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Wartsila's comments-Part 1 of three attachments

Attached are Wartsila's comments. The comments are submitted by Joseph Ferrari, Market Development Analyst, Wartsila North America.

Additional submitted attachment is included below.

WÄRTSILÄ

Wärtsilä North America, Inc.

November 21, 2014

California Energy Commission
1516 9th Street
Sacramento, CA

Re: Comments/submittal to questions posed for AB1257 Staff Workshop on California's Natural Gas Infrastructure, Storage and Supply (Natural Gas / Electricity Panel)

Dear CEC,

It was a pleasure to attend this workshop in Sacramento on November 18, 2014. I provided verbal comments during the public comment period and would like to follow up with a written submittal including two attachments. My comments are with respect to the last of 9 questions considered by the Natural Gas / Electricity Panel.

Question 9 in brief states that simple cycle flexible capacity is less efficient than gas turbine combined cycles (CCs), and raises the concern that more frequent use of flexible capacity may contribute to the increased use of natural gas in California.

Our analyses show that proper use of flexible capacity can, in fact, reduce natural gas consumption in California. I submit two white papers completed in conjunction with Energy Exemplar, LLC (Sacramento office). These analyses show that proper allocation of flexible capacity can actually increase system efficiency and reduce natural gas consumption (and carbon dioxide emissions).

Combined cycles are indeed the most efficient assets in the portfolio of thermal resources, but they are not meant for highly cyclic operations. Repeated starts and stops, combined with prolonged operational periods at low loads can decrease their efficiency and increase operating costs. Flexible capacity should not be used to displace combined cycle operation, but rather to work in concert with combined cycle operation to provide an optimal balance of reliability and cost effectiveness as they work together to balance net loads.

When considered appropriately, flexible capacity can increase fleet efficiency and reduce gas consumption (and carbon dioxide emissions) by:

- Absorbing net load fluctuations and ancillary service needs in an efficient manner.

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- Allowing combined cycles to run at higher loads and capacity factors, running more hours at higher efficiencies, with fewer costly starts and stops.

The real problem that California needs to address is the way in which long term planning analyses choose capacity for future new builds. At present the paradigm relies on load duration curve based capacity expansion models, which are incapable of addressing flexibility needs. Subsequent fine scale dispatch analyses are then performed to address gaps in flexibility and the appropriate capacity and technology to fill the gaps. This is an ad hoc approach yielding suboptimal solutions (less efficient and more costly than necessary). We suggest moving towards a more holistic paradigm that can address long-term energy and flexibility needs simultaneously. One such approach is Chronological Capacity Expansion modeling, which is the basis of the "Chrono" LTPlan module of PLEXOS™. PLEXOS is the software used by California utilities, the CAISO, CEC and other agencies to evaluate renewable integration challenges.

Additionally, California limits the pool of capacity choices considered for future capacity build outs. Currently, the technologies considered as flexible capacity are aero-derivative and at times, frame or industrial gas turbines. These technologies are considered due to their 10 to 20 minute start times and fast ramp rates relative to combined cycles. However, the pool of choices considered by the utilities and government agencies should be broadened to include additional technologies. One technology in particular is medium speed, utility scale internal combustion engine (ICE) power plants.

ICE power plants are offered by companies such as Wärtsilä, Caterpillar and GE. Plants can be configured to sizes as large as 500 MW, with multiple units in parallel (individual units are typically in the 5, 10 and 20 MW size range). Simple cycle units consume 10% less fuel per MWh than the most advanced intercooled aero-derivative gas turbines. EPC costs are equivalent on a $/kW basis to aero-derivative gas turbines. Closed loop radiator cooling ensures zero water consumption. ICEs are quick, with power to the grid within seconds and full power within 5 minutes of the start command. Operational ramp rates are such that the plants can be ramped from 40% load to 100% load in 30 to 40 seconds.

Wärtsilä is the leading supplier of ICE power plants, with close to 60 GW in service globally, and with over 2.5 GW installed in the USA. These include facilities in CA such as the 50 MW Modesto Irrigation District plant and 170 MW for Pacific Gas & Electric in Humboldt County.

To illustrate the manner in which ICEs can improve system efficiency, reduce gas burn and carbon dioxide emissions, I would like to submit the attached White Paper "*Power System Optimization by Increased Flexibiity*". This paper explores the positive impact

ICEs can have on CAISO operational and ratepayer costs, as well as system efficiency, for the year 2022.

The aforementioned paper only looks at operational costs. To take capital costs into account as well, we have performed an additional study that looks at capacity expansion modeling (CEM) for a California utility. Please note our simulations were not done as a prescription for this utility, rather we used the utility as a test case. For this work we evaluated the load duration curve approach against the Chronological CEM, to demonstrate the superior accuracy of the Chrono CEM approach. Next we performed a comparison where the technology choices were limited to gas turbines versus outcomes if ICEs were considered alongside gas turbines. This work showed when ICEs were considered alongside gas turbines, 900 MUSD NPV savings occurred over 10 years, mainly due to increased system efficiency and a more capital efficient build out of ICEs over aero-derivative and frame GTs, as well as 1-2% reductions in CO_2 emissions at the fleet-level. The white paper associated with this work is attached as well, titled "*Incorporating Flexibility in Utility Resource Planning*".

Once again, thank you for the opportunity to comment on AB1257 Staff Workshop on California's Natural Gas Infrastructure, Storage and Supply.

Sincerely,

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