Panelist Q&A

1. With the considerable capital/regulations for container, and to greater extent, bulk, how can LNG be a bridge?

*Murray Clay:* Irrespective of the modality, LNG is a bridge for the power sector if the fuel contract were flexible in terms of allowing declining volumes over time. A careful cost analysis would need to be conducted to see if the savings will pay for themselves quickly enough to justify a shortened useful life of the fixed assets. The larger volume of LNG is for marine transportation, heavy truck transportation, and thermal demand.

*Ron Cox:* Most of the capital investment is made by the company(s) delivering the LNG. Our on-island investment is minimal and confined to the investment on the generating stations necessary to use the gas. I’d point out that investment in gas infrastructure may also be useful and necessary one day to achieve the 100% renewable goal, as renewable or biogas from waste (think Waimanalo dump, next to Kahe power plant) becomes more economic in the future.

2. Is 2019 target date realistic?

*Murray Clay:* Due to the extensive analytical work still needed, as well as siting the regasification and storage sites (EIS, permits, potential lawsuits, construction timeline, etc.), it would take considerable galvanizing of political will and social cohesion that have not yet been shown for this project.

*Ron Cox:* Yes, based on our timelines we’ve developed through our RFP process and negotiations, 2019 is an aggressive but realistic date assuming the critical milestones are achieved.

3. Is it worth the significant capital for LNG when we would have to get rid of it by 2045?

*Murray Clay:* As discussed in question 1, the issue is whether the capital costs, when amortized into the fuel costs for the appropriate duration, are economically justified compared to the alternatives for both the power, transportation and thermal markets that LNG serves.

*Ron Cox:* Yes, the savings from shifting to this cleaner fuel will more than pay for the investments within a short time. As mentioned above, much of the investment may continue to be useful in the future for renewably sourced gas, or biogas.

4. How should energy efficiency fit into the LNG discussion and, more generally gas use, as it would shorten any "bridge" should one be built?

*Murray Clay:* Energy efficiency should always come first, and that includes electrical and transportation efficiency. Any fuel contracts would need to be flexible enough to allow for declining LNG volumes over time to allow for maximum efficiency and conservation efforts.

*Ron Cox:* Our models for the LNG volume necessary to “build the bridge” assumes our demand decreases over time for three main reasons. In our Power Supply Improvement Plan, we assume rapid adoption of energy efficiency, greater integration of solar and
energy storage, and modernization of the thermal generation fleet with more efficient technology that produces power using less fuel. Even with these assumptions, we can comfortably use the LNG volumes during the Bridge period.

5. Billions of dollars in customer savings is much more important than fear-mongering “what ifs?”

Murray Clay: The important thing to note is that the savings are not currently guaranteed. A quantitative analysis of fuel price volatility is responsible forecasting to understand the risks that the ratepayers are involuntarily exposed to and that the regulators have a fiduciary responsible to protect against.

Ron Cox: We are 100% committed to achieving the states renewable goals as cost effectively as possible. That’s why we believe replacement of oil with natural gas that is cheaper, cleaner, and more stable in price is a prudent step to help hold down costs while we make the necessary grid modernizations to accommodate more renewables. Further, we believe LNG delivered in containers offers the opportunity to do this while minimizing on-island infrastructure investment. It’s worth remembering that this transition is a “marathon”, not a sprint. We have to plan prudently decades into the future if we are to be successful.

6. For Murray, I suspect a 100% renewable scenario, if you had run it, would have resulted in a high but stable price. Any comments?

Murray Clay: Not if I simply ran the model as-is. The model was about fuel costs and at $0.14 / kwh, renewables beat LNG. The price only becomes “high” potentially if one includes all the grid upgrades and/or technology improvements that will allow 100% renewables. We can’t currently be 100%, for example, based on intermittent solar and wind without batteries or other measures to firm the generation.

7. How do we address risk w/ future carbon tax? Good question with a very difficult answer.

Murray Clay: If you wanted to do it quantitatively, you’d have to estimate probabilities for a carbon tax being enacted ranging from 0 to X% starting at year Y in the future. Those probabilities could be layered into the Monte Carlo I displayed, but the probabilities and tax rate would be pretty subjective estimates at this point.

Ron Cox: Fortunately, due to the rapid growth of renewable energy for power generation in the last few years, we are positioned to comply with new Federal (EPAs Clean Power Plan) and state (Green House Gas reduction) regulations to reduce carbon emissions while minimizing cost to customers.

8. Why isn’t Hawaiian Electric explaining their LNG plan or collaborating with Hawaii Gas for better outcome?

Ron Cox: Hawaiian Electric has been engaged in a Request for Proposals (RFP) process and subsequent negotiations for the more than a year. The negotiations have taken longer than expected because we are intent on ensuring that customer cost benefits would be realized,
even with lower global oil prices. If we’re successful, other users in the state (Hawaii Gas, Kauai Island Utility Cooperative) would have opportunities to seek LNG through direct negotiation with suppliers and utilize the supply chain that would be put in place to serve Hawaiian Electric. Please note, Hawaiian Electric does not sell gas today nor has plans to enter into gas sales in the future. Our interest is in purchasing cleaner, cheaper gas, delivered as LNG, to fuel our power plants.

9. If not natural gas to transition to 100% RE, then what, coal and oil?

**Murray Clay:** The main option on the table other than LNG is a 75% oil, 25% diesel blend. That option would be a higher price than oil alone at current prices but would meet the higher emissions regulations that will soon be in effect.

**Ron Cox:** If we are unsuccessful in delivering LNG to Hawaii to replace oil, it is likely oil would continue to be used to fuel our generating fleet. Unfortunately, the cost of oil will increase in the next few years as environmental regulations require cleaner fuels with lower emissions. Status quo isn’t an option for Hawaiian Electric. Our choices are a more expensive, dirtier liquid fuel, or a cleaner, lower carbon natural gas delivered as LNG.

10. How great is the risk of stranded assets for LNG infrastructure with 100% RPS?

**Murray Clay:** This depends on how quickly the cost savings for the fuel (LNG) can “pay for” the fixed infrastructure costs. It will also depend on how decoupling works in the future. Right now, any/all fuel price savings would be passed on to the ratepayer. The utility doesn’t keep any of that. So, even if ratepayers save an amount of money over the years in excess of the cost of infrastructure, the utility can only recover its fixed asset charge over time through rate cases. It may need to keep collecting on those stranded assets long after they are no longer needed unless the utility is allowed to share in future fuel cost savings.

**Ron Cox:** Please see the answer to question 1 and 3 above.

11. How will HECO deal with huge amount of traffic for trucking ISO containers?

**Ron Cox:** Our traffic studies have shown only modest impact to traffic. On Maui and Hawaii island, LNG trucks on the road would replace diesel oil or naptha trucks. If you’re familiar with the ignition and explosivity of these fuels, you’ll realize that LNG is a much safer fuel to transport than distillate fuels. On Oahu, there would be a net increase of truck deliveries of fuel to serve major power plants around the island. These deliveries would be managed during hours of low traffic, late in the evenings or very early in the morning hours, to minimize traffic impacts. By way of comparison, we estimate there are double the number of deliveries of trash to the H-Power waste to energy plant every day, compared to the number of deliveries of LNG that are expected.

12. Why is clean energy more expensive to produce?

**Murray Clay:** It isn’t necessarily. Utility-scale solar and wind projects are currently able to produce electricity at a price competitive with, and in some cases lower than, oil.

**Ron Cox:** In many cases it isn’t. For example, the energy price of new Utility scale solar projects are competitive with oil in Hawaii today. New wind projects and geothermal can
also be competitive. What is missing is a firm source of cost competitive renewable power or energy storage, to fill in those periods when the sun isn’t shining, the wind isn’t blowing, and there is no geothermal resource available. This gap is where LNG can replace oil and lower costs to customers.

13. Should long-term LNG contracts be the metric for RE pricing?

**Murray Clay:** Currently LNG contracts that are as long in duration as the life of the fixed assets do not seem to be on the table. If you could get a very long-term fixed-price contract of comparable length to renewable energy PPAs (20-30 years), then such a comparison would be fair. Currently, LNG contracts are not fixed price and are not 20-30 years in duration, so the comparison breaks down and you are back to comparing a cheap (currently) volatile fuel price/type to a fixed price, longer term contract for renewables.

**Ron Cox:** Yes. In order to ensure customers see reductions in their bills, renewable energy producers must price their projects against the next lowest alternative, which is LNG based power production costs. The good news is that renewable energy projects have responded to this healthy competition and customers have benefited.

14. Ron, are your CO2 numbers based on lifecycle emissions or site emissions?

**Ron Cox:** We are regulated based on site emissions.

15. Will units be repowered with LNG?

**Ron Cox:** Modernized Generation assets would be dual fuel capable, so they could operate on gas or liquid fuels to ensure we can reliability produce power if there is ever a shortage of either fuel (fuel security) and also to ensure we have maximum flexibility to operate on the most economic fuels in the future, including renewable fuels.

16. Based on our position geographically, isn't LNG a good contingency for our economy and lifestyle?

**Ron Cox:** I believe it is a prudent choice to ensure we're able to achieve our renewable energy goals at reasonable costs. I also believe it is better to source our gas from North America, rather than continue to rely exclusively on oil imports from Asia and the Mideast.

17. Why is LNG still being pursued now that the 100% RPS is in effect?

**Murray Clay:** Even if the State reaches its goal of 100% renewable energy by 2045, we will still, unfortunately, need a lot of fossil fuels of some kind for the next 30 years unless there are remarkable breakthroughs in firm renewable energy in the near future such as a very large geothermal resource being discovered or great tech advancements in biofuels.

18. If we move to LNG will HECO move totally off oil?

**Ron Cox:** No. it’s prudent to keep the capability to use minimal amounts of oil for power generation as our backup fuel to ensure Generation continuity in case there are short term unexpected delays in LNG deliveries.
19. If we are really concerned with fossil fuels, why not address transportation like aviation?

*Murray Clay:* We need to do exactly that. Transportation uses more fossil fuels by far than electricity generation. Currently, technologies like solar and wind are more commercially viable than large-scale biofuel production. We need to electrify transportation where possible and focus on efficiency and conservation until biofuels come down in cost (due to future tech advancements).

*Ron Cox:* I know the state energy office is working hard to reduce fossil fuel use in transportation markets. We believe electrification of transportation is a viable alternative for ground transport and further reduces fossil fuel use as we increase renewable power generation.

20. Is fracking regulation causing upward trends in gas costs?

*Ron Cox:* To my knowledge, increasing regulation has not resulted in significant cost increase.

21. If we think about the impact of fracking, should we consider the same lens for the mining of heavy metals for batteries?

*Ron Cox:* All power generation technologies has plus’s and minus’s. I believe a balanced portfolio of firm and variable generation is the best fit for reliable operation of our electric grid.

22. Based on fuel price forecasts, what is pay-back period for retrofitting HECO generators and other necessary infrastructure investment?

*Ron Cox:* Since LNG negotiations are in progress, I’m unable to provide a specific pay back period until all the terms, conditions and costs have been finalized.

23. I’ve heard of safe fracking is that so?

*Ron Cox:* I am not an expert on fracking technology used for oil and gas production. We would rely on the Environmental Protection Agency and other government agencies to regulate fracking safety and ensure it’s in the public interest.

24. The environmentalist lobbyist have brought us tremendous increases in costs of everything and stopped so much progress. Why?

*Ron Cox:* We believe in the importance of environmental regulations and strive to comply with all state and federal requirements.
25. 58 counties and 2 states in the US have banned fracking. How will LNG pricing be impacted should fracking be stopped in the North America?

*Murray Clay:* Clearly the price of LNG would go up substantially. Even without such a ban, LNG prices will move more in concert with oil once sufficient export terminals for LNG are built in the United States.

*Ron Cox:* We have not analyzed this hypothetical.

26. Will your company provide a "not to exceed" guaranteed maximum cost of LNG support infrastructure?

*Ron Cox:* Any new LNG infrastructure owned and operated by Hawaiian Electric will be competitively bid and supplied under a firm price. These contracts will be subject to the same Regulatory review process as all our fuel contracts.

27. What is the total estimated cost for building the LNG support infrastructure? Will you guarantee those costs?

*Ron Cox:* The current estimated cost for LNG infrastructure is approximately $300M as stated in Hawaiian Electric's Power Supply Improvement Plan. The Public Utilities Commission and Consumer Advocate will use the Regulatory process to review the prudence of these expenditures.

28. Should we have renewables at any cost?

*Murray Clay:* Ulupono supports economically viable renewable energy. There are enough cost competitive options out there that we don’t need to pay large premiums for renewables anymore (vs. in the early years when renewables were less efficient).

29. Does the utility and PUC have the resources to invest in both LNG and high renewables simultaneously?

*Ron Cox:* We expect LNG will reduce the cost of fuel borne by our customers. This will allow us to continue making the necessary investments in grid modernization without burdening customers. So we believe it’s necessary to transition to gas and off oil to make high renewables possible.

30. If LNG is a bridge fuel what will HECO do with the infrastructure in 2045?

*Ron Cox:* By 2045 the LNG infrastructure will be near the end of useful life. It is too early to know how this infrastructure will be used in 2045. As prudent planners for the future, we strive to preserve our options to continue use of our liquid and LNG/gas infrastructure should we transition to renewable gas or liquid fuels in the future.
31. Cost effective 100% renewable energy is not here yet. Should we ignore cost savings now and bet on a miracle in renewable technology?

*Murray Clay:* Given the pace of technological advancement it is entirely possible that cost effective energy storage or firm renewables (e.g., geothermal, biofuels, etc.) could be here within 10 years. Do we want to make a (for example) 30-year commitment to LNG only to have cost-effective, firm renewables show up within the next 10 years?

32. Current renewable energy costs aren’t valid at 100% renewables without extra costs and risks for batteries or other storage devices.


33. What R.E. cost did you use in your model (Murray)?

*Murray Clay:* For all of the Monte Carlo simulations I showed, I used the actual PPA prices of the renewable energy projects currently in service for the status quo renewable energy and then added in the PPA prices of the waiver projects for the future “high” renewable energy option. That brings the weighted average PPA price to roughly 16.5 cents per kwh.

34. Now that Hawaii has a 100% RPS, won’t that help the utility meet environmental regulations without LNG?

*Murray Clay:* Eventually yes, but the 100% goal is by 2045. The new regulations (MATS) take effect in 2016 or 2017 depending on what extensions HECO is granted. It will need to meet these higher emissions standards in the very near future.

*Ron Cox:* The environmental regulations in question pertain to thermal power plant emissions which will be necessary for many years into the future. LNG enhances our move to renewables and serves to control customer costs as we modernize our grid.

35. To index to Henry Hub, if we can’t get LNG sourced from Canada, how does Jones Act factor in?

*Ron Cox:* Jones Act applies to ships operating between US ports. Although there are several potential LNG export sites in Canada, the US and Mexico with gas pricing tied to Henry Hub index pricing, none are as far along in the development process as the Fortis Tillsbury plant in British Columbia, where construction has already begun.

36. Why isn’t Hawaiian Electric collaborating with Hawaii gas so if we go with LNG, we have just one plan?

*Ron Cox:* Hawaiian Electric and Hawaii Gas have been communicating on LNG plans.

37. We talk about new generators. What about Kalaeloa and Campbell conversion to LNG?
Ron Cox: There is potential for conversion of other generating units to natural gas should Hawaiian Electric be successful in bringing LNG to Hawaii and if the economic analysis shows it will lower costs to customers.

38. Ron: if solar is now as economic as LNG why not continue investing in solar?

Ron Cox: Hawaiian Electric supports investment in utility scale solar projects and have submitted contracts for commission approval. Natural gas, shipped to Hawaii as LNG, complements these projects with a cleaner, lower cost fuel to supply firm, dispatchable power that will supply the grid during those periods when solar isn’t producing (such as during cloud covered days or at night). Gas fired combined cycle generation technology offers the most economic, flexible thermal generation available to complement the energy produced by solar and wind.

39. Can we get short-term LNG contracts? And how short?

Ron Cox: Short term contracts for LNG cargos are possible, but the proper infrastructure needs to be in place, with supply chains established, in order to be able to use the LNG.