

Powering the Blue Economy

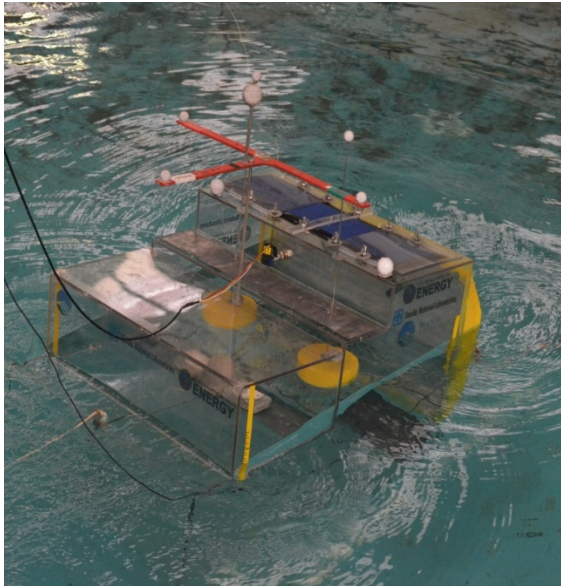
David Hume

Marine Engineer Contractor

david.hume@ee.doe.gov

OREC - September 19, 2018

About the Water Power Technologies Office (WPTO)



WPTO **invests in early-stage research** to accelerate development of innovative water power technologies while **ensuring that long-term sustainability and environmental issues are addressed.**



WPTO supports efforts to **validate performance and grid-reliability** for new technologies, develop and increase accessibility to **necessary testing infrastructure**, and evaluate **systems-level opportunities and risks.**



WPTO aggregates, analyzes and disseminates **relevant, objective, technical information** on water power technologies and related issues to stakeholders and decision-makers.



WPTO has traditionally been focused on R&D that leads to improvements in performance and reductions in cost for marine energy devices supplying power to the grid.

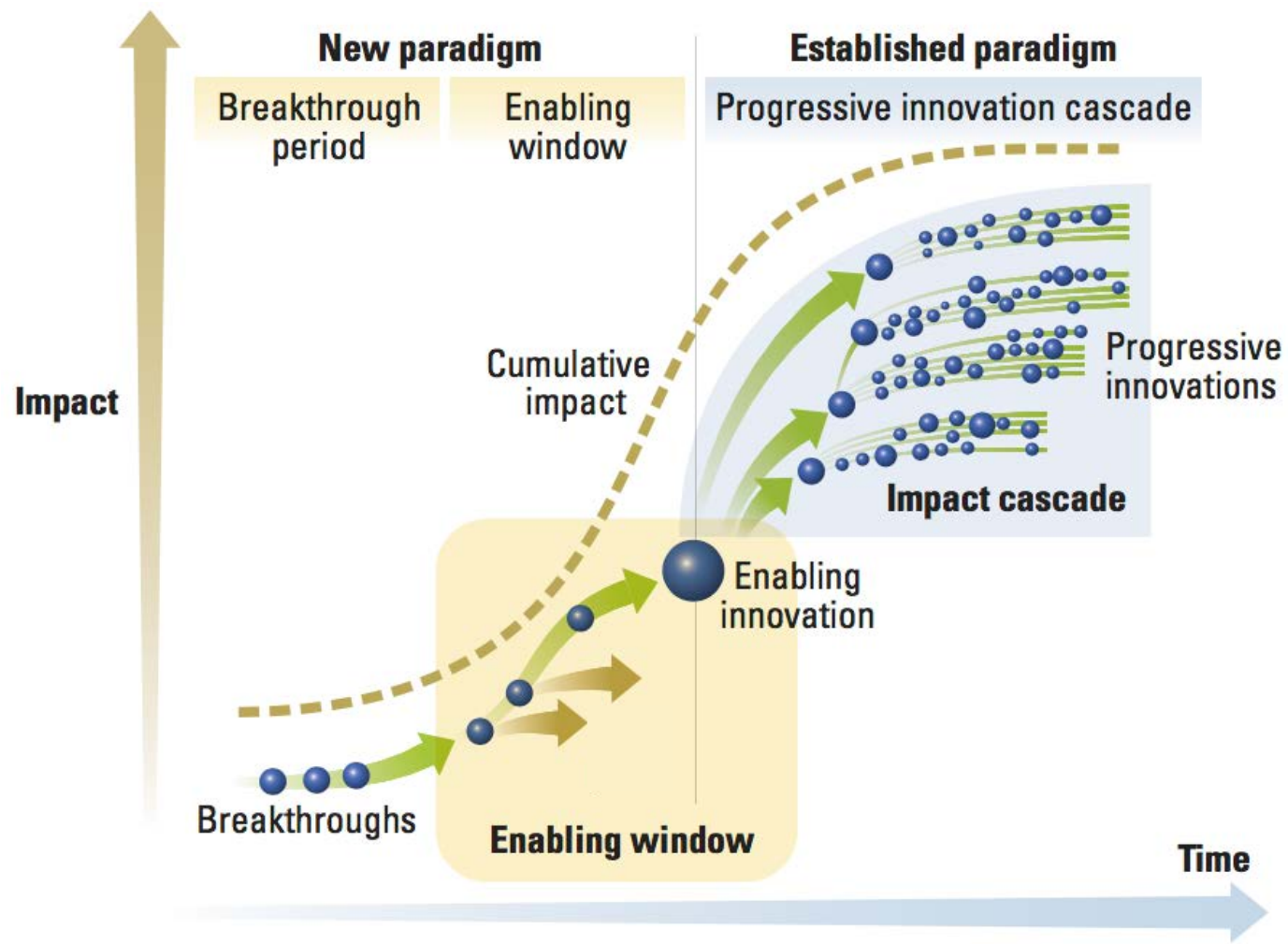
What are other beachhead markets that marine energy developers could pursue that:

- Require smaller scale devices
- Have customers with a higher willingness to pay
- Are power constrained
- Have few incumbent competitors or technologies
- Have high growth potential
- Enable new opportunities



WPTO is focusing on off-grid applications for several reasons:

- Near term revenue potential for industry
- Non-grid markets may not be as cost sensitive as the grid market
- Opportunities for more basic research and development
- Develop technologies, reduce costs (leveled cost of electricity), develop supply chain, improve IO&M
- Non-grid applications and markets may play to MHK strengths



Joseph V. Sinfield and Freddy Solis, "Finding a Lower-Risk Path to High-Impact Innovations," June 13, 2016, MIT Sloan Management Review

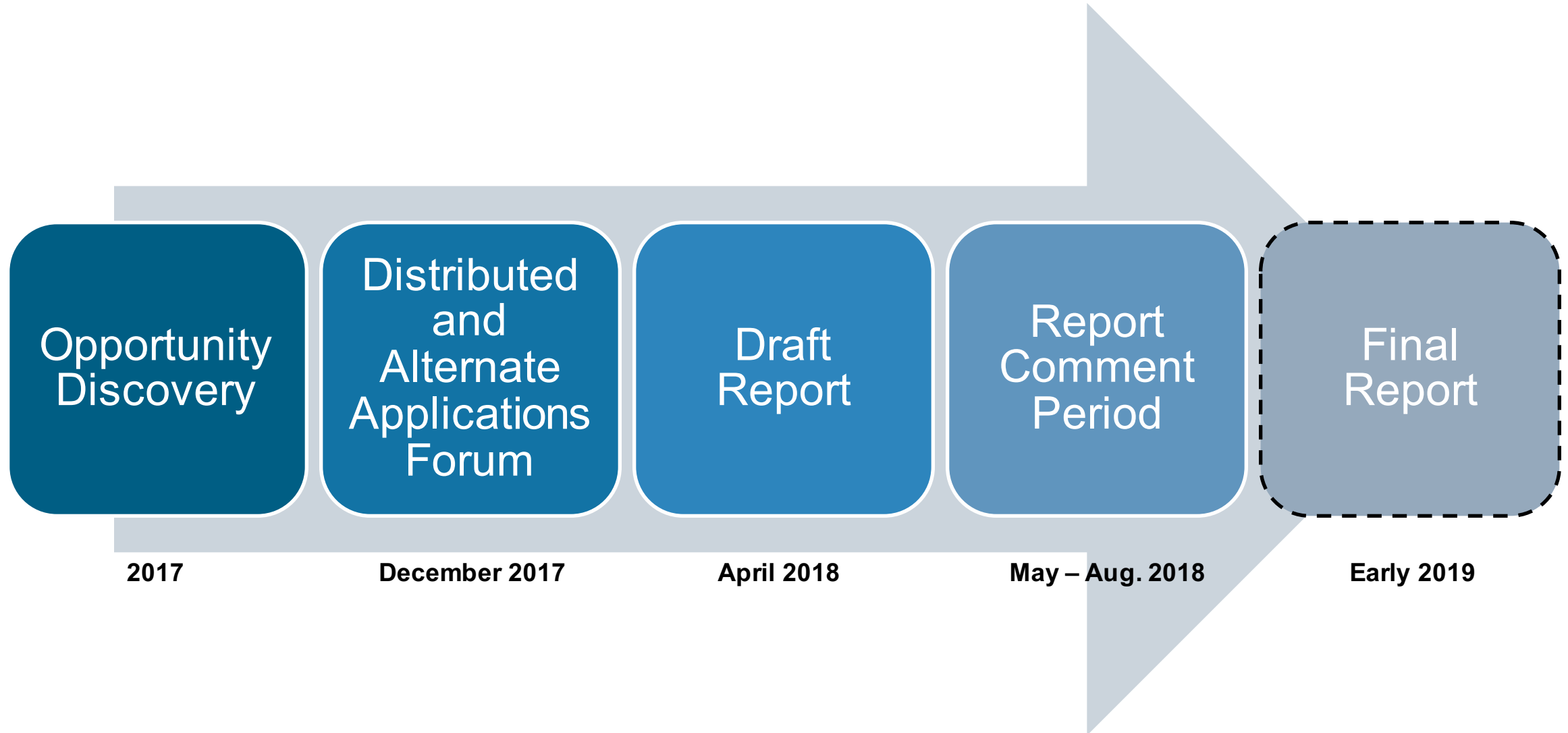


Vision: *Unlocking new opportunities in ocean science, security, and maritime technology through distributed applications of marine renewable energy.*

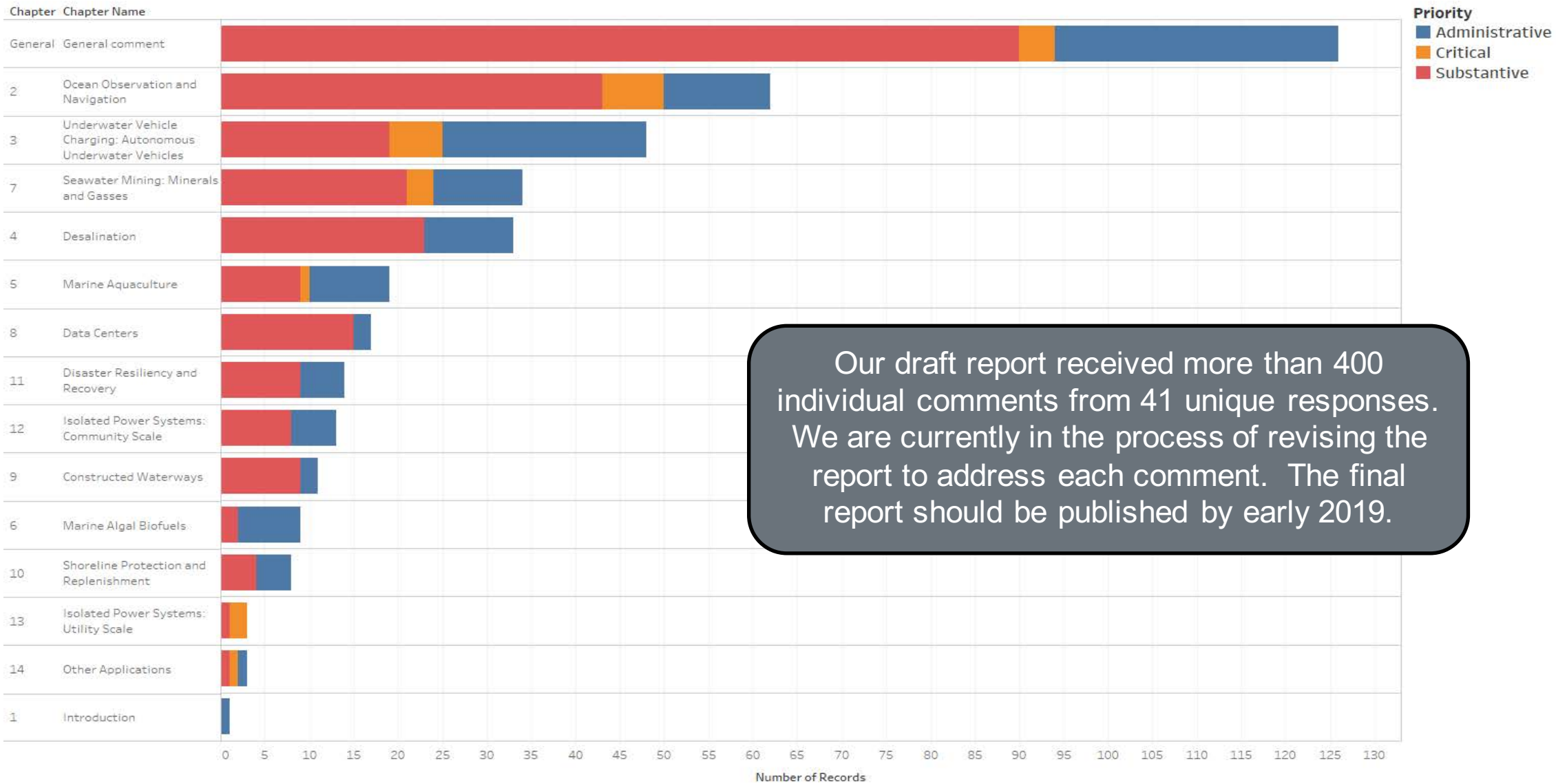
Goals:

- Support competitive R&D opportunities for distributed MHK technologies targeting coastal and offshore off-grid markets
- Engage partners in ocean science, security, and maritime technology to achieve shared goals
- Unlock new growth in the blue economy through energy system innovation
- Accelerate MHK technology readiness towards future grid-scale applications.





Results from Public Comment on Draft Report



The International Maritime Organization recently passed a regulation to reduce harmful SOx emissions from commercial vessels, this has pushed vessel operators and ports to consider alternative fuels, like hydrogen. Pilot projects are already underway and the tendrils of a supply chain are emerging. Marine energy could play a significant role in hydrogen production for the maritime industry given its proximity to the end user and consistent power generation profile.

8 FEBRUARY 2017 ANALYSIS

Is there a future for hydrogen-powered ship propulsion?

DNV GL's First AiP for Maritime Hydrogen Solution goes to Hyon in Norway

June 18, 2018 | Norway Oslo

California Port to Vote on Hydrogen Fuel

Shailata A. Lakshmi August 6, 2018

Maritime fuel cell demonstrator project shows promise

ABB and Ballard Power Systems to jointly develop zero-emission fuel cell power plant for ship

World's First Hydrogen-Powered Cruise Ship Scheduled