



## **Environmental Requirements on Energy Producers**

Charles Feinstein, World Bank

Notwithstanding current political uncertainties affecting the Kyoto Protocol process, greenhouse gas emissions and climate change are poised to become the dominant energy-environment problem facing Hawai'i and the developed world. While direct trade-offs between local environmental issues (e.g., energy facility siting) and global effects are difficult to make, even at today's depressed valuations in the global carbon market the economic (shadow) value of greenhouse gas reductions is already 5-10 times higher than other air emissions reductions in the Hawai'ian airshed.

It is unlikely that voluntary measures (such as the voluntary Renewables Portfolio Standard instituted in Hawai'i) will have significant impact on environmental emissions, especially greenhouse gas emissions which are invisible and not subject to easy public scrutiny. There is certainly a place for voluntary action, however. This could most effectively be pursued through corporate adoption of internal greenhouse gas emissions reduction targets, and the simultaneous institution of internal carbon trading mechanisms under which corporate units engage in inter-unit trading.

In any case, the Renewables Portfolio Standard may not represent the best renewable energy policy option for the Hawai'i utility industry. RPS creates competitive pressures when there are actually multiple utilities operating in a service territory. In Hawai'i, only pseudo-competition with little or no internal trading of renewable energy certificates/credits would result. Hawai'i would be well advised to look into instituting a System Benefit Charge (a small levy on electricity consumption) that could fund competitively awarded subsidies for private sector development of grid-connected renewables á la the U.K. and California.

Hawaii's emphasis on tax credit incentives to promote renewables is also somewhat misplaced. These are well suited to stimulate introduction of small-scale and distributed clean energy sources like solar water heaters. However, they do not inspire market entry and competition for the larger scale grid-connected renewables (e.g. wind) that will be a necessary component of any longer-run energy-environment strategy in Hawai'i

Hawai'i cannot afford to put all its energy-environment eggs in the renewables basket. For reasons of geography and local opposition, renewables are unlikely to play a dominant role in the islands' utility system. The emphasis on renewably produced hydrogen fuels is similarly misplaced. Hydrogen will be the basis of the long term sustainable energy future, but for the next 20-30 years the transition is more relevant and that will be significantly based on fuel cells (and micro-turbines) fed by hydrogen-rich gas streams derived from reformed hydrocarbons. Such as natural gas or coal-derived 'syngas'.

Hawai'i would be well advised to study the experience of Puerto Rico (one LNG terminal in operation) and the Dominican Republic (one LNG terminal in operation and one under construction). Both are tourism-dependent island economies with utility system demands in the range of 1,500-2,000 MW - about the size of Hawaii's electrical demand. Shipboard-based LNG re-gasification is now being deployed commercially and could emerge as an attractive option for alleviating Hawaii's safety and siting concerns. Greenhouse gas savings of natural gas in utility applications are typically 50-75 percent compared to conventional alternatives. Coal gasification offers the promise of high-efficiency electricity generation and supply of syngas for distributed energy applications. Integrated Gasification Combined Cycle (IGCC) electricity generation technology can be readily adapted to the separation of hydrogen and CO<sub>2</sub> from the gas stream. Long-run viability under future greenhouse constraints will be dependent on finding an environmentally acceptable, low-cost means of CO<sub>2</sub> storage or disposal.

To see the full study go to the Hawaii Energy Policy Forum's website at:  
<http://hawaiienergypolicy.hawaii.edu/papers/feinstein.pdf>



COLLEGE OF SOCIAL SCIENCES  
**HAWAII ENERGY POLICY FORUM**  
UNIVERSITY OF HAWAII AT MANOA

## Hawaii Hydrocarbon Outlook

Fereidun Fesharaki and Jeff Brown, et al., FACTS, Inc.

This study examines the important global, regional, and local trends that will affect Hawaii's energy horizon over the next several decades. Its main focus is to examine the potential for expanding the use of alternative hydrocarbon fuels, such as coal or natural gas, in an effort to diversify away from oil.

Numerous topics are discussed, including: the outlook for petroleum, coal, and natural gas at the global, regional, and local level; the future of hydrocarbons in power generation; the future viability of the refining business in Hawaii; the impact of new technology in the transport sector; Hawaii's fuel tax structure; and energy security issues of particular importance to Hawaii. The observations and suggestions are wide-ranging, but the key points include:

- In comparison to other states, Hawaii is heavily oil-dependent—it relies on oil for almost 90 percent of its primary energy. If the utilities' current plans are followed, the State's reliance on oil looks set to continue through at least 2020.
- The Middle East will increasingly dominate the oil export market, and prices are likely to remain volatile, but most analysts project that the average price will remain in the \$20-30/bbl range over the next several decades. Sustained higher prices bring massive supplies of unconventional oil into play, which effectively acts as a ceiling on oil prices.
- Partly due to proximity and partly because of Hawaii's need for low sulfur crudes to produce low sulfur fuel oil for power generation, the State is heavily dependent on Asian crude imports (which tend to be low in sulfur). Hawaii also relies on crude from the Alaska North Slope. Unfortunately, production of these crudes is generally stagnant or in decline at the same time that the Asia-Pacific region's thirst for crude continues to grow. As a consequence, Hawaii's refineries will most likely have to pay a growing premium for the State's crude imports.
- In the past, liquefied natural gas (LNG) was considered to be a relatively expensive energy source, but technological advances and the entry of several key suppliers into the market in the 1990s has driven prices down—it is now clearly a buyer's market.
- Hawaii is in a good position because there is a great deal of interest in bringing LNG from Asia into the U.S. West Coast—Hawaii could be part of a larger scheme to import LNG. However, a possible concern is that introducing LNG would disrupt the current energy balance and weaken the position of Hawaii's refineries.
- Looking forward, LNG is a relatively clean burning fuel source that could enable Hawaii to reduce its dependence on oil while at the same time serving as a bridge to alternative fuel technologies, such as fuel cells. It can also be sourced from relatively stable countries, such as Australia and Malaysia, which could help enhance energy security.

To see the full report go to the Hawaii Energy Policy Forum's website at:  
<<http://hawaiienergypolicy.hawaii.edu/papers/FACTS.pdf>>



## Evaluating Liquefied Natural Gas (LNG) Options for the State of Hawaii

Fereidun Fesharaki and Jeff Brown, et al., FACTS, Inc.

The objective of this study is to enhance the general level of understanding about the global LNG market and to clearly identify the strengths and limitations of LNG as a future fuel source for Hawaii. LNG would provide clear benefits for the State in terms of energy diversification and the environment, as well as serving as a possible bridge to a hydrogen economy, but it could be disruptive to the current energy balance. The topics discussed include: recent developments in LNG markets, such as trends in pricing and contract terms and the growth of short term trading; the outlook for small markets (similar to Hawaii's); technological developments, environmental and safety concerns, and the possibility that LNG could serve as a bridge to a hydrogen economy. The study concludes with an examination of the possible impact of LNG on the State's energy sector as well as the overall economy.

This study is currently in progress, but some key findings include:

- The global and regional LNG markets have undergone a dramatic transformation in recent years. Technological developments and a number of new supply sources have transformed into a buyer's market, and prices have dropped considerably versus the 1990s. LNG prices would likely be competitive with fuel oil, which is currently primary fuel used in power generation in Hawaii.
- In contrast to popular perception, LNG is a relatively low risk fuel which has an exemplary safety record.
- LNG may be sourced from relatively stable countries, including Australia and Malaysia, and as such it provides a means to relatively quickly reduce the State's dependence on oil. In the long term LNG could serve as a bridge to a hydrogen economy.
- LNG has clear environmental benefits in terms of reducing localized and global pollution.
- The downside of LNG is that it may disrupt the State's existing energy balance—there is a possibility that the displacement of fuel oil in power generation could lead to the closure of one of the State's refineries. The study explores the economic impact of such a closure.