

HAWAII ENERGY STRATEGY 2007
Comments by the World Business Academy
On Second Stakeholders' Meeting, October 24, 2006

The World Business Academy submits the following brief comments in response to RMI's request for public comments on the Second Stakeholders' Meeting, October 24, 2006. The Academy believes that it would be most useful to prepare and circulate its own parameters of renewable energy opportunities and challenges for the Governor, the legislature, businesses, and the public. However, because RMI encouraged public comment on the underlying assumptions of its presentation, the Academy responds with these comments.

Oil Price Assumptions

World oil prices are a key component of any vision and strategy for Hawaii's energy future. RMI forecasts that world crude oil prices will be \$50 a barrel in 2012 under both the "adequate supplies" scenario and the "constrained world" scenario.¹ This is unrealistically low. On November 16, 2006, the price of oil on the New York Mercantile Exchange was \$59.09 a barrel. The Academy's Energy Task Force has been monitoring oil prices for the last two years and predicts that the price of oil could well hit \$100 a barrel before December 2008.

Even without any intervening traumatic events (ITEs),² several factors are converging to drive up the cost of oil:

- Peak oil

The supply of oil is peaking worldwide. Once about half of any given oil field is gone, it becomes increasingly difficult and expensive to extract it, and the rate of extraction cannot be speeded up without damaging the field's lifetime productivity. Cheap oil is gone.

- Lack of spare production and refining capacity to meet global demand

The world is consuming virtually all the oil now produced. There is less than 1.25 percent spare production capacity, and inadequate refining capacity further limits supply.

- Increased worldwide demand, particularly from China and India

¹ Power point slide 10 of 69-page power point presentation by RMI entitled, "Hawaii Energy Strategy 2006, Second Stakeholders Meeting, October 24, 2006" ("Power Point Presentation").

² "Intervening traumatic events" is a broader term than the more common term, "supply-side disruptions."

China and India's oil consumption is growing at an unprecedented rate. China's consumption alone more than doubled between 1994 and 2004.³

- The dollar's shaky status as the reserve currency for oil

A number of other countries have begun pricing their oil in euros or a basket of currencies or are considering doing so. Russia, Venezuela, Malaysia, and Iran all fall in this category. Iraq had started pricing its oil in euros before the war began. If the dollar's virtual monopoly on oil pricing ends, the value of the dollar will go down thereby driving up the relative cost of oil for Americans.

Oil price forecasts based on EIA data

RMI's oil price forecasts under both the "adequate supplies" scenario and the "constrained world" scenario were based partly on information and forecasts from the U.S. Department of Energy's Energy Information Administration (EIA).⁴ EIA's oil price forecasts have historically been unrealistically low. *Actual* fuel prices in 2004 and 2005 were 60 to 70 percent higher than their 2002 levels, and were substantially higher than those the EIA had then forecast at any time in the period through 2025.⁵

Calculating "what the market would do, without policies"

During the question and answer period, a member of the audience said that the cost of oil in RMI's power point presentation failed to take into account the social and environmental costs of oil. RMI responded by saying that its presentation and cost calculations were an attempt to calculate baseline market conditions-- "what the market would do, without policies."

In fact, the existing oil pricing structure does not derive from a free market, unaffected by government policies or market interventions. Governments across the globe directly and indirectly subsidize fossil-fuel industries. The existing oil pricing structure reflects those massive subsidies which together promote the inefficient use of fuel, electricity, and transportation. U.S. expenditures on roads and highways are just one indirect subsidy of fossil-fuel industries, which were part of the successful lobby for the Federal Aid to Highways Act of 1956. In a similar vein, the Energy Act of 2005 contained numerous tax incentives for Big Oil. Other provisions too numerous to count within the U.S. tax code provide depletion allowances, tax preferences, and other subsidies.

Demand-Side Assumptions

³ Lester Brown, "Plan B 2.0: Rescuing a Planet Under Stress and a Civilization in Trouble" (Earth Policy Institute 2006) at p.9.

⁴ Power Point Presentation, slides 9 and 10.

⁵ Travis Bradford, Solar Revolution (MIT Press 2006) at p. 119.

RMI's "demand-side inputs" include historical demand and consumption by economic sector.⁶ The model should factor in the likelihood of decreased tourism as a result of a mainland recession, as discussed below.

Supply-Side Assumptions

RMI's "supply-side inputs" include historical capacity and generation data.⁷ HECO is operating at 90 percent of capacity. RMI should clarify whether the model takes into account the possibility of rolling black-outs as a supply-side constraint.

Economic Assumptions

RMI's "economic assumptions are based on stable modest growth."⁸ There is widespread agreement that a mainland recession has either begun or is imminent. The basis for any assumption that decouples Hawaii's economy from the mainland should be explicit.

Economic releases by the Federal Reserve and the Commerce Department show that growth in the 3rd quarter of 2006 was 1.6 percent, down from 2.6 percent in the 2nd quarter, which was also down from 5.6 percent in the 1st quarter. This means that the economy, on a quarter to quarter basis, has seen GDP growth fall from 5.6 percent to 2.6 percent to 1.6 percent. Worse yet, the 3rd quarter number, when juxtaposed against core inflation of 2.5 percent for the same period, shows that there was negative GDP growth in the 3rd quarter on an inflation-adjusted basis. All of this shows that a broadly distributed economic slowdown is already occurring within the United States. Conditions emanating from the housing market, the debt structure, the balance of payments deficit, and other general economic factors suggest that a recession of unknown depth and duration is arriving for a part or all of 2007.⁹

Assumptions about Renewable Energy Technologies in the Mix

Because RMI omits certain renewable energy technologies from two of its sets of assumptions, it is unclear which technologies RMI thinks are appropriate for Hawaii. RMI makes assumptions under the "adequate supplies" scenario about improvements over time in renewable energy technologies, but omits ethanol,

⁶ Power Point Presentation, slide 6.

⁷ Power Point Presentation, slide 7.

⁸ Power Point Presentation, slide 8.

⁹ EconForecast, Vol. 20, No.4, October 30, 2006, a publication of the World Business Academy. For an interesting discussion of the dangerous interplay of America's oil and debt vulnerability, and the looming dethroning of the dollar, see Kevin Phillips, "American Theocracy: The Perils and Politics of Radical Religion, Oil, and Borrowed Money in the 21st Century" (Viking 2006).

biomass, and other biofuels.¹⁰ These technologies are also omitted from the cost and capacity assumptions under the “constrained supplies” scenario,¹¹ yet they are key to Hawaii’s transition to energy independence. RMI has addressed ethanol, biomass, and other biofuels in the past (e.g., in its August 8, 2006 Hawaii Biofuels Summit Briefing Book, and in the context of the legislative mandates for phased implementation of Alternative Fuel Standards), but it would have been helpful to have these technologies included within its current analysis.

RMI also omits ocean thermal energy conversion (OTEC) from these assumptions. RMI characterizes the use of OTEC for sea water air conditioning (SWAC) as a “technology wild card,”¹² despite the fact that OTEC has been commercially successful in Scandinavia and is being developed in Hawaii. It is also unclear why large scale adoption of wave power is characterized as a “technology wild card.”¹³

The implications of these omissions and assumptions should be made explicit, as should the mix of technologies that RMI assumes to be appropriate for Hawaii.

Cost and Conversion Efficiency Assumptions

RMI’s “biofuels costs and conversion efficiency assumptions” under both the “adequate supplies” and “constrained” scenarios contain unexplained or incorrect assumptions.¹⁴

First, it is not clear why RMI omits biomass and Pure Vegetable Oil (PVO) made a variety of biological ways suitable to Hawaii’s unique tropical growing conditions (e.g., palm kernel oil, oil from algae, etc.). There is wide agreement that potentially the best way to biologically derive oil for biofuels is to extract it from algae, especially salt water algae. Algae, which should be developed in Hawaii due to the optimum growing conditions here, produces vastly more biofuel oil per acre than any other source. 6000 gallons/acre is a realistic target for current technology using algae from sea water. This compares to a fuel yield of only 1500 gallons/acre for sugarcane ethanol produced using the Brazilian method. Growing algae appears to be immensely more efficient than harvesting palm kernel oil as now routinely harvested in Malaysia for domestic use and export. Algae from sea water has the added benefit of consuming excess CO₂. Ideally the algae should be fed a CO₂ enriched air stream to help it grow. We would like to see these sources of biofuels evaluated by RMI as part of its approach.

¹⁰ Power Point Presentation, slide 11.

¹¹ Power Point Presentation, slide 12.

¹² Power Point Presentation, slide 38.

¹³ Power Point Presentation, slide 38.

¹⁴ Power Point Presentation, slide 16.

Second, we question the assumed gallon-to-gallon conversion efficiency of biodiesel and vegetable and would appreciate learning the basis for this conversion theory in order to better understand what RMI is suggesting.

Third, in calculating the feedstock cost for biodiesel, RMI assumed that waste oil would be converted or that it could be derived from soy oil. The Academy's data demonstrates that using soy-derived oil is less efficient than using palm kernel oil or oil derived from algae. We believe this section of the RMI report should be reviewed with the assumption changed from favoring soy oil to favoring oils derived from biological crops that are more suitable for Hawaii to grow, and which have dramatically higher yields per acre at lower costs.

Production Costs Assumptions

The basis for RMI's production cost supply curves for 2010, 2015, and 2020 is unclear.¹⁵ The Academy's assumptions about the production costs for sugar cane ethanol in Hawaii are higher than the \$1.15 to \$1.40 costs shown (even though Brazilian production costs for sugarcane ethanol are known to be 81¢/gallon). The Academy would like to have a conversation about the implications of acquiring ethanol in Hawaii for about \$2.00/gallon. This cost still puts the cost of sugarcane ethanol substantially below the existing cost of petroleum based fuels. More importantly, acquiring ethanol produced in Hawaii even at the upper end of this range, at \$2.00/gallon, would keep that \$2.00/gallon revenue in Hawaii rather than sending it overseas to the oil sheiks of the Middle East. This needs to be thought through much more carefully for adequate policy decision making.

Fuel Cost Assumptions

The basis of RMI's assumptions and comparisons of "cost competitive renewables" is unclear, especially its assumptions about the cost of using refuse as a fuel.¹⁶ Hawaii has no shortage of refuse.

Preliminary Findings: Adequate Supplies

RMI finds that "state biofuels demand, particularly for ethanol, will be steady."¹⁷ It appeared from the presentation that RMI is predicting that between 2008 and 2023 "total technical demand" will be essentially flat, and ethanol and biodiesel production capacity will be flat. If that is in fact what RMI is saying, the Academy respectfully disagrees. RMI should clarify the basis of this finding and what it means to convey with this portion of the presentation.

¹⁵ Power Point Presentation, slides 17-19.

¹⁶ Power Point Presentation, slide 23.

¹⁷ Power Point Presentation, slide 28.

Preliminary Findings: Constrained Supplies

It appeared that RMI was saying that energy demand for transport will be essentially flat between 2005 and 2025.¹⁸ If that is the RMI conclusion, the Academy respectfully disagrees. Even the introduction of the superferry (which could run on biodiesel or PVO) will affect demand. RMI should clarify the basis of this finding.

RMI appears to incorrectly assume that existing power plants will continue to use their current fuels. Such an assumption would be incorrect because plants cannot afford oil at \$100 or more per barrel, and will have to change fuels in order to break the cycle of ever escalating “pass along” fuel costs. Either existing plants will have to be converted to run on biofuels or, if that is impossible to achieve, as may be the case with many of the older plants, those plants will have to be retired and replaced by plants that will run on biofuels.

RMI finds that sites for large-scale adoption of wave power are “available on all islands.”¹⁹ Yet, even the suppliers of wave power generators (e.g., Polemis) currently believe that wave power projects smaller than 30 MWh/yr are not commercially viable. Only Oahu has a sufficiently large population to support large-scale wave projects. The Academy believes, as do leading proponents of wave power, that there is a very meaningful role for wave power in Hawaii’s future. It remains to be seen whether the population base of the Neighbor Islands can each individually support a meaningful wave power installation. Hence, as a single component of a package of solutions for Hawaii, wave power should be developed wherever commercially feasible. It is not, however, likely to be as significant a component of Hawaii’s future as biofuels for both transportation *and* electrical generation. In addition to wave power, Hawaii should also be looking at power harnessed from ocean currents, an energy source which was totally absent from RMI’s review and which needs to be considered.

RMI finds that Hawaii sales of new “light vehicle flex-fuel vehicles” will start in 2010.²⁰ The Academy believes that Hawaii should push immediately for the importation of flexible fuel vehicles in 2007 and beyond. There are currently almost 5,000,000 of these vehicles on U.S. roads and millions more are already committed to by GM, Ford and Chrysler. The basis for delaying the importation of flex-fuel vehicles until 2010 is unclear. GM, Ford, and Chrysler are all acutely aware that Toyota and Honda have become the dominant players in the hybrid vehicle world and sense that the opportunity for the “Big Three” is to rapidly develop a leadership position in flex-fuel vehicles. Each of the Big Three is making public commitments for flex fuels that cumulatively will total over

¹⁸ Power Point Presentation, slide 33.

¹⁹ Power Point Presentation, slide 38.

²⁰ Power Point Presentation, slide 39.

1,000,000 units per year by the end of the 2007 model year. Hawaii should be demanding that a significant portion of these vehicles be sent here for sale. The incremental cost of building a flex-fuel vehicle is literally less than \$100 more than an identical vehicle that is not capable of operating on two fuel sources.

Implications

RMI concludes that one implication of its findings is that “if oil supplies are adequate, there is little impetus for the energy system to change until 2020.”²¹ The Academy respectfully disagrees. Hawaii residents already feel the pain of high-priced oil in their ever-escalating utility bills. KIUC’s high-cost electricity is partly the result of its high fuel costs that are passed on to its customers. The public all across the islands is demanding relief now. Moreover, the public is becoming increasingly aware of its vulnerability to foreign oil in a world where the Middle East is already on fire, Israel is threatening to “prevent” Iran from achieving a nuclear capability, and terrorists are increasingly focusing on the vulnerability of the West to its oil umbilical cord. Added to this is the certain conclusion that oil supplies will not be “adequate,” which means that the impetus for change exists today and will accelerate in the months ahead.

Conclusion

Based on the above factors, the Academy believes that RMI’s proposed scenarios are unrealistic. The real scenario will drive up the price of oil in ways not addressed. While we have great respect for RMI’s independence and sophistication as an institution, we are left questioning conclusions which are drawn from data which are highly optimistic to the point of being unrealistic. With that in mind, we would like to address the policy options for Hawaii in a framework that assumes: (1) oil at \$59 a barrel and rising; (2) the occurrence of ITEs that could cause sudden spikes in oil prices and/or partial disruptions in supply; and (3) the significant likelihood of continuing violence in the Middle East, which could escalate as the U.S. prepares to shift policies in that region.

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²¹ Power Point Presentation, slide 44.