as the world strives to keep global warming at or below 1.5 °C above pre-industrial levels. The effects of climate change will impact Northern California by increasing annual maximum temperatures, altering stream flows, lengthening the fire season, sea level rise, and increased risk of flooding, as well as increasing the likelihood of intense storms within a shorter wet season and a prolonged dry season. The surest way to take action to reduce emission and lessen the effects of climate change is by targeting the biggest source of emissions, the energy sector.

In Humboldt County, each of us depends on energy 24 hours a day, and we continuously benefit from the direct and indirect use of energy resources. Energy is ever present in our daily lives and much of the time it's taken for granted. From the sun we draw heat, light, and solar power; while it works to grow our food, forests, flowers, and more. We depend on fossil fuels to get us to work, school, local shops, as well as to transport our food, commodities, mail, and garbage. Electricity enables us to work after the sun goes down; we depend on it to light our offices, classrooms, and streets; to keep our food cold and our ice cream frozen; to pump water through pipes; to transmit information and keep in touch. Energy in a diversity of forms fuels our industries and business ventures: from powering lumber mills to dairy farms; from firing ceramics to pizzas, and from brewing beer to baking bread. It's clear that reliance on energy resources characterizes a large part of our everyday lives.

The production and consumption of energy also affects our daily lives in more indirect ways, particularly with regard to the environment. The burning of fossil fuels has led to damaging environmental effects such as acid rain, smog, water pollution, and global warming. Exploratory drilling and extraction of non-renewable energy sources (such as coal, petroleum, and natural gas), and their attendant infrastructure, has resulted in the degradation of other natural resources, for example forests, coastal communities, and rainforests. Although these areas may be far away, the environmental impacts can reach Humboldt County. The fact is, all forms of energy production, including renewable energy, have environmental and social impacts, and responsible energy planning seeks to minimize negative impacts while maximizing community benefits.

The original RePower Humboldt strategic plan published in 2013 showed that Humboldt County has hundreds of megawatts of untapped renewable energy potential from a variety of sources, including solar, wind, wave, and biomass. With a population of less than 140,000 and a limited industrial base, electric loads in Humboldt are light. In contrast, California's urban counties have much larger loads and little potential for renewable energy generation other than rooftop solar. For example, in 2018 San Francisco consumed seven times as much electricity as Humboldt County, and Los Angeles County used 85 times Humboldt's load. If California as a whole is to meet its renewable energy and greenhouse gas reduction goals, resource-rich counties like Humboldt will need to export a portion of their energy wealth to these urban load centers.

In Humboldt County, energy is used as a transportation fuel and as electrical and heat energy in homes, businesses, industries, and agriculture. In 2015 it is estimated that Humboldt County spent over $400 million to meet local energy demands, the majority of which left the county. A major portion of the energy was used as transportation fuel (gasoline and diesel), with large amounts also used to meet end use electrical demands and end-use natural gas heating demands. Primary energy sources were comprised mainly of natural gas, gasoline, diesel, and propane.

REDWOOD COAST ENERGY AUTHORITY MISSION AND PURPOSE

The purpose of the Redwood Coast Energy Authority is to develop and implement sustainable energy initiatives that reduce energy demand, increase energy efficiency, and advance the use of clean, efficient and renewable resources available in the region for the benefit of the Member agencies and their constituents. To further that purpose, the Redwood Coast Energy Authority will work toward the following goals, as enumerated in our Joint Powers Agreement:

A. To lead, coordinate and integrate regional efforts that advance secure, sustainable, clean and affordable energy resources.

B. To develop a long-term sustainable energy strategy and implementation plan.

C. To increase awareness of, and enhance access to, energy conservation, energy efficiency, and renewable energy opportunities available to the region.

D. To add value to, but not duplicate, energy services offered by utilities and others serving the region in a manner that does not conflict with acting as a community choice aggregator.

E. To keep key decision makers and stakeholders informed of policy, regulatory, and market changes that are likely to impact the region.

F. To support research, development, demonstration, innovation, and commercialization of sustainable energy technologies by public and private entities operating in Humboldt County.

G. To develop regional capabilities to respond to energy emergencies and short-term disruptions in energy supply, infrastructure, or markets that could adversely affect Humboldt residents and businesses.

In striving to achieve the above goals, RCEA will ensure that environmental and social impacts associated with production and consumption of energy are minimized, and that any unavoidable impacts are borne to the extent possible within Humboldt County rather than by other communities, and will seek to maximize social, economic, and environmental benefits to Humboldt County associated with local energy production

The RePower Humboldt plan is intended to support achieving these goals through strategies that specifically address: Regional Energy Planning & Coordination, Integrated Demand Side Management, Low-Carbon Transportation, and Energy Generation & Utility Services.

VISION STATEMENT

The below vision statement was developed in 2005 through the public comment process for the original draft of the Humboldt County General Plan Energy Element prepared by RCEA. It expresses the community qualities and characteristics that the RePower Humboldt plan aspires to achieve, expressed as how Humboldt County could be described in 2030. Minor modifications have been made to the original vision statement to reflect recent changes to the state and local energy economies, as well as community input gathered in developing this 2019 RePower Humboldt update.

In 2030…

Humboldt County has achieved the goal of net-zero greenhouse gas emissions and is a net exporter of renewable energy. We achieve energy independence and self-sufficiency through high levels of energy conservation, efficiency, and electrification combined with locally-produced and -managed energy generation. Our energy comes from renewable sources. Money spent on energy stays in the county.

Individual communities have developed greater energy self-sufficiency and independence as has the county overall. Citizens have a diversity of choices for how to meet their energy needs. We have local control over energy prices. We readily adapt to any major external changes in energy supply or technology.

Our energy consumption is level from year to year, due to increasing conservation and efficiency to offset increases in growth-related demand.

Our overall quality of life is better than it was in 2005. The population is healthier as a result of leading energy-conserving lifestyles. It is common, safe, pleasant, and economically favorable to have a lifestyle that doesn't consume much energy.

Energy conservation education has reached, and continues to reach, effectively, everyone in the county. Energy considerations and decisions are integrated with all other decision-making arenas.

The county has minimized negative environmental, social, and economic impacts associated with meeting its energy needs, while ensuring any unavoidable impacts are borne locally rather than by other communities

The County is energy efficient through neighborhood design. Good community planning has reduced sprawl. There are fewer automobiles used for travel; people depend more on transit, bikes, walking, and shared-use automobiles than they depend on private automobiles. Public transportation is conveniently available and well utilized. There is much less consumption of energy from non-renewable sources for transportation.

All buildings are energy efficient. All new construction is all-electric and done in the most energy efficient manner, starting with building design. All existing buildings have been upgraded to be more efficient and many have converted their previous uses of natural gas and propane to electricity. Energy efficiency is integral to locally adopted building standards, which have flexibility and include meaningful incentives. Many homes and businesses produce more energy than they consume.

The County is a thriving research and development center and incubator for energy technology and related manufacturing, which is a stable source of local jobs.

Strategies

Regional Energy Planning & Coordination

RCEA will take a leadership role to develop and advance strategic regional energy goals through economic development, funding, planning efforts, and education. This work will be done in coordination with RCEA's member governments, other local public agencies, local tribes, and other public and private stakeholders.

Goals: **Achieve net-zero greenhouse gas emissions county-wide by 2030.**

By 2030 fully establish Humboldt County as an energy secure community that can affordably and reliably meet its local energy needs with local renewable resources and has the robust local capabilities and infrastructure necessary to effectively respond to any energy emergencies or disruptions in energy supply.

Build the clean energy sector into a cornerstone of the local economy through a breadth of strategies that include innovation, research and development, local energy-related business development, and establishing Humboldt Bay as the primary west coast hub for the offshore wind energy industry.

ECONOMIC DEVELOPMENT

Attract Energy-related Business. Collaborate with local economic development entities to attract technology developers, manufacturers, and energy service providers to locate operations in the County when appropriate.

Support Proactive Energy-related Business Development. Collaborate with local jurisdictions to identify and pre-assess locations and facilities for energy-related business ventures.

Support Energy-sector Workforce Development. Work with other local entities to provide training and continuing education that develops and maintains a qualified local workforce available to implement energy efficiency upgrades, renewable energy projects, and advanced-vehicle technology deployment.

ENERGY-RELATED EMERGENCY RESPONSE

Develop Emergency Response Capabilities. Coordinate with other local entities to develop regional capabilities to respond to energy emergencies and disruptions impacting energy supply, infrastructure, or energy markets. Incorporate efforts to enhance emergency response capabilities across all of RCEA's customer programs.

Assist with Energy Emergency Response Procedures. Assist the Humboldt County Office of Emergency Services in the preparation of energy response procedures for the Humboldt County Emergency Response Plan.

Support Climate Change Adaptation. Work with other local entities to conduct a climate change risk assessment and develop an adaptation plan consistent with the best-practices guidance provided by the California Natural Resources Agency and California Office of Emergency Services.

FUNDING

Develop Regional Energy Funding Mechanisms. Offer support and act as the fiscal agent and funding clearinghouse for countywide energy programs.

Pursue Cap and Trade Auction Proceeds. Work regionally to access Cap and Trade auction proceeds and other State funding mechanisms to ensure effective, efficient, coordinated, and equitable resource allocation in the North Coast Region.

Develop Job Development Incentives. Collaborate with local economic development entities to identify funding opportunities for developing jobs in the field of energy conservation, efficiency, and renewable sources.

Implement Energy Project Financing. Work with local economic development entities and/or financial institutions to develop and implement financing programs that enable residents and businesses to implement energy efficiency and renewable energy projects. Facilitate Property Assessed Clean Energy (PACE) and other financing programs that access the needed capital to deploy regional energy independence strategies.

Develop Local Energy Investment Programs. Work with local economic development entities and financial institutions to develop programs and resources that facilitate local community investment in and/or ownership of energy efficiency and renewable energy projects.

Pursue an Investment Grade Credit Rating for RCEA's Community Choice Energy Program. Through building program reserves and responsible program management, secure an investment grade credit rating from a major financial services company to support long-term energy transactions.

PLANNING

Support Renewable Energy Permitting. Support the County in streamlining permitting for renewable energy generation including updating zoning codes and creating wind energy GIS overlays.

Support Carbon Sequestration. Support the development and deployment of mechanisms for retaining carbon in the region's abundant natural areas and working lands.

Assist with Climate Action Planning. Work with local jurisdictions to regularly complete greenhouse gas inventories, set greenhouse gas reduction targets, and develop climate action plans.

Support Countywide Strategic Energy Planning. Coordinate an effective energy strategy based on self-sufficiency, development of renewable energy resources, energy conservation, and electrification that is actively implemented countywide through Climate Action Plans, General Plans and the Redwood Coast Energy Authority's RePower Humboldt plan.

Encourage Adoption of Energy Elements. Encourage and assist with the adoption of energy elements by other local and regional jurisdictions. Periodically review local energy elements and recommend updates, as necessary, to reflect changing technologies for the generation, transmission, and efficient use of energy.

Encourage Energy Policies and Plans. Encourage other jurisdictions and entities, including the cities in Humboldt County, to adopt and implement sound energy plans and policies, to include energy elements and/or energy policies in their general plans and ordinances. Advocate and disseminate energy planning strategies, policies, and other information.

Promote Energy Efficiency, Renewable Energy, and Storage Permitting. Support local ordinances that streamline permitting processes for energy efficiency, renewable energy, and storage technologies.

Develop Programs that Foster Social Equity. Identify, fund, and establish new programs that address the energy needs of the least advantaged and underserved members of our community.

EDUCATION

Maintain an Energy Resource Center. Operate an energy resource center open to the public and provide information on energy conservation, energy planning, renewable energy, energy storage, low-carbon transportation, all-electric buildings, and energy-efficient building design and retrofits.

Hold Regional Energy Forums. Serve as a forum for addressing countywide energy issues.

Develop Public Displays. Encourage and assist development of educational displays for exemplary renewable energy and distributed energy systems installed throughout Humboldt County. Displays should provide county residents and businesses with information on how the systems work and how well they perform and should inform county residents about the importance, benefits, and associated impacts of developing local energy resources.

Provide Energy Efficiency, Conservation and Electrification Education and Training. Provide community education, information, and resources on energy issues to support informed decision making related to customer energy use, including the benefits of conservation, electrification and increased energy efficiency. Collaborate with schools and colleges for energy-related research, education, and conservation practices.

Provide Energy Professional Education and Training. Provide and encourage training for local contractors and energy professionals on energy-related topics such as: energy code, energy

efficiency, demand response, zero net energy retrofits and construction, electrification, heat pumps, battery storage and solar.

Integrated Demand Side Management

RCEA will use an Integrated Demand Side Management approach to develop distributed energy resources and reduce energy consumption in the residential, commercial, industrial, agricultural, and government sectors and to align customer energy use with variable clean and renewable energy supplies. RCEA will prioritize efforts that enhance local energy resiliency and independence.

Goals: **Support the wide-spread installation of customer solar energy systems, with a target to increase installations to a rate of one system every day for the next decade and reach 30MW of customer solar installed by 2025 and 50MW installed by 2030.**

Make energy efficiency and conservation services available to every household and business in the county by 2030.

Expand existing energy efficiency, conservation and electrification programs to reduce greenhouse gas emissions from fossil fuel use in buildings by 20% by 2030 and maintain a trajectory to reduce emission from natural gas by 90% by 2050.

Develop a network of community microgrids and renewable-energy back-up power systems across the county to reduce greenhouse gas emissions and to provide energy resiliency and long-duration emergency energy supply at all critical facilities by 2030.

INTEGRATED DEMAND SIDE MANAGEMENT STRATEGIES

Support Member Agency and Local Government Energy Management. Support member agencies in managing their energy usage. RCEA will support activities that reduce and align energy use with available clean and renewable supplies to reduce costs while being consistent with state energy goals and Greenhouse Gas Emission Reduction goals. Additional activities will be prioritized where they support energy resiliency and independence.

Support Implementation of Codes and Standards. Support the State's goals related to residential and commercial net-zero-energy and zero-net carbon standards along with other green building

standards, including the local implementation of Title 24 building energy codes, Title 20 appliance efficiency standards and individual projects that strive to achieve energy efficiencies that exceed state and local requirements. Support the consideration, adoption, and implementation of above code energy ordinances.

Assist with Facility Benchmarking. Assist local governments and businesses with facility benchmarking to evaluate and track the energy performance of non-residential buildings.

Perform Energy Assessments. Advise building owners on the life cycle costs and benefits of energy efficiency, conservation, demand response, generation, electrification and storage opportunities through assessments. Assessments will be followed with comprehensive reports detailing an integrated strategy for energy management.

Integrate Distributed Energy Resources. Develop and implement customer programs that support, promote and integrate distributed energy resources, including but not limited to grid-connected generation, energy storage, energy efficiency, electric vehicle and demand response technologies.

Integrate a Distributed Energy Resource Management System. Support the development and installation of systems needed for effective and responsive management of distributed energy resources. Evaluate the potential integration of distributed energy resources into a unified system that would allow RCEA to aggregate and automate demand response activities.

Support and Deploy Microgrids. Support and deploy energy microgrids, focusing on critical infrastructure and community facilities, that combine onsite generation, energy storage, and advanced control systems to provide energy resiliency and maintain emergency-response capabilities as well as ongoing economic and environmental benefits.

Use Advanced Metering Infrastructure. Support advanced metering infrastructure to expand every customer's visibility into their energy usage for more ownership and control of their energy related behavior and decisions. Use advanced metering data to make informed program decisions.

ENERGY EFFICIENCY & CONSERVATION

Maximize the Efficiency of Buildings. Support energy efficiency and conservation as core strategies toward achieving environmental, economic, and community goals. Promote the whole-house approach to energy efficiency using the latest building science and incorporating interactive effects between passive and active energy systems in a home. First reduce the need to use energy and then use energy efficiently where it is required. An example would be to air seal and insulate the home and furnace ductwork to reduce heat loss before upgrading the furnace. Support programs that increase building shell efficiency through air sealing, insulation, and window upgrades while improving comfort and indoor air quality.

Support Electrification. Prioritize the development and implementation of programs and services that promote the replacement of fossil fuel burning appliances with the most energy-efficient electric equipment including heat pump hot water and space heaters and the electrification of commercial and industrial processes.

Increase Equipment Efficiency through Market Transformation. Prioritize the development and implementation of programs and services that promote the use of the most energy-efficient equipment for space and water heating, ventilation, lighting, refrigeration, and air conditioning in all buildings, including residential, commercial and industrial facilities.

Promote Performance Contracting. Promote residential and commercial performance contracting that is consistent with current best practices for energy efficiency and environmentally sound construction techniques.

Develop and Support Behavioral, Retro-Commissioning and Operations Programs. Promote, develop, and implement programs that enable energy conservation and load-shifting through customer behavior changes, building system retro-commissioning, and operational changes.

Promote Smart Technologies and Smart Controls. Support the replacement of existing plug load devices with smart technology devices that are programmed to save energy, shift energy use outside of peak hours, and/or provide automated demand response using utility signaling. Examples include internet-of-things enabled lighting, water and space conditioning, dish and clothes washing, and refrigeration. Promote control technologies that adjust the use of equipment based on environmental input or demand. Examples include variable speed fans and ventilation, variable speed pumps and motors, daylighting controls, occupancy sensor controls, smart thermostats, and building management systems.

DEMAND RESPONSE

Implement Demand Response and Distributed Energy Resource Programs. Support and prioritize demand response programs that offer customers a role in balancing energy usage with the availability of electricity on the grid**.**. Demand response programs and offerings will, where possible, integrate with distribution-connected efficiency systems and controls, renewable energy generation, and energy storage measures. Where feasible, energy technologies will be controllable and integrated as a distributed resource; any such efforts will require customer education and approval and will be implemented with a commitment to respecting and protecting customers' rights to privacy.

Support Reduced Energy Use During Peak Hours and Peak Event Days. Notify, support, and enable action from customers who choose to participate by shifting energy usage to off-peak hours, reduce daily energy usage during peak hours, and/or reduce energy usage during peak event days.

Enable Automated Demand Response. Install communicable controls with electrification, efficiency, and storage technologies that automatically reduce energy use during demand response events. Implement building demand response systems that allow for the curtailment of loads without major impacts to occupants and operations.

CUSTOMER DISTRIBUTED GENERATION & STORAGE

Support Customer Installation of Distributed Generation. Support the deployment of behind-the-meter grid-connected renewable energy and storage systems as core strategies toward achieving environmental, economic, and community stability/resilience goals.

Implement the Public Agency Solar Program. Continue to implement the solar and energy-storage technical assistance program for public agencies; integrate grid-connected resources, efficiency, electrification and microgrids as feasible.

Implement a Community Solar and Storage Program. Evaluate, design and launch community solar and storage program services that support the increased adoption of grid-connected solar and storage technologies.

Integrate Vehicle to Grid Storage. Integrate vehicle to grid storage solutions with transportation and demand side management goals and objectives.

Low-carbon Transportation

RCEA will decarbonize regional transportation through efforts to reduce vehicle miles travelled, increase advanced fuel vehicles adoption and fuel efficiency, and expand advanced fuel infrastructure.

Goals: **Accelerate the adoption of electric vehicles, with a target of over 6,000 electric vehicles on the road in Humboldt County by 2025 and 22,000 vehicles by 2030. Develop public, workplace, and residential electric vehicle charging infrastructure necessary to support these county-wide electric vehicle targets.**

Work with other local public entities to reduce vehicle miles traveled in Humboldt County by at least 25% by 2030.

By 2030 reduce greenhouse gas emission from transportation by over 65% through reductions in vehicle miles traveled, improved vehicle efficiency, the adoption of electric vehicles, and, where determined to be an effective emissions-reduction strategy, the use of biofuels as a bridge to a full transition to zero-emissions vehicles. Maintain a trajectory of emissions reduction to eliminate the use of fossil fuels by 2050.

REDUCE VEHICLE MILES TRAVELED

Strengthen Broadband Infrastructure. Support efforts to strengthen rural regional broadband infrastructure to facilitate remote access to educational and business opportunities, and deploy advanced, resilient grid management technology and integrated energy efficiency and demand response solutions.

Encourage Transportation-efficient Land Use Planning. Encourage infill, transit-oriented development, and walkable and bikeable communities through thoughtful zoning and land-use planning processes.

Facilitate Multi-modal Transportation Infrastructure. Support improving multi-modal transportation options through regional trail networks, transit infrastructure, and complete streets infrastructure strategies that support walking, biking, carsharing, ridesharing, and the use of public transportation.

INCREASE ADVANCED FUEL VEHICLE ADOPTION & FUEL EFFICIENCY

Support Local Vehicle Fleet Owners Leading by Example. Encourage local government and private fleets to maximize the use of low-carbon vehicles and support low-carbon transportation initiatives at other agencies.

Promote Advanced Fuels. Equitably promote, support and incentivize low carbon vehicle and fuel adoption by local governments, commercial fleets, and the public. Encourage the use of non-fossil sources of advanced fuels that reduce greenhouse gas emissions, which may include electricity, hydrogen, biodiesel, ethanol, and renewable diesel.

Support Electric Vehicle Adoption. Conduct public outreach campaigns to promote electric vehicles. Offer electric vehicle incentives and provide customers with web and in-person decision support when considering the purchase of an electric vehicle. Conduct leadership by example among government agencies.

Promote Efficient Driving Practices. Promote the use of energy-efficient driving practices that improve fuel efficiency, such as moderate speed changes and legal speeds, anti-idling, and traffic-calming features.

Support Shipping Efficiency. Support the implementation of trucking efficiency technologies and best-practices, including idle-reduction technologies, aerodynamic retrofits, and low rolling resistance tires. Support the analysis of other potential transportation modes that could provide efficient shipping alternatives such as barge and rail.

EXPAND FUELING INFRASTRUCTURE

Develop Transportation Electrification Infrastructure. Develop and implement Electric Vehicle charging stations. Provide local incentives for electric vehicle charging infrastructure and prioritize technologies that align with integrated demand-side management goals.

Utilize Biofuels. Promote use of biofuels with low California Low Carbon Fuel Standard (LCFS) scores, particularly those produced with local waste feedstocks.

Streamline Permitting for Electric Vehicle Charging Infrastructure. Encourage local jurisdictions to list vehicle charging as a permitted use across a broad range of zoning classifications. If a zoning review is triggered, consider vehicle charging as an accessory use to another permitted use whenever possible. Develop a standard vehicle charging permitting process.

Promote Vehicle-to-Grid Connection. Promote integration of electric vehicles with the electric grid. Evaluate the development status of vehicle-to-grid interconnect standards and the use of grid-connected vehicles for short-term energy storage.

Energy Generation & Utility Services

RCEA will address Humboldt County's supply-side energy needs through its existing Community Choice Energy (CCE) program and development of new programs and initiatives.

Goals: **By 2025 100% of RCEA's power mix will be from a combination of state-designated renewable energy sources—solar, wind, biomass, small-hydroelectric, and geothermal—and state-designated net zero carbon emission existing large hydroelectric facilities.**

By 2030 Humboldt County will be a net exporter of renewable electricity and RCEA's power mix will consist of 100% local, net-zero-carbon-emission renewable sources.

Humboldt County can effectively respond to regional and local disruptions to energy supply and distribution systems through modernization of the local electric grid, the deployment of local distributed energy resources, and the development of community microgrids.

POWER RESOURCES

Maximize the Use of Local Renewable Energy to the Extent Technically and Economically Feasible and Prudent. Use the CCE program with its renewable energy targets, and programs supporting distributed energy resources, to achieve this goal.

Minimize Greenhouse Gas Emissions Associated with RCEA's CCE Program. Procure a power mix that by 2025 has zero greenhouse gas emissions as counted under the California Air Resources Board's Regulation for the Mandatory Reporting of Greenhouse Gas Emissions, other than emissions from resources meeting California's Renewable Portfolio Standard. Assess, evaluate, and monitor the short-term and lifecycle emissions from all generation sources to ensure power resources align with RCEA's greenhouse gas emissions goals.

Act as Community Liaison to Renewable Energy Developers. Using RCEA's position as a wholesale power purchaser, work with developers on proactive strategies to reduce and mitigate the environmental and community impacts of potential energy projects. Ensure that local projects are developed in such a way that prioritizes community benefits.

Maximize Renewable Energy Content of RCEA's CCE Program. Procure a power mix that reaches 100% clean and renewable content by 2025.

Ensure Diversity in Local Sources. Pursue development of a diverse, locally produced renewable electricity supply that is price-competitive in the California power market and that can be generated in a way that minimizes adverse environmental and community impacts.

Promote Energy Feasibility Studies. Encourage and support feasibility studies of local wind, solar, hydropower, and ocean energy resources. Make recommendations on preferred alternatives that are consistent with community goals for energy security and sustainability.

Power Resources: Distributed Generation

Designate "Renewable Energy Parks." Work with County and City planning departments to designate areas of the county preferred for renewable energy development.

Develop Distributed Generation. Encourage studies to identify key locations throughout the county that would benefit from distributed generation systems. Encourage development of responsive distributed generation demonstration sites

Provide Feed-In-Tariff Power Procurement Program for Small Generators. Offer long-term contracts at a market-adjusting rate for Renewable Portfolio Standard eligible renewable energy generators.

Power Resources: Solar

Support Utility Scale Solar Energy Development. Support local efforts to develop solar electric systems in the county. Support development of local training programs for solar contractors and installers. Educate the public about the benefits of solar energy systems. Develop programs that facilitate an increase in the number of solar energy systems in the county.

Procure Local Solar Energy. Contract for local onshore solar energy as part of RCEA's community choice energy portfolio to the extent economically feasible and compatible with portfolio diversity needs.

Power Resources: Offshore Wind

Develop Offshore Wind Energy. Work with public and private entities to develop offshore wind energy off of the north coast region's coastline, and support establishing Humboldt Bay as a west-coast hub for the offshore wind industry.

Procure Local Offshore Wind Energy. Contract for local offshore wind energy as part of RCEA's community choice energy portfolio to the extent economically feasible and compatible with portfolio diversity needs.

Power Resources: Onshore Wind

Promote Large-Scale Wind Energy. Provide information about the potential for cost-effective, commercial-scale wind farms in the county. Educate the public about the benefits and impacts of wind energy systems. Work with utilities, local government, and private companies to develop onshore wind energy projects.

Procure Local Onshore Wind Energy. Contract for local onshore wind energy as part of RCEA's community choice energy portfolio to the extent economically feasible and compatible with portfolio diversity needs.

Power Resources: Bioenergy

Support Biomass Fuels Reduction and Utilization. Develop strategies and technologies for improved biomass utilization in ways that effectively support restoration objectives and fire management priorities. Coordinate with local agencies, communities, and landowners to develop biomass energy plans that are consistent with sustainable forest management, hazardous fuels reduction, fire safety, and restoration needs.

Procure Local Biomass Energy. Contract with local biomass facilities at a scale not to exceed the local supply of wood waste from mills and, when feasible and appropriate, from forest management and restoration activities. Require and support a high standard of environmental performance from RCEA's biomass suppliers. Support the deployment of the best-available emissions control technologies. Determine whether, within the context of local commercial forest land management practices and the forest-products sector, local biomass power generation sector has net-zero greenhouse gas emissions on both a short-term and long-term basis, adjusting RCEA's biomass strategy as needed to ensure net-zero emissions.

Promote Small-Scale Biomass Generation Sites. Monitor feasibility of smaller and/or mobile biomass electric generators fed with wood waste and very small diameter logs (e.g., from thinning for fire safety and timber harvest slash). If/when technology proves feasible and cost effective, promote its use in county areas where appropriate.

Pursue Biogas Development. Support HWMA and others with the development of organic waste digesters. Develop and publicize dairy biogas demonstration sites and work with local

farm organizations to promote dairy biogas energy systems where appropriate. Publicize the use of biogas at existing local wastewater treatment facilities and encourage its use at additional facilities where appropriate. Encourage biogas use to produce electricity onsite rather than pipeline injection to support long-term phaseout of natural gas distribution infrastructure and avoid the potential greenhouse gas emission impacts of pipeline leaks.

Power Resources: Wave and Tidal

Pursue Wave and Tidal Energy Development. Build on the previous WaveConnect and CalWave projects to explore and evaluate opportunities for local wave and tidal energy research, development, and pilot deployment.

Power Resources: Hydro

Support Existing and New Local Small-scale Hydroelectric Power. Evaluate options for contracting with existing small hydroelectric projects as well as the development of new run-of-river hydroelectric projects that would be eligible for Renewable Portfolio Standard designation and compatible with environmental and cultural priorities. Update the Oscar Larson and Associates' 1982 assessment of small hydroelectric resource potential in the county.

UTILITY ENERGY SERVICE

Minimize Energy Interruptions. Work with local utility providers to minimize the impact of power outages and improve the reliability and resiliency of the local electricity delivery service.

Provide Energy via Direct Access. Explore the feasibility of RCEA acting as an electricity provider through direct access.

Review Utility Options. Review the effectiveness of the incumbent utility in meeting Humboldt County's long-term energy needs and evaluate the feasibility of establishing a local municipal electric utility or joining a new regional public power entity.

Provide Outstanding Customer Service to RCEA Customers. Ensure that participants in RCEA's community choice energy program receive high-quality customer service related to enrollment, rates, billing, and customer programs supported by CCE program customer funds.

RATES & TARIFFS

Provide Community Choice Energy Program Customer Rate Savings. Provide customer rates that are affordable and price-competitive with customers' other electric supply options.

Provide Electricity Buyback from Self Generators. Provide a net energy metering program that encourages more distributed local generation and more equitably compensates such generation.

Retain and/or Redirect Rate-Payer Dollars Back into Humboldt County. Work to maximize the amount of ratepayer dollars retained in Humboldt County when taking into consideration local power

procurement, electricity rates, local program spending, and allocations toward building the reserve fund for RCEA's Community Choice Energy program.

Provide Match Funding for State, Federal, and Foundation Energy Grants. Support bringing resources into Humboldt County to pursue CCE community energy goals.

Support Transition to Time of Use Rates. Inform and educate CCE customers on CPUC transition to default Time Of Use rates. Support customer adoption and transition to time of use electricity rates.

Provide Education on all Electric Rate Schedule Options. Provide information on all available electric rate schedules including Net Energy Metering, Time Of Use, and RePower+ (100% renewable energy). Offer electric rate analysis to estimate financial impacts of different rate schedules. Inform and educate the community of the California Public Utilities Commission's transition to default Time Of Use rate schedules.

Provide a 100% Carbon-Free Service Option for CCE Customers. Develop an additional opt-up choice for CCE customers consisting of solar energy and other emissions-free resources, with a portion of the incremental revenues used to underwrite energy programs benefitting community non-profits and/or low income residential CCE participants.

TRANSMISSION & DISTRIBUTION INFRASTRUCTURE

Facilitate Transmission Assessments and Monitoring. Encourage development of long-term transmission assessments and, if necessary, electrical transmission grid upgrade and/or expansion plans. Monitor local electricity transmission system planning to ensure that projected growth areas are adequately served and to support the development of local renewable energy projects.

Support Upgrade of the Electricity Transmission and Distribution System. Collaborate with PG&E, the California Independent System Operator, and renewable energy developers to upgrade the regional transmission and distribution electrical grid to enable increased development of both utility-scale renewable energy projects and community-scale distributed generation systems, including capability to export surplus renewable electricity from Humboldt County to other areas of the state and to operate Humboldt County's grid independently during regional emergencies.

Appendix A:
Quantitative Targets

This appendix articulates the targets for Humboldt County's electricity generation and use on the ten-year horizon that is outlined in RCEA's RePower Strategic Plan. The following sections lay out anticipated changes to electricity supply and demand due to buildout of new renewable energy resources, electrification of transportation and building energy use, and increased adoption of distributed energy.

Power Resources

The portfolio of local generation sources anticipated to meet Humboldt County's electricity demand in 2030 includes new and existing resources, as seen in Table 1. In addition to existing small hydroelectric and biomass facilities, two utility scale wind projects, one small hydroelectric facility, and several solar plants are planned to be developed without requiring the buildout of additional transmission capacity[1].

Table 1 Nameplate capacities of currently-operational and planned generators in the Humboldt Local Reliability Area.

Generator Name	Resource	Location	Operational Capacity (MW)	Planned Capacity (MW)
DG Fairhaven Power	biomass	Humboldt	15	15
Humboldt Sawmill Cogeneration	biomass	Humboldt	25	32.5
Baker Station Hydro Plant	hydro	Humboldt	1.5	1.5
Big Creek Water Works	hydro	Trinity	5	5
Gosselin Hydroelectric Plant	hydro	Trinity	2	2
Kekawaka Hydro Plant	hydro	Trinity	5	5
Three Forks Waterpower Project	hydro	Trinity	1	1
Boulder Creek Hydro Plant	hydro	Humboldt	-	8
Redwood Coast Airport Microgrid	solar	Humboldt	-	2
RCEA Feed-In Tariff Projects	solar	Humboldt	-	6
Redwood Coast Offshore Wind	wind	Humboldt	-	120
Terra-Gen Humboldt Wind	wind	Offshore	-	125
		Total	54.5	323

[1] The CAISO interconnection study currently underway may result in transmission infrastructure upgrades to accommodate the offshore wind capacity shown.

Figure 1 shows a comparison of RCEA's power mix in 2018, comprised of local biomass power and other non-local sources, and the anticipated renewable power supply for the entire county in 2030[2].

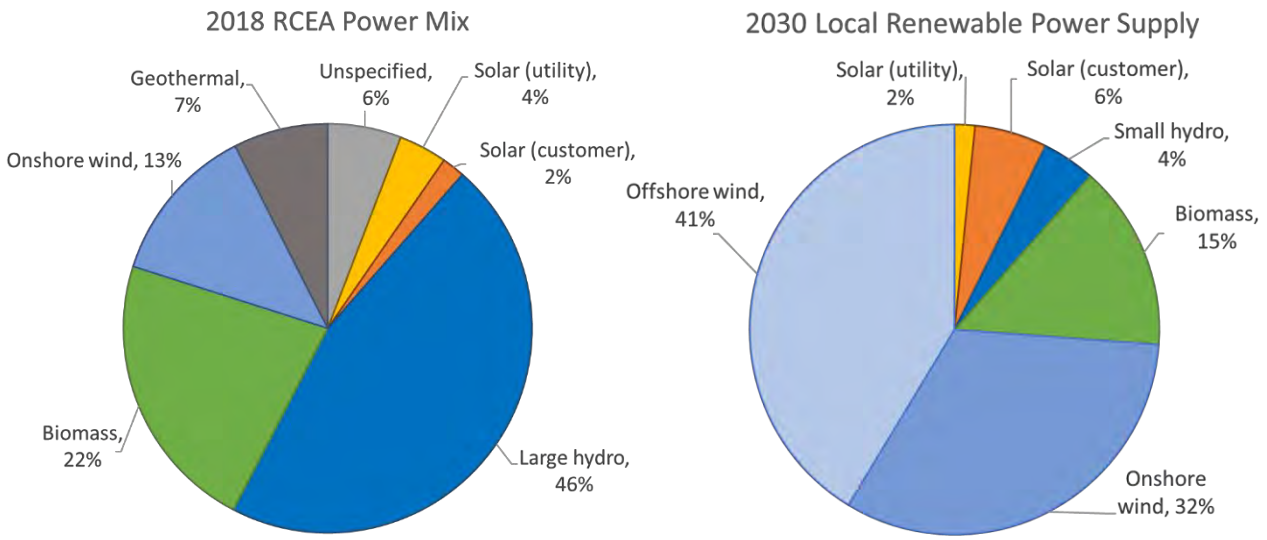
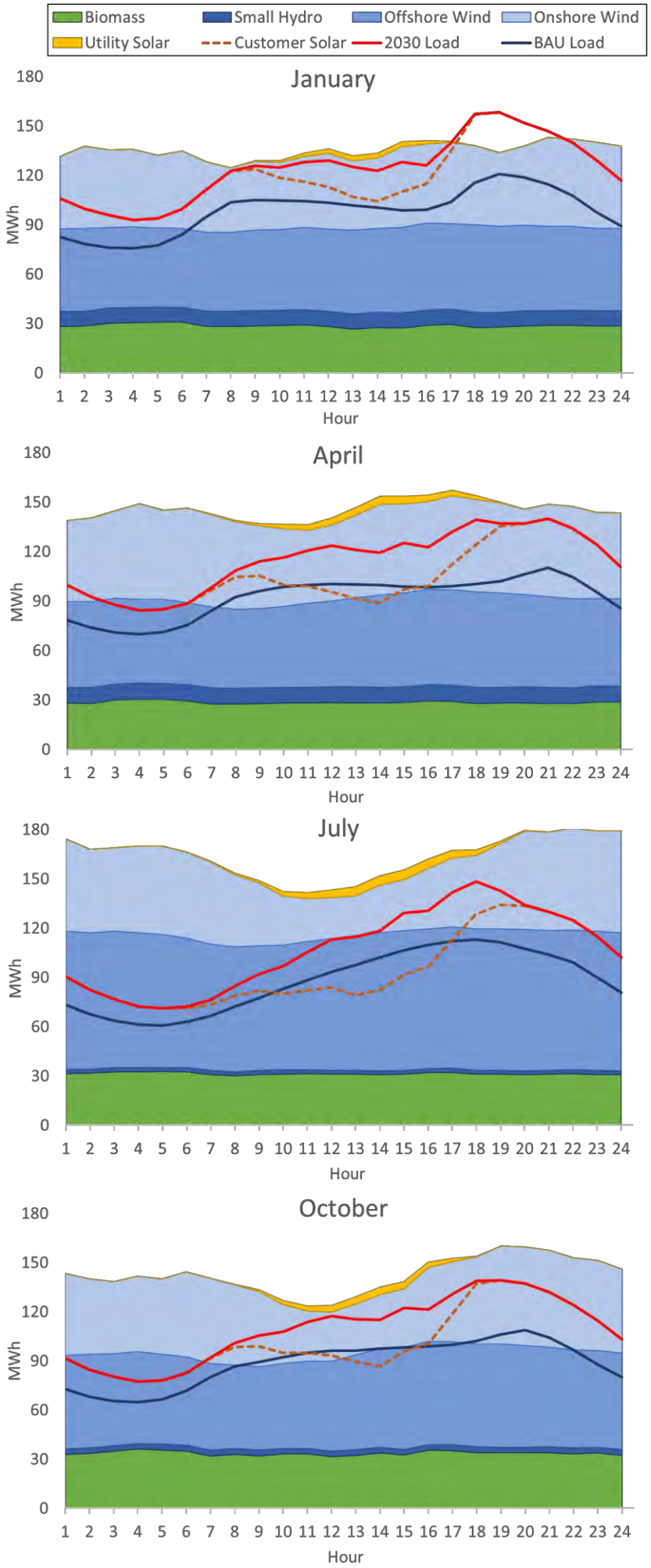


Figure 1 RCEA's 2018 power mix and the potential renewable energy mix for Humboldt County in 2030.

Figure 2 shows how generation and load are projected to line up each hour of an average day during the four seasons in 2030 and anticipates Humboldt County as a net exporter of renewable electricity. The stacked areas show how much the resource mix would generate each hour of the day, while the lines show forecasted load each hour of the day. The augmented load (red line) accounts for increased electricity demand due to electrification of vehicles and building energy use, while the business-as-usual (BAU) load (blue line) shows the demand without the electrification components. The customer solar (orange dashed line) shows how much load would be served in the middle of the day by net energy metered (NEM) systems, assuming RCEA's aggressive NEM targets are achieved. The charts are intended to advise the quantitative analysis for RCEA's 2020 Integrated Resource Plan and will later be updated with those results.

Figure 2 A comparison of the projected 2030 renewable energy supply and energy demand, represented as Business as Usual and as the Load with the implementation of RCEA's quantitative targets.

[2] RCEA's power mix in 2030 may not exactly mirror the local renewable power supply, as it depends on what contractual power purchases are executed between now and then.


Biomass
Small Hydro
Offshore Wind
Onshore Wind
Utility Solar
Customer Solar
2030 Load
BAU Load
January
April
July
October
MWh
Hour
0
30
60
90
120
150
180
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Electricity Load

Transportation

According to Humboldt County's 2015 GHG inventory, the transportation sector is one of the greatest local sources of greenhouse gases, with most of the emissions coming from single passenger vehicles. Light duty vehicles are about 80% off all vehicles in the county. To support state and local GHG-reduction goals, RCEA is adopting the following targets for reducing transportation emissions. The two strategies identified are electric vehicle (EV) adoption and reduction in vehicle miles traveled (VMT).

EV Adoption

The following table shows RCEA's five- and ten-year targets for facilitating the adoption of over22,000 EVs, which should make up 19% of all light duty transportation in Humboldt County by 2030.

Table 2 RCEA's quantitative target for EVs and the associated electric load increase compared to a BAU scenario.

Year	BAU Light Duty Eclectic Vehicles	RCEA's Target for Light Duty Electric Vehicles	Additional Load (MWh) from BAU
2025	2,000	6,000	15,400
2030	3,700	22,000	57,400

VMT Reduction

California can't reach its GHG reduction goals from fuel switching alone but must learn to reduce its energy consumption and embrace an energy conscious lifestyle. To support a reduced energy lifestyle, RCEA will work with other local governments entities facilitate a decrease in annual vehicle miles traveled using year 2020 as a baseline. By year 2030, the annual VMT will be reduced by 400 million, equaling a 25% reduction from 2020 VMT levels.

Table 3 RCEA's VMT reduction targets for 2025 and 2030

Year	% VMT Reduction	VMT Reduced	Total VMT with Reduction
2025	10%	170 Million	1.5 Billion
2030	25%	420 Million	1.2 Billion

Building Energy Use

According to Humboldt County's 2015 greenhouse gas inventory, the second largest emitter after transportation is the stationary combustion sector. The stationary combustion of fuels includes natural gas, propane, and wood fuel for both residential and non-residential energy users. RCEA is adopting the following targets to electrify natural gas and propane technologies associated with space heating, water heating, cooking, and additional uses. Shifting homes and businesses from fossil fuels to electricity is known as fuel substitution.

Table 4 RCEA's reduction targets for natural gas and propane from electrification, along with the associated increases in electric load

Year	% Reduction in Natural Gas and Propane Use	Electrical Load Increase (MWh)
2025	10%	9,000
2030	20%	18,000

Customer Solar (NEM)

Grid-tied solar arrays that are interconnected on the customer side of the meter as opposed to the utility side are often referred to as net energy metering (NEM). RCEA's 10-year plan involves accelerating the adoption rate of solar NEM systems and greatly increasing the number of systems in Humboldt County. In addition to RCEA's goals, California Title 24 Building Code has mandated that starting in year 2020 all new residential construction under 3 stories must have a grid connected solar PV system.

RCEA's target is to accelerate the rate of NEM system installation to 365 solar PV systems per year so that another 3,650 systems are online by 2030, producing around 64,000 megawatt-hours of electricity per year. Roughly 90% of these systems are anticipated to be residential installations and 10% non-residential installations.

Table 5 Number of solar systems installed by 2025 and 2030, starting in year 2020, along with their associated energy production in MWhs.

Year	Additional Solar Arrays	MW AC Added	Annual MWh Added
2025	1,825	19.75	32,000
2030	3,650	39.50	64,000

Appendix B:
Assumptions and Methodologies

The RePower Strategic Plan is intended to be a comprehensive plan for all of Humboldt County, not just for customers served by RCEA's CCE program or generators who are currently under contract with RCEA to serve those customers. Thus, the analysis attempts to account for all anticipated electricity supply and demand [1]within our community's reliability area of the electricity grid.

Power Resources

The Humboldt Local Reliability Area [2](see Figure 3) and thirty miles off the Humboldt Coast are the geographic boundaries used to count existing and planned generators in the analysis. The new generators are modelled at capacities that are feasibly developable by 2030 and don't require significant buildout of new transmission infrastructure. Below is a list of assumptions that are specific to certain resource types and facilities.

Figure 1 Humboldt Local Reliability Area

Resource-specific assumptions:

- Existing biomass and hydroelectric facilities are repowered and continue to operate at similar capacities to today's
- The annual generation profiles of all hydroelectric facilities are similar, scaled by their nameplate capacities, and are consistent hour by hour within a given month
- RCEA's Feed-in Tariff program is completely subscribed and all projects are solar photovoltaic with similar hourly generation profiles to that of the Redwood Coast Airport Microgrid project, scaled by their nameplate capacities
- The operational offshore wind capacity by 2030 is limited to one project within the Bureau of Ocean Energy Management's 2018 Humboldt Call Area

Sources of generation data:

[1] The analysis does not capture the electric load of customers on Direct Access within Humboldt County

[2] Humboldt Local Reliability Area as defined by the California Energy Commission includes area outside of Humboldt County's boundaries : https://ww2.energy.ca.gov/maps/reliability/LRA_Northern.html

Project	Location	Data Source
DG Fairhaven Power	Humboldt	Actual generation
Humboldt Sawmill Cogeneration	Humboldt	Actual generation
Baker Station Hydro Plant	Humboldt	CEC QFER Database
Big Creek Water Works	Trinity	CEC QFER Database
Gosselin Hydroelectric Plant	Trinity	CEC QFER Database
Kekawaka Hydro Plant	Trinity	CEC QFER Database
Three Forks Waterpower Project	Trinity	CEC QFER Database
Boulder Creek Hydro Plant	Humboldt	Oscar Larson & Associates analysis
Redwood Coast Airport Microgrid	Humboldt	Schatz Energy Research Center
RCEA Feed-in Tariff projects	Humboldt	Schatz Energy Research Center
Terra-Gen Humboldt Wind	Humboldt	Estimated from proprietary data
Redwood Coast Offshore Wind	Offshore	Estimated from proprietary data

Electricity Load

Hourly Load Forecast

RCEA's hourly load forecast generated by The Energy Authority (TEA) is used as the Business as Usual (BAU) load forecast. A load factor of 1.06 is applied to include opted out customers in Humboldt County who are not currently served by RCEA. Direct Access customers who are served by providers other than PG&E and RCEA are not counted in the load analysis.

Transportation Load

Electric Vehicle Adoption

The 2017 mobile source emission model by EMFAC[3] is used to forecast vehicle population, vehicle type, and fossil fuel consumption for years 2020, 2025, and 2030. Light duty (LD) electric vehicle (EV) kWh consumption is provided by Humboldt County's 2015 GHG inventory[4] and assumes that EVs will make efficiency gains at the same rate as fossil fuel vehicles. Consumption for heavy duty (HV) and medium duty (MD) EVs is provided by the National Renewable Energy Laboratory's (NREL) Zero-Emission Bus Evaluation[5]. Gains in efficiency are not incorporated for MD and HD EVs.

RCEA EV adoption goals are determined using the BAU EV forecasts and the California State goal to reach 80% below 1990 emissions by 2050. RCEA's EV adoption goal will

[3] https://www.arb.ca.gov/emfac/2014/?_ga=2.114116750.862177112.1570490806-866086873.1536797044
[4] 2015 Humboldt County Emissions Inventory will be made available to the public early 2020
[5] https://www.nrel.gov/docs/fy19osti/72864.pdf

keep Humboldt County on a trajectory to replace all light duty gasoline vehicles with EVs. The difference between the BAU EV forecast and RCEA's EV goals is the additional electrical load attributed to an increase in electric vehicles. It is assumed that the additional EVs will replace gasoline LD vehicles.

Calculations for RCEA's EV Adoption Goals:

$$Number\ of\ added\ EVs = BAU\ EV\ Pop - (\ LD\ Vehicle\ Pop\ \ * RCEA's\ EV\ \%\ Goal)$$

$$Annual\ MWHs\ per\ EV = \frac{\left(VMT\ per\ day * \frac{kwh}{mile} * 365\ days\right)}{EV\ Pop}$$

$$Annual\ MWHs\ added\ from\ RCEA's\ EV\ Goal = Number\ of\ added\ EVs * Annual\ MWH\ per\ EV$$

Reduction in Vehicle Miles Traveled

RCEA will work with other partners to facilitate County wide VMT reduction across all vehicle and fuel types. The 2017 mobile source emission model from EMFAC[6] is used to project VMT for year 2020. The forecast provides a baseline to calculate a 10% and 20% VMT reduction for years 2025 and 2030, respectively. These VMT reductions apply to all vehicle types and their corresponding fuel types.

Calculations for RCEA's Reductions in VMT:

$$RCEA\ VMT\ Reduction\ Goal = 2020\ VMT - (2020\ VMT * \%\ Reduction)$$

$$VMT\ Per\ Vehicle\ Type\ and\ Fuel\ Type = (\frac{BAU\ VMT\ per\ Vehicle\ and\ Fuel\ Type}{Total\ VMT}) * RCEA\ VMT\ Reduction\ Goal$$

Electric Vehicle Load Curve

The Humboldt weekday load profile from the CEC Infrastructure Projection EVI-Pro Tool[7] is used to estimate future electric vehicle charging times. Potential load shifting due to future time-of-use incentives or demand response is not modelled.

Building Energy Use

Residential Fuel Substitution

An average household's gas-based heating fuel usage in Humboldt County is estimated using the CEC's natural gas consumption data[8] and Census Bureau data on House

[6] https://www.arb.ca.gov/emfac/2014/?_ga=2.114116750.862177112.1570490806-866086873.1536797044
[7] https://maps.nrel.gov/cec/
[8] https://ecdms.energy.ca.gov/

Heating Fuel[9]. Data collected from RCEA's home energy assessments[10] is used to estimate the usage by other appliances and fuels across the County.

The electricity use of household air- and water-source heat pumps is calculated using the formulas below. A conversion factor for gas (expressed in kWh) consumption to heat pump kWh of approximately 1/3 was calculated for fuel substitution.

Calculation for Heat Pump electricity usage equivalent to 80% efficient furnace:

$$Btu\ out = Therms\ (in) \times 80\%\ Efficiency \times 100{,}000 \frac{Btu}{Therm}$$

$$HP\ kWh\ (in) = Btu\ Out \times 0.000293 \frac{kWh}{Btu} \times 4.0\ COP$$

Calculation for Therms input into traditional 80% efficient furnace expressed in kWh.

$$NG\ kWh\ (in) = Therms\ (in) \times 29.3 \frac{kWh}{Therm}$$

Calculation for kWh of Natural Gas converted to kWh of Electricity through fuel substitution.

$$\begin{aligned} Heat\ Pump\ kWh\ (in) &= \frac{NG\ kWh\ (in)}{29.3} \times 80\% \times 100{,}000 \times 0.000293 \times 4.0 \\ &= NG\ kWh\ (in) \div 0.32H \end{aligned}$$

$$Heat\ Pump\ kWh\ (in) \approx \frac{Nat\ Gas\ kWh(in)}{3}$$

Residential Load Curves

To estimate the seasonal load increase due to residential fuel substitution, the load curves are based on annual usage calculated for each appliance-fuel combination and PG&E's heating degree days for climate zone 1. Hourly load curves for lighting are adapted from scientific papers by the National Renewable Energy Laboratory (NREL) and the U.S. Department of Energy[11] , as well as articles published in the journal Applied Energy[12]

Non-Residential Fuel Substitution

Due to a lack of data on space and water heating in the non-residential sector and the wide variety of end-uses for natural gas and propane, non-residential fuel is modeled with a flat seasonal load curve using the annual fuel consumption from the CEC's data

[9] https://factfinder.census.gov/

[10] Residential assessment data from 2012 to present collected by the Redwood Coast Energy Authority and compiled in the Energy Assessment Survey Tool (EAST). 4279 data points.

[11] https://www.nrel.gov/docs/fy16osti/64904.pdf

[12] https://www.sciencedirect.com/science/article/pii/S0306261917308954

on energy consumption in Humboldt County[13]. Propane consumption is estimated using the percentages from the 2005 Humboldt County General Plan Energy Element.

Customer Solar (NEM)

The NEM Currently Interconnected Data Set from the California Solar Initiative (CSI) Database[14] provides historic solar PV installation rates that advise RCEA's NEM adoption targets. In 2018, around 280 new solar NEM systems were interconnected in Humboldt County. Of those 280 systems, 270 were residential installations and 10 were non-residential. RCEA's target increases the annual number of interconnected PV systems to 365 per year, or a rate of 1 system installed per day, with similar proportions of residential and non-residential adoption as historical rates.

RCEA's solar NEM goal will decrease the BAU electrical load forecast for Humboldt County in 2030. Using the average system size for residential and non-residential PV arrays, system size of future installations is anticipated to be slightly larger due to assumed increases in solar cell efficiencies and building electricity usage due to EV charging. The anticipated system size is 6 kW for residential and 50 kW for non-residential. A solar calculator designed for RCEA's Public Agency Solar Program using solar insolation data from NREL[15] provides estimates for 2025 and 2030 electricity generation at the anticipated total NEM adoption capacity. Decommissioning of NEM systems and degradation of photovoltaic cell efficiency over time is not accounted for in the analysis.

The generation profile of NEM systems is assumed to be similar to that of the Redwood Coast Airport Microgrid project, scaled by nameplate capacity.

[13] https://ecdms.energy.ca.gov/
[14] https://www.californiadgstats.ca.gov/downloads/
[15] https://pvwatts.nrel.gov/

RePower Humboldt

The Redwood Coast Energy Authority's Comprehensive Action Plan for Energy

2019 UPDATE – DRAFT 3.0

11-15-19

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TABLE OF CONTENTS

Executive Summary

Consistent with Humboldt County's General Plan, the County of Humboldt recognizes the Redwood Coast Energy Authority (RCEA) as the regional energy authority to foster, coordinate, and facilitate countywide strategic energy planning, implementation, and education through RePower Humboldt, RCEA's comprehensive action plan for energy. This action plan consists of implementation measures specific to the functions of RCEA as the regional energy authority for Humboldt County and in alignment with the mission and purpose ~~stated~~ in RCEA's Joint Powers Agreement, which is to:

> Develop and implement sustainable energy initiatives that reduce energy demand, increase energy efficiency, and advance the use of clean, efficient and renewable resources available in the region.

~~The CAPE strategies target the following objectives:~~

> ~~**Regional Energy Planning & Coordination:** Facilitate coordinated strategic energy planning within Humboldt County, provide a forum for addressing countywide energy issues, and assist local jurisdictions with completing greenhouse gas inventories, climate action plans, and general plan energy elements.~~
>
> ~~**Energy Reliability & Security:** Coordinate with utility providers and other local governments on energy emergency planning and response, evaluate transmission and distribution systems, and conduct a climate change risk assessments and develop adaptation plans.~~
>
> ~~**Economic Development:** Support the development of emerging energy technologies, attract and support energy-sector businesses and ventures, and provide training and workforce development assistance for jobs in the energy field.~~
>
> ~~**Built Environment Efficiency:** Develop and implement programs which encourage energy efficiency and renewable energy retrofits in existing buildings, and support local implementation of state-wide energy efficiency standards and goals.~~
>
> ~~**Education:** Through a variety of channels, provide the community with comprehensive education and information on energy conservation, energy planning, renewable energy, and energy efficiency.~~
>
> ~~**Water & Waste:** Support water and waste conservation initiatives that will result in reduce energy demand and or renewable energy generation.~~
>
> ~~**Transportation:** Encourage energy-efficient, health-promoting modes of travel such as walking, bicycling, and public transit, and support the adoption of alternative fuels.~~
>
> ~~**Energy Generation & Utility Services:** Promote policies which seek to meet local energy needs with a diversity of renewable energy resources, distributed generation, and cogeneration.~~

~~This action plan shall be periodically updated by the RCEA Board and presented to the Humboldt County Board of Supervisors for review.~~

The strategies within this 2019 update of the RePower Humboldt strategic plan will be implemented between 2020-2030 to achieve the goals listed below. Reduction targets are from a baseline year of 2018, unless otherwise stated. While this plan has a ten-year time horizon, RCEA will revisit it regularly during that period to keep it updated and reflective of changes to our community's needs and energy market trends.

REGIONAL PLANNING AND COORDINATION

RCEA will take a leadership role to develop and advance strategic regional energy goals through economic development, funding, planning efforts, and education. This work will be done in coordination with RCEA's member governments, other local public agencies, local tribes, and other public and private stakeholders.

Goals: Achieve net-zero greenhouse gas emissions county-wide by 2030.

By 2030 fully establish Humboldt County as an energy secure community that can affordably and reliably meet its local energy needs with local renewable resources and has the robust local capabilities and infrastructure necessary to effectively respond to energy emergencies or disruptions in energy supply.

Build the clean energy sector into a cornerstone of the local economy through a breadth of strategies that include innovation, research and development, local energy-related business development, and establishing Humboldt Bay as the primary west coast hub for the offshore wind energy industry.

INTEGRATED DEMAND SIDE MANAGEMENT

RCEA will use an Integrated Demand Side Management approach to develop distributed energy resources and reduce energy consumption in the residential, commercial, industrial, agricultural, and government sectors and to align customer energy use with variable clean and renewable energy supplies. RCEA will prioritize efforts that enhance local energy resiliency and independence.

Goals: Support the wide-spread installation of customer solar photovoltaic energy systems, with a target to increase installations to a rate of one system every day for the next decade and reach 30MW of customer solar installed by 2025 and 50MW installed by 2030.

Make energy efficiency and conservation services available to every household and business in the county by 2030.

Expand existing energy efficiency, conservation and electrification programs to reduce greenhouse gas emissions from fossil fuel use in buildings by 20% by 2030 and maintain a trajectory to reduce emission from natural gas by 90% by 2050.

Develop a network of community microgrids and renewable-energy back-up power systems across the county to reduce greenhouse gas emissions and to provide energy resiliency and long-duration emergency energy supply at all critical facilities by 2030.

LOW-CARBON TRANSPORTATION

RCEA will decarbonize regional transportation through efforts to reduce vehicle miles travelled, increase advanced fuel vehicles adoption and fuel efficiency, and expand advanced fuel infrastructure.

Goals: Accelerate the adoption of electric vehicles, with a target of over 6,000 electric vehicles on the road in Humboldt County by 2025 and 22,000 vehicles by 2030. Develop public, workplace, and residential electric vehicle charging infrastructure necessary to support these county-wide electric vehicle targets.

Work with other local public entities to reduce vehicle miles traveled in Humboldt County by at least 25% by 2030.

By 2030 reduce greenhouse gas emissions from transportation by over 65% through reductions in vehicle miles traveled, improved vehicle efficiency, the adoption of electric vehicles, and, where determined to be an effective emissions-reduction strategy, the use of biofuels as a bridge to a full transition to zero-emissions vehicles. Maintain a trajectory of emissions reduction to eliminate the use of fossil fuels by 2050.

ENERGY GENERATION AND UTILITY SERVICES

RCEA will address Humboldt County's supply-side energy needs through its existing Community Choice Energy (CCE) program and development of new programs and initiatives.

Goals: By 2025 100% of RCEA's power mix will be from a combination of state-designated renewable energy sources—solar, wind, biomass, small hydroelectric, and geothermal—and state-designated net-zero-carbon-emission existing large hydroelectric facilities.

By 2030 Humboldt County will be a net exporter of renewable electricity and RCEA's power mix will consist of 100% local, net-zero-carbon-emission renewable sources.

Humboldt County can effectively respond to regional and local disruptions to energy supply and distribution systems through modernization of the local electric grid, the deployment of local distributed energy resources, and the development of community microgrids.

Introduction

ENERGY FUELS OUR EVERYDAY LIVES

With the impending consequences of global climate change on the horizon, it's never been a more important time to significantly reduce greenhouse gas emissions. It's imperative that Humboldt County does its part to reduce emissions within the next ten years as the world strives to keep global warming at or below 1.5 °C above pre-industrial levels. The effects of climate change will impact Northern California by increasing annual maximum temperatures, altering stream flows, lengthening the fire season, sea level rise, and increased risk of flooding, as well as increasing the likelihood of intense storms within a shorter wet season and a prolonged dry season. The surest way to take action to reduce emission and lessen the effects of climate change is by targeting the biggest source of emissions, the energy sector.

In Humboldt County, each of us depends on energy 24 hours a day, and we continuously benefit from the direct and indirect use of energy resources. Energy is ever present in our daily lives and much of the time it's taken for granted. From the sun we draw heat, light, and solar power; while it works to grow our food, forests, flowers, and more. We depend on fossil fuels to get us to work, school, local shops, ~~and the hospital;~~as well as to transport our food, commodities, mail, and ~~even~~ garbage~~; we depend on it to visit far off places by plane, or to visit a close friend by car~~. Electricity enables us to work after the sun goes down; we depend on it to light our offices, classrooms, and streets; to keep our food cold and our ice cream frozen; to pump water through pipes; to transmit information and keep in touch. Energy in a diversity of forms fuels our industries and business ventures: from powering lumber mills to dairy farms; from firing ceramics to pizzas, and from brewing beer to baking bread. It's clear that reliance on energy resources characterizes a large part of our everyday lives.

The production and consumption of energy also affects our daily lives in more indirect ways, particularly with regard to the environment. The burning of fossil fuels has led to damaging environmental effects such as acid rain, smog, water pollution, and global warming. Exploratory drilling and extraction of non-renewable energy sources (such as coal, petroleum, and natural gas), and their attendant infrastructure, has resulted in the degradation of other natural resources, for example forests, coastal communities, and rainforests. Although these areas may be far away, the environmental impacts can reach Humboldt County. The fact is, all forms of energy production, including renewable energy, have environmental and social impacts, and responsible energy planning seeks to minimize negative impacts while maximizing community benefits.

The original RePower Humboldt strategic plan published in 2013 showed that Humboldt County has hundreds of megawatts of untapped renewable energy potential from a variety of sources, including solar, wind, wave, and biomass. With a population of less than 140,000 and a limited industrial base, electric loads in Humboldt are light. In contrast, California's urban counties have much larger loads and little potential for renewable energy generation other than rooftop solar. For example, in 2018 San Francisco consumed seven times as much electricity as Humboldt County, and Los Angeles County used 85 times Humboldt's load. If California as a whole is to meet its renewable energy and greenhouse gas reduction goals, resource-rich counties like Humboldt will need to export a portion of their energy wealth to these urban load centers.

In Humboldt County, energy is used as a transportation fuel and as electrical and heat energy in homes, businesses, industries, and agriculture. In ~~2010~~2015 it is estimated that Humboldt County spent ~~$460~~over $400 million to meet local energy demands, the majority of which left the county. ~~Approximately half~~A major portion of the energy was used as ~~a~~ transportation fuel (gasoline and diesel), with large amounts also used to meet end use electrical demands and end~~-~~-use natural gas heating demands. ~~Primary energy sources were comprised mainly of natural gas, gasoline, diesel, and biomass (wood waste and firewood).~~

REDWOOD COAST ENERGY AUTHORITY MISSION AND PURPOSE

The purpose of the Redwood Coast Energy Authority is to develop and implement sustainable energy initiatives that reduce energy demand, increase energy efficiency, and advance the use of clean, efficient and renewable resources available in the region for the benefit of the Member agencies and their constituents. To further that purpose, the Redwood Coast Energy Authority will work toward the following goals, as enumerated in our Joint Powers Agreement:

A. To lead, coordinate and integrate regional efforts that advance secure, sustainable, clean and affordable energy resources.

B. To develop a long-term sustainable energy strategy and implementation plan.

C. To increase awareness of, and enhance access to, energy conservation, energy efficiency, and renewable energy opportunities available to the region.

D. To add value to, but not duplicate, energy services offered by utilities and others serving the region in a manner that does not conflict with acting as a community choice aggregator.

E. To keep key decision makers and stakeholders informed of policy, regulatory, and market changes that are likely to impact the region.

F. To support research, development, demonstration, innovation, and commercialization of sustainable energy technologies by public and private entities operating in Humboldt County.

G. To develop regional capabilities to respond to energy emergencies and short-term disruptions in energy supply, infrastructure, or markets that could adversely affect Humboldt residents and businesses.

In striving to achieve the above goals, RCEA will ensure that environmental and social impacts associated with production and consumption of energy are minimized, and that any unavoidable impacts are borne to the extent possible within Humboldt County rather than by other communities, and will seek to maximize social, economic, and environmental benefits to Humboldt County associated with local energy production

The ~~CAPE~~RePower Humboldt plan is intended to support achieving these goals through strategies that specifically address: Regional Energy Planning & Coordination, Integrated Demand Side Management, Low-Carbon Transportation, ~~Energy Reliability & Security, Economic Development, Built Environment Efficiency, Education, Water & Waste, Transportation,~~ and Energy Generation & Utility Services.

VISION STATEMENT

The below vision statement was developed in 2005 through the public comment process for the original draft of the Humboldt County General Plan Energy Element prepared by RCEA. It expresses the community qualities and characteristics that the ~~CAPE~~RePower Humboldt plan aspires to achieve, expressed as how Humboldt County could be described in 2030. Minor modifications have been made to the original vision statement to reflect recent changes to the state and local energy economies, as well as community input gathered in developing this 2019 RePower Humboldt update.

In 2030…

Humboldt County has achieved the goal of net-zero greenhouse gas emissions and is ~~no longer~~ a net ~~importer~~exporter of renewable energy. We achieve ~~a high degree of~~ energy independence and self-sufficiency through high levels of energy conservation~~ and~~, efficiency, and electrification combined with locally-produced and -managed energy generation. ~~Most of our~~Our energy comes from renewable sources. ~~Significantly less money~~Money spent on energy ~~leaves~~stays in the county.

Individual communities have developed greater energy self-sufficiency and independence as has the county overall. Citizens have a diversity of choices for how to meet their energy needs. We have ~~much more~~ local control over energy prices. ~~We have been able to~~We readily adapt to any major external changes in energy supply or technology.

Our ~~rate of~~ energy consumption is level from year to year, due to increasing conservation and efficiency to offset increases in growth-related demand.

Our overall quality of life is ~~as good as or~~ better than it was in 2005. The population is healthier as a result of leading energy-conserving lifestyles. It is common, safe, pleasant, and economically favorable~~, and typical~~ to have a lifestyle that doesn't consume much energy.

Energy conservation education has reached, and continues to reach, effectively, everyone in the county. Energy considerations and decisions are integrated with all other decision-making arenas.

The county has minimized negative environmental, social, and economic impacts associated with meeting its energy needs, while ensuring any unavoidable impacts are borne locally rather than by other communities

The County is energy efficient through neighborhood design. Good community planning has reduced sprawl. There are fewer automobiles used for travel; people depend more on transit, bikes, walking, and ~~there is less automobile dependence.~~shared-use automobiles than they depend on private automobiles. Public transportation is conveniently available and well utilized~~ and walking, bicycling and other non-automobile forms of transportation are commonly used~~. There is much less consumption of energy from non-renewable sources for transportation.

All buildings are energy efficient. All new construction is all-electric and done in the most energy efficient manner, starting with building design. All existing buildings have been upgraded to be more efficient~~.~~ and many have converted their previous uses of natural gas and propane to electricity. Energy efficiency is integral to locally adopted building standards, which have flexibility and include meaningful incentives. Many homes and businesses produce more energy than they consume.

The County is a thriving research and development center and incubator for energy technology and related manufacturing, which is a stable source of local jobs.

~~Draft 2019~~

Strategies ~~Update~~

Regional Energy Planning & Coordination

RCEA will take a leadership role to develop and advance strategic regional energy goals through economic development, funding, planning efforts, and education. This work will be done in coordination with RCEA's member governments, other local public agencies, local tribes, and other public and private stakeholders.

Goals: **Achieve net-zero greenhouse gas emissions county-wide by 2030.**

By 2030 fully establish Humboldt County as an energy secure community that can affordably and reliably meet its local energy needs with local renewable resources and has the robust local capabilities and infrastructure necessary to effectively respond to any energy emergencies or disruptions in energy supply.

Build the clean energy sector into a cornerstone of the local economy through a breadth of strategies that include innovation, research and development, local energy-related business development, and establishing Humboldt Bay as the primary west coast hub for the offshore wind energy industry.

ECONOMIC DEVELOPMENT

Attract Energy-related Business. Collaborate with local economic development entities to attract technology developers, manufacturers, and energy service providers to locate operations in the County when appropriate.

Support Proactive Energy-related Business Development. Collaborate with local jurisdictions to identify and pre-assess locations and facilities for energy-related business ventures.

Support Energy-sector Workforce Development. Work with other local entities to provide training and continuing education that develops and maintains a qualified local workforce available to implement energy efficiency upgrades, renewable energy projects, and advanced-vehicle technology deployment.

ENERGY-RELATED EMERGENCY RESPONSE

Develop Emergency Response Capabilities. Coordinate with other local entities to develop regional capabilities to respond to energy emergencies and disruptions impacting energy supply, infrastructure, or energy markets. Incorporate efforts to enhance emergency response capabilities across all of RCEA's customer programs.

Assist with Energy Emergency Response Procedures. Assist the Humboldt County Office of Emergency Services in the preparation of energy response procedures for the Humboldt County Emergency Response Plan.

Support Climate Change Adaptation. Work with other local entities to conduct a climate change risk assessment and develop an adaptation plan consistent with the best-practices guidance provided by the California Natural Resources Agency and California Office of Emergency Services.

FUNDING

Develop Regional Energy Funding Mechanisms. Offer support and act as the fiscal agent and funding clearinghouse for countywide energy programs.

Pursue Cap and Trade Auction Proceeds. Work regionally to access Cap and Trade auction proceeds and other State funding mechanisms to ensure effective, efficient, coordinated, and equitable resource allocation in the North Coast Region.

Develop Job Development Incentives. Collaborate with local economic development entities to identify funding opportunities for developing jobs in the field of energy conservation, efficiency, and renewable sources.

Implement Energy Project Financing. Work with local economic development entities and/or financial institutions to develop and implement financing programs that enable residents and businesses to implement energy efficiency and renewable energy projects.

~~**Facilitate Financing Mechanisms.**~~ Facilitate Property Assessed Clean Energy (PACE) and other financing programs that access the needed capital to deploy regional energy independence strategies.

Develop Local Energy Investment Programs. Work with local economic development entities and financial institutions to develop programs and resources that facilitate local community investment in and/or ownership of energy efficiency and renewable energy projects.

Pursue an Investment Grade Credit Rating for RCEA's Community Choice Energy Program. Through building program reserves and responsible program management, secure an investment grade credit rating from a major financial services company to support long-term energy transactions.

PLANNING

Support Renewable Energy Permitting. Support the County in streamlining permitting for renewable energy generation including updating zoning codes and creating wind energy GIS overlays.

Support Carbon Sequestration. Support the development and deployment of mechanisms for retaining carbon in the region's abundant natural areas and working lands.

Assist with Climate Action Planning. Work with local jurisdictions to regularly complete greenhouse gas inventories, set greenhouse gas reduction targets, and develop climate action plans.

~~**Support Climate Change Adaptation.** Work with other local entities to conduct a climate change risk assessment and develop an adaptation plan consistent with the best practices guidance provided by the California Natural Resources Agency and California Emergency Management Agency.~~

Support Countywide Strategic Energy Planning. Coordinate an effective energy strategy based on self-sufficiency, development of renewable energy resources ~~and~~, energy conservation, and electrification that is actively implemented countywide through Climate Action Plans, General Plans and the Redwood Coast Energy Authority's ~~Comprehensive Energy Action Plan~~RePower Humboldt plan.

Encourage Adoption of Energy Elements. Encourage and assist with the adoption of energy elements ~~in~~by other local and regional jurisdictions. Periodically review local energy elements and recommend updates, as necessary, to reflect changing technologies for the generation, transmission, and efficient use of energy.

~~**Assist with Energy Emergency Response Procedures.** Assist the Humboldt County Office of Emergency Services in the preparation of energy emergency response procedures for the Humboldt County Emergency Response Plan.~~

Encourage Energy Policies and Plans. Encourage other jurisdictions and entities, including the cities in Humboldt County, to adopt and implement sound energy plans and policies, to include energy elements and/or energy policies in their general plans and ordinances. Advocate and disseminate energy planning strategies, policies, and other information.

Promote Energy Efficiency, Renewable Energy, and Storage Permitting. Support local ordinances that streamline permitting processes for energy efficiency, renewable energy, and storage technologies.

Develop Programs that Foster Social Equity. Identify, fund, and establish new programs that address the energy needs of the least advantaged and underserved members of our community.

EDUCATION

Maintain an Energy Resource Center. Operate an energy resource center open to the public and provide information on energy conservation, energy planning, renewable energy, energy storage, low-carbon transportation, all-electric buildings, and energy-efficient building design and ~~retrofit information~~retrofits.

Hold Regional Energy Forums. Serve as a forum for addressing countywide energy issues.

Develop Public Displays. Encourage and assist development of educational displays for exemplary renewable energy and distributed energy systems installed throughout Humboldt County. Displays should provide county residents and businesses with information on how the systems work and how

well they perform and should inform county residents about the importance, benefits, and associated impacts of developing local energy resources.

Provide Energy Efficiency, Conservation and Electrification Education and Training. Provide community education, information, and resources on energy issues to support informed decision making related to customer energy use, including the benefits of ~~reduced energy consumption,~~conservation, electrification and increased energy efficiency. Collaborate with schools and colleges for energy-related research, education, and conservation practices.

Provide Energy Professional Education and Training. Provide and encourage training for local contractors and energy professionals on energy-related topics such as: energy code, energy efficiency, demand response, zero net energy retrofits and construction, electrification, heat pumps, battery storage and solar.

Integrated Demand Side Management

RCEA will use an Integrated Demand Side Management ~~(IDSM)~~ approach to ~~match~~develop distributed energy resources and ~~enhance~~ reduce energy consumption in the residential, commercial, industrial, agricultural, and government sectors and to align customer energy use with ~~intermittent~~variable clean and renewable energy supplies. ~~An additional priority~~RCEA will ~~be placed on~~prioritize efforts that enhance local energy resiliency and independence.

Goals:

- **Support the wide-spread installation of customer solar energy systems, with a target to increase installations to a rate of one system every day for the next decade and reach 30MW of customer solar installed by 2025 and 50MW installed by 2030.**
- **Make energy efficiency and conservation services available to every household and business in the county by 2030.**
- **Expand existing energy efficiency, conservation and electrification programs to reduce greenhouse gas emissions from fossil fuel use in buildings by 20% by 2030 and maintain a trajectory to reduce emission from natural gas by 90% by 2050.**
- **Develop a network of community microgrids and renewable-energy back-up power systems across the county to reduce greenhouse gas emissions and to provide energy resiliency and long-duration emergency energy supply at all critical facilities by 2030.**

INTEGRATED DEMAND SIDE MANAGEMENT STRATEGIES

Support Member Agency and Local Government Energy Management. Support member agencies in managing their energy ~~consumption~~usage. RCEA will support~~ varying~~ activities that reduce and align energy use with available clean and renewable supplies to reduce costs while being consistent with ~~performance-based action plans~~state energy goals and Greenhouse Gas Emission Reduction goals. Additional activities will be prioritized where they support energy resiliency and independence.

Support Implementation of Codes and Standards. ~~Support~~Support the State's goals related to residential and commercial net-zero-energy and zero-net carbon standards along with other green building standards, including the local implementation of Title 24 building energy codes, Title 20 appliance efficiency standards and individual projects that strive to achieve energy efficiencies that exceed state ~~or~~and local requirements. Support the consideration, adoption, and implementation of above code energy ordinances.

~~**Promote No Regrets Energy Efficiency, Solar and Storage Permitting.** Support local ordinances that streamline permitting processes for energy efficiency, solar and storage technologies.~~

Assist with Facility Benchmarking. Assist local governments and businesses with facility benchmarking to evaluate and track the energy performance of non-residential buildings.

~~**Support Zero-Net–Energy Standards.** Support the State's goals related to residential and commercial net-zero-energy standards along with other green building standards that align to RCEA's IDSM strategies.~~

~~**Conduct Community Engagement.** Provide community facing information and resources that will support informed decision making as relating to customer energy use.~~

~~**Support**~~**Perform Energy Assessments.** ~~Support and encourage full knowledge of~~Advise building owners on the life cycle costs and benefits of energy efficiency, conservation, demand response, generation, electrification and storage ~~activities~~opportunities through assessments. Assessments will be followed with comprehensive reports detailing an integrated strategy for energy management.

Integrate Distributed Energy Resources. ~~Support~~Develop and implement customer programs that support, promote and integrate ~~distribution~~distributed energy resources, including but not limited to grid-connected generation, energy storage, energy efficiency, electric vehicle and demand response technologies~~ into new and existing customer facing programs~~.

Integrate a Distributed Energy Resource Management System. ~~Integrate~~Support the development and installation of systems needed for effective and responsive management of distributed energy resources. Evaluate the potential integration of distributed energy resources into a unified system that ~~can~~would allow RCEA to aggregate ~~or~~and automate demand response activities.

Support and Deploy Microgrids. Support and deploy energy microgrids, focusing on critical infrastructure and community facilities, that ~~through~~combine onsite generation, energy storage, and advanced control systems to provide energy resiliency and maintain emergency-response capabilities as well as ongoing economic and environmental benefits.

Use Advanced Metering Infrastructure. ~~Use~~Support advanced metering infrastructure to ~~make informed, data driven program decisions and allow customers~~expand every customer's visibility into their energy usage for more ownership and control of their energy related behavior and decisions. Use advanced metering data to make informed program decisions.

ENERGY EFFICIENCY & CONSERVATION

~~RCEA will support~~ **Maximize the Efficiency of Buildings.** Support energy efficiency and conservation as core strategies toward achieving ~~the program's~~ environmental, economic, and community goals. ~~Where feasible,~~ Promote the whole-house approach to energy efficiency ~~technologies will be controllable~~using the latest building science and ~~integrated as a distributed resource; any such efforts will require customer education~~incorporating interactive effects between passive and ~~approval~~active energy systems in a home. First reduce the need to use energy and ~~will be implemented with a commitment to respecting~~then use energy efficiently where it is required. An example would be to air seal and ~~protecting customers' rights to privacy. RCEA will:~~insulate the home and furnace ductwork to reduce heat loss before upgrading the furnace. Support programs that increase building shell efficiency through air sealing, insulation, and window upgrades while improving comfort and indoor air quality.

Support Electrification. Prioritize ~~new~~the development and implementation of programs and ~~alterations to existing~~ services that promote the ~~use of~~ replacement of fossil fuel burning appliances with the most energy-efficient electric equipment including heat pump ~~domestic~~ hot water and space heaters~~, induction stoves and clothes dryers~~ and the electrification of commercial and industrial processes.

~~**Encourage Energy-Efficient Equipment.** Encourage~~**Increase Equipment Efficiency through Market Transformation.** Prioritize the development and implementation of programs and services that promote the use of the most energy-efficient equipment for space and water heating, ventilation, lighting, refrigeration, and air conditioning in all buildings~~ and developments~~, including residential ~~and~~, commercial and industrial facilities.

Promote Performance Contracting. Promote residential and commercial performance contracting that is consistent with current best practices for energy efficiency and environmentally sound construction techniques.

Develop and Support Behavioral, Retro-Commissioning and Operations ~~**(BROs).** Develop, promote~~**Programs. Promote,** develop, and ~~support~~implement programs that ~~promote~~ enable energy conservation and load-shifting through customer behavior changes, building system retro-commissioning, and operational changes~~ that reduce or change~~.

Promote Smart Technologies and Smart Controls. Support the ~~time~~replacement of ~~energy use.~~

~~**Replace Plug Loads**. Replace~~ existing plug load devices ~~and install line-signaling~~ with smart ~~technologies that~~technology devices that are programmed to save energy~~ and~~, shift energy use outside of peak hours, and/or provide ~~an integrated solution that aligns with~~ automated demand response ~~and storage measures~~using utility signaling. Examples include internet-of-things enabled lighting, water and space conditioning, dish and clothes washing, and refrigeration. Promote control

technologies that adjust the use of equipment based on environmental input or demand. Examples include variable speed fans and ventilation, variable speed pumps and motors, daylighting controls, occupancy sensor controls, smart thermostats, and building management systems.

DEMAND RESPONSE

~~RCEA will support~~**Implement Demand Response** **and** **Distributed Energy Resource Programs.** Support and prioritize demand response programs that ~~give ratepayers an opportunity to play~~ offer customers a role in balancing energy ~~load~~usage with ~~renewable energy supply.~~the availability of electricity on the grid.. Demand response programs and offerings will, where possible, integrate with distribution-connected efficiency~~, solar and~~ systems and controls, renewable energy generation, and energy storage measures. Where feasible, energy technologies will be controllable and integrated as a distributed resource; any such efforts will require customer education and approval and will be implemented with a commitment to respecting and protecting customers' rights to privacy.

Support ~~**Time of**~~**Reduced Energy** **Use**~~.~~ **During Peak Hours and Peak Event Days.** Notify, support, and enable action from customers who ~~express an interest in load~~choose to participate by shifting ~~or shaving~~energy usage to off-peak hours, reduce ~~evening hour coincident demand.~~

~~**Provide and Support Peak Day Pricing.** Notify and support customer energy use changes~~daily energy usage during ~~summer peak day events.~~ peak hours, and/or reduce energy usage during peak event days.

Enable Automated Demand Response. Install communicable controls with electrification, efficiency, and storage technologies that automatically reduce energy use during demand response events. Implement building demand response systems that allow for the curtailment of loads without major impacts to occupants and operations.

~~**Implement Grid Connected Buildings.** Implement grid connected buildings that allow for the curtailment of loads in descending order of priority.~~

CUSTOMER DISTRIBUTED GENERATION & STORAGE

~~RCEA will support~~**Support Customer Installation of Distributed Generation.** Support the deployment of ~~distribution~~ behind-the-meter grid-connected ~~solar~~renewable energy and storage ~~technologies~~systems as core strategies toward achieving environmental, economic, and community stability/resilience goals.

~~**Administer and**~~ **Implement the Public Agency Solar Program.** Continue to implement the solar and energy-storage technical assistance program for public agencies; integrate grid-connected resources, efficiency, electrification and microgrids as feasible.

~~Administer and~~ **Implement ~~the~~a Community Solar and Storage Program.** Evaluate, design and launch community solar and storage program services that support the increased adoption of grid-connected solar and storage technologies.

Integrate Vehicle to Grid Storage. Integrate vehicle to grid storage solutions with transportation and ~~IDSM~~demand side management goals and objectives.

Low-carbon Transportation

RCEA will decarbonize regional transportation through efforts to reduce vehicle miles travelled, increase advanced fuel vehicles adoption and fuel efficiency, and expand advanced fuel infrastructure.

Goals: **Accelerate the adoption of electric vehicles, with a target of over 6,000 electric vehicles on the road in Humboldt County by 2025 and 22,000 vehicles by 2030. Develop public, workplace, and residential electric vehicle charging infrastructure necessary to support these county-wide electric vehicle targets.**

Work with other local public entities to reduce vehicle miles traveled in Humboldt County by at least 25% by 2030.

By 2030 reduce greenhouse gas emission from transportation by over 65% through reductions in vehicle miles traveled, improved vehicle efficiency, the adoption of electric vehicles, and, where determined to be an effective emissions-reduction strategy, the use of biofuels as a bridge to a full transition to zero-emissions vehicles. Maintain a trajectory of emissions reduction to eliminate the use of fossil fuels by 2050.

REDUCE VEHICLE MILES TRAVELED

Strengthen Broadband Infrastructure. Support efforts to strengthen rural regional broadband infrastructure to facilitate remote access to educational and business opportunities, and deploy advanced, resilient grid management technology and integrated energy efficiency and demand response solutions.

Encourage Transportation-efficient Land Use Planning. Encourage infill, transit-oriented development, and walkable and bikeable communities through thoughtful zoning and land-use planning ~~process~~processes.

Facilitate Multi-modal Transportation Infrastructure. Support improving multi-modal transportation options through regional trail networks, transit infrastructure, and complete streets infrastructure strategies that support walking, biking, carsharing, ridesharing, and the use of public transportation.

INCREASE ADVANCED FUEL VEHICLE ADOPTION & FUEL EFFICIENCY

~~**Electrify Transportation.**~~**Support Local Vehicle Fleet Owners Leading by Example**. Encourage local government and private fleets to maximize the use of low-carbon vehicles~~. Provide local incentives for electric vehicles.~~ and support low-carbon transportation initiatives at other agencies.

Promote Advanced Fuels. Equitably promote, support and incentivize low carbon vehicle and fuel adoption by local governments, commercial fleets, and the public. Encourage the use of non-fossil sources of advanced fuels that reduce greenhouse gas emissions, which may include electricity, hydrogen, biodiesel, ethanol, and renewable diesel.

~~**Promote PEV**~~**Support Electric Vehicle** **Adoption.** Conduct public outreach campaigns to promote ~~EV driving; fleet analysis. Provide~~electric vehicles. Offer electric vehicle incentives and provide customers with web and in-person decision support~~.~~ when considering the purchase of an electric vehicle. Conduct leadership by example among government agencies.~~ Support low-carbon transportation initiatives at other agencies.~~

Promote Efficient Driving Practices. Promote the use of energy-efficient driving practices that improve fuel efficiency, such as moderate speed changes and legal speeds, anti-idling, and traffic-calming features.

Support Shipping Efficiency. Support the implementation of trucking efficiency technologies and best-practices, including idle-reduction technologies, aerodynamic retrofits, and low rolling resistance tires. Support the analysis of other potential transportation modes that could provide efficient shipping alternatives such as barge and rail.

EXPAND FUELING INFRASTRUCTURE

Develop Transportation Electrification Infrastructure. Develop and implement Electric Vehicle ~~(EV)~~ charging stations. Provide local incentives for ~~EV~~electric vehicle charging infrastructure and prioritize technologies that align with integrated demand-side management goals.

~~**Develop Biofuels.** Promote use of waste oils and other biomass sources for biofuels production. Focus on waste oils and other biomass that are not already being used for other purposes, and explore potential opportunities and issues of new technologies for biofuels production from local resources.~~

Utilize Biofuels. Promote use of biofuels with low California Low Carbon Fuel Standard (LCFS) scores, particularly those produced with local waste feedstocks.

Streamline Permitting for ~~PEV~~Electric Vehicle Charging Infrastructure. ~~List PEV~~Encourage local jurisdictions to list vehicle charging as a permitted use across a broad range of zoning classifications. If a zoning review is triggered, consider ~~the EVSE~~vehicle charging as an accessory use to another permitted use whenever possible. Develop a standard ~~EVSE~~vehicle charging permitting process~~ that can be used across the North Coast Region, etc.~~.

Promote Vehicle-to-Grid Connection. Promote integration of ~~motor~~electric vehicles with the electric grid~~, including battery electric vehicles, fuel-cell vehicles, plug-in hybrid electric vehicles, and solar electric vehicles.~~. Evaluate the development status of vehicle-to-grid interconnect standards and the use of grid-connected vehicles for short-term energy storage.

Energy Generation & Utility Services

RCEA will address Humboldt County's supply-side energy needs ~~for Humboldt County~~ through its existing Community Choice ~~Aggregation~~Energy (CCE) program and development of new programs and initiatives~~ as appropriate~~.

Goals: **By 2025 100% of RCEA's power mix will be from a combination of state-designated renewable energy sources—solar, wind, biomass, small-hydroelectric, and geothermal—and state-designated net zero carbon emission existing large hydroelectric facilities.**

By 2030 Humboldt County will be a net exporter of renewable electricity and RCEA's power mix will consist of 100% local, net-zero-carbon-emission renewable sources.

Humboldt County can effectively respond to regional and local disruptions to energy supply and distribution systems through modernization of the local electric grid, the deployment of local distributed energy resources, and the development of community microgrids.

POWER RESOURCES

Maximize the Use of Local Renewable Energy to the Extent Technically and Economically Feasible and Prudent. Use the CCE program with its renewable energy targets, and programs supporting distributed energy resources, to achieve this goal.

Minimize Greenhouse Gas Emissions Associated with RCEA's CCE Program. ~~Procure a power mix has.~~Procure a power mix that by 2025 has zero greenhouse gas emissions as counted under the California Air Resources Board's Regulation for the Mandatory Reporting of Greenhouse Gas Emissions, other than emissions from resources meeting California's Renewable Portfolio Standard. Assess, evaluate, and monitor the short-term and lifecycle emissions from all generation sources to ensure power resources align with RCEA's greenhouse gas emissions goals.

~~**Reduce Regulatory Barriers.** Support efforts to increase the efficiency of the energy systems permitting process and reduce any excessive regulatory barriers to renewable energy and distributed generation projects. Work to develop~~**Act as Community Liaison to Renewable Energy Developers.** Using RCEA's position as a wholesale power purchaser, work with developers on proactive strategies to reduce and mitigate the environmental and community impacts of potential energy projects. Ensure that local projects are developed in such a way that prioritizes community benefits.

Maximize Renewable Energy Content of RCEA's CCE Program. Procure a power mix ~~is at least 5% more renewable energy (as defined by state law) than PG&E's power mix and~~that reaches 100% clean and renewable content by 2025.

Ensure Diversity in Local Sources. Pursue development of a diverse, locally produced ~~energy supply, with an emphasis on~~ renewable ~~resources,~~electricity supply that is price-competitive in the California power market and that can be generated in a way that minimizes adverse environmental and community impacts.

Promote Energy Feasibility Studies. Encourage and support feasibility studies of local wind, solar, ~~hydro-power~~hydropower, and ocean energy resources. Make recommendations on preferred alternatives that are consistent with ~~the County's~~community goals for energy security and sustainability.

Power Resources: Distributed Generation

Designate "Renewable Energy Parks." Work with County and City planning departments to designate areas of the county preferred for renewable energy development.

Develop Distributed Generation. Encourage studies to identify key ~~facilities~~locations throughout the county that would benefit from distributed generation ~~and energy~~ systems. Encourage development of responsive distributed generation demonstration sites

Provide Feed-In-Tariff Power Procurement Program for Small Generators. Offer long-term contracts at a ~~set~~market-adjusting rate for Renewable Portfolio Standard eligible renewable energy generators ~~of 1MW or smaller~~ .

Power Resources: Solar

Support Utility Scale Solar Energy Development. Support local efforts to develop solar electric systems in the county. Support development of local training programs for solar contractors and installers. Educate the public about the benefits of solar energy systems. Develop programs that facilitate an increase in the number of solar energy systems in the county.

Procure Local Solar Energy. Contract for local onshore solar energy as part of RCEA's community choice energy portfolio to the extent economically feasible and compatible with portfolio diversity needs.

Power Resources: Offshore Wind

~~Pursue~~**Develop** **Offshore Wind Energy.** Work with public and private entities to develop offshore wind energy off of ~~Humboldt County's~~the north coast region's coastline, and support establishing Humboldt Bay as a west-coast hub for the offshore wind industry.

Procure Local Offshore Wind Energy. Contract for local offshore wind energy as part of RCEA's community choice energy portfolio to the extent economically feasible and compatible with portfolio diversity needs.

Power Resources: Onshore Wind

Promote Large-Scale Wind Energy. Provide information about the potential for cost-effective, commercial-scale wind farms in the county. Educate the public about the benefits and impacts of wind energy systems. Work with utilities, local government, and private companies to develop onshore wind energy projects.

Procure Local Onshore Wind Energy. Contract for local onshore wind energy as part of RCEA's community choice energy portfolio to the extent economically feasible and compatible with portfolio diversity needs.

Power Resources: Bioenergy

Support Biomass Fuels Reduction and Utilization. Develop strategies and technologies for improved biomass utilization in ways that effectively support restoration objectives and fire management priorities. Coordinate with local agencies, communities, and landowners to develop biomass energy plans that are consistent with sustainable forest management, hazardous fuels reduction, fire safety, and restoration needs.

~~**Contract for 20MW Local Biomass Energy.** Contingent on price and market conditions, contract for a target of around 20MW of local biomass energy.~~

Procure Local Biomass Energy. Contract with local biomass facilities at a scale not to exceed the local supply of wood waste from mills and, when feasible and appropriate, from forest management and restoration activities. Require and support a high standard of environmental performance from RCEA's biomass suppliers. Support the deployment of the best-available emissions control technologies. Determine whether, within the context of local commercial forest land management practices and the forest-products sector, local biomass power generation sector has net-zero greenhouse gas emissions on both a short-term and long-term basis, adjusting RCEA's biomass strategy as needed to ensure net-zero emissions.

Promote Small-Scale Biomass Generation Sites. Monitor feasibility of smaller and/or mobile biomass electric generators fed with wood waste and very small diameter logs (e.g., from thinning for fire safety and timber harvest slash~~ in National Forest areas).~~). If/when

technology proves feasible and cost effective, promote its use in county areas ~~near National Forests where existing electric transmission lines are available~~where appropriate.

Pursue Biogas Development. Support HWMA and others ~~in the developmen~~with the development of ~~a food~~organic waste ~~digester~~digesters. Develop and publicize dairy biogas demonstration sites and work with local farm organizations to promote dairy biogas energy systems where appropriate. Publicize the use of biogas at existing local wastewater treatment facilities and encourage its use at additional facilities where appropriate. Encourage biogas use to produce electricity onsite rather than pipeline injection to support long-term phaseout of natural gas distribution infrastructure and avoid the potential greenhouse gas emission impacts of pipeline leaks.

Power Resources: Wave and Tidal

Pursue Wave and Tidal Energy Development. Build on the previous ~~WaveConnent~~WaveConnect and CalWave projects to explore and evaluate opportunities for local wave and tidal energy research, development, and pilot~~-~~ deployment.

Power Resources: Hydro

Support Existing and New Local Small-scale Hydroelectric Power. Evaluate options for contracting with existing small hydroelectric projects as well as the development of new ~~small-scale~~ run-of-~~the~~ river hydroelectric projects that would be eligible for Renewable Portfolio Standard designation and compatible with environmental and cultural priorities. ~~Encourage appropriate local agencies to prepare an updated~~Update the Oscar Larson and Associates' 1982 assessment of small hydroelectric ~~resources~~resource potential in the county.

UTILITY ENERGY SERVICE

Minimize Energy Interruptions. Work with local utility providers to minimize the impact of power outages and improve the reliability and resiliency of the local electricity delivery service.

Provide Energy via Direct Access~~ or Core Transport Agent Agreements.~~. Explore the feasibility of RCEA acting as an electricity provider through direct access~~ and/or acting as a natural gas core transport agent for local energy customers.~~.

Review Utility Options. Review the effectiveness of ~~PG&E~~the incumbent utility in meeting Humboldt County's long-term energy needs and evaluate the feasibility of establishing a local municipal electric utility or joining a new regional public power entity.

Provide Outstanding Customer Service to RCEA Customers. Ensure that participants in RCEA's community choice energy program receive high-quality customer service related to enrollment, rates, billing, and customer programs supported by CCE program customer funds.

RATES & TARIFFS

Provide Community Choice ~~Aggregation~~Energy Program Customer Rate Savings. Provide customer rates that are affordable and price-competitive with customers' other electric supply options.

Provide Electricity Buyback~~.~~ from Self Generators. Provide a net energy metering program that encourages more distributed local generation and more equitably compensates such generation.

Retain and/or Redirect Rate-Payer Dollars Back into Humboldt County. Work to maximize the amount of ~~rate-payer~~ratepayer dollars ~~redirected back into~~retained in Humboldt County when taking into consideration local power procurement, ~~customer rate savings~~electricity rates, local program spending, and allocations toward building the reserve~~/contingency~~ fund for RCEA's Community Choice ~~Aggregation~~Energy program.

Provide Match Funding for State, Federal, and Foundation Energy Grants. Support bringing resources into Humboldt County to pursue ~~CCA~~CCE community energy goals.

Support Transition to Time of Use Rates. Inform and educate CCE customers on CPUC transition to default Time Of Use rates. Support customer adoption and ~~transitions~~transition to time of use electricity rates.

Provide Education on all Electric Rate Schedule Options. Provide information on all available electric rate schedules including Net Energy Metering, Time Of Use, and RePower+ (100% renewable energy). Offer electric rate analysis to estimate financial impacts of different rate schedules. Inform and educate the community of the California Public Utilities Commission's transition to default Time Of Use rate schedules.

Provide a 100% Carbon-Free Service Option for CCE Customers. Develop an additional opt-up choice for CCE customers consisting of solar energy and other emissions-free resources, with a portion of the incremental revenues used to underwrite energy programs benefitting community non-profits and/or low income residential CCE participants.

TRANSMISSION & DISTRIBUTION INFRASTRUCTURE

~~Perform~~**Facilitate Transmission Assessments and Monitoring.** Encourage development of long-term transmission assessments and, if necessary, electrical transmission grid upgrade and/or expansion plans. Monitor local electricity transmission system planning to ensure that projected growth areas are adequately served and to support the development of local renewable energy projects.

Support Upgrade of the Electricity Transmission and Distribution System. ~~Upgrade~~Collaborate with PG&E, the California Independent System Operator, and renewable energy developers to upgrade the regional transmission and distribution electrical grid to enable increased development of both utility-scale renewable energy projects ~~as well as~~and community-scale distributed generation systems, including capability to export surplus renewable electricity ~~generation~~ from Humboldt

County to other areas of the state and to operate Humboldt County's grid independently during regional emergencies.

Biomass Power in Humboldt County

Brief Summary of Workshops, Consultations, and Research

Prepared by

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November, 2019

Key Points

1. Biomass is considered a climate change "bridge" solution, beneficial until other cleaner sources can fill the gap.

2. Biomass power emits air pollutants that are dangerous to human health where humans are exposed. Open burning emits more air pollutants and GHGs, but human exposure to air pollutants in the field is usually small.

3. Biomass provides local "baseline" power that is otherwise provided locally by the PG&E Natural Gas plant.

4. Biomass is often considered "carbon neutral" because wood products and mill residues are inside the natural carbon cycle. GHGs are emitted, and carbon neutrality is difficult to establish.

5. Biomass burning confers only small savings in GHG over open burning of mill residue or forest slash. The timing of emissions is modified but the totals emissions are similar.

6. Most alternatives for mill residue disposal produce higher levels of greenhouse gas warming than burning the residues for power.

7. Sequestering to carbon in mill residues over climate-meaningful timeframes is a local opportunity to contribute to climate change mitigation. Few alternatives exist at the required scale, but several are promising. Composting appears infeasible at the required scale. Additional manufactured products could be feasible, depending on investment, technology, and markets. Biochar production holds the most promise. A large-scale biochar pilot project using mill wastes is recommended to define the economic, the social, the logistical potentials of biochar production using mill wastes.

What is the global context for biomass power?

Since the human discovery of how to start a fire, biomass has been the primary human energy source. Even today, more than half the world's people use biomass as their primary energy source. We have transitioned modern society to burning fossil fuels for energy, not realizing that the emissions would disrupt the climate worldwide, with immense and growing adverse consequences.

The UN IPCC has recently concluded that to avoid severe climate consequences, greenhouse gas emissions should be reduced as much as possible as soon as possible.

Now we face a critical question: How do we move from powering our world with fossil fuels to using only the sun, the wind, moving water, and the heat of the earth's crust?

We need bridge solutions, and biomass is considered a prime candidate worldwide. The potential to generate electricity and heat is obvious, but so are its drawbacks: air pollution, and carbon emissions, and the concern for forest and agricultural management needs and impacts.

At present, biomass fuels about two percent of global electricity production, more than any other renewable source. In some countries—Sweden, Finland, and Latvia among them—bioenergy is 20 to 30 percent of the national generation mix, almost entirely provided by trees. Biomass energy is on the rise in China, India, Japan, South Korea, and Brazil. (Hawken, et al. 2017.)

Is there a State of California context for biomass power?

The California Department of Forestry and Fire Protection has published a California's Forest Carbon Plan (2018).

Among the findings of the report:

- Reducing carbon losses from forests, particularly the extensive carbon losses that occur during and after extreme wildfires in forests and through uncharacteristic tree mortality is essential to meeting the state's long-term climate goals. Fuel reduction in forests can increase the stability of the remaining and future stored carbon.
- The limited infrastructure capacity for forest management, wood processing, and biomass utilization, and the limited appropriately trained or licensed supporting workforce are significant impediments to forest restoration and ongoing forest management.

Near-term actions proposed by the State include:

- Expand wood products manufacturing in California and take actions to support market growth scaled to the longer-term projections of forest productivity and resource management needs.
- Continue public investment to build out the 50 megawatt (MW) of small scale (5MW or less sized facilities), wood-fired bioenergy facilities mandated through SB 1122 (Rubio, 2012).
- Maintain existing bioenergy capacity at a level necessary to utilize materials removed as part of forest restoration and to support long-lived storage of carbon in building materials.

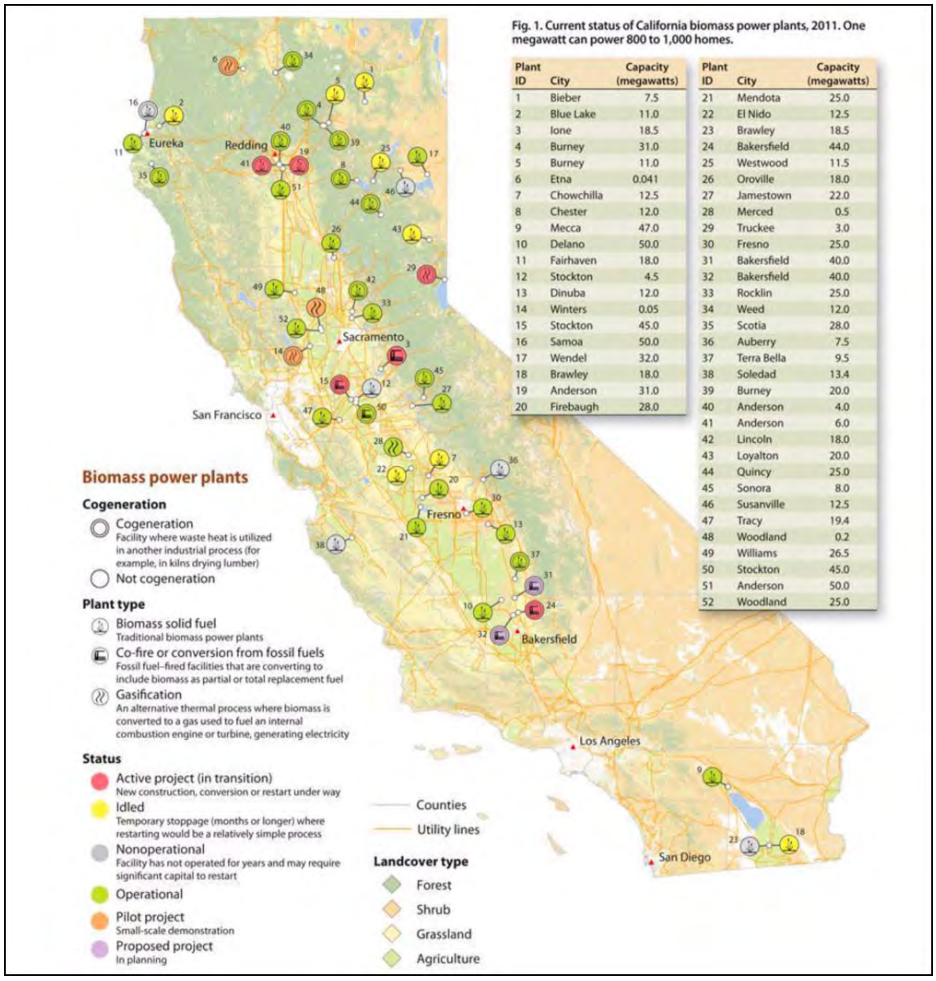


Fig. 1. Current status of California biomass power plants, 2011. One megawatt can power 800 to 1,000 homes.

Plant ID	City	Capacity (megawatts)
1	Bieber	7.5
2	Blue Lake	11.0
3	Ione	18.5
4	Burney	31.0
5	Burney	11.0
6	Etna	0.041
7	Chowchilla	12.5
8	Chester	12.0
9	Mecca	47.0
10	Delano	50.0
11	Fairhaven	18.0
12	Stockton	4.5
13	Dinuba	12.0
14	Winters	0.05
15	Stockton	45.0
16	Samoa	50.0
17	Wendel	32.0
18	Brawley	18.0
19	Anderson	31.0
20	Firebaugh	28.0
21	Mendota	25.0
22	El Nido	12.5
23	Brawley	18.5
24	Bakersfield	44.0
25	Westwood	11.5
26	Oroville	18.0
27	Jamestown	22.0
28	Merced	0.5
29	Truckee	3.0
30	Fresno	25.0
31	Bakersfield	40.0
32	Bakersfield	40.0
33	Rocklin	25.0
34	Weed	12.0
35	Scotia	28.0
36	Auberry	7.5
37	Terra Bella	9.5
38	Soledad	13.4
39	Burney	20.0
40	Anderson	4.0
41	Anderson	6.0
42	Lincoln	18.0
43	Loyalton	20.0
44	Quincy	25.0
45	Sonora	8.0
46	Susanville	12.5
47	Tracy	19.4
48	Woodland	0.2
49	Williams	26.5
50	Stockton	45.0
51	Anderson	50.0
52	Woodland	25.0

Current status of biomass power facilities in California. Map source: UC Division of Agriculture and Natural Resources. As the wood products and bioenergy landscapes in California are quite dynamic, some of the 2012 data presented here may no longer be accurate. The University of California maintains an up-to-date wood facility database at: https://ucanr.edu/sites/WoodyBiomass/Project/California_Biomass_Power_Plants/

What is the Humboldt County Context for Biomass power?

Locally biomass is presently the only renewable energy source, with the minor exceptions of small solar installations and several small hydroelectric installations.

Humboldt County produces enough electricity for local consumption, using biomass and natural gas (RePower 2013). Additional generating capacity might increase soon if planned onshore and offshore wind power is installed and solar installations are built.

Biomass generates continuous power output to the grid, contributing to meeting variable electricity demand and complementing the power available from intermittent solar and wind.

In Humboldt County, biomass electricity, using chiefly mill residues, has been generating heat and electricity since the late 1980s. A local lumber manufacturing economy has been operating here for well over a century. Lumber mills generate remarkably large volumes of unusable wood materials, mostly sawdust, bark, and cutoffs. These have been disposed of in open burning, mostly in teepee burners until these were prohibited, and currently mainly in biomass generation plants.

Burning biomass produces carbon emissions. However, it is not adding fossil carbon that has been stored for eons far belowground, as is the case with fossil fuels. Biomass energy generation burns carbon that is in circulation, cycling from the atmosphere to plants and back again.

Does this carbon to the atmosphere count? Yes and no, depending on the time periods we consider and how we view the overall carbon balance and the continued extraction of fossil fuels.

Why is biomass power considered a climate solution? Is biomass power "carbon neutral"?

Climate change has primarily resulted from the extraction of fossil carbon from outside the natural carbon cycle and adding it to the atmosphere and oceans, resulting in a significant and consequential radiative forcing and the rapid climate warming that we now observe. There is a global consensus that we must limit the further additions of fossil carbon to the atmosphere and do so as quickly as possible.

Biomass burns carbon-containing materials and thus emits greenhouse gasses, but this carbon is "in the cycle" and does not contribute to increasing the total amount of carbon circulating on the earth system. That is, the carbon in biomass is already in circulation and, after being emitted, is typically sequestered again in years to decades.

Consideration and accounting for greenhouse gas emissions from biomass burning are nuanced.

The energy density of woody material is low relative to coal or natural gas. The CO2 emissions are thus higher than these other two sources. Approximately 320,000 tons of CO2 are emitted annually by the two plants.

The CO_2 emissions per unit of energy generation are:

Natural gas: 118 lb. CO_2/MMBtu

Bituminous coal: 205 lb. CO_2/MMBtu

Wood: 213 lb. CO_2/MMBtu (bone dry)

The authors of Repower Humboldt pointed out several key issues that would need to be addressed before any expansion of biomass

infrastructure. One of these issues was the assumption that biomass is "carbon neutral":

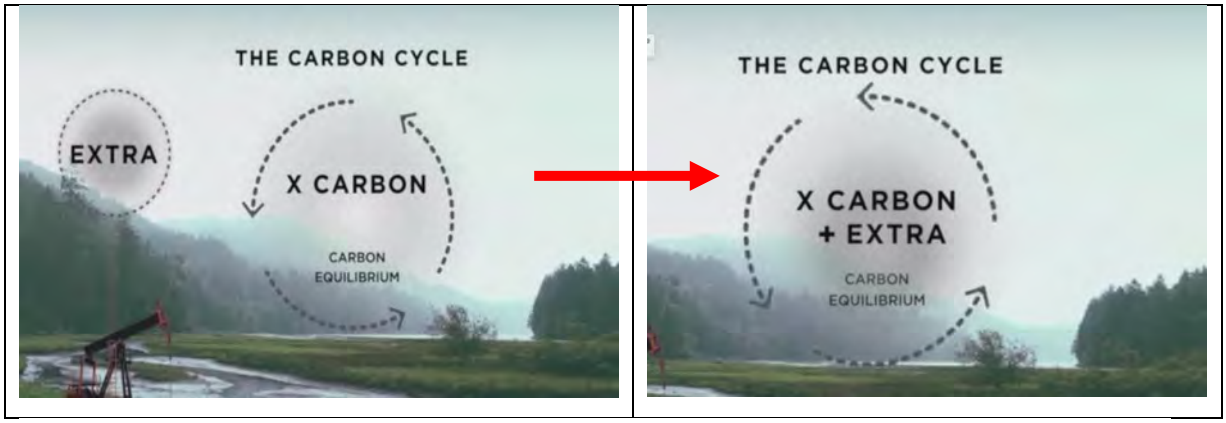
> *"In general, biomass has been treated as a carbon-neutral resource as long as the harvest rate does not exceed the rate of new growth. However, this premise is currently being scrutinized and regulatory treatment of biomass could change. (...) These emissions can be assessed in a life cycle analysis. This study treated biomass as a carbon-neutral resource. It is recommended that this assumption be further evaluated as a topic of future research."*

Biomass helps to move away from fossil fuels and helps balance the supply from intermittent power from solar and wind generation. When more flexible grid solutions come about and storage facilities are added, this will become less important.

Scientists tend to be split on whether biomass burning can be considered "carbon neutral." The carbon loading of any biomass generation facility depends on its context: fuel source, transportation and handling costs, the degree of substitution for fossil fuels, and other factors and differs from facility to facility.

Many scientists conclude that if trees grow back in a few decades and if harvest volume is equal to or greater than burned volume, the GHG inputs do not "count," as they are re-sequestered, just as the carbon cycle has been operating for millions of years. That is, if burning biomass that is inside the natural carbon cycle substitutes for fossil fuels, many contend that this amount can be "subtracted", creating a neutral or even carbon-negative result.

Others contend that a CO_2 molecule is the same and has the same radiative effect regardless of its source: and therefore, biomass burning does count as an adverse emission. In California and International carbon emissions accounting, some emissions from Land Use, Land-Use Change, and Forestry (LULUCF), which are inside the natural carbon cycle, is counted, while some are not, due to difficulties in measurement, such as for soil carbon.



The extraction of billions of tons per year of non-circulating fossil carbon has been added to the carbon cycle. This is the primary driver of human-caused climate change.

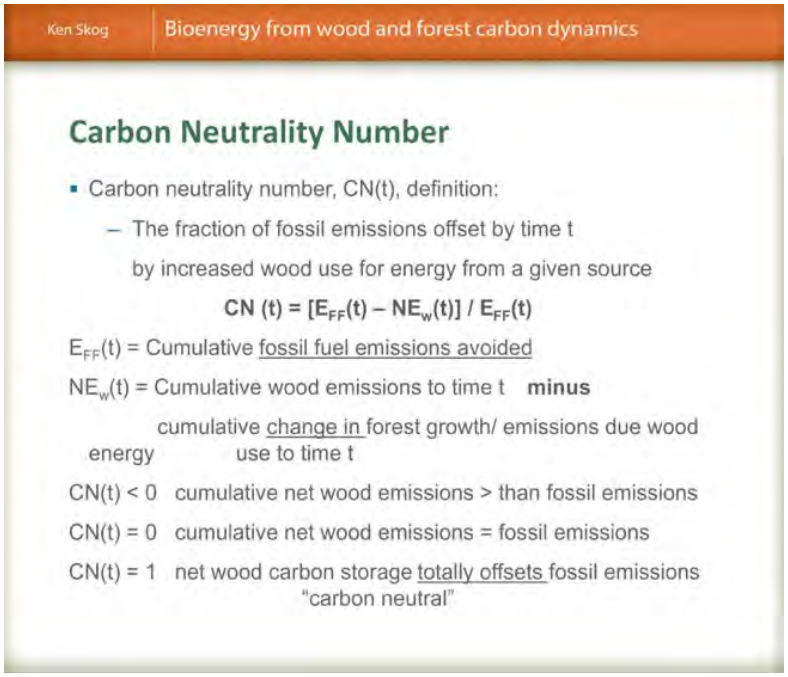
According to Morris, 2008,

> *" Carbon Neutral and Beyond: The greenhouse-gas emissions produced at biomass and biogas generating facilities comes from carbon that is already a part of the linked atmospheric – biospheric carbon cycle. This is in stark contrast to fossil fuel combustion, which removes carbon from permanent geologic storage, and adds it as net new carbon to the carbon already in the atmospheric – biospheric circulation system. Most people focus on this aspect of bioenergy production, and proclaim it to be "Carbon Neutral." …. Biomass energy production can change the timing and relative mix (oxidized vs. reduced) of carbon forms emitted into the atmosphere associated with the disposal or disposition of the biomass resources. As a greenhouse-gas, reduced carbon (CH4) is twenty-five times more potent than oxidized carbon (CO2) on an instantaneous, per-carbon basis."*

How the GHG emissions are regarded in emissions accounting depends on many factors: wildfire risk, frequency, extent, and severity; timing of emissions, the chemistry of environmental transformations; human interventions; applied logic and assumptions; assumed time periods of analysis; substitutions of biomass for fossil fuels; other avoided impacts, philosophy, and other factors.

The perplexities of the burning of biological carbon can be somewhat resolved by a thorough life-cycle analysis (LCA). Without a thorough life-cycle analysis, carbon neutrality cannot be claimed, quantified, or denied.

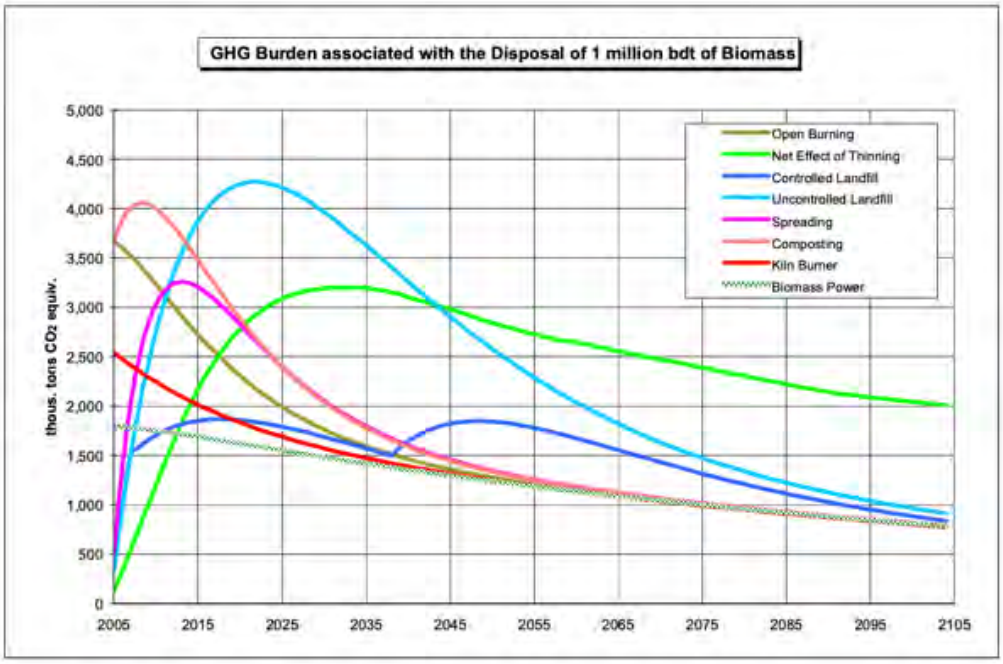
A formula used by US Forest Service economists is:



Forest Service economist Ken Skog. From: Swanston, Chris; Furniss, Michael J.; Schmitt, Kristen; Guntle, Jeffrey; Janowiak, Maria; Hines, Sarah, eds. 2012. Forest and grassland carbon in North America: A short course for land managers. Gen. Tech Rep. NRS- 93.

Considerable research effort is underway to more accurately assess the environmental and social impacts of biomass, including life cycle assessment modeling and tool development at the Schatz Energy Research Center at Humboldt State University. However, a detailed LCA of the local biomass plants is not planned at present.

As assessed in Morris 2008, biomass burning changes the timing of GHG emissions:



The curve for stack emissions from the biomass energy alternative is based on the immediate release of virtually all of the fuel-bound carbon as CO_2, followed by its gradual clearance from the atmosphere. The conversion of one million bdt of biomass leads to emissions of 1.75 million tons of biogenic CO_2 equivalents. Open burning and low-efficiency combustors (kiln boilers and fireplaces) also produce their emissions immediately, but their greenhouse-gas emissions are higher, in terms of tons of biogenic CO_2 equivalents, than those of the power alternative because of the release of black carbon and other products of incomplete combustion. (Morris, 2008).

Open burning of woody material from forest and milling operations emits substantially more air pollutants than the high-efficiency burning in a power plant, as the burning is less complete and less efficient. Black carbon (soot) and methane emissions from open burning are substantial and especially adverse to atmospheric warming but are short-lived.

What about the air pollution produced by the biomass plants?

Biomass power in RCEA's mix is generated by burning mill waste, comprised of woody material from lumber mills. Burning wood creates smoke. Smoke includes air pollutants that adversely affect human health to those exposed.

There is a growing worldwide recognition of the adverse health effects of smoke and other forms of air pollution, which can lead to a wide variety of serious human diseases and shorten life. Impacts can be especially severe for the young and infirmed. Smoke from wildfires, open burning, biomass production, campfires, even candles is not healthy to breathe. Recent large wildfires have exposed many city-dwellers to high levels of smoke and have sharpened awareness of this source of air pollution and its health consequences.

Smoke from burning wood emits several pollutants of concern, but by far the most serious is particulate matter – small particles that can pass through the lungs into the bloodstream. Small particles of 2.5 microns and below ($PM_{2.5}$) are of most significant impact and concern. There is no recognized No Effect Level (NOEL) for exposure to particulate matter.

Other pollutants in smoke include nitrogen oxides, carbon monoxide, volatile hydrocarbon compounds, and secondary production of ground-level ozone.

Pollutant	Description	Health Effects	Welfare Effects
Carbon Monoxide (CO)	Colorless, odorless gas	Headaches, reduced mental alertness, heart attack, cardiovascular diseases, impaired fetal development, death.	Contributes to the formation of smog.
Sulfur Dioxide (SO_2)	Colorless gas that dissolves in water vapor to form acid, and interact with other gases and particles in the air.	Eye irritation, wheezing, chest tightness, shortness of breath, lung damage.	Contribute to the formation of acid rain, visibility impairment, plant and water damage, aesthetic damage.
Nitrous Oxides (NO_2)	Reddish brown, highly reactive gas.	Susceptibility to respiratory infections, irritation of the lung and respiratory symptoms (e.g., cough, chest pain, difficulty breathing).	Contribute to the formation of smog, acid rain, water quality deterioration, climate warming, and visibility impairment.
Ozone (O_3)	Gaseous pollutant when it is formed in the lower atmosphere.	Eye and throat irritation, coughing, respiratory tract problems, asthma, lung damage.	Plant and ecosystem damage.
Lead (Pb)	Metallic element	Anemia, high blood pressure, brain and kidney damage, neurological disorders, cancer, lowered IQ.	Affects animals and plants, affects aquatic ecosystems.
Particulate Matter (PM)	Very small particles of soot, dust, or other matter, including tiny droplets of liquids.	Eye irritation, asthma, bronchitis, lung damage, cancer, heavy metal poisoning, brain damage, cardiovascular effects.	Visibility impairment, atmospheric deposition, aesthetic damage.

Health and welfare effects of common pollutants (from: Furniss 2017)

Health organizations that have publicly opposed biomass power include: the American Academy of Pediatrics, American Lung Association, American Public Health Association, Asthma and Allergy Foundation of America, National Association of County & City Health Officials, National Environmental Health Association, Trust for America's Health, Children's Environmental Health Network and Physicians. (Form letter of 2016)

Air quality and air ambient air monitoring

Air quality is continuously monitored in Eureka and is usually in the "good" category, considered "healthy" and "attaining" USEPA air quality standards, except sometimes for particulate matter. Humboldt County is a considered a "Non-Attainment" area for PM_{10} particulate air pollution.

No monitoring of ambient air quality is done in Fairhaven or Scotia, where exposure to biomass emissions would be expected to be the greatest.

Emissions by type of combustion in pounds emitted per ton of woody biomass consumed

	$PM_{2.5}$ (lb./ton)	NOx (lb./ton)	CO (lb./ton)	VOC (lb./ton)	CO_2 (lb./ton)
Industrial (dry fuel)	0.7-6.5	8.8	10.8	0.31	3120
Residential Stove	6-23	2-14	46-160	10-44	~2800
Prescribed Burn	12-34	6	167	19.0	~2700
Wildfire	~30	4	140	12-24	~2600

References: USEPA, AP12, Fifth Edition. McDonald et al. 2000, Environmental Science and Technology. USDA Forest Service, various reports

Average air quality impacts for boiler-spinner electricity generators

Air Emissions	Coal Fueled Boiler (lb./MMBtu)	Biomass Fueled Boiler (lb./MMBtu)	Natural Gas Boiler (lb./MMBtu)
CO	0.02-0.67	0.60	0.058
CO_2 fossil	178-231	0	117.6
CO_2 non-fossil	0	195.0	0
NOx	0.27-1.15	0.22-0.49	0.031-0.27
SOx	1.3	0.025	0.0005
VOC	0.002-0.048	0.017	0.005
Methane	0.002	0.021	0.002
Particulates	0.37-2.4	0.05-0.56	0.007

Note: Both contracted local plants use grid power for start-up and ongoing operation, much of which is fossil carbon.

Permitted air pollutant discharges

HRC Scotia permitted discharge of PM (all sizes) = 0.04 lbs./MMBtu

DGF permitted discharge of PM (all sizes) = 0.10 lbs./MMBtu

BL permitted discharge of PM (all sizes) = 0.04 lbs./MMBtu

Year	Facility	Total GHG	Non-Biomass GHG	Biomass CO2
2016	DG Fairhaven Power LLC	87,243	6,158	81,085
2016	Humboldt Sawmill Company	231,566	6,132	225,435
2016	PG&E Humboldt Bay Generating Station	171,847	171,847	0

Year	Facility	CO2	CH4	N2O	VOC	NOx
2016	DG Fairhaven Power LLC	85,532	27.75	3.64	8.9	74.8
2016	Humboldt Sawmill Company	226,819	76.95	10.1	36.9	174.8
2016	PG&E Humboldt Bay Generating Station	171,676	3.26	0.33	15.9	24.9

Year	Facility	SOx	PM10	PM2.5	Diesel PM	Formaldehyde	Hydrochloric Acid
2016	DG Fairhaven Power LLC	12.7	14.3	13.3	8.63	4,457	19,222
2016	Humboldt Sawmill Company	34.6	37.4	34.5	56.6	12,376	442
2016	PG&E Humboldt Bay Generating Station	1.2	5.2	5.2	129	1,933	

Reported greenhouse gas and air pollutant emissions for 2016. Data from California Environmental Protection Agency Air Resources CARB Pollution Mapping Tool. Accessed 11/18/2019

The current annual fine particle standard has been revised from the current level of 15.0 micrograms per cubic meter (µg/m3) to 12.0 µg/m^3. An area will meet the standard if the three-year average of its annual average PM2.5 concentration (at each monitoring site in the area) is less than or equal to 12.0 µg/m3[1]

[1] USEPA 2012 The National Ambient Air Quality Standards for Particle Pollution Revised Air Quality Standards for Particle Pollution and Updates To The Air Quality Index (AQI)

Air Resources Board

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Select 8 Summary

FAQs

Monitoring Sites	PM2.5 State Annual Average 2014	2015	2016	2017	2018
Humboldt County					
Eureka-Humboldt Hill	7.4	4.7	*	*	*
Eureka-Jacobs	*	5.8	6.0	*	7.7

Air Basins	PM2.5 State Annual Average 2014	2015	2016	2017	2018
California					
North Coast Air Basin	7.4	7.9	6.4	9.4	11.3

Note: * There was insufficient (or no) data available to determine the value.

The annual standard is 12.0 μg/m^3. Last five years: 5.8 – 7.7 μg/m^3.

Table 3.12-1. Federal/State Ambient Air Quality Standards

Pollutant	Federal	State
Ozone	Unclassified/Attainment	Attainment
Sulfur Dioxide	Unclassified	Attainment
Nitrogen Dioxide	Unclassified/Attainment	Attainment
Particulate Matter 2.5 Microns or Smaller ($PM_{2.5}$)	Unclassified/Attainment	Attainment
Particulate Matter 10 Microns or Smaller (PM_{10})	Unclassified	Non-attainment
Sulfates	No Standard	Attainment
Lead	Unclassified/Attainment	Attainment
Hydrogen Sulfide	No Standard	Attainment
Vinyl Chloride	No Standard	Attainment
Carbon Monoxide	Unclassified/Attainment	Attainment

Source: ARB, 2016a

Federal and State ambient air quality standards

Table 3.12-2. Criteria Pollutant Concentrations in Humboldt County, 2011-2015.

Pollutant	State Std.[a]	National Std.[a]	Pollutant Concentration by Year[b] 2011	2012	2013	2014	2015
Ozone (ROG, NOx, CO)							
Highest 1-hour average (State), ppm	0.09	--	0.047	0.053	0.055	0.049	0.060
Days over State Std.[f]			0	0	0	0	0
Highest 8-hour average (State/national), ppm	0.07[c]	0.075	0.043/ 0.043	0.049/ 0.048	0.049/ 0.049	0.043/ 0.043	0.053/ 0.052
Days over State Std.			0	0	0	0	0
Days over National Std.			0	0	0	0	0
Respirable Particulate Matter (PM_{10})							
Highest 24-hour average (state national), μg/m^3	50	150	**53.9/ 49.6**	46.3/ 44.5	**66.7/ 64.3**	ND[d]/ **104.7**	ND[d]/ 54.9
Days over State Std.			6.1	0	11.8	ND[d]	ND[d]
Annual average (State), μg/m^3	20[e]	--	19.1	16.8	19.3	ND[d]	ND[d]
Fine Particulate Matter ($PM_{2.5}$)							
Highest 24-hour average, μg/m^3	--	35	24.8	22.3	28.1	21.2	18.6
Days over National Std.			ND[d]	0	0	0	0
Annual average (National), μg/m^3	12	15	6.6	6.7	7.1	3.0	4.6

Notes:
Bold = in excess of standards
ppm = parts per million; μg/m3 = micrograms per cubic meter
[a] COE, 2008.
[b] ARB, 2016b (ozone data are from the Eureka-Humboldt Hill monitoring station while PM_{10} and $PM_{2.5}$ data are from the Eureka-Jacobs and monitoring station).
[c] In 2006, the State approved amendments to the regulations for the State Ambient Air Quality Standard for ozone establishing a new 8-hour average ozone standard of 0.070 parts per million (ppm).
[d] No data available.
[e] The national annual PM_{10} standard was revoked in December 2006 (ARB, 2008a).
[f] The national 1-hour ozone standard was revoked in June 2005 (ARB, 2008a).
Source: ARB, 2016b; compiled by ESA.

A sampling of criteria pollutant concentrations for Humboldt County

NCUAQMD has issued permits to the three biomass plants in Humboldt County. Emissions are monitored at the stack of the plants, but actual exposures of local populations in Eureka, Fairhaven, Scotia, and Blue Lake are not monitored.

Emission alone do not describe the public health hazard; Exposure of people to the emitted pollutants is necessary but is not currently available. The District has stated that it has done exposure modeling in formulating the permits, but this information is not publicly available, and ongoing exposure modeling and monitoring are not conducted.

In the absence of exposure modeling and monitoring, public health risks cannot be quantified or described. Scotia, Fairhaven, and Blue Lake plants are proximate to population centers. The DGF is across Humboldt Bay from the Eureka population but is proximate to the community of Fairhaven.

The emissions from biomass plants, where combustion is controlled to tight tolerances, efficiency is an objective and particulate control facilities are in place, are much less than from open burning, as occurs in burning piles of slash in the woods, in wildfires, in controlled burns, and in the teepee burners that were used for decades to dispose of mill wastes.

The emission controls at the two RCEA-contracted plants, based on the air quality permits, include:

DG Fairhaven

- Mechanical Multicyclone Collector
- Electrostatic Precipitator
- Forced Overfire Air System

HRC Scotia

- Particulate matter is controlled with multiple cyclones followed by an electrostatic precipitator manufactured by General Electric Co. The unit has three separate transformer/rectifier fields and a collection plate area of 42,120 sq.ft. Two of the fields are rated at 50 KVA and one at 35 KVA. A forced overtire air system is utilized to help control gaseous emissions.

Open burning of woody material from forest and milling operations emits substantially more air pollutants than the high-efficiency burning in a power plant, as the burning is less complete and less efficient. Black carbon (soot) emissions from open burning are particularly large and adverse to atmospheric warming.

What is the feed material and why does it matter to RCEA and the community?

The feed material for the two contracted plants is residues from local lumber mills that are not otherwise used for salable by-products of lumber manufacture. Small amounts of logs from arborists and sanitation of logs killed by Sudden Oak Death are also included. Small quantities of waste logs from forest thinning on public land have been burned at DG Fairhaven in the past.

Character

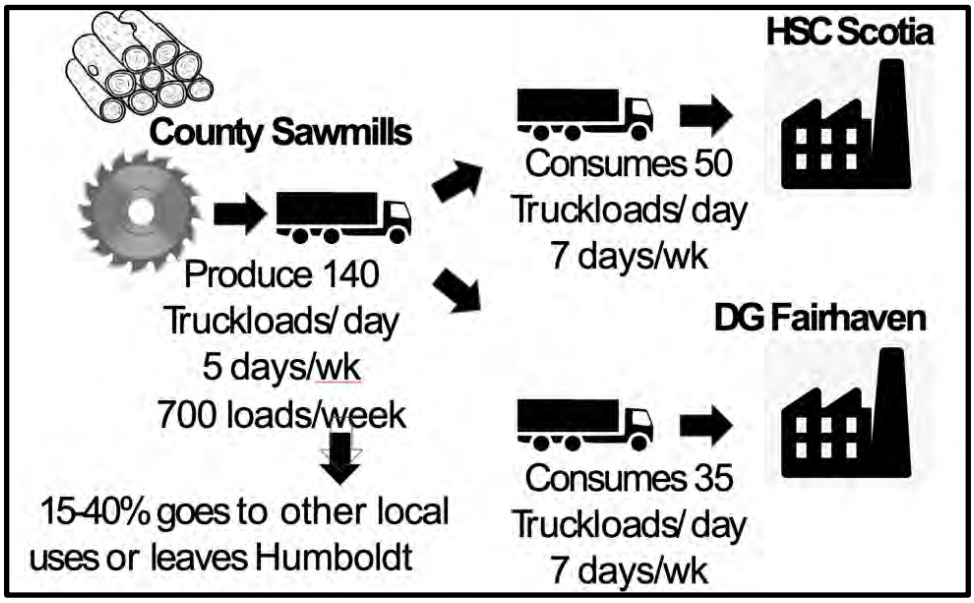
Lumber mills produce waste from lumber manufacture, including sawdust, bark, cutoffs, wings, and so on. Some of this material has economic value and is sold as chips for paper manufacture, mulch, fiberboard manufacture, burnable pellets, and so on. For these uses, the material must be of a particular quality, and there must be a current market demand, which can vary significantly over time.

What remains after these by-products are sold and transported away, is a low-quality material that has no current economic value, but can be burned to generate steam and electric power.

The primary factor that determines the quantity of mill residues used as fuel in California is the level of activity in the primary forest-products industry.

Unsaleable mill residues can look like this but vary in composition, sizes, and moisture content. A large component is in the form of sawdust.

Currently produced quantities of mill residue, based on queries to the mill operators are:



Note: Lumber mill operations have seen a steady decrease in the amount of waste per unit of lumber production via the use of computer analysis of logs for optimum lumber yield, low-kerf saws, and other technology.

What used to be done with this material?

History

Mill wastes that could not be sold as by-products have historically been burned in "teepee burners." During the height of timber harvest in the county, approximately 200 mills were operating, and each had a teepee burner that burned mill residues around the clock. A great deal of smoke was emitted. Many of these burners can still be seen today at old mill sites.

Teepee burners were common before stringent air pollution control regulations. Every mill had one, and they usually operated 24/7/365. The resulting air pollution was far worse than the relatively efficient burning conditions with pollution controls in a modern biomass plant.

What about forest health and sustainability?

Concerns about feed material and forest sustainability

The source material for biomass is a central issue in most biomass power elsewhere – that is, how this use and demand could induce unsustainable pressure to harvest forests and to use of agricultural land for other than food production.

This is not currently relevant here, as the feed is mill waste only, with very minor exceptions (the plants accept arborist waste and sanitation logs that must be burned, such as tanoak infected with Sudden Oak Death.)

While current biomass plant generation is fully satisfied by mill residues, additional capacity could be added, markets might divert more mill waste than currently, and forest management activities could become feed material for the plants,

Forestry officials in California hope to see extensive thinning and controlled burning in California forests to reduce wildfire hazards and improve forest health. Pre-commercial thinning is expected to increase markedly throughout California forests in the near future. Considerable

funding is becoming available for this work. Large amounts of small logs and slash will be generated.

However, the economics of transport mostly keeps this material in the woods; it is simply not worth the transportation costs to bring it to the mills or the biomass plants. A haul of more than ~50 miles is cost-prohibitive. The small logs and slash must be treated in the woods to reduce fire hazards and enable regeneration.

There are several active research and development projects, including a local effort to evaluate various means of on-site processing of fuel treatment thinning and the associated large volumes of slash, including more efficient burning, wood-energy concentration for transportable fuel, and sequestration as biochar.

In terms of a concern that larger trees will be logged to feed biomass plants, this is not an issue -- sawlogs are always far more valuable for lumber manufacture than for burning in biomass plants.

Who is in favor and who is opposed to using biomass to generate electricity?

Public opposition is substantial. Vocal opponents come to CAC and Board meetings and express opposition and concern, primarily about air pollution, greenhouse gas emissions, and forest management.

Gaining the full support of the community is not likely or possible.

Local environmental groups that have addressed this include 350-Humboldt and EPIC are both are "neutral."

Four highly credible professional groups are notable:

1. Forestry and timber manufacturing professionals tend to be strongly in favor
2. Medical professionals, as represented by several professional medical societies, and two local physicians have strong concerns and opposition due to air pollution and greenhouse gas emissions.
3. Climate scientists and specialists are generally in favor of biomass as a bridge solution, but with caveats.
4. California Air Pollution Control Officers Association (CAPCOA) has issued a written statement in favor of biomass as a way to limit air pollution from other methods of waste incineration or landfills.

   Exceptions exist in all groups and are acknowledged.

Opponents frequently note that biomass cannot be considered "clean" because it emits both air pollutants and greenhouse gases. There is no broadly accepted definition of "clean" energy. In the context of energy and climate in California, "clean" means "non-fossil and non-nuclear" and not that there is no associated pollution.

What will happen to the mill residues if RCEA no longer buys the power from the plants?

As noted, a large volume of residue is generated at local mills. If biomass is not burned for electric generation, options for disposal include:

- Note: HRC uses biomass power for mill operations and heat from the plants for lumber drying, and so would continue to run at some level even if there were no electricity buyers.
- Transporting the material out of the county to other biomass plants or to landfills.
- Trucking the material to Anderson, CA for burning in the Wheelabrator biomass plant there (about 300 miles round trip) or other more distant plants.

- Open burning (this unlikely to be permitted locally due to air pollution regulations). The residue could be hauled to an acceptable open burning location.
- Plants sell electricity to other buyers, such as a community choice energy program serving a jurisdiction outside Humboldt County, as many municipalities have a mandate for renewable energy.
- Closing the mills and sending logs out of the County (likely to Oregon). Prices for local logs would decrease substantially. This would have the effect of making restoration forestry, road maintenance, and wildfire-resilience thinning less feasible and less practiced.

None of these options eliminates GHG emissions, and most would increase both air pollution and GHG emissions. Landfilling of mill waste could decrease air pollution but substantially increase GHG gas emissions, including methane, Current severe systemic societal waste disposal challenges would worsen. Landfills might not accept large quantities of organic wastes.

Two other options that could sequester the carbon include:

Developing or discovering additional products and markets for the residues.

Mill operators are always looking for new and reemerging by-product markets for mill residues. The potential depends on the existence of markets, levels of demand, manufacturing technologies and distance to markets. The quality of the unused material is often sub-standard for any commercial uses and sales: it is too variable in size, often has rock and dirt contamination, and has variable moisture content. Unless the provenance of the material in the piles is verifiably known, insect and pathogen non-presence cannot be assured.

Residues are currently sold as "by-products" for:

- Chips for paper manufacture, mostly to Asia, but also the PNW states. Paper manufacture requires large, clean chips, and there is currently a market for these over the Fairhaven loading dock.
- Burnable wood pellets are commonly produced and sold from Eastern USA forests for sale to the EU, Japan, and other places to substitute for coal burning, as climate mitigation. There might be a potential market for local burnable pellets, particularly for industrial use where feed material quality and produce polish is less important than for consumer-grade pellets.
- Small amounts of residues are sold for compost-making, landscaping, animal bedding, playground mulch, and so on.

A challenge to selling by-products is that interstate and international quarantines exist to prevent the introduction of pathogens. This is a barrier to export for some types of sales.

Emerging technologies include: gasification, torrefaction, biochar, and others are in active research and development locally and elsewhere.

Gasification converts woody materials into gasses by reacting the material at high temperatures (typically >700 °C), with little oxygen. The product is wood gas fuel that can be burned as fuel in furnaces, stoves, and vehicles in place of gasoline, diesel, or other fuels. Biochar is a byproduct.

Gasification is relatively expensive and is highly energy-intensive. The moisture content of the feedstock must be carefully controlled. Some of the sawmill residues could be diverted to a gasification plant, but it would require a significant capital investment and tight controls on the quality of the feedstock. The material would be burned with the associated carbon emissions. Gasification technology is not currently at a feasible scale to process the amount of available local sawmill residues.

Torrefaction is intended to increase the energy density of wood and involves the heating of biomass in the absence of oxygen to a temperature of typically 200 to 400°C. The weight loss is about 30%, but the energy loss is ~10%. The main product is the solid, torrefied biomass, either as torrefied wood material or briquettes. During the torrefaction process, combustible gas is produced that provides heat to drive the process. *(Biomass Technology Group. Accessed 11/11/19.)*

Torrefaction produces material to burn for heat, not for carbon sequestration.

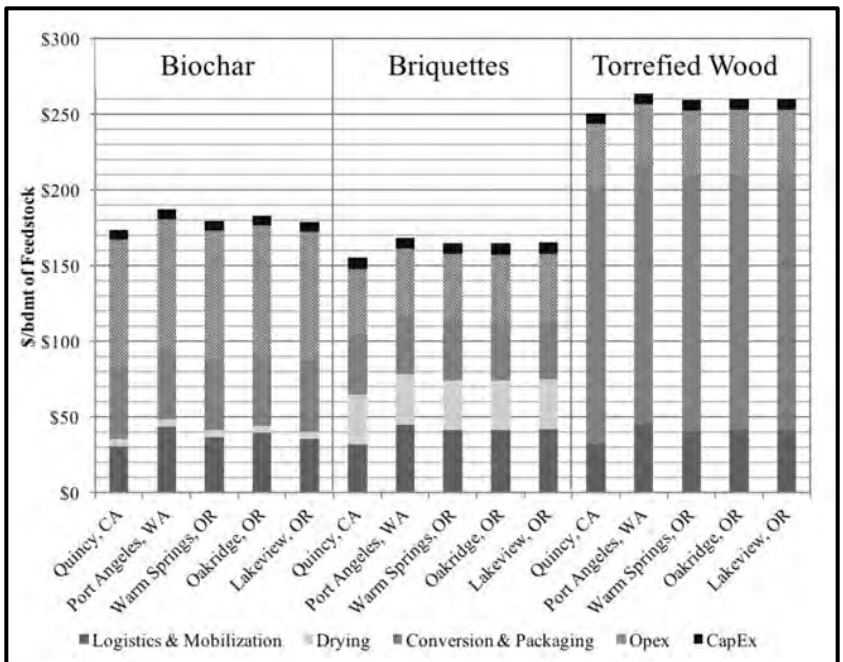


Figure 2. Production cost of product expressed as $/bdmt of feedstock.

Cost comparison for production of biochar, torrefied briquettes, and torrefied wood. From: Waste to Wisdom. 2018. Utilizing forest residues for the production of bioenergy and biobased products. (Waste to Wisdom, Final Report.

What are potential ways to achieve long-term sequestration of the carbon in local mill residues

A substantial opportunity exists for carbon sequestration of the embodied carbon in mill residues if a method to do this can be developed at the required scale and is economic against other options for disposal. To be meaningful for climate change, carbon must be sequestered for a century or more.

Manufactured products

Manufactured building materials can be an effective means of sequestering the carbon in mill residues, but at present, requires high-quality starting material. Sawdust, mill ends, and cutoffs are generally not suitable. That is, some mill waste can be manufactured into long-lived building materials, but a substantial residue of unsuited materials will always remain.

Composting

Composting of the non-salable residues is a common suggestion.

Sawdust is commonly added to biosolids (sewage sludge) to make compost, adding carbon-rich materials. Compost manufacture and biosolids disposal is the objective of these efforts, not mill residue disposal, and the operational scales are tiny when compared to the volume of local mill residue.

Advantages of composting

Compost can greatly improve soils, and increased soil fertility furthers soil carbon sequestration as well as plant growth.

Compost can substitute for synthetic nitrogen fertilizer, which is a significant source of NOx emissions. NOx is a powerful greenhouse gas and air pollutant and persists longer in the atmosphere than CO_2 or other GHGs.

Some small proportion of compost can form long-term soil humus, especially when lignin-rich wood is the source material.

Compost creation at the needed scale entails substantial challenges:

- Local mill waste comprises a large volume of material. The scale is significant and unprecedented.
- Composting would require substantial energy inputs to process and transport the resulting compost.
- Storing a large amount of chips presents fire hazards because the decomposition process generates and accumulates heat and compost fires are common. (The Burris wildfire incident in Lake County three weeks ago was ignited by a compost pile.)
- For composting to occur, N-rich material must be added to support decomposition. Sawdust is typically 325:1 carbon to nitrogen, while the rapid composting that is required to destroy pathogens and create high-quality compost needs a C:N of 25-30:1. Sewage and/or kitchen waste or green waste could provide the needed N, but concerns about sanitation, weeds, pathogens, and public nuisance would be present in any such operations.
- Most of the carbon in compost returns to the atmosphere in years or decades as compost decomposes. A small amount of compost might remain for climate-meaningful periods (100+ years), but the large majority does not remain for nearly that long.
- There are concerns about invasive plants and pathogens surviving the composting process and being introduced to fields where compost is applied. Most applications would require certified weed- and pathogen-free compost, and this can be difficult to achieve and ensure.

- The composting process releases methane, an especially powerful GHG.
- There is little or no local market. An existing local composting facility is currently producing more than the market demand. Non-local markets could likely be developed.

Bio-char

Biochar currently offers the most technically feasible option for sequestering the carbon in mill residues.

Biochar is a charcoal-type substance, similar to charcoal. It is produced by burning biomass material in a controlled process called pyrolysis. During pyrolysis, biomass is burned in a container with little or no oxygen. During the pyrolysis process, the organic material is converted into biochar and wood gas. Wood gas can be used as a fuel and can help to power the pyrolysis process.

Biochar a highly stable form of carbon that does not decompose or return carbon to the atmosphere. Biochar converts the carbon in biomass to a stable, long-term material. However, only half of the carbon in the feed material is sequestered. The pyrolysis process releases GHG and air pollutants, though less than biomass electricity generation.

Some air pollutants are released in making biochar, but far less than with burning.

Biochar is black, highly porous, lightweight, fine-grained, and has a vast surface area. Approximately 70 percent of its composition is carbon. The remaining material consists of nitrogen, oxygen and hydrogen and other elements. Biochar's chemical composition varies depending on the feedstocks used to make it and methods used in pyrolysis.

Biochar is a highly beneficial soil amendment, increasing water- and nutrient-holding capacity, enhancing soil biology, decreasing N_2O emissions from soils, and enhancing the sequestration of recalcitrant carbon in soil through increased soil fertility and plant growth. (Severy,et. al. 2018). Recent research points to electron channels in biochar that enhance soil microbial ecology (Sun et al. 2019)

Incorporating biochar into soils is a sound and tested method of storing carbon for long periods.

U.S. Forest Service research is demonstrating the benefits of making and using biochar. https://www.fs.fed.us/blogs/promise-biochar-forests-grasslands-and-farms

The potential to sequester carbon using biochar is well-recognized and the methodology and equipment are available. However, using the large quantities of local mill residue to make, market, and distribute biochar requires further research and development to establish the economic, sociologic, market, and logistic costs and benefits. A large-scale local pilot project to learn how this can be done makes good sense. A public-private partnership might be the best way to accomplish this.

Waste Option	Potential GHG impacts	Time frame for sequestration	Other impacts/considerations
Landfilling	Potential for substantial amounts of methane to be released, particularly if gases are not collected	Decades	California law may make it difficult to landfill organics. Methane production increases warming potential over alternatives. Less air pollutants.
Composting	5-20% of carbon sequestered but for short time periods; potential to release substantial amounts of methane	10-20 years	Expensive and complex at scale. Needs addition of N-rich material. Energy required for handling and processing. Benefits to soil. Potential multiplier effect as increased soil fertility increases plant growth and recalcitrant humus formation. Substitutes for N fertilizer reducing associate N_20 emissions.
Raw biomass incineration	Most carbon converted to CO_2	Essentially instantaneous	Human health impacts. Not permitted where human exposure to air pollutants is high. Higher GHG effects
Gasification	Similar GHG emissions as raw biomass incineration	Essentially instantaneous	Typically more efficient than raw biomass incineration; may have lower air quality impacts.
Biochar production	~50-80% of carbon sequestered	100-1000 years,	Expensive to scale; particulates and GHGs released during production. Benefits to soil. Multiplier effect increasing plant growth and recalcitrant humus formation.
Sale and reuse, durable products, including mass timber products	Most or all carbon in waste sequestered (theoretically). Can substitute for concrete and steel, with large avoided emissions	Potentially, 100+ years	Requires adequate base material, sawdust and end pieces are not suited for present technology. Potential environmental, health and climate impacts from glues.

Options for mill residue disposal. Adapated and modifed from Gurin et al., 2018

A new report has just been published by the Sierra Club that examines the context and some of the details involved in alternatives to burning woody material from forestry operations. (Sierra Club, 2019)

Should RCEA use biomass power for the foreseeable future?

Planning to manage adaptively is always a sound strategy. Scenario-based planning can accommodate the uncertainties of future energy supplies, technology, climate policy, and economics.

Several considerations are paramount:

The future holds some crucial unknowns and unknowables: technology developments; availability and price of energy sources; electric grid upgrades; markets for various mill residues; climate policies for mitigation including sequestration incentives (such as offsets for sequestering mill residues), future air quality regulation, and so on.

Biomass power plants need some assurance of being able to sell power to justify upgrades to increase efficiency and reduce air pollution. These upgrades are expensive and often involve shutdowns for installation.

Scenarios can be created to evaluate potential futures and inform future decisions. For example, scenarios could be built for solar and wind power availability and prices into the future, increased grid flexibility for dispatchable power, and how these compare to a likely fixed price of biomass power. If prices, availability, and dispatchability cross a threshold, biomass power might be abandoned in one scenario and continued in another.

It is reasonable to expect that the cost to produce biomass power will not change much if at all in the next decade, while the costs of wind and solar are likely to continue to decline sharply. At what point is the differential determinative as to continuing to use biomass power? This could be specified.

Should RCEA use their purchasing leverage to incentivize better air pollution control technologies at the plants?

Ideally, the biomass plants would use the Best Available Control Technology (BACT) to limit air pollution effects. This is not currently the case. State-of-the-art control of air pollution is a reasonable goal for any

power purchased by RCEA, as the emissions are directly connected to the purchases, and public health is an agency responsibility. RCEA could considering adding financial incentives and contract language to provide air quality protection beyond what the State requires, and be able to cancel contracts if emissions performance is substandard.

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Gathered research materials (not an RCEA site): https://sites.google.com/view/biomass-info/home

Consultations and Expert Panelists

September 13 panel

Mark Andre, City of Arcata
Richard Engel, RCEA
Kevin Fingerman, HSU Environmental Science
Colin Fiske, 350 Humboldt
Carrise Geronimo, Schatz Energy Research Center
Katy Gurin, 350 Humboldt
Julia Levin, Bioenergy Association of California
Melanie McCavour, HSU
Timothy Metz, Restoration Forestry, Inc.
Bob Moreno, DG Fairhaven Power, LLC
Michael Richardson, Humboldt Sawmill Company
Wendy Ring, Independent physician
Adam Steinbuck, Humboldt Redwood Company
Andrea Tuttle, California Dept of Forestry and Fire Protection
Yana Valachovic, UYC Cooperative Extension
Michael Winkler, City Council of Arcata, RCEA Board Chair
Sheri Woo, HBMWD, RCEA Board member

October 18th panel

Richard Engel, RCEA
Kevin Fingerman, HSU
Angie Lottes, California Department of Forestry and Fire Protection
Wendy Ring, Freelance physician
Adam Steinbuck , HRC Scotia
Yana Valachovic, UC Extension
Jason Wilson, NCUAQMD
Michael Furniss, Consultant to RCEA - Moderator

Individual consultations

Jason Davis
Richard Engel
Kevin Fingerman
Jana Ganion
Larry Goldberg
Katy Gurin
Arne Jacobson

Angie Lottes
Matthew Marshall
Melanie McCavour
Bob Moreno
Wendy Ring
Gary Rynearson
Adam Steinbuck
Nancy Stephenson
Andrea Tuttle
Yana Valachovic
Tom Wheeler
Brian Wilson
Michael Winkler
Sheri Woo

Biomass Power in Humboldt County

Summary of Workshops
and Research

Michael J Furniss
Climate and Forests Consultant to RCEA

RCEA Board of Directors Meeting 11/21/2019

1

What is the global context for biomass power?

2

Is there a State of California context for biomass power?

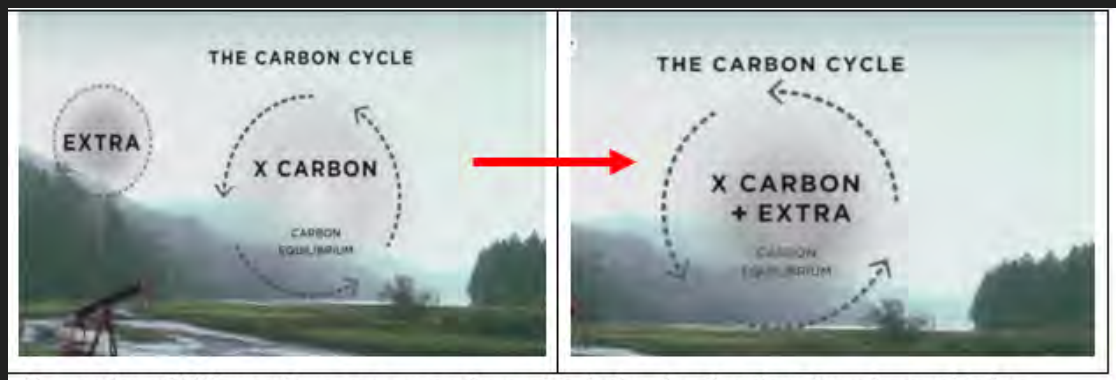
3

Why is biomass power considered a climate solution?

Is biomass power “carbon neutral”?

4

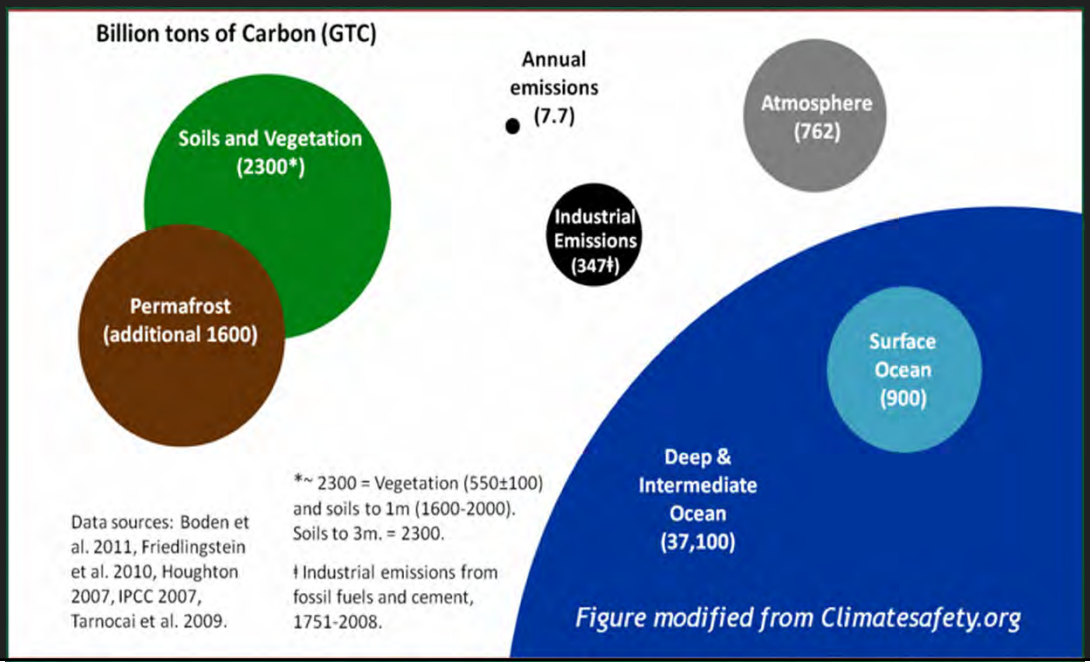
Why is biomass power considered a climate solution?



Extraction of billions of tons per year of non-circulating fossil carbon have been added to the carbon cycle. This is the primary driver of human-caused climate change.

5

Carbon stocks and emissions



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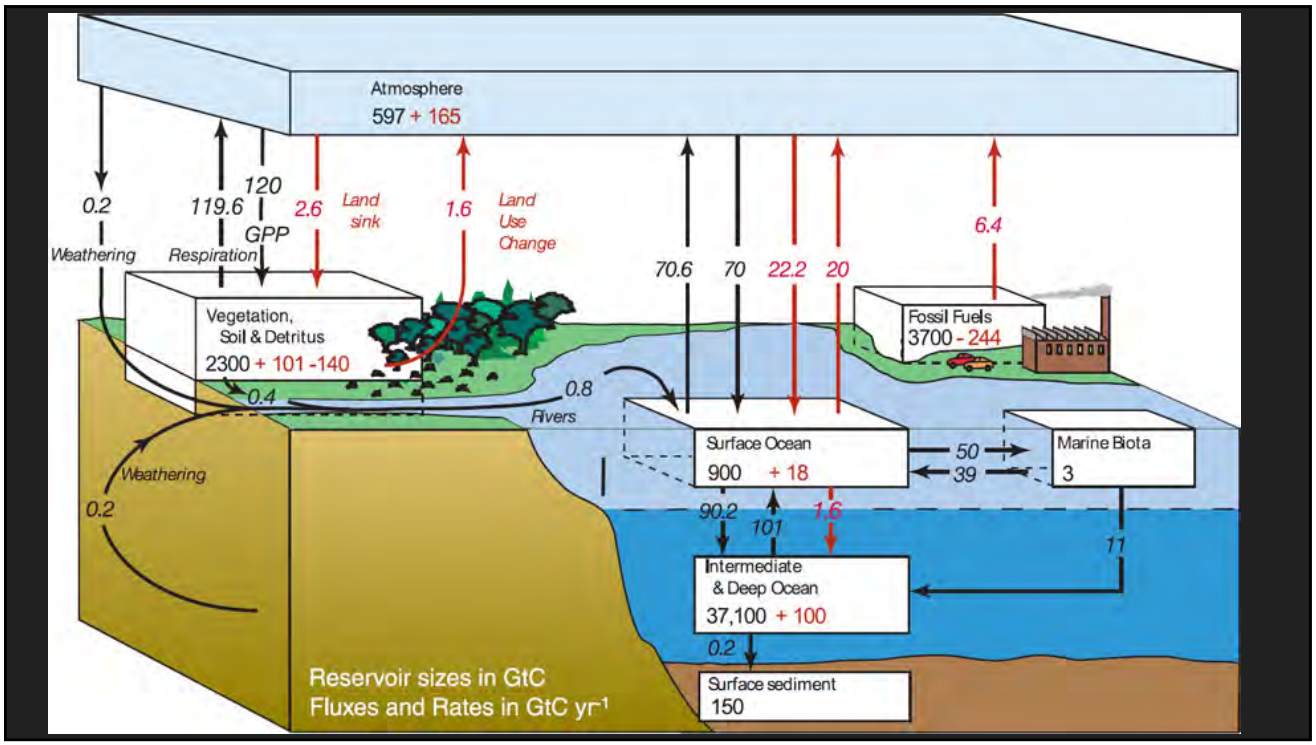


7

Carbon neutrality?

Ken Skog | Bioenergy from wood and forest carbon dynamics

Carbon Neutrality Number

- Carbon neutrality number, CN(t), definition:
  - The fraction of fossil emissions offset by time t by increased wood use for energy from a given source

$$CN(t) = [E_{FF}(t) - NE_w(t)] / E_{FF}(t)$$

$E_{FF}(t)$ = Cumulative fossil fuel emissions avoided

$NE_w(t)$ = Cumulative wood emissions to time t **minus** cumulative change in forest growth/ emissions due wood energy use to time t

CN(t) < 0 cumulative net wood emissions > than fossil emissions

CN(t) = 0 cumulative net wood emissions = fossil emissions

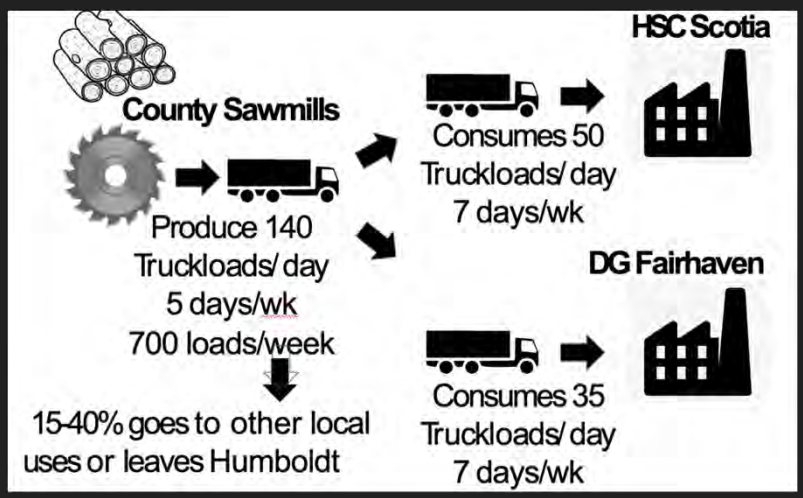
CN(t) = 1 net wood carbon storage totally offsets fossil emissions "carbon neutral"

8

What is the feed material and why does it matter to RCEA and the community?

9

Abundant local feed material



10

What used to be done with this material?

11

What used to be done with this material?

12

What about the air pollution produced by the biomass plants?

13

Air Pollutants

Pollutant	Description	Health Effects	Welfare Effects
Carbon Monoxide (CO)	Colorless, odorless gas	Headaches, reduced mental alertness, heart attack, cardiovascular diseases, impaired fetal development, death.	Contributes to the formation of smog.
Sulfur Dioxide (SO_2)	Colorless gas that dissolves in water vapor to form acid, and interact with other gases and particles in the air.	Eye irritation, wheezing, chest tightness, shortness of breath, lung damage.	Contribute to the formation of acid rain, visibility impairment, plant and water damage, aesthetic damage.
Nitrous Oxides (NO_2)	Reddish brown, highly reactive gas.	Susceptibility to respiratory infections, irritation of the lung and respiratory symptoms (e.g., cough, chest pain, difficulty breathing).	Contribute to the formation of smog, acid rain, water quality deterioration, climate warming, and visibility impairment.
Ozone (O_3)	Gaseous pollutant when it is formed in the lower atmosphere.	Eye and throat irritation, coughing, respiratory tract problems, asthma, lung damage.	Plant and ecosystem damage.
Lead (Pb)	Metallic element	Anemia, high blood pressure, brain and kidney damage, neurological disorders, cancer, lowered IQ.	Affects animals and plants, affects aquatic ecosystems.
Particulate Matter (PM)	Very small particles of soot, dust, or other matter, including tiny droplets of liquids.	Eye irritation, asthma, bronchitis, lung damage, cancer, heavy metal poisoning, brain damage, cardiovascular effects.	Visibility impairment, atmospheric deposition, aesthetic damage.

14

Exposure to air pollution

15

What about forest health and sustainability?

16

What will happen to the mill residues if RCEA no longer buys the power from the plants?

17

What are potential ways to achieve long-term sequestration of the carbon in the residues

18

Composting mill residues?

19

Biochar to sequester the carbon?

20

Biochar

21

Who is in favor and who is opposed to using biomass to generate electricity?

22

Should RCEA use biomass power for the foreseeable future?

23

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Wendy Ring MD, MPH

Allergy & Asthma NETWORK

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN®

AMERICAN LUNG ASSOCIATION®

APHA

AMERICAN PUBLIC HEALTH ASSOCIATION

aafa

Asthma and Allergy Foundation of America

NACCHO

National Association of County & City Health Officials

NATIONAL ENVIRONMENTAL HEALTH ARSOCIATION

PSR

PHYSICIANS FOR SOCIAL RESPONSIBILITY

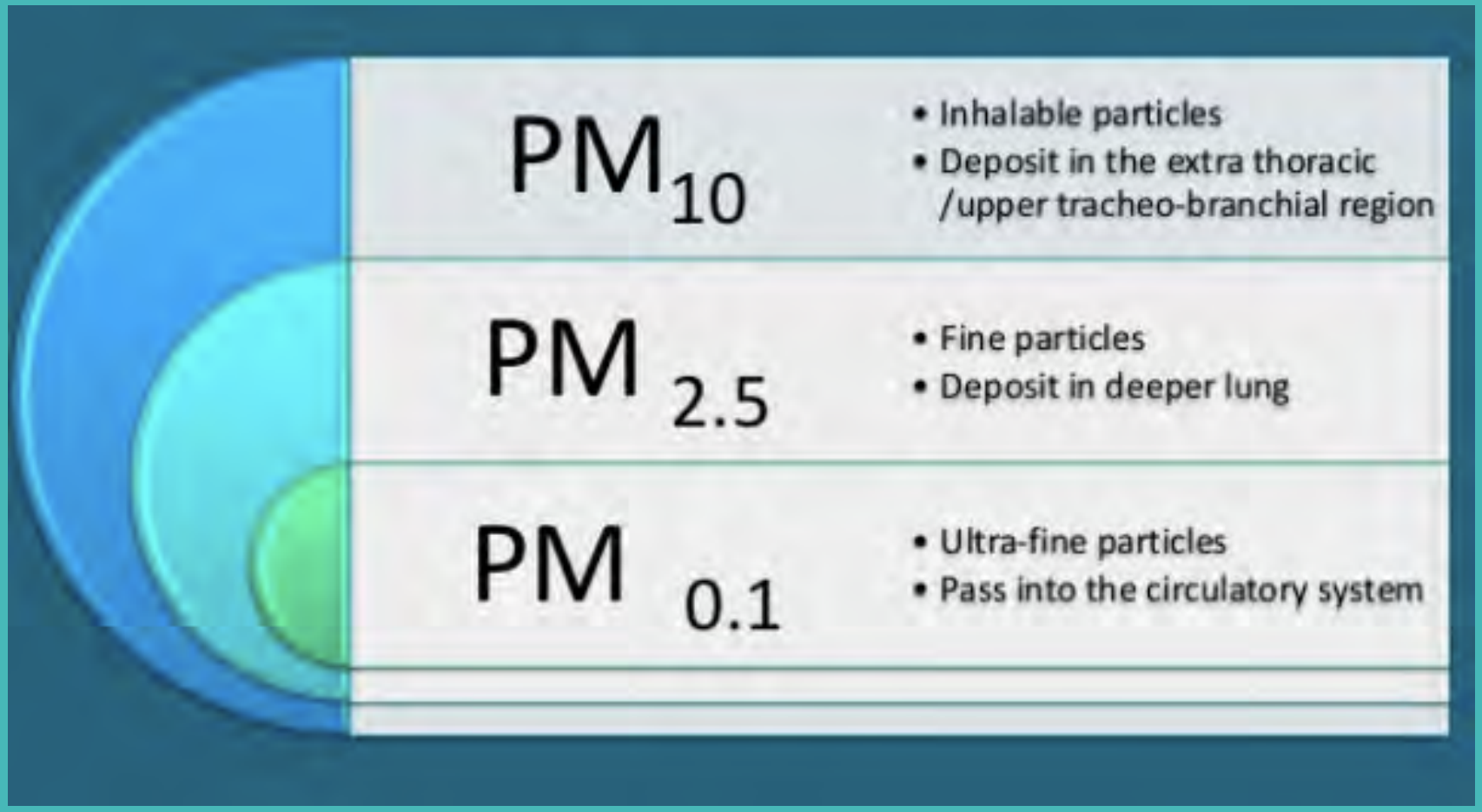
Biomass Pollution 2017

(12% of power mix)

Particulates	33 tons
Nitrogen Oxides	170 tons
Sulfur Oxides	35 tons
Volatile Organics	41 tons
Air Toxics	12 tons

In 2019, 23% of power mix
so roughly multiply by 2

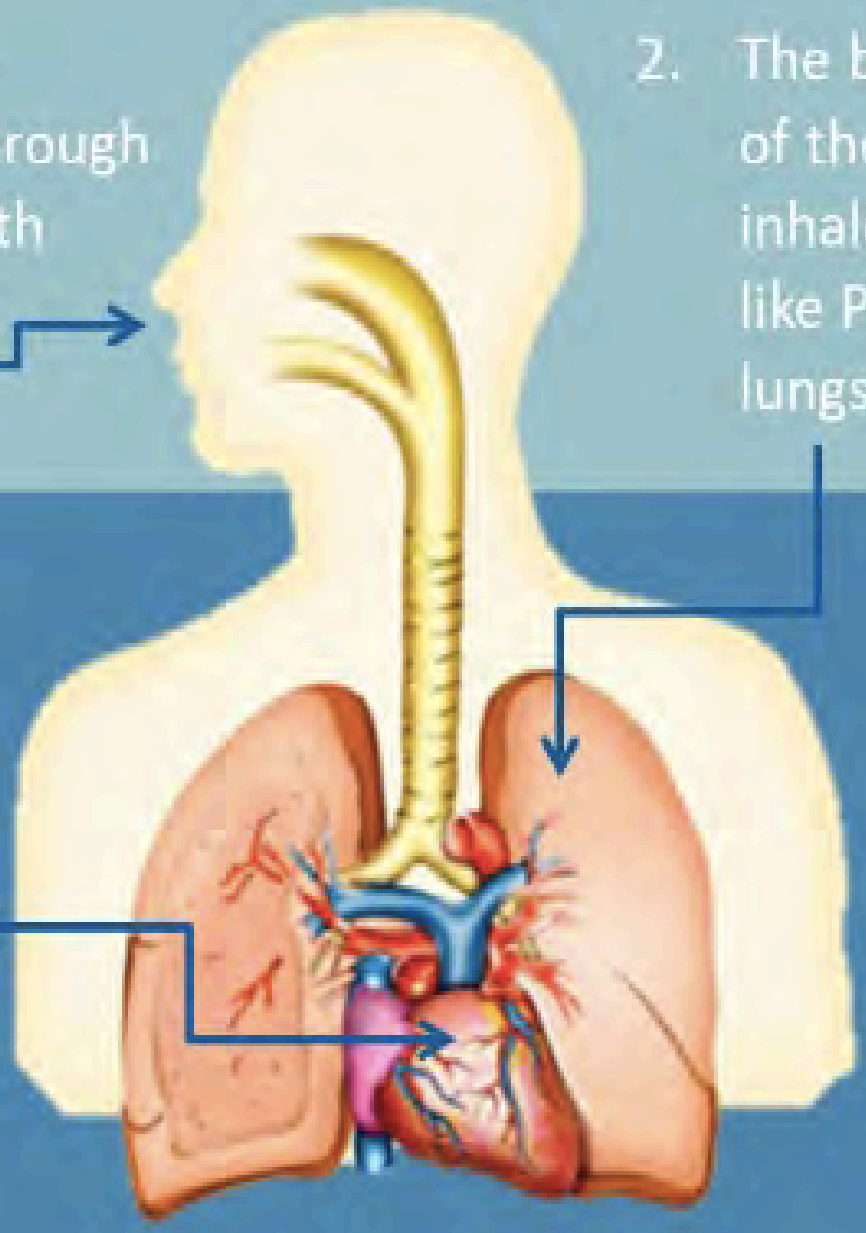
Particles come in different sizes



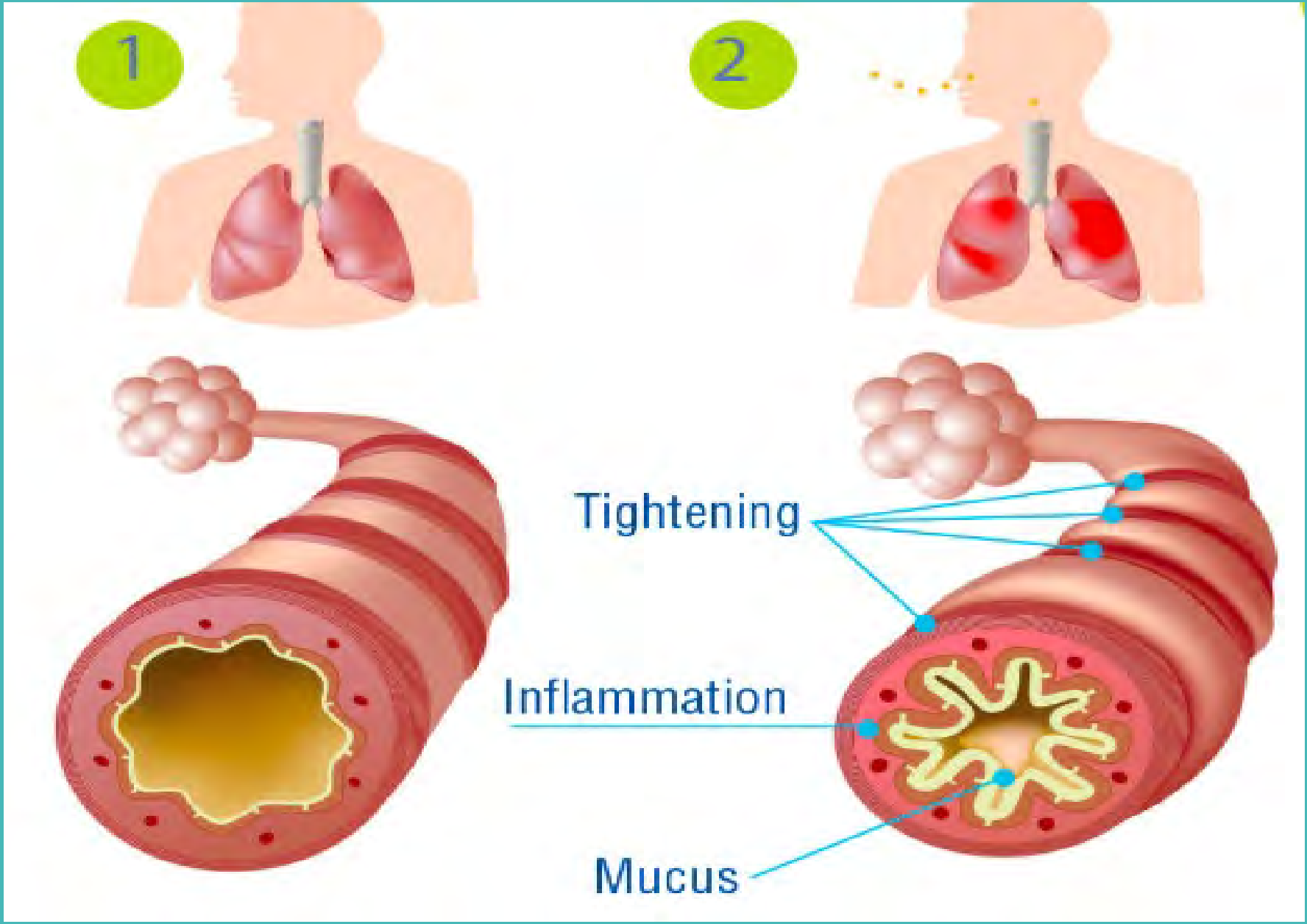
1. Particulate matter enters the body through the nose and mouth when we breathe.

2. The body eliminates most of the larger particles we inhale. Smaller particles like PM2.5 continue to the lungs.

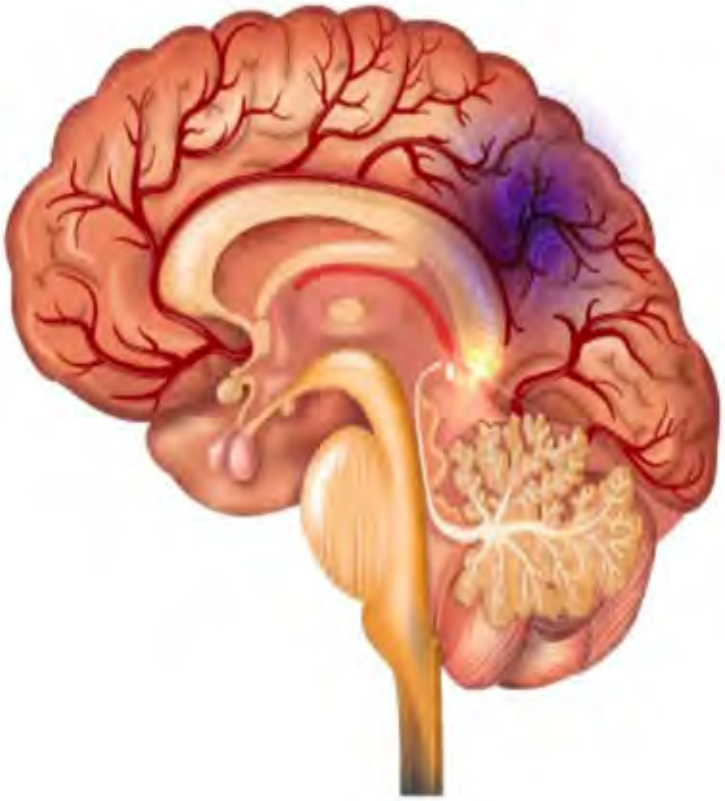
3. PM2.5 can penetrate deep into the lungs, having serious health consequences for the lungs and heart.



Short Term Exposure: Inflammation

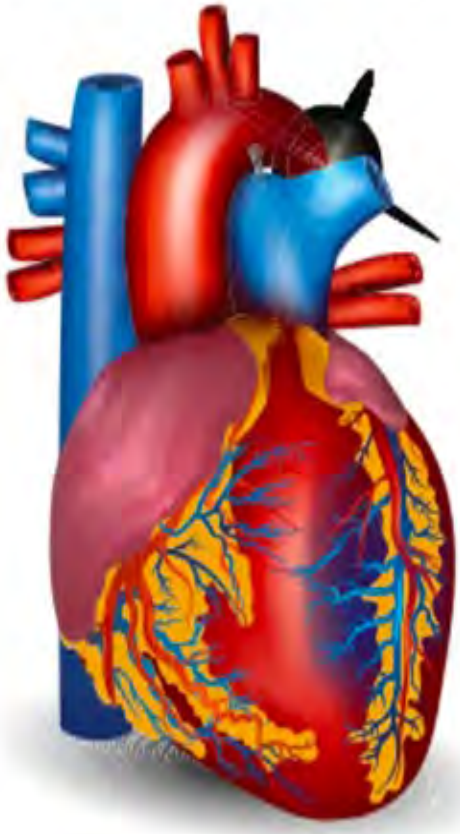


STROKE



BLOOD CLOT BLOCKS
BLOOD FLOW TO THE BRAIN

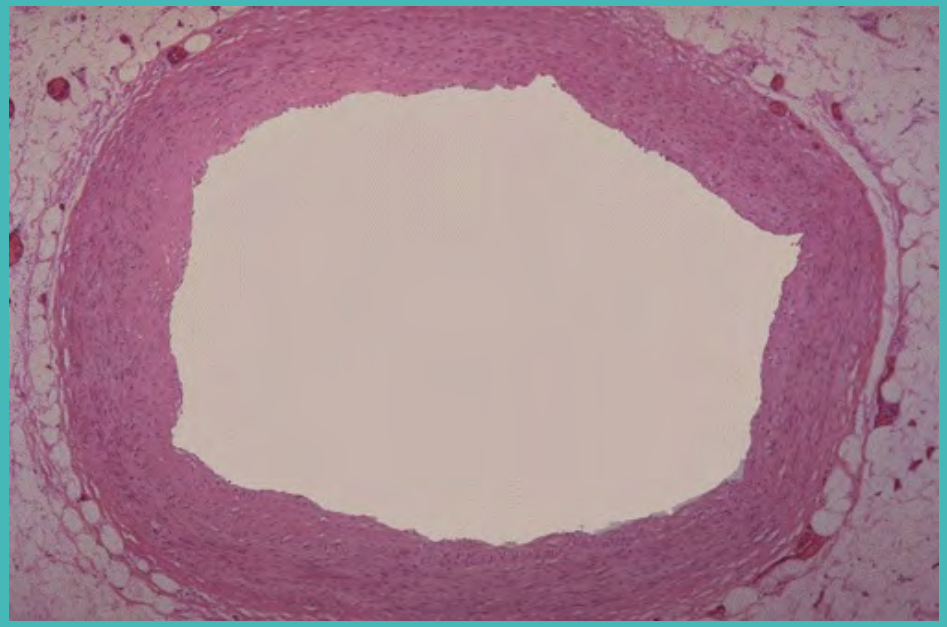
HEART ATTACK

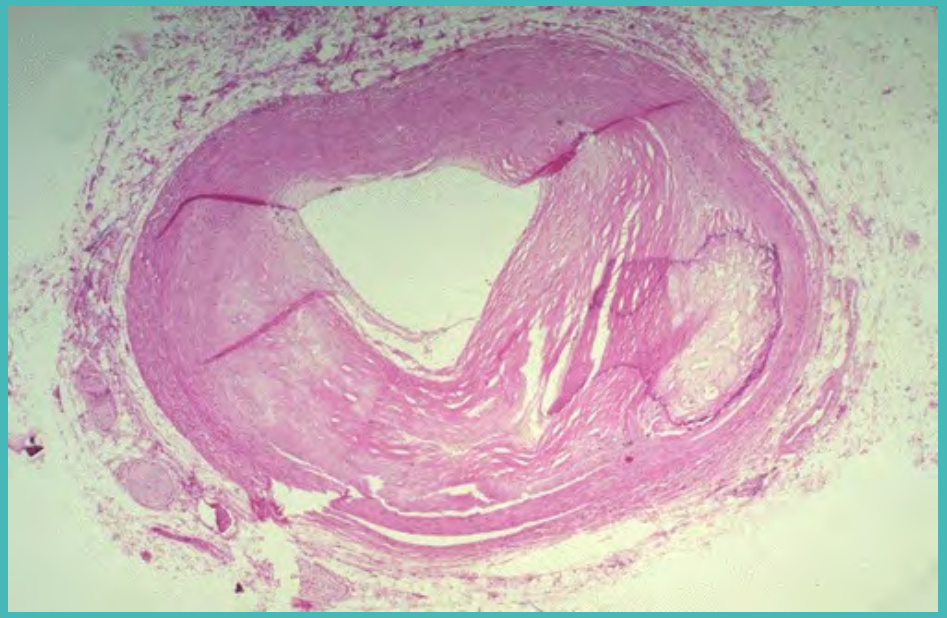


BLOOD CLOT BLOCKS
BLOOD FLOW TO THE HEART MUSCLE

Long Term Exposure:
Inflammation PLUS Altered gene expression

ORGAN DAMAGE: Lung, Cardiovascular





ENDOCRINE DISRUPTION:
Reproductive, Obesity, Diabetes

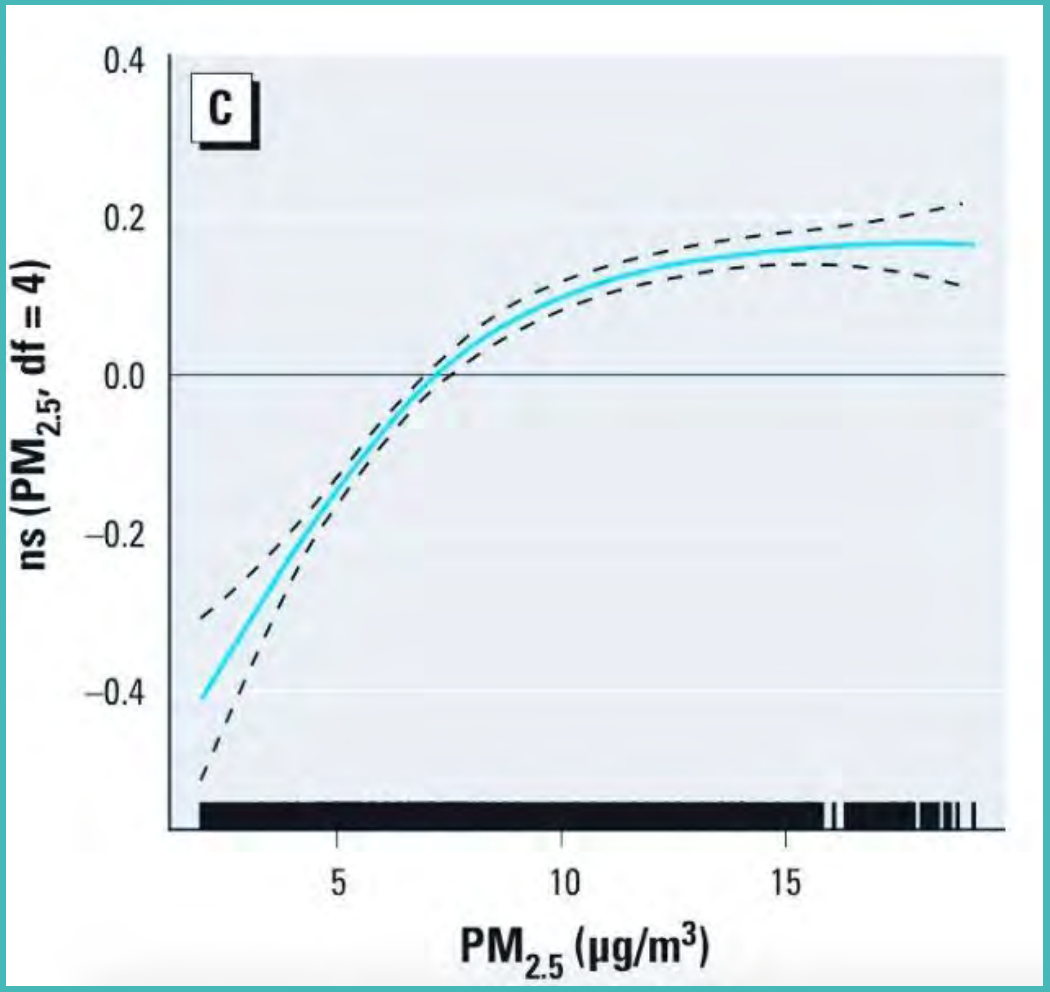
High Risk in Humboldt

Age <18 and >65	49,854
Asthma	10,383
COPD	5,140
CV Disease	7,360
Diabetes	11,870

American Lung Association **2019 State of the Air Report**

2 million Canadians
Long term low level exposure:
For every 10ug/m3, Cardiac Deaths increase 30%

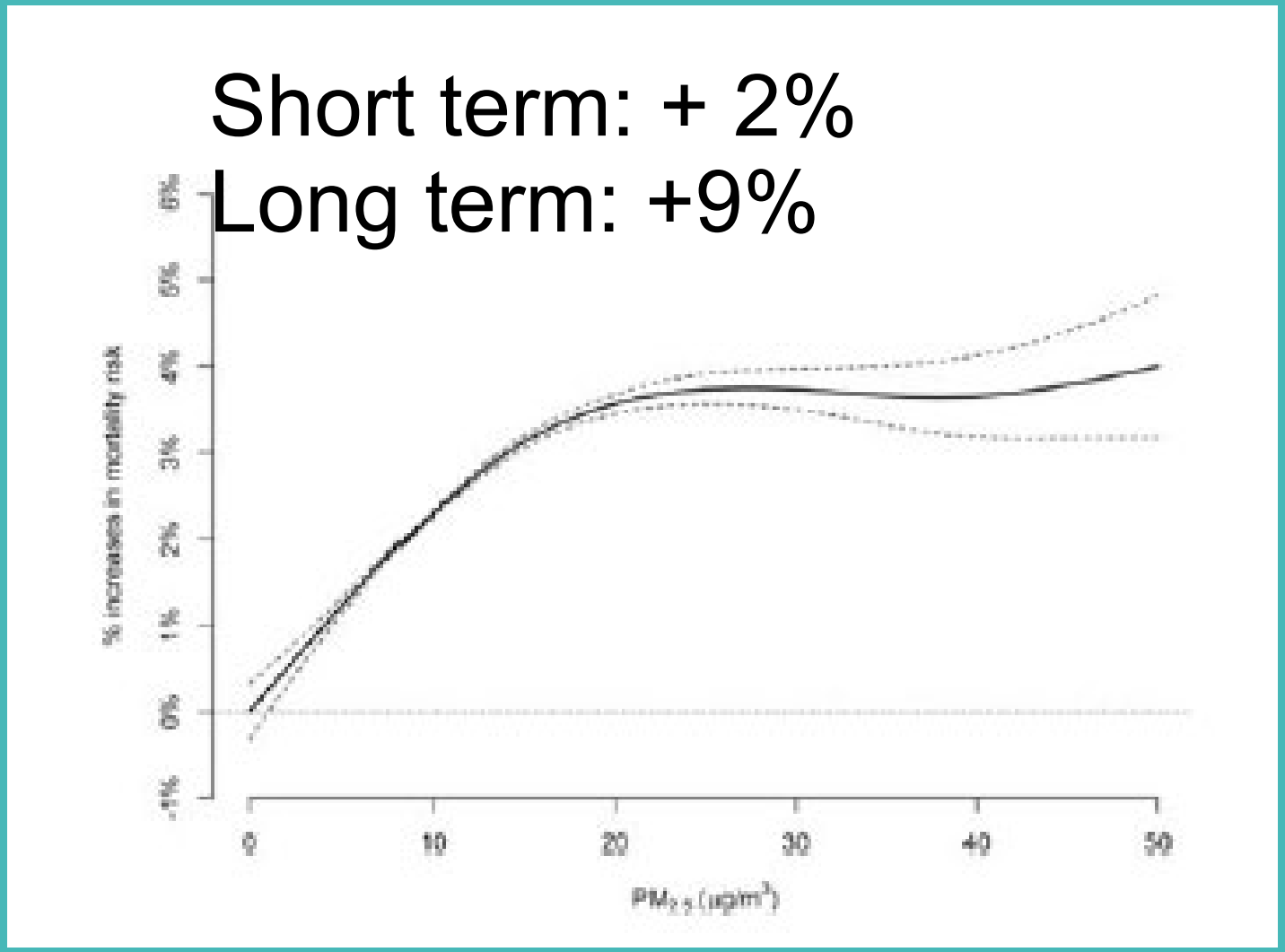
Cardiac Deaths



Krause, 2012

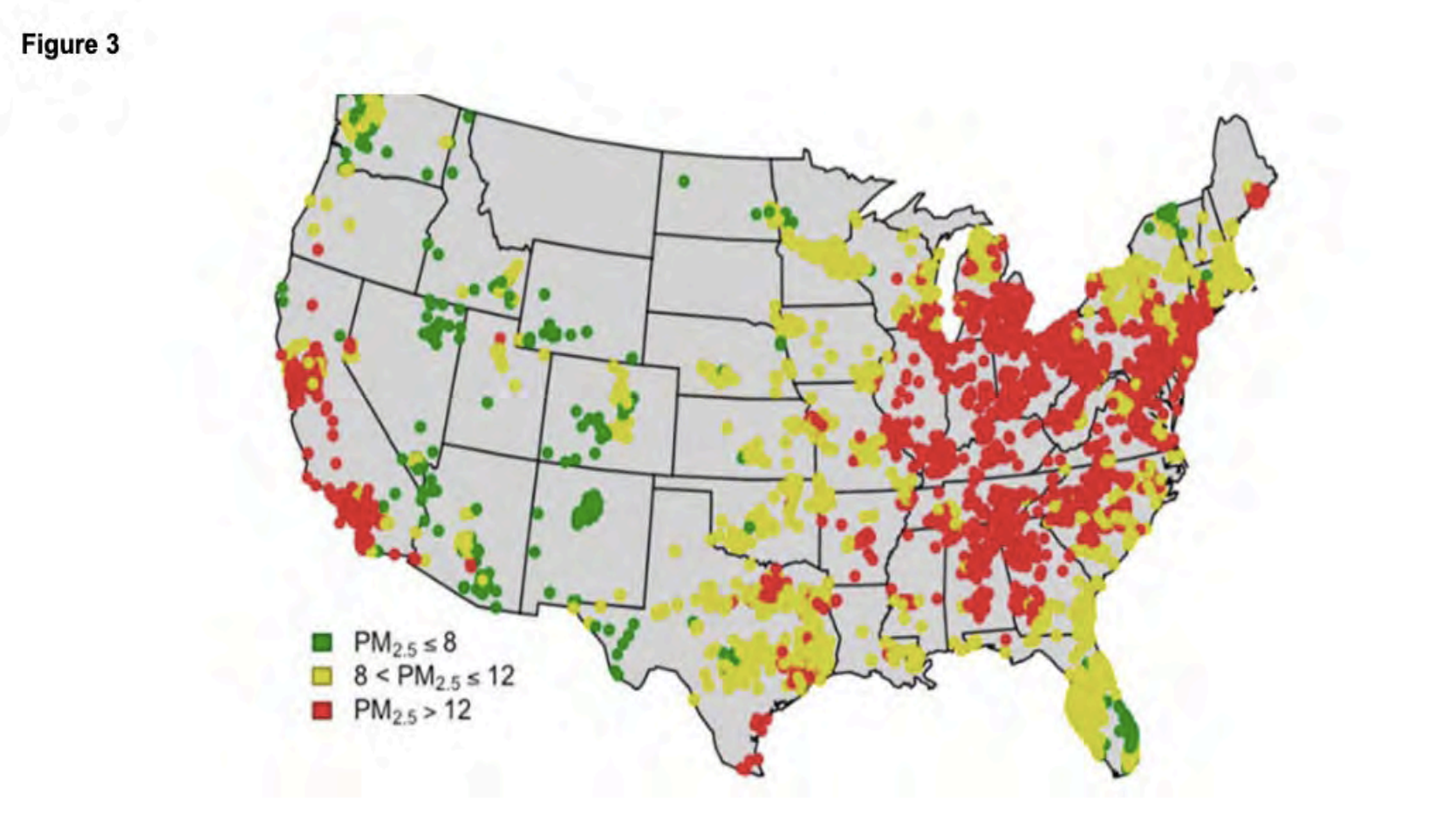
Harvard Entire Medicare Population

daily risk of death



PM2.5

MIT Medicare Hospital Admissions



Heart +18% Respiratory +21%

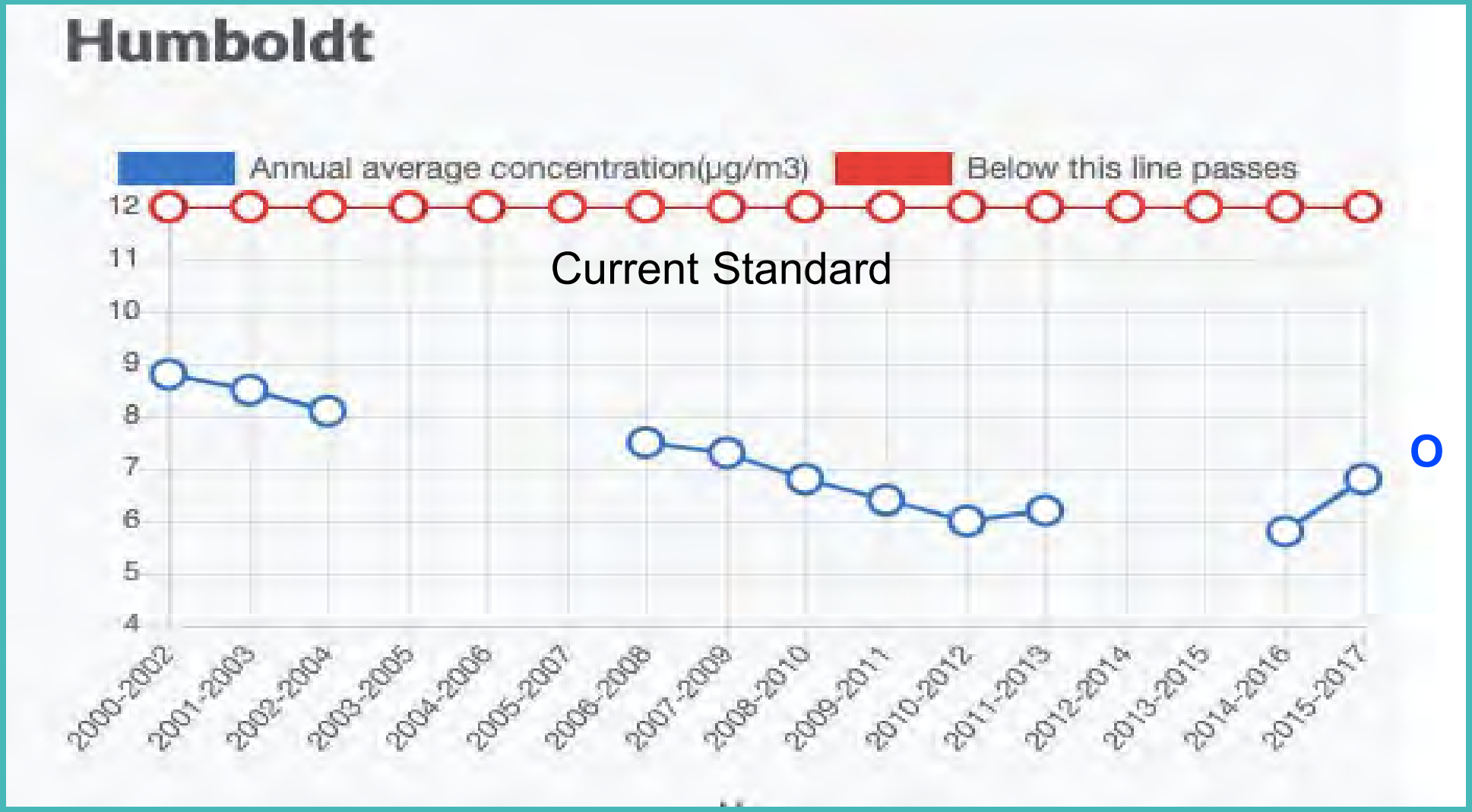
Makar. 2017

American Lung Association State of the Air 2019

If you live in Humboldt County, the air you breathe may put your health at risk.

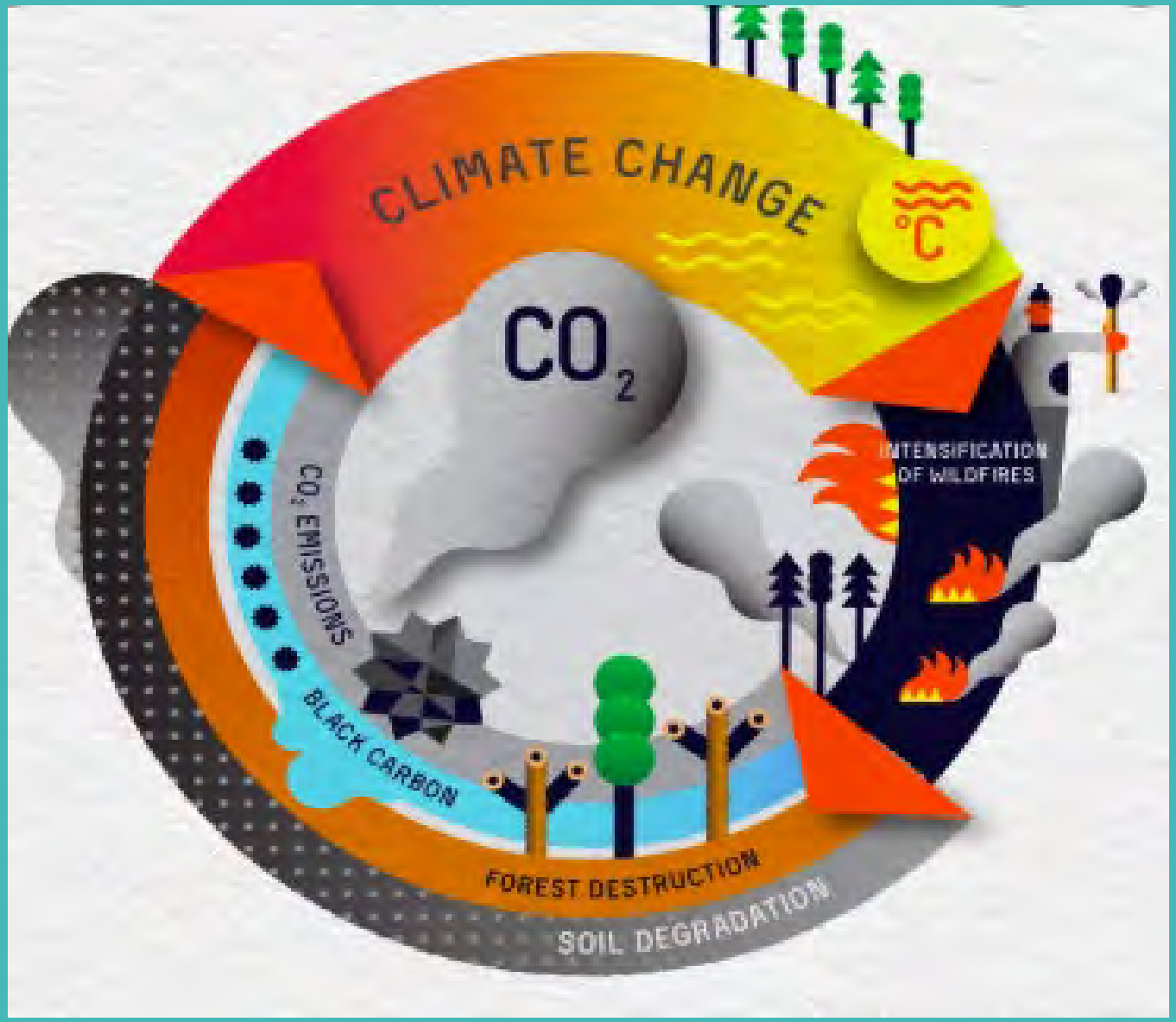
Ozone	Particle Pollution 24-hour	Particle Pollution Annual
B	F	PASS

Annual average pm 2.5 rising



American Lung Association

466,883 Metric Tons CO2e/year



Scotia Class of 86

Same emissions limits as original permit.

Pollution controls don't remove ultrafine PM

Biomass pollution harms our health.

Many local people are vulnerable.

Every little bit matters.

Air quality is getting worse.

Don't hold your breath.

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Forest-based Bioenergy

November 21, 2019

Yana Valachovic, RPF #2740
Forest Advisor, County Director
UC Cooperative Extension

Overarching issues

- Is our goal to transition off of fossil fuels?
  - All renewables have issues and a dark side
- The north coast is a forested and windy region- is it important to use what we produce?
- Forest-based bioenergy is critical part of the 2018 Forest Carbon Plan
- Broad scale support was expressed in the October CAPE meeting

What is biomass?

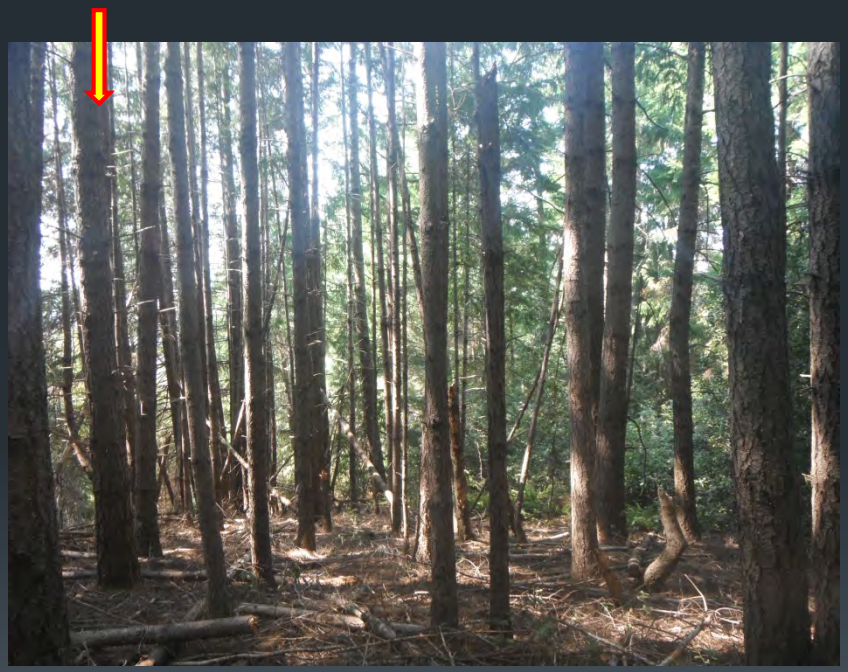
- Woody materials
- Non-hazardous

✓ Mill residues- chips, bark, mill ends

✓ Forest sources- slash, small diameter materials,

- Agriculture- pits, shells, prunings
- Urban wood waste- construction wood, yard trimmings

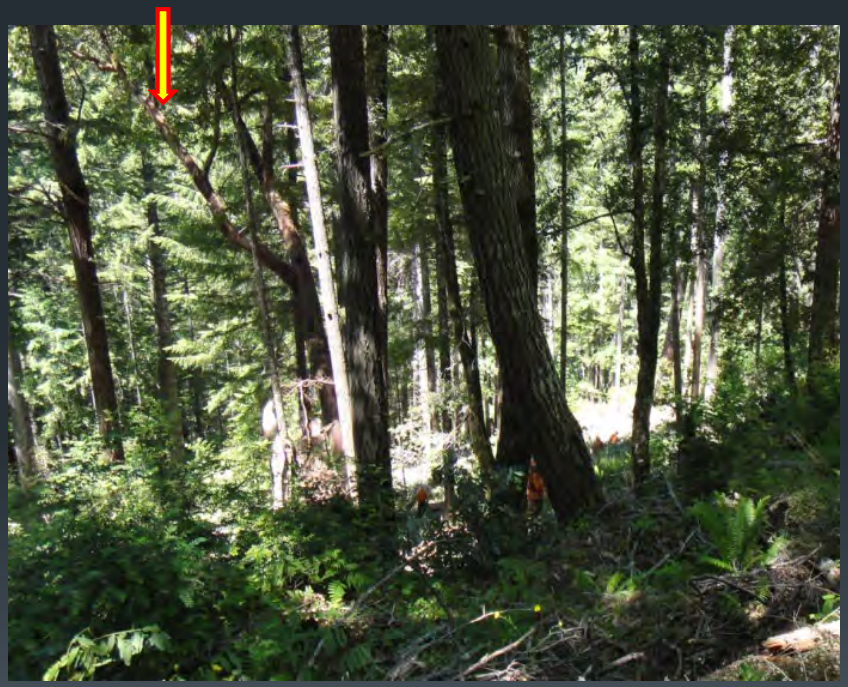
Biomass thinning



BEFORE

AFTER

Forest health treatment

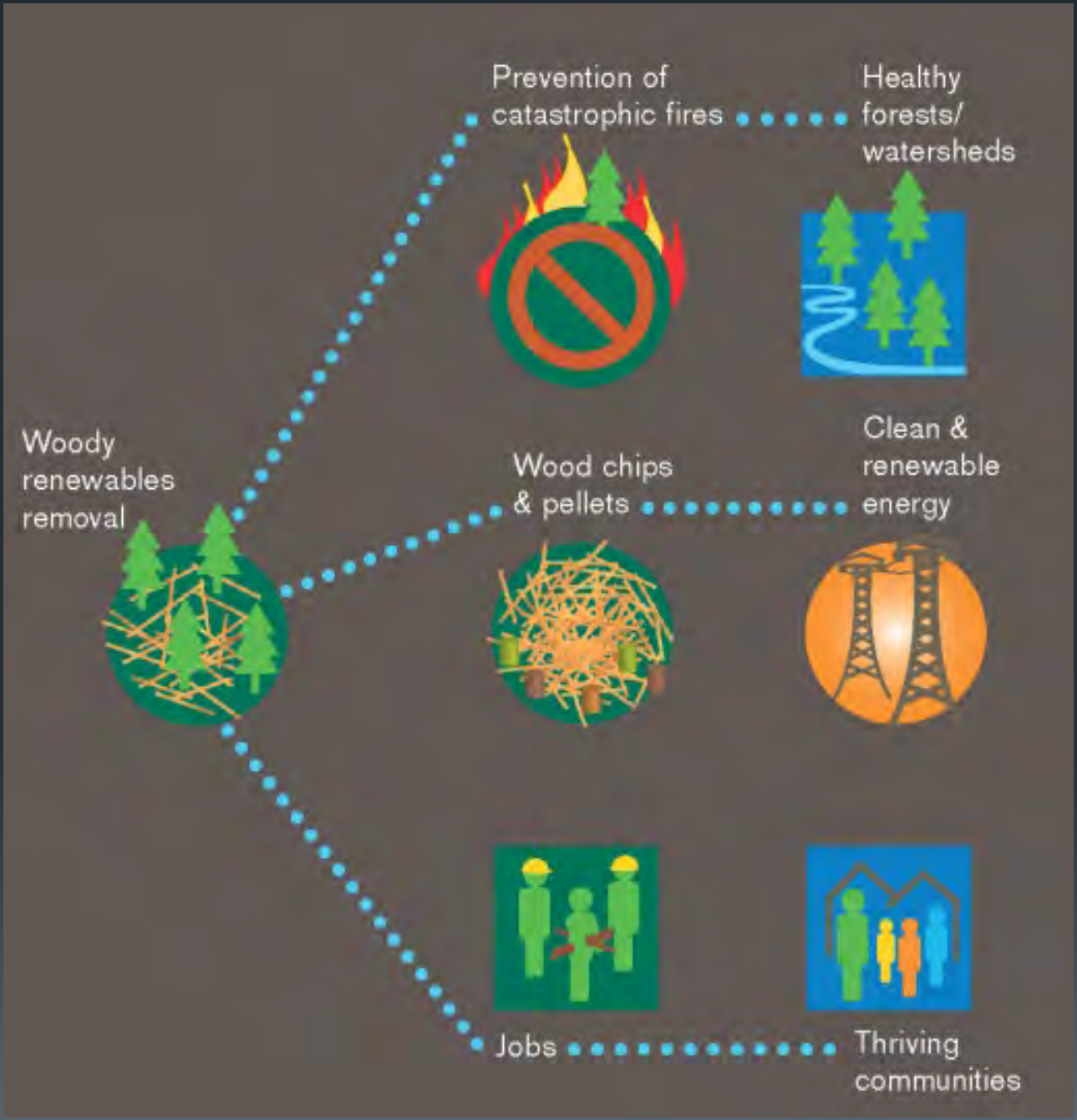


BEFORE

AFTER

Biomass benefits

- Delivers distributed, baseload generation, “resource adequacy”
- Promotes healthy forests and defensible communities
- Reduces emissions from wildfires or burn piles
- Reduces greenhouse gas emissions
- Utilizes an abundant local product
- It’s renewable



Graphic courtesy of the Sierra Institute for Community and the Environment

Woody Forest Products Manufacturing

Forest ecosystems provide a diverse range of services and products. Wood is but a small part of this complex relationship yet is embedded within every aspect of our lives, framing homes, printing magazines, and even powering cell phones. This diagram conceptualizes the transformation of wood from forests into "end market products", defined here as consumer product encountered in everyday life.

Start Here!

Forest Ecosystem

Forests provide a variety of uses. Utilization of wood may be direct (harvesting, farming, and quality of raw material is chosen) or indirect (harvesting is chosen for lumber or veneer, small diameter logs once for poles and fence posts, needles, cones and branches are used for engineered energy, engineering, and personal).

Raw Material
Initial products extracted from managed forestland

Processing
Process through which raw material is reformed into an end market product, or an intermediate product to be further processed

Intermediate
Products with limited consumer level use and thus further manufactured into a final market product

End Product
Final market product available for consumer use. See product types below for more detail.

Primary Output
Primary (typically highest value) product manufactured from associated material or process.

Co-Product Output
Secondary product produced from material or process with limited, but cost effective value.

Composite
Wood particulates engineered with non-woody materials including waxes, cements, adhesives, and plastics to form specific shapes to meet engineering strength and use requirements.

Energy
Wood products specifically manufactured to generate heating or electrical power.

Landscaping
Products designed for outdoor applications including design, soil enhancement, and more.

Lumber
Sawn lumber used for building or construction purpose. Typically directly sawn from raw material and only undergoes a single processing step.

Engineered Building Materials
Engineered product with high strength and stability designed to replace steel and concrete building materials.

Panel
Sheet-based wood product. Engineered to meet strength, aesthetic, and structural specification.

Paper
Fiber based products typically produced rolls but may be shaped into a variety of products.

Remanufactured
Finished product built from taking an end market product and reprocessing it into another form.

University of California
Wood Resources Group
For additional information, please visit us at: ucanr.edu/woodresources

This is a product of the UC Berkeley Wood Resources Group. Funding support is provided by the USFS R5, State and Private Forestry.

Last updated: R5 8/7/15

University of California
Agriculture and Natural Resources

Sawlog

Roundwood harvested and removed from managed forest. Can form a softwood product industry (typically has a 4" notch sink diameter minimum and 8' log lengths. Common products include dimensional lumber, studs, and railties.

Sawmill

Processes sawlogs received from managed forests into a range of solid wood products (studs, planks, stain and dimensional lumber, railties, panels, beams, rafters). Products can be planed, in kiln dried, end painted, resawed, and glued into secondary products.

Soil Amendment & Mulch

Chipped wood and bark material collected from several co-products (unused wood control, fire protection, soil enhancement, water retention, and other landscaping applications). Material may be mixed with compost and/or blended with other organic and mineral components.

Lumber

Solid wood products sawn from hardwood or softwood logs into boards. May be directly used or further reprocessed (resawed, planed, glued, finished, adhered, etc.) to create the final product.

Paper & Fabric Products

Sheets formed by chemical and mechanical fiberization of wood, followed by bearing underlying fibers into thin sheets. Fiber type determines final product, including print newsprint, cardboard, specialty (insulation, pulp, milk carton), fluff, wet tissue, toilet paper, and structural (cardboard, pulp).

Molding & Scrollwork

Hardwood and softwood lumber milled to a variety of products including flooring, molding, and trim.

Laminated Timber

Engineered beam manufactured from multiple pieces of kiln dried lumber is delivered in panel (glued, untreated timber) or as angled (cross laminated timber) to create shapes and sizes not possible without engineering. Replaces concrete and steel as a building material.

Management Residual

Material from managed forests unsuitable for use in milling or roundwood applications due to size, form, or quality such as branches, tree tops, and trees over-ripe from non-commercial thinning, wildlife hazard reduction, and other management activities.

Chipper

Mechanical process that produces small, uniform pieces of wood from raw forest material. The wood may be sliced by a rotating disc or spiral auger, but which with a rotating drum or cutter head with rotating hammers.

Sawdust

Fine particulate co-product of sawing, grinding, or cutting operation. Clean sawdust is pure wood material without non-wood contaminants (foliage, bark).

Fuel Log

Compressed uniform wood particulate (chip, sawdust, fiber), adhesive compounds and/or wax treating a high density, low emission, long burning fuel. Hydrophobility, higher flammability, and lower moisture than other uniform and natural wood chip products.

Wood Fiber Composite

Wood fiber blended with thermoplastic or cement to create products with enhanced elasticity, durability, and strength. Can be molded into a variety of sizes and shapes. Applications include decorative ceiling and cement aerated wood fiber.

Particleboard

Bound wood chips compressed and adhered into wood particles. May or may not be layered or block depending on type of adhesive used. Product generally has thin, dense, smooth plate surfaces and moderate to good flexural properties.

Furniture

Wood components such as tables and chairs, used to make houses, offices, or other space in, table for fishing or working. Product may be sent in pieces or as a finished product, or other (sand, stain, and structural properties).

Small Log

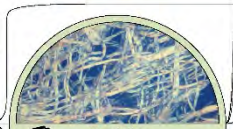
Small diameter roundwood material (exclusive of sawlogs and peeler logs), with straight, sound wood suitable for poles, posts, or sawed roundwood lumber. May be stacked into higher value products or for fuel, non-engineered products manufacturing.

Post Peeler

Process of shaving material off small diameter logs to create a cylindrical wood product with no bark and uniform diameter. Produces chip and bark co-products.

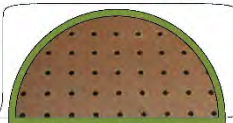
Wood Chips

Wood mechanically deconstructed from small log, manufacturing co-product, or residual material. Chips have uniform, specified dimensions and may be further compressed, adhered, and thermally/chemically decomposed to form other agricultural or energy products.



Wood Fiber

Pure wood fiber derived from mechanical or chemical decomposition of logs, chips, or manufacturing residue. Cellulosic source of fibers enhance elasticity and strength when used in composites. Wet fiber, coarse, and non-pulp fiber is used in paper products.



Fibreboard

Wood fibers formed and adhered into a structural panel in comparison to particle-based panels. Variable fiber sources can be used with performance goals defined by density and/or wet/dry strength. Products include medium-density fiberboard, high-density fiberboard, and hardboard.

Nanocellulose

Cellulose particles (<1-100 nm in diameter) produced from high pressure, temperature, and velocity impact homogenization of pulp. Nanocellulose fibrils have unique characteristics useful for a variety of applications including reinforcement, barrier films, and fiber bonds.

Injection Molded Composite

Wood particulate (nanocellulose, sawdust, wood) combined and shaped into specific shapes with plastic and adhesives. Lower cost and higher strength to weight ratio compared with solid plastic. Differs from fiber composites in that structural qualities of wood fiber are not considered.

Specialty Items

Custom designed or formed products (turned bowls, knobs, cabinet hardware, ax handles, musical instruments, ice sculptures, etc.). Wood alternatives available for food, pots, or sawed roundwood lumber. May be stacked into higher value products or for fuel, non-engineered products manufacturing.

Post & Poles

Peeled, small diameter logs of variable thickness and length. Poles are used in cable, fence or fencing, greenhouse and tomato packed and used in housing construction, telephone poles and stakes. May be stacked or untreated with wood preservative.

Veneer

Thin sheets of wood peeled or sliced from peeler logs. Veneers range in thickness from 0.7mm to 1mm depending on structural (thicker veneers) or thin (finer) application, and may be taper (mostly hardwoods more commonly used for decorative purposes).

Pyrolysis Oil

Liquid produced from pyrolysis of wood. This heterogeneous substance can be used directly as a fuel in some types of engines and turbines or refined to extract specific chemical compounds for a variety of uses including plastics and liquid transportation fuels.

Producer Gas

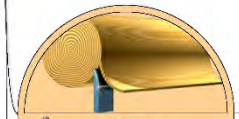
Combustible gas produced from heating wood in a low-oxygen environment. Producer gas may be cleaned, combusted to produce heat or used to remove water and particulates for use in internal combustion engines, or undergo catalytic reforming into liquid fuels and feedstock chemicals.

Char

Carbon material produced by combusting wood in a low-oxygen environment. Char may be used as fuel in cooking and heating, a medium for absorption of pollution in pollution water, horticulture, or soil amendment. Biochar, charcoal, and activated carbon are forms of char.

Alcohols

Alcohols such as methanol and methanol and ethanol are produced from cellulosic fuel additives. Emulsifiers in alcohols are produced through biochemical hydrolysis of wood by breaking down complex sugars, cellulose, and then cellulose, and simple sugars that are fermented into alcohol, or thermochemical-thermal breakdown of wood that can be converted into methanol and then polymerized into alcohols or other chemicals.



Peeler Log

Straight, high quality, log relatively clean of major defects (knots, cracks, rot, etc.). Log length are generally 8 feet for hardwood and 8-12 feet for softwood logs. Logs are peeled or sliced along the circumference to form veneer sheets.

Veneer Peeler/Slicer

Produces veneer sheets by slicing sheets from the side of a saint or peeling logs with a rotary blade.

Shavings

Uses mostly sawdust generated to provide an absorbent material mixed through the solution for livestock and pets.

Plywood

Panels of veneers (or sheets) bonded together in alternating grain direction. May be mixed with other materials such as particleboard to enhance strength and weight characteristics. Plywood products include blockboard, veneer core, veneer, multi-ply, and commercial plywood.

Wood Pellets

Wood particles mechanically compressed into cylindrical pieces of variable diameter (3/8-1 inch) and length (3/4-1 inch). Pellets are used in heating systems and wood stoves. Pellets have a higher energy to weight ratio and may be specific to increase fuel by energy density and hydrophobicity.

Heat

Heat generated through the combustion (complete or partial) of wood or other biomass. Heat is used for manufacturing processes, heating homes, or other uses. Heat is also used in cooking, residential, district heat/cooling, and other industrial processes.

Electricity

Electricity produced from wood combustion, combustion or gasification technology, internal combustion engines and turbines generates may be directly fuelled from producer gas, syngas, or pyrolysis oil. High pressure steam from combustion is used chiefly for turbines to drive electrical generators (e.g. steam).

Cellulosic Biofuel

Liquid fuel or combustible fuel produced biochemically. Hydrolysis of wood cellulose into fermentable sugars and fermentation of sugar into alcohols or other chemicals (e.g. lignin, acetic acid, etc.). Wood alternatives available for food, pots, or sawed roundwood lumber. May be stacked into higher value products or for fuel, non-engineered products manufacturing.

Strander/Flaker

Machinery that sliced or ground wood into uniform long strands. Strands retain the wood strength of wood fibers and can be oriented and formed into panel products with greater strength than randomly shaped wood.

Wood Strands/Flakes

Small, flat wood particles of uniform dimensions and bar dimension along the grain of the tree, similar to a veneer slicer. Distinct fiber direction is retained for manufacturing of structural oriented strand board, or engineered lumber, and wet process strand lumber.

Structural Composite Lumber

Wood veneers and flakes formed in the same direction as fibers, and formed into engineered blocks. Strength of lumber strength that outperforms conventional lumber. Includes laminated veneer lumber, parallel strand lumber, laminated strand lumber, and laminated strand lumber.

Oriented Strand Board

Particle panel formed by heating and pressure using waterproof adhesive with cross-oriented layers (usually five layers) layered in alternating right angle to give oriented strand board, uniform strength and elasticity not found in non-oriented wood products (particleboard).

I-Joist

Engineered structural beam formed with wood fiber strands bonded and shaped into a vertical shape between top and bottom flange made from fiber glued or laminated veneer lumber. The joist is assembled with wood fiber strands bonded and pressed into an I shaped beam.

Cellulosic Biofuel

Liquid fuel or combustible fuel produced biochemically. Hydrolysis of wood cellulose into components sugars and fermentation of sugar into alcohols or other chemicals (e.g. lignin, acetic acid, etc.).

Woody Forest Products Manufacturing

Forest ecosystems provide a diverse range of services and products. Wood is but a small part of this complex relationship yet is embedded within every aspect of our lives, framing homes, printing magazines, and even powering cell phones. This diagram conceptualizes the transformation of wood from forests into "end market products", defined here as consumer product encountered in everyday life.

Start Here!

Forest Ecosystem

Forests provide a variety of services and products. Wood is but a small part of this complex relationship yet is embedded within every aspect of our lives, framing homes, printing magazines, and even powering cell phones. This diagram conceptualizes the transformation of wood from forests into "end market products", defined here as consumer product encountered in everyday life.

Forest Residuals Small logs

Sawlog

Roundwood harvested and removed from managed forest. Can form a softwood products industry (typically has a 6" nominal sawlog diameter minimum, 20' sawlog lengths, common products include dimensional lumber, plywood, and railroad ties.

Sawmill

Processes sawlogs sourced from managed forests into a range of solid wood products (e.g. dimensional lumber, timbers, and lumber, rail ties, pallet, beams, rafters). Products can be planed, trimmed, end painted, resawed, and glued into secondary products.

Soil Amendment & Mulch

Chipped wood is the raw material derived from several co-products (such as wood control, pest protection, soil enhancement, water retention, and other landscaping applications). Mulches may be sold with compost ingredients such as food waste or other organic materials.

Lumber

Solid wood product sawn from hardwood or softwood logs (varieties may be known as "boards" or "dimensional lumber"). Lumber is a versatile material, commonly used in construction, furniture, and various other products.

Paper & Fabric Products

Sheets formed by physical and mechanical fibrillation of wood followed by bearing and drying fibers into thin sheets. Includes paper, cardboard, tissue, specialty papers (including wallpaper, cardstock), specialty papers (e.g. gaskets, filters), and other specialty products (e.g. toilet paper), and structural sheathing/siding.

Molding & Scrollwork

Hardwood and softwood lumber milled into a variety of profiles including flooring, molding, siding, and more.

Laminated Timber

Engineered beam manufactured from multiple pieces of lumber. Lumber is glued together (typically with adhesives) or as angled (cross-laminated timber) to create shapes and sizes not possible without engineering. Replaces concrete and steel during protocols.

Management Residual

Material from managed forests unsuitable for use in milling or hardwood applications (including from normal harvest, thinning, and fuel treatments).

Chipper

Mechanical process that produces small, uniform pieces of wood from raw forest materials. The wood may be sliced by a rotating disk or spiral auger, cut with teeth on a rotating drum, or pulverized with crushing hammers.

Sawdust

Fine particulate co-product of sawing, grinding, or cutting operations. Clean sawdust is a pure wood material with the same wood properties as the original wood, but smaller in size.

Fuel Log

Compressed, dry, firm wood particulate (chips, sawdust, fiber) adhesive compounds and/or wax (treating a high density, low ash, long burning fuel. Hydrophobicity, uniform shape, and consumer-friendliness are important considerations.

Wood Fiber Composite

Wood fiber blended with either a plastic or cement to create products with enhanced elasticity, durability, and strength. Can be molded into a variety of sizes and shapes. Applications include consumer goods and cement-based wood fiber.

Particleboard

Board made of compressed and adhesive-bound wood particles. May or may not be overall single composition, depending on type of adhesive used. Product generally has a flat, smooth surface and uniform thickness. Used for furniture, cabinetry, and other interior applications.

Furniture

Wood equipment such as tables and chairs, used to make a house, office, or other space fit for living or working. Product may be used in pre-fabricated assemblies (for efficiency) and functional properties.

Small Log

Small diameter roundwood material (sawlogs of sawlogs and peeler logs), with small, no sawlog value, suitable for peeling or sawed (manual, lathe). May be retained in higher value products for further engineered products, manufacturing.

Post Peeler

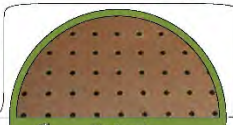
Process of shaving material off small diameter logs to create a cylindrical wood product with no bark and uniform diameter. Products: clapboard, cork co-products.

Wood Chips

Wood mechanically decorative, uniform size, low, manufacturing co-product, or raw material. Chips save uniform, specified dimensions and may be further compressed, adhered, and thermally/chemically decomposed to form other structural or energy products.

Wood Fiber

Pure wood fiber derived from mechanical or chemical decomposition of logs, or manufacturing residue. Cellulosic wood fibers enhance elasticity and strength. Uses include fillers and live in composites, flocs, fibers, coatings, and more. Also used in paper products.



Fibreboard

Wood fibers formed and adhered into a structural panel in combination with particle-based panels. Various fiber sources can be used when performance goals (e.g. fire) are met. Fibreboard is used in many products including furniture, building, and insulation.

Nanocellulose

Cellulose particles (0.1-100 μm in diameter) produced from high pressure, temperature, and robust processes. Nanocellulose fibrils have unique characteristics useful for a variety of applications, including strength, stiffness, capacitors, and biodegradability.

Injection Molded Composite

Wood particulate (sawdust, fiber, sawmill wood, and/or other) and thermoplastic (polypropylene, polyethylene, polystyrene, polyvinyl chloride, and polyethylene terephthalate) are combined and heated to form a composite material. Lower cost and higher strength to weight ratio compared with pure plastic. Differs from fiber composites in that structural properties of wood fiber are [illegible]

Specialty Items

Custom designed or traditional products (turned bowls, musical instruments, carved figurines, gifts, toys, etc.) and other items that are made of wood products (veneer, sawdust, fiber, etc.). Products may be made of wood, wood co-products, or wood fiber directly from the forest.

Post & Poles

Peeled, small diameter logs of variable thickness and lengths. Products used for cattle, farm or fencing. Structural and aesthetic applications. Pressure, combustion, telecommunications and electrical. May be treated or untreated with wood preservatives.

Veneer

Thin sheets of wood peeled or sliced from peeler logs. Veneers range in thickness from 0.2mm to 10mm depending on structural (thicker) or decorative (thinner) applications and machine types (mostly hardwoods more commonly used for decorative purposes).

Pyrolysis Oil

Liquid produced from pyrolysis of wood. This heterogeneous substance can be used directly as a fuel in some types of [illegible] and can be upgraded to a variety of products including plastics and liquid transportation fuels.

Producer Gas

Combustible gas produced from heating wood in low oxygen environment. Production may be [illegible]

Char

Carbon material produced by combusting wood in a low-oxygen environment. Char may be used as fuel in cooking and heating, as a medium for absorption of oil, pollution, or odors, in metal refining, or soil amendment. Biochar, charcoal, and activated carbon are forms of char.

Alcohols

Alcohols such as ethanol and methanol produced through [illegible] fuel additives. Ethanol is typically produced through biochemical hydrolysing of wood, by breaking down complex sugars into simple sugars that are fermented into alcohol or thermochemical thermal breakdown of wood [illegible] alcohols or other chemicals.

Peeler Log

Straight, high quality, long relatively clean of major defects (knots, cracks, rot, etc.). Log length varies depending on the [illegible] and 8' feet for softwood logs. Logs are peeled or sliced along the circumference to form veneer sheets.

Veneer Peeler/Slicer

Produces veneer sheets by slicing sheets from the side of a stump or peeling logs with a rotary lathe.

Shavings

Loose material designed to provide an absorptive medium and thermal insulation for livestock products.

Plywood

Panel material created by bonding together thin wood grain direction. May be mixed with other materials such as particleboard to add strength and weight characteristics. Plywood products include blockboard, cellulosic board, veneer, multiply, and composite plywood.

Wood Pellets

Wood particles which usually undergo processing (pulverized, pressed, or extruded) to form pellets (5-8 mm and length 15-40 mm). Pellets are used as heating fuel (residential, industrial, coal power plants and wood stoves). Pellets have higher weight to weight ratios and may be compacted to increase fuel density, energy density, and hydrophobicity.

Heat

Heat generated through the combustion (complete or partial) of wood material as primary fuel, which is then used to drive a [illegible] or other [illegible] and used in [illegible], residential district heating/cooling, and other industrial processes.

Electricity

Electricity produced from wood combustion. Combustion or other [illegible] technology, internal combustion engines and turbines generators make sealed fuels from pressure gas, organic or synthetic oil, fuel cell systems and from cellulosic or wood chips, or [illegible] fuels may [illegible] used as [illegible]

Cellulosic Biofuel

Liquid transportation fuels produced biochemically (hydrolysis of wood cellulose into components sugars and thermochemically (gasification of wood into CO, CO2, and H2 molecules followed by fermentation or catalytic reforming).

Strander/Flaker

Machinery that sliced wood into uniform long strands. Strands retain the same strength of wood fibers and can be oriented and formed into panel products with greater strength than similarly shaped sawn wood.

Wood Strands/Flakes

Small, flat wood particles of uniform dimensions and thin direction along the grain or [illegible] similar to a [illegible] wafer size. Distinct fiber direction is retained for manufacturing of structurally oriented strand board, oriented strand lumber, and [illegible]

Structural Composite Lumber

Wood veneers and fibers formed in the same direction as fibers and formed into engineered blocks. Offers uniform strength that outperforms conventional lumber. Includes laminated veneer lumber, parallel strand lumber, and [illegible] laminated lumber, and laminated strand lumber.

Oriented Strand Board

Particle panel formed by bearing and compressing waterproof adhesive with stems of wood (usually fibers). Layering layout in alternating right angle orientation (cross-ply) and board in form strength and elasticity not found in non-oriented products (like fibreboard).

I-Joist

Engineered structural member formed as a wood or specialized strand board panel (usually chosen between a top and bottom flange made from layers of wood or lumber, or veneer layers). The web is typically made of wood strand board, or fiberboard. Used in "I" shape beam.

Cellulosic Biofuel

Liquid transportation fuels produced biochemically (hydrolysis of wood cellulose into component sugars and fermentation of sugar into alcohol) or thermochemically (gasification of wood into CO, CO2, and H2 molecules followed by fermentation or catalytic reforming).

Raw Material
Initial products extracted from managed forests.

Processing
Process through which raw material is reformed into an end market product, or an intermediate product to be further processed

Intermediate
Products with limited consumer level use and thus further manufactured into a final market product

End Product
Final market product available for consumer use. See product types below for more detail.

Primary Output
Primary (typically highest value) product manufactured from associated material or process.

Co-Product Output
Secondary product produced from material or process with limited, but cost effective value.

Composite
Wood particulates engineered with non-woody materials including waxes, cements, adhesives, and plastics to form specific shapes to meet engineering strength and use requirements.

Energy
Wood products specifically manufactured to generate heating or electrical power.

Landscaping
Products designed for outdoor applications including design, soil enhancement, and more.

Lumber
Sawn lumber used for building or construction purpose. Typically directly sawn from raw material and only undergoes a single processing step.

Engineered Building Materials
Engineered product with high strength and stability designed to replace steel and concrete building materials.

Panel
Sheet-based wood product. Engineered to meet strength, aesthetic, and structural specification.

Paper
Fiber based products typically produced rolls but may be shaped into a variety of products.

Remanufactured
Finished product built from taking an end product and reprocessing it into another form.

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Wood Resources Group
For additional information, please visit us at: www.woodyforests

This is a product of the UC Berkeley Wood Resources Group. Funding is partially provided by the USDA R3, State and Private Forestry.

Last Updated: 8/15/15

University of California
Agriculture and Natural Resources

Woody Forest Products Manufacturing

Forest ecosystems provide a diverse range of services and products. Wood is but a small part of this complex relationship yet is embedded within every aspect of our lives, framing homes, printing magazines, and even powering cell phones. This diagram conceptualizes the transformation of wood from forests into "end market products", defined here as consumer product encountered in everyday life.

Start Here!

Forest Ecosystem

Forests provide a variety of uses. Utilization of wood may be direct (cut and carry, farm, mill and dry) or low intensity (chipped logs are mixed with lumber or veneer, small diameter logs once used as poles and fence posts, needed as fuel wood and branches are used for engineered energy and agricultural purposes).

Raw Material
Initial products extracted from managed forestland

Processing
Process through which raw material is reformed into an end market product, or an intermediate product to be further processed

Intermediate
Products with limited consumer level use and thus further manufactured into a final market product

End Product
Final market product available for consumer use. See product types below for more detail.

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Finished product built from taking an end market product and reprocessing it into another form.

University of California
Wood Resources Group
For additional information, please visit us at www.ucanr.edu/woodresources

This is a product of the UC Berkeley Wood Resources Group. Funding support is provided by the USFS R5, State and Private Forestry.

Last updated: R15 8/7/15

University of California
Agriculture and Natural Resources

Sawlog
Roundwood harvested and removed from managed forest. Can form a softwood products industry (typically based 4" notch sawlog diameter minimum or 8' log lengths. Common products include dimensional Lumber, studs, and railties.

Sawmill
Processes sawlogs received from managed forests into a range of solid wood products (studs, custom and dimensional lumber, railties, panel, beams, rafters). Products can be planed, in-kiln dried, end painted, resawed, and glued into secondary products.

Soil Amendment & Mulch
Chipped wood and bark material combined from several co-products to provide wood control, soil protection, soil enhancement, water retention, and other landscaping applications. Materials may be mixed with compost and/or products to enhance nutritional composition.

Lumber
Solid wood products sawn from hardwood or softwood logs into boards. May be directly used or further reprocessed (resawed, planed, glued, finished, adhered, etc.) into specific products.

Paper & Fabric Products
Sheets formed by chemical and mechanical fiberization of wood followed by bleaching and drying fibers into thin sheets. Fiber can be determined by end product, including print newsprint, cardstock, specialty (medical, pulp, milk carton), bag and packaging, tissue, toilet paper, and structural (cardboard, spun

Molding & Scrollwork
Hardwood and softwood lumber milled to a variety of products including flooring, molding, siding, and other

Laminated Timber
Engineered beam manufactured from multiple pieces of lumber (typically dimensional lumber) or as angled cross laminated timber (CLT) creates shapes and sizes not possible without engineering. Replaces concrete and steel as a building material.

Management Residual
Material from managed forests unsuitable for use in milling or roundwood applications due to size, form, or quality (which includes branches, tree tops, and tops of cut trees left from non-commercial thinning, wildlife habitat reduction, and other management activities.

Chipper
Mechanical process that produces small, uniform pieces of wood from raw forest material. The wood may be sliced by a rotating disc or spiral auger, but which with a rotating drum or cylinder fitted with rotating hammers.

Sawdust
Fine particle co-product of sawing, grinding, or cutting operation. Clean sawdust is a pure wood material without inner wood or bark units (foliage, bark).

Fuel Log
Compressed uniform wood particulate (chip, shavings, fiber), adhesive compounds and/or wax treating a high density, low emission, long burning fuel. Hydrophobility, water-resistance, and cover even under high humidity/rainfall conditions. Wood chip pucks

Wood Fiber Composite
Wood fiber combined with thermoplastic or cement to create product with a chance elasticity, durability, and strength. Can be produced in a variety of sizes and shapes. Applications include decorative siding and cement aerated wood fiber.

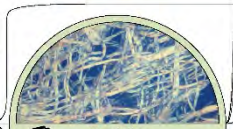
Particleboard
Bound wood chips compressed and adhesive and wood particles. May or may not be layered with a depending on type of adhesive used. Product generally harder than medium density fiberboard (MDF) and more suitable for outdoor use.

Furniture
Wood equipment such as tables and chairs, used to make a space, office, or other space in, table for filing or working. Product may be used in a variety of environments and has other (and dimensional properties).

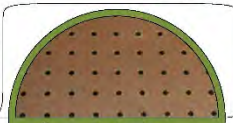
Small Log
Small diameter roundwood material (exclusive of sawlogs and peeler logs), with small or no sawlog value suitable for post, pole, or dowel manufacturing. May be stranded into higher value products such as those, non-engineered products manufacturing.

Post Peeler
Process of shaving material off small diameter logs to create a cylindrical wood product with no bark and uniform diameter. Produces dowel and bark co-products.

Wood Chips
Wood mechanically decomposed into small uniform chips, mainly during co-product or residual material. Chips have uniform, specified dimensions and may be further compressed, adhered, and thermally/chemically decomposed to form other agricultural or energy products.



Wood Fiber
Pure wood fiber derived from mechanical or chemical decomposition of logs, chips, or manufacturing residue. Cellulosic series of fibers enhance elasticity and strength when used as filler or additive in composites. Wet fiber, fresh, coarse, and moist pulp is used in paper products.



Fibreboard
Wood fibers formed into a sheet with particle-strengthened. Variable fiber sources can be used with performance goals defined by adhering water resistance. Products include medium density fiberboard, high density fiberboard, and hardboard.

Nanocellulose
Nanocellulose is a material produced from high pressure homogenization of pulp. Nanocellulose fibrils have unique characteristics useful for a variety of uses, including in cellulose nanomaterials.

Injection Molded Composite
Wood particulate (nanocellulose, sawdust, wood) combined and bound with specific polymer, wax, pigments, and adhesives. Lower density than other strength to weight ratio compared to other materials. Differs from fiber composite in density, structural properties, and wood content.

Specialty Items
Custom designed or formed products (turned bowls, knobs, musical instruments, ax/sec handles, cutting boards, etc.). Wood alternative and alternative products (sawn, specialty lumber, etc.). Should be manufactured from wood, most products be wood sourced directly from the forest.

Post & Poles
Peeled, small diameter logs of variable thickness and length. Posts are used to cable, fence or fencing, greenhouse and tomato padded and used in housing construction, landscape posts and stakes, mine ties. May be processed or untreated with wood preservative.

Veneer
Thin sheets of wood peeled or sliced from peeler logs. Veneers range in thickness from 0.7mm to 10mm depending on structural (thickness) and aesthetic (appearance) application, and may be typically hardwoods more commonly used for decorative purposes.

Pyrolysis Oil
Liquid produced from pyrolysis of wood. This heterogeneous substance can be used directly as a fuel in some types of engines and turbines or refined to extract specific chemical compounds for a variety of uses including plastics and liquid transportation fuels.

Producer Gas
Combustible gas produced from heating wood in low oxygen environment. Producer gas may be directly combusted to produce heat or refined to remove tars and particulates for use in internal combustion engines, or undergo catalytic reforming into liquid fuels and feedstocks for chemicals.

Char
Carbon material produced by combusting wood in a low-oxygen environment. Char may be used as fuel in cooking and heating, a medium for absorption of pollution, in pollution water remediation, or soil amendment. Biochar, charcoal, and activated carbon are forms of char.

Alcohols
Alcohols such as methanol and ethanol and synthetic fuels, preservatives, fuel additives, and solvents. Alcohols are produced through biochemical hydrolysis of wood by breaking down complex sugars, cellulose, and hemicellulose, into simple sugars that are fermented into alcohol, or through thermochemical thermal breakdown of wood that can be converted into methanol and gas and then processed into alcohols or fuels through chemicals.

Peeler Log
Straight, high quality, log relatively clean of major defects (knots, cracks, rot, etc.). Log length are generally 8 feet for hardwood and 8-12 feet for softwood logs. Logs are peeled or sliced along the circumference to form veneer sheets.

Veneer Peeler/Slicer
Produces veneer sheets by slicing sheets from the side of a saint or peeling logs with a rotary blade.

Shavings
Lower moisture, less grease than sawdust. Used as animal bedding, mulch, and soil amendment for livestock and pets.

Plywood
Sheets of veneer (or sheets) bonded together in alternating grain direction. May be mixed with other materials such as particleboard to enhance strength and weight characteristics. Plywood products include blockboard, cellular board, veneer, multi-ply, and composite plywood.

Wood Pellets
Wood particles mechanically compressed into cylindrical pieces of uniform diameter (5/16 inch) and length (3/4 inch). Pellets are used in small stoves and wood stoves. Pellets have a high energy to weight ratio and may be specific to increase fuel efficiency, density, and hydrophobicity.

Heat
Heat generated through the combustion (complete or partial) of wood or other biomass. Heat used for manufacturing processes, for use in other industries, or as a source for power generation, or other. Uses both are used in homes, residential district heating/cooling, and other industrial processes.

Electricity
Electricity produced from wood combustion. Combustion or gasification of wood in a variety of ways, including internal combustion engines and turbines generates mechanical energy from pressurized gas, typically a pyrolysis oil. High pressure steam from combustion is used to drive a turbine to produce electricity. Wood chips may be used in a variety of ways including gasification.

Cellulosic Biofuel
Liquid fuel or combustible fuel produced biochemically. Hydrolysis of wood cellulose into fermentable sugars and fermentation of sugar into alcohols or other chemicals by yeast or microorganisms. Wood sourced from DOE, USDA, and industry data to convert to fuel or other co-products.

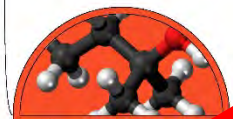
Strander/Flaker
Machinery that sliced or ground wood into uniform long strands. Strands retain the wood strength of wood fibers and can be oriented and formed into panel products with greater strength than similarly shaped sawn wood.

Wood Strands/Flakes
Small, flat wood particles of uniform dimensions and bar dimension along the grain of the tree. Similar to veneer, but not veneers slice. Distinct fiber direction is retained for manufacturing of structural oriented strand board, or in edge-glued lumber, and as a filler in strand lumber.

Structural Composite Lumber
Wood veneers and flakes are bonded in the same direction as lumber, and are formed into large sheets or blocks. Strength that outperforms conventional lumber. Includes laminated veneer lumber, parallel strand lumber, laminated strand lumber, and laminated strand lumber.

Oriented Strand Board
Particle panel formed by heating and pressure using waterproof adhesive with cross-oriented layers (3 layers). Layers are layered in alternating right angle to give enhanced strand board. Uniform strength and stiffness in non-orientation.

I-Joist
Engineered structural member formed as a wood web sandwiched between flanges made from fiber glue and finger joints. Flanges are typically solid wood or laminated veneer lumber. The web is assembled with wood fiber structural adhesive and pressure. Made in engineered beams.



Cellulosic Biofuel
Liquid fuel or combustible fuel produced biochemically. Hydrolysis of wood cellulose into fermentable sugars and fermentation of sugar into alcohols or other chemicals by yeast or microorganisms. Wood sourced from DOE, USDA, and industry data to convert to fuel or other co-products. Followed by fermentation of sugar into alcohols (ethanol).

Energy

Woody Forest Products Manufacturing

Forest ecosystems provide a diverse range of services and products. Wood is but a small part of this complex relationship yet is embedded within every aspect of our lives, framing homes, printing magazines, and even powering cell phones. This diagram conceptualizes the transformation of wood from forests into "end market products", defined here as consumer product encountered in everyday life.

Start Here!

Forests: Forest Ecosystem

Be sustained towards a variety of uses. Utilization of harvesting, or thinning, forest material, usually low value material chipped as well as lumber or veneer, small diameter logs once poles and fence posts, needles, cones and branches are used for engineered energy, engineering and personal.

Raw Material
Initial products extracted from managed forestland

Processing
Process through which raw material is reformed into an end market product, or an intermediate product to be further processed

Intermediate
Products with limited consumer level use and thus further manufactured into a final market product

End Product
Final market product available for consumer use. See product types below for more detail.

Primary Output
Primary (typically highest value) product manufactured from associated material or process.

Co-Product Output
Secondary product produced from material or process with limited, but cost effective value.

Composite
Wood particulates engineered with non-woody materials including waxes, cements, adhesives, and plastics to form specific shapes to meet engineering strength and use requirements.

Energy
Wood products specifically manufactured to generate heating or electrical power.

Landscaping
Products designed for outdoor applications including design, soil enhancement, and more.

Lumber
Sawn lumber used for building or construction purpose. Typically directly sawn from raw material and only undergoes a single processing step.

Engineered Building Materials
Engineered product with high strength and stability designed to replace steel and concrete building materials.

Panel
Sheet-based wood product. Engineered to meet strength, aesthetic, and structural specification.

Paper
Fiber based products typically produced rolls but may be shaped into a variety of products.

Remanufactured
Finished product built from taking an end market product and reprocessing it into another form.

University of California
Wood Resources Group

For additional information, please visit us at www.ucanrwoodresources

This is a product of the UC Berkeley Wood Resources Group. Funding support is provided by the USFS R5, State and Private Forestry.

Last updated: R5 8/7/15

University of California
Agriculture and Natural Resources

Sawlog
Roundwood harvested and removed from managed forest. Ca. form a softwood products industry typically has a 6" notice sawlog diameter minimum or 8' log lengths. Common products include dimensions Lumber, studs, and railties.

Sawmill
Processes sawlogs round from managed forests into a range of solid wood products (studs, plywood and dimensional lumber, railties, panel, beams, rafters). Products can be pressed, in kiln dried, and painted, revised, and glued into secondary products.

Soil Amendment & Mulch
Chipped wood and bark material collected from several co-products (sawlogs, wood control, etc. protection, soil enhancement, water retention, and other landscaping applications. Material may be mixed with compost and/or pesticides or other additional composition.

Lumber
Solid wood products sawn from hardwood or softwood logs into boards. May be directly used or further processed (remanufactured, composite products, adhered, glued, machine lip products.

Paper & Fabric Products
Sheets formed by chemical and mechanical fiberization of wood, followed by bearing underlying fibers into thin sheets. Fiber size determines final product, including print newsprint, cardboard, specialty (molding, pulp, milk carton), fluff, sanitary tissue, toilet paper, and structural (cardboard, paper).

Molding & Scrollwork
Hardwood and softwood lumber milled into a variety of products including flooring, "molding, siding, and trim".

Laminated Timber
Engineered beam manufactured from multiple pieces of kiln dried lumber is glued together and bonded (finger or as angled cross laminated timber) to create shapes and sizes not possible without engineering. Replaces concrete and steel structural materials.

Management Residual
Material from managed forests unsuitable for use in milling or roundwood applications due to size, form, or quality such as branches, tree tops, and tops left over from non commercial thinning, wildlife hazard reduction, and other management activities.

Chipper
Mechanical process that produces small, uniform pieces of wood from raw forest material. The wood may be sliced by a rotating disc or spiral auger, but which both cut a rotating drum or other tree with rotating hammers.

Sawdust
Fine particulate co-product of sawing, grinding, or cutting operation. Clean sawdust is a pure wood material without non-wood contaminants (foliage, bark).

Fuel Log
Compressed form wood particulate (chip, shavings, fiber), adhesive compounds and/or wax treating a high density, low emission, long burning fuel. Hydrophobility, water flammability, and lower environmental impact than other solid wood fuel products.

Wood Fiber Composite
Wood fiber blended with other plastic or cement to create product with enhanced elasticity, durability, and strength. Can be molded into a variety of sizes and shapes. Application with decorative siding and cement aerated wood fiber.

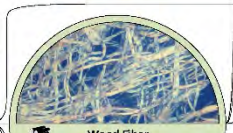
Particleboard
Bound wood chips compressed and adhesive and wood particles. May or may not be layered or side depending on type of adhesive used. Product generally has 1 flat side, smooth plate surface. Used in furniture, wood furniture loss less in purposes.

Furniture
Wood product such as tables and chairs, used to make a house, office, or other space in, table for living or working. Product may be used in, or for, external settings and/or other (and structural properties).

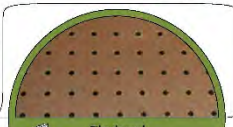
Small Log
Small diameter roundwood material (exclusive of sawlogs and peeler logs), with structural properties suitable for post, pole, or dowel manufacturing. May be stranded into higher value products such as those non-engineered products manufacturing.

Post Peeler
Process of shaving material off small diameter logs to create a cylindrical wood product with no bark and uniform diameter. Produces clap and bark co-products.

Wood Chips
Wood mechanically decomposed, without small log, round or forming co-product, or residual material. Chips have uniform, specified dimensions and may be further compressed, adhered, and thermally/chemically decomposed to form other agricultural or energy products.



Wood Fiber
Pure wood fiber derived from mechanical or chemical decomposition of logs, chips, or manufacturing residue. Cellulosic source of fibers enhance elasticity and strength when used as filler or additive in composites. Wood fiber (fine, coarse, and mixed pulp) is used in paper products.



Fibreboard
Wood fibers formed and adhered into a structural panel in comparison to particle-based panel. Variable fiber sources can be used with performance goals defined by density and/or specific intended use. Products include medium-density fiberboard, high-density fiberboard, hardboard, and insulation board.

Nanocellulose
Cellulose particles (0.1-100 nm in diameter) produced from high pressure, temperature, and velocity impact homogenization of pulp. Nanocellulose fibrils have unique characteristics useful for a variety of applications including reinforcement, barrier layers, and fiber bonds.

Injection Molded Composite
Wood particulate (nanocellulose, sawdust, wood fiber) and adhesive and plastic (polyolefin, polyethylene, polyvinyl chloride, polyester) composite. Lower cost and higher strength to weight ratio compared with other plastic. Differs from fiber composites in that structural properties of wood fiber are not considered.

Specialty Items
Custom designed or formed products (turned bowl, knife, cutting implements, ax, sec Pyramids, cutting boards, etc.). Usually other material and wood products (bowls, personal items, etc.). Should be manufactured from wood, most products be wood, but may be directly from the forest.

Post & Poles
Peeled, small diameter logs of variable thickness and length. Poles are used in cable, fence or fencing, greenhouse and farm, packed and used in housing construction, landscape edging and stake, and more. May be stressed or untreated with wood preservative.

Veneer
Thin sheets of wood peeled or sliced from peeler logs. Veneers range in thickness from 0.6mm to 10mm depending on structural (thicker) or decorative (thinner) application, and may be tape (costly hardwoods more commonly used for decorative purposes).

Pyrolysis Oil
Liquid produced from pyrolysis of wood. This heterogeneous substance can be used directly as a fuel in some types of engines and can be refined to produce specific chemical compounds for a variety of uses including plastics and liquid transportation fuels.

Producer Gas
Combustible gas produced from heating wood in low oxygen environment. Producer gas may be directly combusted to produce heat or used to remove water and particulates for use in internal combustion engines, or under pressure, will compress liquid fuels and feedstocks.

Char
Carbon material produced by combusting wood in a low-oxygen environment. Char may be used as fuel in cooking and heating, a medium for absorption of pollution, in pollution water, in medicinal, as soil amendment, biochar, charcoal, and activated carbon are forms of char.

Alcohols
Alcohols such as methanol and methanol and ethanol are common fuel additives. Ethanol is alcohols are produced through biochemical hydrolysis of wood by breaking down complex sugars, cellulose, and hemicellulose, into simple sugars that are fermented into alcohol, or thermochemical-thermal breakdown of wood that can be converted into methanol and gas subjugated into alcohols or liquid through chemicals.

Peeler Log
Straight, high quality, log relatively clean of major defects (knots, cracks, rot, etc.). Log length are generally 8 feet for hardwood and 8-12 feet for softwood logs. Logs are peeled or sliced along the circumference to form veneer sheets.

Veneer Peeler/Slicer
Produces veneer sheets by slicing sheets from the side of a saint or peeling logs with a rotary blade.

Shavings
Lower more valuable, generally produced as a co-product when wood is moved through the sawmill or for livestock and pets.

Plywood
Sheets of veneer (or wood) bonded together in alternating grain direction. May be mixed with other materials such as particleboard to enhance strength and weight characteristics. Plywood products include blockboard, cellular board, veneer, multiply, and composite plywood.

Wood Pellets
Wood particles mechanically compressed into cylindrical pieces of variable diameter (3/8-1 inch) and length (3/4-1 inch). Pellets are used in small stoves or boilers that could power plants and wood stoves. Pellets have higher energy to weight ratios and may be specific to increase fuel by energy density and hydrophobicity.

Heat
Heat generated through the combustion (complete or partial) of wood or other biomass. Heat used for manufacturing processes, heating, and/or other. Uses both are used in cooking, residential, district heat/cooling, and other industrial processes.

Electricity
Electricity produced from wood combustion, combustion or gasification technology, internal combustion engines and turbine generators may be directly fuelled from producer gas, syngas, or pyrolysis oil. High pressure steam from combustion is used chiefly in steam turbines or steam engines.

Cellulosic Biofuel
Liquid fuel or combustible fuel produced biochemically. Hydrolysis of wood cellulose into fermentable sugars and fermentation of sugar into alcohol, or the mechanical pyrolysis of wood at 300-500°C and refined/upgraded to lower by fermentation or costs and performance.

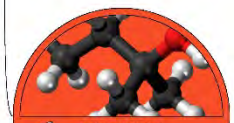
Strander/Flaker
Machinery that slices roundwood into uniform long strands. Strands retain the wood strength of wood fiber and can be oriented and formed into panel products with greater strength than similarly shaped sawn wood.

Wood Strands/Flakes
Small, flat wood particles of uniform dimensions and bar direction along the grain. Shape similar to a flattened veneer slice. Distinct fiber direction is retained for manufacturing of medium oriented strand board, or reinforcing fiberboard, and as a fiber in strand lumber.

Structural Composite Lumber
Wood veneer and fibers formed in the same direction (strands) and formed into large rectangular blocks. Strands are bonded together with adhesive and pressed. Product strength that outperforms conventional lumber. Includes laminated veneer lumber, parallel strand lumber, laminated strand lumber, and laminated strand lumber.

Oriented Strand Board
Particle panel formed by heating and pressing wet or dry strands of wood in alternating right angle layers (oriented strand board). Uniform strength and elasticity not found in non-oriented strand board (particleboard).

I-Joist
Engineered structural beam formed from two parallel flanges made from fiber glued or bonded or veneer lumber. The flanges are connected with wood or structural plywood or pressed fiberboard or plywood web.



Cellulosic Biofuel
Liquid fuel or combustible fuel produced biochemically. Hydrolysis of wood cellulose into fermentable sugars and fermentation of sugar into alcohol, or the mechanical pyrolysis of wood at 300-500°C and refined/upgraded to lower by fermentation or costs and performance.

Lumber

Issues and opportunities

- **Resource adequacy** is a key metric
- Where does this 140 chip vans/5 day week if not to bioenergy?
- Bioenergy plants are **essential infrastructure**, key to the restoration industry
- **Little public funds** invested in wood products innovation over the last several decades
- **Long-term carbon storage** in wood products, new codes with sprinklers are helping to prevent woody building loss
- Wood has a much lower **carbon footprint** for building than steel and cement
- RCEA could benefit from a biomass technical advisory committee

Historic “teepee” burner of wood waste, Carlotta, CA

Conclusion

- Rather than pitting biopower against other solutions, California needs to embrace a "*Yes, and*" approach to woody biomass. That is—
- *Yes,* we need to **encourage wood product innovation** for continued improvements in emissions, climate, and economic outcomes from biomass.
- *And*, we need to continue to **support existing emissions-controlled biopower**. Because:
  1. the alternative is typically open pile burning, wildfire, or decomposition – all forms of emissions
  2. new wood product innovations are not at sufficient scale and will need time to reach maturity in California

REDWOOD COAST EnergyAuthority

STAFF REPORT

Agenda Item # 6.1

AGENDA DATE:	November 21, 2019
TO:	Board of Directors
FROM:	Matthew Marshall, Executive Director
PREPARED BY:	Lori Taketa, Executive Support Specialist
SUBJECT:	Letter to CPUC Regarding PG&E Ownership

SUMMARY

On November 5, 2019, a coalition of mayors of cities serviced by PG&E sent a letter to the California Public Utilities Commission (CPUC) asking the Commission to consider changing PG&E from an investor-owned utility to a customer-owned utility during bankruptcy proceedings. This proposal precedes a CPUC review of PG&E's proposed reorganization plans that is required by federal bankruptcy code and state law.

The mayors and supervisors who signed the letter pointed to PG&E estimates that tens of billions of dollars will be needed over the next decade for system hardening, wildfire protection and cyber security. A not-for-profit, customer-owned utility, they say, can: raise capital at a much lower cost than can a private, investor-owned company; operate without the burdens of paying dividends to shareholders and federal taxation; and better focus dollars on long-neglected maintenance, repairs and capital upgrades, mitigating some of the upward pressure on utility rates. The changed ownership model can, proponents also say, begin to restore public trust by allowing the public to have a greater role in decision-making, instead of allowing the investor profit motive to drive decisions.

Chair Winkler has requested that the Board consider supporting or signing this letter and joining a coalition of officials supporting PG&E's restructuring as a customer-owned utility.

FINANCIAL IMPACTS

None.

RECOMMENDED ACTIONS

Discuss and potentially take action to have RCEA sign on to a letter calling on the California Public Utilities Commission to make PG&E a customer-owned utility.

ATTACHMENTS

1. November 4, 2019 Letter to California Public Utilities Commission from Mayors and Supervisors

2. November 5, 2019 Press Release – "Leaders Representing Over 5 Million Californians Call on CPUC to Make PG&E Customer-Owned"

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November 4, 2019

Hon. Marybel Batjer, President
Hon. Martha Guzman Aceves
Hon. Liane M. Randolph
Hon. Clifford Rechtschaffen
Hon. Genevieve Shiroma

California Public Utilities Commission
505 Van Ness Avenue
San Francisco, CA 94102

President Batjer and Commissioners:

RE: Critical Matters Related to the PG&E Bankruptcy

As local leaders across Northern and Central California, collectively representing more than 5 million residents, we write to you about a matter vital to the safety and quality of life of the communities we serve. While our immediate attention focuses on the recovery of our neighbors and communities from recent tragic fires and power shut-offs, we have serious concerns about whatever emerges from the bankruptcy of Pacific Gas and Electric Company and its parent, PG&E Corporation. We write in our individual capacities as elected and appointed leaders, but as our coalition of local leaders grows in the weeks ahead, we will advocate these positions with our boards and councils as well, and seek their support.

Both the federal bankruptcy code and state law invest the California Public Utilities Commission with a responsibility for approving any Plan of Reorganization for those entities. The Bankruptcy Court may not confirm such a Plan if it involves any rate change (as is the likely case) without this Commission's assent, while recently-enacted state law establishes your approval as a necessary predicate for the emergent entity to have access to the Wildfire Fund. The Commission now plays an essential part in the restoration of Northern California's incumbent utility to a position where it can provide safe, reliable, and affordable power to our citizens.

At present, the Commission is considering the scope of its review. It is focusing primarily on the two plans before it, developed in the Chapter 11 proceeding by competing financial interests. One, from the companies themselves, reflects the current driving forces that govern PG&E, namely financial entities that purchased controlling equity interests as the crisis unfolded. The other is the product of distressed asset bondholders. Both vie for ultimate control, and both reflect a short-term desire to maximize financial gain for their proponents. Neither plan addresses the three key matters that we believe are of utmost importance. They are:

First, the discussions so far have been almost entirely devoid of any consideration of whether PG&E can emerge under either plan as a viable, credit-worthy entity. The bankruptcy code requires that the reorganized PG&E to be a feasible, financially stable enterprise, able to perform its functions for the long term. Under Section 1129 (a)(11) of the Bankruptcy Code, the Court

may not confirm a Plan that does not meet this standard. Even without that mandate, as a matter of public policy, this should be a primary consideration. Rather, the proceedings appear dominated so far by a pitched battle between Wall Street titans for control of the bankruptcy process, control of the company, and the ability to control exit financing. This is merely spectacle, without regard for what will be left behind when the financial players inevitably leave the scene.

Second, the scope of review must include consideration of whether the reorganization plans before you address any of the organic operational issues that have plagued this company to the great detriment of its customers. The public interest cannot be swept aside in the name of merely addressing the bankruptcy exit. The Plan of Reorganization must substantially improve the company's operational footing — boosting its capacity to deliver electricity and gas that meets its customers' reasonable expectations for reliable service, while remaining solvent. This requires aligning the financial interest of the company with the public interest — for focused investment in safe, resilient, well-maintained, and sustainable infrastructure.

So far, neither Plan before you posits a vision for a reorganized PG&E that will address those operational issues.

Third, the Commission has indicated that as part of its review, it will examine "structural" issues involving PG&E's governance. We urge you to embrace this aspect of your review broadly and incisively.

Recently, Governor Newsom declared that "when they come out of bankruptcy, [PG&E] has to be a completely re-imagined company." We agree. That reimagining must begin now, as part of your review.

In a growing coalition of local community leaders, we are developing a proposed structural change for PG&E that addresses all three of these key elements. Based on a foundation currently in the Public Utilities Code, we will propose transforming PG&E into a mutual benefit corporation – in essence, a cooperative owned by its customers.

We propose a customer-owned utility for three primary reasons. The most compelling rationale is that PG&E correctly estimates it must invest tens of billions of dollars over the next decade for system hardening, wildfire protection and cyber-security. A mutualized PG&E can raise capital from a broad pool of debt financing in amounts substantially greater than can an investor-owned PG&E, and at much lower cost. A customer-owned utility can operate without the burdens of paying dividends to shareholders, and exempt from federal taxation. As a result, a cooperative financial structure will save ratepayers many billions of dollars in financing costs over this next decade. A customer-owned PG&E will better focus its scarce dollars on long-neglected maintenance, repairs, and capital upgrade, and mitigating some part of the substantial upward pressure on rates.

Next, a customer-owned utility structure can be accomplished through a Chapter 11 Plan, with results far superior to those that would be seen from the two plans currently under consideration.

Finally, the customer-owned utility structure would allow PG&E to begin the process of restoring public confidence, in part by allowing the public to have greater role in determining decisions that increasingly have come to define matters of life and death. To the extent that the public continues to believe that a profit motive has dominated PG&E's decision making, the enterprise will never regain the trust of its customers, its regulators, and public policy-makers. It is time to pass control of the company from geographically distant investors to its customers.

Although recent actions bring the urgency of change into sharp relief, we do not pursue this option out of mere anger or angst. Rather, the moment compels PG&E's transformation. AB 1054 was a response to the realization that customers will be called upon to bear billions of dollars of costs associated with wildfire recovery and payment of claims. We face the need for a completely re-engineered and reconstructed system to adapt to the realities of climate change and poorly maintained infrastructure. PG&E cannot meet these challenges if it stumbles out of bankruptcy, barely able to raise capital, and suffering prohibitive costs.

There is a better way, and we want you to consider it. Your proceeding is that opportunity. We urge that it not be a cramped or limited exercise, focused solely on getting through the current Chapter 11 case.

We stand ready to participate in these proceedings, and to work with you. However, we again urge that the scope of your inquiry must address these broader and compelling matters that go well beyond the immediate desire to simply get through the bankruptcy proceeding. The Commission must do more than approve a Plan – any Plan – merely so that the bankruptcy can be concluded. This situation requires a full and comprehensive effort to chart a sustainable course for the future of PG&E, one that will serve the interests of its customers, and position the company to meet the challenges we will face from a changing climate.

Signed:

Mayor Sam Liccardo, City of San José
Mayor Darryl Steinberg, City of Sacramento
Mayor Libby Schaaf, City of Oakland
Mayor Michael Tubbs, City of Stockton
Mayor Ted Brandvold, City of Modesto
Mayor Steve Ly, City of Elk Grove
Mayor Barbara Halliday, City of Hayward
Mayor Larry Klein, City of Sunnyvale
Mayor Jesse Arreguin, City of Berkeley
Mayor Tom Butt, City of Richmond
Mayor Drew Bessinger, City of Clovis
Mayor Randall Stone, City of Chico
Mayor Julie Winter, City of Redding
Mayor Ian Bain, City of Redwood City
Mayor Brett Lee, City of Davis
Mayor Martine Watkins, City of Santa Cruz

President Carole Groom, San Mateo County Board of Supervisors
Chair Ryan Coonerty, Santa Cruz County Board of Supervisors
Chair Kate Sears, Marin County Board of Supervisors
Chair Don Saylor, Yolo County Board of Supervisors
Chair Mark Medina, San Benito County Board of Supervisors

Mayor Teresa Barrett, City of Petaluma
Mayor Heidi Harmon, City of San Luis Obispo
Mayor Dominic Foppoli, City of Windsor
Mayor Jack Dilles, City of Scotts Valley
Mayor Amy Harrington, City of Sonoma
Mayor John Dell'Osso, City of Cotati

cc:

Hon. Gavin Newsom, Governor
Hon. Toni G. Atkins, President Pro Tem, California State Senate
Hon. Anthony Rendon, Speaker of the California Assembly
Hon. Ben Hueso, Chair Senate Committee on Energy, Utilities & Communications
Hon. John M.W. Moorlach, Vice Chair Senate Committee on Energy, Utilities & Communications
Hon. Chris R. Holden, Chair Assembly Committee on Utilities & Energy
Hon. Jim Patterson, Vice Chair Assembly Committee on Utilities & Energy
Administrative Law Judge Peter Allen
Service List I.19-09-016

Note: San José Mayor Sam Liccardo will hold a media availability at 12:15 p.m. at San José City Hall. Please contact Rachel [redacted] if you would like to attend.

FOR IMMEDIATE RELEASE

Media Contact:
Jim Reed, Office of Mayor Sam Liccardo [redacted]
Rachel Davis, Office of Mayor Sam Liccardo [redacted]

Leaders Representing Over 5 Million Californians Call on CPUC to Make PG&E Customer-Owned

Leaders write State's Public Utilities Commission urging to restructure PG&E into a customer-owned utility — aligning PG&E with customer interests instead of investors

San José, Calif. (November 5, 2019) – A coalition of leaders from many of the largest California cities served by Pacific Gas and Electric (PG&E) sent a letter to the California Public Utilities Commission (CPUC), urging exploration of restructuring the investor-owned utility into one owned by California customers. The coalition is led by San José Mayor Sam Liccardo, whose city is the largest in California that is served by PG&E.

The leaders endorsed a proposal for a customer-owned utility ahead of a CPUC review of proposed plans for PG&E's reorganization under consideration in bankruptcy court. Federal bankruptcy code and state law require the CPUC to approve any such Plan of Reorganization for PG&E. The leaders argue that neither of the two plans currently proposed concretely address a vision for a reorganized PG&E that will adequately protect the public's interest and ensure safety, reliability, and affordability over the long-term.

Together, the Mayors and Supervisors write,"what has dominated the proceedings so far is simply a battle being waged between Wall Street titans for control of the bankruptcy process, control of the company, and the ability to control exit financing. This is merely spectacle, without regard for what will be left behind when the financial players inevitably leave the scene."

"This situation requires a full and comprehensive effort to chart a sustainable course for the future of PG&E, one that will serve the interests of its customers, and position the company to meet the challenges we will face from a changing climate."

Collectively representing over 5 million Californians, the leaders are proposing a not-for-profit, customer-owned utility for the following reasons:

1. PG&E correctly estimates it must invest tens of billions of dollars over the next decade -- assets they do not have -- for system hardening, wildfire protection and cyber-security:
    a. A customer-owned PG&E can raise capital from a broad pool of debt financing at a much lower cost than a private investor-owned company.
    b. A customer-owned utility can operate without the burdens of paying dividends to shareholders, and is exempt from federal taxation. As a result, a customer-owned financial structure will save ratepayers many billions of dollars in financing costs over this next decade.
    c. A customer-owned PG&E will better focus its scarce dollars on long-neglected maintenance, repairs, and capital upgrade, and mitigating some part of the substantial upward pressure on utility rates.

2. On Friday, Governor Newsom called for a quick resolution to PG&E's bankruptcy process. Transforming PG&E's structure to a customer-owned utility can be accomplished now, while they are still bankruptcy, with results far superior to those that would be seen from the two plans currently under consideration.

3. The customer-owned structure would allow PG&E to begin the process of restoring public confidence, in part by allowing the public to have a greater role in determining decisions that increasingly have come to define matters of life and death. To the extent that the public continues to believe that that an investor profit motive has dominated PG&E's decision making, the enterprise will never regain the trust of its customers, its regulators, and public policy-makers. It is time to pass control of the company from geographically distant investors to its California customers.

The signatories of the letter are:

- Mayor Sam Liccardo, City of San José
- Mayor Darryl Steinberg, City of Sacramento
- Mayor Libby Schaaf, City of Oakland
- Mayor Michael Tubbs, City of Stockton
- Mayor Ted Brandvold, City of Modesto
- Mayor Steve Ly, City of Elk Grove
- Mayor Barbara Halliday, City of Hayward
- Mayor Larry Klein, City of Sunnyvale
- Mayor Jesse Arreguin, City of Berkeley
- Mayor Tom Butt, City of Richmond
- Mayor Drew Bessinger, City of Clovis
- Mayor Randall Stone, City of Chico
- Mayor Julie Winter, City of Redding
- Mayor Ian Bain, City of Redwood City
- Mayor Brett Lee, City of Davis
- Mayor Martine Watkins, City of Santa Cruz

- President Carole Groom, San Mateo County Board of Supervisors
- Chair Ryan Coonerty, Santa Cruz County Board of Supervisors
- Chair Kate Sears, Marin County Board of Supervisors
- Chair Don Saylor, Yolo County Board of Supervisors
- Chair Mark Medina, San Benito County Board of Supervisors
- Mayor Teresa Barrett, City of Petaluma
- Mayor Heidi Harmon, City of San Luis Obispo
- Mayor Dominic Foppoli, City of Windsor
- Mayor Jack Dilles, City of Scotts Valley
- Mayor Amy Harrington, City of Sonoma
- Mayor John Dell'Osso, City of Cotati

The full letter can be found here.

Mayor Liccardo, San José

"With a customer-owned PG&E, we can align the company's financial interests with the public interest, and restore reliable, safe utility service for our residents and businesses. I stand with local leaders representing more than 5 million Californians urging the company's transformation, to put PG&E's days of underinvestment, mismanagement, and negligence behind us."

Mayor Libby Schaaf, Oakland

"Every resident in California deserves a reliable utility to deliver power safely and consistently. It's time to remove PG&E's investors from our process and take back control for us, the customers. Rather than reorganizing a failed company, I support exploring a new customer-owned utility, that prioritizes people over profits and creates a safe, consistent, power supply for all residents."

Mayor Darrell Steinberg, Sacramento

"It is important to consider all options as we seek to balance the need to keep Californians safe while avoiding unacceptable mass disruptions in power," said Mayor Darrell Steinberg. "Public ownership is an option worth seriously examining."

Mayor Steve Ly, Elk Grove

"The proposal's intent is to allow the public to have a greater role in decisions that have come to define matters of life and death. Additionally, this structure will provide an opportunity for PG&E to begin the restoration of public trust. The time has come to pass control of the company from remote investors to its local customers."

Mayor Tom Butt, Richmond

"The current model for providing gas and especially electric services is simply not working. We need to explore alternatives. Many critical services, such as water, wastewater, fire, police, and transportation are successfully provided by public agencies or public-private partnerships."

Mayor Michael Tubbs, Stockton

"With continued blackouts, this literally dark period is an opportunity to restructure PG&E by placing control of our power grid into the hands of our residents. Creating a customer-owned entity allows us to put people ahead of profits, safety ahead of dividends and local control ahead of corporate rule."

Mayor Martine Watkins, Santa Cruz

"As our cities suffer under PG&E's mismanagement, and California burns, it's high time we pave a different path. I join my colleagues across northern California in urging the CPUC to transform PG&E into a customer-owned utility."

Chair Ryan Coonerty, Santa Cruz County Board of Supervisors

"PG&E's focus needs to be on the health and vitality of Californians, not corporate profits. The people of California need to come first and that will never happen if PG&E is captured by hedge funds and investors. A customer-owned utility will properly align values and investment for the good of our communities."

Mark Landman, Cotati Councilmember

"It's time to stop paying credit card rates on fixing the grid. A customer-owned utility will help us afford to repair PG&E's decades of neglect."

# # #

REDWOOD COAST EnergyAuthority

STAFF REPORT

Agenda Item # 6.2

AGENDA DATE:	November 21, 2019
TO:	Board of Directors
PREPARED BY:	Ben Mattio, Acting Director of Demand Side Management
SUBJECT:	PG&E Energy Watch 2020 Contract Work Authorization

SUMMARY

Many of RCEA's energy efficiency customer programs are funded through RCEA's Energy Watch Partnership with Pacific Gas and Electric Company (PG&E). The 2019 Energy Watch contract with PG&E is ending, and efforts to negotiate and finalize a six-month 2020 contract extension are advancing. The 2019 Master Services Agreement (MSA) with PG&E, which sets the general terms and conditions of our Energy Watch contract will be extended through June 2020. We are now ready to present the Draft Contract Work Authorization (CWA), consisting of the Scope of Work, for the Board's consideration and approval.

The CWA sets the scope of services, budget and energy saving goals. The tables below present the negotiated budget and goals for January 2020 through June 2020.

Category	Admin	Marketing	Implementation	Incentives	Total
Resource	$26,000	$21,000	$228,300	$194,173	$469,473
Non-Resource	$3,150	N/A	$101,850	N/A	$105,000
Total Budget	**$29,150**	**$21,000**	**$330,150**	**$194,173**	**$574,473**

	2020 Net Savings Goals
kW	50
kWh	725,218
Therms	3,466

FINANCIAL IMPACTS

The six-month 2020 Energy Watch budget is roughly half of the 2019 Energy Watch Budget. No significant financial impacts are expected.

RECOMMENDED ACTION

1. Approve Draft PG&E Energy Watch Contract Work Authorization and authorize the Executive Director to execute the final agreement and any associated documents contingent on final review and approval of any revisions by RCEA legal counsel.

ATTACHMENTS

1 - Draft PG&E Energy Watch Contract Work Authorization

REGIONAL SMB PROGRAM SCOPE OF WORK

TABLE OF CONTENTS

ATTACHMENTS TO PG&E's CWA SCOPE OF WORK:

Non-Utility Energy Efficiency
Redwood Coast Energy Watch Regional SMB

Program STATEMENT OF WORK (SOW)

1. INTRODUCTION

1.1 Redwood Coast Energy Authority implements the Redwood Coast Energy Watch (RCEW) Program, offering comprehensive energy efficiency services to local governments and small and medium businesses (SMB). RCEW, administered by PG&E and Redwood Coast Energy Authority (Joint Powers Authority), aims to achieve energy savings in Humboldt County. Energy savings will be realized through services such as but not limited to: energy efficiency audits, retrofits, retro-commissioning, rebates, education and training and the development of long-term energy reduction strategies for cities and counties. Other activities may include the support of the California Long-Term Energy Efficiency Strategic Plan, community outreach and integrated marketing efforts, workforce development programs and direct collaboration with third party implementers and Redwood Coast Community Choice Energy.

2. PROGRAM REQUIREMENTS

2.1 Program Begin and End Dates.

2.1.1 Under this scope of work (SOW), the Contractor shall continue its Program with the 2020 Program Year activities beginning on January 1, 2020 until ending on June 30, 2020 (Term). The Contractor shall continue its Program activities in accordance with the provisions in this SOW.

2.1.2 End Date for Program Direct Implementation Activities. Unless otherwise directed by PG&E's Program Manager (PM), all direct implementation Program activities, installation services and project applications, shall be complete by June 30, 2020.

2.1.3 Incomplete Approved Program Projects. Contractor shall track any Program projects that are approved by PG&E with reserved incentives (Committed Projects) that will not be completed by June 30, 2020, and shall provide the following information to PG&E's PM by May 15, 2020:

Project level data:

(a) a list of Committed Projects and their respective kW, kWh, and therm savings; and

(b) a Project description, current status and estimated completion date

Program level data:

(c) unspent Program budget funds; and

(d) incentive funds required to complete the Projects.

2.1.4 End Date for Program Administrative Activities. Administrative activities must be complete and submitted to PG&E with a final invoice and Final Completion Program Report, defined below by July 25, 2020. If this SOW is terminated prior to then, these items must be submitted to PG&E as defined in the Program Transition Plan no later than forty (40) days after the SOW termination date.

2.2 Program Compliance. During the Term, Contractor agrees to continue to comply with current and upcoming PG&E, Statewide, and California Public Utilities Commission (CPUC) Policies, Procedures, Protocols, Rules, Processes, Guidelines, and the Regional SMB Program Manual (Program Manual) located on PG&E's Wiki website. Collectively these Program requirements are referred to as the Program Rules as set forth in this SOW.

2.2.1 Project Development Protocol for Custom Projects. All custom projects are subject to PG&E's sole discretion in determining whether such project is considered custom. If Contractor discovers or anticipates any part of a custom project may or does deviate from any of the Program Rules, Contractor shall immediately notify PG&E's PM. All such custom project deviations require PG&E's written authorization. Contractor will need to produce such written authorization for any 3rd party data requests.

2.2.2 Energy Insight. Contractor agrees to continue and have its staff trained to use PG&E's Energy Insight (EI) portal to transmit all project transactions, reports and communications.

2.2.3 Contractor shall use PG&E's Energy Insight portal for the following activities unless otherwise directed by your PG&E Program Manager (PM), including but not limited to:

1. Project management and documentation as described here and specified in the Policies and Procedures Manual (deliverable from section 3.6) including:
   a. Input of project information, as soon as customer interest is confirmed, to provide pipeline visibility
   b. Input of all customer, project, measure, and comment fields as required by PG&E
   c. Periodic update of customer referrals and projects throughout the sales cycle, including but not limited to 1) naming the assigned energy auditor, 2) updating the status (i.e., "Opportunity Milestone") of customer referrals, 3) converting customer referrals to projects or closing disqualified referrals, 4) providing estimated project energy savings (kW, kWh, and Therms), and 5) providing estimated completion dates.
   d. Quarterly updates of the KPI input form at end of each quarter as requested by the PM

e. Request to withdraw project as soon as project is confirmed no longer viable by the Contractor and PM

2. Transfer of any and all confidential or customer information through private Chatter group:
   a. Invoices, monthly reports, and KPIs to PG&E
   b. Customer data that includes PII (Personally Identifiable Information, any two or more data points identifying a customer)
   c. Any other ad-hoc requests by PG&E PM (data requests, accruals reports, program pipelines, etc.)
3. Other EI Contractor requirements:
   a. Attend all EI trainings as appropriate or requested by PG&E's PM
   b. Follow the current EI procedures as made available through trainings, communications, and postings in EI groups
   c. Follow EI Chatter protocol for all project-related and reportable communication among project stakeholders, excluding the customer
   d. Join appropriate EI Chatter groups for training and procedural materials
   e. Promptly notify PG&E's PM of any anomaly or issue affecting project management in EI
   f. Confirm monthly to PM all Contractor's active and inactive EI users
   g. Keep current all active user contact info in EI

2.2.3 Evaluation, Measurement and Verification (EM&V). In addition to the EM&V requirements set forth in section 9.0 of the Contract Specific Conditions, Contractor's EM&V responsibilities shall also include, but is not limited to, estimating program savings, providing feedback, and offering recommendations to improve program design and implementation. Implementers shall collect, report, verify, and deliver accurate data necessary to enable process and impact EM&V evaluations, and for conducting internal performance analysis. Contractor's EM&V activities may include responding to Program administrator's, CPUC and other 3rd party data requests, facilitating interviews with program staff and program participants, enabling verification of measure installation at customer sites, providing access to Contractor's program related data and information, participating in embedded evaluation activities, and responding to evaluation recommendations.

2.2.4 Cost-effectiveness. It is the Contractor's responsibility to manage their projects and pipeline to ensure they are delivering cost effective savings in accordance with PG&E's Annual Budget Advice Letter (ABAL) filing and CPUC mandates regarding cost-effectiveness. Contractor shall be responsible to provide a CET run as requested. This CET run shall include data from projects paid to date and will also incorporate the pipeline of future projects through end of each calendar year.

California Energy Data and Reporting System (CEDARS) is the system of record for demand side management programs in California. Contractor represents the data reflected on CEDARS for their Program is correct and accurate. Contractor agrees to discuss and resolve with PG&E's PM any questions or inconsistencies in the Program data.

It is the Contractor's responsibility to manage their Program project costs, measure mix, and other factors affecting the Total Resource Cost (TRC). Contractors must take actions to improve their TRC and make Program and measure adjustments based on their review and Program data using this metric. Contractor agrees to provide updates to PG&E's PM regarding any actions taken to improve their TRC.

2.2.5 Business Plan Sector-Level Metric: Per Application 17-01-013, PG&E's Energy Efficiency Business Plan Portfolio and Sector-Level Metrics, PG&E reserves the right to request additional project and/or customer data to be collected by the Contractor, including, but not limited to, square footage of customer facilities where the Contractor has completed an energy audit or energy efficiency project, disadvantaged community information, hard-to-reach community information, customer satisfaction, annual water/wastewater flow information and building type designation. The PG&E PM will communicate to the Contractor if any additional data is required to be collected and Contractor shall take reasonable steps to support the request in a timely manner.

3. TASK 1 - DEVELOP PROGRAM MATERIALS AND PROGRAM LAUNCH–

3.1 The Parties acknowledge that Contractor has developed from the previous year's Program, a Program Management Plan (PMP) that includes a Work Plan, Marketing Plan, and a Quality Assurance/Quality Control Plan. Contractor agrees to update and modify the PMP for its 2020 Program to reflect any modifications or additions to their existing Program content to reflect and comply with this SOW's requirements.

3.2 Program Policies and Procedures Manual (P&P Manual). Contractor shall update and submit the P&P Manual for PG&E's review within 30 days of the execution of this CWA. Contractor agrees to make the P&P updates as follow:

3.2.1 To update the P&P Manual when relevant to ensure conformance with current CPUC policy updates.

3.2.2 Certify the P&P Manual review has been completed in conjunction with monthly reporting and invoicing.

3.2.3 Provide a change history addendum to the P&P Manual documenting the "list of affected pages" with each update.

3.3 Training. The following Program Training is required as directed by the PM:

3.3.1 Program and Technical Training. Contractor shall attend technical in-person training, workshops, web based and other training events to use PG&E's data reporting systems, update information on regulatory and environmental activities, codes and standards, energy efficiency and demand response products and other information pertinent to Program implementation. PG&E will provide mandatory technical, policy, procedures and custom project development training seminars. Contractor's personnel that do not attend and complete all mandatory technical training shall not develop any scope or technical characteristics for a Project and submit it to PG&E for review.

3.3.2 When relevant, Contractor is to provide training for PG&E staff and Customer field representatives either via PG&E-established Webcasts or in person at PG&E facilities. Contractor shall develop and submit to PG&E PM for review and approval an agenda of the Program training events. Contractor shall conduct additional discussions and training on an as-needed basis.

3.6 Task 1 - Schedule of Deliverables

Deliverable	Draft Due Date	Final Due Date
Updated Policy and Procedures Manual	30 days following contract execution	One week after receipt of PG&E PM comments, Reviewed and updated monthly
Updated Marketing Materials (if applicable)	Ongoing	Two weeks after receipt of PG&E PM comments
Updated Training Materials (if applicable)	45 days following contract execution	One week after receipt of PG&E PM comments

4. TASK 2 - SOLICIT CUSTOMER PARTICIPATION IN THE PROGRAM

The following activities may take place as a part of the solicitation process for enrolling customers in the Program and possible other PG&E energy efficiency programs.

4.1 Contractor shall evaluate potential Customers to ensure energy efficiency opportunities are identified and the Customer has the eligibility and intent to meet the Program requirements to achieve long-term energy savings. Contractor is responsible to determine the Customer meets all Program eligibility criteria and sign required Program Forms.

4.2 After the Customer executes the Access Agreement in accordance with the MSA, Contractor shall determine which Program services best serve the

Customer and align with the Program goals. Contractor shall keep PG&E assigned representative(s) engaged and informed of the status of Program activities. These shall include, but are not limited to:

4.2.1 Initial Walkthrough / Facility Assessment. A facility walkthrough to discuss the facility operation and equipment to understand the systems to be evaluated for efficiency opportunities. Systems may include, but are not limited to, air conditioning, process cooling and refrigeration equipment, compressed air systems, ventilation and fan systems, pumping systems, lighting, and associated controls and control systems.

4.2.2 Energy Audits. A simple energy audit to identify potential Measures and to determine whether there are opportunities for cost-effective energy efficiency upgrades.

4.2.3 Identify Measures. Based on the audit findings, Contractor shall discuss the cost-effective capital investment Measures. Contractor should identify which Measures have the most potential of generating energy savings. Contractor should also discuss other possible benefits of implementing equipment modifications such as water conservation, safety and environmental benefits and productivity improvements.

4.2.4 Other Programs. Contractor, PG&E PM, and the Customer field representative shall coordinate to explain other applicable Program offerings and how to receive them with the Customer.

4.2.5 Customer Targeting. For the purposes of customer targeting and achievement of contract savings goals, at least 50% of contract energy savings achievement must come from the assigned geographies outlined in Attachment 1. In addition, at least 75% of contract energy savings achievements must come from municipal and small and medium business customers as defined in Attachment 1. When engaging customers with maximum annual peak demand over 200 kW the Contractor must contact PG&E's BES representative prior to beginning the project to see if the customer is being pursued by another implementer.

5. TASK 3 - ENROLL CUSTOMERS AND PG&E'S PROJECT APPROVAL

5.1 Enroll Customers. Contractor shall enroll qualified Customers in the Program by having them sign the Contractor's current Customer Program Participant Agreement (PPA) with updated Program Date, project deadline language, completed project certification and any other requirements impacting the Program as set forth in this SOW.

5.2 Contractor will also assist Customer in obtaining all supporting documentation for PG&E to evaluate and approve Customer's Project. Contractor may provide the Customer other program materials in accordance with the approved P&P

Manual and consistent with the Custom Policies and Regional SMB Program Policies, as provided by PG&E PM.

5.3 Design and/or Technical Assistance. When relevant, Contractor shall provide design and/or technical assistance to identify energy efficiency opportunities and to facilitate Customer's analysis and project implementation.

6. TASK 4 –PROJECT IMPLEMENTATION

6.1 Project Permits and Verification Statements

Legal and regulatory updates require that Contractor revise their Program Incentive Recipient Certification Form and Certification of HVAC Permit License Forms (collectively Forms) to reflect such modified language adopted used in PG&E's Forms on Attachment 2 and Attachment 3 in accordance with the statutory and regulatory requirements stated below:

Public Utility Code Section 399.4 (b) states in relevant part: all incentives foran energy efficiency improvements or installations of energy efficient components, equipment, or appliances, the incentive recipient must submit a statement certifying that appropriate permits have been obtained and, if a contractor performed the installation or improvement, the contractor holds the appropriate licenses for the work performed. The CPUC has ordered when the work involves obtaining a permit for heating, ventilation, central air-conditioning (HVAC) and heat pump projects, documentation of proof the permit has been closed must also be provided.

The CPUC also ordered Workforce Standards be adhered to be eligible for certain HVAC and Lighting Control incentive thresholds. Contractor agreed in the previous CWA change order to add such language terms to its Customer Program Agreements as follows:

HVAC AND LIGHTING CONTROL WORKFORCE STANDARD QUALIFICATION REQUIREMENTS

To be eligible for an incentive for non-residential heating, ventilation, and air conditioning (HVAC) measure exceeding $3000 and/or for lighting control (LC) measure exceeding $2000, ***prior to*** a technician installing, modifying or maintaining these measures, the technician performing this work is required to provide their applicable qualification documentation for (1) HVAC Measure Installation Qualification the person doing the work must have at least one of the followingcriteria:

(a) Completed an accredited HVACapprenticeship.
(b) Is enrolled in an accredited HVACapprenticeship.
(c) Completed at least five years of work experience at the journey level according to the Department of Industrial Relations definition, Title 8, Section 205, of the California Code of Regulations, passed a practical and written HVAC system installation competency test, andreceived

credentialed training specific to the installation of the technology being installed.

(d) Has a C-20 HVAC contractor license issued by the California Contractor's State Licensing Board; and for (2) LC measures the person doing the work must produce an installer certification from the California Advanced Lighting Controls Training Program.

6.1.1 Contractor must abide by all record retention policies as outlined in the Parties MSA, particularly in the case of a rebate or Incentive delivered directly to the customer.

6.1.1.1 Project Completion Documentation. Prior to issuing final project incentive payments, Contractor must collect, complete and retain copies of all required and applicable project documentation that includes, but is not limited to:

a) Signed Customer Access Agreement

b) Signed Customer Application Form

c) Signed Incentive Recipient Certification Form

d) Signed Contractor Certification of HVAC Permits and License Form

e) Post-Installation Field Verification Report

f) Proof of purchase/installation (as required by delivery channel)

g) Copy of Customer Incentive Check

h) Verification that qualified product was installed (e.g., screenshot from the Design Light Consortium (DLC) website)

i) Hard-to-Reach Questionnaire

j) Other documentation specifically requested by PG&E.

6.2 Energy Efficient Hardware Installation Projects.

6.2.1 Project Installation. Contractor shall assist Customer and any installation vendors, to ensure Measures are installed according to the Project timeline. Upon Customer's request, Contractor shall provide assistance, including but not limited to, bids, reviewing purchase orders, and securing financing. As a Project is being installed, Contractor shall provide periodic oversight at the Customer facility to ensure all equipment installation meets the design specification and all other Program requirements are being implemented.

6.2.2 Remedy Installation Issues. Contractor may assist in remedying all installation problems promptly. After the Measure is installed, any discrepancies between the installation documentation and the onsite verification shall be documented in the Field Verification Report. If these discrepancies involve a number of units installed or differing efficiency ratings the Project may still qualify for an Incentive, but the final Incentive shall be recalculated using the values of the installation.

6.2.3 Improper Installation. Installed equipment not meeting Program standards, improperly installed, or is otherwise not functional, such equipment will be disqualified for an Incentive and Performance Payment, where relevant. Contractor shall provide Customer a written notice explaining these discrepancies and Customer shall have 30 calendar days to resolve any issues and reschedule an inspection. If further inspections of the equipment reveal non-compliance, such equipment will no longer be eligible for an Incentive(s).

7. TASK 5 - PROGRAM BUDGET AND REPORTING

7.1 Program Budget, CPUC Budget Allocations

7.1.1 Program Budget. The aggregate total of PG&E payments for all Work approved under this SOW shall be the Program 2020 budget (Budget). The Budget is the maximum amount of funding allocated for this Program Year 2020. If Contractor depletes the Budget prior to the SOW Term, Contractor must terminate the Program. The total Budget amounts are:

Work Category	**Admin**	**Marketing**	**Implementation**	**Incentives**	**Total**
Resource (LGEAR)	$26,000	$21,000	$228,300	$194,173	$469,473
Non-Resource (SER)	$3,150	N/A	$101,850	N/A	$105,000
Total Budget	**$29,150**	**$21,000**	**$330,150**	**$194,173**	**$574,473**

	2020 Net Savings Goals
kW	50
kWh	725,218
Therms	3,466

7.1.2 CPUC Budget Allocation. Contractor may be required to provide an annual Program Budget allocation in the CPUC-specified categories which includes Administration, Marketing and Direct Implementation Non-Incentive Costs as itemized on Attachment 4. Contractor will notify PG&E if at any time during the year there is significant change that may impact this CPUC Budget Allocation.

7.1.3 CPUC Budget Allocation Summary Table

CPUC Budget Allocation Summary (Refer to Attachment 4 for itemization).	2020 Annual Total Amounts	% of total Program Budget
Administration	$29,150	5%
Marketing	$21,000	4%
Direct Implementation Non-Incentive (DINI) Costs	$330,150	57%
Incentives	$194,173	34%
TOTAL ALLOCATION BUDGET	**$574,473**	100%

8. TASK 6 - PROGRAM REPORTS AND INVOICE REQUIREMENTS

8.1 Monthly Progress Report documenting Program accomplishments, savings and budget tracking, Project installations performed in the preceding calendar month, Customer Feedback Survey results and Customer Service log. Contractor will work with PG&E PM on the format and content of the Monthly Progress Report but may include the following:

- Program performance
- Customer Feedback Survey Results
- Customer Service Log

8.2 Monthly Program Forecast and Accruals. Contractor will provide PG&E with a monthly forecast of expenditures and Accruals, in the forecast and accruals template provided by PG&E. This forecast/accrual determines the energy savings Contractor seeks to achieve during the Program. The Contractor and PG&E PM will revisit the forecast/accruals on a monthly basis to ensure that any changes in Program delivery are reflected. Material changes in this forecast/accrual will impact PG&E's decision to terminate the CWA, impact the payment of Customer Incentives and Budget allocations.

8.3 Contractor agrees that PG&E and Contractor will meet monthly to discuss the Program budget, project pipeline forecast, program logistics, marketing

coordination, evaluation, monitoring and verification coordination, invoicing requirements, scope of work, and any contractual issues.

PG&E will provide Contractor guidance on any changes to the Program, budget and/or energy savings forecast at that time. Monthly savings forecasts and financial accruals shall include:

- Net Energy Savings (kW, kWh, Therms)
- Forecasted Expenditures and Accruals
- Committed and Installed Projects

8.4 Monthly Invoice(s) totals are required to be broken down by CPUC budget allocation categories. The invoice shall show the monthly, year to date, and percentage of the total budget allocation as set forth in Attachment 4. The monthly invoice will also detail the monthly amounts paid to Customer Incentives. PG&E may request proof of cancelled Incentive check.

8.5 Project Pipeline Report. Contractor shall provide monthly Project Pipeline Report accessible to the PM and BES through PG&E's EI, which is to be updated per the standards called out in the guidelines in the PGEWiki EI Pipeline Maintenance Plan and include relevant savings information and development status for any projects with an Expected Completion Date (ECD) 30 days hence.

8.6 Monthly Key Performance Indicators (KPI) Reporting Data. Contractor shall report cumulative monthly data around quarterly forecasted energy savings and forecasted Incentive and Non-incentive spend in a format similar to that provided in Section 8.2. Contractor also shall update KPIs for Strategic Energy Resources non-resource activities and report on them on a monthly basis. Data will be collected monthly and reviewed together with the PG&E PM on a quarterly basis. Final KPIs, including annual energy savings goals, will be documented in the Program Management Plan.

8.7 Ad Hoc Reports and Additional Data. PG&E may require Contractor to provide other reports or documentation ("Ad Hoc Reports"). Additional information may be required by the CPUC.

8.8 CPUC Regulatory Reporting. Contractor shall comply with all CPUC regulatory reporting requirements. PG&E may request such data be provided in a format suitable for submittal to the CPUC.

8.9 Monthly Direct Costs/Activities (applicable to Time and Materials invoices). Contractor shall provide a list of individuals and total hours worked by each individual per month.

8.10 Annual Forecast. Contractor shall provide an annual updated forecast for administrative, marketing, direct implementation non-incentive and Customer Incentive costs consistent with the CPUC Budget Allocation budget format specified in this SOW.

8.11 Contractor shall deliver a Final Program Report upon Program completion and shall include, but is not limited to, the following topics:

- Program Overview
- Summary of Program Accomplishments
- Description of Best Practices or Program Improvement Recommendations
- Description of Program Challenges or Other Issues
- Other items as requested by the PG&E PM

Task 6 Invoicing and Reporting Schedule of Deliverables

Deliverable (Per Project)	**Due Date**
Monthly Progress Report	15th calendar day of the month
Monthly Invoice with breakdown of administration, marketing, direct implementation costs and actual monthly Customer Incentive payments	15th calendar day of the month
Monthly Forecast and Accrual Report	15th calendar day of the month
Pipeline Report	20th calendar day of the month
Annual Forecast	Per PM request
KPI Reporting Data	Monthly, as relevant for Program
Ad-Hoc Reports	As needed
CPUC Reports	As needed
Final Program Report	30 days after Program Completion

9. PROJECT COMPLETION AND PROGRAM PAYMENT TERMS

9.1 Time and Materials-Based (T&M) Payments (if applicable). Contractor shall bill PG&E for that portion of the Budget which PG&E has agreed to pay on a time-and-materials, not-to-exceed basis for each of the Tasks and Deliverables indicated as "T&M Payments" according to the labor rates contained in the MSA.

9.2 Customer Incentive Payments and Direct Installation Reimbursements. The “Gross Participant Cost”, is a Customer co-payment which should not be billed to PG&E which PG&E will not pay.

9.2.1 Budget Adjustments/Measure Disallowance/Termination. Upon 60 days' advance written notice to Contractor, PG&E reserves the right to: (a) reduce or increase the Budget and its associated savings, (b) shift program funds, or (c) cancel or terminate the CWA.

9.2.2 PG&E reserves the right to modify any Program requirements that include, but are not limited to, CPUC directives, Program portfolio reviews, Measure energy savings, net-to-gross ratios, energy costs, Measure effective useful life and adjustments to Incentives. Contractor shall make these modifications upon notice from PG&E accordingly.

9.2.3 If PG&E reduces funding, terminates the CWA, or the Program is discontinued, Contractor shall provide a Project(s) status report. PG&E shall pay Contractor for all services rendered and costs incurred before any such termination.

10. RAMP-DOWN PROGRAM

10.1 Program Transition. Within 30 days of Notification of Transition, Contractor shall provide a Transition Plan to ramp down and transition the program. The Transition Plan must provide PG&E with a list of projects and necessary steps to successfully transfer such projects to the PG&E designated program. At a minimum, the list must include all in-flight opportunities that have not yet reached stage 7A – New as referenced in PG&E's Energy Insight.

10.2 Savings Claimed and Incentives. Contractor shall take into consideration that all Projects past Stage 7A – New as referenced in PG&E's Energy Insight, need to be complete, and Incentives paid, within 60 days of Notification of Transition. The Contractor will assist transition to a new third-party Implementer workflow for any project not paid by day 60.

10.3 Program Transition Notification. Contractor shall develop, for PG&E PM approval, a transition notification for Customers as part of the Transition Plan. The notification shall be sent to Customers no later than 14 days after PG&E has informed Contractor of transition.

11. NOTICES

11.1 Contractor designates Ben Mattio, 633 3rd Street, Eureka, CA 95501, 707.269.1700 ext 311, BMattio@redwoodenergy.org as Contractor's Contract Representative for all matters relating to this CWA.

11.2 PG&E designates Lindsey Tillisch, 245 Market Street, Mail Code N6G, 415-973-3658, lindsey.tillisch@pge.com as PG&E's PM for all matters relating to CWA.

11.3 The Parties may modify their designated contact representatives at any time by providing the other Party with a written update notification with the new contact information.

12. CPUC AUTHORITY

12.1 This CWA and SOW can be modified at any time in accordance with any directive of the CPUC and regulation of PG&E. Any information, results and reports regarding this CWA and SOW shall be made available to the CPUC.

Attachment 1

Allowable Measures, Geographic Areas, and Customers to be Served by this Program

This Attachment describes the Measures that Contractor may install and the Customers and geographic areas (within the Service Territory). Contractor shall not install any other Measures or serve any other Customers under this Program without the prior written approval of the PG&E PM.

Contractor understands there are other Contractors, including PG&E, local governments, other affiliates and similar third-party Contractors that may include the same Measures, Customers, and geographic locations.

PG&E reserves the right in its sole discretion to amend these assignments during the course of the Program. No deviation from these assignments is permitted without the prior written consent by the PG&E PM.

Eligible Customers:

Contractor may serve the following Customers:

- Municipal customers, including but not limited to cities, counties, special districts, wastewater treatment facilities (NAICS 22132x) and K-12 public schools.
- Small and Medium Businesses (SMB) - including non-profit organizations. SMB customers are defined as non-residential customers with an annual maximum peak demand of less than 200kW.
- At least 75% of program energy savings achievements must come from Municipal and SMB customers up to 200 kW in annual maximum peak electric demand. Up to 25% of program energy savings achievements may come from non-residential customers between 200-500 kW in annual maximum peak electric demand.
- Any exceptions to this list of eligible customers must be approved in writing by the PG&E PM.

Eligible Geographic Area:

Contractor may serve the above eligible customers in the following counties within PG&E's service territory: Humboldt. At least 50% of program energy savings achievements must come from these counties. Upon written notification from PG&E the Contractor may serve eligible customers in any other county within PG&E's service territory, but no more than 50% of program energy savings achievements may come from outside of the counties specified above.

Allowable Measures: All eligible Core Deemed, Core Calculated and Direct Install measures must be consistent with the Regional SMB Program Policies, and approved for program inclusion by PG&E PM.

Attachment 2

Incentive Recipient Certification Form

Contractor must develop an Incentive Recipient Certification Form, modeled after this PG&E form. Contractor may integrate the collection of this information in their existing processes. Contractor's form must be approved by the PG&E PM.

Incentive Recipient Certification of Contractor License and Permits for Pacific Gas and Electric Company (PG&E) Customized Incentive Projects

To be completed by the incentive recipient for the following programs:

- Customized Incentives
- Retrocommissioning
- Savings by Design
- Automatic Demand Response
- Commercial Whole Building
- California Advanced Homes Program

Important Details:

- Sign, date, and submit this form, along with project invoices, after completion of your project.
- Please refer to the email cover letter sent with this form for full project incentive process and final payment instructions.
- Questions about this form or process? Contact your PG&E Project/Implementation Manager. **Your Project/ Implementation Manager is:**

Name

Email

Phone Number

In accordance with Public Utilities Code Section 399.4 (b) (1), recipients of incentives must certify that they have used a licensed contractor, as appropriate, and have complied with applicable permitting requirements for the installation to receive a rebate or incentive from PG&E.

This form must be signed and returned by the PG&E incentive recipient (PG&E customer or Third Party Implementer or Project Sponsor) before an incentive check can be issued.

Instructions:

This form must be filled out by the incentive recipient and returned to your PG&E Project/Implementation Manager along with the project invoices after installation of the project.

STEP 1 PROJECT APPLICATION NUMBER

STEP 2 CERTIFICATION OF COMPLIANCE

As an authorized agent representing this project, by signing below, I certify that the improvement or installation complies with any applicable permitting requirements and, if a contractor performed the installation or improvement, the contractor holds the appropriate license for the work performed. If lighting control measures were installed, the technician prior to performing this work, made available the CALTP (California Advanced Lighting Controls Training Program) certificate.

Signature

Name (Print)

Account Holder/Customer Name

Title

Date

STEP 3 RETURN TO

Name

Phone

Email

Fax

June 2019 CLB-0619-1196

Attachment 3

Contractor Certification of HVAC Permits and License Form

Contractor Certification of HVAC Permits and License for

Custom Calculated Projects

To be completed by the licensed contractor for the following programs:

- Customized Incentives
- Savings By Design
- Third-party programs
- Commercial whole building

Important Details:

- This form must be signed and dated by a licensed contractor and then submitted with **applicable project invoices and permitting documents** after completion of your project.
- Please refer to the email cover letter sent with this form for full project incentive process and final payment instructions.
- Questions about this form or process? Contact your PG&E representative. **Your PG&E representative is:**

Name

Email

Phone Number

In accordance with California Public Utilities Code Section 399.4 (b), and the California Public Utilities Commission Decision, Pacific Gas and Electric Company (PG&E) is required to collect the information specified below from contractors and/or customers for projects involving the installation of heating, ventilation and air conditioning (HVAC) measures, including heat pumps. This form verifies that the contractors are licensed and that the appropriate permits have been obtained.

Instructions:

This form must be filled out by the licensed contractor installing or overseeing the installation of HVAC replacements and returned to your PG&E representative along with the project invoices after installation of the project.

STEP 1 CUSTOMIZED INCENTIVE PROJECT APPLICATION NUMBER

STEP 2 PERMIT INFORMATION

As an authorized agent of my company, I certify I am a licensed contractor and have followed applicable permitting requirements and provided the appropriate workforce standard qualifications prior to the HVAC measure installation for this HVAC project.

Permit Number

Permitting Agency

Contractor Company Name

Company Representative (Name and Title)

Signature Date

STEP 3 PROOF OF PERMIT CLOSURE

☐ This project does not include the installation of central air-conditioning and heat pumps (including air handling units (AHU), split and packaged units) or their related fans.

☐ I have included proof of permit closure by the local permitting authority as an attachment. This project includes the installation of central air-conditioning and heat pumps (including AHUs, split and packaged units) and their related fans.

STEP 4 RETURN TO (along with project invoices)

Name

Phone Number

OR

Email

Fax

June 2019 CLB-0619-7193

Attachment 4

Itemization of CPUC Budget Allocation

Upon PG&E PM request, Contractor may be asked to complete a cost allocation budget exercise resembling the attached worksheet.

3P CWA
Attachment 7 - I...

ATTACHMENT 5

OBF Workflow Overview and Implementer Requirements

The "PG&E OBF Eligibility Handbook" (OBF Handbook) provides an in-depth description of this process, provides definition details, such as eligibility and other applicable requirements. Below is an overview of the OBF workflow and certain Contractor requirements.

I. OBF WORKFLOW OVERVIEW (QC Provider referenced below means a 3rd partyreviewer)

- Payment History Screening
  - Project developer/CRM representative initiates process in Energy Insight as usual
- Project development – Project Developer (ICP certified engineer)
  - Define baseline and develop EEM recommendation
- Pre-install energy savings calculation and cost estimation
  - Pre-install project report
  - Pre-install QA/QC checklist completed
  - M&V defined
  - O&M plan defined
- Pre-install QA/QC review
  - The QA provider will perform the QA/QC review on the project developers report, and the determine if project meets OBF loan criteria.
  - The QA Provider needs to demonstrate appropriate experience both with project development and technical reviews to be able to effectively identify issues or concerns with the project-related methodologies, assumptions, and results
  - PG&E On-Bill Financing will then generate and process loan agreements.
- Installation
  - Project developer works with customer as usual to make sure EEM's are getting installed as pre-approved
- Post-install verification and report
  - Final QA/QA summary/report
  - Post install QA/QC checklist
  - O&M verification
  - M&V verification
- Post-install QA/QC review
  - The QC provider will review the final reports and supporting documents
- PD and/or installer provides updates to PG&E at least once a year for life of loan
  - Based on O&M and M&V plan

II. Contractor Requirements

1. The Contractor is required to be part of the ICP developer network in order to develop projects that do not have incentives, unless the project is lighting only, and the OBF lighting workbook is used.
   - o If the Contractor does not get ICP certified, the Contractor is required to work with a company that is ICP certified (for both the project development and QA processes), and provide proof of this certification when submitting pre and post packages to the QA provider/reviewer.

2. The Contractor is required to be part of the ICP network to act as the QA provider for projects developed by other Implementers. If the Contractor is certified and interested in acting as the QA provider, PG&E requests that the Contractor reaches out to the OBF team for guidance prior to offering these services.

3. The Contractor is responsible for managing the process detailed in the OBF Handbook for each project. Projects will not be eligible for an OBF loan that do not adhere to the OBF Handbook procedures.

4. Changes to the "OBF Project Eligibility Handbook" may be made by PG&E at any time. In order to qualify for OBF without an Incentives, projects must be developed following the OBF Handbook procedures.

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REDWOOD COAST EnergyAuthority

STAFF REPORT

Agenda Item # 7.1

AGENDA DATE:	November 21, 2019
TO:	Board of Directors
PREPARED BY:	Richard Engel, Director of Power Resources Jocelyn Gwynn, Manager of Power Resources
SUBJECT:	Renewable Long-Term Power Purchase Agreement Negotiation

SUMMARY

In June 2019 the RCEA Board directed staff to negotiate three long-term power purchase agreements (PPAs) to help meet various procurement targets and compliance obligations, including SB 350. One of the proposed PPAs, a twelve-year contract for 50 MW of capacity from Candela Renewables LLC's planned 200 MW solar project located in Fresno County, is currently experiencing indefinite delays that are significant enough to cause staff to consider other offers originally submitted under the RPS solicitation. This change in plans is needed in order to ensure compliance with our long-term procurement requirement for the fourth compliance period (2021-2024) of the State's Renewable Portfolio Standard.

Staff reached out to developers of the other previously shortlisted projects and obtained refreshed pricing and project updates to evaluate the available options. The Energy Authority revised their quantitative analysis with the updated project parameters and fundamental energy market data and consulted with staff on the viability of the projects. Staff selected the following project to recommend to the Board for negotiation of a PPA.

- A 15-year contract for 50 MW of capacity from EDP Renewables North America LLC's planned 100 MW solar project located in Kern County.

This project is similar to the Candela project in scale, technology, pricing, geographic location, expected online date, and other key metrics, thereby minimizing risk associated with this change. The developer scored well in our original qualitative evaluation and is considered by staff an acceptable substitute for the PPA that the Board previously authorized RCEA to negotiate with Candela Renewables.

RECOMMENDED ACTION

<u>Authorize staff to negotiate a power purchase agreement with EDP Renewables North America LLC for 50 MW of solar, to present to the Board for final approval.</u>

EDP Renewables North America

Company Background & Project Status

November 2019

Confidential and Proprietary

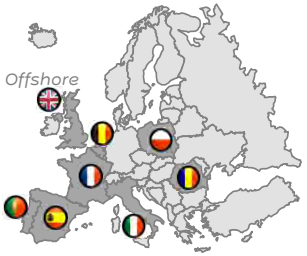
ABOUT EDPR: CORPORATE BACKGROUND

Ranked 4th globally in installed wind capacity, EDPR is active in 13 markets and operates 11 GW of projects

edp renewables

North America | Europe | South America

Houston, TX
NA Headquarters



Madrid, Spain
Headquarters

São Paulo, Brazil
SA Headquarters

~11 GW
Total Installed Capacity

16 GW
Of Pipeline

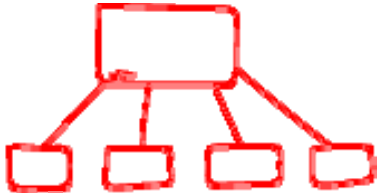
Active in 13
Countries

1,300+
Employees

ABOUT EDPR NORTH AMERICA

EDPR's North American platform operates 54 projects in 16 states/provinces for 6,300+ MW of installed capacity as of Q4 2019

Headquartered in Houston



13 regional offices

600+ employees

EDPR NA's 300+ person Houston team provides:

24/7/365 Operations Support	Regulatory Compliance	Finance, Treasury, AR/AP
Engineering	Market Operations	Legal
Procurement	Asset Management	Community Relations
Wind and Solar Assessment	Turbine Reliability	Back-office Support
Construction Management	Turbine Performance	

EDPR NA'S FOOTPRINT

54
OPERATING
PROJECTS

16 STATES/
PROVINCES

6,300+ MW
OPERATING

CONFIDENTIAL

EDPR NA'S EXPERTISE

EDPR NA is an industry leader in development, procurement, finance and operation of renewable energy facilities.

Development	Procurement	Finance	Operations
~20 years of development experience in the U.S.	Strong relationships with leading manufacturers	Secure funding through construction provided by Parent Company (EDP)	2,900+ turbines in operation
Continuous Efforts tracking to secure PTC/ITC	Secure safe-harbored components for PTC qualification strategy	~$5B in tax equity financing since 2007	24/7/365 staffed remote operations control center
Community-centered development	Run competitive RFPs to obtain best-fit equipment & labor	Secured first tax equity deal for a merchant wind farm	120+ million turbine-hours of operational data

SANDRINI PROJECT DETAILS

Project Location

Site Description and History

- Located 20 miles south of Bakersfield, CA
- Sited on agricultural land
- Under development since 2017

Facility Information

Location:	Kern County, CA
Nameplate Capacity:	100 MW
Expected COD:	Q4 2022
Expected Generation:	~305,668 MWh in Year 1 (34.9% NCF)
Interconnection Point:	PG&E's Wheeler Ridge substation at 70kv
Land Control:	920 acres under executed option to lease

Interconnection

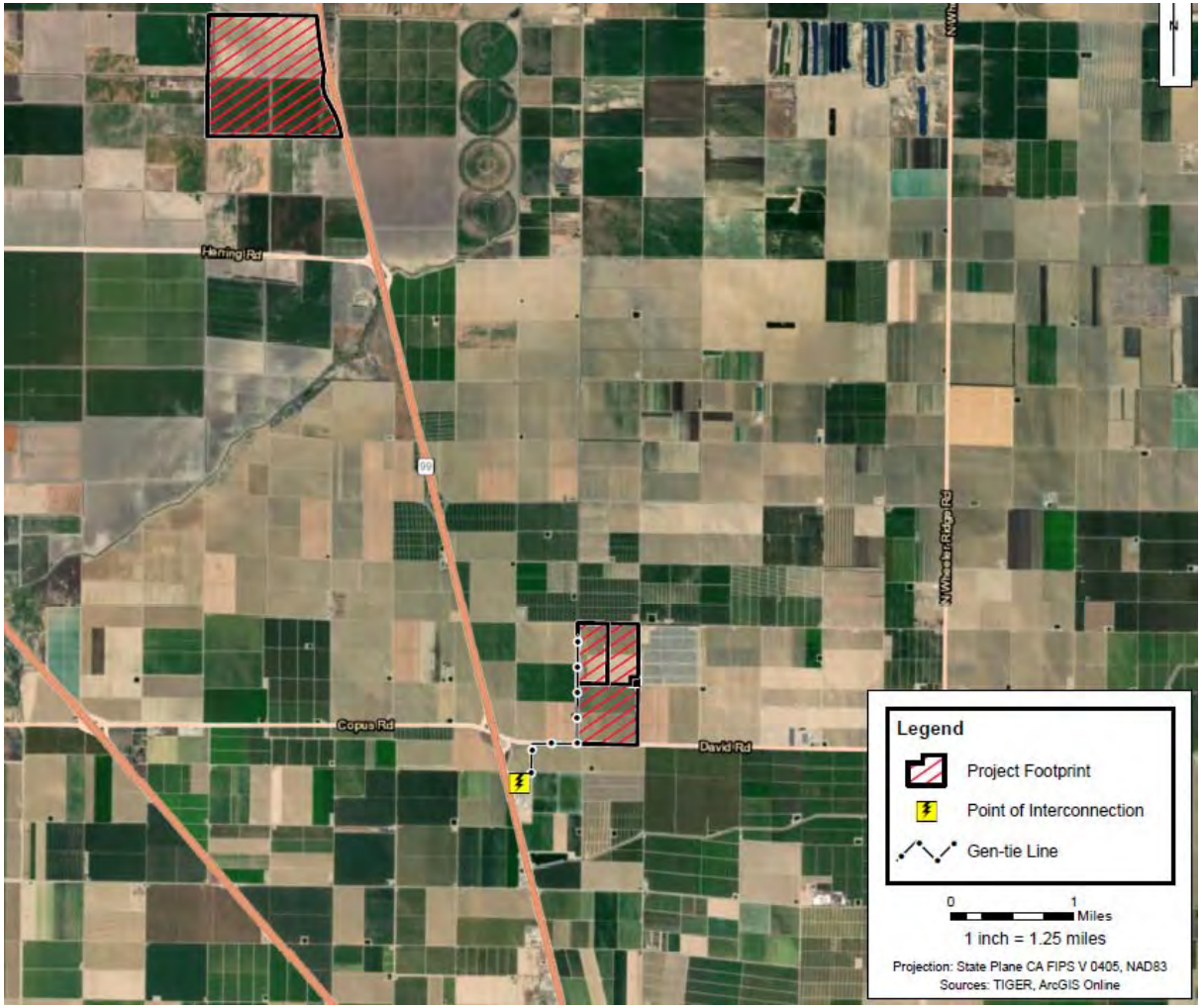
- Phase 2 Interconnection Study results received and Interconnection Agreement tendered
- Currently parked for purposes of securing deliverability (100% deliverability allocation expected March 2020)
- Execution of interconnection agreement expected Summer 2020

Permitting

- Habitat assessment and select wildlife studies completed Q1 and Q2 2019 with remainder of wildlife studies ongoing; preliminary consultations held with CDFW and USFWS
- Conditional Use Permit application submitted to Kern County and deemed complete
- Technical studies and CEQA process to run through remainder of 2019 and 2020 with CUP targeted by Q2 2021

edp renewables

PROJECT MAP



edp renewables

edp renewables

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REDWOOD COAST EnergyAuthority

STAFF REPORT

Agenda Item # 8.1

AGENDA DATE:	November 21, 2019
TO:	Board of Directors
PREPARED BY:	Mahayla Slackerelli, Account Services Manager
SUBJECT:	Rate Update

SUMMARY

October Rate Adjustment

On October 1, PG&E implemented new generation rates for all classes of customers. Once those rates were published, staff created an updated rate sheet for RCEA's rates. These new RCEA rates were calculated by applying the Board approved 1% discount to PG&E's rates, while taking the Power Charge Indifference Adjustment and the Franchise Fee into account (See Attachment A and B). These new RCEA rates were implemented October 17. This rate adjustment constitutes a small increase in generation rates. On average, customer rates are increasing by 0.5%. Residential customers are taking a larger share of the increase with their rates going up by around 2%. Commercial and industrial customers have only seen their rates go up by 0.2%.

November Structural Commercial Rate Change

In the April Board meeting, a representative from PG&E presented on the time-of-use (TOU) transition. This is a statewide initiative to move all customers in California from a tiered rate to a TOU rate that better complements the energy curve for the state's electricity grid. In the May meeting, the Board voted to participate in this transition that will widely benefit RCEA customers. The first stage of the plan to move all customers to TOU rates is to offer the newly structured commercial and industrial rates to customers on a voluntary basis. Then, in November 2020, all commercial and industrial customers will be automatically enrolled in the new rate that corresponds to their current one. As of November 1, PG&E implemented these new commercial rates and made them available to customers. Now that the rates are published, staff has been working with Calpine to implement these structurally new rates.

While the new rates correspond to currently existing commercial and industrial rates, they are structured somewhat differently. Notably many of the rates include a super off-peak significance period during the winter, which did not exist in previous incarnations of these rates. The difference in structure requires a longer implementation process. However, staff is expecting to have the rates implemented in time to appropriately bill all customers who have moved over to the structurally new rates in November.

Future Rate Adjustments

The next PG&E rate adjustment is expected to occur on January 1, 2020. This rate change is forecasted to include a modest increase to generation rates much like the October rate adjustment.

However, PG&E's recent rate-making history has demonstrated a significant amount of uncertainty and staff is monitoring the process closely.

FINANCIAL IMPACTS

Consultants are working with staff on a financial analysis of the October rate adjustment. Staff will report out on the financial impact during the Board of Directors meeting.

RECOMMENDED ACTIONS

None - information only.

ATTACHMENTS

Attachment A: RCEA Residential Rate Sheet Effective October 17, 2019

Attachment B: RCEA Commercial Rate Sheet Effective October 17, 2019

REDWOOD COAST EnergyAuthority

For 100% renewable REpower+ add $0.01/KWH

RCEA Community Choice Energy Program

Residential Generation Rates

Effective October 17th, 2019

Does not include transmission and distribution charges; see https://www.pge.com/tariffs/ERS.SHTML for complete PG&E rate schedules. PG&E rates are effective as of October 1, 2019 and subject to change

PG&E Equivalent Schedule	RCEA Rate Schedule	Time of Use Period	RCEA Rate	RCEA Rate Plus PG&E Fees[1]
E-1, EL-1, EM, EML, ES, ESL, ESR, ESRL, ET, ETL	E-1 Energy $/KWH	Total	0.08896	0.11659
E-6, EL-6	E-6 Energy $/KWH	Summer Peak	0.23287	0.26050
		Summer Part Peak	0.11188	0.13951
		Summer Off Peak	0.06249	0.09012
		Winter Part Peak	0.08991	0.11754
		Winter Off Peak	0.07633	0.10396
EV-A	EV-A Energy $/KWH	Summer Peak	0.24851	0.27614
		Summer Part Peak	0.10545	0.13308
		Summer Off Peak	0.03924	0.06687
		Winter On Peak	0.07556	0.10319
		Winter Part Peak	0.03684	0.06447
		Winter Off Peak	0.04163	0.06926
EV2-A	EV2-A Energy $/KWH	Summer Peak	0.15656	0.18419
		Summer Part Peak	0.11230	0.13993
		Summer Off Peak	0.07157	0.09920
		Winter On Peak	0.10026	0.12789
		Winter Part Peak	0.08789	0.11552
		Winter Off Peak	0.06465	0.09228
E-TOU-A	E-TOU-A Energy $/KWH	Summer On Peak	0.17181	0.19944
		Summer Off Peak	0.09699	0.12462
		Winter On Peak	0.08534	0.11297
		Winter Off Peak	0.07119	0.09882
E-TOU-B	E-TOU-B Energy $/KWH	Summer On Peak	0.19350	0.22113
		Summer Off Peak	0.09147	0.11910
		Winter On Peak	0.08772	0.11535
		Winter Off Peak	0.06911	0.09674
E-TOU-C3	E-TOU-C3 Energy $/KWH	Summer On Peak	0.14700	0.17463
		Summer Off Peak	0.08419	0.11182
		Winter On Peak	0.09110	0.11873
		Winter Off Peak	0.07394	0.10157

[1]PG&E fees include the Power Charge Indifference Adjustment and the Franchise Fee.

Voltage Discount - 4%

For rate schedules not segregated by service voltage, each component of the standard rate shall be discounted for primary or higher service voltage.

REDWOOD COAST EnergyAuthority

For 100% renewable REpower+ add $0.01/KWH

RCEA Community Choice Energy Program

Commercial, Industrial & Agricultural Generation Rates

Effective October 17th, 2019

Does not include transmission and distribution charges; see https://www.pge.com/tariffs/ERS.SHTML for complete PG&E rate schedules. PG&E rates are effective as of October 1, 2019 and subject to change

PG&E Equivalent Rate	RCEA Rate Schedule	Charge Type	Time of Use Period	RCEA Rate Schedule	RCEA Rate plus PG&E Fees[1]
A-1	A-1-A	Energy ($/KWH)	Summer Total	0.10444	0.13203
		Energy ($/KWH)	Winter Total	0.06470	0.09229
A-1-X	A-1-B	Energy ($/KWH)	Summer On Peak	0.11891	0.14650
		Energy ($/KWH)	Summer Part Peak	0.09550	0.12309
		Energy ($/KWH)	Summer Off Peak	0.06841	0.09600
		Energy ($/KWH)	Winter Part Peak	0.09530	0.12289
		Energy ($/KWH)	Winter Off Peak	0.07460	0.10219
A-10-S	A-10-A	Energy ($/KWH)	Summer Total	0.09268	0.12141
		Demand ($/KW)	Summer Total	5.68	5.68
		Energy ($/KWH)	Winter Total	0.06565	0.09438
A-10-P	A-10-A-P	Energy ($/KWH)	Summer Total	0.08313	0.11186
		Demand ($/KW)	Summer Total	4.96	4.96
		Energy ($/KWH)	Winter Total	0.05962	0.08835
A-10-T	A-10-A-T	Energy ($/KWH)	Summer Total	0.07379	0.10252
		Demand ($/KW)	Summer Total	3.92	3.92
		Energy ($/KWH)	Winter Total	0.05323	0.08196
A-10-S-X	A-10-B	Energy ($/KWH)	Summer On Peak	0.14592	0.17465
		Energy ($/KWH)	Summer Part Peak	0.09134	0.12007
		Energy ($/KWH)	Summer Off Peak	0.06355	0.09228
		Demand ($/KW)	Summer Total	5.68	5.68
		Energy ($/KWH)	Winter Part Peak	0.07555	0.10428
		Energy ($/KWH)	Winter Off Peak	0.05866	0.08739
A-10-P-X	A-10-B-P	Energy ($/KWH)	Summer On Peak	0.13407	0.1628
		Energy ($/KWH)	Summer Part Peak	0.08401	0.11274
		Energy ($/KWH)	Summer Off Peak	0.05766	0.08639
		Demand ($/KW)	Summer Total	4.96	4.96
		Energy ($/KWH)	Winter Part Peak	0.07045	0.09918
		Energy ($/KWH)	Winter Off Peak	0.05473	0.08346
A-10-T-X	A-10-B-T	Energy ($/KWH)	Summer On Peak	0.12005	0.14878
		Energy ($/KWH)	Summer Part Peak	0.07364	0.10237
		Energy ($/KWH)	Summer Off Peak	0.04859	0.07732
		Demand ($/KW)	Summer Total	3.92	3.92
		Energy ($/KWH)	Winter Part Peak	0.06196	0.09069
		Energy ($/KWH)	Winter Off Peak	0.04754	0.07627

PG&E Equivalent Rate	RCEA Rate Schedule	Charge Type	Time of Use Period	RCEA Rate Schedule	RCEA Rate plus PG&E Fees[1]
A-6	A-6	Energy ($/KWH)	Summer On Peak	0.35627	0.38386
		Energy ($/KWH)	Summer Part Peak	0.11909	0.14668
		Energy ($/KWH)	Summer Off Peak	0.06137	0.08896
		Energy ($/KWH)	Winter Part Peak	0.08659	0.11418
		Energy ($/KWH)	Winter Off Peak	0.06926	0.09685
E-19-S,V	E-19-S	Energy ($/KWH)	Summer On Peak	0.11922	0.14634
		Energy ($/KWH)	Summer Part Peak	0.07200	0.09912
		Energy ($/KWH)	Summer Off Peak	0.04072	0.06784
		Demand ($/KW)	Summer On Peak	14.73	14.73
		Demand ($/KW)	Summer Part Peak	3.64	3.64
		Energy ($/KWH)	Winter Part Peak	0.06553	0.09265
		Energy ($/KWH)	Winter Off Peak	0.04849	0.07561
E-19-S,R	E-19-R-S	Energy ($/KWH)	Summer On Peak	0.27800	0.30512
		Energy ($/KWH)	Summer Part Peak	0.11185	0.13897
		Energy ($/KWH)	Summer Off Peak	0.04510	0.07222
		Energy ($/KWH)	Winter Part Peak	0.06903	0.09615
		Energy ($/KWH)	Winter Off Peak	0.05259	0.07971
E-19-P,V	E-19-P	Energy ($/KWH)	Summer On Peak	0.10802	0.13514
		Energy ($/KWH)	Summer Part Peak	0.06346	0.09058
		Energy ($/KWH)	Summer Off Peak	0.03480	0.06192
		Demand ($/KW)	Summer On Peak	13.11	13.11
		Demand ($/KW)	Summer Part Peak	3.19	3.19
		Energy ($/KWH)	Winter Part Peak	0.05744	0.08456
		Energy ($/KWH)	Winter Off Peak	0.04188	0.06900
E-19-P,R	E-19-R-P	Energy ($/KWH)	Summer On Peak	0.26354	0.29066
		Energy ($/KWH)	Summer Part Peak	0.10198	0.12910
		Energy ($/KWH)	Summer Off Peak	0.03910	0.06622
		Energy ($/KWH)	Winter Part Peak	0.06093	0.08805
		Energy ($/KWH)	Winter Off Peak	0.04592	0.07304
E-19-T,V	E-19-T	Energy ($/KWH)	Summer On Peak	0.06609	0.09321
		Energy ($/KWH)	Summer Part Peak	0.05147	0.07859
		Energy ($/KWH)	Summer Off Peak	0.03211	0.05923
		Demand ($/KW)	Summer On Peak	14.41	14.41
		Demand ($/KW)	Summer Part Peak	3.61	3.61
		Energy ($/KWH)	Winter Part Peak	0.05376	0.08088
		Energy ($/KWH)	Winter Off Peak	0.03890	0.06602
E-19-T,R	E-19-R-T	Energy ($/KWH)	Summer On Peak	0.25542	0.28254
		Energy ($/KWH)	Summer Part Peak	0.10088	0.12800
		Energy ($/KWH)	Summer Off Peak	0.03885	0.06597
		Energy ($/KWH)	Winter Part Peak	0.05974	0.08686
		Energy ($/KWH)	Winter Off Peak	0.04541	0.07253

PG&E Equivalent Rate	RCEA Rate Schedule	Charge Type	Time of Use Period	RCEA Rate Schedule	RCEA Rate plus PG&E Fees[1]
E-20-S,V	E-20-S	Energy ($/KWH)	Summer On Peak	0.11001	0.13617
		Energy ($/KWH)	Summer Part Peak	0.06702	0.09318
		Energy ($/KWH)	Summer Off Peak	0.03750	0.06366
		Demand ($/KW)	Summer On Peak	14.29	14.29
		Demand ($/KW)	Summer Part Peak	3.52	3.52
		Energy ($/KWH)	Winter Part Peak	0.06077	0.08693
		Energy ($/KWH)	Winter Off Peak	0.04477	0.07093
E-20-S,R	E-20-R-S	Energy ($/KWH)	Summer On Peak	0.25223	0.27839
		Energy ($/KWH)	Summer Part Peak	0.10381	0.12997
		Energy ($/KWH)	Summer Off Peak	0.04123	0.06739
		Energy ($/KWH)	Winter Part Peak	0.06367	0.08983
		Energy ($/KWH)	Winter Off Peak	0.04825	0.07441
E-20-P,V	E-20-P	Energy ($/KWH)	Summer On Peak	0.11443	0.13899
		Energy ($/KWH)	Summer Part Peak	0.06711	0.09167
		Energy ($/KWH)	Summer Off Peak	0.03802	0.06258
		Demand ($/KW)	Summer On Peak	15.65	15.65
		Demand ($/KW)	Summer Part Peak	3.70	3.70
		Energy ($/KWH)	Winter Part Peak	0.06088	0.08544
		Energy ($/KWH)	Winter Off Peak	0.04517	0.06973
E-20-P,R	E-20-R-P	Energy ($/KWH)	Summer On Peak	0.27029	0.29485
		Energy ($/KWH)	Summer Part Peak	0.10343	0.12799
		Energy ($/KWH)	Summer Off Peak	0.04119	0.06575
		Energy ($/KWH)	Winter Part Peak	0.06324	0.08780
		Energy ($/KWH)	Winter Off Peak	0.04809	0.07265
E-20-T,V	E-20-T	Energy ($/KWH)	Summer On Peak	0.06844	0.09152
		Energy ($/KWH)	Summer Part Peak	0.05408	0.07716
		Energy ($/KWH)	Summer Off Peak	0.03508	0.05816
		Demand ($/KW)	Summer On Peak	18.65	18.65
		Demand ($/KW)	Summer Part Peak	4.45	4.45
		Energy ($/KWH)	Winter Part Peak	0.05634	0.07942
		Energy ($/KWH)	Winter Off Peak	0.04175	0.06483
E-20-T,R	E-20-R-T	Energy ($/KWH)	Summer On Peak	0.26381	0.28689
		Energy ($/KWH)	Summer Part Peak	0.09686	0.11994
		Energy ($/KWH)	Summer Off Peak	0.03739	0.06047
		Energy ($/KWH)	Winter Part Peak	0.05790	0.08098
		Energy ($/KWH)	Winter Off Peak	0.04382	0.06690
Agricultural Rates					
AG-1-A	AG-1-A	Energy ($/KWH)	Summer Total	0.08765	0.11218
		Connected Load	Summer Total	1.54	1.54
		Energy ($/KWH)	Winter Total	0.06643	0.09096
AG-1-B	AG-1-B	Energy ($/KWH)	Summer Total	0.09136	0.11589
		Demand ($/KW)	Summer Total	2.33	2.33
		Energy ($/KWH)	Winter Total	0.06696	0.09149

PG&E Equivalent Rate	RCEA Rate Schedule	Charge Type	Time of Use Period	RCEA Rate Schedule	RCEA Rate plus PG&E Fees[1]
AG-1-P-X	AG-1-B-P	Energy ($/KWH)	Summer Total	0.09136	0.11589
		Demand ($/KW)	Summer Total	1.81	1.81
		Energy ($/KWH)	Winter Total	0.06696	0.09149
AG-R-A	AG-R-A	Energy ($/KWH)	Summer On Peak	0.27529	0.29982
		Energy ($/KWH)	Summer Off Peak	0.05417	0.07870
		Connected Load	Summer Total	1.52	1.52
		Energy ($/KWH)	Winter Part Peak	0.06205	0.08658
		Energy ($/KWH)	Winter Off Peak	0.04980	0.07433
AG-V-A	AG-V-A	Energy ($/KWH)	Summer On Peak	0.23831	0.26284
		Energy ($/KWH)	Summer Off Peak	0.05114	0.07567
		Connected Load	Summer Total	1.59	1.59
		Energy ($/KWH)	Winter Part Peak	0.06034	0.08487
		Energy ($/KWH)	Winter Off Peak	0.04834	0.07287
AG-V-B	AG-V-B	Energy ($/KWH)	Summer On Peak	0.22118	0.24571
		Energy ($/KWH)	Summer Off Peak	0.05196	0.07649
		Demand ($/KW)	Summer Total	2.69	2.69
		Demand ($/KW)	Summer On Peak	2.10	2.10
		Energy ($/KWH)	Winter Part Peak	0.04807	0.07260
		Energy ($/KWH)	Winter Off Peak	0.03782	0.06235
AG-4-A	AG-4-A	Energy ($/KWH)	Summer On Peak	0.15505	0.17958
		Energy ($/KWH)	Summer Off Peak	0.05561	0.08014
		Connected Load	Summer Total	1.56	1.56
		Energy ($/KWH)	Winter Part Peak	0.06012	0.08465
		Energy ($/KWH)	Winter Off Peak	0.04827	0.07280
AG-4-B	AG-4-B	Energy ($/KWH)	Summer On Peak	0.11293	0.13746
		Energy ($/KWH)	Summer Off Peak	0.05694	0.08147
		Demand ($/KW)	Summer Total	2.75	2.75
		Demand ($/KW)	Summer On Peak	2.93	2.93
		Energy ($/KWH)	Winter Part Peak	0.05502	0.07955
		Energy ($/KWH)	Winter Off Peak	0.04375	0.06828
AG-4-B-X	AG-4-B-P	Energy ($/KWH)	Summer On Peak	0.11293	0.13746
		Energy ($/KWH)	Summer Off Peak	0.05694	0.08147
		Demand ($/KW)	Summer Total	2.07	2.07
		Demand ($/KW)	Summer On Peak	2.93	2.93
		Energy ($/KWH)	Winter Part Peak	0.05502	0.07955
		Energy ($/KWH)	Winter Off Peak	0.04375	0.06828
AG-4-C	AG-4-C	Energy ($/KWH)	Summer On Peak	0.13339	0.15792
		Energy ($/KWH)	Summer Part Peak	0.06643	0.09096
		Energy ($/KWH)	Summer Off Peak	0.04209	0.06662
		Demand ($/KW)	Summer On Peak	6.80	6.80
		Demand ($/KW)	Summer Part Peak	1.16	1.16
		Energy ($/KWH)	Winter Part Peak	0.04900	0.07353
		Energy ($/KWH)	Winter Off Peak	0.03854	0.06307

PG&E Equivalent Rate	RCEA Rate Schedule	Charge Type	Time of Use Period	RCEA Rate Schedule	RCEA Rate plus PG&E Fees[1]
AG-5-A	AG-5-A	Energy ($/KWH)	Summer On Peak	0.14233	0.16686
		Energy ($/KWH)	Summer Off Peak	0.06024	0.08477
		Connected Load	Summer Total	4.25	4.25
		Energy ($/KWH)	Winter Part Peak	0.06405	0.08858
		Energy ($/KWH)	Winter Off Peak	0.05167	0.07620
AG-5-B	AG-5-B	Energy ($/KWH)	Summer On Peak	0.13948	0.16401
		Energy ($/KWH)	Summer Off Peak	0.03290	0.05743
		Demand ($/KW)	Summer Total	5.17	5.17
		Demand ($/KW)	Summer On Peak	6.46	6.46
		Energy ($/KWH)	Winter Part Peak	0.05512	0.07965
		Energy ($/KWH)	Winter Off Peak	0.02371	0.04824
AG-5-C	AG-5-C	Energy ($/KWH)	Summer On Peak	0.11197	0.13650
		Energy ($/KWH)	Summer Part Peak	0.05574	0.08027
		Energy ($/KWH)	Summer Off Peak	0.03482	0.05935
		Demand ($/KW)	Summer On Peak	11.99	11.99
		Demand ($/KW)	Summer Part Peak	2.26	2.26
		Energy ($/KWH)	Winter Part Peak	0.04109	0.06562
		Energy ($/KWH)	Winter Off Peak	0.03157	0.05610
Standby Service					
S-TOU-P	S-TOU-P	Energy ($/KWH)	Summer On Peak	0.09810	0.11913
		Energy ($/KWH)	Summer Part Peak	0.07920	0.10023
		Energy ($/KWH)	Summer Off Peak	0.05446	0.07549
		Reservation Charge ($/KW)	Summer Total	0.46530	0.46530
		Energy ($/KWH)	Winter Part Peak	0.08221	0.10324
		Energy ($/KWH)	Winter Off Peak	0.06305	0.08408
		Reservation Charge ($/KW)	Winter Total	0.46530	0.46530
S-TOU-T	S-TOU-T	Energy ($/KWH)	Summer On Peak	0.07822	0.09925
		Energy ($/KWH)	Summer Part Peak	0.06264	0.08367
		Energy ($/KWH)	Summer Off Peak	0.04204	0.06307
		Reservation Charge ($/KW)	Summer Total	0.38610	0.38610
		Energy ($/KWH)	Winter Part Peak	0.06509	0.08612
		Energy ($/KWH)	Winter Off Peak	0.04927	0.07030
		Reservation Charge ($/KW)	Winter Total	0.38610	0.38610
Street and Outdoor Lighting					
LS-1, LS-2, LS-3,	LS-1	Energy ($/KWH)	All Total	0.06924	0.09295
TC-1	TC-1	Energy ($/KWH)	All Total	0.07622	0.10368

Voltage Discount - 4%

For rate schedules not segregated by service voltage, each component of the standard rate shall be discounted

[1]PG&E fees include the Power Charge Indifference Adjustment and the Franchise Fee.

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