Improving Decarbonization: SB844 Jail Expansion Project

In accordance with the proposed Climate Emergency Resolution (CER), Supervisors Gjerde and Williams requested Mendocino County Climate Action Advisory Committee (MCCAAC) assessment of the *Energy Analysis of Mechanical Systems Alternates* (hereinafter termed the *Analysis*) for the SB844 Jail Expansion Project. Members of MCCAAC undertook this assessment, with the help of in-county energy experts [see Appendix].

Our conclusion, supported herein, is that Alternate One, all-electric air-sourced heat pumps, is the best of the choices proposed by the architects. (nacht&lewise, n&l)

Findings: direct decarbonization

Energy costs are bound to increase over the thirty years of the analysis. Reliance on electricity will almost certainly see an ever evolving and improving carbon footprint. Reliance on natural gas will inevitably cause a worsening global carbon effect and will possibly be interrupted for safety reasons over the same period. [for backup information for the following points, please refer to the Appendix]

In the past, a strict assessment of carbon dioxide production could ignore "elsewhere emissions" like those created by generation of electricity in Lodi, California using natural gas powered generators, or the West Texas emissions and water table damages caused by fracking. MCCAAC is committed to the planetary position, that *any* emissions caused on behalf of Mendocino County citizens are our responsibility. We consider it is our duty as well as our charge to call for decisions to limit these emissions as best we can.

Findings: installation and operation costs

The *Analysis* (page 8) estimates the increased cost of the equipment for Alternative 1 to be on the order of $166,000. Our assessment, made with the help of the electricity provider, the City of Ukiah, is that the **savings over the first ten years of the new jail's operation, will offset this increased equipment cost**.

We find the annual energy use calculations in the *Analysis* to be reasonable. However, we question the *Analysis*'s future projections of operating costs correctly. *Analysis* footnotes state a 3% energy escalation rate; we understand that a straight-line projection is easier to compute, but is unlikely to represent future energy costs for natural gas. Tight gas and shale gas production is increasingly costly, and demand is increasing. At the same time, electricity provided by the City of Ukiah, and the California ISO, is rapidly improving its renewables share, thereby decreasing greenhouse gas (GHG) production. The current 3% annual escalation, if continued, will be used to increase GHG-free generation infrastructure.

The *Analysis* appears to be biased in favor of the original proposal by exaggerating the likely cost of electricity: the n&l *Analysis* assumes $.176/kWh; City of Ukiah suggests $.127/kWh (summer) and $.102 (winter) for a 50% overstatement of electricity costs. Likewise, natural gas prices cannot be known with precision, but are likely to be above k&l's assumption of $1.16/therm.

The embedded energy and added costs of Alternatives 2 and 3 would likely offset decarbonization gains.

We question the suggestion that a 45 day delay for project revision will cause a 5% inflationary factor in the cost of the project. Current experience with large projects appears to show a reduction in contracting costs.

Marie Jones
MCCAAC chair

Michael Potts
MCCAAC vice chair

Macadam M. Lojowsky
MCCAAC member

Appendix: Improving Decarbonization: SB844 Jail Expansion Project

Experts consulted

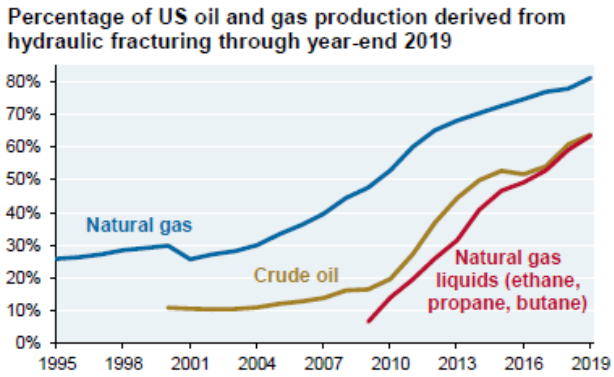
Mel Grandi, Electric Utility Director, City of Ukiah

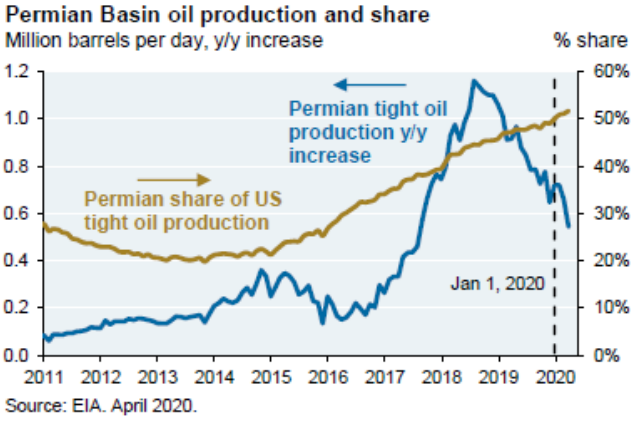
Brian Corzilius, principal author 2007 Energy Working Group report

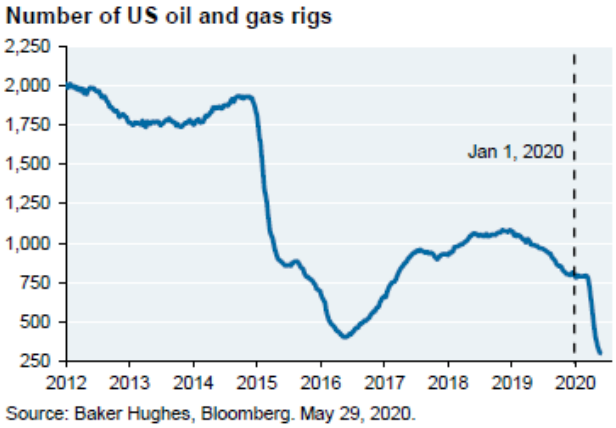
MacAdam M. Lojowsky, LEED AP, Director of Facilities, Mendocino-Lake Community College District

Natural Gas futures

Fracking is the F-word among climate change activists, and any project associated with fracking will be subject to intense scrutiny. Through deregulation, regulatory loopholes, and rapid expansion of fracking, the U.S. has achieved short-term energy independence, but is unlikely to persist. The primary U.S. source for tight and shale gas, the Permian Basin in West Texas, is thought by experts to be already at peak and requiring increased efforts and production costs in the near term. The best projections show that the market for natural gas will tighten, and costs will rise.

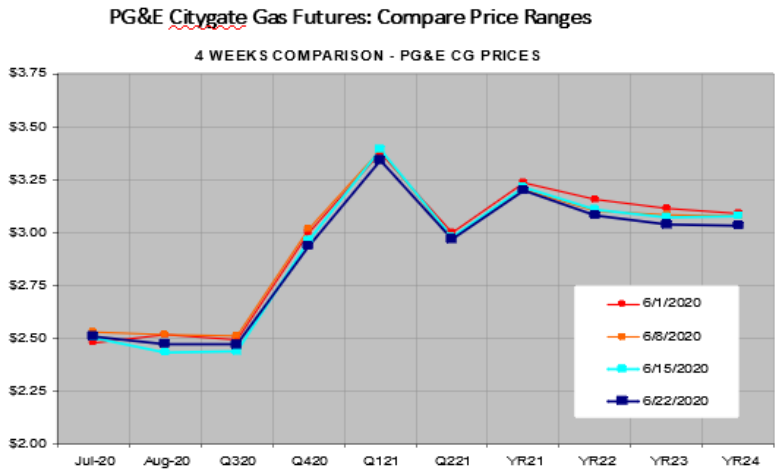






Experts assume that other tight oil and shale plays will achieve similar peaks and declines under pressure from increased demand. If hunger for energy continues at present or ever-increasing levels, the prospect of off-shore drilling for gas and oil will return to the Mendocino Coast.

The *Analysis* posits a 3% increase in natural gas pricing, but PG&E, the local provider, foresees an immediate increase, and fails to project the decline of domestic availability in its future scenarios:



In addition to the undesirability of fracking, the *Analysis* notes that natural gas heated water systems are 80% efficient. The balance, 20%, is expressed as unburned byproducts including carbon dioxide, SOx, NOx, and other GHG components that add toxicity to the atmosphere. The presence of these toxins is particularly undesirable in the Ukiah Valley, where meteorological inversion subjects residents to toxic air.

One consultant (Corzilius) notes that upstream counties and cities have begun to question the safety of aging natural gas infrastructure passing beneath their neighborhoods. He suggests that natural gas may become unavailable before the end of the 30 years analysis period.

Electricity futures

Pollution created during electrical generation is typically not emitted into our local atmosphere. Furthermore, carbon taxes are assessed at the generation site, creating a strong incentive for their reduction. The increased availability of renewables, improvements in photovoltaic and electrical storage technologies, and the prospect of electricity sourcing nearer demand, all favor design for electrical energy use.

Being close to the world's largest geothermal field (the Geysers), the City of Ukiah's electric resource portfolio stands near 65% carbon free, with 48% in renewables. Utility Director Grandi states "We are getting greener." Concentrating energy sourcing to electricity, even without any special circumstances, is the most responsible path.

When planning for the best energy bargain in the inherently volatile future of carbon-based electrical/gas rates, the County should acknowledge the widespread deployment and proven success of carbon-neutral renewable energy rates (such as Power Purchase Agreements) that are fixed and guaranteed. We have little control of global/national energy markets but we do have control of our local market in terms of historical data of sunshine days and solar production rates for our region. We can safely and reasonably predict how much renewable power we can generate at a certain location with a certain number of photovoltaic panels. And, as these renewable systems continue to increase exponentially in efficiency and decrease in cost, the County should be positioning itself to take advantage of the highest and best use of these opportunities. While this approach is more cumbersome – taking a longer and broader consideration of multiple factors, and addressing the real and tangible opportunities to counter the carbon-dependent effects of climate – these changes present our community's leadership the ability to affect a positive change.

The Jail project also presents an exceptional opportunity for cogeneration: solar canopies could be developed over the existing parking lots with minimal interruption in services, and would provide shortest-haul electricity during summertime peak air conditioning demand while also shading parked vehicles. There is a possibility that a reduction in electrical costs for the production of this field could be negotiated, according to Director Grandi. Even without development of solar canopies on site, the City of Ukiah is actively exploring possibilities for electricity production nearer to its demand, because half the cost of electricity is presently due to distribution and transmission costs – "transportation."

As noted above, Director Grandi advises that the bulk of the 3% annual increase anticipated in the cost of electricity will be used to develop projects that will generate electricity more reliably, with less carbon footprint, and closer to home.

Energy Efficiency

Burning fossil fuels for hot water and space heating are technologies from the past, and are implicated in the global atmospheric GHG load. Scientists unanimously agree that remaining fossil carbon should be preserved as feedstocks for durable good manufacture – drugs, plastics, hydrogen production – rather than for burning and

polluting the atmosphere. In the year 2020, MCCAAC maintains that choosing retrograde technology for a County building is irresponsible.

Modern technologies such as heat pumps are efficient because they use heat energy already present in the ambient, and do not use energy to generate heat as does combustion. The energy cost of pumping and compressing is less than the cost of heating by combustion, even before incident pollution is taken into account. Heat pumps are simply air conditioners that can move heat in both ways, out of a building in the summer, and into the building in winter. They heat or cool space by compressing a refrigerant (transfer fluid) and "pumping heat" from one place to another, taking advantage of the energy of phase conversion. Ukiah's greatest degree-days – a measure of the amount of space conditioning required to maintain habitability – are in summer, as acknowledged by the original design for the jail's space conditioning: air conditioners. At present, great advances in heat pump and refrigerant technology are being made; this is clearly the best proven technology at this time. Combining the cooling and heating cycle and servicing it with a single solution is likely to reduce maintenance costs, equipment footprint, and the complexity of energy provision. Trane, a major provider of heating and cooling solution, states, "a heat pump can transfer 300 percent more energy than it consumes. In contrast, a high-efficiency gas furnace is about 90 percent efficient. Heat pumps are powered by electricity, so you can save substantially on fuel consumption."

Alternatives 2 and 3 involve considerable drilling and extensive pumping, and their water- and ground-source technology are not as stable as is more conventional air-source heat pumping. There are instances of abandonment of expensive underground infrastructure. Our assessment strongly suggests that the small gains in decarbonization for these two alternatives are offset by the uncertainty and complexity of the technology and the additional equipment and construction cost. Alternative 1 is clearly the conservative choice for optimal decarbonization of the project.

A gesture to the People

The citizens of Mendocino County have expressed on many occasions their strong support of efforts to reduce GHG emissions. Supervisors have acknowledged this political will by creating the Mendocino County Climate Action Committee, who have submitted a *Climate Emergency Resolution* noting that the "California Legislature has set clear climate objectives for the next decade, including a 40% reduction in 1990 level GHG emissions by 2030; 50% renewable energy; 50% reduction in petroleum use in vehicles and a doubling of energy efficiency savings in existing buildings." It strikes the authors of this assessment as foolish to implement technology in a new building that will increase the County's carbon load. The MCCAAC's *First Policy Recommendations*, currently in the final discussion phase before submission to the Board, suggests "The County should maximize opportunities for energy efficiency in all county projects and purchases including all proposed County remodels and new construction projects. "

We urge you, the Supervisors, to call for a revision to the SB844 Jail Expansion Project for all the above financial and environmental reasons, and also as a gesture of good faith and prudent, forward-looking administration, on behalf of your electorate.