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Mitsubishi Comments to The CPUC Regarding Grid Reliability and Aligning Near and Long-term Planning

Additional submitted attachment is included below.

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Establish Policies, Processes, and Rules to Ensure Reliable Electric Service in California in the Event of an Extreme Weather Event in 2021	Rulemaking 20-11-003 (Filed November 20, 2020)

OPENING COMMENTS OF MITSUBISHI ELECTRIC US PRESENTED TO THE CALIFORNIA PUBLIC UTILITY COMMISSION REGARDING THE ORDER INSTITUTING RULEMAKING (OIR) TO ESTABLISH POLICIES, PROCESSES AND RULES TO ENSURE RELIABLE ELECTRIC SERVICES IN CALIFORNIA IN THE EVENT OF AN EXTREME WEATHER EVENT IN 2021

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Submitted by Mistubishi Electric, December 3, 2020 by:

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I. INTRODUCTION

Mitsubishi Electric greatly appreciates the Commission's rapid response to the need to meet peak demand periods on the grid brought on by extreme weather events understood to be the direct result of climate change, and which are anticipated to increase in the coming years. Mitsubishi Electric US, Inc., Heating and Air Conditioning Division (MEUS HAD), is a leading manufacturer of ductless and Variable Refrigerant Flow (VRF) heat pumps and air conditioning systems. We appreciate the Commission's efforts to mitigate the impacts of buildings on climate change and recognize the importance of rapid mobilization strategies that produce measurable reductions in GHGs over the next thirty years as well as the broader goal to transform California's economy to carbon free and carbon negative alternatives. Although we are not direct stakeholders in grid resources, successful decarbonization of the grid over the coming decades is critical to the carbon footprint of the heat pump technologies we manufacture, and therefore to the soundness of our technologies as a near and long-term solution to climate mitigation challenges.

On issues of climate mitigation strategies Mitsubishi Electric is an outspoken advocate. In June 2019, Mitsubishi Electric published “Environmental Sustainability Vision 2050” to clarify the company’s stance on addressing long-term environmental issues. This corporate vision asserts that “The Mitsubishi Electric Group shall utilize diverse technological assets throughout wide-ranging business areas to solve various environmental issues, including climate change…” Mitsubishi Electric regards climate mitigation a primary mission and service to our customers, and in furtherance of the goals of the Paris Accords, we desire to be reliable and consistent partners in the global climate mitigation efforts.

For the purposes of transparency and full disclosure, it is important to note that Mitsubishi Heavy Industries (MHI) based in Japan manufactures offshore wind turbines and hydrogen power plants, and we do not want to give the impression that our comments today attempt in any way to represent their interests, and to clarify that Mitsubishi Electric US has no direct affiliation or correspondence with MHI. Our corporate interest is purely in maintaining and accelerating the schedule of grid decarbonization and the “grid harmonization” of renewables through a continuously improved renewable portfolio standard (RPS) because this impacts the carbon impact of our heat pump technologies directly.

II. Investment in Natural Gas Power Plants: A “Sunk Cost”

The above referenced OIR states: *“To develop new resources, this OIR will consider multiple options, including directing each investor-owned utility (IOU) to develop new supply-side resources to the extent they can be brought online in 2021 and to bring additional capacity online by procuring incremental capacity from the existing resources, implementing efficiency upgrades to existing generators, and retrofitting existing generators that are set to retire, such as Once-Through-Cooling (OTC) generators”*(pg.10). It is not at all clear in the OIR if the intent is to “retrofit” existing generators to eliminate the OTC feature as required by Cal-EPA, or if the retrofitting would be in regard to increasing the efficiency of the inefficient and outdated gas turbines already installed at these plants. Either of these options is not acceptable given the states stated 2050 decarbonization goals. Climate mitigation should not be compromised by further investment in carbon producing technologies that inherently creates either a stranded asset (which ratepayers pay for) or further long term commitment to technologies that by their nature are carbon producing regardless of how "efficient" they may be. We need better long term planning to be married to better short-term planning.

There are a total of eighteen once-through-cooling (OTC) plants in California*[1] and all are located on the coast and the value of the grid infrastructure going to them is worth billions (approximately $20B-$30B). We now have a choice between either perpetuating the marine and emissions impacts of these plants, or exercising the opportunity to plug renewables into this newly available grid capacity. If we do not rapidly build and deploy renewables to plug into this grid capacity as it becomes available, the grid infrastructure going to these plants also becomes a stranded asset. Given the immediacy of the heat storm peak load events that we are now anticipating in the summer of 2021, California needs to develop its long term "Marshall Plan" to rapidly deploy offshore wind which provides more consistent power that almost perfectly complements solar on the grid*[2] and by doing so, reduces by more than half the investment required in utility storage.

Any improvements and gas system upgrades to OTC plants slated for closure due to non-compliance with EPA rules become sunk costs. Such scenarios create a commitment and an incentive to keep these plants operating to recover the value of the investment, but this is clearly a reversal of our legislated mandate to rapidly transition to a lower carbon grid by increasing the RPS, and the CPUC has a legislated mandate to explore rapid deployment of renewables instead. It is indeed ironic, that our first reaction to the looming heat storms would be to invest in extending the service of carbon producing power plants that are known to be a contributing cause of the heat storms – a solution that perpetuates the problem. This is not an emergency that calls for digging the hole deeper. Let us focus on the real solutions to climate change while continuing to factor ALL lifecycle costs and carbon impacts. Renewables are now cost competitive with natural gas power plants*[3] so there is no economic argument to addressing the immediate crisis by reverting to business-as-usual scenarios, and every economic argument against it, including the long term financial impacts on California households*[4] and the projected loss of 90% of California's agricultural output if we fail to mitigate climate change*[5].

III. Low-Temperature Geothermal as an Alternative to Utility Scale Batteries

There are emerging technologies such as low-temperature geothermal that should also be considered for distributed energy resource (DER) development over the coming decade. Because these technologies require much lower ground source temperatures, the well sites can be far more distributed, lowering grid infrastructure costs and improving community resiliency. And these potential geothermal resources are baseload generation that provide power continuously, while they can also be turned on and off instantaneously, making them another key grid harmonization resource that replaces or supersedes the need for extensive utility scale storage*[6].

Why should we consider alternatives to utility scale batteries? Although batteries can instantaneously respond to grid demand, and therefore act as a "shock absorber" in the grid management system, current Li-ion battery technologies have a high embodied carbon footprint and their high energy density actually makes them better suited for light duty vehicle applications. There are in fact high lifecycle cost impacts associated with lithium batteries, including mining, transport, manufacture and recycling, so there use to balance the grid should be minimized as much as possible, and limited to a "shock absorber" role.

IV. The Economics of Hydrogen as Storage is No Longer a Dream

Although the economics of hydrogen have always been twenty years away from implementation, there are some clear indications that we are now only five years away from full economic viability, and excess renewable generation can be converted to hydrogen gas at a relatively high efficiency of 70%. Although this efficiency is lower than the charging efficiency of batteries, this form of utility scale storage has an overlay of benefits and applications: 1) There are few technologies other than hydrogen for decarbonizing high-heat and heavy industrial applications that require such concentrated energy resources; 2) Hydrogen can be burned in specially designed gas turbines*[7] (now available) which can be used to balance the grid where a combination of renewables such as solar and offshore wind may not be fully "harmonized" with demand; 3) Hydrogen can be used to power heavy transport such as long distance trucking and bus fleets*[8], trains and aviation*[9] (first hydrogen jets now under construction); 4) Hydrogen can be used in "motor-sailing" cargo ships*[10] which are now on the drawing boards and can revolutionize shipping. One must ask, how else can we meet California's decarbonization goals, and why is the state not marshalling a plan to rapidly achieve economies of scale with both OSW and hydrogen storage plus peaker plants when this is so clearly the path we must take? Given recent articles indicating that we are falling short of Paris Accord goals*[11], a "Marshall Plan" is called for.

V. Near Term Solutions to Anticipated 2021 Peak Events

Because deployment of offshore wind will take several years, the focus in the meantime should be on demand side management strategies such as more aggressive and incentivizing TOU rates to motivate enrollment in demand response programs and public outreach and advertising to educate ratepayers not to use appliances during peak hours. The use of social media campaigns to make consumers aware of immanent peak load events and how they should respond is clearly a worthwhile investment as it will help avoid investments that are likely to become sunk costs. Also, public education is not a lost investment. Once the public is more aware of TOU rates and appropriate responses to events, more energy conscious behavior should continue into the future. Such behavioral nudges and public outreach in the form of "emergency declarations" appear to have evoked appropriate and significant response last summer. This is by far a better investment than upgrades that become stranded assets.

VI. Vehicle to Grid as a Resiliency Resource

Also, it is time that a real EV to grid resource be developed and implemented. Given the number of EVs now on the road, and given that the average commute is usually 29 miles and it is now far lower than that due to the COVID crisis, we should use the current peak demand challenge to rapidly implement rules requiring EV chargers to have vehicle to grid (V2G) capability*[12]. As EV fleets increase, they represent a growing resiliency resource but only if chargers are outfitted to feed the grid during peak events and EV owners are incentivized to charge in advance of such events and feed the grid during the heat storm. It is critical to our midterm and long term resiliency strategies that ALL chargers and EVs have V2G capability to help "grid harmonize" renewables in the decades to come.

The math works: We can know with some certainty that EV drivers on average are not driving more than a 29-mile average commute. As of the end of 2019 there were 670,000 EVs on the road in California, and despite the pandemic, sales of battery EVs (pure EVs) is anticipated to top 100,000 units in 2020. To assess this available capacity, we should count only the spare battery capacity of only the Tesla EVs because shorter range EVs may need their capacity (about half of the total). If there are about 375,000 Teslas on the road in California, at least 100,000 of them were sold before 2015 and may have some reduced battery capacity, so to avoid deep discharge of this reduced capacity, we should derate the rated capacity of the batteries. Even if we consider only 2/3 of the rated capacity of the Teslas, this resource represents 22 GWh of stored energy, a significant resource (90kwh x .66 x 375,000 =22,275MWh). This resource would have more than met the 1,792 MW and 3,219 MW shortfall (from 6pm to 10pm) during the August 14-15, 2019 heat storm event. If EV owners were paid a high premium to feed the grid during peak load events, most would participate, and the premium would be worth paying to avoid higher carbon resources as well as avoid investment in back-up systems that would usually remain idle. Vehicle to grid technology has been discussed since 1991. It's time to stop talking and make it a reality.

VII. Hydrogen Buses as a Resiliency Resource

There is another form of V2G technology that is not widely known or discussed. Hydrogen powered buses which have electric drives powered with fuel cells, can be outfitted with inverters allowing them to be used as portable 1MW generation stations that can be deployed to hospitals, emergency facilities, and command centers during power outages and other emergencies. Because these fleets are "charged" by refilling them with hydrogen, they can provide continuous power to "heat relief centers" for vulnerable populations. Because there are numerous hydrogen bus fleets already on the road, it is affordable and viable to outfit all of them with inverters to fulfill this resiliency mission*[13].

VIII. Operational Changes to CAISO vs. Peaker Plant Expansion

If there were "operational issues with the day-ahead market, among other issues, (which) restricted CAISO's ability to increase the amount of net imports" (pg. 6 of the OIR) these operational issues should be addressed quickly in the coming months in order to avoid investment in upgrading OIR plants that are slated to retire. Any operational changes which can increase the flexibility of grid management options should be explored before any consideration is given to further investment in and commitment to NG peaker plants and/or extending the proposed shutdown of OIR facilities. If we are to invest in gas peaker plant upgrades anytime in the coming 5 years, we should delay those upgrades until such time that mass deployment of hydrogen turbines can be scheduled so that stranded assets and sunk costs are avoided. On this note, we agree with the preliminary report recommendations that: *"1) the Commission should consider updating its resource and reliability planning targets to better account for extreme heat events and the evolving operational needs for the electricity grid given the state's transitioning energy mix, and 2) the Commission should expedite the development of additional resources (e.g., demand-side resources) that can be online by the summer of 2021"*(pg. 9 of OIR), provided however that no investment is made in carbon producing power plants that could become a stranded asset, or that sidesteps the opportunity to achieve economies of scale with hydrogen peaker plants and storage facilities in the next five years. Mitigation of the immediate crisis of meeting demand during heat storms should not result in actions that prevent or postpone response to the equally immediate crisis of climate change.

IX. Implementation of Optimized HVAC Installation Standards

Seemingly unrelated to the need to mitigate peak HVAC loads on the grid is the need to change the entire business model for how HVAC contractors operate. Currently, close to 90% of the heating system replacements or "retrofits" that performed in the state of California are not permitted and therefore are not inspected by "third-party" inspectors called "HERS raters". The pervasiveness of this widespread disregard for code compliance requirements has led to very low "delivered efficiency". This "installed efficiency" of HVAC equipment is a dismal 56% to 58% of the actual rated efficiency of furnaces and air conditioning systems depending upon which national study you cite (NIST*[14], ACEEE, NCI). Imagine the inequity of all the consumers being told that they are buying a 95% efficient furnace or an 18 SEER AC system when the delivered efficiency and energy savings are about half of that. The disregard for "quality installation" standards (QI), results in everyone going home at 6pm, flipping on their AC and the demand spike being twice as great at the neck of the so called "duck curve" which is used to graphically illustrate this demand management problem.

Although SB1414 legislatively required the CEC and the CSLB to collaborate on compliance solutions, the report proposing solutions is overdue, and private discussions with CSLB board members indicates reticence against revising hundred-year old rules and rule interpretation that may directly address the compliance problems. Our peak demand events would be entirely mitigated if there was a 95% compliance with current Title 24 code requirements on HVAC replacements and repairs so that “delivered efficiency” approaches 100% of the rated efficiency of the equipment. This is in fact a critical piece of the overall grid harmonization strategy.

Now imagine if we had a means to reduce residential peak HVAC demand to about a third of what it currently seen in existing buildings. That HVAC optimization method exists and is well-documented with hard data. Rick Chitwood, a pioneering field researcher for the CEC has developed such methods using a “whole-house” approach to heat pump integration which calls for downsizing equipment by deeply burying and tightening ducts (low leakage) as well as managing some duct air flow characteristics that increase efficiency. However, there is a Catch-22 that prevents HVAC installers from using this method: In short, it forces them to lose money*[15]. HVAC contractors cannot provide comfort to their customers unless they can reinsulate attics simultaneous to the downsized HVAC system installation, but HVAC contractors are not allowed to profit from the insulation portion of the job even though it directly impacts the optimization of their install, and the CSLB will not reinterpret old rules to allow this “whole-house” optimization to occur. Basically, to achieve the greatest societal benefit, and the highest overall system efficiencies with the best paybacks and energy savings for consumers, the rules must change; business models must change; permitting processes for HVAC replacements need to be uniform and available through a centralized permitting portal, and contractors must be allowed to compete and profit when they deliver a quality installation. CPUC, CEC and CSLB need to collaborate to allow quality HVAC installation to happen in the marketplace.

X. Conclusions

Mitsubishi Electric remains firmly committed to climate mitigation strategies that work. It is clear from recent research by E3*[16] and RMI*[17] that electrification of buildings will be the most cost effective strategy to decarbonization the building sector. Furthermore, research from Earth Justice and the Sierra Club*[18] indicate that it will not be economically feasible to decarbonize the existing gas infrastructure by introducing a 4% to 6% mix of renewable natural gas. Similarly, the proposal to introduce a blend of hydrogen (H2) with natural gas (NG) for distribution in the residential gas infrastructure as proposed by some gas industry research* remains uncertain given the “thinner” H2 molecule, its propensity for increasing leakage, the corrosivity of H2, and the already leaky natural gas infrastructure that needs systematic repair or complete replacement before it can be used for hydrogen. Clearly, the industrial gas infrastructure already needs to be rebuilt to accommodate hydrogen for high heat applications, and this will keep pipefitters busy for decades to come.

Given the economic realities of RNG and the most practical applications for RNG and hydrogen, these fuels should be reserved for the industrial and heavy transport applications that will demand their use if we are to fully decarbonize all sectors of the economy by 2050. Hydrogen has a special role to play in many sectors, most importantly as the most reliable form of long term storage that can power gas peaker plants to harmonize the grid with a much lower overall carbon footprint than lithium based utility scale storage. Until these longer term strategies are deployed, we should not compromise their future deployment by investing further in natural gas peaker plants that should be slated for conversion to hydrogen by the close of this decade. Neither should the RPS standard be compromised in order to meet the anticipated 2021 summer peak demand. The near and midterm solutions should focus on demand side management, consumer education and revision of TOU rates to incentivize off-peak demand and load shifting. Mitsubishi Electric US remains committed to working in partnership with the CPUC to produce real solutions to climate change and the greatest long term societal benefits.

Respectfully submitted,

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Footnotes:

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