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Comments by Natel Energy: 2016 IEPR Commissioner Workshop on Climate Adaptation and Resiliency for the Energy Sector

Additional submitted attachment is included below.



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Comments by Natel Energy: 2016 IEPR Commissioner Workshop on Climate Adaptation and Resiliency for the Energy Sector

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Natel Energy is a low-head, distributed hydropower manufacturing company, located in Alameda, California. Natel manufactures and sells proprietary fish-friendly hydroelectric turbines called hydroEngines™ that are suitable for low-head, high-flow settings, and range from 50 kW to 1.2 MW of capacity per unit. Natel is focused on offering a competitive turbine product for small hydro installations that drives down the cost of project development, as well as offering an alternative to large-dam, conventional hydropower called EcoSmartHydro™. EcoSmartHydro™ combines a watershed management platform - watershedOS - with the hydroEngine to optimize the generation of hydropower in conjunction with human and ecosystem needs. Specific for projects in California, Natel uses watershedOS to screen projects that have the potential to deliver climate resilience co-benefits in the form of ecosystem and water management strategies by pairing distributed hydropower sites with groundwater recharge and flood mitigation projects. Natel's vision is to enable efficient, cost-effective use of water to produce new, baseload renewable energy while maintaining conditions that sustain or improve water resources for ecosystems, for human consumption, and for agriculture, with the potential to actively develop in-canal projects that are able to pass additional winter runoff flows to drive groundwater recharge, storage for irrigators, and flood mitigation, and flexible generation dispatch for firming services and better integrate intermittent renewable sources. All of these co-benefits drive a unique new approach to climate-resilient hydropower development strategy.

More information can be found on our website at www.natelenergy.com

Climate Resilience through Distributed Hydropower + Water and Ecosystem Management

To help address climate resilience issues in the energy sector in the state of California, Natel Energy is able to pair new, flexibly dispatched, distributed and low-impact baseload renewable generation using the hydroEngine with water management strategies, starting in irrigation district infrastructure. Natel aims to develop integrated cascades of hydropower projects in canals that can be coordinated with existing groundwater recharge and flood mitigation efforts, to help simultaneously deliver on water and climate resilience goals as well as state GHG reduction and renewable energy deployment goals. Many irrigation districts in California, such as Yolo Irrigation District, are already passing winter precipitation and runoff, which is increasingly falling as rain instead of snow, for diversion of flows into recharge basins, such as fallowed farmland, to help drive groundwater recharge and help mitigate flood impacts. Natel is already in discussion with numerous California irrigation districts that are pursuing such strategies where an existing drop would be a good fit for Natel's hydroEngine technology. In such a project, the pairing of increased flows through irrigation canals in the winter months with in-canal deployment of the hydroEngine could deliver 2-3 months of extra baseload renewable energy generation, thus providing an additional 2-3 months of revenue for the irrigation district partner, while delivering groundwater recharge through the regular seepage of water into the ground surrounding the canal. Where applicable, this could also be paired with the downstream diversion of water into recharge basins for a few extra months a year to increase active recharge. Natel has partnered with U.C. Berkeley's Renewable and Appropriate Energy Lab to research the innovation on the Controls side needed to deliver flexibly-dispatched, distributed project layouts for firming services, as well as



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to conduct a California statewide assessment of the potential for pairing Natel's units with groundwater recharge and flood mitigation co-benefits.

Distributed, Flexible, and Adaptable Baseload Generation

The modularity of Natel's low-head hydropower turbine also allows for greater system flexibility in the long-run, given the presumed changes in water flows and allocations that will occur over time due as a result of drought and climate change. By developing smaller, distributed plants, Natel is able to design projects for financial return on a shorter time scale that allows for projects to be re-evaluated and adjusted as needed on a 20-year project timescale, as opposed to the long lifetimes of conventional hydropower. These projects can then be flexibly updated over time given changes in water availability, surrounding ecosystem needs, and other relevant factors.

This characteristic of Natel's unique approach to distributed hydropower generation is of particular relevance in the state of California, where demand for baseload renewable generation becomes increasingly urgent and critical with time. The recent closing of the Diablo Canyon nuclear plant has left a 2.2 GW void in baseload generation that PG&E has committed to source using renewable energy generation and storage technologies. Natel's hydroEngine technology is in a position to deliver new, baseload renewable energy generation that, because of plant size and modularity, can be flexibly dispatched so that individual project sites can have the flexibility to change over time with changes in water flows, ecosystem needs, irrigation water demands, etc. In California alone, the statewide estimated potential for new small hydro development, based on Navigant Consulting's 2006 "Statewide Small Hydropower Resource Assessment for the California Energy Commission", as well as internal GIS mapping analysis, is over 500 MW in size. Being able to flexibly dispatch that generation as well in certain site scenarios, as discussed earlier, would enable a new type of energy storage capacity through distributed hydropower systems that is more cost-effective and scaleable than either pumped storage or battery technology currently allow. Distributed low-head hydropower systems, therefore, could become essential resources to the ever-increasing demand for baseload renewable generation and storage capacity in the California grid system.

Leveraging Grant Funding to Unlock Private Investment and Scale Commercial Solutions

Natel's work is one example of many new technologies that are developing unique, innovative approaches to addressing cross-sector climate issues. As opposed to tackling siloed, single-sector goals, these solutions are aimed at delivering value on multiple fronts with a single investment, driven by simultaneous state and federal policy goals of ramping renewable energy generation, addressing flood risks and ecosystem habitat risk, and safeguarding water supplies. We would like to emphasize the importance of the California Energy Commission and California Public Utilities Commission and other relevant agencies in directing support and funding towards solutions that best utilize investment dollars by delivering multiple co-benefits in the energy and climate resilience sectors. In order to develop a climate resilient energy sector, and in lieu of statewide goals for dramatic increases in renewable generation and integration driven by SB350, generation technologies that are designed to be flexible and distributed, that are designed with ecosystem, water, and land needs in mind, and that are designed with climate co-benefits integrated into their project model should be prioritized. Such solutions can help the state get the best "bang for its buck" in both energy and climate investment pursuits.

Additionally, in order to scale these technologies, the California Energy Commission and California Public Utilities Commission must ensure that funding flowing out of their respective agencies, as well as those they coordinate with, are being used to further unlock private investment and built pathways to



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markets to attract that private capital. To address our most pressing climate issues, and to deliver solutions with near-term urgency, it is essential that grant money and relevant appropriations aim to unlock private capital that can in-turn accelerate on larger scales the market solutions necessary. As most current grant programs are structured as grant programs, Natel would like to emphasize the need for solicitations and programs that are focused on commercial demonstration and deployment of early-stage technology. While R&D programs are still essential, policymakers and staff should ensure that scaleable early-stage solutions with a clear path to market are able to receive the initial pilot and commercial demonstration support needed to deliver solutions that can then, in turn, attract and scale within private markets. By targeting such opportunities, California can lead the way in development of technologies and business models that can encourage climate resilience and adaptation, while also delivering on state GHG reduction and renewable deployment goals. Many of the technologies necessary to address our climate needs, such as conserving water resources, mitigating the effects of extreme weather events, and building out flexible energy infrastructure to encourage long-term ecosystem health, are currently in the development stage, and providing support can send appropriate market signals to investors in this space and accelerate the transition to the marketplace.