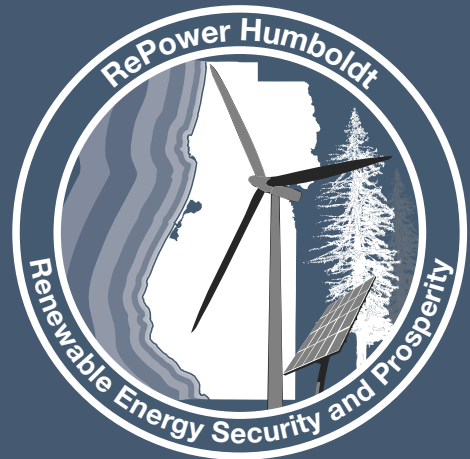


# RePower Humboldt

A Strategic Plan for Renewable Energy  
Security and Prosperity



Executive Summary  
March 2013



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More online at the RePower Humboldt website:  
<http://www.redwoodenergy.org/programs/repower>

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# Executive Summary

RePower Humboldt is a plan to develop the county's renewable energy resources. We are striving to meet the energy needs of the community and secure our sustainable energy future at minimal costs to energy consumers. Developing local renewable energy resources, including energy efficiency, will provide for energy, economic, and environmental security.

Humboldt County has untapped renewable energy resources including wind, wave, hydropower and biomass. Combined, these resources could provide about three times more electricity each year than we currently consume. If electricity is used for heating (with heat pumps) and transportation (with electric vehicles), there is enough renewable energy in Humboldt County to meet all of our present energy needs.

Humboldt County can lead the way toward a sustainable energy future by using local renewable resources to meet the majority of its electricity loads and a large portion of its heating and transportation needs. However, accomplishing this task effectively and efficiently will require comprehensive planning. That is the purpose of the Repower Humboldt study, which includes a thorough analysis of the technical and economic implications of renewable energy development in the county.

The RePower Humboldt study is a collaborative effort of the Redwood Coast Energy Authority (RCEA), the Schatz Energy Research Center (SERC) at Humboldt State University, and the Pacific Gas & Electric Company (PG&E). Principal funding came from the California Energy Commission, with match funding from each of the three participating organizations.

This strategic plan summarizes the key findings and recommendations of the RePower Humboldt study and charts a course for near- and long-term activities that can help Humboldt County realize its shared community vision for a sustainable energy future.

*Humboldt County has abundant renewable energy resources. Developing these resources will provide for energy, economic, and environmental security.*



## Planning Process

The RePower Humboldt strategic planning process was conducted over a 3-year period starting in November of 2009. Key tasks included an assessment of resource and technology options and an economic analysis that considered costs as well as job and economic stimulus opportunities. The study team also examined project development, financing and ownership alternatives, and regulatory and political issues. As a crucial part of this effort, the team made a concerted effort to gather input from a diverse group of county stakeholders and include their views. All of the information collected from this work informed the development of the RePower Humboldt strategic plan.

In Humboldt County there are three major types of demand for energy: electricity, fuel for heating, and fuel for transportation. The county is geographically isolated and is almost an energy island. There are only two major connections to the larger electric grid, and the electric transmission capacity that connects Humboldt County to the larger grid is approximately 70 MW, less than half of the County's 170 MW peak electrical demand. For this reason the county generates much of its own electricity, using mostly natural gas and biomass fuels. Natural gas enters the county through a single pipeline from the larger natural gas grid and petroleum-based transportation fuels are primarily imported to the county by barge.

Biomass, natural gas, and petroleum each comprise about a third of the total primary energy consumed in Humboldt County. The annual greenhouse gas emissions associated with energy use in the county total 1.5 million metric tons of CO<sub>2</sub> equivalent. About 60% of these emissions are associated with the transportation sector (the source being petroleum fuels) while the remaining 40% are split nearly evenly between the electricity and heating sectors (the main source being natural gas).



## The RePower Humboldt Vision

The RePower Humboldt stakeholder group developed a vision statement for Humboldt County's energy picture in 2030. In that vision Humboldt County is no longer a net importer of energy. The county enjoys a high degree of energy independence through conscientious use of energy conservation and efficiency combined with locally produced and managed renewable energy generation. Significantly more of the money spent on energy stays in the county, supporting more local jobs. Citizens have a diversity of choices for meeting their energy needs and have more local control over energy prices. The county is a thriving research and development center and an incubator for energy technology and related industries. Because citizens, businesses and industries consume modest quantities of energy derived from local renewable sources, life in the county is secure and prosperous.

In addition, a majority of stakeholders identified the following key criteria to be used in evaluating proposed energy development projects and initiatives (in order of importance):

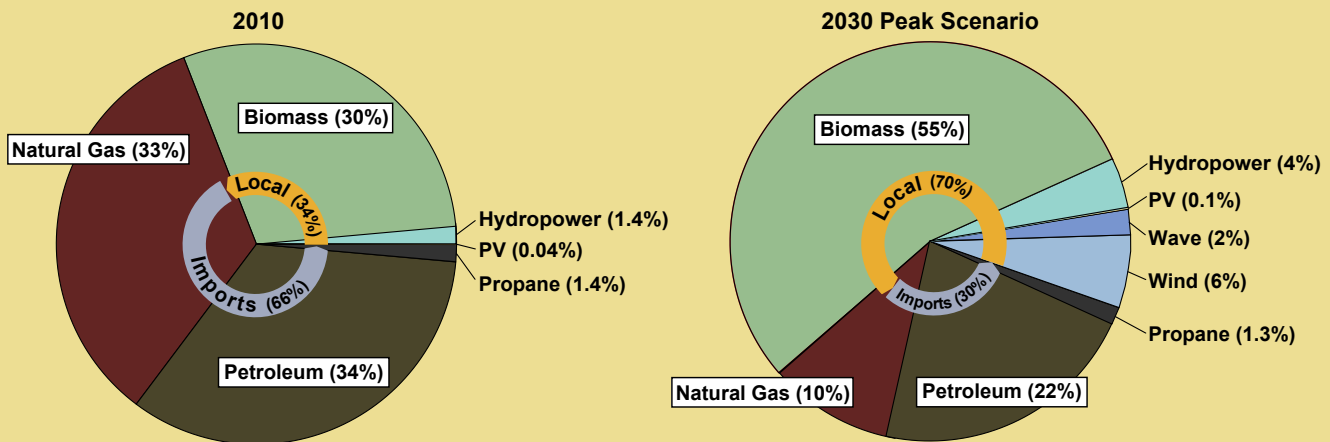
- Environmental Quality/Impacts
- Financial Viability of Implementation and Affordability of Use
- Local Acceptance, Participation, and Control
- Economic Impact on Jobs and Income

## Key Findings

It is likely that the following local renewable energy resources and energy technologies will play significant roles in Humboldt County's sustainable energy future (ordered alphabetically):

- Biomass
- Distributed generation

### Humboldt County Energy Sources: Where are we now and what can we achieve?



This chart shows how our primary energy consumption could change in one possible scenario. Primary energy refers to energy in its raw form before being converted to other forms, for example natural gas or biomass before they are converted to electricity. Note that hydropower, PV, wave and wind energy have all been converted to the equivalent amount of primary natural gas energy that they displace. The **peak** scenario includes 100 MW of new wind capacity, 50 MW of new wave capacity, 25 MW of new small hydro capacity and 4 MW of new solar electric capacity, in addition to 100 MW of new biomass capacity. Nonetheless, biomass dominates the **peak** primary energy pie compared to the other renewable energy sources because it historically has played a big role (it accounted for 30% of the primary energy pie in 2010), it typically runs at full output for many hours of the year (two to five times as many as wind, wave or solar electric), and conventional biomass power plants are not very efficient (typically 20%), so they require a lot of biomass fuel (primary energy) to operate.





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- Electric heat pumps
- Electric vehicles
- Energy efficiency and conservation
- Small hydro
- Solar
- Wave
- Wind

Using these resources and technologies, a wide range of scenarios was examined. Results show that by the year 2030 and with only a 5 percent increase in overall energy costs, the county can meet over 70 percent of its electricity demand, displace 25 percent of its heating load, and supply 10 percent of its transportation energy needs with local renewable energy. At a cost increase of about 15 percent, those fractions increase to 98 percent of electricity demand, 33 percent of heating load, and 13 percent of transportation energy needs.

*By the year 2030 and with only a 15 percent increase in overall energy costs, the county can meet over 98 percent of its electricity demand, displace 33 percent of its heating load, and supply 13 percent of its transportation energy needs with local renewable energy.*

Tremendous community benefits will be realized due to the switch to local renewable energy. Hundreds of new jobs will be created and tens of millions of dollars will be injected into the local economy. Simultaneously, greenhouse gas emissions will be reduced by 33% to 45%. In addition, the county will be more energy secure because it won't rely substantially on imports. It will have more control over its local energy resources and prices will stabilize.

In summary, key findings from the RePower Humboldt study include:

- A renewable energy future is feasible.
- A RePower Humboldt future will have beneficial economic, security, and environmental impacts.
- Energy efficiency is our cheapest option and should be maximized.
- Biomass, wind and small hydro can play a significant supply side role.
- Fuel switching to electric vehicles should play a key role.
- Distributed generation can play an important role, but utility-scale generation continues to be necessary.
- A mix of power options is needed and all options have impacts, including the "do nothing" option.



- The PG&E Humboldt Bay Generating Station provides important energy services and is well suited to support local renewable energy development.
- Significant transmission and distribution system upgrades will be necessary to accommodate large-scale renewable energy development.

## Community Engagement

The RePower Humboldt stakeholder group clearly identified "Local Acceptance, Participation, and Control" as a critical criterion for considering future energy projects. This suggests that to realize the RePower Humboldt vision, there will need to be significant community engagement. This should include a constructive dialog and an inclusive public process that builds consensus and prepares us to seize opportunities as they become available. We should also work to develop community-based energy projects wherever possible, along with the financing mechanisms that will enable local projects to proceed. County projects can include facilities that are owned and operated by the community and arrangements that allow community members to purchase local, renewably generated electricity.

*Tremendous community benefits are realized due to the switch to local renewable energy. Hundreds of new jobs are created and tens of millions of dollars are injected into the local economy. Simultaneously, greenhouse gas emissions are reduced by 33% to 45%.*



## Near-Term Actions

This plan describes both long- and near-term actions for moving the County toward the RePower Humboldt vision. The most important actions in the near term are:

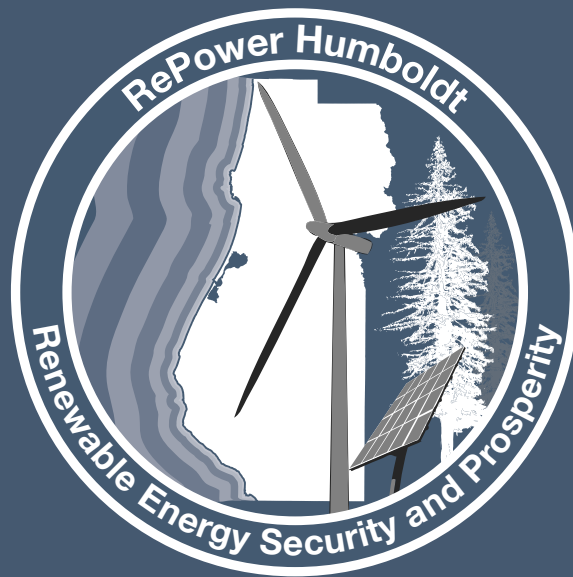
- **Continue and expand energy efficiency efforts.** Energy efficiency measures are cost effective and efficiency gains should be considered before additional power generation. RCEA and PG&E are already active in this area; their work should be supported and expanded.
- **Support responsible wind energy development.** Wind power is commercially viable on-shore in the Cape Mendocino area and off-shore throughout the county. Wind can supply a large portion of local electricity and is unexploited at present.
- **Support and expand the responsible use of biomass for energy that is consistent with forest restoration needs and priorities.** Biomass from forestry operations is already used to generate about one third of our electricity. There is potential to expand use of this abundant, renewable resource using forest treatment residues.

- **Develop infrastructure for and encourage use of electric vehicles.** RCEA, SERC, and others are already planning for an EV infrastructure. EVs are the best way to reduce dependence on petroleum imports for transportation.
- **Encourage development of distributed energy installations.** Combined heat and power generation systems installed at the point of use are inherently much more efficient than our current technology.
- **Form an energy leadership group.** To be successful, the RePower Humboldt effort needs local champions. The county Board of Supervisors and area city councils should form a leadership group, possibly through RCEA, to move this effort forward.

## A Pioneering Effort

Securing Humboldt County's sustainable energy future will be a challenging undertaking, but the combination of abundant resources and a modest energy load make it a real possibility. Once successful, the county's pioneering effort will provide a blueprint for other regions to follow our lead.





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