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U.S. Department of Energy
Forrestal Building
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RE: National Hydropower Association Response to the Department of Energy Request for Information on the Energy Improvements in Rural and Remote Areas Program

The National Hydropower Association (NHA) is a non-profit national association dedicated to preserving and expanding clean, renewable and affordable waterpower which meets the electricity needs to an estimated thirty million Americans.

NHA promotes innovation and investment in all waterpower technologies including hydropower, pumped storage hydropower and marine energy. NHA believes that marine energy and small hydropower have a significant role to play in helping to foster lower carbon, reliable grid systems in rural and remote communities and as such support for waterpower technologies should be a key feature of the Energy Improvements in Rural and Remote Areas (ERA) Program.

NHA's organizational structure contains eleven committees and councils. NHA's Marine Energy Council (MEC) and Small Hydro Development Council (SHC) provided input for this response to the Request for Information (RFI) from the U.S. Department of Energy (DOE) Office of Clean Energy Demonstration (OCED) on the ERA Program.

Background on Marine Energy

Marine energy (clean power from waves, tides, currents, and other water-based resources) is an emerging renewable that has great potential to help decarbonize the domestic energy portfolio and provide a material contribution in the effort against climate change. In short, deployment of marine energy at scale in the United States is a massive economic and environmental opportunity.

A DOE funded 2021 study by the National Renewable Energy Laboratory (NREL), "Marine Energy in the United States: An Overview of Opportunities", found that the total marine energy technical resource in the fifty states to be 2,300 terawatt hours per year (TWh/yr), equivalent to roughly 57% of 2019 U.S. electricity generation[1]. DOE-supported demonstration projects and research over the past decade show that marine energy technologies will provide clear and competitive benefits to the electric system and facilitate off-grid "Blue Economy" market opportunities. These benefits include marine energy's proximity to demand loads, relative predictability, energy density, generating profiles, reliability, resiliency, and ability to deploy in rural and remote areas.

To realize these potential benefits and ensure U.S. leadership in this emerging clean energy sector, we must move swiftly and with urgency to incentivize local production of domestic-based technologies which will support economic growth with global exports and high value job creation. NHA membership is thankful for the ongoing support from the DOE Water Power Technologies Office (WPTO) for private sector-led research, development, demonstration, and deployment (RDD&D) efforts dating back to the marine energy program's establishment in Fiscal Year (FY) 2008. However, much more can and must be done in the near-term to commercialize the domestic marine energy sector.

Marine energy technologies are currently undergoing rapid innovation, with a number of systems commercializing now, but we must move swiftly and assuredly to help deliver this future. As with more mature power generation technologies, support from the U.S. Federal Government for critical technology RDD&D, along with aligning regulatory processes to development stage and implementation of appropriate incentives, are key to igniting commercialization of the domestic marine energy sector.

Marine energy is poised to emerge as the next significant source of clean, renewable power with the appropriate level of federal support. However, deployment of marine energy at scale would be greatly accelerated if OCED resources were utilized to mature technologies from mid to high level technical readiness in order to increase project bankability which is needed to expand near-term private sector investment.

Background on Small Hydropower

Small hydropower is a readily available technology that includes a wide range of projects spread across the U.S. Small hydropower can be defined by projects having a generating capacity of up to 20 MW— typically built using existing dams, pipelines, and canals. Small hydropower has substantial opportunity for growth. Existing small hydropower comprises about 75% of the US hydropower fleet in terms of number of plants[2].

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[1] "Marine Energy in the United States: An Overview of Opportunities," NREL, (2021), https://www.energy.gov/sites/prod/files/2021/02/f82/78773_3.pdf

[2] "Small Hydropower in the United States," ORNL, (2015), https://info.ornl.gov/sites/publications/files/Pub56556.pdf

These smaller projects can capture energy from low-head stream flows or using existing dam, irrigation, or industrial infrastructure. Installing small turbines in irrigation canals, water-treatment plant outfalls and existing hydroelectric facilities means projects often have little to no environmental impact. The economic feasibility of developing new small hydropower projects has substantially improved recently, making small hydropower one type of new hydropower development most likely to occur,[3] in addition to pumped storage hydropower. There is also tremendous opportunity throughout the country in strategically rehabilitating projects from the last century that have faithfully served our country's communities, but are needing support to enable continued use of this existing infrastructure.

A recent report conducted by the Oak Ridge National Laboratory (ORNL) funded by DOE titled, "An Assessment of Hydropower Potential at National Conduits," found that there is an estimated 1.4 GW of potential energy in undeveloped conduits across the U.S.[4] with the largest portion of conduit hydropower potential being in the agricultural sector followed by the industrial and municipal sectors.

Government support, critical to fostering these small hydropower resources, and enabling them to compete on a level playing field with other renewable resources, includes research and development, continued tax incentives in support of renewable energy development, enhanced intergovernmental cooperation in the federal licensing process and strategic funding support where available

NHA appreciates the opportunity to submit the following comments in response DOE's OCED RFI on the ERA Program.

Comments

1.1 What type of organization do you represent, or are you responding as a private citizen? To help DOE categorize responses, please use one of the following respondent classifications: private citizen, government, community-based organization, labor union, energy provider, American Indian Tribe and Alaska Native Village, or other tribal organization, for-profit company, other type of non-profit entity, or other. If other, please specify.

NHA is a non-profit national trade association. NHA's membership consists of more than 300 organizations. Members include both public and investor-owned utilities, independent power producers, innovative technology developers, equipment providers & manufacturers, service providers, environmental and engineering consultants, attorneys, and public policy, outreach, and education professionals.

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[3] "Small Hydropower in the United States," ORNL, (2015), https://info.ornl.gov/sites/publications/files/Pub56556.pdf

[4] "An Assessment of Hydropower Potential at National Conduits," ORNL, (2022), https://info.ornl.gov/sites/publications/Files/Pub176069.pdf

NHA works with private sector companies, academia, and government partners to[5]:

- Encourage the commercialization of marine energy technologies
- Support the growth and expansion of small hydropower project development
- Raise awareness of the waterpower industry's considerable potential to create good paying jobs and to secure an affordable, reliable, and environmentally friendly and just energy future

1.2 What role would you or your organization play in an energy project conducted through this Program?

MEC member organizations develop wave, tidal, ocean current and riverine hydrokinetic energy projects that can be scaled to provide tremendous benefits to the rural and remote communities targeted by the ERA. The benefits include innovative and replicable approaches to improve the resilience, safety, reliability, and availability of energy generation serving island and coastal rural and remote areas, as well as reduce the adverse impacts from energy generation serving those locations.

For energy projects conducted through the Program, these organizations have the ability to develop and demonstrate clean energy generation technologies; conduct stakeholder engagement, project development, and permitting and regulatory approvals; and provide ownership and operation of projects.

The MEC will support organizations selected for energy projects conducted through the Program with stakeholder engagement and by sharing best practices, research, and advocacy resources.

SHC member organizations develop, maintain, and own varying types of waterpower projects around the country.

If included in the Program, SHC members would be able to demonstrate and validate their innovative approaches to small hydropower generation and community engagement, financial and business modeling strategies within rural and remote communities. These approaches are highly replicable and will help divest communities from fossil fuel usage while providing reliable, affordable hydropower and widespread, localized economic benefits as will be seen in answering the following sections of this RFI.

2.1 In Section 40103(c), "rural or remote area'' is defined as a city, town, or unincorporated area that has a population of not more than 10,000 inhabitants. Would you characterize the

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[5] Learn more about NHA's work at https://www.hydro.org/.

area you represent or have in mind regarding this program as being rural or remote? If so, why? If you are considering many areas (e.g., as a governmental body or non-profit), what characteristics would be indicative of communities fitting this definition?

NHA's SHC and MEC members range in geographic area within the U.S., but their projects and technologies are highly replicable and could be placed in many rural, remote and coastal areas that meet the Program's criteria.

From our perspective, wind and solar alone will not be able to satisfy the energy needs of many rural and remote communities. Speaking specifically of rural and remote areas on U.S. islands and coasts, many of these communities have strong marine energy resource availability but continue to rely heavily on generation from combustion of liquid hydrocarbon fuels. Marine energy and small hydropower projects can be deployed in the near term in order to reach the scale needed to provide the communities within the Program's criteria clean, affordable energy in accordance with federal clean energy goals for 2030 and beyond.

There are somewhere around 6-10 Alaskan rural communities that do have some amount of wind generation – in a couple cases it could be as much as thirty to fifty percent of their annual energy production. Though, in King Cove, Alaska two small run-of-river hydropower projects already produce around eighty-five percent of their annual 5MW demand, so investing in wind does not make financial sense to them at this time despite the presence of "class 6" winds near the community.

MEC member organizations are developing wave, tidal, coastal current and riverine hydrokinetic energy technologies that could provide zero-carbon, zero-hazardous air pollutant, reliable renewable energy to rural and remote communities on island and coastal communities throughout the United States.

Moving away from specifically coastal remote areas, some NHA member organizations are already demonstrating replicable applications to service rural and remote communities while others have demonstrations planned in their strategic roadmaps. Projects supported through the Program would allow member organizations to increase the scale and speed with which they deliver marine energy or small hydropower to serve these communities.

One example is the Igiugig Hydrokinetic Project in the remote southwestern Alaska tribal village of Igiugig. After the Federal Energy Regulatory Commission (FERC) issued its first permit to a U.S. tribal entity for a water-powered project not connected to a dam, Ocean Renewable Power Company (ORPC) deployed a 35-kilowatt RivGen® Power System, using a submerged cross-flow river current turbine system to harvest energy from the Kvichak River. This is the first of a two-device installation that will also include smart microgrid controls and a battery energy storage system. When completed the project will reduce local diesel consumption by up to 90 percent[6].

Another example is in the City of King Cove, Alaska, a remote community of about 1,000 inhabitants which had historically relied on diesel fuel for their electricity and heating needs. About 25 years ago, the community began the development of two run-of-river small hydropower facilities. Now, the local municipal utility, owned and operated by the City of King Cove, has been a highly functioning renewable energy community with their two small hydropower facilities providing about 85% of their annual 5MW electricity demand[7]. The city has the potential for developing a third small hydropower project. In fact, King Cove has analyzed a tidal energy project but the costs are prohibitive in the current investment environment. Federal support would for these types of marine energy and small hydropower projects in rural and remote areas would assist in moving towards 100% clean, reliable energy.

Residents of King Cove, Alaska have historical knowledge of their usual river flows, so it only makes sense that they train and gain experience to operate the facilities. Having this connection to their environment has benefited the community's clean energy generation and shows that local workforce development is not only possible when developing small hydropower facilities in rural and remote areas, but it is the best option for the desired clean energy generation results.

Based on examples from the waterpower industry, characteristics of rural and remote communities that will best be served through waterpower (marine energy and small hydropower) technologies and innovative approaches include:

- All those parameters set by the Program to define rural and remote.
- Located on or near a coast, island or river and meeting the DOE Energy Transitions Initiative Partnership Projects definition of a "remote, island or islanded community"[8]or located on existing water or industrial infrastructure (
- Electricity delivered by a local grid (minigrid or microgrid) that is not connected to a larger electric grid overseen by an ISO or RTO, or connected to such a grid but facing congestion, or other constraints (distance from generation, single distribution line exposure, etc.) that result in unreliable service or communities that have existing unutilized or aging water/industrial/or power infrastructure.

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[6] Read more at https://www.energy.gov/eere/water/articles/energy-department-funding-helps-transform-alaskan-river-renewable-energy-source and https://www.energy.gov/indianenergy/igiugig-village-council-2019-project

[7] https://alaskapublic.org/2017/12/14/king-cove-closer-to-goal-of-100-percent-renewable/

[8] https://www.energy.gov/eere/about-energy-transitions-initiative-partnership-project)

- Those areas whose load is served through the combustion of liquid hydrocarbon fuels or other high-cost sources of generation (which, frequently, also admit high levels of greenhouse gas emissions and hazardous air pollutants that negative affect health outcomes in the local community) or other non-localized generation.

NHA recommends that future rural, remote and coastal waterpower installations selected by the Program use similar holistic approaches to those above to deliver renewable power to targeted communities, as well as provide energy storage systems for excess produced power. In addition to batteries, clean hydrogen production and hydrogen derivatives should be considered for energy storage and utilization.

2.2 Would you characterize this area as underserved, overburdened, disadvantaged, or as having environmental justice concerns? If so, why and with what metrics? In what ways, if any, does being rural or remote shape these challenges?

Many rural and remote island, coastal, and river-adjacent communities are underserved due to the high cost and logistical challenges of connecting them to a larger electric grid. When these rural and remote communities are not grid-connected or are underserved due to transmission and distribution constraints, residents face higher energy burdens and there is reduced economic activity due to the higher cost of liquid hydrocarbon fuel-based energy alternatives. These hydrocarbon generators also create environmental justice issues and energy security risks for these communities. Diesel or other hydrocarbon generators produce a high level of hazardous air pollutants that negatively impact health outcomes and produce a high level of greenhouse gas emissions, which drive climate change impacts such as sea-level rise that are a primary threat to the existence of coastal and island communities. Because fuel for these generators is often delivered to these communities by ship, the communities face a disadvantage in energy security due to the many supply and logistics challenges that can result in adequate fuel delivery. Further, many rural agricultural and industrial communities have unutilized or aging infrastructure that could be used to produce new, local generation or ensure the continued use of historic clean generation resources. Utilizing these resources provides widespread local economic benefits, stabilizes the grid with distributed generation resources, and helps offset the importing of carbon-polluting, more expensive energy sources.

While there are rural and remote communities in every state and U.S. territory, the areas below provide clear cases reflecting the challenges. 2020 census data reveals median household income in coastal rural/remote areas in these locations:

- Puerto Rico — $21,000
- Kusilvak Census Area, Alaska — $38,000
- Bethel Census Area, Alaska — $52,000
- Lake and Peninsula Area Borough, Alaska — $54,000
- Prince of Wales-Hyder Census Area, Alaska — $54,000
- Liberty County, Montana -- $46,750

- Gooding County, Idaho -- $50, 057
- Kern County, California -- $54,851
- Palisades, Colorado -- $54,367[9]

These figures compare to U.S. median household income of $70,784[10].

However, the U.S. Energy Information Administration (EIA) states that the average cost of electricity for residential customers is 20.02 cents/kWh in Alaska, 35.45 cents/kWh in Puerto Rico, and 19.65 cents/kWh in California compared to an average of 11.10 cents/kWh[11] in the U.S. as a whole. In Puerto Rico, 37% of the territory's generation still comes from expensive, high-emitting oil-fired generation, and hurricanes in recent years have repeatedly exposed the vulnerability of the local grid that relies on traditional transmission and distribution infrastructure to deliver power from central hydrocarbon generation sources.

In Alaska, 12% of generation comes from oil-fired sources, with another 40% from natural gas. Many coastal and island communities in Alaska are served by minigrids and microgrids that rely on smaller hydrocarbon generators that face higher costs to operate and are vulnerable to shipping supply chain disruptions. The Alaska Energy Authority budgets approximately $30 million annually to provide energy cost subsidies to eligible remote villages and utilities whose costs are high above the statewide average, primarily due to the prevalence of diesel fuel use.

Many states with significant opportunity for small hydro currently rely on coal for the majority of their energy generation. For example, in Colorado, approximately 41.6% of its generation comes from coal and 25.5% of its generation comes from natural gas. Montana has significant hydroelectric resources, but still uses coal for 43% of its generation.

Recent geopolitical and macroeconomic issues highlight additional disadvantages for these island and coastal rural and remote communities. European nations seeking new sources of fuel for energy generation to replace supplies from Russia have driven up the cost of energy commodities including LNG and diesel. Because U.S. rural and remote communities must compete in the global market for shipped fuels, they face greater energy price increases and volatility than communities connected to the grid or natural gas pipeline distribution networks. In 2022, energy costs have been much higher, with no relief in sight.

Even in rural and remote areas served by larger grid resources that currently have relatively affordable retail electricity rates (such as some states in the Mountain West region), price increases are likely as RPS mandates and other climate policies put pressure on current resources. And, the potential for widespread, perpetuating economic benefits from these projects helps a variety of sectors of these communities, including the agricultural and environmental communities, skilled workers and a variety of small businesses.

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[9] https://www.census.gov/quickfacts/

[10] https://www.census.gov/library/publications/2022/demo/p60-276.html#:~:text=Highlights,and%20Table%20A%2D1).

[11] https://www.eia.gov/electricity/state/

For these reasons, NHA emphasizes the importance for the development of waterpower technologies in areas that fit the Program's criteria. Fossil-fuel based electricity generation is not only unsustainable and expensive in these areas, but it is unsafe. Research shows that burning fossil fuels can result in health issues such as asthma, cancer and heart disease[12]. Waterpower technologies do not contribute to air pollution and therefore will not contribute to the same adverse health effects in rural and remote areas as fossil fuel usage does. Waterpower is the best option for reliable, non-intermittent, affordable and safe electricity generation.

2.3 What, if any, energy challenges does the rural or remote area have? What are the community's priorities among these challenges? Has the area considered specific solutions and, if so, what progress has been made to implement the solutions? Answers can cover both a specific community you represent as well as broader categories or types of relevant communities.

NHA member organizations are providing and have the potential to provide solutions to challenges faced by a diverse array of island, coastal, agricultural, industrial, and river-adjacent rural and remote communities. Hence, it is impossible to list specific community priorities and solutions they have considered.

However, in general, a significant challenge for relevant communities is the higher cost of energy, as described in our answer to 2.2. Two interrelated key issues in remote areas are maintenance and local workforce skills. When a generator breaks down, which can be a frequent occurrence for older hydrocarbon generators[13] most often used in these communities, replacement parts are often not available on site. Obtaining replacement parts can include long waits and high shipping costs. In addition, repair technicians often have to travel to the community to complete the maintenance because no one in the local community is trained to conduct the work.

Many of these communities continue to pursue hydrocarbon generation solutions because the most mature renewable energy technologies, solar and wind, are not appropriate for their use case. This could be due to a lack of solar or wind resources or an inability for the community's local grid to provide reliable service given the intermittency of those resources. Some communities are pursuing solar plus battery energy storage solutions (BESS) to address these challenges. However, the high costs and supply chain challenges for solar plus BESS make it

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[12] Fact Sheet | Climate, Environmental, and Health Impacts of Fossil Fuels, Environmental and Energy Study Institute (2021) https://www.eesi.org/papers/view/fact-sheet-climate-environmental-and-health-impacts-of-fossil-fuels-2021#3

[13] "Generating Unit Statistical Brochure 4 2017," North American Electric Reliability Corporation, (2022), https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx

clear that there is a need for alternative clean, reliable solutions such as small hydropower and marine energy to be developed and scaled up.

2.4 Given the purposes referenced above (bullets A-F), what types of energy projects would be most impactful?

By incorporating marine energy or small hydropower into suitable rural or remote areas, projects will deliver the following benefits for the rural and remote communities they serve:

- Improve the overall cost-effectiveness of energy generation, transmission, or distribution systems
- Reduce greenhouse gas emissions from energy generation
- Provide new electric generation facilities
- Contribute clean, renewable generation to new or existing microgrids
- Increase energy efficiency
- Ensure that economic benefits from clean energy generation are realized in the communities that need this energy
- Utilize existing water infrastructure or site-specific, run-of-river capability to produce low-environmental impact

In total, these benefits will combine to make waterpower technologies a major force providing community and economic stability.

The types of waterpower projects supported by the Program that would be most impactful are (1) those that allow communities to replace high-cost, high-emitting hydrocarbon generators, particularly in areas where wind and solar are not viable alternatives; (2) projects that utilize existing infrastructure (either non-powered water infrastructure or historical small hydro or industrial[14] facilities that need some level of reinvestment). Due to its higher density, predictability, and year-round availability, waterpower technologies can fill many gaps that wind and solar cannot.

Including waterpower technologies in the Program will be advantageous and impactful for rural and remote communities because it will give the communities the option to utilize site-specific technology to meet the purposes of the Program, mentioned above. Both marine energy technologies and small hydro technologies come in varying technology types. Having these varying options to create a sustainable, reliable electricity grid, specific to that community will incentivize community buy-in and prolonged success of the technologies in those areas.

[14] Some historical industrial sites, such as mills, have the capability to utilize existing water infrastructure to add electricity generation.

Looking specifically at marine energy, commercial advancement of the marine energy sector will result in the majority of benefits to rural and remote island, coastal, and river-adjacent communities. Later, this commercial advancement will allow marine energy to reach utility-scale, similar to wind, solar and conventional hydropower, which will help the U.S. meet its deep decarbonization goals.

Support for small hydroelectric projects in rural and remote communities will ensure that the economic, environmental, and workforce benefits associated with the decarbonization of the US energy system are realized in such communities by utilizing their existing generation and workforce potential.

Wave energy is relevant for virtually all remote coastal communities, and tidal energy generally works where wave energy does not; they are not competing technologies. Wave, specifically, also complements solar plus BESS, given the annual fluctuations of solar and wave energy, especially further north.

To maximize impact for rural and remote communities, the majority of Program funds supporting marine energy projects should be awarded to existing technologies — those that have been proven to a DOE-rated technology readiness level of TRL 4 or higher. MEC member organizations with existing technologies at this level are prepared to use Program funds to accelerate scale up to get clean energy solutions to market quicker. It is critical that the marine energy sector get dozens of devices in the water as soon as possible in order to demonstrate this critical renewable energy resource is a viable tool to serve numerous rural and remote communities, and ultimately the larger U.S. market at utility-grid scale

Conduit hydropower – adding hydropower generation to any tunnel, canal, pipeline, aqueduct, flume, ditch, or similar manmade water conveyance that is operated for the distribution of water for agricultural, municipal, or industrial consumption and not primarily for the generation of electricity – is a viable option for adding renewable, reliable electricity generation to rural and remote communities which have this already existing infrastructure in the area. Conduit hydropower projects typically have few environmental impacts because the channels involved are not natural streams and projects do not involve new dams or impoundments. The projects also do not result in increase of greenhouse gas emission[15].

Retrofitting – adding hydropower generation to existing dams that were built for other purposes such as flood control, drinking water storage or waterway navigation – or modernizing existing small hydropower facilities – upgrading existing hydropower turbines or powerhouse components – are both exciting opportunities that rural and remote communities could take advantage of under the Program to provide new electric generation or increase the energy efficiency of existing projects.

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[15] An Assessment of Hydropower Potential at National Conduits, Oak Ridge National Laboratory (2022), https://info.ornl.gov/sites/publications/Files/Pub176069.pdf

Projects supported under the Program should primarily be energy technology advancement (including interconnection and grid support technologies), optimization, and demonstration projects with a mission to deliver inclusive, sustainable, scalable, and mature energy resource options for rural and remote communities.

Projects to improve the scale, reach, and cost-effectiveness of waterpower systems serving community energy networks will provide a reliable source of sustainable, clean, locally generated electricity and local workforce development for rural and remote communities. These projects will also improve energy security and enable more robust and equitable economic development and quality of life for the targeted communities.

2.5 Would this type of project(s) address energy burdens, economic burdens, environmental impacts, lack of quality jobs, or other energy equity and environmental justice considerations? If so, how?

As described in our response to 2.2, many rural and remote communities, including coastal and island communities, face a higher average energy burden due to lower-than-average median household income and higher-than-average energy costs. Also as described in 2.2, the most viable energy solution for some of these communities are small hydrocarbon generators that are much more expensive than grid power, emit a high level of hazardous air pollutants that negatively impact health outcomes, and emit a high level of greenhouse gases. It should be noted that greenhouse gas emissions have an outsized impact on coastal and island communities due to their contribution to climate change and rising sea levels that present an existential threat.

While today's marine energy systems have costs higher than utility-scale grid power, they are already cost competitive compared to the status quo in many rural and remote communities relying on hydrocarbon generators. Additional research and development supported with federal funding will allow marine energy systems to soundly beat the status quo on cost in the near future.

Even traditional small hydropower tends to have an initial capital cost that can be higher than competing intermittent renewable energy technologies such as wind and solar. However, these projects have a working life of fifty to a hundred plus years, ensuring that the initial investment is realized and there are no additional environmental impacts (for example from heavy metal extraction and disposal associated with solar panels), while providing numerous community and environmental benefits as outlined elsewhere. In addition, these projects provide direct financial support for local communities in the form of property taxes and often pay back to treasury over the life of the project in the form of FERC license fees or Bureau of Reclamation Lease of Power Privilege payments.

Despite the current costs for marine energy systems, these technologies, in addition to small hydropower, are already superior solutions to address other challenges for these communities. For example, they would eliminate hazardous air and greenhouse gas emissions when displacing hydrocarbon generators. They also eliminate fuel supply and shipping constraints by providing a local source of energy, thereby enhancing energy security for these communities.

Grid-interconnected resources in small communities can be retro-fitted to have black start capability, provide benefits of distributed generation (such as reduction in line losses and transmission congestion), and provide localized economic benefits.

Because marine energy systems are deployed in the water, they can enable unique additional economic benefits and job growth in targeted communities by powering aquaculture, fish processing, and aquatic tourism operations. The marine ecosystem is critical to the health of virtually all rural and remote island and coastal communities, so it is critical to note that wave, ocean current and tidal technologies cause no harm to these local ecosystems. In fact, by helping displace hydrocarbon generation, marine energy removes a major threat to marine ecosystems in the form of spills and hazardous air pollutants.

Compared to other renewable energy alternatives such as wind and solar, marine energy and small hydropower provide more consistent and predictable resources. This reliability benefit is critical to help these communities and the larger grid fully wean off hydrocarbon fuels.

Both marine energy and small hydropower technologies contribute to local workforce development and can increase the amount of quality jobs in the area.

Small hydropower projects can remain in the community for up to a hundred years. The projects need regular maintenance and monitoring, so the community can rely on the clean energy generation and access to jobs while the project is operational. The job availability expands past just the operators of the projects with local tradesman, manufacturers and other waterpower supply chain individuals being necessary for the success of the projects. In addition, projects located on agricultural systems operated by local farmers pay direct power sales revenue to such farmers in the form of royalty payments, lease payments, or profit-sharing payments. This revenue offsets the cost of operating their water infrastructure, allowing irrigators to invest more in their farms, businesses, families, and communities. And, as discussed elsewhere, a unique feature of irrigation conduit production is that the generation is uniquely matched to load demand when farmers draw energy to run their pumps during the irrigation season. This load/generation match between the water being used to generate clean energy and the energy demands to pump that water onto the fields is distinctive and highly advantageous as we strive to achieve the twin goals of decarbonization and economic vitality.

As can be seen, small hydropower and marine energy technologies, while sometimes providing different community-centric benefits, both will provide rural and remote communities with improved energy, economic, and environmental reliability during their time in a community and if included in the Program, will allow communities to take advantage of all the site-specific benefits of these technologies.

2.6 What barriers have been encountered or would be anticipated for these types of projects or relevant analogs? What are potential paths to overcoming them? Provide specific examples of the types of barriers of interest in the categories of permitting, financing, community engagement, materials acquisition and construction, and operations and maintenance.

The primary barrier for these types of projects has been a lack of financing — both from the private markets and government financing, particularly when compared to historic federal government support for wind, solar and increasingly, hydrogen. This has made it difficult for these technologies to compete for financing and in the power sales market with the more heavily and consistently supported renewable technologies. Further, although some markets are beginning to recognize and monetize the unique benefits of these water projects' relative lack of intermittency and low environmental impacts, most projects currently do not receive compensation for these attributes they provide to our energy systems. A lack of consistency in federal funding for development has also been a barrier.

From 2009 through 2022, almost all U.S. Federal Government support for marine energy has come from the DOE WPTO, with Funding Opportunity Announcements (FOA) for private sector-lead technology development during that period totaling less than $200 million. By comparison, DOE support for wind and solar from 2005 to 2015 included $45.8 billion in tax incentives, $4 billion in research grants, and $1.3 billion in credit incentives. The funding gap solar and wind enjoy over marine energy has only increased since 2015, and will continue to do so with incentives for those industries provided in the Inflation Reduction Act of 2022 (IRA). The IRA will continue to give solar and wind a significant advantage over other emerging renewable energy technologies. For example, through the IRA, wind and solar projects will be eligible for up to a 60% tax break, while marine energy projects can only get up to 40%. The Program, and OCED more broadly, can ensure quicker scale-up and go-to-market for marine energy systems that are ready, but need support to get past the early demonstration phases which have been the focus of the WPTO.

When federal funding and support has been available for marine energy, the programs have been inconsistent from a frequency and focus perspective. The programs have been defined by a lack of alignment with what MEC member organizations need to best advance marine energy technologies to scale. For example, programs have used project-based funding models, as opposed to more holistic approaches to fund the development roadmaps of the most promising companies and technologies. This serial approach to technology development slows the commercialization process and limits the use of funds for critical components of long-term success, such as business development, expanding manufacturing capabilities, and enhancing proprietary technology components that are not project-specific.

In addition, past government support has suffered from lengthy funding and regulatory processes. The start-and-stop nature of funding opportunity announcements (FOAs) and then lengthy roll-out times between award announcements and funding has hampered the momentum and agility of MEC member organizations.

Other small hydro technologies have likewise been subject to inconsistent governmental support compared with other renewables. Depending on the type of project, there can be years of development in terms of acquiring permits, working with the local utility to undertake interconnection processes to the grid, and lining up an off-taker that allows for the project to be economically feasible. Having inconsistent federal support can make it extraordinarily difficult to ensure the timing and viability of these projects.

Outside of financing, the high cost of operations in remote areas is a significant barrier. A trained local workforce could reduce this barrier. However, lagging workforce development is generally a concurrent challenge. For MEC member organizations, there is also a prohibitively high cost to rally community involvement with and support for projects.

Lastly, regulatory hurdles such as permitting to deploy systems in state and federal waters is another barrier.

2.7 What would equitable and meaningful community involvement look like for this type of energy project(s)? How can you incorporate perspectives from groups within the community who experience disproportionate socio-economic, environmental, political, or energy burdens? What support is needed to build equitable community engagement?

The DOE's Energy Transitions Initiative Partnership Project (ETIPP) provides strong guidelines for meaningful community involvement in rural and remote coastal and island communities. ETIPP works with remote, island and islanded communities seeking to transform their energy systems and increase energy resilience through strategic energy planning and the implementation of solutions that address their specific challenges. ETIPP's multiyear, cross-sector technical assistance effort applies a tailored, community-driven approach to clean and resilient energy transitions, leveraging the experience and expertise of the ETIPP partner network: a broad coalition of local stakeholders, tribal leaders, regional organizations, national laboratories, and DOE offices. Read the ETIPP fact sheet to learn more about technical assistance in communities. ETIPP leverages the

Energy Transitions Initiative's (ETI) proven framework to address community energy challenges, build capacity, and accelerate the sharing of best practices and innovations[16].

Existing projects from NHA member organizations also demonstrate equitable and meaningful community involvement. As mentioned in 2.1, MEC and SHC members have had successful community engagement and buy-in to implementing waterpower projects.

For example, MEC member ORPC partnered with the Igiugig Tribal Village Council to deploy the Igiugig Project, initially in 2014 with an expansion underway. The tribal council and ORPC worked together to determine community priorities, including the importance of protecting

[16] Additional information is available at https://www.energy.gov/eere/about-energy-transitions-initiative-partnership-project

local salmon populations in the river and the ability to deploy the system using locally available vessels, equipment and contractors. This collaborative approach both preserved and enhanced the village's economic opportunities, while also increasing energy resilience and offsetting the remote community's reliance on diesel fuel. In the words of Igiugig Village Council President AlexAnna Salmon: "We appreciate the manner in which ORPC collaborates with locals to modify design and deployment, and most importantly, to study vigilantly the two highest local concerns: the ice and our salmon."[17]

For NHA member organizations to support equitable community engagement on projects supported by the Program, the Program should provide specific budgets for these activities in supported projects.

2.8 For projects conducted within the community area in the past or that are being planned, what is the approximate size (e.g., measured in dollars, power rating, geographic benefit)? What size projects could this rural or remote area support in the future? Are there approaches to make projects scalable for future community needs?

For marine energy, initial projects would be best suited in the 50-200 kW range. At this size, projects supported by the Program will deliver enough electrical capacity to benefit targeted communities while being small enough to be manageable and impactful in a relatively short time-frame. Depending on the needs of the community, projects could be scaled to 1 to 5 MW, depending on the location and local marine energy resource.

The MEC believes that 20-30 marine energy companies should be supported through the Program within the next two years, following an approach that is more akin to entrepreneurial ecosystem-style innovation (i.e., "go fast and break things"). This approach, outlined in detail in our response to 3.16, advocates for the Program to make longer-term commitments that support marine energy developers' commercialization roadmaps, rather than using a traditional serial FOA-by-FOA approach. This new "pathway" approach will ultimately allow superior technologies to emerge quicker and at less total taxpayer investment, thereby resulting in projects that are scalable and replicable for wider-spread uses in additional rural and remote communities.

The threshold for hydropower to be considered "small" is a capacity <10 MW, so NHA's SHC members are able to propose projects ranging in capacity size to meet the community's requirements. As the technology and approaches seen within the SHC membership vary based on size and electricity output, they are all scalable and replicable. For example, SHC member Emrgy, Inc. has been partnered with Denver Water since 2017. Emrgy, Inc. placed four turbines within an existing Denver Water canal. Each turbine produces between 5-25 kW depending on

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[17] https://orpc.co/case-study/

the speed and depth of the water in the canal. Depending on the needs of a community, multiple turbines could be placed into existing infrastructure to scale up the size.

Another SHC member, Sorenson Engineering, also develops small hydropower projects in existing infrastructure such as irrigation canals. Sorenson Engineering's projects vary in size, but mostly fall into a 1-7 MW range.

Availability of public funding and inclusion in the Program will continue the advancement of these waterpower technologies and improve the scalability of the technologies for future community needs.

2.9 How long would an envisioned project take to go from concept to operation?

Envisioned marine energy projects will go from concept to operation in approximately 18 to 48 months. It's important to note that a traditional, serial FOA-by-FOA approach has resulted in delays to marine energy companies' ability to scale-up commercialization of systems to be supported by the Program. The start-and-stop nature of that model kills momentum due to funding gaps and limits the ability of organizations to innovate their approaches. Using the MEC's proposed "pathway" approach to funding detailed in 3.16, a multiyear commitment through the Program to fund companies' commercialization roadmaps will allow the companies to deploy supported projects to targeted rural and remote communities in 18 to 48 months and be in position to scale-up those projects and other projects for replicability in remote and rural community needs in the coming decade.

2.10 Is this project in the review or design stage, or is it ready to build? How do you assess readiness of the project?

MEC member organizations have developed marine energy generation technologies at various levels of technical maturity. Some organizations have technologies at DOE-rated Technical Readiness Level (TRL) 4 or higher, which are ready to deploy in projects serving rural and remote island, coastal, and river-adjacent communities. It is important to note that MEC's proposed "pathways" approach detailed in 3.16 will maximize the Program's impact advancing the technology readiness levels of marine energy technologies supported through the Program. As a result, more marine energy technologies will be prepared to scale-up and go to market due to Program support.

2.11 Demonstration projects through DOE typically require a 50% cost share, in other words a minimum 1:1 match of private sector to federal funds. Do you anticipate challenges for a 50% cost share requirement?

While a 50% cost share requirement might make sense for more mature renewable energy technologies like wind and solar, it does not make sense for earlier stage marine energy technologies and smaller businesses. The companies that are developing innovative technologies may not yet have the revenue stream necessary to meet the 50% cost share requirement. The focus of the Program should be to help marine energy and small hydropower advance through the technology readiness levels currently ranging in the TRL 4-8 range.

NHA strongly advises that due to the need to mature marine energy and small hydropower technologies, a cost share requirement should be set at 0% to 10% which has precedent within DOE. For example, the WPTO already provides for 10% private cost share for technology research, development, and validation in projects. As previously noted, mature renewables may not be appropriate for many of these targeted rural and remote island and coastal communities. This contributes to their underserved nature and the need to remove pre-existing barriers, such as requiring high private investment at too early a stage for technologies like marine energy that are uniquely appropriate to serve their needs.

Also as previously mentioned, operating in rural and remote areas is more complex and expensive. As such, obtaining private funding to cover a cost share requirement in this type of project is likely to be very challenging. The MEC believes this will hold true for any respondent to this RFI.

2.12 Is your organization sufficiently staffed to develop a DOE funding application and, if awarded, manage the project? If not, what support could DOE or other organizations provide to enable your participation in the program?

NHA member organizations that choose to apply to the Program are sufficiently staffed to develop the application and manage their projects. NHA members have applied for and received DOE funding in numerous past programs and successfully managed projects. Applying member organizations will be capable of building their companies to deliver mature technologies and cost-effective projects, and will be supported by the Program's efforts to also build independent research and support organizations capable of delivering research and permitting support.

2.13 Do you have existing partners to aid in funding applications and project management? If not, what could DOE do to facilitate these relationships?

Depending on the company, some NHA member organizations have existing partners to aid in funding applications and project management. NHA provides advice and shares best practices with member organizations in these areas. Through the Program and other means, the DOE could facilitate project management partnerships by supporting independent organizations that can aid in permitting and workforce development challenges.

2.14 Would you anticipate any challenges in operating or maintaining the energy project? These challenges could include factors such as hiring and retaining staff and long-term business models to ensure funding is available for operations and maintenance.

NHA anticipates its member organizations will encounter four primary challenges:

1. Hiring appropriately skilled staff from the local community. These communities are often underserved from a workforce training perspective. Project implementation supported by the Program should include a focus on developing workforce skills and experience through local/regional community colleges, apprenticeship programs or other workforce development and training resources that can serve members of these communities through all phases of the Program.
2. Maintaining local community support for the project. This challenge is interrelated with upskilling and hiring local community members, but extends to other members of the community who are necessary to ensure ongoing project success, such as town or tribal council leaders. The Program should support education and stakeholder relationship-building resources through all stages of the program to ensure projects maintain the necessary local support. Examples might include Program funding support for studies to show that the project technology does not impact important local marine or river life or shipping/boating activity.
3. Managing logistical challenges to deliver necessary parts and equipment. Many rural and remote island and coastal communities can only be reached by ship or boat, or suboptimal roads and rail lines with limited capacity. This can exponentially increase the cost of shipping equipment necessary for maintenance and repairs. The higher cost of maintenance and repair over the life of projects should be factored into funding for long-term success of project business models.
4. Interconnection costs, if connecting to a utility grid is necessary for the project, can be cost-prohibitive for small project owners. Local utilities require that the energy project owner pay for the interconnection of the project to the grid. In some cases, these costs are too high to make the project economically feasible. Including funding within the Program for interconnection cost assistance would be beneficial for project owners and the community if a project is required to be connected to a local grid.

2.15 Diversity, equity, inclusion, and accessibility (DEIA) is a priority for OCED-funded projects. If your organization already has a DEIA plan, what challenges, if any, do you face in fully realizing this plan? If not, what support do you need to create and carry out a DEIA plan?

Many NHA member organizations have DEIA plans either in place or have support within the NHA community to structure their plans. Challenges to fully realizing these plans are often related to organizations' ability to secure longer-duration funding. As referenced in 2.14, DOE-funded workforce development and training resources serving the targeted local communities would allow member organizations to hire and maintain local support staff, thus achieving a critical DEIA goal. It should be noted that many rural and remote island, coastal, and river-adjacent communities have very small and racially/ethnically homogenous populations, such as those on tribal lands. Thus, hiring staff from the local community can support equity, inclusion, and accessibility on a project-by-project basis, but diversity will likely be best measured on an aggregate basis across all communities supported by the Program.

NHA believes the Program should include funding for the implementation of DEIA plans for supported projects. The funding should be inclusive of research and stakeholder engagement to develop DEIA plans that are tailored to the specific and unique attributes of each community.

2.16 Which entities would need to be involved in these energy projects for them to be successful? Please describe the roles of these entities.

Entities critical to the success of projects supported by the Program include:

- Local community leaders and councils
- The local workforce and workforce training resources, such as community colleges
- Supply chain and logistics support companies, both small and local shipping and air operations that serve the targeted communities and larger national/regional companies that may need to deviate from ordinary practices/procedures to support a project need.
- Independent and local environmental, conservation, and research groups that can validate the minimal impact of projects on local natural resources
- Local and Federal regulatory agencies to ensure information-sharing is widespread within the agencies so there is a catalog of successful project deployments and use-cases for the agencies to reference when granting future permits and licenses for other waterpower projects

2.17 What barriers exist for forming or strengthening relationships with any critical project partners for these demonstrations?

Funding is the most significant barrier for NHA member organizations to commit the early and sustained presence in targeted communities needed to educate the local community on benefits and build support among the community and key local stakeholders. NHA member organizations have the relationship-building skills to support project success, but typically do not yet have the financial wherewithal to deploy staff at each project location for sustained relationship building.

Local environmental, conservation, and research groups also may not be interested in using their own resources to independently verify that projects will create no or minimal impacts, and third-party funding is needed to help those organizations provide independent assessments that will have the trust of targeted communities.

2.18 Do you work with any regional or other partners you believe that would strengthen your ability to participate in this program?

NHA member organizations each have a unique and diverse network of partners, many of which have a presence and impact in rural and remote island, coastal, and river-adjacent communities around the U.S. These partners will strengthen member organizations' ability to participate in the program. How much participation from each partner will be on a case-by-case basis depending on the project location, the specific member organization, and the organization's specific partners.

2.19 What potential impacts, positive or negative, could result from the type of energy projects over the full life of the project? What factors might influence how those impacts are distributed?

Positive impacts include:

- Improved overall cost-effectiveness of energy generation, transmission, or distribution systems
- Reduced greenhouse gas emissions and hazardous air pollutants from energy generation
- New electric generation facilities with a longer expected life and lower maintenance cost than existing facilities
- Clean, reliable, renewable electricity generation delivered to new or existing grids
- Job creation and transferable skill training for the local community
- Increased energy efficiency
- Increased energy independence, via production of energy from a local resource rather than hydrocarbon fuels imported from other markets
- Decreased energy price volatility and supply risk, achieved by reducing dependence on hydrocarbon fuels often delivered by small shipping or freight companies with limited operational capacity
- Flexibility in choosing from different site-specific waterpower technologies to best meet the community's clean energy goals using their available surrounding resources and infrastructure

The Program can influence the distribution of the positive impacts of these projects by supporting workforce development efforts to upskill and train local workers and by supporting community grid improvements that may be needed to manage the interconnection and energy distribution of a renewable resource.

As with any new energy projects, potential negative impacts could include higher costs or unmet energy security goals through unforeseen issues or poor project development, which can be mitigated through proper oversight, reporting, and community engagement.

2.20 What outcomes would the organization you represent prioritize for an energy project? What metrics would be appropriate to convey these outcomes?

Prioritized outcomes for projects supported by the Program should include:

- Greenhouse gas reductions. As waterpower technologies produce zero-emission energy, a key metric would be total GHG emissions offset by the project compared to business-as-usual energy production to meet local demand.
- Hazardous air pollutant (HAP) reductions. As all waterpower technologies produce zero-emission energy, a key metric would be total HAP emissions offset by the project compared to business-as-usual energy production to meet local demand.
- Reduced energy costs. While waterpower technologies generate electricity from a freely available renewable resource, the cost of systems can be high. A key metric is the per kWh cost of electricity to local residents and businesses, and this metric can be improved through creative project funding and payback frameworks. The cost metric will also improve as companies achieve scale in the market and with supply chain efficiencies, as seen along the development roadmap experienced by wind and solar). While the new kWh cost can easily be compared to the prior kWh cost of electricity, it will also be important to track the future cost of hydrocarbon fuels over the life of the project to understand the relation of the kWh cost in a community served by a project versus the kWh cost they would have faced given fluctuations in fuel costs that were offset by the project.
- Jobs created, both during construction and during operation over the life of the project, as well as jobs created indirectly by economic growth in areas like aquaculture and aquatic tourism attributable to the waterpower systems.
- Increased energy security. When rural and remote communities depend on the delivery of hydrocarbon fuels through often capacity-constrained channels, they take on risk of commodity supply and delivery risk. Key metrics will include data and stakeholder feedback from communities on challenges securing needed fuel supplies historically.
- Decreased energy price volatility. While high energy burden is the most pressing challenge in rural and remote communities, the ability to budget for energy costs in a highly volatile market is also a challenge. Because the cost of project deployment and

future O&M are relatively predictable, the cost of electricity from waterpower projects will be stable. A key metric is electricity bill spikes offset or avoided as compared to the would-be impact of local hydrocarbon fuel cost fluctuations.

2.21 What attributes of the project(s) need to be demonstrated to support their replication for follow-on deployments? Example factors affecting replication could include attributes such as geographic context, business model, regulatory or permitting, community or ownership structure, or other contextual factors.

To create a replicable business model and ownership structure success, projects must demonstrate that operations and maintenance knowledge can be transferred from the marine energy or small hydropower project developer to the local electric cooperative or other organization that manages electricity distribution to the local community. To create replicable technological success, projects should validate specific technologies in various geographies. To create replicable community success leading to follow-on deployments, projects should include a focus on early and sustained community education and stakeholder engagement.

ORPC's Igiugig project, which became the longest operating marine energy project on the continent, again provides guidance on successful attributes. ORPC worked with the Igiugig Village Council and local contractors to gain community support and facilitate transfer of day-to-day operations to the local community. ORPC installed a RivGen turbine in 2019 and is completing installation of a BESS and smart microgrid capabilities, along with the deployment of a second RivGen device. When completed in 2023, the project will reduce diesel use in the community by up to 90 percent. Before entering the existing commercial operations phase, ORPC and Igiguig collaborated on demonstration projects in 2014 and 2015.

As demonstrated by the multiphase Igiugig project, NHA recommends that the ERA Program should support multiphase projects in which companies that meet certain success criteria will receive ongoing support to partner in targeted communities, and advance the marine energy and small hydropower technologies deployed there.

2.22 What are the key performance metrics or measures your organization would need insight about to have confidence in the technology, business model, or other elements of project structure and replicability?

In regard to marine energy technologies, the MEC believes 20-30 marine energy projects must be deployed in rural and remote island, coastal, and river-adjacent communities in the next two to three years in order for the industry and DOE to gain adequate insights about marine energy technology effectiveness, project deployment times, business models, project structures and replicability.

In regard to small hydropower projects, the SHC believes insight already exists on the confidence of the varying types of small hydropower technologies. The SHC believes there needs to be a toolbox for communities to use when deciding if small hydropower projects are right for their area based on data from existing, similar projects in other areas of the U.S. We have already seen success of community engagement and excitement for developing small hydropower projects on existing infrastructure, improving the efficiency of existing facilities and moving away from hydrocarbons by developing small, unconventional hydropower projects. Now, that information needs to be shared, so small hydropower technologies can be introduced to new, historically energy burdened rural and remote communities through this Program.

Given a critical mass of supported projects, additional key performance metrics will be those cited in our answer to 2.20 (e.g., GHG and HAP emissions reductions, energy costs, energy reliability, energy security, cost volatility reductions, direct and indirect jobs created, etc.)

3.1 Are there best practices OCED should consider for engaging with rural or remote stakeholders?

See previous responses related to engaging workforce development and training resources, such as local/regional community colleges, and engaging local environmental, conservation, and research groups to provide independent validation of the benefits of projects.

3.3 Are there any communities or entities that would struggle to or lack capacity to participate in the program, and how should OCED consider any additional resources to help these communities?

As previously discussed, some communities will lack the adequate workforce skills and training to participate in project deployment as well as ongoing operations and maintenance. OCED should provide funding for ongoing workforce development and training.

3.4 Are there any considerations OCED should consider in the design of the program to incorporate challenges for communities not ready for a demonstration program? Are there partners who can help work alongside these communities?

Local/regional community colleges and universities can not only provide workforce development and training for targeted communities, they can also provide research resources to track key metrics around positive and negative impacts of projects. Local/regional environmental, conservation, and research groups will be key partners to overcome community support challenges by providing a trusted voice that projects will not impact important local natural resources such as fisheries. Local governing bodies, city administrators and leadership councils of larger tribes can provide trust and buy-in that is useful to expand efforts to multiple villages within a community, tribe or tribal region.

3.5 What existing Federal, Regional, and or State entities that are already engaging in rural and remote communities should OCED leverage?

- The U.S. Department of Commerce
- The U.S. Department of Defense
- The U.S. Department of Agriculture (USDA) Rural Energy for America Program (REAP) and similar state and local initiatives.
- The DOE's ETIPP and similar state and local initiatives.
- Relevant industry trade associations that represent businesses and economic interests relevant to rural and remote island, coastal, and river-adjacent communities, such as the National Aquaculture Association.
- Local/regional environmental and conservation groups.
- The National Rural Water Association and state rural water associations.
- Union and trade training and apprentice programs.

3.7 Are there agencies or state-level organizations OCED should work with on implementation?

State energy offices or energy authorities (e.g., the Alaska Energy Authority). Regional federal-state partnerships such as the Denali Commission, the Delta Regional Authority, the Northern Border Regional Commission, etc.

3.8 How can OCED design the ERA Program to unlock other, non-Federal sources of capital for rural and remote energy projects?

MEC and SHC projects may need help for cost-sharing and socializing risk between investors and the federal government. ERA could look to typical methods for project development such as Power Purchase Agreements and help market the opportunities for development. Also, the federal government could be helpful in posting collateral that would mitigate the risk for the investor while lowering the barriers for developers and off-takers.

For marine energy technologies, the Program should be designed to advance the commercialization pathways of MEC member organizations so that they are capable of building their companies to deliver mature technologies and cost-effective projects. By focusing on the advancement of commercialization pathways, the Program will achieve the greatest impact of unlocking private and other non-federal sources of capital for additional rural and remote projects in the future.

For small hydropower projects, it is important for the Program to recognize and value the ancillary services that hydropower provides. One example is black-start. Most small hydropower projects do not have black start capability, but the Program should include funds to develop this capability on small hydropower facilities in rural and remote areas. Black start is the ability of generation to restart parts of the power system to recover from a blackout. If communities are relying on solar or wind, recovery from a blackout could take a long time and require fossil fuel generators to start the grid back up. But, if these remote communities, which may be on their own grid, have small hydropower facilities which have black start capabilities, the recovery after a blackout could take minutes. Having a structure available within the Program to develop black start abilities would make an investment in developing or maintaining an existing small hydropower project in a rural and remote community more viable.

Also, consistent funding opportunities and grants from the Program on a regular basis will allow project investors to plan accordingly. If developers can let investors know when the Program is distributing money, investors providing non-Federal sources of capital will have more confidence in the investment.

3.9 What existing Federal, Regional, and or State entities that are already engaging in rural and remote communities should OCED leverage?

The USDA's Rural Energy for America Program (REAP) and similar state and local initiatives. The DOE's ETIPP and similar state and local initiatives. Federal entities that will emerge from the Inflation Reduction Act that will have goals and funding relevant to energy and climate change in rural and remote communities.

3.10 How can OCED design the ERA Program to best complement other Federal assistance for rural or remote energy projects?

The Program should not disqualify any organizations that have received previous support from the DOE through other programs and funding initiatives. The Program should seek to complement or amplify the resources and efforts of federal initiatives such as REAP and ETIPP.

3.11 What are some of the broad challenges to accessing cost share that could be realized through this provision?

Please see response to 2.11.

3.12 Are there any key considerations OCED should keep in mind while shaping prize competitions?

NHA advises against the use of prize competitions to allocate Program funds. Prize formats are not relevant to the primary type of projects we recommend to scale-up and accelerate market adoption of marine energy and small hydropower projects that will benefit rural and remote communities.

The WPTO has already supported seed-stage marine energy ventures with prizes in the past. As such, the relative maturity of marine energy generation technologies is beyond the seed-stage in which prizes are beneficial, and the Program's emphasis should be on supporting companies that require technology or innovative strategy validation through demonstration and deployment activities.

Due to the considerable upfront cost with only a potential likelihood of recovering this cost if a prize is won, prize competitions typically lead to prize participants being small, loosely organized teams or grad students. These groups are not leaders in the waterpower industry and may not be well positioned to execute a project large and complex enough to be impactful in rural or remote communities.

3.13 Are there areas that you believe would be well suited for a prize competition?

While NHA does not recommend utilizing Program funding to implement any prizes, these mechanisms could potentially be of benefit for immature key components, such as low-cost, easy-to-deploy cabling technologies for rural and remote projects. However, the prize should be structured to provide adequate compensation to involve established manufacturing companies that can apply technical and fabrication resources to quickly solve problems. Fast-track scheduling must also be implemented for any such prize.

3.14 DOE intends to release multiple competitive solicitations over the duration of the ERA Program. Are there specific timing considerations of which DOE should be aware in releasing solicitations? For example, amount of time respondents need, timing within the calendar year, or reoccurrence during FY22-FY26?

MEC member organizations' previous experience with federal government programs has included funding gaps that stymie project momentum and overall progress toward commercialization. The Program should seek to limit funding gaps and avoid onerous processes and procedures that divert valuable resources away from project implementation. We advocate for a commercialization pathway funding model, as described in 3.16, in order to achieve these ends.

3.15 OCED is considering the role of project partners to aggregate projects and work with projects as a cohort or in a region. Are there examples of key organizations that can serve as aggregators for projects? What are their key attributions?

Wave, tidal, ocean current, and riverine hydrokinetic energy technologies are distinct and unique, and the marine energy industry remains a disaggregated one in which typically small companies focus on only a single one of those means of energy production. As such, marine energy technology developers specializing in one of the technologies are generally best suited as partners to conduct projects as a cohort. Expertise in a given type of marine energy production is the key attribute for any Program partner, unlike the more mature solar and wind industries which may allow for a project developer with no technology or manufacturing expertise to manage a cohort of projects.

Project development companies, such as Tidal Energy Corp of Anchorage Alaska, are starting to emerge and can bring project development, management, and scaling expertise to otherwise technology development-focused entities. Such developers would be an ideal partner in aggregating projects by region, tribe, or phase of execution. However, there are a limited number of such entities.

3.16 What are the key criteria OCED should consider, given the available $200M per year for the next five years for the provision?

NHA recommends that a new approach is needed to support marine energy commercialization efforts versus the traditional serial, FOA-by-FOA approach that we believe will not deliver meaningful near-term results.

NHA proposes what we call the "pathways approach." The pathways approach would involve the Program offering multiyear financial commitments to marine energy technology and project developers to underwrite their commercialization roadmaps. These roadmaps offer demonstratable achievement through stated interim and end goals in critical areas within the OCED's mandate.

The goal of the pathways approach is to make optimal resource allocation decision-making and planning a company-driven process, rather than a DOE-driven process. The approach recognizes energy generation technology maturation and energy project development and delivery are integrated, complex undertakings best designed by technology and project development companies.

The pathways approach recognizes that funding must be present for a myriad of parallel activities. Rapid implementation of maturing technologies cannot occur in serial fashion. Technology development companies must balance component advancement, rapid demonstrations, building robust stakeholder engagement and permitting processes and capacities, manufacturing, logistical, deployment and operational optimization, among other considerations.

The approach also recognizes the equally important need for oversight to assure material, promised gains are being achieved. While NHA recommends the entire roadmap be contracted at the initiation of Program support, the actual funding would be phased, with established stage gates at a frequency that allows appropriate monitoring of systemic progress without unnecessary administrative and scheduling burdens. Achievement of pre-established metrics at each stage unlocks the next phase of contracted funding. This approach ensures oversight and accelerates progress. Specifically, unlocking a new stage of funding would include meeting metrics and criteria such as installed capacity levels, capital and operating expense reduction, standardization for manufacturing and logistics complexity reduction, operating efficiency, power-to-weight improvements, and reliability and availability improvements.

NHA recommends funding eligibility extend to technologies ranging from those entering commercialization (TRL 4/5) to those prepared to deliver multiple systems in the near term (TRL 8).

The pathways approach is not a FOA-by-FOA approach as traditionally seen in some federal funding programs. It is a holistic, integrated funding program in which each applicant outlines what is required to quickly deliver impactful technologies and projects. Applicants' multiyear roadmaps will deliver material results for rural and remote communities. These roadmaps should cover technology and project development, in addition to the formation of internal and external resources necessary to achieve pathway goals. Milestones and metrics demonstrating progress should be clearly defined with progress monitored by OCED, or an appointed entity, to ensure invested funds enable achievement of pathway goals.

3.17 Are there programs in other federal agencies run through OTAs or PIAs that could serve as models for OCED to consider?

An OTA/PIA structure such as that currently used for Department of Defense funding of system upgrades would be ideal for certain industry-wide upgrades in technology.

For example, an OTA/PIA focused on improving all manner of current marine energy technologies to work year-round in typical ice conditions could be beneficial within the ERA Program. The OTA could be used to provide a framework for funding all pertinent systems upgrades, engage a project developer to manage such an industry-wide upgrade, and guide multiple systems and improvements over a several year period to working full time in typical ice conditions. If a PIA is used, then an academic entity can be brought in as co-project manager or in a QAQC function.

3.20 Are there other key areas not listed above that should be considered for technical assistance needs for project and project developers?

In addition to assessing existing workforce skills, the Program should provide technical and other support to enhance workforce skills and training in those communities that lack adequate workforce development to complement clean energy demonstrations. The Program might also provide incentives for the workforce to work on a clean energy demonstration project, such as student loan forgiveness for work in the Peace Corps or public-school teaching.

In addition to assessing permitting and siting needs, the Program should provide support for permitting and siting requirements such as environmental impact reports or other unique state and local requirements.

3.21 Are there key organizations that should be considered to provide technical assistance, in addition to the Centers supported through EPA and the national laboratories?

The Program should support the National Marine Energy Centers, their university partners and other independent research and support organizations capable of delivering research and permitting support, preferably from local entities. These organizations will be critical contributors to an independent and self-sustaining waterpower industry with the ability to scale-up and accelerate market adoption for the benefit of rural and remote island, coastal, and river-adjacent communities.

3.22 Are there technical assistance programs that should be examined as key models for supporting rural and remote areas in improving energy infrastructure?

The MEC believes the developers of projects supported by the Program should have the ability to select their own technical assistance partners, in alignment with the flexibility and company-driven focus of the pathway model outlined in 3.16. In addition to improved project outcomes and commercialization progress, such free choice of technical assistance partners will have the added benefit of projects working with local/regional partners, which will increase diversity, equity, inclusion and accessibility efforts along with job creation goals in targeted communities.

3.23 What are some of the key measures that would need to be validated to demonstrate reliability enhancements?

NHA believes these measurements and validations should be clearly outlined in the pathway approach agreement, as outlined in 3.16, at project initiation. As detailed in 3.16, unlocking a new stage of funding along the pathway would include meeting metrics and criteria that include reliability-relevant measures. These include meeting installed capacity levels, capacity factor improvements, operating efficiency, power-to-weight improvements, system availability, and energy costs relative to the current solution (including the presumed cost of the current solution, were its use not offset or eliminated by the project).

3.24 How can OCED best release information that would allow for trusted validation of performance of these projects?

NHA recommends the appointment of an independent, nonfederal or quasi-federal entity to monitor and validate reported results. We note that in addition to validation of the energy performance (i.e., reliability, cost of energy, avoided GHG emissions, etc.) of projects, other areas of validation will also be critical to community support. These areas include validation of the impact of projects on local natural resources, such as fisheries, and on commerce, such as shipping and boating activity. For those additional areas, local/regional organizations should be the preferred entities to release information.

4.1 Please provide any additional information or input not specifically requested in the questions above that you believe would be valuable to help DOE develop the ERA Program.

The majority of rural and remote energy-islanded communities rely heavily on U.S. federal government support through many different departments and programs. A government-wide approach to decarbonizing these communities through implementation of already existing contracting would be ideal. For example, every village in Alaska has a federally mandated school, post office, and air strip, at a minimum. As maintenance contracts come up to, for example, replace heavy equipment serving the air strip, the contracting authority (in this case, the Department of Transportation) must contract for either an electrical or hydrogen/derivative-powered replacement for the out-of-service equipment. The DOE could repeat this model for the school and post office heating systems and other upgrades.

As can be seen in answers to the above questions, marine energy and small hydropower technologies provide clean, reliable, safe and affordable energy generation. What is needed now is their inclusion in this Program to be able to demonstrate and validate their technology and approaches to community engagement, financing and energy efficiency improvements to bring them to the forefront of America's decarbonization goals. Making sure the Program includes these technologies and provides assistance to communities in selecting which waterpower technology will fit into a community's needs is how the marine energy and small hydropower sectors will join wind, solar and conventional hydropower as demonstrated, validated and necessary technologies for the clean energy transition while empowering rural and remote communities to be a part of the clean energy transition instead of contributing to higher energy burden and lack of energy justice as fossil fuel use has in the past.

Closing

Thank you for the opportunity to address these important matters. We respectfully request that DOE carefully consider and incorporate NHA's priorities when finalizing the ERA Program guidelines. Please let me know if you have any questions or require additional information.

Sincerely,
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