



# RePowering Humboldt

with Community Scale Renewable Energy

Mad River Valley Biomass Pilot Project





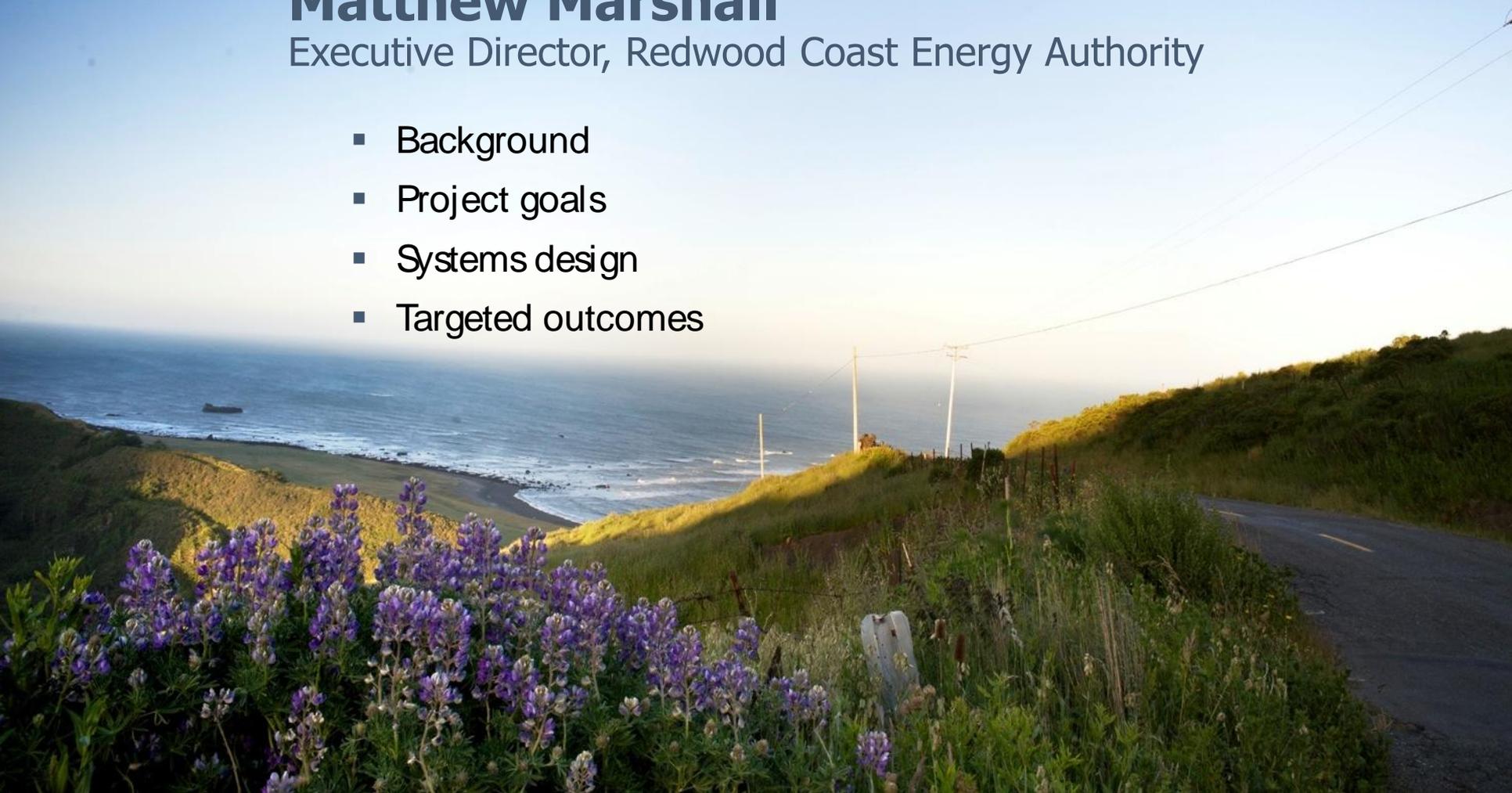
# CA Biomass Working Group

Sacramento, CA | September 24, 2013

## Matthew Marshall

Executive Director, Redwood Coast Energy Authority

- Background
- Project goals
- Systems design
- Targeted outcomes





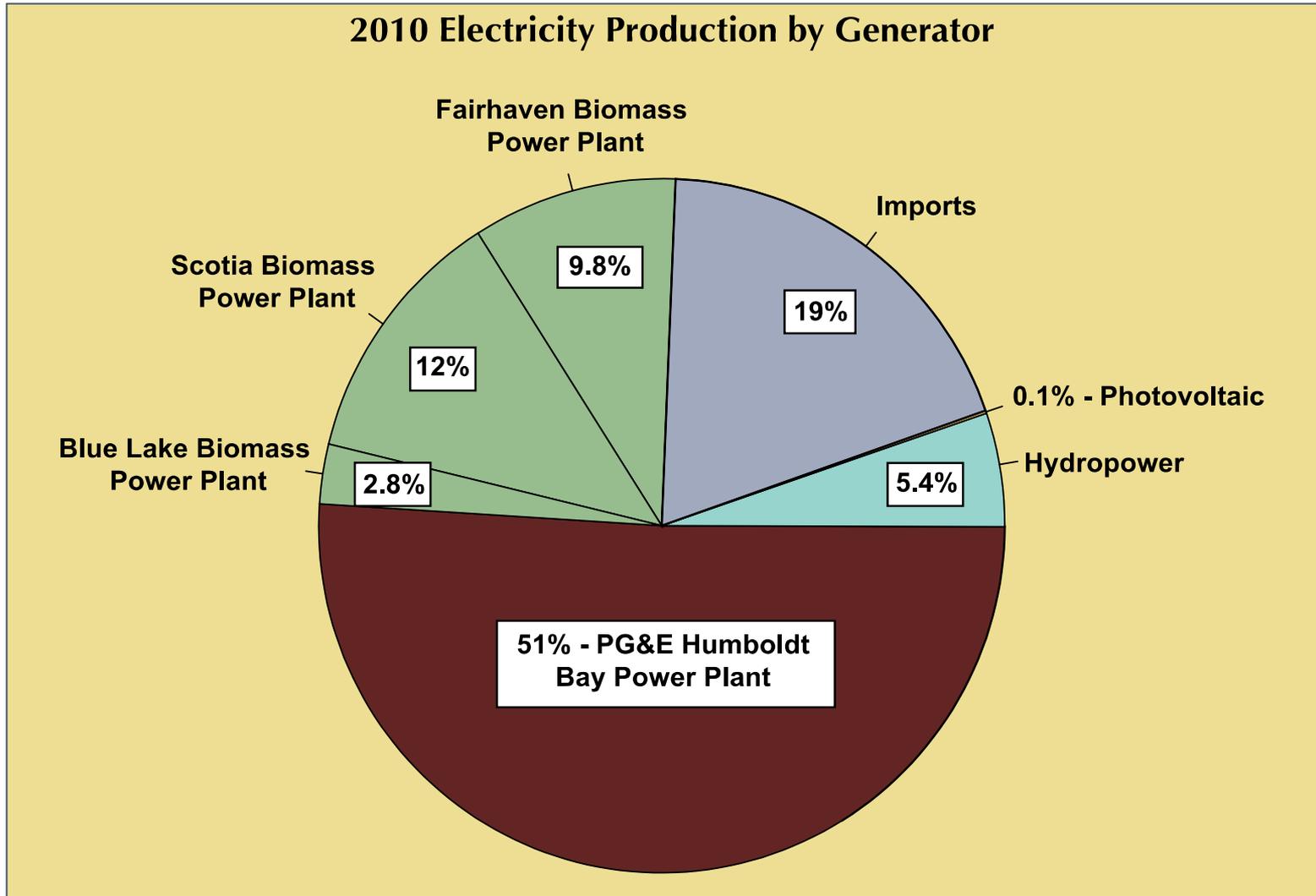
# REDWOOD COAST Energy Authority

- Local Government  
Joint Powers Agency
- Established 2003
- Mission:
  - 1) Reduce energy demand
  - 2) Increase energy efficiency
  - 3) Advance the use of clean, efficient, local renewable resources.





# Our Current Electricity Picture





# RePowering Humboldt Background

“RePower Humboldt Strategic Plan”

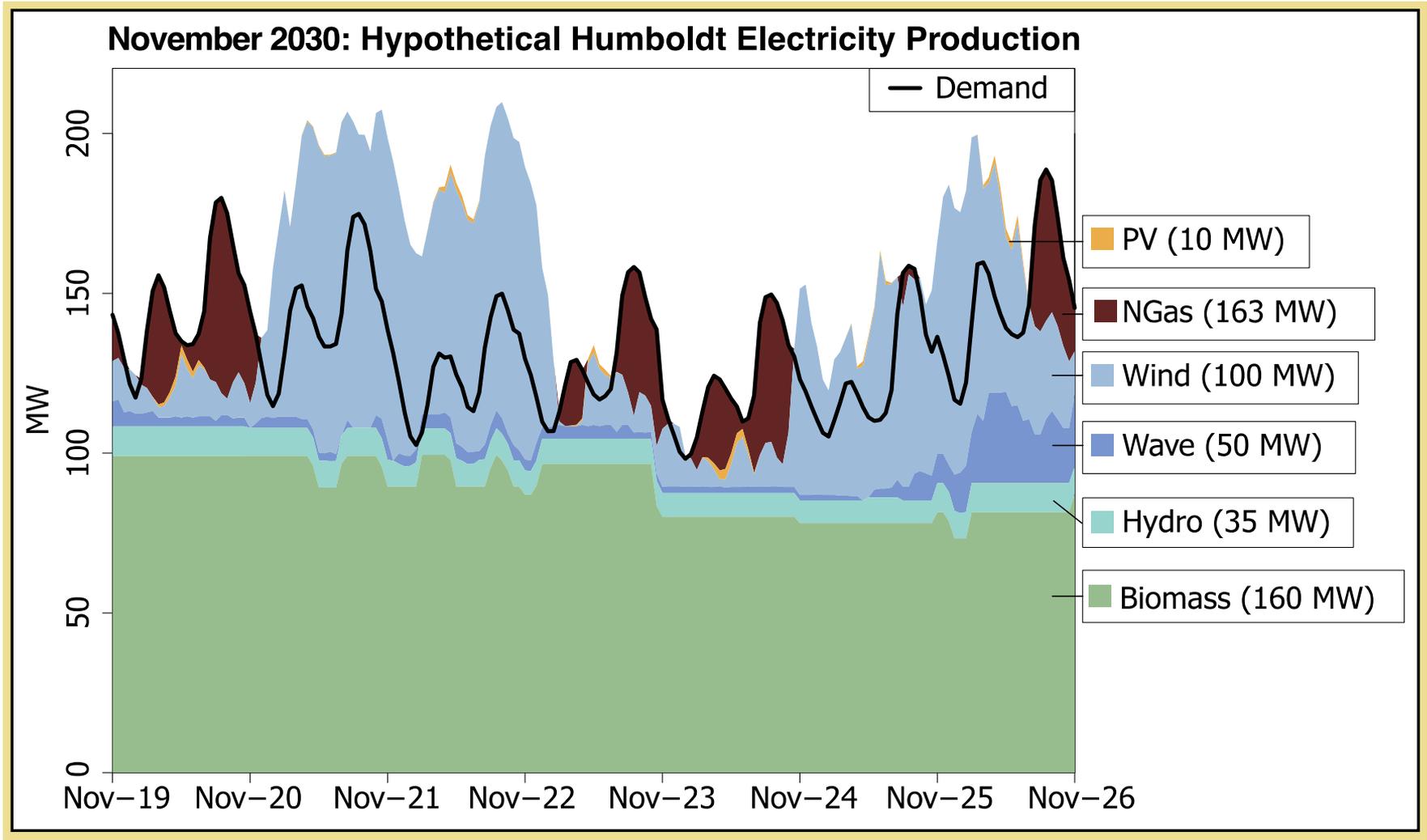
- Detailed technical analysis
- Substantial public input

Key Findings include: Biomass can play a key role.



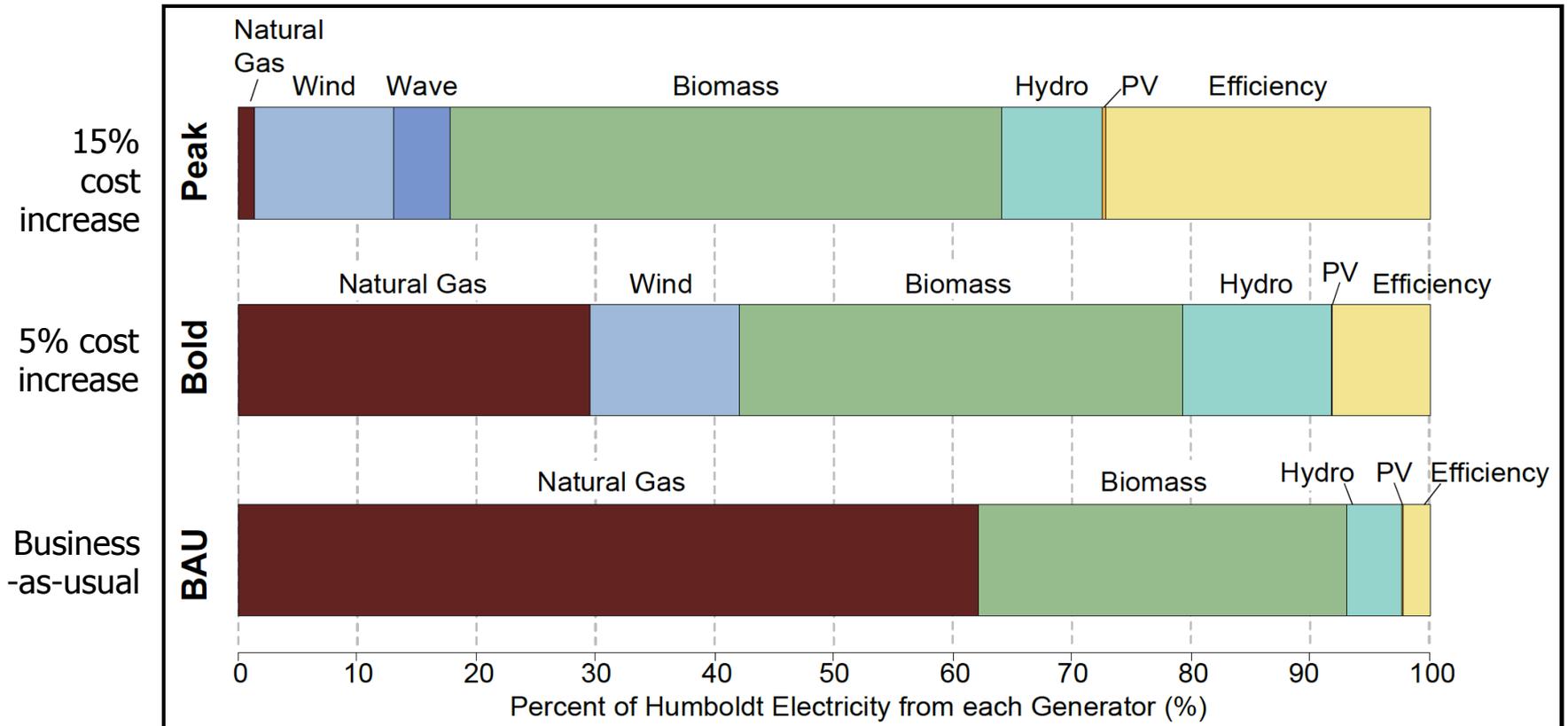


# Hourly Dispatch Model





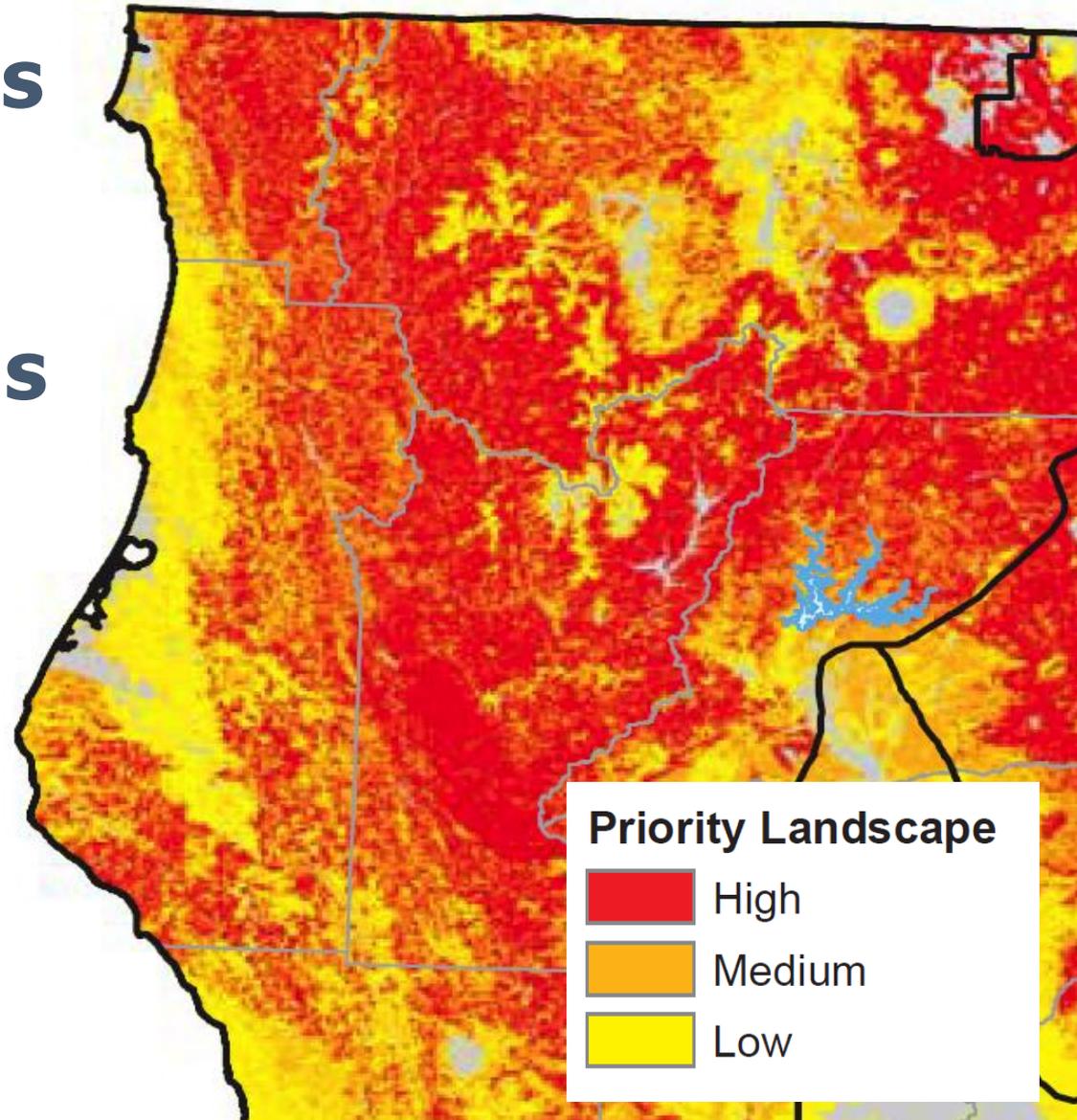
# RePowering Humboldt Background



Note: Bold and Peak scenarios both include substantial adoption of electric heat pumps and plug-in electric vehicles.



# Pursue a biomass energy strategy driven by restoration needs and priorities





# RePowering Humboldt With Community-scale Renewables

- **CA Energy Commission Grant**
  - \$1.75million CEC grant
  - \$1.79million Matching funds



- **August 2013 – March 2015 timeline**





# Project Overview

- **Goals**

- Implement, demonstrate and evaluate “Key Findings” from *RePower* strategic plan

- **Objectives**

- Demonstrate an innovative distributed generation biomass energy system
- Demonstrate fuel switching technologies
- Develop and implement pilot community-based energy upgrade program to overcome market barriers





# Biomass/gasifier/fuel cell Combined Heat and Power (CHP) System

- Install and operate a biomass gasifier that produces a syngas with  $\geq 60\%$  hydrogen
- Design, install, and operate a biomass gasifier/fuel cell CHP system that has a peak output of 175 kWe, a capacity factor of  $>75\%$ , and a biomass-to-electricity efficiency of  $>25\%$
- Evaluate performance, assess potential for replication, share results





## Project Area

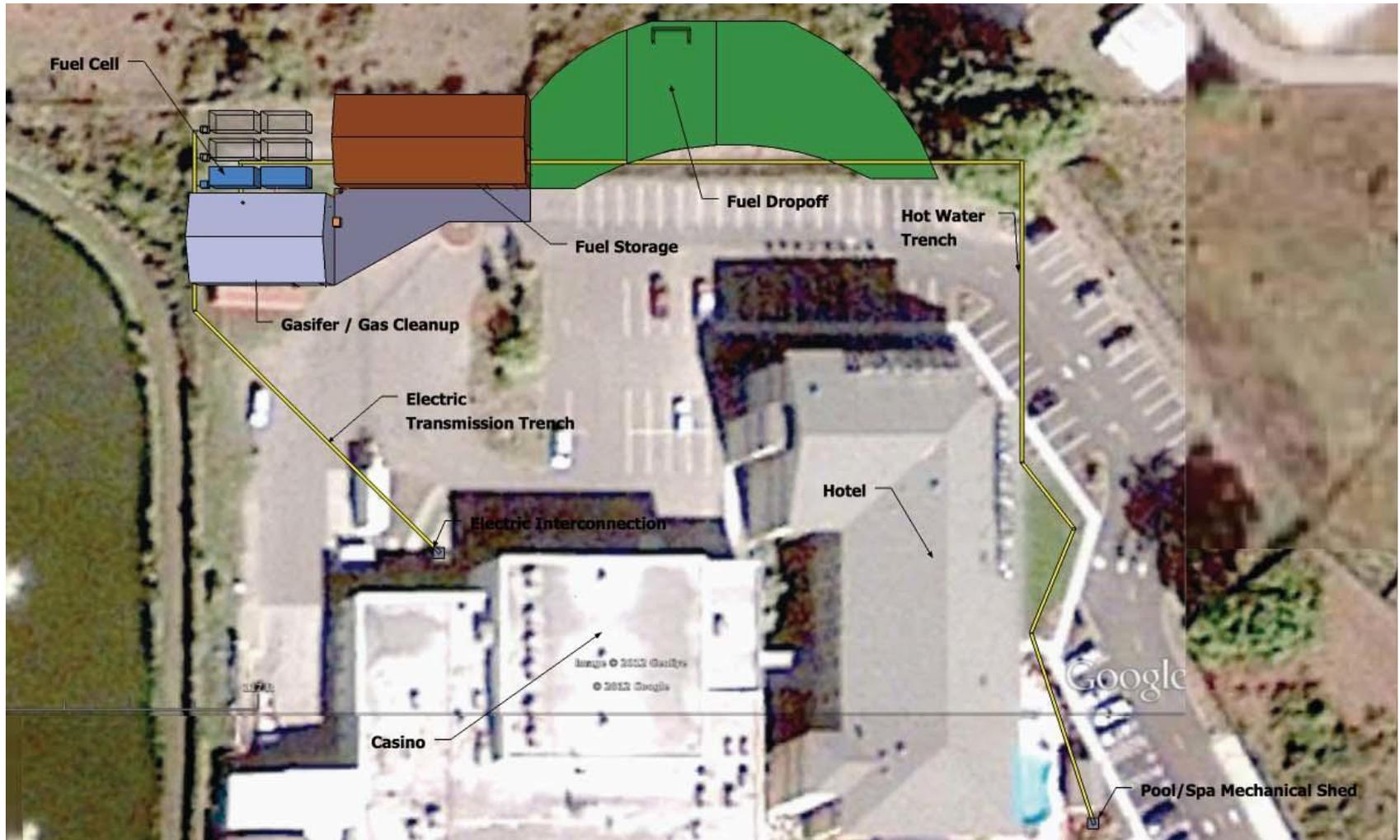
Blue Lake Rancheria, City of Blue Lake, and the greater Mad River Valley community





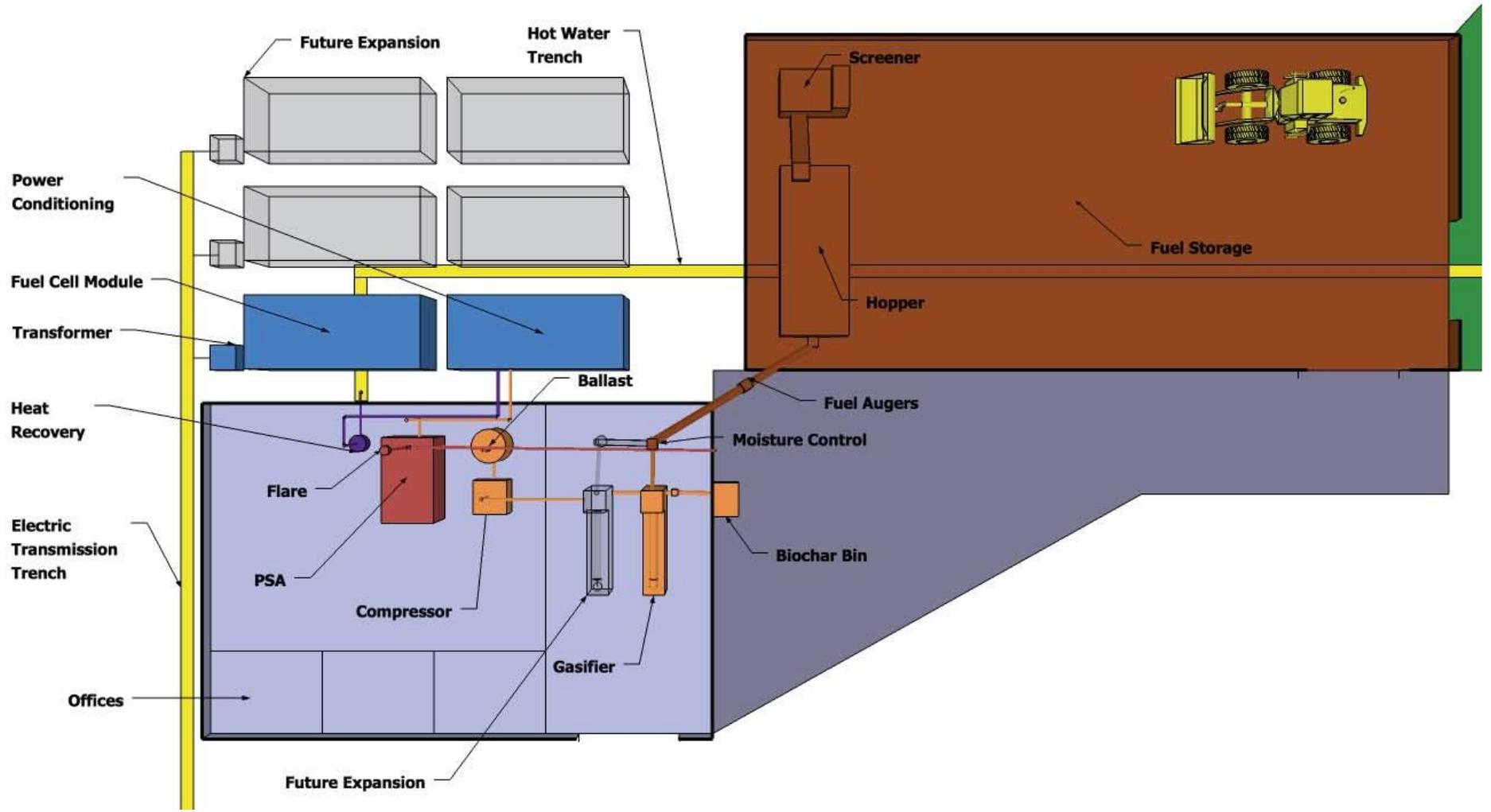


# Site Plan – BLR DG Biomass CHP Project



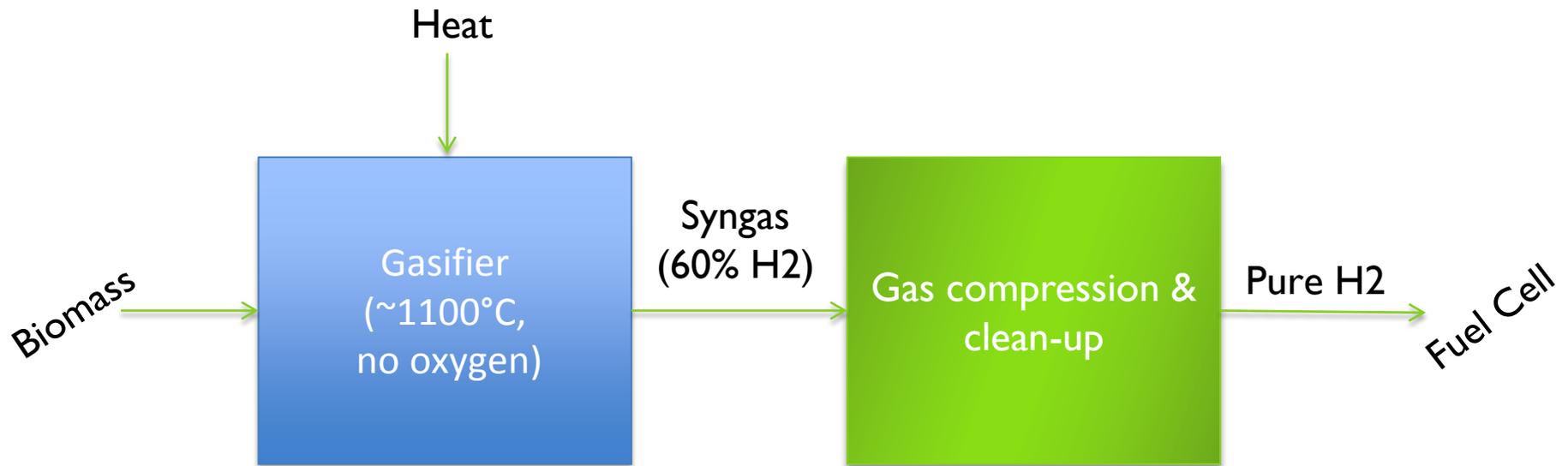


# Component Layout – BLR DG Biomass CHP Project





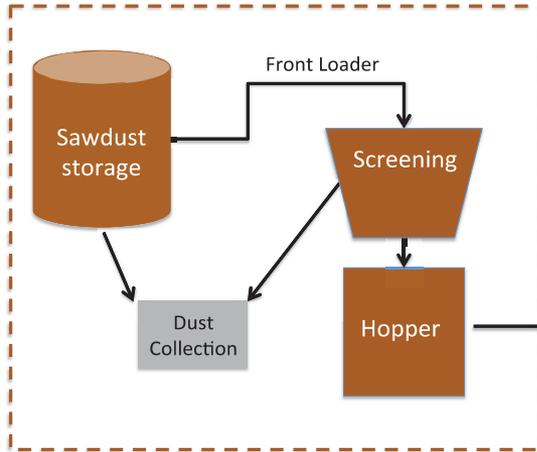
# System Design



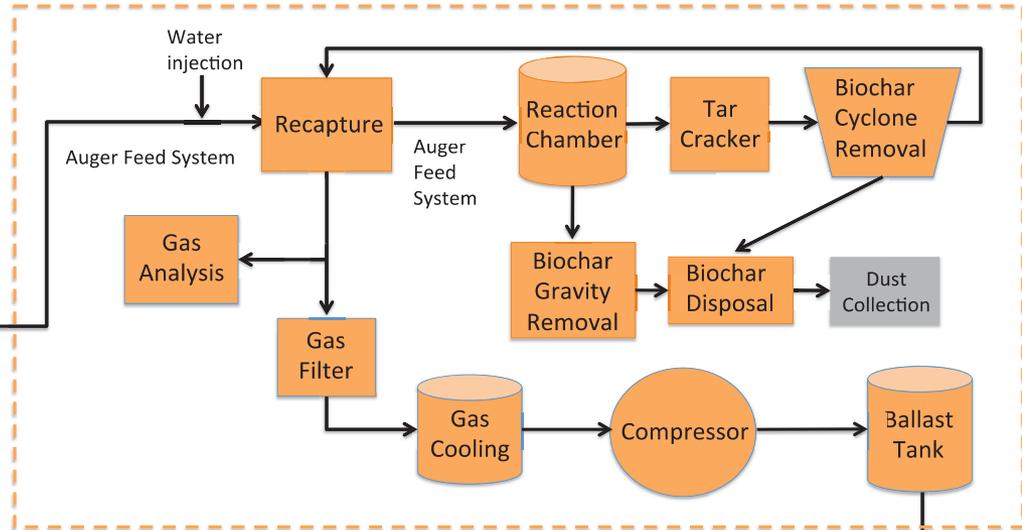


# System Design

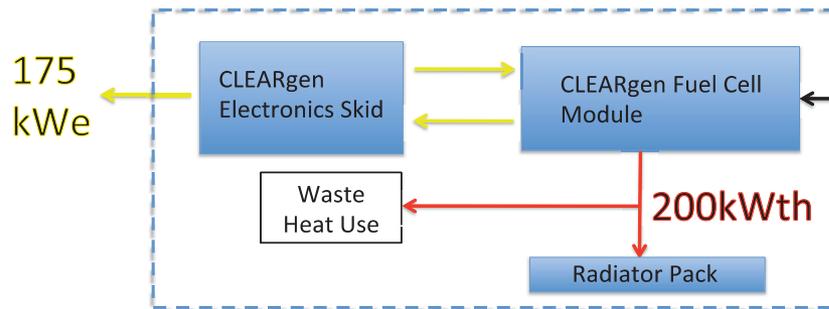
## Biomass Storage/Feed



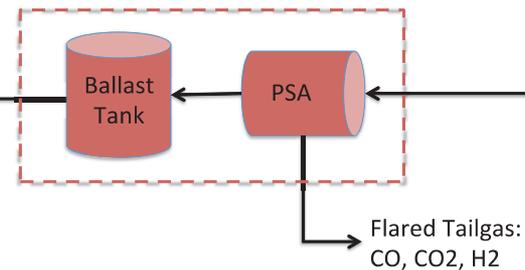
## Pyrolysis Gasifier



## Fuel Cell Power System



## Gas Cleanup





# Why this system?

- Conventional biomass boiler systems not efficient enough for this application; electricity generation is most valued; CHP is useful, but thermal energy is secondary in terms of value.
- Identified biomass gasification and fuel cell system as preferred alternative.
- Gasifier is flexible in terms of feedstocks.
- Fuel cells are more efficient in converting fuel to electrical power (~40-50%) compared with gas gensets.
- The gasifier/fuel cell system has lower air emissions.
- The system generates pure hydrogen, which could be used to power hydrogen vehicles or other hydrogen-based systems.



# Potential Long-term Benefits

- Scalable and replicable DG Biomass system, with the capacity to provide 1,400 MW of renewable DG in CA
- Utilizing a local renewable energy resource to provide baseload power, providing stability for the grid that is not available with wind/solar generators
- Using forest residues for energy production





# REDWOOD COAST Energy Authority

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# RePowering Humboldt

## Schedule, Key Milestones, & Deliverables

Gantt Chart -- RePowering Humboldt with Community Scale Renewable Energy

Year		2013	2013	2013	2013	2013	2013	2013	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2014	2015	2015	2015		
Month		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	
Month			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
Task																								
1.0 Administration				Kick-off Mtg									CPR Report →	CPR Mtg								Draft Report	Final Report	Final Mtg
Biomass CHP System																								
2.1 Final System Design																								
2.2 Interconnection Agreement																								
2.3 Fuel Supply Contract																								
2.4 Equipment Procurement																								
2.5 Site and Facilities Work																								
2.6 System Installation																								
2.7 Start-up & Commissioning																								
2.8 Develop System Test Plan																								
2.9 Data Collection and Analysis																								
2.10 Project Evaluation																								