Energy Usage and its Impact
on
Mendocino County

Including

General Plan Recommendations

Prepared for the
Mendocino County Planning Department

by the

Mendocino County
Energy Working Group

Rev: 05/29/07, bsc

Preface

The Energy Working Group (EWG) is a group of Mendocino County citizens brought together (*under direction of the Board of Supervisors*) to provide guidance for the General Plan update. Each member of the EWG group represents some aspect of the greater county and brings various aspects of energy expertise, ranging from renewable energy, engineering, and government. The volunteer group worked under the guidance of (and with special thanks to) Patrick Ford of the Mendocino County Planning Department; (fordp@co.mendocino.ca.us).

This paper is a working document that is intended to present the results of the EWG's county-wide energy and emissions inventory and to outline recommendations for the General Plan update and general policy. Where possible, the pertinent narrations appear in the main body of the document while the details are relegated to the appendices.

In creating this paper, every measure has been taken to ensure the accuracy of the information presented as well as the feasibility of the steps. Should errors or questions arise, we would appreciate them being brought to our attention so that they can be corrected or elaborated on.

The latest version of this document is available at:
http://www.greentransitions.org/Papers/EWG2007_FReport.pdf

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With special thanks for the inputs from the various county economic localization groups, including CELL, GULP and WELL as well as Ecology Action, Live Power Farms and many more.

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Forward

From the observations of the EWG, it appears that the county General Plan (GP) update process is top-loaded with outside (the area) consultants that know little of the county's needs. Further the consultant's hierarchy placement (between the supervisors and the planning commissioners) seems to place them at minimal interaction with the county planning staff. What we have seen so far confirms that there is very little foresight being put into the next GP and this is cause for concern.

In essence, the planning consultants are making policy (via the GP update), the supervisors are minimizing public input, and the GP will be released to provide short-sighted governance. It will only be by an issue coming to light that is in conflict with the public that findings will be made and policies changed (an arduous task). In actuality, it should be the other way around: public input and findings should predicate policy changes.

The current General Plan update document, as produced (primarily) by the consultants, appears to be simply a 'repackaged' version of the 1981 GP; and has several serious and potentially fatal flaws that if not corrected may result in citizen-directed law suits against Mendocino County.

These include:

1. The General Plan update's goals and policies are being updated before issues and findings are determined which should form the basis for the framework. Existing issues and findings, upon which the original GP is based, have changed substantially over the last 30 years.

2. The updated plan should not only address current issues but should also attempt to address issues that will affect the citizens of the county over the 10 to 20 year expected future life of the plan (like escalating energy costs and Climate Change).

3. The framework for citizen input has been limited to relatively few community meetings that were focused primarily at the policy level and did not address or acknowledge the overarching issues facing the citizens of the county now and in the future.

4. Any new issues, findings and goals that were used by the county staff and consultant to update the policies were not available to the public which severely limited the public's ability to have constructive input.

5. The Board of Supervisors has further stated a desire to reduce planned citizen input for the final draft of the General Plan document, ostensibly in an effort to expedite its release.

6. California State Laws have recently changed to reflect the realities of inaction on the causes of global Climate Change. The EWG is aware of two counties that have been sued by the state for non-compliance with state laws that address the serious issue of Climate Change.

It is the intent of the EWG, in the research and preparation of this document, to ensure it is widely distributed and discussed amongst the Mendocino citizenry. Our sole intent is to ensure we have effective policy that prepares us for the future. To paraphrase the GP itself (section 1.0, Legality): **"In order for a General Plan to be effective, it must remain current."**

1. Executive Summary

Within the next decade, before the next General Plan (GP) update is scheduled, the residents of Mendocino County will be facing 2 major crises: Climate Change and the end to cheap petroleum-based energy (aka 'Peak Oil'). This report addresses those issues and proposes GP additions that will help us prepare our county for the coming transitions.

While both Climate Change (aka 'global warming') and Peak Oil continue to be controversial, the debate has passed and both are accepted as inevitable. The only question is timing.

Spiraling energy costs, resulting from both Climate Change and declining petroleum stocks, are already having an impact on the citizenry of Mendocino county. As these costs continue to mount, unemployment and social services requests will grow, and county revenues will decline. Waiting until that point will force the county to face some tough decisions.

Not knowing when the full impact will be felt is a double-edged sword. We can choose to do nothing until the crisis is upon us or we can plan wisely and prepare for it, leading by example.

This report will present a policy direction that will provide benefits for the populace that will go beyond simply dealing with the crisis to one of strengthening our county's economy and position in the coming decade.

2. Energy Usage in the County

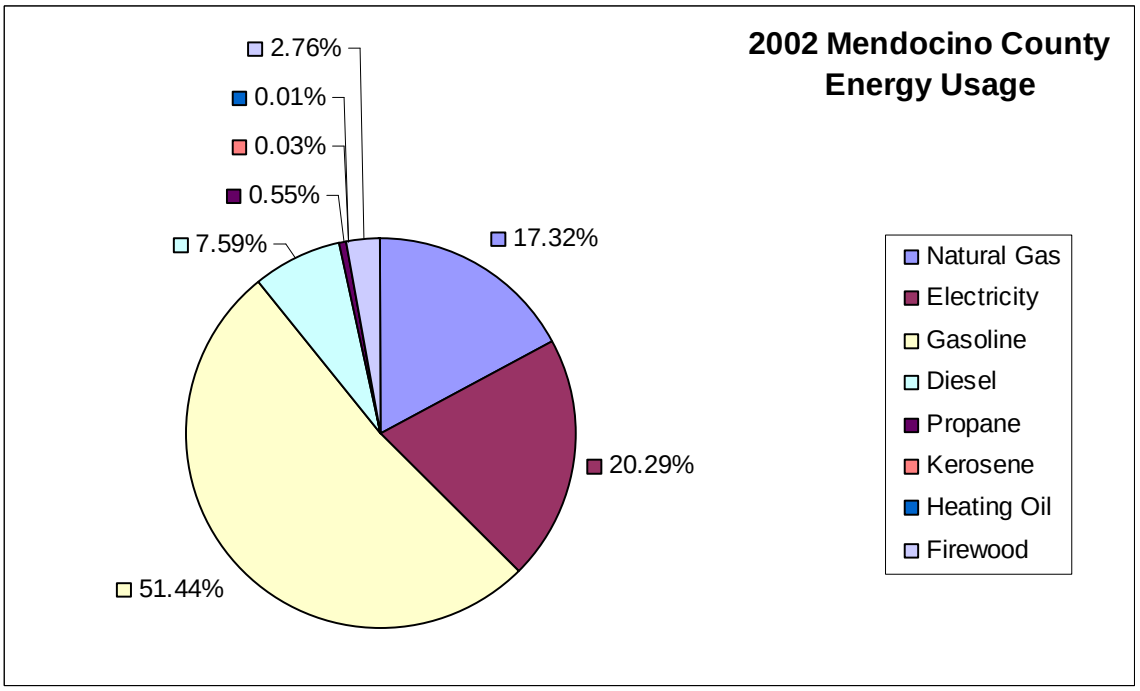
In 2002, energy expenditures for Mendocino County totaled over $156 million dollars[1]. This amounted to an average19% of the after-tax household expenses. By 2007, with consumption roughly stable, this figure had grown to over **31% of after-tax household expenditures** and is still rising. *This is money leaving the county, money that is not providing services or creating local employment.*

The highest share of the county energy expenditures goes to transportation (59%), with the second largest expenditure going towards electricity (>20%). And both rely almost entirely upon petroleum as the ultimate source of that energy. [The complete county Energy Inventory can be found starting on page 31.]

Petroleum is a limited resource created ultimately by nearly 4 billion years of solar energy and some very unique geological conditions. It is generally accepted to have become a major energy commodity in the mid 1800s, and by most estimates, the remaining known world reserves are already in decline. This is a concept known as Peak

[1] We consumed the equivalent of nearly 3 terawatt hours of energy.

Oil -- which merely states that once half the oil is extracted, the remaining half becomes more and more difficult (and expensive) to reach; and that remaining oil is of declining quality. [A more detailed discussion of Peak Oil and the decline of Petroleum can be found starting on page 35.]



Regardless of your position on the concept of Peak Oil, fuel prices continue to rise, and although they fall periodically, they never seem to recede to the previous levels. Additionally, the burgeoning economies of China and India are increasing their share of the demand and ownership of the remaining supplies. We must accept that petroleum is limited and that the prices will continue to rise.

Beyond the immediate impacts at the gas pump, petroleum prices affect us in all aspects of our lives. Since petroleum is not only a fuel but also a chemical feedstock (i.e. used as a starting point in chemical manufacture), rising petroleum prices will impact our food, medicine and plastics just to name a few. But the reality is, the decline of petroleum, if we have not planned wisely for it, will cripple society and its government institutions as we know them today.

While we cannot necessarily drill for oil locally to supply our needs and keep our lifestyle as it is, there are some choices we can make today – while petroleum is still relatively cheap – that will provide a transition to a viable future.

These choices include the development of local energy alternatives, the re-thinking of how we live and commute, and the provisions for local food production. Each of these requires the foresight and motivation of the citizenry (and its government).

But there is one more aspect that must be considered. The low and fixed income amongst our residents will be the first to be impacted, and will be the hardest hit. Increasing costs and decreasing discretionary incomes will reduce health coverage and further stress the health care system, which is already in crisis. Food and housing costs will consume a larger share of household budgets and push people toward lower-quality housing choices at the same time that auto transportation costs increase dramatically. First responders, especially police, are likely to be further taxed as social service agencies struggle to meet demand. If we do not create programs that will ensure these folks have a role in a post-petroleum future, we may very well face a social implosion.

"The U.S. in 1950 was self-sufficient in all resources and a net exporter of oil and manufactured goods. By 2005 this had reversed and, in addition, many of our jobs are now being exported to follow the resource availability."

[Richard Heinberg]

3. Greenhouse Gas Emissions from County Activities

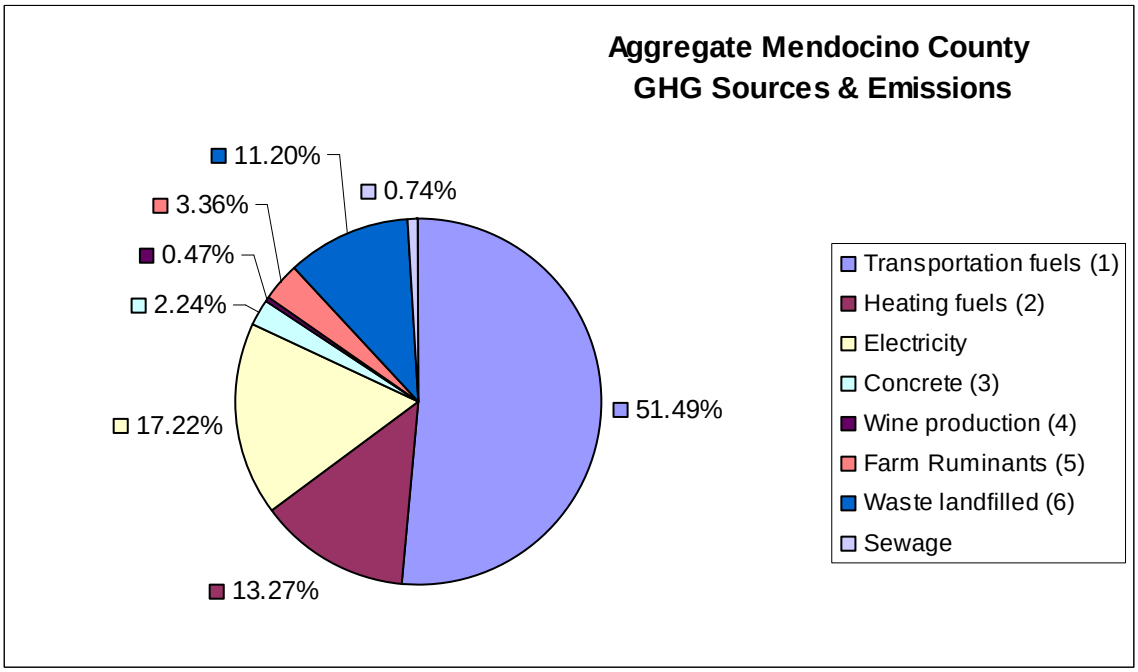
The 'greenhouse effect' is a natural process by which some of the radiant heat from the Sun is captured in the lower atmosphere of the Earth, thus maintaining the temperature and making Earth habitable. The gases that help capture the heat are called GreenHouse Gases (GHG). While the most common GHG are found in nature (e.g. water vapor, CO_2), the widespread use of burning fossil fuels have increased the sheer volume of the gases beyond those of natural equilibrium. [A more detailed discussion of GHG and Climate Change can be found starting on page 39.]

From a strictly Mendocino County view, the energy consumed by county residents in 2002 produced over 880,000 thousand tons per year of GHG emissions, or roughly 10 tons per-person (26 tons per-household), per-year. When combined with other sources of GHG emissions in the county, the **total Mendocino annual GHG emission is nearly 1.1 million tons**.

While most of the county GHG emissions stem from transportation, the heating of homes and businesses as well as electricity usage also make noteworthy contributions. Interestingly, waste and sewage are next, followed by agriculture (by means of farm ruminants as well as wine production). [The complete county GHG Emissions Inventory can be found starting on page 33.]

Greenhouse Gas emissions are the primary cause of Climate Change; and Climate Change is forecasted to have a very profound effect on the way each of us carry on our lives. Forecasts include decreased precipitation, increased frequency and duration of heat waves, the migration into our area of new diseases and disease vectors, the decline of native plant and animal species (as well as the northward migration of existing native

species), and a shift of viable food crops that can be produced locally. If GHG emissions are not drastically reduced in the very near term, it is quite possible the world as we know it will not survive to the end of this century.



But how does this impact the county government and the General Plan Update? Under California's AB32, county GHG emissions will need to be inventoried with the goal of reducing them below 1990 levels. It will take the foresight of county planners to ensure county policy directs us to that goal while preserving the viability of our economy and way of life. But there is a silver lining of sorts at work here. Specifically, *the solutions to Peak Oil and to Climate Change are nearly identical*; and it is the hope of this group that this paper will help guide this county's planners in the choices that must be made.

"The debate is over. The science is in. The time to act is now. Global warming is a serious issue facing the world"

[Governor Arnold Schwarzenegger]

4. Local Economic Consequences of Energy and Greenhouse Gases

Imagine for a moment what your neighborhood, town or county will be like with gasoline at $10 per gallon. Better still, imagine the time when the percentage of our energy expenditures reach 60+% of our available household after-tax income. Will people be neighborly, helping one another? To an extent, yes; but the reality is that crime will

escalate and the ability of people to get to work, let alone to provide the most basic sustenance to the table will be seriously tested.

Ok, let's just assume that petroleum doesn't run out for awhile. There is still the very real aspect of Climate Change from the greenhouse gases we have pumped into the atmosphere over the last century and a half. Current discussions at the Federal level, as well as throughout the rest of the world, are pushing for carbon taxes and a greatly reduced use of polluting technologies. These too will drive up the costs of energy, impacting basic household goods and personal transportation. At the same time, Climate Change will potentially reduce food production and seriously threaten water availability.

The truth is, in the coming decade, through either declining petroleum or Climate Change mandates, we may very well see gasoline reaching $10 per gallon and this will impact not only our individual capability to get to work or go shopping, it will also drive up our food costs dramatically.

American food production and distribution have become highly dependent on fossil fuels, accounting for 17 percent of U.S. energy consumption. Because of this, higher oil and natural gas prices are expected to lead to a decline in the amount and variety of food produced and available locally. Food prices will rise, further straining the ability of low-income households to put food on the table.[2]

Electricity is another area of economic impact. Most of the new generating capacity in California is fueled by natural gas but 87% of the fuel used is imported from outside the state. As the Federal government begins to impose carbon taxes and implements programs for cleaner power plants, these costs will be passed onto the consumer. Add to this the impact of Climate Change, specifically more frequent and longer duration heat waves and reduced snowpack (impacting hydroelectric production), and we see the demand exceeding supply.

The reality is that we are facing drastically changing times and it is the local leadership the citizens of this county will look to for guidance. <u>And this change will happen *before* the next General Plan update</u>.

Beyond the hardships individual residents and families will face, **the county itself will be faced with declining revenues and find itself hard pressed to fund basic programs**. This will be the result of not only higher transportation costs but also increasingly marginal housing choices, spiraling food and health care costs, increased unemployment and an accompanying heightened demand for social services.

Most importantly, escalating energy costs will drive up the costs of any solutions we contemplate and the longer we wait, the more expensive these solutions will become.

[2] "Descending the Oil Peak: Navigating the Transition from Oil and Natural Gas", City of Portland Peak Oil Task Force, March 2007

"The possibility for a significant, high technology future requires the springboard of a functioning, energy intensive society as we have today" [3]

[John Howe, "The End of Fossil Energy and a Plan for Sustainability"]

5. Solutions for the Future

Addressing the consequences of declining petroleum as well as Climate Change will surely take a shift in the American consciousness; but more importantly, it will also require a major shift in the local county policies. Perhaps the issues seem insurmountable but we believe the policy needs can be brought down to a few categories:

- Development practices
- Transportation, including public transit
- Energy conservation
- Local energy production
- Agricultural / local food production
- Local, in-community employment

Essentially the bottom line is this: we need to cut oil and natural gas consumption in half; transforming how energy is used in transportation, food supply, buildings and manufacturing (and hence, reducing GHG emissions); and this needs to happen as soon as possible.

The biggest issue (and consumer of energy) presently is transportation. By creating policies that encourage in-fill of existing communities, mixed-use buildings (businesses on the ground floor, apartments above), and co-locating industry so that heating, cooling and waste streams are shared, we will have made a marked first step. Add to this the leasing of rail access to allow electric trolleys to run between the major commuting centers (e.g. Brooktrails and Ukiah) and we are now beginning to provide incentives to reduce personal vehicle use. Add to this the prioritization of bike paths for existing and new road work along major routes (and perhaps along the railroad right-of-way). Yet the biggest issue will still be changing the individual tendency to jump into their car, alone, to drive to wherever their destination might be.

Personal transportation is indeed problematic. It was estimated that the $3/gallon pricepoint would start changing the American consciousness but it has not. Some are now targeting the $4/gallon point. What is needed is a multi-step process, beginning with the current generation of hybrids, transitioning to plug-in hybrids, and finally to true

[3] This is reminding us that if we want to be able to develop alternative sources of energy in order to maintain some semblance of our society today, we need to do so now while energy is still cheap and plentiful. We cannot afford to wait until fossil fuels decline to the point of severe economic impact – the changes to ensure our survival need to begin today. Those same fossil fuels we save by striving for energy independence today will provide the basis for sustaining agriculture and healthcare tomorrow.

electric vehicles as they become commercially available once again. Unfortunately, with the average car's lifetime being 10-15 years, we will need incentives to get people to transition to these new vehicles. Perhaps the gasoline pricepoint will do it, but the reality is that escalating energy prices reduce the discretionary spending to undertake such considerations.

Biofuels and hydrogen have been put forth as the answer by some, including the current administration in Washington; but these are not the answer.. The net energy[4] costs of biofuels, let alone the displacement of food crops[5] make this a net negative.

> *Both biodiesel and ethanol (a gasoline substitute) can be produced locally but at the expense of arable food-production or timber-production lands[6]. As such,* ***the production of these fuels must be limited to transitional status*** *(i.e. only until the need for food production supersedes).*

In the long run, the best vehicle fuel will be one that we already have and one that requires no new distribution network or point-of-sale facilities – that is electricity. Electricity is a medium by which any of a variety of sources can feed in (hydroelectric, solar, wind, natural gas, geothermal, etc.), but the output is common and universal. What's more, the technology exists to make electric vehicles today. In fact, the first cars were electric and some of those are still available today (in running condition with the original batteries). Beyond that, the largest vehicles in the world are also electric – from the Navy submarines, the large excavators and dump trucks in the open pit mines and so on. Currently there are at least 3 startup companies in Silicon Valley working on electric vehicles and similar developments are emerging worldwide. The caveat here though is that we'll have to start mandating the installation of electric vehicle charging stations throughout the county; but coupling those with solar-electric (PV) shaded parking structures that both provide electricity to charge the vehicles and feed into the grid would make this a win-win situation.

Beyond transportation, we need to look at how we use energy in our homes and businesses (not to mention in government facilities). By creating a county-wide agency to provide energy audits to homes and businesses, conservation can be affected easily. One such example is the Redwood Coast Energy Alliance in Humboldt County[7], which is funded by local municipalities, PG&E, the PUC and the DOE. This same agency also provides advice and support on installing renewable energy systems (such as solar) and can help with the rebates and funding. A small investment in community energy conservation will go a long way toward energy independence.

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[4] Net energy is the consideration of how much energy is required to produce a fuel versus how much energy will be produced by that fuel. In the case of biofuels, hydrogen, and increasingly petroleum, it is typically a net loss.

[5] The federal government push for biofuels, especially ethanol has already had a major impact on food prices. Over the past year the price of basic corn tortillas in Mexico has *quadrupled* and prices are already on the rise in the US for downstream products like eggs, cereals, etc.

[6] Bio fuels can also be produced with wood or crop waste (e.g. cellulose fermentation conversion or through wood distillation processes); but these processes have not been developed to large scale.

[7] Redwood Coast Energy Authority: http://www.redwoodenergy.org/ or (800) 931-RCEA.

For every 1 MegaWatt saved by conservation methods, an estimated $1 million is saved in developing power generation facilities (not to mention the lifetime emissions)… [8]

Taking this a step further, the county could promote the transition to a 'community-owned' utility. Basically this means that we become the utility instead of PG&E, purchasing power in blocks, at discount. With that discount, the county could add a small tax (say 0.25 to 0.5 cents per kilowatt hour) to fund both conservation and fixed/low income renewable energy programs. [Community-Owned Utilities and CCA information can be found beginning on page 45].

If Mendocino County were to begin to develop its own power generation capabilities (and there is high potential in solar, wind, wave and biomass power generation here), groups such as Northern California Power Authority (NCPA)[9], are interested in funding new power sources or at least purchasing excess power.

Renewable Energy Sources

Type	Terawatt hours / YEAR
Direct Solar Radiation	350,000,000
Wind	200,000
Ocean Thermal	100,000
Biofuel	50,000
Hydroelectric	30,000
Geothermal	10,000
Tidal / Wave	5,000

Non-renewable Energy Sources

Type	Terawatt hours TOTAL
Coal	6,000,000
Natural Gas (US Peak 2004)	1,500,000
Uranium (US Peak ~2008)	1,500,000
Petroleum (US Peak 1970, Worl Peak ~2010)	1,000,000
Tar Sands	800,000

Annual Global energy consumption = 70,000 terawatt hours / year
[Steve Heckeroth]

One last note on electricity: Currently most energy purchases are made from out-of-county providers, which represent a net outflow of money from the county. When the

[8] When discussing solar energy, for every watt conserved, $5-10 are saved in system costs.
[9] The Northern California Power Agency (NCPA) is a public agency of the State of California and works as an independent power broker unaffiliated with investor-held utility companies. The NCPA, as part of the Independent System Operators (ISO) can offer communities the ability to purchase blocks of electric power at discount, for distribution at the local level to community power customers. This electric power can additionally be specified as to its content (i.e. by percentage of renewable sources), making membership one way to achieve a higher 'green' energy content for the community. **The City of Ukiah is already a member**. www.ncpa.com

amount of energy purchased is reduced, the amount of money expended to secure those supplies is also reduced. If that energy is purchased from a local provider, the funds that are expended remain in Mendocino County, strengthening our local economy.

The sun sheds enough energy on Earth in one minute to meet its energy needs for an entire year.

"All of the energy needs of the U.S. could be met with a 100 square mile installation of photovoltaic panels in the Nevada desert"

[American Solar Energy Society]

But there is still the problem of escalating food prices. The average food reaching your plate today travels nearly 1500 miles. In addition, it takes more than 10 calories of energy to produce every calorie of food you consume; and the average town has *no more than a 3-day supply of food* in store stocks[10] Local, small-scale agriculture generally is less energy intensive, in terms of machinery, fertilizers, pesticides, and the distance it needs to travel to market[11]. By examining land use and planning policies (i.e. minimum parcel sizes, agricultural incentives and the possibility of 'intentional farming communities'), we could make it affordable for small-scale farming and have local foods at greatly reduced costs (and increased nutritional value). And by targeting primarily organic farms, Mendocino County could continue to grow the recognition it is receiving for its organic products.

The last item on our list is local employment. Land use policies govern what kind of development gets put where. In every community there needs to be business and industrial zoning[12]. Further, policies need to be realized that encourage entrepreneurial development of localized businesses and industries. In this manner we promote localized employment. And localized employment means fewer hours commuting, less spent on transportation fuels, and the higher likelihood of earned income staying local and thus further stimulating the local (and county) economy.

"The scarcest resource is not oil, metals, clean air, capital, labor, or technology. It is our willingness to listen to each other and learn from each other and to seek the truth rather than to seek to be right."

[Dr. Donella Meadows (1941-2001), founder of the Sustainability Institute]

6. Policy Recommendations for the General Plan

[10] John Jeavons, Ecology Action, Willits

[11] A range of 94-96% less energy is used in the production of local foods and yields are 4-5 times higher than industrial agriculture. John Jeavons, Ecology Action, Willits.

[12] By community we don't mean the quiet neighborhood, but rather the region or area where people typically live and shop.

So far we have only touched upon areas the county can address policy-wise to mitigate the pending crises. While such generalizations are appropriate for narration, they aren't effective for developing successful policy for the GP. To aid in this process, the EWG has taken the existing GP framework and developed policy recommendations, placing them in the appropriate categories, along with suggested wording. As such, that section of this document can be removed and serve as a stand-alone document. That section, formal General Plan recommendations, begins on page 11. In addition, a separate Agriculture Policy enhancement recommendation has been prepared and that can be found beginning on page 23.

7. Closing

We are facing two rapidly approaching crises: Climate Change and Peak Oil. The solutions to both are the same – a timely transition to a sustainable and intelligent view of our place on this planet and within our communities…

Within this paper the EWG has presented a sometimes pessimistic view of the future, but one centered in the best available knowledge. Scientists have been warning us of both declining petroleum as well as the buildup of GHG since at least the 1970s. It is time we listen and begin to effect the changes necessary to sustain our existence.

While some may view the suggestions put forth as bordering on social engineering, the facts are that if we do not change our ways (transportation, communities, local food production and the like), we will not have much of a future. When the future is looked at objectively, and if changes begin while resources are still economically feasible (i.e. before price escalation spirals out of control), we can build a stronger county with sustainable communities and viable local employment. We have the resources; and surely we can set an example for others to follow.

We encourage the county to effect the policy recommendations set forth herein, embracing the challenges we face, to build a stronger future for the citizenry of Mendocino County.

"We must become the change we seek"

[Mahatma Gandhi]

Appendix A. Policy Recommendations per the General Plan Framework

In the context of energy and Climate Change issues discussed, the Energy Working Group prepared a set of policy recommendations for the General Plan update now underway. This section presents those recommendations, and where possible, supporting references to further qualify the same.

Note: The recommendations presented herein are placed within the GP framework where it was felt they were most appropriate by the EWG. All section headers are from that framework…

A.1. GP Section 2: Comprehensive Growth Strategy

2-1 Planning Principles

2-1c: *Emphasize compatibility between human activity and environmental resources and processes at all levels from regional planning to site design*

- Require commercial developments and major renovations to be based on the Green Building Council standards, to reach or exceed a specific LEED score[13].
- For all building permits, adopt a tiered permit fee structure emphasizing energy / green measures.[14]
- Mandate a minimum content of 20-25% pozzolanic flyash in local concrete mixes to reduce the county's contributions to the energy expended in cement production and, most importantly, global warming.[15]

2-2 Economic Development and Jobs/Housing Principles

2-2a: Emphasize long-term and sustainable economic and community objectives over short-term gains.

[13] The US Green Building Council uses the LEED rating system to determine compliance (and may also be used to rate existing developments). This provides a readily accessed system for the building department to adopt.

[14] From Sebastopol; Basically the building department knows the minimum fee they must collect, but sets the published fee higher. During the permitting process, an energy or green checklist is consulted and the fee is reduced (towards the minimum fee) based on the features of the project.

[15] One of the significant county contributors to greenhouse gases (specifically CO_2) is Portland Cement. Roughly 1 ton of CO_2 is released for every ton of Portland cement produced. Pozzolan (qualified fly ash, a coal-fired power plant waste product) can effectively replace up to 40-60% of the Portland cement, thereby reducing an equivalent percentage of CO_2 from being released. The resulting concrete takes slightly longer to set but is stronger than Portland and has some self healing capabilities. Currently most redimix facilities are using between 7 and 15% pozzolan in their batches.

- Support the creation and continued existence of an independent energy authority to guide and assist municipal, county, private and commercial interests.[16]
- Implement a county-wide carbon tax to promote energy and emissions awareness while providing funds to finance programs to shift us towards a reduced or carbon-neutral county.

2-2d: Employment and housing opportunities should be balanced within each region to maintain reasonable commute times, worker productivity and a sense of community.

- The county should ensure mass transit is available to its employees and encourage its use, serving as an example to the rest of the population (a substantial percentage of county workers working in Ukiah live in Brooktrails)

    - Encourage the development of a rail-based commuter system to augment MTA's bus service along the highway 101 and 20W corridors.[17]

2-3 Coordination, Partnerships and Funding

A.2. GP Section 3: Development Element

3-1 Land Use Classification

3-1-1 through 4 (All):
Mandate tree-lined streets in new (and existing) residential and commercial developments. Encourage 'green roofs' where applicable.[18]

3-1-1 through 13 (All):
All land use classifications will include a requirement that a minimum of 25% of the estimated energy usage will be provided by onsite renewable energy. Phase this in stages as follows:

Electricity	2008
Heating and cooling	2009
Transportation	2010

3-1-1 through 13 (All):

[16] An example is Humboldt County's Redwood Coast Energy Authority (www.redwoodenergy.org) funded by grants from CPUC and DOE. They focus on energy conservation, efficiency measures / upgrades and renewable energy advisement, regardless of income level or ability. The intent is to ensure resources are available for county residences to understand energy conservation measures.
[17] A rail-based trolley, coupled with bus-based services at both ends would handle a decent size of this commute. MTA could negotiate for time-based access rights to NCRA's rail right-of-way, with the cost of leasing or purchasing a rail-based trolley roughly 10-20% above the cost of a conventional bus.
[18] Tree lined streets and preserved green space reduce air conditioning needs thus reducing peak electricity usage. Green roofs provide storm runoff mitigation (see the City of Chicago's *'green roof program'*).

For all developer-created developments, for each residential unit, a requirement that 400 square feet of garden space is set aside with access to enough water for growing fruit and vegetables. Encourage this as green buffers or commons. Implemented by 2008.

3-1-7 Agricultural lands:

Minimum Parcel Size:

Reduce the minimum agricultural parcel size to 5 acres on the valley floors, 20 acres in the hills to encourage small scale farming, supporting local food production. This should be augmented by (or be adjunct to) greenbelt considerations to prevent islanding of agricultural lands.[19]

Agricultural land *cannot* be taken out of that designation unless replaced by comparable land elsewhere (i.e. protect all agricultural lands regardless of parcel size).

3-1-7 Agricultural lands:

Maximum Dwelling density:

Encourage, with appropriate agricultural commitments, multiple workers (and their families) living on and working the same property. In cases where more than one dwelling is requested and permitted, restrict such to clustered commons to preserve the primary focus of agricultural activity.[20]

3-2 Land Use, Density and Intensity

3-3 Community and Growth Area Boundaries

3-3b: Allow "mixed use" development (i.e. residences above businesses, etc.).

3-3c: Remove "premature" (agricultural, timber and open space lands should *never* be converted to urban uses)

3-3d: Integrate suburban and urban land use patterns to create walkable mixed use communities that are defined by agricultural, timber and open space 'greenbelts.'

3-3d:

Change the 4th bullet to: "<u>Prohibit</u>" commercial strip development along…….

3-4 Community Areas and Urban Spaces

3-5 Commercial and Mixed Use Development

[19] There is an ever increasing value of land in general making it difficult for (small-scale/organic) farmers to raise local food crops. The current agricultural zoning designations need to be carefully examined to preserve what arable flat land has not been developed while encouraging the proliferation of small agricultural plots in the traditional cattle ranch areas (the 'highlands'). The intent here is to encourage the development of small, organic farms (which tend to be minimal consumers of fossil fuels); and to provide a method of ensuring land developed into agricultural potential remains as county agricultural reserves for future generations. A secondary impact is to ensure sprawling suburbs do not encroach upon viable agricultural lands which inevitably reduces infrastructure (road, sewer, water) needs in new developments.

[20] See separate Agricultural Policy enhancement proposal, beginning on page 23.

3-X Agricultural Development [new section]

3-Xa: Encourage wineries to develop methods to capture the CO_2 emitted from fermentation and to sequester that which is captured.[21]

3-6 Industrial Development

3-6b: add "prime agricultural soils" after natural resources:
Locate and design industrial sites and uses in a manner that protects natural resources, *prime agricultural soils* and minimizes environmental degradation and risk from natural or manmade hazards.

*3-6i: *Promote and encourage environmentally sound industries and practices that achieve or promote General Plan objectives.*

- Encourage the development of coherent business and industrial parks such that co-location (the use of one business's waste as feedstock for another) and co-generation (the shared use of process-generated heat) can readily be effected.

3-6j: [new] Strive to create industrial and commercial 'parks' near population centers throughout the county in order to be able to attract potential employers to the population centers.[22]

3-6k: [new] Under new Commercial or Industrial Development, consider requiring a waste disposal and energy use plan as part of the building application process to ensure such items are addressed early on.[23]

3-6l: [new] Promote and encourage cottage scale industry for the production of essential products produced from in-county resources for in-county markets.

3-7 Community Health [make this the section title]
3-7 Noise -> 3-7a Noise [and change sub-headings to reflect]

3-7b Light [new section]

Light pollution is becoming more and more of a recognized serious problem with impacts reaching into animal migration patterns, astronomy (tourist & research potential), human

[21] A secondary greenhouse gas (CO_2) contributor, growing in status in our county is the wine industry. For every 1000 gallons of wine produced, the fermentation produces roughly 980lbs of CO_2. Many wineries passively collect this, piping it to other vats to use as a fermentation moderator (to slow fermentation). However, no one captures it completely so it is inevitably released.
[22] Intent: To ensure jobs are created while minimizing the sprawl of infrastructure to support the same. The more employment we can create locally to the population centers, the less energy (and time) is wasted on commuting to jobs in other areas and more income stays in our local economy.
[23] Intent: To provide information to planners that will help them better determine a new development's impact on existing infrastructure while encouraging developers to design in energy and waste considerations early on.

sleep and learning, to most importantly (in our case), energy issues. Inevitably, by reducing the impact of light pollution, the wattage of exterior lighting will be reduced as will the energy consumed.

- Mandate reflectors on lights and effect a policy governing the percentage of stray light emitted away from the ground by a light installation, commercial, public or private.

3-7c: Health Care [new section]

Health care for all county residents should be a fundamental concern. With spiraling costs for both insurance and treatment, as well as a growing population without access to basic medical care, the county needs to take a leadership role in identifying potential solutions both through local networks as well as with state legislators.

- Identify and encourage legislation that will facilitate fundamental health care access to all residents.

3-8 Infrastructure Overview

Include "develop and encourage distributed renewable power generation" in Infrastructure Overview.

Include a level 3 sub-section on <u>County Facilities</u> (or as another level 2 section?)

3-8e: [new] All county and municipal facilities shall undergo an energy audit and that funds be made available to implement the recommendations. The energy audits should be <u>re-occurring</u> every 5-10 years.[24]

3-8f: [new] As streetlights and other municipal/county outdoor lighting are replaced, LED or other ultra-high efficiency lighting will be the primary consideration.[25]

3-8g: [new] As municipal and county buildings are renovated, solar and other renewable energy generation facilities will be incorporated directly into the building.

3-8h: [new] As county and municipal waste treatment facilities are renovated (e.g. sewage, landfill), methane capture will be obligatory, with its primary use in offsetting the facility's energy costs.

3-9 Education

[24] Intent: To ensure the county and municipality facilities lead the way in energy reductions, reducing taxpayer burden. Since new, higher efficiency devices (and practices) are becoming available constantly, this should be a periodic (not one-time) audit. The cost savings developed by the implementation will make this program self-supporting.

[25] LEDs are many times more efficient than traditional lighting and typically last for 100,000 hours.

3-10 Cultural Resources
3-11 Parks and Recreation

3-12 Hazard Reduction and Emergency Response

3-12b: *Locate and design critical infrastructure to withstand and operate during hazard events and subsequent recovery phases.*

- Initiate the upgrade of critical services, including water treatment facilities, to employ on-site renewable energy systems to provide rudimentary operation in times of crisis.

3-12g: [new] Retrofit all county schools with stand alone renewable energy systems to support essential loads (i.e. water pumping, food storage… etc.) so they can serve as long-term emergency shelters.

3-13 Fire Protection Services
3-14 Law Enforcement

3-15 Transportation Systems Overview

3-15f: [new] Create an enforceable timetable for transitioning the county's transportation system to be fueled by non-polluting renewable energy (i.e. electric vehicles charged from solar, wind, etc.).

3-16 Road Systems

3-16b: *Maximize the use of existing road systems and reduce environmental and community disruption through compatible land use planning.*

- Support the designation of Neighborhood Electric Vehicle (NEV) routes to reduce conventional fossil fuel vehicle in communities.

3-16d: *Maintain and rehabilitate County roads, bridges and related drainage systems, consistent with Pavement Management System standards and environmental objectives.*

- Include bicycle and pedestrian routes in the maintaining and rehabilitation of county roads and bridges.

3-17 Pedestrian and Bicycle Systems

3-17a: [change to read] All land divisions and other discretionary projects shall provide for pedestrian and bicycle routes along public roadways. And all new developments must ensure that there is safe bicycle and pedestrian access to schools and services.

3-18 Transit Systems

3-18b: *Work with transit providers to coordinate transit routes, services and facilities with development.*

- The county should ensure mass transit is available to its employees and encourage its use, serving as an example to the rest of the population (a substantial percentage of county workers working in Ukiah live in Brooktrails).

3-19 Rail

Add to summary: Rail transport of heavy goods is several times more efficient than current truck-based transport.

3-19c: Support the re-opening of the rail lines for heavy freight transportation through this county.

3-19d: Encourage the Mendocino Transit Authority (MTA) to negotiate access rights and use of existing rail corridors for rail-based commuter trolley.

3-20 Airports

***3-21 Harbor*s**

3-21c: [new] Development plans for harbors and waterways should acknowledge that moving freight by barge or ship is an order of magnitude more energy efficient than moving freight by truck and appropriate handling facilities shall be encouraged.

3-22 Water Supply and Sewer (Wastewater Treatment) Services

3-22i: [new] Initiate the upgrade of critical services, including water treatment facilities, to employ on-site renewable energy systems to provide rudimentary operation in times of crisis.

3-22j: [new] As wastewater treatment facilities are renovated, methane capture will be obligatory, with its primary use in offsetting the facility's energy costs.

3-23 Drainage Systems

3-24 Other Utility Systems

3-24c: [new] Support and encourage the creation of a community choice aggregate (CCA) or a community-owned utility at the county level. This would enable the county citizenry to purchase utilities at a block rate and specify the energy mix they desired (i.e. percentage of renewables).[26]

[26] Membership in the Northern California Power Authority (NCPA) would also create access to funding to help develop local renewable energy production within the county, as well as the sale of excess 'green' energy as might come available.

- Under a county-owned utility, allow a small county tax to be added to each kilowatt hour sold to finance energy conservation and renewable energy programs for those that cannot afford it (fixed and low income).

3-25 Solid Waste and Hazardous Waste and Materials Management

3-25b: Promote materials recovery programs and facilities, focusing on wastes generated in the Mendocino County region

- On-site recycling facilities will be developed such that viable building materials and similar items are removed from the waste stream and made available for public purchase at a nominal cost.[27]

3-25d: [new] As landfill facilities are renovated methane capture will be obligatory, with its primary use in offsetting the facility's (and county's) energy costs.

3-25e: [new] The development of a new in-county landfill facility will be considered a priority. The landfill will reduce county resident's solid waste costs (through reduced processing and shipping costs) while providing a local energy resource from the methane capture.[28]

A.3. GP Section 4: Resource Management Element

4-1 Ecosystems and Resources Overview

4-2 Air Quality

4-2k: [new] Adopt a plan and timeline to eliminate emissions from the transportation sector by replacing internal combustion vehicles with zero emission vehicles (ZEV) to maintain county compliance with AB 32.

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[27] See Sonoma County's recycling efforts at their transfer stations. A small office is setup, items are removed from the waste stream and offered to the public, with proceeds from the sales used to pay the attendant's salaries.

[28] Our understanding is that *the county has a debt load of over $120 million*, primarily in pension obligations and related future expenses. *It is possible to mitigate this debt in as little as 3 years.* Specifically, Sonoma County is (as is Mendocino) now paying to have trash trucked out of the county to locations as far away as Nevada. If Mendocino County were to develop a state-of-the-art landfill, including methane capture, ground seepage prevention and monitoring, as well as the foresight for future mining of the trash for its embodied resources; and if Mendocino County were to do so with a rail linkage (and given that the link from Willits south is due to be opened early on), Mendocino County could take the trash from Sonoma, for a fee, and gain a substantial source of income, reduce energy expenditures (and GHG emissions) in long-distant truck hauling, create a local energy source (in the use of the methane for local electricity generation as well as emergency vehicle fuel, etc.) and have a potential future store of mine-able resources. Hundreds of jobs would be created, empty rail cars coming north to pick up timber and other natural resources could be filled (back-hauling), and the county could negate its debt without relying on significant growth. Yes, this idea would be problematic to sell, especially environmentally; but placed in the proper context, and with the potentially-adverse parties involved in the planning and development, it is also quite do-able.

- Implement a county motor pool Zero Emissions Vehicle (ZEV) buy-in program
- As new developments are approved, ensure electric vehicle charging stations are in place.
- Focus new development within and around community areas to reduce vehicle travel
- Implement transit-and pedestrian –oriented land use and site design strategies
- Encourage the use of alternative fuels, energy sources and advanced technology

4-2l: [new] Adopt a plan and timeline for transitioning from fossil fueled power generation to distributed renewable generation to reduce GreenHouse Gas (GHG) emissions

4-2m: [new] Improve building efficiency standards to reduce need for heating fuels.

4-2n: [new] Capture or mitigate GHG emissions from landfills and sewage treatment facilities.

4-2o: [new] Capture or mitigate GHG emissions from farm, ranch, and vineyard operations.

4-2p: [new] Capture or mitigate GHG emissions from industrial sources while encouraging co-generation (recycling of waste heat, etc.).

4-3 Energy Resources

4-3b: Encourage research and development of renewable energy sources to meet current and increasing energy demands.

- Inventory and map solar, wind, and tidal energy resources.
- Encourage investment in identified renewable resources, either through tax breaks and similar incentives normally offered commercial developers; and/or under the community-owned utility program[29].
- Use the California Solar Rights Act to ensure that new building projects do not disrupt solar access.
- Review all laws that restrict the placement of local distributed energy generating devices such as: wind turbines, solar arrays, wave energy devises etc. and eliminate those restrictions that are based on *aesthetic* preference.
- Ensure the Assessor's Office follows California Tax Code, section 73 that *excludes solar energy systems in property tax calculations.* This exemption should be properly interpreted to *include the supporting structure and inverter/battery enclosure*, as long as it is not part of a structure used for living or business.

[29] Membership in the Northern California Power Authority (NCPA) would also create access to funding to help develop local renewable energy production within the county, as well as the sale of excess 'green' energy as might come available.

- Create an ordinance to protect renewable installations (solar, wind, etc.) from vandalism and/or theft (regardless of government, commercial or private ownership).[30]

4-3e: Energy efficiency shall be a major consideration in land use and transportation planning decisions.

- Make use of passive solar design a requirement in all new building projects.
- Encourage the use of bio-mass and landfill gas for projects that can take advantage of the co-generation of heat and electricity.

4-3h: [new] All new development projects will require a minimum of 25% of the estimated energy usage to be provided by onsite renewable energy. Phase this in stages as follows:

Electricity	2008
Heating and cooling	2009
Transportation	2010

4-4 Geological Resources
4-5 Soil Resources
4-6 Seismicity
4-7 Mineral Resources
4-8 Watersheds
4-9 Water Supply
4-10 Water Quality
4-11 Flooding and Inundation
4-12 Biological Resources Overview
4-13 Terrestrial Resources
4-14 Freshwater and Marine Resources

4-15 Agricultural Resources

Add to summary:
It currently takes 10 units of fossil energy to put 1 unit of food energy on American tables (our food travels an average of 1500 miles to reach our plates). This is not sustainable as we approach the limits of finite fossil energy supplies. As a result, all policies in the General Plan should recognize and encourage the need to transition towards smaller more labor intensive farms that are in close proximity to markets. Mendocino County led the way in banning Genetically Modified Organisms (GMOs) and we need to do the same in encouraging local food production.

*4-15c: *Support the diversification and expansion of the agricultural economic base.*

[30] The intent here is to provide the same protection that utilities enjoy under the laws that protect against theft or vandalism of utility services.

- Reduce the minimum agricultural parcel size to 5 acres on the valley floors, 20 acres in the hills to encourage small scale farming, supporting local food production. This should be augmented by (or be adjunct to) greenbelt considerations to prevent islanding of agricultural lands.
- Encourage, with appropriate agricultural commitments, multiple workers (and their families) living on and working the same property. In cases where more than one dwelling is requested and permitted, restrict such to clustered commons to preserve the primary focus of agricultural activity[31].

4-15e: Land shall not be converted from the Agricultural Lands or Range Lands classifications to non-agricultural classifications unless all of the following criteria are substantiated:

- [new] Agricultural land *cannot* be taken out of that designation unless replaced by comparable land elsewhere (i.e. protect all agricultural lands regardless of parcel size).

Add as 4-15x (e.g. under 'Development Compatibility'):
4-15x For all new developments; for each residential unit, a requirement that 400 square feet of garden space is set aside with access to enough water for growing fruit and vegetables. Encourage this as green buffers or commons. Implemented by 2008.

4-16 Forest Resources
4-17 Open Spaces, Rural Landscapes, and Scenic Resources

[31] See separate Agriculture Proposal beginning on page 23.

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Appendix B. Agricultural Policy Enhancement Recommendation

Food today travels an average of 1500 miles to our plates and consumes more than 10 calories (of energy) for every calorie it provides us in sustenance. Small scale, local agriculture is generally light on fossil fuel and pesticide use (typically over 90% more energy efficient[32]); and the encouragement of such could go a long way in ensuring food security for our county. What follows is a proposal developed by the EWG and community members to address policy such that local food production can be encouraged.

This policy is one of two suggestions to shift agriculture in this county. The first part concerns the affordability of land to the individual farmer and calls for a reduction in the minimum AG designation lot size. That is contained within the main body of the GP Recommendations. This section details the second part of the suggestions, which discusses the provisions for "Intentional Farming Communities" (IFCs). IFCs would allow several farmers to combine their efforts onto a single piece of land to best share resources and knowledge.

B.1. Key Points about the Proposal

- Does not alter lot size minimums
- Does not change existing or proposed plans or zoning ordinances
- Voluntary arrangement
- Grants a new set of permissions
- Outlines a new set of responsibilities
- Fosters the long term presence of agriculture
- Protects the small farmer

B.2. Introduction

Over the past few years a number of individuals have expressed interest in seeing the county's General Plan and Zoning Code to be modified so that individuals or groups seeking to farm would face fewer regulatory hurdles such as the specification of a minimum lot size. The county has concerns about the potential implications of allowing the proliferation of small agricultural lots in highly productive areas that had historically seen little in the way of development. <u>This proposal outlines a compromise solution where the proponents of small-scale agriculture can receive General Plan and Zoning acceptance and protection they need to initiate these types of farming operations without any actual modifications to the AG zoning or elimination of the General Plan policies in place to protect current operations.</u>

[32] John Jeavons, Ecology Action.

B.3. Background

Over the past few years there has been a growing level of concern about the safety, security and affordability of our food supply. Converging factors—some that we can control and some that we cannot—are beginning to call into question the short-term safety and affordability and the long-term viability of our current food supply system. These concerns include:

- Increasing number of food contamination "scares"
- Increased rates of cancer among agriculture workers
- Increasing fuel costs translating into higher food prices (the average item of food travels 1500 miles from field to table)
- Increased use of crops for bio-fuel instead of food is raising base commodity prices
- Dependence on large quantities of oil and natural gas to produce and transport food from field to table as well as for the production of fertilizers and pesticides
- Development of anti-biotic resistant bacteria due to chronic over use of antibiotics in confined animal operations.
- Risk of mass crop losses in the event a new disease or fungus evolves to take advantage of regional monocultures (e.g. a new corn predator wipes out the crop in the Midwest)
- Topsoil loss and soil salinity damage in prime cultivation areas due primarily to large-scale mechanized farming.
- Depleted aquifers (e.g. the Ogallala Aquifer in the Great Plains)
- Dead zones in our rivers, estuaries and seas due to run-off.
- Unknown impacts from genetically modified organisms (the Honey Bee Colony Collapse Syndrome has been potentially implicated).

B.4. Sustainable Agriculture

There is another way. Instead of finding success through growth and integration with the conventional food supply network, some farmers are finding success with a low-input, low volume model of food production that maximizes the value placed on each crop and supports it with direct distribution. This model of agriculture requires no heavy equipment for regular operations, which saves the farmer a lot on capital and fuel expenditures. Nor does it require a significant amount of outside inputs as most fertilization and pest avoidance strategies are home generated and often take advantage of natural processes (such as composting). By growing a variety of crops and raising a limited number of small farm animals (chickens) the farmer can attend to the specific needs of each crop while not being dependent on the success or failure of any one specific crop. It's a very labor-intensive process. And without mechanization, there is an effective limit to the amount of land each person can cover during the course of a growing season. Thus you see the beginning of the argument for smaller farm sizes; large ones are not practical.

The second part of this argument revolves around the distribution. Simply growing crops on a small scale itself will not work economically for the farmer. So rather than produce for the conventional food supply system, many will choose to sell outside it. This manifests itself in the form of farmer's markets, where the farmer direct sells to the customer or a cooperative that will sell on the farmer's behalf. Additionally the last several years have witnessed the growth of Community Supported Agriculture (CSAs), which represent an altogether different way of doing business. With a CSA a farmer (or group of farmers) will sell a "subscription" to the farm—like $20-30 a week—in exchange for a constant weekly delivery of whatever is being harvested that week. Several CSAs already operate in this county. All three distribution models offer the farmer a far greater return on each item sold (which already commands a higher price due to it being "organic") than the conventional distribution system, primarily due to removing the middle man and the reduction of transport costs. The important thing to remember here is that size is a disadvantage. Growing too large requires either additional labor or an investment in heavy equipment. Both entail significant ongoing costs.

Finally it should be noted, a network that delivers food direct (or close to it) from the farmer to the consumer will result in a much greater return for the farmer, less fuel being consumed to transport the food and a better level of food security (safety, price and availability) for the consumer. It will also "sustain" the local economy better than the agribusiness model of food production and ensure local food availability in times of calamity. Food and money would circulate locally with such a model and the presence of a diverse range of high valued crops would lend itself well to value-added types of business arrangements. Exports from the county would command a premium over conventional or even other forms of organic agriculture and could generate new revenue for the county.

B.5. Underlying Concerns

Both parties interested in this subject have a number of concerns that need to be addressed for any policy to be successful.

County Government		**Sustainable Agriculturalist**
• New owners have to be monitored to ensure agricultural production. Who monitors them? What are the standards? Who defines them? • What are the enforcement mechanisms? How are the agriculture requirements recorded? What are the penalties? Is this even legal? • What happens when one property owner sells to another…are the rights transferable? • How are the monitoring and		• Most (conventional) agricultural interests fail to understand the rationale or economics behind the human scaled agriculture. This includes local government. • Most agricultural parcels exist in sizes too large for human-scaled agricultural operations to function, or afford. • Most individuals that ARE interested in entering the agricultural profession are unable

enforcement provisions funded? • How are the residential components and tenure monitored? • What happens if a newly created landowner decides to rent cultivation to one person and the housing unit to another? Both parties will be forced to commute to their jobs. • Where do Williamson Act and other provisions fit in? • How much might this cost the county in administration costs? • How many new parcels may be created? • In the end, will this parcelation preserve a working rural landscape or lead to rural sprawl?		to purchase (or even lease in some cases) the necessary land because the purchase price is well beyond their financial reach, again owing to the fact it is far larger than they need it to be. • Legal mechanisms for the group purchase and operation are lacking • Current zoning codes make co-housing on agricultural lands impossible to come by while state Farm Worker Housing provisions fail to offer a useful alternative; and • None offer the prospective farmer the security/stability to allow them to make those multi-year investments in farm infrastructure, perennial planting or produce marketing strategies without fear that the "rules will change" and force them to start over elsewhere.

B.6. Proposal Summary

The county does not change the structure of its existing or proposed General Plan Goals or modify the existing Zoning Ordinances for the AG and other zones. Rather, the county creates a new goal and related policies for the General Plan Update that references the existence of human-scaled intensive farming and proposes policies that serve to protect that practice of agriculture. Furthermore, the county would create a new zoning combining district or overlay that allows prospective farmers and farming operations additional land use permissions while outlining certain responsibilities. Both existing small-scale operations and proposed cooperatives would be able to access the provisions discussed below.

B.7. Proposal Details

I. New General Plan Goal

"Recognizing the environmental and economic benefits from human-scaled intensive organic agriculture, Mendocino County shall promote policies and implementation measures that are supportive of this type of agriculture without creating unwanted risk to the county or neighboring farmers and communities."

Related General Plan Policies

a. Mendocino County shall grant special status and recognition to those farms and operations that practice human-scaled organic agriculture if they are willing to meet specified land use and operational standards
b. While not allowing the creation of new small scaled parcels for these types of operations, allow and encourage existing single-owner human scaled agricultural operations on RR or non-conforming sized RMR, RL, or AG zones to gain full protection under the proposed Combining District
c. Remove legal barriers to group or collective land ownership and cultivation practices on larger parcels to prevent pressure to create new parcels.
d. Encourage and facilitate the long term viability and protection of human scaled sustainable agricultural operations of any size (that meets the standards below) via Williamson Act protection and/or securing of Land Trust Protection
e. Work with other agencies to develop an appropriate regulatory structure that understands the unique needs of these types of operations.
f. Encourage the development of a comprehensive sustainable food network that builds on this type of agriculture by working with the county's economic development arm to help create the conditions needed for the related agricultural-support jobs to develop.

II. Creation of a new Combining District (overlay) that will grant the interested farming operator/cooperative in any of the county's zoning classifications new rights:

a. Recognition that a group with two or more co-owners or operators could own a single parcel and functionally allocate farming area assignments to each of the members without implying the creation of new parcels.
b. Permission to construct multiple housing units for unrelated farming households, the exact number specified by the property's filed Production Plan
c. Permission to construct multi-family or co-housing structures, the exact unit count being specified by the site's Production Plan.
d. Permission to construct or place a dormitory structure, strictly for apprentice and trainee use (if desired). The number of beds would be equivalent to the number of farming allotments in the Production Plan. This structure may be permanent or temporary.
e. Permission to utilize alternative and experimental building techniques for onsite construction (with a provision that a conventional practice would be substituted if the technology failed to perform as intended)
f. The right to ask for Williamson Act status, regardless of the base zoning, if farmed in a human-scaled manner
g. The right to secure an agricultural easement or put the land into permanent trust status.

h. For non-AG parcels in this overlay, property tax equivalency to AG, provided human-scale agriculture is shown to be practiced.

This new combining district would also be accompanied by a new set of responsibilities, the most important of which is the preparation and filing of an **Agricultural Production Plan** that discusses

a. The division (not parcelization) of the land into smaller farmsteads suitable for production
b. The disposition or use of lands to be held communally.
c. The anticipated cultivation plan (does not need to be specific, just a general crop listing and rough approximation of location)
d. The anticipated operations plan for non-cultivation activities, such as produce packaging or processing, crop transport, or general maintenance.
e. The number of units required for farmstead use (should not exceed the number of farmsteads)
f. The number of dormitory-style units (if any) for apprenticeship/student use. Realistically the number of beds should not exceed the number of farmsteads as well if they are desired.
g. The number of overall units in a multiple family or co-housing structure, if that housing option is selected.
h. The site design for the residential portion, which will include discussion on how the structures are built, by whom, their phasing and how their impacts on the environment will be minimized or eliminated (green building).

Additionally, reflecting the intensive nature of this form of (organic) agricultural operations and the resulting increase in rural densities any operation requesting the overlay **the owner/operators/cooperative must:**

a. Minimize or exclude the use of internal combustion powered tools and implements (except during construction and for offsite transportation).
b. Not apply chemical pesticides or fertilizers
c. Not utilize GMO-crops or seeds.
d. Not burn any waste matter on the property
e. Be able to meet at least the USDA/California standards for organic production
f. Steward the land such that run-off is prevented and that soils continue to be developed and maintained.
g. Maintain livestock in a humane and consistent manner.
h. Cluster proposed housing;
i. Share utility and infrastructure investments wherever possible
j. Agree to maintain production in accordance to the production plan. Failure to do so will result in forfeiture of rights outlined above.

Figure 1. An Intentional Farm Community[33]

[33] John Jeavons, Ecology Action

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Appendix C. County Energy Usage Inventory

[Note, raw data for the following tables can be found beginning on page 55.]

2002 Mendocino County Energy Costs, Usage & CO2 Emissions

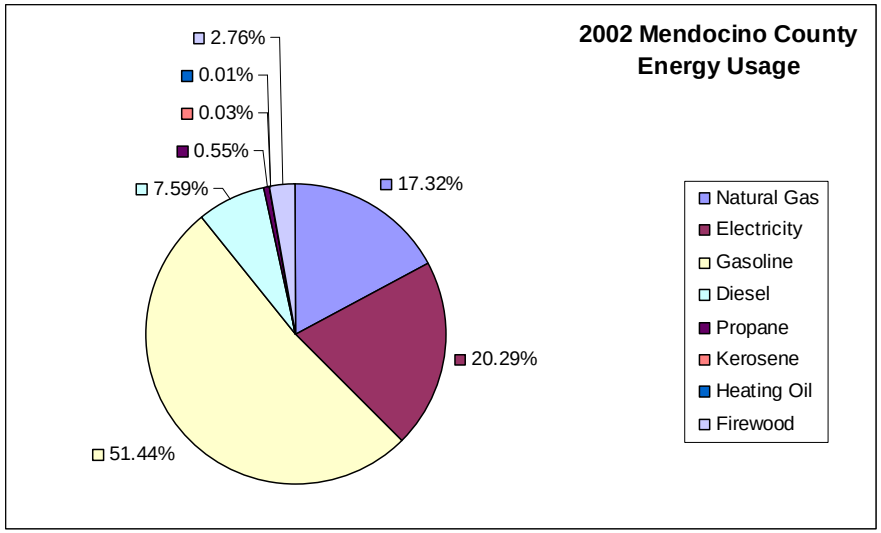
Fuel	Annual Residential	Annual Non-Residential	Total (annual)	Units	Unit Cost	Annual Value	Total (daily), Therms	Total Daily MegaWattHrs (MWhr)	Average Daily per Person (KWhr)	CO2 Emission Factor	Total CO2 Emissions (tons)
Natural Gas	6.3	11.6	17.9	MT	$521,000	$9,300,892	48,909.6	1,433.1	16.5	5,667.0	101,167.1
Electricity	260.8	351.6	612.3	MKWhr	$125,201	$76,664,451	57,279.1	1,678.3	19.3	305.0	186,761.6
Gasoline			47,754.9	KGallons	$1,242	$59,315,930	145,227.3	4,255.2	48.9	9.9	472,773.9
Diesel			8,318.2	KGallons	$870	$7,232,700	21,422.3	627.7	7.2	9.9	82,350.5
Propane			1,899.0	KGallons	$416	$789,033	1,560.8	45.7	0.5	6.3	12,030.1
Kerosene			33.3	KGallons	$900	$30,005	88.9	2.6	0.0	9.9	330.1
Heating Oil			16.1	KGallons	$543	$8,724	41.4	1.2	0.0	11.2	179.7
Firewood			20.3	KCords	$160,000	$3,248,247	7,786.9	228.2	2.6	1,250.0	25,376.9
Total Daily Consumption:							**282,316**	**8,272**	**95**		
Total Annual Value of Consumed energy:						**$156,589,982**					

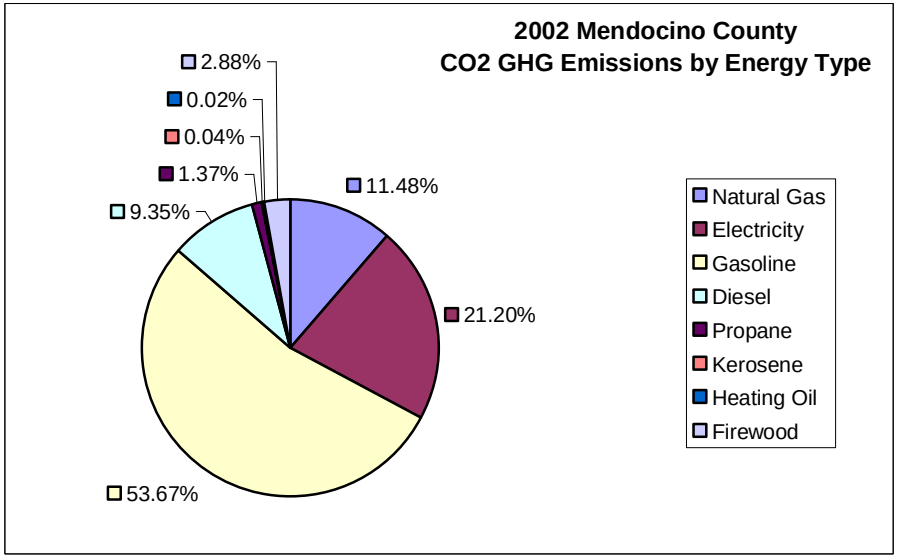
2002 Cost [per Person], [per Household] of Total Fuels Consumed:	**$1,799**	**$4,573**
Percentage of Median After-tax Household Income Expended on Energy, 2002:		**19%** (tax liability estimated at 30%)

Total 2002 CO2 Emissions for Consumed Energy (tons):	**880,970**	
2002 CO2 Emissions [per Person], [per Household] in tons from above-noted fuels:	**10**	**26**

2002 CO2 Greenhouse Gas Emissions & Fuel Cost Comparison by Common Energy Units Consumed:

Fuel	Cost Ranking (lowest=1)	Emissions Ranking (lowest=1)	Equiv Annual Qty	Units	Unit Cost	Annual Value	Equiv daily, Therms	Equiv daily MWh	CO2 Emission Factor	Total CO2 Emissions (tons)
Natural Gas	1	1	0.365	MT	$521,000	$190,165	1,000.0	29.3	5,667.0	2,068.5
Electricity	8	4	10.69	MKWhr	$125,201	$1,338,436	1,000.0	29.3	305.0	3,260.6
Gasoline	5	2	328.83	KGallons	$1,242	$408,435	1,000.0	29.3	9.9	3,255.4
Diesel	3	6	388.30	KGallons	$870	$337,625	1,000.0	29.3	9.9	3,844.1
Propane	7	8	1,216.67	KGallons	$416	$505,525	1,000.0	29.3	6.3	7,707.6
Kerosene	3	5	375.13	KGallons	$900	$337,625	1,000.0	29.3	9.9	3,713.8
Heating Oil	2	7	388.30	KGallons	$543	$210,970	1,000.0	29.3	11.2	4,345.1
Firewood	6	3	2.61	KCords	$160,000	$417,143	1,000.0	29.3	1,250.0	3,258.9


2002 Mendocino County
Energy Usage
2.76%
0.01%
0.03%
0.55%
7.59%
17.32%
20.29%
51.44%
Natural Gas
Electricity
Gasoline
Diesel
Propane
Kerosene
Heating Oil
Firewood


2002 Mendocino County
CO2 GHG Emissions by Energy Type
2.88%
0.02%
0.04%
1.37%
9.35%
11.48%
21.20%
53.67%
Natural Gas
Electricity
Gasoline
Diesel
Propane
Kerosene
Heating Oil
Firewood

Appendix D. County Greenhouse Gas Emissions Inventory

[Note, raw data for the following tables can be found beginning on page 55.]

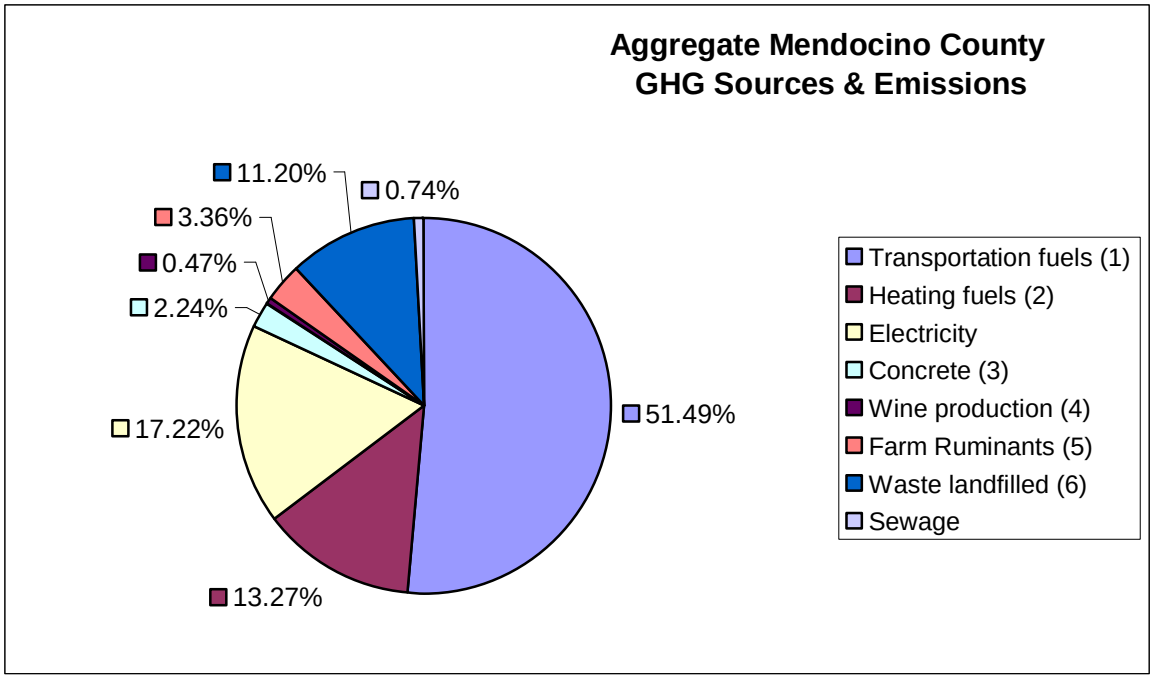
County GHG Sources & Emissions

CO2 (carbon dioxide), CH4 (methane) considered; NOx, etc. not included due to data ava

Source	CO2 (tons/year)	CH4 (tons/year)	Total, CO2 Equivalent (tons/year)	% Total
Transportation fuels (1)	555,124.3	157.1	558,422.9	51.49%
Heating fuels (2)	139,083.9	230.9	143,932.4	13.27%
Electricity	186,761.6	2.1	186,804.7	17.22%
Concrete (3)	24,279.5	N/A	24,279.5	2.24%
Wine production (4)	5,145.0	N/A	5,145.0	0.47%
Farm Ruminants (5)	N/A	1,734.9	36,432.0	3.36%
Waste landfilled (6)	14,068.2	5,115.7	121,498.4	11.20%
Sewage	N/A	383.7	8,058.6	0.74%
Total Est. Emissions (tons/year):	**924,462.6**	**7,624.3**	**1,084,573.7**	

Notes:

1. Gasoline, diesel
2. NatGas, Wood, Heating oil, propane, kerosene
3. Portland cement
4. From fermentation only
5. Cattle, sheep (direct emissions only)
6. Inclusive only of waste bound for landfills (no recycled, etc.)


Aggregate Mendocino County
GHG Sources & Emissions
11.20%
0.74%
3.36%
0.47%
2.24%
17.22%
51.49%
13.27%
Transportation fuels (1)
Heating fuels (2)
Electricity
Concrete (3)
Wine production (4)
Farm Ruminants (5)
Waste landfilled (6)
Sewage

Appendix E. The Demise of Petroleum

Petroleum is our society's primary source of energy, and demand continues to increase world-wide. Yet petroleum is a finite resource resulting from nearly 4 billion years of solar energy and some very unique geological processes. Across the board, there is consensus that oil will decline within our lifetime, and a growing number feel it likely within the next decade.

E.1. What is "Peak Oil"?

In the general vernacular there is a term 'Peak Oil'. Peak Oil defines the point when one half of the potential extractable oil has been removed. From that point on, extraction becomes more difficult (and expensive). Additionally, the quality of the product also declines (e.g. going from sweet to sour, an expression of the sulfur content), increasing the costs of refining as well as the potential for increasing pollution levels.

Peak Oil was first put forward by an oil geologist named Hubbard who was researching the potential production lifetime of the US oil fields. In the 1950s, he correctly theorized that Peak Oil for US production would occur in the 1970s. A man named Campbell took Hubbard's work and used it to forecast World Peak Oil. He estimated that would occur between 2005 and 2010.

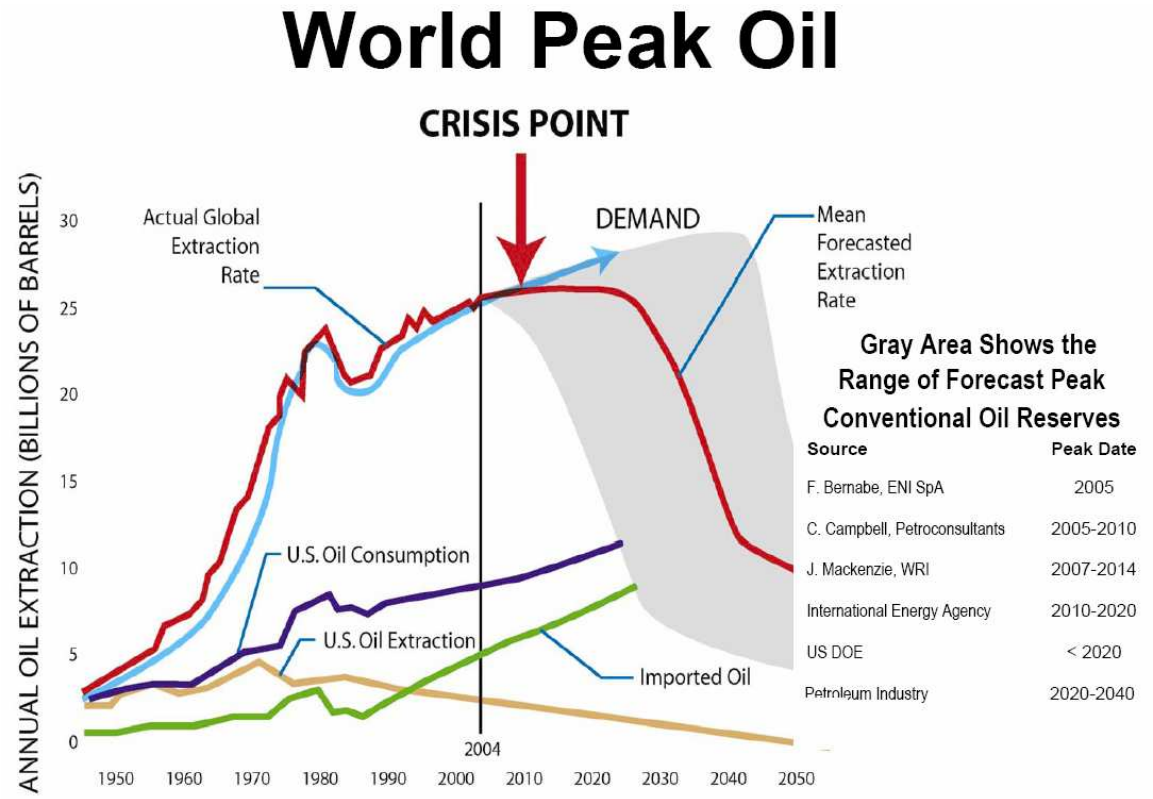


Figure 2. World Peak Oil Projections[34]

[34] Steve Heckeroth, after Stern magazine, 2002

As you can see from the graph, there are other estimations of when 'World Peak Oil' will occur, with the most conservative (of course) coming from the petroleum industry itself.

Why is there such a discrepancy? In one word, politics. For the oil producing countries, it is their political strength to overstate their reserves; for the industry, it is their stock value; and for the governments, it is for the calm of their citizenry.

Regardless of the discrepancy, it must be accepted that oil production will decline in the next few years (i.e. within the time frame of this general plan update's tenure) and we need to be prepared socially and politically.

E.2. Why Should We Worry About Peak Oil?

Oil is used in everything we do. It fuels our transportation (and is used to produce the tires and roads we drive on), illuminates and heats our homes and offices, and serves as a precursor chemical for plastics, medicine, fertilizers and paints. Without oil, conventional agriculture could not exist, nor could the American lifestyle. The repercussions of the demise in its availability are severe and far-reaching.

Natural gas, traditionally a waste product of oil drilling, is also in decline, with many experts stating we have already passed its peak. Natural gas reserves are also far more difficult to characterize since it is a gas. Being under pressure, it will appear to give a constant production until just before it is exhausted. Of special concern here is the fact that *70% of California's electricity is generated by natural gas fueled plants.*

We are not about to run out of oil, but production is about to reach a peak, if it has not done so already. It is worth briefly recalling what occurred in Europe in late 2000, as a foretaste of what happens when oil supply becomes short and expensive. The French fishermen blockaded the Channel Ports because their fuel costs had doubled, even though their fuel was already tax-free. The dispute spread rapidly to England and other countries. Schools were closed. Hospitals had red alerts because staff and patients could not reach them. Supermarkets started rationing bread. Trade and industry was seriously interrupted: the cost was huge. People lost confidence in their governments, whose popular support fell sharply. If an interruption in supply lasting only a few days could cause such havoc, it surely demonstrates how utterly dependent on oil we have become.[35]

Peak Oil is not necessarily about when oil will run out, but when supplies will become expensive enough to force us to start looking at other methods to fuel transportation, heat our homes and so on. What is important here is that we do so early enough so that the remaining petroleum reserves will be available to us (and future generations) as the all-

[35] From a paper prepared by C.J. Campbell, revised 2002, presented by MBendi [http://www.mbendi.co.za/indy/oilg/p0070.htm]

important feedstock to the chemical industry for the beneficial medicines, plastics, etc. that are produced from it.

From the perspective of the county general plan, one especially poignant facet is worth noting. Rising energy prices, which we are already seeing, impact the lower- and fixed-income first. Ignoring the reality of declining petroleum-based energy will bring about social class implosion and the costs to sustain some semblance of economic viability in this county will be high. We need to plan for this future and to ensure all members of our community will be able to participate.

E.3. Preparing for Peak Oil

The City of Portland (Oregon) established a Peak Oil Taskforce to study the problem and to recommend policy changes to prepare for the inevitable. In their study, they found transportation to be the most problematic:

> "Of all the impacts from rising oil prices, the clearest are those on transportation, which will experience profound pressure to shift toward more efficient modes of travel. For personal travel, this means transit, carpooling, walking, bicycling and highly efficient vehicles. *Transportation of freight will become more costly and either decline or shift modes from air and truck* ***to rail and boat***. Population may shift to city centers, and density and mixed-use buildings will increase." [36]
> [emphasis added]

The study went on to lament that even under the most optimistic projections of remaining (oil) reserves, there is still insufficient time to make the kind of infrastructure changes needed to continue a functioning society:

> "Despite the apparent breadth of current projections, ***even the most optimistic forecasts offer little time to adapt*** *given the very long lead times required to change such things as transportation and building infrastructure*."[37]
> [emphasis added]

The Portland study is a good reference to see what actions a government entity might be willing to undertake to ensure the future viability. What is probably the most important part of their study is the list of resolutions they arrived at to guide their policy making. These are listed below[38]. Note that the solutions for the demise of petroleum are quite similar to the actions needed to be undertaken for Climate Change.

> 1. Reduce total oil and natural gas consumption by 50 percent over the next 25 years.

[36] "Descending the Oil Peak: Navigating the Transition from Oil and Natural Gas", City of Portland Peak Oil Task Force, March 2007
[37] Ibid.
[38] Ibid.

2. Inform citizens about Peak Oil and foster community and community based solutions.
3. Engage business, government and community leaders to initiate planning and policy change.
4. Support land use patterns that reduce transportation needs, promote walkability and provide easy access to services and transportation options.
5. Design infrastructure to promote transportation options and facilitate efficient movement of freight, and prevent infrastructure investments that would not be prudent given fuel shortages and higher prices.
6. Encourage energy-efficient and renewable transportation choices.
7. Expand building energy-efficiency programs and incentives for all new and existing structures.
8. Preserve farmland and expand local food production and processing.
9. Identify and promote sustainable business opportunities.
10. Redesign the safety net and protect vulnerable and marginalized populations.
11. Prepare emergency plans for sudden and severe shortages.

Appendix F. Climate Change from Greenhouse Gases

"You can't disperse billions of years of solar energy, which have been saved in the earth in the form of fossil fuels, back into the atmosphere in a short 150 year period and expect this would not have consequences."[39]

F.1. A Short Primer on Greenhouse Gases and Climate Change

[The following is partially excerpted from the "Source Inventory of Bay Area Greenhouse Gas Emissions", November 2006, Bay Area Air Quality Management District and from the "Greenhouse Gas Emission Inventory", Sonoma County, January 2005, Climate Protection Campaign]

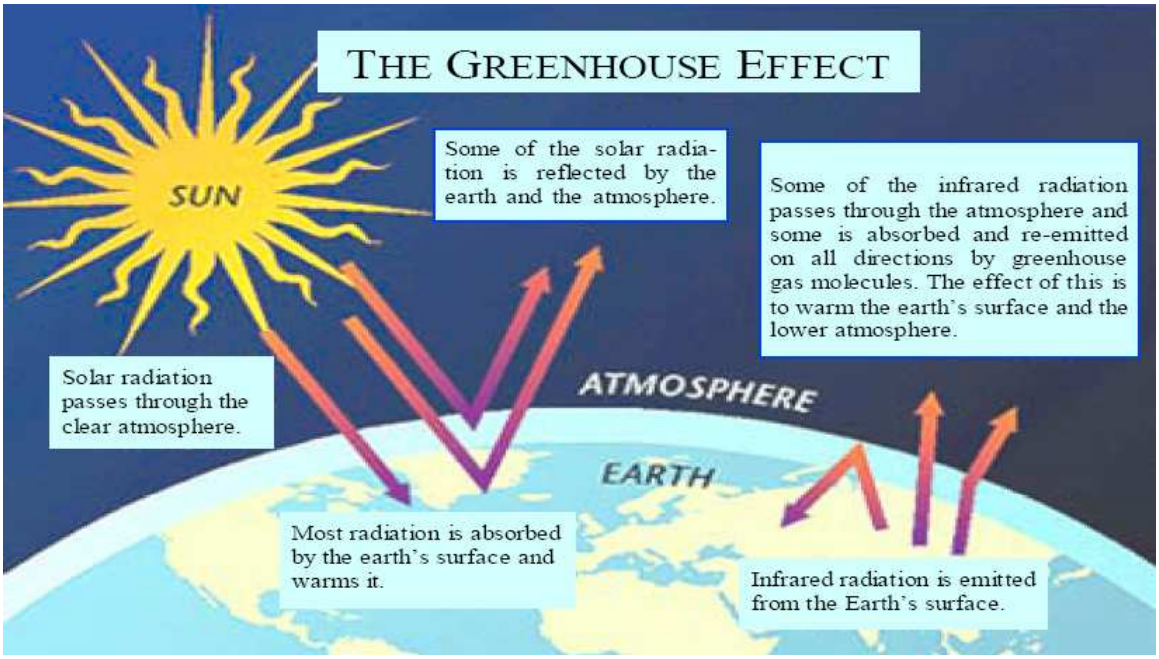


Figure 3. The Greenhouse Effect[40]

Once, all climate changes on Earth occurred naturally. However, during the Industrial Revolution, we began altering our climate and environment through changing agricultural and industrial practices. Before the Industrial Revolution, human activity released very few gases into the atmosphere, but now through fossil fuel burning, deforestation and growing population (e.g. waste disposal), we are affecting the natural mixture of gases in the Earth's atmosphere.

[39] James Kunstler, "The Long Emergency"
[40] "Source Inventory of Bay Area Greenhouse Gas Emissions", November 2006, Bay Area Air Quality Management District

The greenhouse effect is a natural process by which some of the radiant heat from the Sun is captured in the lower atmosphere of the Earth, thus maintaining the temperature and making Earth habitable. The gases that help capture the heat are called greenhouse gases. All of these gases have been identified as forcing the earth's atmosphere and oceans to warm above naturally occurring temperatures.

Some greenhouse gases occur naturally in the atmosphere, while others result from human activities. Naturally occurring greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Certain human activities, however, add to the levels of most of these naturally occurring gases.

Carbon Dioxide (CO_2) is released to the atmosphere when solid waste, fossil fuels (oil, natural gas, and coal), and wood and wood products are burned.

Methane (CH_4) is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from the decomposition of organic waste in municipal solid waste landfills, and the raising of livestock.

Nitrous Oxide (N_2O) is emitted during agricultural and industrial activities, as well as during combustion of solid waste and fossil fuels.

Very powerful greenhouse gases, also known as high global warning potential (GWP) gases that are not naturally occurring, include hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6), are generated in a variety of industrial processes.

Each greenhouse gas differs in its ability to absorb heat in the atmosphere. High GWP gases such as HFCs, PFCs, and SF_6 are the most heat-absorbent. Methane traps over 21 times more heat per molecule than carbon dioxide, and nitrous oxide absorbs 310 times more heat per molecule than carbon dioxide. Often, **estimates of greenhouse gas emissions are presented in carbon dioxide equivalents** (sometimes shown as CO_2e), which weight each gas by its GWP.

Each greenhouse gas also has a lifetime or persistence in the atmosphere. CO_2, with the shortest life span, still persists for roughly 100 years in our atmosphere.

As human population and consumption has increased, so has the amount of greenhouse gas emitted into Earth's atmosphere. In the mid 1850s there was about 280 parts per million of carbon dioxide in the atmosphere; now there is about 379. Human activity has increased the blanket of heat-trapping gas surrounding the Earth, magnified the greenhouse effect, and increased Earth's average temperature by an average of more than 1°F over the last 100 years.

Scientists prefer the term *Climate Change* to global warming because climatic changes vary across the planet, from place to place and season to season. With Climate Change comes extreme weather – both record breaking hotter and colder temperatures, both

droughts and floods. While no single weather event can be attributed to global Climate Change, the pattern of increasing extreme weather can, say climatologists.

The world's foremost authority on Climate Change, the International Panel on Climate Change (IPCC), involves thousands of scientists worldwide who study atmospheric changes, their potential impacts, and appropriate policy responses. Having verified the increase in greenhouse gas, the rise in temperatures, and the impacts on Earth's living systems, these scientists concluded that global Climate Change imperils life on Earth. In 1995, the IPCC specified that stabilizing the concentration of carbon dioxide required an immediate reduction in CO_2 emissions of 50 to 70 percent, and required further reductions thereafter until the year 2100.[41]

F.2. Climate Change Impact Projections for California

The latest projections, based on state-of-the art climate models, indicate that if global heat-trapping emissions proceed at a medium to high rate, temperatures in California are expected to rise 4.7 to 10.5°F by the end of the century. These temperature increases would have widespread consequences including[42]:

1. Substantial loss of snow pack resulting in declining water availability, as well as decreased hydroelectric production.
2. Reductions in the quality and quantity of certain agricultural products, as well as new pests (weeds, insects, etc).
3. Increasing energy demands.
4. Public health impacts (heat, air quality, disease vector increases).
5. Changes in the natural landscape as plant habitat changes (decreasing forest yields and similar activities).
6. Rising sea levels, increasing coastal flooding.
7. Increased risk of large wildfires.
8. Increased extinction rate of species.

F.3. California's AB32 Objectives

AB32 is known as the California Global Warming Solutions Act of 2006 and mandates the inventory of gases contributing to Climate Change as well as the reduction of the same. In the following graph, the major contributors of greenhouse gases in California

[41] IPCC second assessment synthesis of scientific-technical information relevant to interpreting article 2 of the UN Framework Convention on Climate Change, 1995, the summary for policymakers, page 9, http://www.ipcc.ch/pub/sa(E).pdf See also "Climate Change Research - Facts, uncertainties and responses," Astrid Zwick, Antonio Soria http://www.jrc.es/pages/iptsreport/vol05/english/art-en1.doc

[42] "Our Changing Climate, Assessing the Risks to California", California Climate Change Center, July 2006.

are shown. You may want to refer to the tables and graphs from Mendocino's emissions inventory found starting on page 33.

Notice (from the graph) that the California state-wide mix of emissions is slightly different than Mendocino County's. The primary difference is in our high reliance on private transportation due to our rural nature, as well as our higher agricultural contribution.

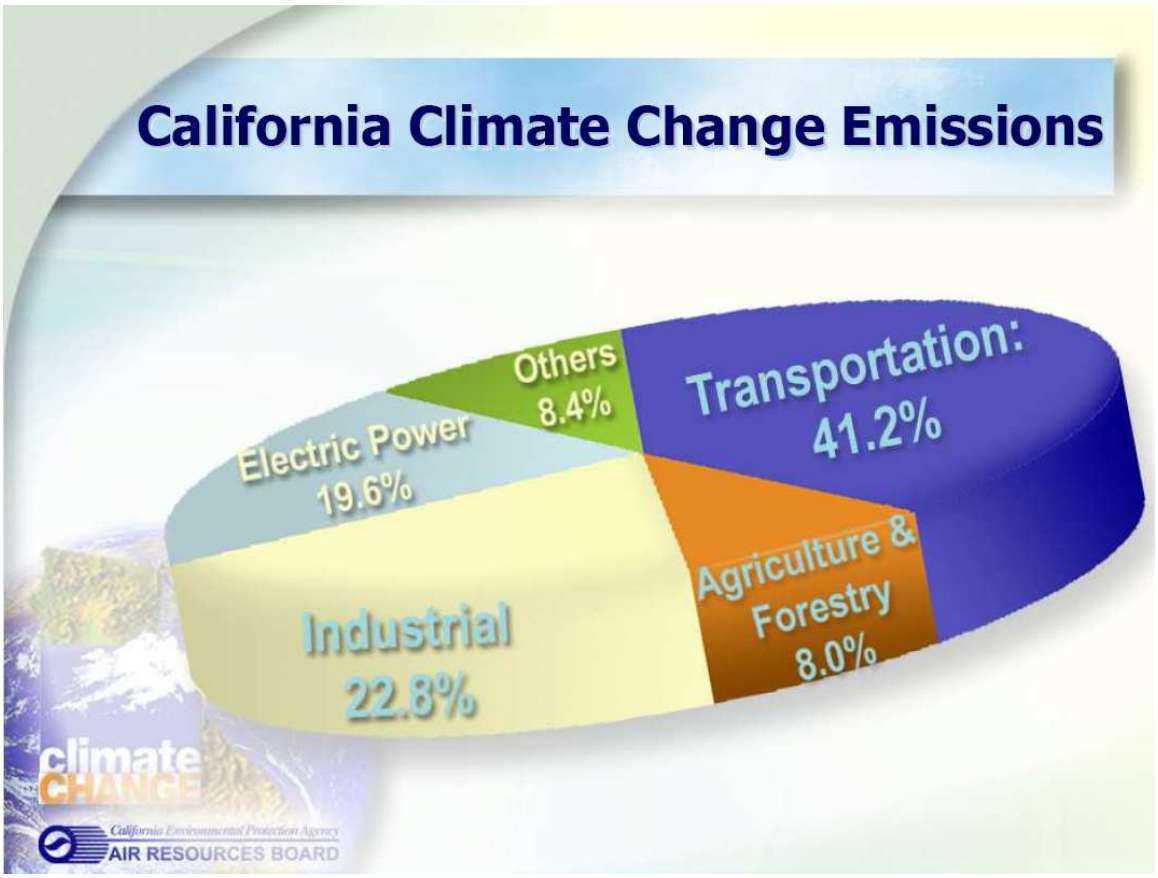


Figure 4. Statewide Emissions Sources.[43]

The California Air Resources Board has prepared a list of areas we can focus on to reduce the impacts of Climate Change as illustrated in the following graph. These areas of potential reductions should be reflected in our county policies, including the General Plan.

[43] "AB 32: The California Global Warming Solutions Act of 2006", California Air Resources Board

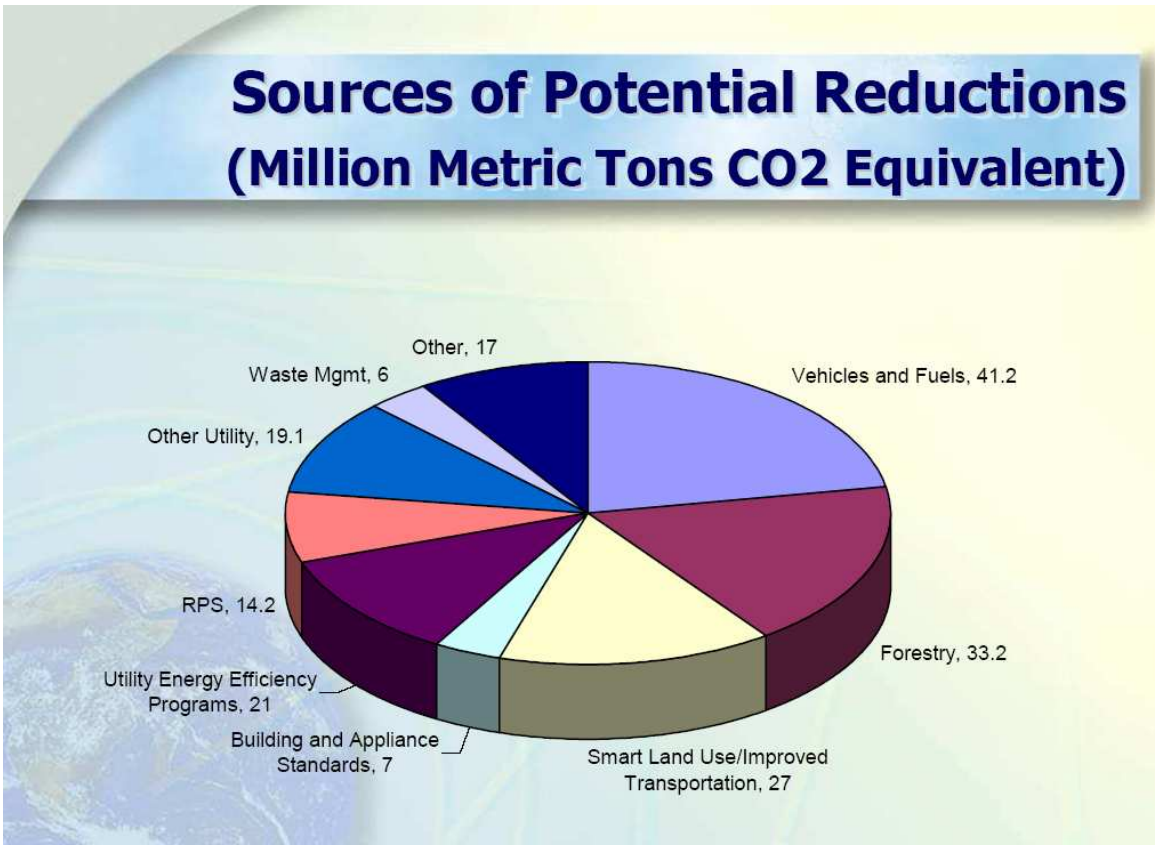


Figure 5. Potential Targets for Reductions.[44]

F.4. Addressing Climate Change

In the first week of May, 2007, over 100 countries meeting in Bangkok, Thailand as the International Panel on Climate Change (IPCC) issued a list of things the world could do to stabilize greenhouse gas emissions. They are as follows[45]:

1. Rethinking how energy infrastructure is designed and operated.
2. Mitigating transportation with vehicle efficiency, biofuels and shifting modes of travel.
3. Agricultural practices.
4. Waste management.
5. Creation of incentives for mitigating energy use (e.g. energy efficiency in both buildings and in appliance standards).

From the California Air Resources Board's work, we can also add

6. Smart land use and improved transportation.

[44] "AB 32: The California Global Warming Solutions Act of 2006", California Air Resources Board
[45] Press Democrat, May 14, 2007, page B-8.

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Appendix G. Creating a Community-Owned Utility Company

When developing electrical generation capacity, there comes a point when the energy produced exceeds the use at the local level. Also, certain forms of electrical generation produce energy only at certain times (like pumped storage hydroelectric, solar, wind, etc.). In order to balance the 'mix' so that electricity is available when the community needs it, being part of a larger grid consortium can be beneficial (e.g. they may be able to provide additional energy flowing into our grid when we need it and visa versa). This appendix presents information regarding Community-Owned Utilities and Community Choice Aggregations (CCAs), both of which are relevant in these considerations.

G.1. Forming Community-Owned Electric Utilities

Deborah Penn, Energy User News, 7/24/2002[46]

Cities Look to Power their Own Way

Communities and their citizens across the country are exercising their basic franchising authority to gain control over an essential local service-electricity. City officials are evaluating an option that has existed since the electricity industry began, a form of self-franchising that is an alternative to granting a franchise to an investor-owned utility. Through the creation of a community-owned electric utility, citizens achieve local control and with it greater stability in the price, reliability, and responsiveness of electric service.

Renewed Interest in Public Utilities

The interest in forming community-owned utilities, often called public power utilities, is greater now than it has been in several decades. In fact, last year more than 200 communities requested information on the public power option from the American Public Power Association (APPA). The California League of Cities estimated that at least two dozen communities in California were studying the public ownership alternative. If any of these communities succeed in taking over the ownership and operation of the local system, they will join approximately 2000 existing public power utilities that serve the electric power needs of 40 million Americans.

Local policymakers, concerned about the troublesome results of electricity restructuring, are looking to protect their citizens against the volatility and uncertainty of the electricity marketplace. They recognize that having local control over decisions regarding generation resources, electricity prices, and service policies may determine the economic health of their communities.

Cities considering municipalization have only to look at more than 2000 existing public systems to see what is possible. Commercial public power customers paid an average of

[46] http://www.energyusernews.com

6.9 cents per kilowatt-hour compared with 7.5 cents per kilowatt-hour paid by commercial customers of investor-owned utilities, according to year 2000 data from the U.S. Department of Energy's Energy Information Administration. Public power utilities provide reliable service in part because their employees are part of the local community. Emergency response by utility employees is subject to immediate and direct accountability by local officials. Also, community-owned electric utilities have control over the capital improvements they make to keep up their local distribution systems. Simply put, a public power utility exists to serve its consumer-owners and has no other geographic areas or missions to serve.

Until a few years ago most municipalization efforts were driven by customers who were dissatisfied with the investor-owned utility's electric rates and were drawn to public power's proven track record of providing lower-cost electricity. More recently, as investor-owned utilities merge and consolidate often-distant operations, communities are becoming frustrated with the closing of customer service centers, loss of personal contact, and a decline in local service responsiveness they once enjoyed. Communities are pursuing public ownership to ensure reliable, predictable, responsive service.

Public Power = Local Partnerships

Cities are learning how valuable these local publicly owned electric systems are in achieving a community's goals. A public power utility is part of the same public service community that deals co-operatively with public works projects, downtown renovation, service extension policies, energy-efficiency programs, and business development and industrial parks.

Local business and industry may join with cities in exploring the public power option as a means to reliable, affordable, clean, high-quality electric service. Given the increasingly heavy reliance on delicate computer systems for many aspects of business operations, customers are more concerned about reliability than ever before. Municipal electric systems work with these commercial and industrial customers to help boost power quality. They provide these business customers with the benefit of "one-stop shopping" for municipal services, including attention to concerns about the reliability and quality of power at the customers' sites. Also, the public power utility has the flexibility to work with local businesses to pursue creative options such as distributed resources, smaller-scale electric power resources typically located near the point of end use.

Although most communities look at public power as a catalyst for lower consumer bills or local economic development, other community goals are served as well. One community, Belleair, FL, a small town in the Tampa Bayarea, is trying to buy the existing poles and wires in town to improve the reliability and aesthetics of the local distribution system. Belleair Mayor George Mariani, Jr. says the town's exploration began in the early 1990s when Florida Power Corporation refused to provide citizens with sufficient value in a project to underground distribution lines. The city commission did not want citizens to pay $4.25 million for an underground system that would be

owned fully by the investor-owned utility. With the town's franchise grant to the investor-owned utility expiring in 10 years, they saw the opportunity to purchase the system instead.

Mayor Mariani says "an intermediate goal would be to systematically replace the decrepit and unreliable system with new under- ground utilities over a period of approximately 5 years." If Belleair owns the distribution system, he says, the town could "improve the reliability of the infrastructure, charge cheaper rates, improve property tax values by improving the aesthetics of the community, could make some contribution to the town's general operating funds or “all of the above."

City Options

In the new market environment, cities are evaluating many more options than just the renewal of their traditional franchise grants to investor-owned utilities. Feasibility studies typically show that acquiring the investor-owned utility's distribution facilities with full ownership and operation brings the greatest economic benefit to the community. But cities may work toward this goal of serving the entire community in stages. For example, the municipality may establish a partial system, then obtain a power supply contract or build or buy generation to serve municipal government facilities or specific business customers at a savings.

Corona, CA, is an example of a community that is pursuing numerous options simultaneously. Last year the city council established a municipally owned electric, natural gas, telephone, and telecommunications utility to serve the community of about 135,000 people. The council's actions authorized the city manager to take all necessary steps to create and establish a municipally owned utility to provide these services. According to George Hanson, the city's power utilities manager, the city is taking steps to help businesses within the community during this time of unpredictable price volatility in California.

The Corona City Council also approved the development of a power generation facility to be located at the city's wastewater treatment plant. The natural gas fueled combined-cycle cogeneration plant is expected to be between 10 and 23 MW and fully operational in late 2003 or early 2004. The power generation facility will be integrated with a biosolids handling operation. Heat from the generation process will be used to dry sludge and reduce the city's cost for treating sludge.

Forming the Public Utility

Communities typically begin the process of forming a municipal electric utility by conducting a preliminary feasibility study that examines the city's electric load growth, projects the cost of service from alternative wholesale power suppliers, and estimates the capital and operating costs of a new municipal utility. These costs are compared with the

projected cost of service from the incumbent utility. Such a study estimates a range of savings, identifies risks and benefits, and recommends a course of action. A preliminary review of legal issues should be done at this time to make sure there are no insurmountable legal impediments.

Follow-on studies evaluate and appraise the distribution facilities that serve the city and analyze the potential cost of acquisition and severance required by the incumbent utility. If the city and incumbent supplier do not succeed in arriving at a purchase price, the next step would be to either take over the system through condemnation or construct alternative duplicate facilities to serve the community. An election may be held to authorize the establishment of the municipal utility or to authorize revenue bonds to secure funds for the acquisition. Throughout the study and implementation process, citizens should be kept well informed about the city's goals and how well they are being met.

Establishing a municipal electric utility takes hard work and long-term community resolve. It means taking accountability for the community's future electric service. On the other hand, public power is a very pragmatic solution for communities, and the potential exists for significant continuing savings for the city, its residents, and businesses.

The community that pursues public ownership typically experiences immediate benefits just from studying the option. The incumbent utility may take steps to improve reliability or service responsiveness and may become more active in community affairs. Large customers in town may be offered special incentive rates tied to long-term contracts with the supplier. In some cities, the movement for public ownership does not result in the creation of a new utility, but the initiative is effective in gaining valuable concessions from the investor-owned utility for the city's consumers and taxpayers.

New Utilities

APPA collects data on public power utilities, including the number of systems formed from or sold to investor-owned utilities. Its data show that during the past 20 years, 48 publicly owned electric systems were created, 25 of them in communities served by investor-owned utilities. New public power systems include: Page (AZ) Electric; Lassen (CA) Municipal Utility District; Trinity County (CA) Public Utility District; Troy (MT) Light & Power; Long Island (NY) Power Authority (LIPA); Massena (NY) Electric Department; Clyde (OH) Light & Power; Emerald (OR) People's Utility District; the City of Hermiston, OR; Tarentum Borough, PA; and the City of Santa Clara, UT.

Public power's critics argue that creating a municipal utility is not a viable alternative because the formation process is so costly. The costliness they refer to, in general, is the litigation brought against the city by the incumbent investor-owned utility in an effort to prevent municipalization. These lawsuits, primarily intended to run the city out of money and political will, have been effective in stopping several dozen municipalization efforts. However, most public power initiatives were dropped only after the city won important

concessions from the incumbent utility, demonstrating that municipalization option is an important competitive force for communities. Today, many cities continue to work their way through the process with the ultimate goal of gaining control over local electric service.

Some Public Power Utilities

The largest of the new public power utilities, the Long Island Power Authority (LIPA) in New York, displaced the investor-owned Long Island Lighting Company (LILCO) nearly four years ago. LIPA provides electric service to about 1.1 million customers in Nassau and Suffolk counties and in the Rockaway Peninsula in Queens, NY. In May 1998, LIPA reduced electric rates across the board by an average of 20%, after it purchased LILCO's transmission and distribution system. Since that rate reduction, Long Island's electricity consumers have saved nearly $2 billion. In addition, LIPA has improved the system's safety and reliability program. It is also in the process of adding some 400 MW of new on-island generation and a new tie line to the mainland that will bring in about 330 MW from off-island resources.

LIPA's relationship with its business and industrial customers on Long Island is a priority for the new utility, and it takes an active role in business and civic organizations. LIPA's commitment to Long Island includes an emphasis on regional development through economic development incentives. It provides qualified businesses with the opportunity to obtain rate incentives and energy efficiency-audits. More than 300 companies have taken advantage of LIPA's economic development program, creating or retaining nearly 50,000 jobs.

LIPA offers many special services to retain and attract key industrial and commercial customers. The utility offers a Commercial Energy Analysis in which an LIPA energy expert examines existing equipment and analyzes the customer's potential energy savings. It then provides specific recommendations for energy saving measures and estimates the cost of projected annual savings. LIPA's Commercial Construction Program provides financial incentives to customers who agree to install energy-efficient equipment in buildings under construction or renovation. The program offers technical assistance to developers to facilitate the construction or renovation of buildings with an energy use performance that exceeds standard building practice.

Outlook for Forming Community-Owned Utilities

Public power initiatives are most likely to succeed when they have the strong support of local civic and business leaders and local citizens. In San Francisco, public power supporters were greatly heartened by the narrowness of their defeat last November. Although the telecommunications companies joined the incumbent investor-owned utility, Pacific Gas & Electric, in spending well over $1 million to fight the initiative, still public power lost by only 533 votes out of more than 129,000 cast. Tom Ammiano, the

president of the city's Board of Supervisors, said the results were still a win for public power. "Now public power is on the table in San Francisco," he said. Supporters may bring the issue to the voters again later this year.

A group of Florida cities have franchise agreements that give them the right to buy the incumbent's distribution system at the end of the franchise term. They have been taking the steps necessary to acquire utility properties and to set up municipal utilities. Belleair's right to do this has been challenged by Florida Power Corporation. However, a judge ruled recently that the franchise agreement is clear and unambiguous, and Belleair has the right to buy the investor-owned utility's poles, wires, and other equipment needed to create a community-owned utility. The judge ordered both sides to come to an agreement over the utility property's worth. Also, the judge ordered Florida Power Corporation to continue to supply power to Belleair citizens in the interim. The investor-owned utility must continue to collect the "pass through" franchise tax of 6% from ratepayers and pay it to the town for the use of public rights of way.

The public power evaluation has the strong support of the mayor in Belleair, FL. Mayor Mariani says that from the beginning the city's evaluation made several important assumptions: that citizens, who are ratepayers, would be considered the "stockholders" of the new enterprise and would pay less for electricity; that the town must earn a reasonable return on its investment; and that the risk evaluation must conclude that a return is a reasonable expectation. Mayor Mariani says the whole thing boiled down to a simple business decision and the town began its due diligence.

Public power utilities are providing their communities with stability and accountability at a time when the electricity industry is changing very rapidly. While critics charge that public power is an outmoded concept, the fundamental control that consumers have through their community-owned utilities is proving vital in face of the risks of the new electricity marketplace.

Deborah Penn is vice president, Information Services, American Public Power Association.

G.2. Northern California Power Authority

Don Dame of the Northern California Power Authority[47] spoke to the Willits Community June 20, 2005. The following are notes from his talk and from the questions posed by the Willits Community in attendance.

Who is the Northern California Power Authority?

The Northern California Power Agency (NCPA) is a public agency of the State of California and works as an independent power broker unaffiliated with investor-held

[47] www.ncpa.com

utility companies. The NCPA, as part of the Independent System Operators (ISO) can offer communities the ability to purchase blocks of electric power at discount, for distribution at the local level to community power customers. This electric power can additionally be specified as to its content (i.e. by percentage of renewable sources), making membership one way to achieve a higher 'green' energy content for the community. In effect, membership is the cooperative ownership of generation plants without (necessarily) the maintenance and power management issues. NCPA membership is open to municipalities, rural electric cooperatives, irrigation districts and other publicly owned entities.

Membership in the NCPA can be at many different levels

At the lowest level, membership allows the community to buy power they need without having to go through investor-owned utilities like PG&E. Under this scenario, the City of Willits simply negotiates contracts to purchase the power needed, then the City bills its customers. Under CPUC laws, the City may add a certain value to cover its expenses or to reinvest into expanding local power generation capacities.

At the highest level, membership allows communities that have their own power generation facilities to balance their 'mix' with other generation sources they do not own, thereby reaching the load needs of the community without having to become a wholly self-contained producer and utility.

At all levels, the NCPA ensures that power will be available to their member communities when they need it for the loads they have contracted.

NCPA Generation Plants Keep Rates Low

With wholesale energy prices higher than ever, NCPA's members found their jointly owned generation plants enable them to keep their rates low. And having generation resources provides assurance that retail rates will be competitive long into the future.

NCPA Membership is Diverse

NCPA Members include: The City of Ukiah (they own their transmission lines and have generation capacity), Healdsburg (does not have any generation capabilities), Redding, Biggs, Gridley, Lompoc, Roseville, Alameda, Palo Alto, Lodi, Santa Clara, BART, Port of Oakland, Placer County Water Agency, Lassen Municipal Utility District and several others.

The City of Willits may do well by contacting the City of Ukiah person that manages their utility to gage their feelings about the NCPA and the success of their program.

NCPA and Willits Community Considerations

Willits should not only consider becoming a Community-owned Public Utility, but also a member of the NCPA. Being a member of the NCPA would effect the formation of a Community-owned Public Utility at its very basic level: specifically the ability to buy blocks of power at a wholesale rate (negotiated to lock-in a long-term stable rate) to resell to the community. Ownership (and maintenance) of power lines, transformers, power generation facilities and the like would not be necessary at this level.

Once established as a NCPA member and Community-owned Public Utility, Willits could develop generation facilities with a cooperatively-owned pool behind them to sell into (and to offset their generation limitations such as time of day, etc.). Technically, at this stage, Willits would be moving into what is called a Community Choice Aggregation (or CCA for short). The CCA classification falls under California AB117 and is basically a descendent of the Direct Power construct that predated deregulation[48]. However, as a member of the NCPA, much of the problematic aspects (such as the price contract management and vulnerabilities) of being a CCA are mitigated.

As the Willits utility generation facilities grew, we could then examine disenfranchising PG&E by condemning PG&E's local facilities such as the power lines and transformers. This falls under Article 11 of California's regulations and would remove the PG&E charge that would have persisted to this point for power transmission. This would place complete control into the hands of the community and create additional local employment in the maintenance of such facilities.

NCPA Summary

The Northern California Power Agency is a public utility network that can offer advice on becoming a community-owned utility to whatever degree Willits may be interested (i.e. from buying blocks of power at a discount to complete ownership of local power generation and transmission facilities). Should the Community of Willits follow through in the goals towards becoming our own utility, membership in the NCPA could be seen as a way to mitigate costs and to help stabilize prices while developing power generation facilities of our own.

G.3. Legal Aspects

On December 16, 2004 the California Public Utilities Commission approved Administrative Law Judge Kim Malcolm's Proposed Decision in its Community Choice Aggregation proceeding, *making it legal for any California municipality or county to find*

[48] A CCA means the power is generated locally, that PG&E (or some other power entity) provides all no-electric supply functions such as billing, and that the CCA entity is at full risk of market fluctuations. In addition, all legal and professional needs and costs are borne by the CCA.

an alternative electricity provider for its community. San Francisco, Los Angeles County and San Diego County have completed studies on how to accelerated renewable energy and efficiency investments at twice the state mandated levels of green power in the electricity mix, ***reducing the exposure of residents and businesses in these municipalities to increasingly volatile fossil fuel prices - achieving massive greenhouse gas reductions --all without so much as a rate increase***. Go to www.local.org for more information.

The transition to a Community Choice Aggregation, to a community-owned utility, and perhaps the specification of the mix of power (i.e. 'green') will most likely require a referendum placed on the ballot for the community to approve.

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Appendix H. Inventory Raw Data and Sources

	A	C	D	E	F	G	H	I	K	L
1	**Mendocino County Collected Energy Statistics & Sources**									
2	Prepared by the 2007 Energy Working Group (EWG)									
3	rev: 03/09/07, bsc		Note:		= calculated from data in sheet (or pulled from one or more other cells)					
4										
5	Data Description	1980	1990	1992	2000	2002	2004	2005	Notes	Source
6	**General**									
7	Land Area				3,509				square miles	http://quickfacts.census.gov/qfd/states/06/06045.html
8	Persons/square mile				24.6					http://quickfacts.census.gov/qfd/states/06/06045.html
9	#degree days				3500-4000					The Passive Energy Solar Energy Book, Edward Mazria
10	Population		79,881	81,158	86,265	87,023	87,782	88,161	2005=official est	http://quickfacts.census.gov/qfd/states/06/06045.html
11	percentage pop. bet 18 and 65						62.60%			http://quickfacts.census.gov/qfd/states/06/06045.html
12										
13	Per-capita income				$19,443.00					http://quickfacts.census.gov/qfd/states/06/06045.html
14	Median household income					$35,091.84	$35,808.00		2003 data, 2002 based on 2% annual increase	http://quickfacts.census.gov/qfd/states/06/06045.html
15	Manufacturer's shipments ($1000)					784,344				http://quickfacts.census.gov/qfd/states/06/06045.html
16	Retail sales ($1000)					910,183				http://quickfacts.census.gov/qfd/states/06/06045.html
17										
18										
19	**Commuting**									
20	Mean work commute, age 16+ (minutes)				20.3				minutes	http://quickfacts.census.gov/qfd/states/06/06045.html
21	# commuting alone	17,419	24,479							http://countingcalifornia.cdlib.org; table LF920
22	# workers carpooling	3,058	4,595							http://countingcalifornia.cdlib.org; table LF930
23	Avg. #occupants/vehicle				1.1					http://www.dot.ca.gov/hq/tsip/otfa/mtab/Travel-Survey/2000_Household_Survey.pdf
24	#weekday trips / vehicle				4.6					http://www.dot.ca.gov/hq/tsip/otfa/mtab/Travel-Survey/2000_Household_Survey.pdf
25	Mean trip length (minutes)				20.6					http://www.dot.ca.gov/hq/tsip/otfa/mtab/Travel-Survey/2000_Household_Survey.pdf
26										
27										
28	**Housing**									
29	Occupied households				33,266					http://quickfacts.census.gov/qfd/states/06/06045.html
30	#persons/household				2.53					http://quickfacts.census.gov/qfd/states/06/06045.html
31										
32	Housing Units available				36,937	37,512	38,087			http://factfinder.census.gov/servlet/, DP-4, Profile of Selected Housing Characteristics: 2000
33										http://quickfacts.census.gov/qfd/states/06/06045.html
34	# 1-unit, detached				25,725					http://factfinder.census.gov/servlet/, DP-4, Profile of Selected Housing Characteristics: 2000
35	# 1-unit, attached				1,162					http://factfinder.census.gov/servlet/, DP-4, Profile of Selected Housing Characteristics: 2000
36	# 2-units				897					http://factfinder.census.gov/servlet/, DP-4, Profile of Selected Housing Characteristics: 2000
37	# 3 or more units				3,858					http://factfinder.census.gov/servlet/, DP-4, Profile of Selected Housing Characteristics: 2000
38	# mobile homes				4,909					http://factfinder.census.gov/servlet/, DP-4, Profile of Selected Housing Characteristics: 2000
39	# boat, RV, van, etc.				386					http://factfinder.census.gov/servlet/, DP-4, Profile of Selected Housing Characteristics: 2000
40										
41	Occupied households	23,046	28,391	28,845	33,266	34,241				http://factfinder.census.gov/servlet/, DP-4, Profile of Selected Housing Characteristics: 2000
42										
43	# w/no vehicles				2,612					http://factfinder.census.gov/servlet/, DP-4, Profile of Selected Housing Characteristics: 2000
44	# w/1 vehicle				11,614					http://factfinder.census.gov/servlet/, DP-4, Profile of Selected Housing Characteristics: 2000
45	# w/2 vehicles				12,458					http://factfinder.census.gov/servlet/, DP-4, Profile of Selected Housing Characteristics: 2000
46	# w/3 or more vehicles				6,582					http://factfinder.census.gov/servlet/, DP-4, Profile of Selected Housing Characteristics: 2000
47										
48	Avg. #vehicles/household				1.69					
49										
50	#heated by electricity	5,449	4,954	4,865	4,509				Generally only utility-connected homes	http://countingcalifornia.cdlib.org; table HS680
51										http://factfinder.census.gov/servlet/, DP-4, Profile of Selected Housing Characteristics: 2000
52	#heated by utility gas	6,851	8,547	9,017	10,895				Utility (Natural) gas only available in larger towns/cities)	http://countingcalifornia.cdlib.org; table HS671
53										http://factfinder.census.gov/servlet/, DP-4, Profile of Selected Housing Characteristics: 2000
54	#heated by bottled/tank/LP	2,803	3,267	3,933	6,596					http://countingcalifornia.cdlib.org; table HS672
55										http://factfinder.census.gov/servlet/, DP-4, Profile of Selected Housing Characteristics: 2000
56	#heated by fuel oil, kerosene, etc				2,139					http://factfinder.census.gov/servlet/, DP-4, Profile of Selected Housing Characteristics: 2000
57	#heated by wood	7,860	11,551	10,957	8,580	9,737				http://countingcalifornia.cdlib.org; table HS710
58										http://factfinder.census.gov/servlet/, DP-4, Profile of Selected Housing Characteristics: 2000
59	#heated by solar energy				77				Could be one or more of the following: hot water, passive, hot air, solar electric, hydronic (radiant). No indication of queries based on solar electric use by interviewees.	http://factfinder.census.gov/servlet/, DP-4, Profile of Selected Housing Characteristics: 2000
60	#heated by other fuel				388					http://factfinder.census.gov/servlet/, DP-4, Profile of Selected Housing Characteristics: 2000
61	# with no heating	83	72	74	82					http://countingcalifornia.cdlib.org; table HS720
62										http://factfinder.census.gov/servlet/, DP-4, Profile of Selected Housing Characteristics: 2000
63	Firewood usage (cords)						2.085		Apply to households listed as wood heating **ONLY**; ~35% use 1.5 cords, ~65% use 2.4 cords, secondary heating considerations not included	WELL Energy group research, based on data rcvd from Mendocino Air Quality Management District Office for 2003-2004
64										
65										
66	**Farms & Ranches**									
67	Number					1,184				http://www.nass.usda.gov; Selected by state-county
68	Acreage					707,466				http://www.nass.usda.gov; Selected by state-county
69	Avg. size, acres					598				http://www.nass.usda.gov; Selected by state-county
70	Cropland acreage					77,256				http://www.nass.usda.gov; Selected by state-county

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
71	#Cattle						20,024					http://www.nass.usda.gov; Selected by state-county														
72	#Pigs						892					http://www.nass.usda.gov; Selected by state-county														
73	#Sheep						9,418					http://www.nass.usda.gov; Selected by state-county														
74	#Chickens						4,451					http://www.nass.usda.gov; Selected by state-county														
75																										
76																										
77	**Mendocino County Utility Energy Deliveries**																									
78	#residential units					33,908						http://www.energy.ca.gov/electricity/electricity_by_county_2000.html														
79	MKWhr delivered					279						http://www.energy.ca.gov/electricity/electricity_by_county_2000.html														
80	#non-residential					7,112						http://www.energy.ca.gov/electricity/electricity_by_county_2000.html														
81	MKWhr delivered					383						http://www.energy.ca.gov/electricity/electricity_by_county_2000.html														
82																										
83	Residential Elect deliveries (MKWhr)			248,238	243,215	269,098	260,768					Andrea Gough, California Energy Commission, 1516 9th Street, MS-22, Sacramento, CA 95814, ph 916.654.4928 fax 916.654.4901, email agough@energy.state.ca.us														
84	Commercial Elect deliveries (MKWhr)			152,298	152,301	184,289	186,366					Andrea Gough, California Energy Commission, 1516 9th Street, MS-22, Sacramento, CA 95814, ph 916.654.4928 fax 916.654.4901, email agough@energy.state.ca.us														
85	Industrial Elect deliveries (MKWhr)			155,722	139,510	140,230	136,818					Andrea Gough, California Energy Commission, 1516 9th Street, MS-22, Sacramento, CA 95814, ph 916.654.4928 fax 916.654.4901, email agough@energy.state.ca.us														
86	Ag & Water pumping Elect deliv (MKWhr)			13,751	13,681	14,906	14,565					Andrea Gough, California Energy Commission, 1516 9th Street, MS-22, Sacramento, CA 95814, ph 916.654.4928 fax 916.654.4901, email agough@energy.state.ca.us														
87	TCU Elect deliveries (MKWhr)			9,876	10,395	13,878	13,816				TCU: Transp., Communic. and Utils (govt) [airports, seaports, post offices, sewar, streetlights, telephones, TV, military]	Andrea Gough, California Energy Commission, 1516 9th Street, MS-22, Sacramento, CA 95814, ph 916.654.4928 fax 916.654.4901, email agough@energy.state.ca.us														
88																										
89	Residential NatGas deliveries (MT)			5,846	5,836	6,903	6,300					Andrea Gough, California Energy Commission, 1516 9th Street, MS-22, Sacramento, CA 95814, ph 916.654.4928 fax 916.654.4901, email agough@energy.state.ca.us														
90	Commercial NatGas deliveries (MT)			3,068	2,959	3,768	3,651					Andrea Gough, California Energy Commission, 1516 9th Street, MS-22, Sacramento, CA 95814, ph 916.654.4928 fax 916.654.4901, email agough@energy.state.ca.us														
91	Industrial NatGas deliveries (MT)			8,831	10,017	9,263	7,839					Andrea Gough, California Energy Commission, 1516 9th Street, MS-22, Sacramento, CA 95814, ph 916.654.4928 fax 916.654.4901, email agough@energy.state.ca.us														
92	Ag & Water pumping NatGas deliv (MT)			0.044	0.010	0.009	0.010					Andrea Gough, California Energy Commission, 1516 9th Street, MS-22, Sacramento, CA 95814, ph 916.654.4928 fax 916.654.4901, email agough@energy.state.ca.us														
93	TCU NatGas deliveries (MT)			0.061	0.047	0.054	0.052					Andrea Gough, California Energy Commission, 1516 9th Street, MS-22, Sacramento, CA 95814, ph 916.654.4928 fax 916.654.4901, email agough@energy.state.ca.us														
94																										
95																										
96	**Daily Vehicle Traffic**		Total Vehicle	Trucks	2 axle	3 axle	4 axle	5+ axle			Generally 2005 verified data	http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
97	Rte1 @ Fishrock Rd dir A (mp 5.09)		2,000	100	51	25	6	18				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
98	Rte1 @ Fishrock Rd dir B		2,500	113	71	24	0	18				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
99	Rte1 @ Rte 128 dir A (mp 40.273)		3,200	220	80	50	20	70				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
100	Rte1 @ Rte 128 dir B		1,200	136	55	32	11	38				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
101	Rte1 @ Rte20 dir A (mp 59.803)		24,000	710	430	140	40	100				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
102	Rte1 @ Rte20 dir B		18,500	831	601	100	30	100				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
103	Rte1 @ Rte211 (mp 90.874)		890	135	40	20	15	60				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
104	Rte1 @ Hywy101, Leggett (mp 105.578)		900	135	40	20	15	60				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
105	Hywy101 @ Hopland/175 dir A (mp 10.89)		14,600	1,256	333	173	114	636				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
106	Hywy101 @ Hopland/175 dir B		14,700	1,308	356	171	112	668				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
107	Hywy101 @ Rte253 (mp 21.59)		17,500	2,478	1,160	295	179	844				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
108	Hywy101 @ Rte222E (mp 23.45)		19,900	2,374	1,131	283	151	808				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
109	Hywy101 @ Rte20E dir A (mp 30.833)		21,000	1,867	1,231	170	95	371				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
110	Hywy101 @ Rte20E dir B		22,000	2,405	1,224	215	107	859				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
111	Hywy101 @ Rte20W dir A (mp 46.363)		22,500	1,242	273	192	131	646				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
112	Hywy101 @ Rte20W dir B		19,800	1,859	703	302	151	703				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
113	Hywy101 @ Rte162E dir A (mp 59.308)		5,900	1,139	254	203	132	549				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
114	Hywy101 @ Rte162E dir B		6,800	1,154	258	206	134	556				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
115	Hywy101 @ Branscomb Rd dir A (mp 69.49)		5,900	1,002	224	178	102	498			This looks fishy but double checked!	http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
116	Hywy101 @ Branscomb Rd dir B		6,000	1,139	254	203	132	549				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
117	Hywy101 @ Rte1, Leggett (mp 91.245)		5,900	1,002	224	178	102	498			This looks fishy but double checked!	http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
118	Hywy101 @ Rte271 (mp103.818)		5,900	1,002	224	178	102	498			This looks fishy but double checked!	http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
119	Rte128 @ Rte253E dir A (mp 29.576)		2,300	315	123	70	25	98				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
120	Rte128 @ Rte253E dir B		4,800	315	125	70	20	100				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
121	Rte128 @ Hywy101 (C'dale) N (mp 4.86)		2,350	200	99	40	0	61				http://traffic-counts.dot.ca.gov/ADA%20format/truck2005final.doc														
122																										
123																										
124	**Vehicle Stats**																									
125	Mileage of County Maintained Roads			2,066	2,031	1,891	1,856					1991: http://ntl.bts.gov/DOCS/472.html														
126												2002: www.dof.ca.gov; California Statistical Abstract, 2002;														
127	#Automobiles registered			46,851	47,672	50,958	51,779					www.dof.ca.gov; California Statistical Abstract, 2002														
128	#Trucks (commercial) registered			26,453	26,965	29,011	29,522					1991: http://ntl.bts.gov/DOCS/472.html														
129												2002: www.dof.ca.gov; California Statistical Abstract, 2002														
130	#Motorcycles registered			2,815	2,720	2,338	2,242					www.dof.ca.gov; California Statistical Abstract, 2002														
131																										
132	#private vehicles					56,276																				
133																										
134	Vehicle miles of travel (millions)			619								http://ntl.bts.gov/DOCS/472.html; CALTRANS Travel and Related Factors in California, 1991														
135	Daily vehicle miles traveled, per-capita		17.5	21.0	21.0	23.5	25.5	26.5	28.0			Particulate Matter Attainment Plan, 12/2004, App. B, Mendocino County Air Quality Management District														
136	Avg. fuel economy, pers. Vehicles (mpg)								20.7			http://www.ncseonline.org/NLE/CRSreports/air/air-10.cfm														
137	Avg. fuel economy, delivery vans & trucks								7.8			http://www.eere.energy.gov/vehiclesandfuels/pdfs/deer_2004/session6/2004_deer_kodjak.pdf														
138																										
139																										
140	**County Energy Use**									*1.234056*	*MendoCo. use adjustment factor; employs known county gasoline consumption and the ratio of county to state population.*														
141	Gasoline (Kgallons)			42,471.8	43,276.8	44,027.2	47,754.9				Gov't estimated (reporting not reqd)	http://ntl.bts.gov/DOCS/472.html; CALTRANS Travel and Related Factors in California, 1991														
142	Diesel (Kgallons)			6,013.9	6,015.5	8,404.8	8,318.2				Kgallons = 1000 gallons															
143	Propane (Kgallons)			2,775.0	2,891.3	1,651.1	1,899.0																			
144	Kerosene (Kgallons)			20.1	10.3	48.7	33.3																			
145	Heating Oil (Kgallons)			31.3	27.5	20.3	16.1																			
146	Electricity (MKWhr)			579.9	559.1	622.4	612.3																			
147	Natural Gas (MT)			17.9	18.9	20.0	17.9																			
148	Firewood (cords)			24,083.8	22,844.9	17,889.3	20,301.5																			
149																										
150																										

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
151	**County Per-Capita Energy Use**																								
152	Gasoline, motor (gallons)			531.69	533.24	510.37	548.76																		
153	Diesel (gallons)			75.29	74.12	97.43	95.59																		
154	Propane (gallons)			34.74	35.63	19.14	21.82																		
155	Kerosene (gallons)			0.25	0.13	0.56	0.38																		
156	Heating oil (gallons)			0.39	0.34	0.24	0.18																		
157	Electricity (KWhr)			7,259.36	6,889.07	7,214.99	7,036.42																		
158	Natural Gas (T)			223.46	232.50	231.81	205.14																		
159	Firewood (cords)			0.30	0.28	0.21	0.23																		
160																									
161																									
162	**Calif. Per-capita Energy Use**										**California-wide**														
163	State population		23,782,000	29,828,000	30,680,000	34,088,000	34,905,600	35,723,200	36,132,000			www.dof.ca.gov; California Statistical Abstract, 2002													
164	Mendocino % of State pop.			0.26781%	0.26453%	0.25307%	0.24931%	0.24573%	0.24400%			http://quickfacts.census.gov/qfd/states/06/06045.html													
165	Coal (million BTU)							2.28			2003 data	http://www.eia.doe.gov/emeu/states/sep_sum/plain_html/rank_use_per_cap.html													
166	Natural Gas (million BTU)							74.38			"	http://www.eia.doe.gov/emeu/states/sep_sum/plain_html/rank_use_per_cap.html													
167	Petroleum, all forms (million BTU)							125.91			"	http://www.eia.doe.gov/emeu/states/sep_sum/plain_html/rank_use_per_cap.html													
168	Electricity (million BTU)							26.73			"	http://www.eia.doe.gov/emeu/states/sep_sum/plain_html/rank_use_per_cap.html													
169																									
170	Gasoline (gallons)							414.4			2004 data	http://www.energy.ca.gov/gasoline/statistics/gasoline_per_capita.html													
171	Electricity (KWhr)							6,732			2003 data	http://www.energy.ca.gov/electricity/us_percapita_electricity_2003.html													
172																									
173																									
174	**Calif. Petro. Product Sales/Consum.**										**Califonia-Wide**														
175	Gasoline for transportation (Kbarrels)			305,983	315,643	335,663	369,567	352,469			1999 data	http://www.ifaucett.com/caltransenergy/body.htm													
176	Diesel for transportation (Kbarrels)			43,327	43,874	64,078	64,373	67,716	70,662.5		1999 data	http://www.ifaucett.com/caltransenergy/body.htm													
177																									
178	Residential Distillate Fuel oil (Kbarrels)			225.4	200.6	154.9	124.3	130.2	161.9			http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
179	Residential Kerosene (Kbarrels)			298.3	32.5	280.7	216.4	276.3	303.5			http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
180	Comm. Distillate (Kbarrels)			4,576.9	4,447.3	1,994.4	1,854.8	1,520.1	2,046.5		Distillate includes diesel fuel	http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
181	Comm. Resid. Fuel oil (Kbarrels)			825.4	43.1	0.5	0.0	0.0	0.0			http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
182	Comm. Kerosene (Kbarrels)			62.9	19.9	52.2	27.3	71.8	58.7			http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
183	Industrial Distillate (Kbarrels)			4,689.2	1,385.5	1,036.9	1,030.0	1,212.5	1,244.9			http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
184	Industrial Resid. Fuel oil (Kbarrels)			1,268.8	1,403.8	113.0	51.1	13.9	11.0			http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
185	Industrial Kerosene (Kbarrels)			79.7	14.0	18.8	7.3	30.7	30.4			http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
186	Farm Distillate (Kbarrels)			8,538.1	6,450.5	5,851.6	7,064.4	7,364.3	7,861.6		Distillate includes diesel fuel	http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
187	Farm Kerosene (Kbarrels)			39.6	5.5	15.3	6.8	11.6	11.2			http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
188	Electric Util Distillate (Kbarrels)			137.1	142.2	270.6	173.2	148.4	136.8			http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
189	Electric Util Resid. Fuel oil (Kbarrels)			15,964.5	1.7	34.6	16.7	0.0	0.0			http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
190	Oil Co Distillate (Kbarrels)			543.7	291.6	143.8	247.4	275.9	246.8			http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
191	Oil Co Resid. Fuel oil (Kbarrels)			450.3	501.6	0.0	137.0	0.0	0.0			http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
192	Transp Distillate (Kbarrels)			52,850.6	50,534.0	69,363.3	71,531.4	75,487.8	81,446.5		rail, vessel, highway	http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
193	*--Transp. Distillate, highway only (Kbar)*			*43,326.6*	*43,874.4*	*62,684.8*	*64,373.3*	*67,716.3*	*70,662.5*																
194	Transp Resid. Fuel oil (Kbarrels)			50,702.7	32,578.9	35,184.0	32,332.7	27,649.6	33,627.7			http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
195	Military Distillate (Kbarrels)			5,425.1	3,324.5	166.5	1,131.9	1,266.6	230.0			http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
196	Military Resid. Fuel oil (Kbarrels)			0.0	22.3	0.0	0.0	0.0	12.8			http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
197	Off-highway Distillate (Kbarrels)			5,320.7	2,977.5	4,973.2	4,059.9	4,142.6	4,402.6			http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
198	All other Distillate (Kbarrels)			0.0	0.2	0.0	0.0	0.0	0.0			http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
199	All other Resid. Fuel oil (Kbarrels)			0.0	2.2	0.0	17.3	0.0	0.0			http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
200	All other Kerosene (Kbarrels)			9.7	3.0	4.0	0.7	0.4	0.4			http://tonto.eia.doe.gov/dnav/pet/pet_cons_821usea_dcu_SCA_a.htm													
201																									
202																									
203	**California Energy Sales/Consum.**																								
204	LPG (Kbarrels)		19,917	19,992	21,088	12,588	14,696				generally propane but also ethane, butane, etc.	http://www.eia.doe.gov/emeu/states/sep_use/total/use_tot_ca.html													
205	Gasoline, motor (Kbarrels)		253,593	305,983	315,643	342,890	369,567					http://www.eia.doe.gov/emeu/states/sep_use/total/use_tot_ca.html													
206	Gasoline, aviation (Kbarrels)		285	1,106	1,059	723	599					http://www.eia.doe.gov/emeu/states/sep_use/total/use_tot_ca.html													
207	Kerosene (Kbarrels)		2,117	145	75	371	258					http://www.eia.doe.gov/emeu/states/sep_use/total/use_tot_ca.html													
208	Kerosene, jet fuel (Kbarrels)		63,201	94,907	86,688	103,001	102,756					http://www.eia.doe.gov/emeu/states/sep_use/total/use_tot_ca.html													
209	Distillate fuel oil (Kbarrels)		62,277	77,233	69,190	93,456	89,580				Distillate includes diesel fuel	http://www.eia.doe.gov/emeu/states/sep_use/total/use_tot_ca.html													
210	Residual fuel oil (Kbarrels)		148,701	64,095	34,315	33,734	30,768					http://www.eia.doe.gov/emeu/states/sep_use/total/use_tot_ca.html													
211	Lubricants (Kbarrels)		4,907	5,024	4,583	5,120	4,636					http://www.eia.doe.gov/emeu/states/sep_use/total/use_tot_ca.html													
212	Asphault & road oil (Kbarrels)		18,431	14,862	13,558	20,359	17,856					http://www.eia.doe.gov/emeu/states/sep_use/total/use_tot_ca.html													
213	Natural gas (Bft3)		1,808	2,036	2,229	2,509	2,273				Bft3=billion cubic feet	http://www.eia.doe.gov/emeu/states/sep_use/total/use_tot_ca.html													
214	Coal (TST)		2,669	3,809	4,062	2,954	2,943				TST=thousand short tons, 1 short ton = 2000lbs	http://www.eia.doe.gov/emeu/states/sep_use/total/use_tot_ca.html													
215											Barrel = 42 gallons; Kbarrel = 42000 gallons														
216																									
217	**California Energy Cost**																								
218	LPG (per MBTU)		$6.09	$10.55	$11.09	$14.28	$13.85				MBTU=million BTUs	http://www.eia.doe.gov/emeu/states/sep_prices/total/pr_tot_ca.html													
219	Gasoline, motor (per MBTU)		$10.19	$8.57	$9.19	$12.63	$11.19					http://www.eia.doe.gov/emeu/states/sep_prices/total/pr_tot_ca.html													
220	Kerosene, jet fuel (per MBTU)		$6.21	$5.76	$4.53	$6.91	$5.40					http://www.eia.doe.gov/emeu/states/sep_prices/total/pr_tot_ca.html													
221	Distillate fuel oil (per MBTU)		$6.62	$7.50	$7.58	$10.48	$9.25				Distillate includes diesel fuel	http://www.eia.doe.gov/emeu/states/sep_prices/total/pr_tot_ca.html													
222	Resid. Fuel oil (per MBTU)		$4.49	$3.66	$1.86	$6.24	$5.78					http://www.eia.doe.gov/emeu/states/sep_prices/total/pr_tot_ca.html													
223	Natural gas (per MBTU)		$3.54	$4.20	$3.97	$6.54	$5.21					http://www.eia.doe.gov/emeu/states/sep_prices/total/pr_tot_ca.html													
224	Coal (per MBTU)		$1.82	$1.89	$1.67	$1.57	$1.71					http://www.eia.doe.gov/emeu/states/sep_prices/total/pr_tot_ca.html													
225	Biomass (per MBTU)		$2.74	$1.38	$1.30	$2.14	$2.31					http://www.eia.doe.gov/emeu/states/sep_prices/total/pr_tot_ca.html													
226	Electricity, retail (per MBTU)		$17.16	$25.98	$28.38	$27.81	$36.67					http://www.eia.doe.gov/emeu/states/sep_prices/total/pr_tot_ca.html													
227																									
228																									
229	**Local Business Surveys**																								
230	*Generator Sales*																								

	A	I	K	L
231	Avg. generator size sold for off-grid (KW)	5	range: 1.2KW to 50KW+; 3KW = ~6.5Hp, 10KW = ~18Hp engines	Willits Power, Michael, 1/4/07
232	Power (Hp) for average gen. size used	10	author extrapolated from above	
233	Dominate generator use:	gen-only	Choices: gen-only, gen+batteries, gen+batteries+solar/wind/hydro	
234	Avg. annual generator hours	3000	Generator-only use method	
235	For avg. size gen., fuel economy =	~1	in gal/hr. Fuel used in order of popularity: 1. gasoline, 2. diesel, 3. propane	
236				
237	Solar Sales			
238	Estimate of #homes solarized, off-grid	5000+	author estimates 150-300	Advance Solar (Calpella), Pete, 1/4/07
239	Avg. size (KW)	5	author estimates closer to 1.5KW	
240	Estimate of #homes solarized, on-grid	250+	author estimates 250-500	
241	Avg. size (KW)	10	author estimates closer to 5KW based on avg daily household consumption of ~20KW	
242	% off-grid using generator backup	100	author estimates 90%	
243	Size of off-grid backup generator (KW)	5	Typically 2x installed solar capacity	
244	Size of off-grid battery bank (AmpHr)	1000	@24VDC, for 24KW stored capacity; author estimates 800AmpHr based on trade offerings and revised off-grid array size noted above.	
245	Avg. annual off-grid generator hours	150	est. by author, based on professional solar design practices	
246				
247				
248	**California Util. Electricity Mix**	77.65%	percent in-state production, 2003	http://www.energy.ca.gov/html/energysources.html
249	Natural gas	33.39%		http://www.energy.ca.gov/html/energysources.html
250	Nuclear	12.87%		http://www.energy.ca.gov/html/energysources.html
251	Large Hydro	11.17%		http://www.energy.ca.gov/html/energysources.html
252	Coal	9.84%		http://www.energy.ca.gov/html/energysources.html
253	Renewables	10.39%		http://www.energy.ca.gov/html/energysources.html
254				
255	**Pacific Gas & Electric (PG&E) Electricity Mix**			http://www.pgecorp.com/corp_responsibility/reports/2005/our_env_clean_energy.html
256	Natural gas	43.0%	see note under coal component	http://www.climateregistry.org/CarrotDocs/19/2005/2005_PUP_Report_V2_Rev1_PGE_rev2_Dec_1.xls
257	Nuclear	22.9%		http://www.climateregistry.org/CarrotDocs/19/2005/2005_PUP_Report_V2_Rev1_PGE_rev2_Dec_1.xls
258	Renewables (hydro, geo, bio, solar, wind)	32.6%	lg hydro=20%, other hydro=4%, geo=2.2%, bio=4.2%, wind=1.2%, solar<0.12% (approx re. both sources)	http://www.climateregistry.org/CarrotDocs/19/2005/2005_PUP_Report_V2_Rev1_PGE_rev2_Dec_1.xls
259	Coal	1.5%	suspect higher based on filed emissions report (nat gas & coal grouped, 44.5% of mix)	http://www.climateregistry.org/CarrotDocs/19/2005/2005_PUP_Report_V2_Rev1_PGE_rev2_Dec_1.xls
260				
261				
262	**Other GHG Issues**			
263	Total wine grape production (tons)	60,000		http://www.findarticles.com/p/articles/mi_m3488/is_7_86/ai_n14817279
264	Wine per ton wine grapes (gallons)	175.0		Louis Foppiano, Foppiano Vineyards, Healdsburg, CA
265	CO2 per 1000 gallons of wine (lbs)	980.0		Author; Chemical equations / calcs available upon request
266	CO2 from Wine, County Total (tons/year)	5,145.0		
267				
268	Concrete usage, per-capita (yd3)		1m3 per-capita, 250kg CO2 per-capita, world-wide	Elias Gartner "Industrially Interesting Approaches to Low CO2 Cements", Cement & Concrete Construction #34 (2004; 1489-98
269	Cement per yd3 concrete (lbs)		Concrete typically 5-6 sack formulation, 1 sack=94lbs portland -10% portland as replaced on avg. by fly ash. (1yd3=~4000lbs)	
270	CO2 per ton of cement produced (tons)			World Resource Institute
271	CO2 from Concrete, County Total (tons/year)			
272				
273	Landfill waste, per-capita (lbs/day)		Recycled portion removed	Opportunities for Small Biomass Power Systems; Schmidt, Pinapati; Energy & Environmental Research Center, Univ. of North Dakota
274	Landfill waste, county-wide (tons/year)			
275	CH4 per-capita, landfill waste (lbs/year)		Tons CH4 = Tons municipal solid waste landfilled x .22 [% degradable org. carbon] x 0.77 [% dissimilated] x 0.67 [pounds of CH4/ per pound biogas]	http://dnr.state.il.us/orep/inrin/eq/gasinv/invil2.htm
276	CO2 per-capita, landfill waste (lbs/year)		Tons CO2 = Tons CH4 x 44/16; no methane flaring or recovery known in county	http://dnr.state.il.us/orep/inrin/eq/gasinv/invil2.htm
277	CO2 from landfill waste, County Total (tons/year)			
278				
279	Sewage sludge, per-capita (lbs/day)			Opportunities for Small Biomass Power Systems; Schmidt, Pinapati; Energy & Environmental Research Center, Univ. of North Dakota
280	CH4 per-capita, sewage treatment (lbs/year)		0.6lb CH4 per lb waste, 16.25% anaerobically treated, no methane recovery known in county	Inventory of US GHG Emissions and Sinks: 1990-2004; April 2006, EPA; http://epa.gov/climatechange/emissions/usinventoryreport.html
281				
282	CH4 per cow (lbs/year)		beef: 61.5 kg/head/year; Dairy: 125.8 kg/head/year;; 75kg used as dairy cattle unreported in mix	http://www.tufts.edu/tie/tci/pdf/Tufts%20Emissions%20inventory.pdf
283	CH4 per sheep (lbs/year)		8 kg/head/year	http://www.tufts.edu/tie/tci/pdf/Tufts%20Emissions%20inventory.pdf
284	CH4 from Ruminants, County Total (lbs/year)			
285				
286	CH4 per Kgallon gasoline (lbs)		0.8g CH4 / kg of gasoline; (1 gal =~3.6kg)	http://tontp.eia.doe.gov/FTPROOT/international/edexfiles/photh.ppt
287	CH4 per Kgallon distillate fuel (lbs)		0.17g / kg of diesel	http://tontp.eia.doe.gov/FTPROOT/international/edexfiles/photh.ppt
288	CH4 per Kgallon kerosene (lbs)		0.087g / kg of jet fuel (kerosene)	http://tontp.eia.doe.gov/FTPROOT/international/edexfiles/photh.ppt
289				
290	CH4 per ton biomass burned (lbs)		includes wood burning, 9g/kg	Energy for Sustainable Development; Volume No. 4; November 1994

	A	F	G	H
231	Avg. generator size sold for off-grid (KW)			
232	Power (Hp) for average gen. size used			
233	Dominate generator use:			
234	Avg. annual generator hours			
235	For avg. size gen., fuel economy =			
236				
237	Solar Sales			
238	Estimate of #homes solarized, off-grid			
239	Avg. size (KW)			
240	Estimate of #homes solarized, on-grid			
241	Avg. size (KW)			
242	% off-grid using generator backup			
243	Size of off-grid backup generator (KW)			
244	Size of off-grid battery bank (AmpHr)			
245	Avg. annual off-grid generator hours			
246				
247				
248	**California Util. Electricity Mix**			77.65%
249	Natural gas			33.39%
250	Nuclear			12.87%
251	Large Hydro			11.17%
252	Coal			9.84%
253	Renewables			10.39%
254				
255	**Pacific Gas & Electric (PG&E) Electricity Mix**			
256	Natural gas			
257	Nuclear			
258	Renewables (hydro, geo, bio, solar, wind)			
259	Coal			
260				
261				
262	**Other GHG Issues**			
263	Total wine grape production (tons)			
264	Wine per ton wine grapes (gallons)			
265	CO2 per 1000 gallons of wine (lbs)			
266	CO2 from Wine, County Total (tons/year)			
267				
268	Concrete usage, per-capita (yd3)		1.20	
269	Cement per yd3 concrete (lbs)		465.0	
270	CO2 per ton of cement produced (tons)		1.0	
271	CO2 from Concrete, County Total (tons/year)		24,279.5	
272				
273	Landfill waste, per-capita (lbs/day)	2.86		
274	Landfill waste, county-wide (tons/year)	45,073.25		
275	CH4 per-capita, landfill waste (lbs/year)	118.6		
276	CO2 per-capita, landfill waste (lbs/year)	326.2		
277	CO2 from landfill waste, County Total (tons/year)	14,068.2		
278				
279	Sewage sludge, per-capita (lbs/day)	0.25		
280	CH4 per-capita, sewage treatment (lbs/year)	8.9		
281				
282	CH4 per cow (lbs/year)		165.0	
283	CH4 per sheep (lbs/year)		17.6	
284	CH4 from Ruminants, County Total (lbs/year)		3,469,716.80	
285				
286	CH4 per Kgallon gasoline (lbs)	6.3		
287	CH4 per Kgallon distillate fuel (lbs)	1.3		
288	CH4 per Kgallon kerosene (lbs)	0.7		
289				
290	CH4 per ton biomass burned (lbs)	18.02		

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
291	CH4 per KCords wood burned (lbs)					22,527.03																				
292																										
293	CH4 per Kgallon heating oil burned (lbs)					1.80						"A Lifecycle Emissions Model..."; Delucchi; Inst. Of Transportation Studies, UC Davis; 2003													
294																										
295	CH4 per Kgallon propane (LPG) burned (lbs)					0.20						"A Lifecycle Emissions Model..."; Delucchi; Inst. Of Transportation Studies, UC Davis; 2003													
296																										
297	CH4 per MSCF Natural Gas burned (lbs)					2.30						"A Lifecycle Emissions Model..."; Delucchi; Inst. Of Transportation Studies, UC Davis; 2003													
298	CH4 per MT Natural Gas burned (lbs)					223.95																				
299																										
300	CH4 per MWhr electricity produced (lbs)					0.0067						Updated State Level GHG Emissions for Elect. Gen.; EIA; 2002; Approx same figures derived for PG&E production (see EWG email 3/01/2007)													
301																										
302	CO2 equivalent of CH4 (factor)					21																				
303																										
304																										
305	**Energy Characteristics**		Energy (BTUs/unit)		CO2 Released																					
306	Natural Gas		1,027	BTU/ft3	0.1164	lbs/ft3	5,667.0	tons/MT				http://www.rmi.org/sitepages/pid343.php														
307	Heating Oil		138,700	BTU/gal	22.38	lbs/gal	11.2	tons/KGallon				http://www.rmi.org/sitepages/pid343.php														
308	Propane		91,333	BTU/gal	12.67	lbs/gal	6.3	tons/KGallon				http://www.rmi.org/sitepages/pid343.php														
309	Electricity		10,346	BTU/KWhr	0.61	lbs/KWhr	305.0	tons/MKWhr				http://www.rmi.org/sitepages/pid343.php														
310												Elect. emissions: Updated State Level GHG Emissions for Elect. Gen.; EIA; 2002; Approx same figures derived for PG&E production (see EWG email 3/01/2007)														
311	Wood, dry		5,650	BTU/lb	1	lbs/lb	1,250.0	tons/Kcord			Wood stove, slow burn, wood@20% moisture. Note that CO2 figures of 1.62 lbs/unit have been noted (20% stove efficiency)	www.OMNI-Test.com; wood stove emissions														
312												http://www.whrc.org/policy/COP/India/Smith_1994.pdf														
313																										
314	**Fuel Potentials (Obtainable)**																									
315	Gasoline	111,000	BTU/gallon									http://www.rmi.org; Rocky Mountain Institute														
316	Biodiesel	119,000	BTU/gallon									http://www.rmi.org; Rocky Mountain Institute														
317	Wood, dry	5,650	BTU/lb	14,000,000	BTU/cord	1 cord ~=	2500	lbs, or	128	ft3		The Passive Energy Solar Energy Book, Edward Mazria														
318	Propane	800	BTU/ft3	30,000	BTU/gallon	1 gal. liquid=	36.3	ft3 gas @ sea level				The Passive Energy Solar Energy Book, Edward Mazria														
319	Natural gas	780	BTU/ft3									The Passive Energy Solar Energy Book, Edward Mazria														
320	Kerosene	97,300	BTU/gallon									The Passive Energy Solar Energy Book, Edward Mazria														
321	Diesel	94,000	BTU/gallon	Also, heating oil (approximately)								The Passive Energy Solar Energy Book, Edward Mazria														
322	Electricity (resistance heating)	3,413	BTU/KWhr									The Passive Energy Solar Energy Book, Edward Mazria														
323	Solar	150	BTU/hr	800	W/m2 (approx.)	typical solar insolation						The Passive Energy Solar Energy Book, Edward Mazria														
324	Coal, (~avg anthracite, bituminous)	8,000	BTU/lb									The Passive Energy Solar Energy Book, Edward Mazria														
325																										
326																										
327	**Transportation Fuel Emissions**																									
328	Hydrocarbons (CxHy)		0.15	lbs/gallon								http://www.rmi.org; Rocky Mountain Institute														
329	Carbon Monoxide (CO)		1.1	lbs/gallon								http://www.rmi.org; Rocky Mountain Institute														
330	Carbon Dioxide (CO2)		19.8	lbs/gallon	9.9	tons/KGallon						http://www.rmi.org; Rocky Mountain Institute														
331	Nitrous Oxides (NOx)		0.07	lbs/gallon								http://www.rmi.org; Rocky Mountain Institute														
332	Benzene		0.004	lbs/gallon								http://www.rmi.org; Rocky Mountain Institute														
333																										
334																										
335	**Conversion Formulas**																									
336	1 KWhr =	3,414.3	BTU (British Thermal Units)																							
337	1 MWhr =	3.4143E+06	BTU	34.143	Therms																					
338	1 MKWhr =	3.4143E+09	BTU	34,143	Therms																					
339	1 Therm =	100,000	BTU	0.0293	MWhr																					
340	1 MTherm (MT) =	1.0E+11	BTU																							
341	1 MBTU =	1.0E+05	MT	0.0003	MKWhr																					
342	1 Horsepower (Hp) =	0.746	KiloWatts																							
343	1 (short) Ton =	2000	lbs (pounds)		long ton =	2240	metric ton =	2204.6	lbs (pounds)																	
344																										
345																										
346	**Abbreviations**																									
347	MT	MegaTherm (1 Million Therms)																								
348	MW	MegaWatt (1 Million Watts)																								
349	MKWhr	MegaKiloWatt Hour (1 Billion Watts per hour, or 1 GigaWatt)																								
350	KWhr	KiloWatt Hour (1 Thousand Watts per hour)																								
351	MBTU	MegaBTU (1 Million British Thermal Units)																								

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