To: WSAC 8/6/15
From: Rick Longinotti
Re: Thinking About Energy Impacts

Dear Committee Members,
If you ever wondered what is motivating my interest in water, you'll find it in this memo. I'm convinced that all of us on the WSAC are concerned about energy use. As an electrical contractor, I've worried about our society's fossil fuel dependency for a long time. I used to tell the kids, "Close the front door. You can't heat up the outside." Now It appears that nature has given us enough coal, oil and gas to do exactly that. The cosmic joke would be that shortly after irrevocably changing the climate, fossil fuel production would begin its inexorable decline and our economy would make a painfully disruptive transition to an economy fueled by the sun---at much lower energy consumption. I'd like our Committee to help make this transition less painful for our local community, leaving the next generation a secure source of water that's not too "dear", as the Brits would say. (Hey, Nicholas has had an impact on me.)

Thanks for considering,
Rick

Water use is energy intensive. Water is heavy. It takes a lot of energy to pump it out of the ground or to pump it up hill, getting it to the customer. Wastewater treatment is energy intensive. In California, approximately 19% of the state's electricity and 32% of the natural gas usage, is water related. Surprisingly, most energy associated with water use is expended on the consumer end. Nearly three-quarters of the water-related electricity and almost all of the natural gas use occurs inside homes and businesses, mostly for heating. [1] This suggests that indoor water conservation is a fruitful greenhouse gas reduction strategy.

In Santa Cruz, water production and sewage treatment consume over half of municipal energy use.[2] Water production in Santa Cruz is less energy intensive than most utilities in the San Francisco Bay Area. That's because the City relies primarily on surface water and doesn't need to pump water uphill for long distances. Kennedy/Jenks estimated that the energy intensity of the proposed desal plant would be over 10 times the energy intensity of the current water supply.[3] Recycled water for direct potable use (not yet legal in California) is estimated to be 4 times as energy intensive as our current water supply[4].

Why does energy use matter in selecting a water supply alternative?

1. Risk of increasing fossil fuel dependency
The WSAC has embraced the concept that the past century is not a good guide to future rainfall patterns. The same approach needs to be applied when considering the future of energy supplies.

California Environmental Quality Act guidelines require consideration of project impacts that "generally commit future generations to similar uses" of fossil fuels. Increasing the energy intensity of the City's water supply portfolio increases the impact of energy prices on future generations.

---

[1] Pacific Institute, "Key Issues for Seawater Desalination in California: Energy and Greenhouse Gas Emissions" (2013)
[2] City of Santa Cruz Greenhouse Gas Emissions Inventory (2008)
[3] Kennedy/Jenks, "Draft Energy White Paper" (2011) The City's energy use for delivered water averages 1.4 kilowatt-hours per thousand gallons. Soquel Creek District averages 2.1 kw/1000gals. The energy intensity of the proposed SCWD2 desalination plant is estimated at 15kw/1000gals.
[4] WSAC tech team, Bld Block 3

The US Department of Energy report called "The Peaking of World Oil Production" describes the current period as approaching the peak in oil production, after which world oil production will decline. According to a 2014 analysis of BP data,[5] oil producing nations that have already passed their peak production year include the USA (1970), Iran (1972), Kuwait (1974), Russia (1987), Mexico (2004), Venezuela (1970), Libya (1970), UK (1999), Indonesia (1977), Norway (2001). The recession which began in 2008 and the recent boom in shale oil extracted by hydraulic fracturing (fracking) has delayed the advent of world peak oil. The ASPO now estimates that peak oil will occur by the end of the decade.

The Energy Dept. report states, "As peaking is approached, liquid fuel prices and price volatility will increase dramatically, and, without timely mitigation, the economic, social, and political costs will be unprecedented." A preview of future impacts occurred when oil prices *doubled* from June 2007-June 2008. According to a Brookings Institution report, these increases were due to shortfalls in oil supply relative to demand and a low price elasticity in demand for oil.[6] The price of oil will also impact demand for natural gas since in some cases gas can be a substitute fuel.

The production of natural gas will also peak and decline. The Post Carbon Institute has analyzed the current boom in shale gas and observed that the productive period of fracking wells is very short. This short lifespan requires more and more well drilling to keep up the current pace of production. The Institute expects that natural gas production will peak in this decade and decline to a small fraction of current production by 2040.[7]

A number of cities, including Portland[8] and San Francisco[9], have produced reports on adaptation to the economic disruption of declining fossil fuel production.

<u>Community Choice Aggregation (CCA)</u>

There has been discussion in the WSAC suggesting that the problems of fossil fuel dependency can be addressed by a shift to renewable energy. Specifically, a CCA is proposed that would purchase green power for our community. An example of a CCA is Marin Clean Energy, founded in 2008. MCE's goal is to develop new local renewable energy projects. It is developing solar installations in a Novato quarry, and a Richmond brownfield.[10]

The development of local renewable energy projects takes time. In the meantime, MCE purchases *renewable energy credits* in order to meet their commitment to green power. REC's provide a small subsidy to developers of renewable power. Because the subsidy is small compared to the actual cost of electricity from renewables, REC's impact on increasing the number of renewable projects is small. REC's simply transfer ownership claims to the renewable energy, allowing the purchaser to make a claim to green energy. For example, MCE purchases wind power REC's from Idaho. In the greenhouse gas ledger book Marin gets credited for using more renewable power, and Idaho gets debited. This transaction nets zero reduction in greenhouse gases. Business Week, in a cover story called "Little Green Lies", wrote:

---

[5] http://peak-oil.org/wp-content/files/The_Oil_Production_Story_2014.pdf

[6] Hamilton, *Causes and consquences of the oil shock of 2007-2008.* Quoted in Gilbert & Perl, *Transport Revolutions,* p 125

[7] http://shalebubble.org/

[8] http://postcarboncities.net/portland_or

[9] http://postcarboncities.net/node/4374

[10] http://www.mcecleanenergy.org/local-projects/

"Often the Renewable Energy Credit trade seems like little more than buying and selling bragging rights, rather than incentives that lead to the construction of wind turbines and solar panels."[11]

In conclusion, the formation of a local Community Choice Aggregation could make an important contribution to shifting away from fossil fuel sources so long as the priority for the CCA is development of new renewable energy projects. But the development of such projects will take many years. Both in the short run and the long run, reducing power consumption and not adding unnecessary new demands on the system are reliable strategies for greenhouse gas reduction.

I recommend reading the article by Lawrence Livermore Labs energy expert, David Fridley, who envisions a future in which society uses renewable energy supplies that are much more limited than our current energy supplies. He notes that there are many constraints on the development of renewable energy, including *energy return on investment; intermittency; scalability; and material input requirements*. Fridley writes, "As we move away from the energy bounty provided by fossil fuels, we will become increasingly reliant on tapping the current flow of energy from the Sun (wind, solar)…What kind of society we can build on this foundation is unclear, but it will most likely require us to pay more attention to controls on energy demand to accommodate the limitations of our future energy supply."[12]

2. Greenhouse Gas Impacts

In order to avoid the greenhouse gas (and extraction) impacts of higher energy use of desalination, the question arose, "Why not run desalination on renewable energy?" The City's *EIR for the Integrated Water Plan* (2005) responded that renewable energy sources, "are not feasible at this time for power requirements typical of large-scale industrial-type applications".

The *Draft EIR for the Desalination Project* (2013) concluded that the greenhouse gas emissions of the plant would not be a significant environmental impact because they would be mitigated by "purchasing certified greenhouse gas offsets".

CSUSJ Environmental Studies Professor, Dustin Mulvaney, submitted a comment on the Draft EIR, critiquing the offset purchase strategy:

> "It is claimed that certified offsets will be used to make up the difference between any project. Who is the certifying organization that will be used as the standard? There are a range of organizations that offer varying qualities of offsets. Are they in voluntary or mandatory markets? Will offsets be limited to California? the US? North America? There appears to be confusion about the distinction between offsets and REC's. In sum, there is no way to assess the credibility of the offsets without more detail. There are many offsets programs that have been criticized for not being real, permanent, or additional. REC's do not even claim to be additional, but are used in the DEIR GHG reduction strategy as if they were."

Prior to the release of the desal EIR, Kennedy/Jenks began a "Greenhouse Gas Minimization" study. Several strategies other than offset purchases were evaluated for their ability to offset the greenhouse gas emissions of the desal project. The Draft EIR listed 3 strategies (table 5.5-14 below) that K/J judged to pass the criteria (real, permanent, additional, etc.)

---

[11] Business Week, 10/29/07

[12] David Fridley, "Alternative Energy Challenges", http://www.postcarbon.org/our-people/david-fridley/

Table 5.5-14. GHG Emissions Reductions from Portfolio and Certified Offsets Options

GHG Reduction Options	CO_2e
Portfolio Option	
PV Panels at Desalination Plant	50
Micro-hydro at Graham Hill Water Treatment Plant and Newell Creek Dam	84
PV Panels at Graham Hill Water Treatment Plant	25
Certified Offset Purchase[1]	1,987
Portfolio Option Total	**2,146[1]**
Certified Offsets Option	
Certified Offset Purchase Total	**2,146[1]**

Those three renewable energy strategies can be seen to offset a small fraction of the carbon emissions of the project. A much larger expenditure of funds for renewable energy projects would need to be made to truly offset the energy use of the project.

3. Environmental Impact of Fossil Fuel Extraction

A new water supply project would add additional load to the PG&E power grid. In 2013, the portfolio of PG&E sources were:

- natural gas (28%)
- nuclear generation (22%)
- renewable resources (22%)-- wind, geothermal, biomass, solar, small hydro
- large hydroelectric facilities (11%)
- "unspecified power" (17%), "not traceable to specific generation sources by any auditable contract trail".

The source for new power loads on the grid should be considered to come primarily from fossil fuels, since peak capacity is supplied by those sources.
So the impacts of additional electrical demand include the impacts of extracting natural gas and coal. About one-fifth of the natural gas production in California is from hydraulic fracturing (fracking).[13]

Impacts for fracking natural gas include:

- Toxic waste disposal of the fracking fluids that return to the surface. As we have seen, this disposal is inadequately regulated in California.[14]
- Risk of polluting potable water aquifers with the toxic fracking fluid due to failures in well casings.
- Risk of inducing earthquakes[15]
- Use of large amounts of fresh water for the fracking process and the energy used in supplying it

For more on impacts of fracking, see the Food & Water Watch report.[16]

In 2008, PG&E listed coal as 8% of its portfolio[17], purchased from utilities that own plants in the Southwest. Impacts for extracting coal include:

---

[13] California Council on Science and Technology, *An Independent Scientific Assessment of Well Stimulation in California* (2015)
[14] http://www.latimes.com/local/california/la-me-fracking-water-20150311-story.html
[15] Ellsworth, William L. "Injection-induced earthquakes." Science 341, No. 6142. July 12, 2013
[16] http://documents.foodandwaterwatch.org/doc/urgent_case_for_ban_on_fracking.pdf

- Environmental impacts of strip mining
- Displacement of thousands of Navaho[18]
- Respiratory illnesses of populations near power plants and workers in coal mines[19]
- High carbon emissions from coal-fired plants

---

[17] PG&E's current reports its power purchase from other utilities as "unspecified power", which masks the purchase of coal-fired electricity.

[18] https://news.vice.com/video/cursed-by-coal-mining-the-navajo-nation

[19] http://www.huffingtonpost.com/2013/06/06/coal-mining-navajo-nation_n_3397118.html