



Powering the Blue Economy: the US Program

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PNNL is operated by Battelle for the U.S. Department of Energy

The Blue Economy – what is it?

- The World Bank:
“the sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean ecosystems.”
- OECD: the “Blue Economy” will double from \$1.5 trillion to \$3 trillion in global economic value by 2030.
- *The Economist Intelligence Unit (2015):*
“The ocean will become an economic force this century” –
- The Blue Economy is a US federal administration priority, reflected in National Ocean Policy and the Decadal Vision for Ocean Science.



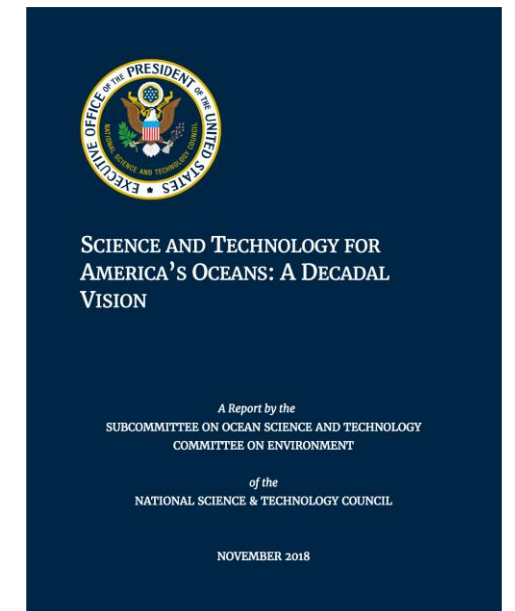
The Economist Intelligence Unit



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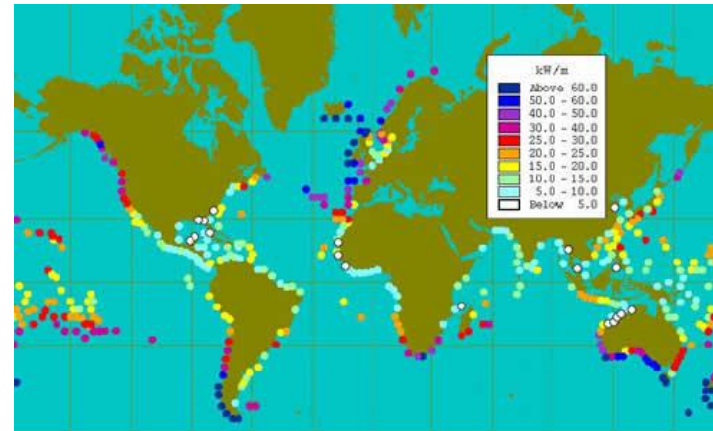
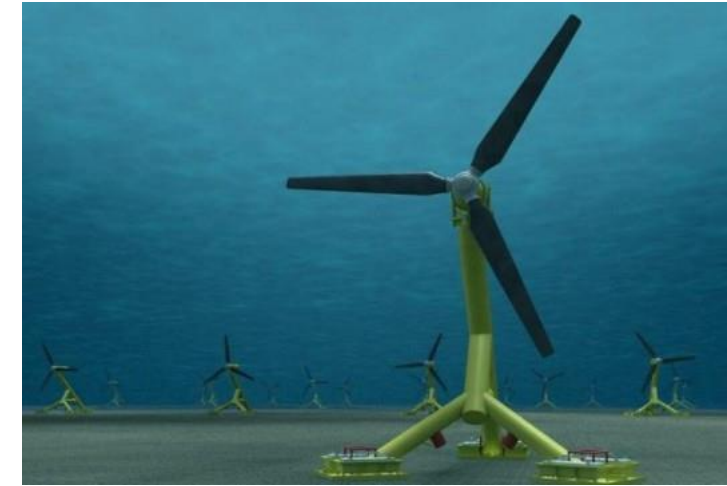
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Role of US DOE's in Blue Economy

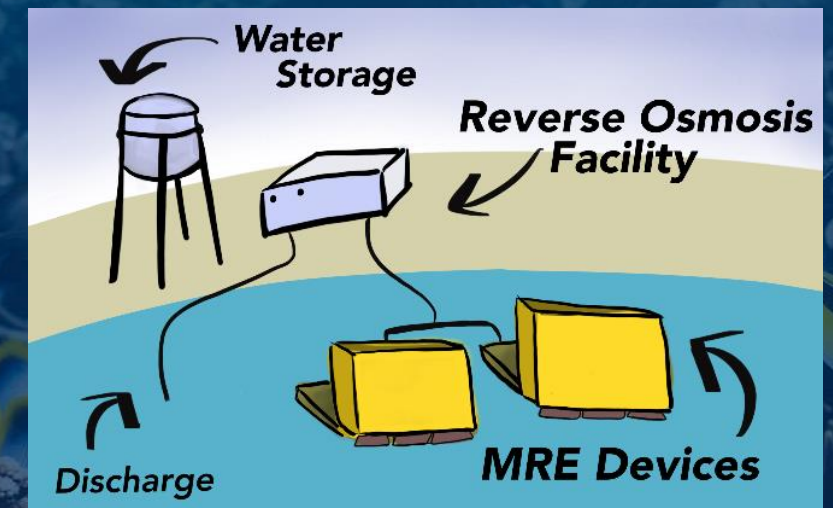
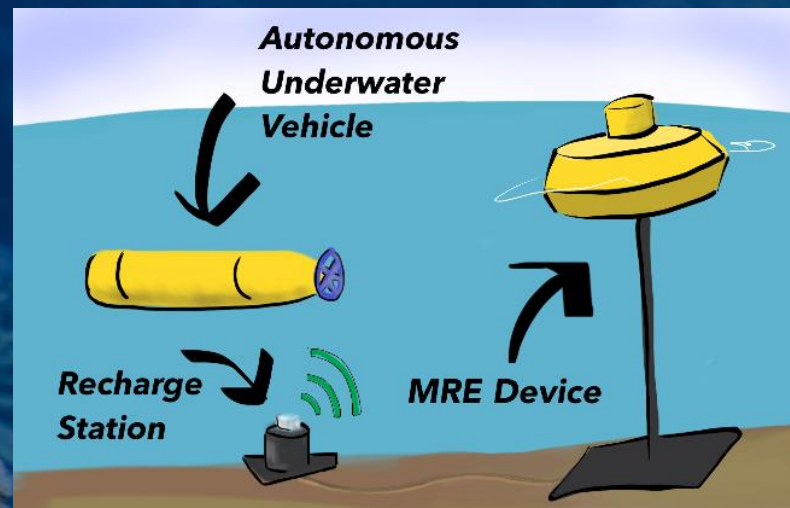
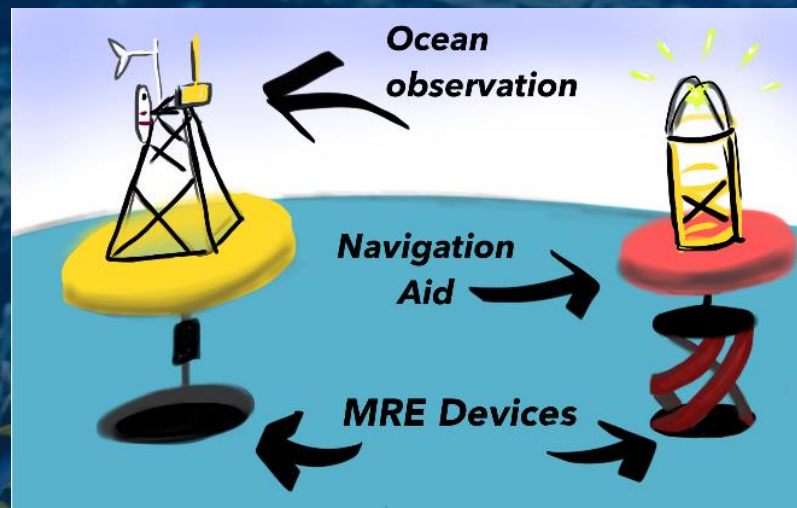
- Traditionally DOE has funded:
 - Early stage R&D for tidal and wave energy conversion technologies
 - Testing and validation efforts for MRE technologies and components
 - Resource characterization
 - Aggregation, analysis, and dissemination of information on MRE
- MRE is not close to being cost-competitive with other renewables for grid scale electricity
- Potential for higher-value, lower amounts of power are closer to reality.

All for grid power applications



US DOE Goals for Blue Economy

1. Addressing energy limitations and contributing to national/international goals for growth in the Blue Economy
2. Accelerating marine energy grid-readiness through near-term opportunities, supporting the WPTO MRE strategy and mission.

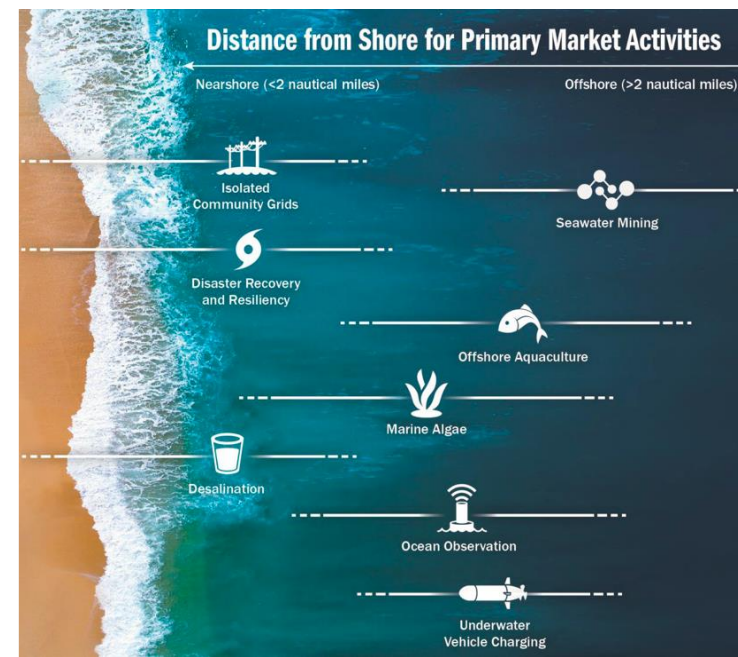
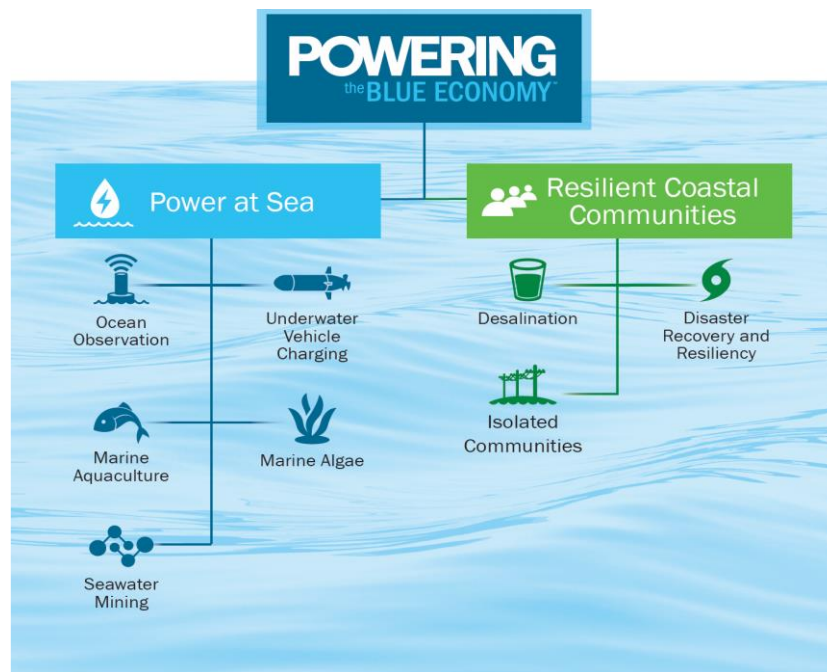


Developing Powering the Blue Economy (PBE)

- Fact finding phase
 - 3 day forum with end users (Dec 2017)
 - Literature review
 - Talking with many experts
 - Lots of soft sources
 - Workshops at EWTEC, WPW, Oceanology
- Public comment and review, report
- US DOE national laboratories created multi-year strategy
 - Examining end user markets and applications
 - Foundational R&D
 - Continued engagement and outreach
- Establishing prize competitions

PBE – Fact Finding/Public Comments/Report

- Report released in April 2019
- 8 end markets or uses divided into:
 - Power at Sea
 - Resilient Coastal Communities



<https://www.energy.gov/eere/water/downloads/powering-blue-economy-report>

PBE – P@S & RCC

Power at Sea

- Remote from land, no export cable
- Few/no other sources of power
- Ocean observations & underwater recharge of AUVs
 - Scientific
 - Military/homeland security
 - Commercial
- Offshore aquaculture
- Growth of marine algae for biomass
- Mining seawater

Resilient Coastal Communities

- Closely tied to land, requires export cable or equivalent
- Often replacing other power sources
- Remote coastal communities, islands
- Desalination of seawater
- Coastal resiliency and disaster recovery

Initial Implementation: FY19- FY20

2019

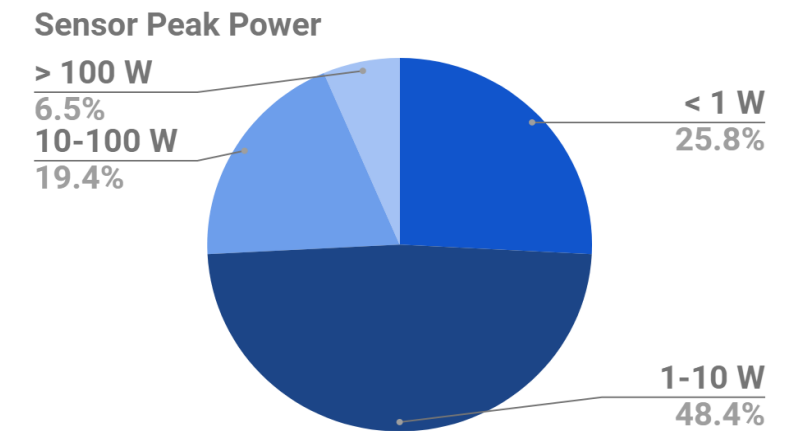
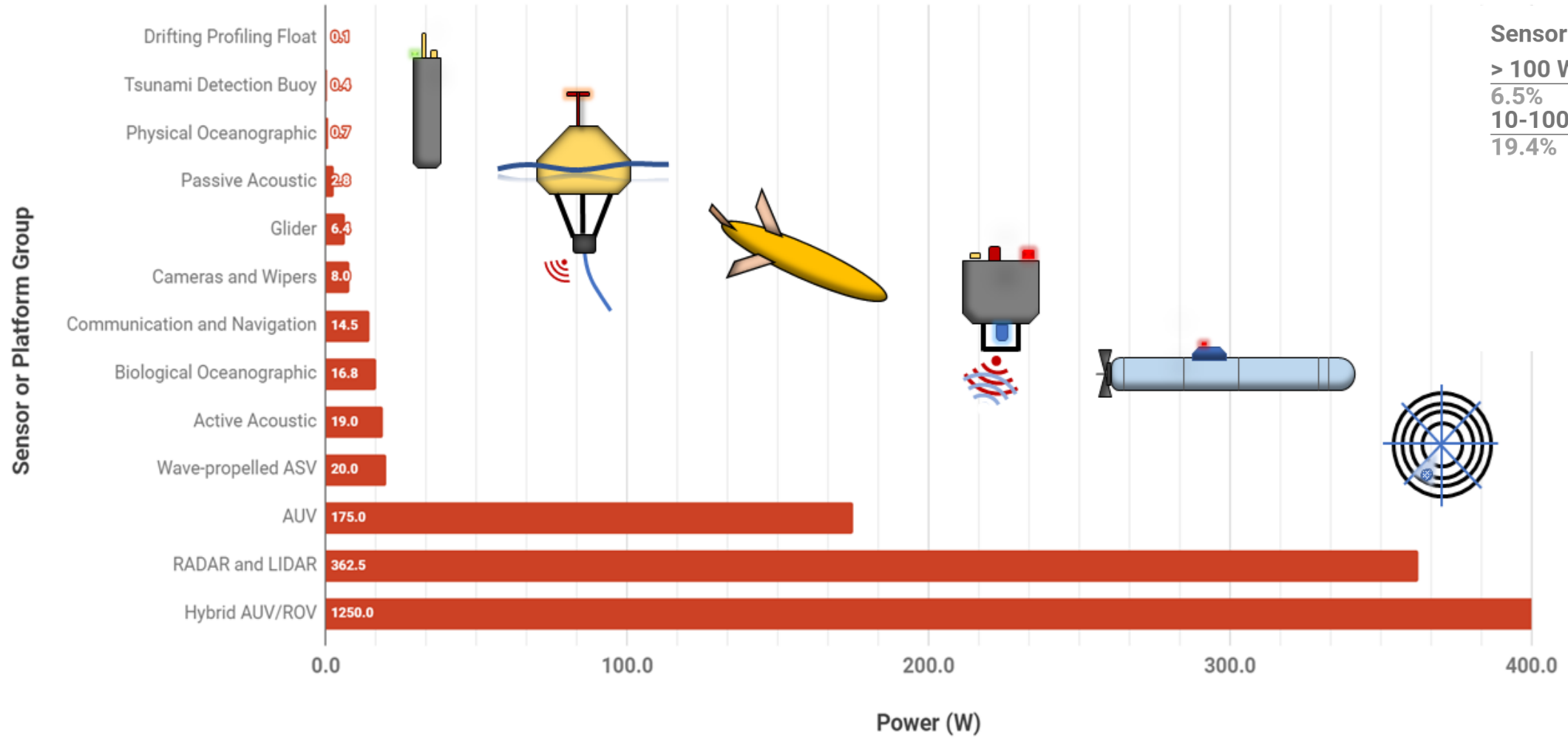
- First end markets:
 - Ocean observations (incl underwater recharge of AUVs)
 - Desalination
- Market analyses
 - Surveys and interviews
 - Continued outreach, engagement with NOAA and others
- Foundational R&D
 - Looking at likely pathways to understand co-development with ocean obs
 - Prizes

2020

- Market analysis
 - More on ocean obs, desal, remote communities, next good markets
 - Define use cases
 - Review existing MRE technologies
- R&D will to define:
 - Functional requirements
 - Constraints and barriers
 - Design parameters
- Outreach
 - Key end users

Power for Sensors and Platforms

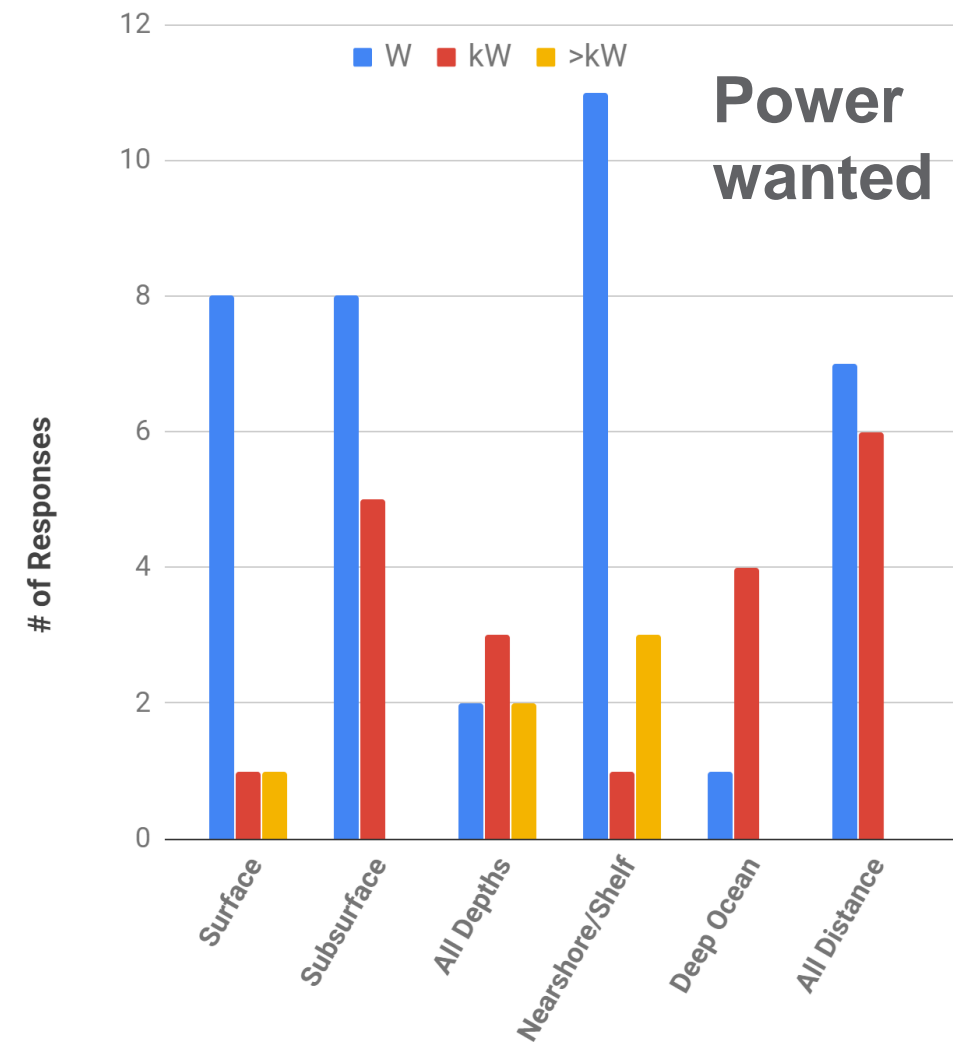
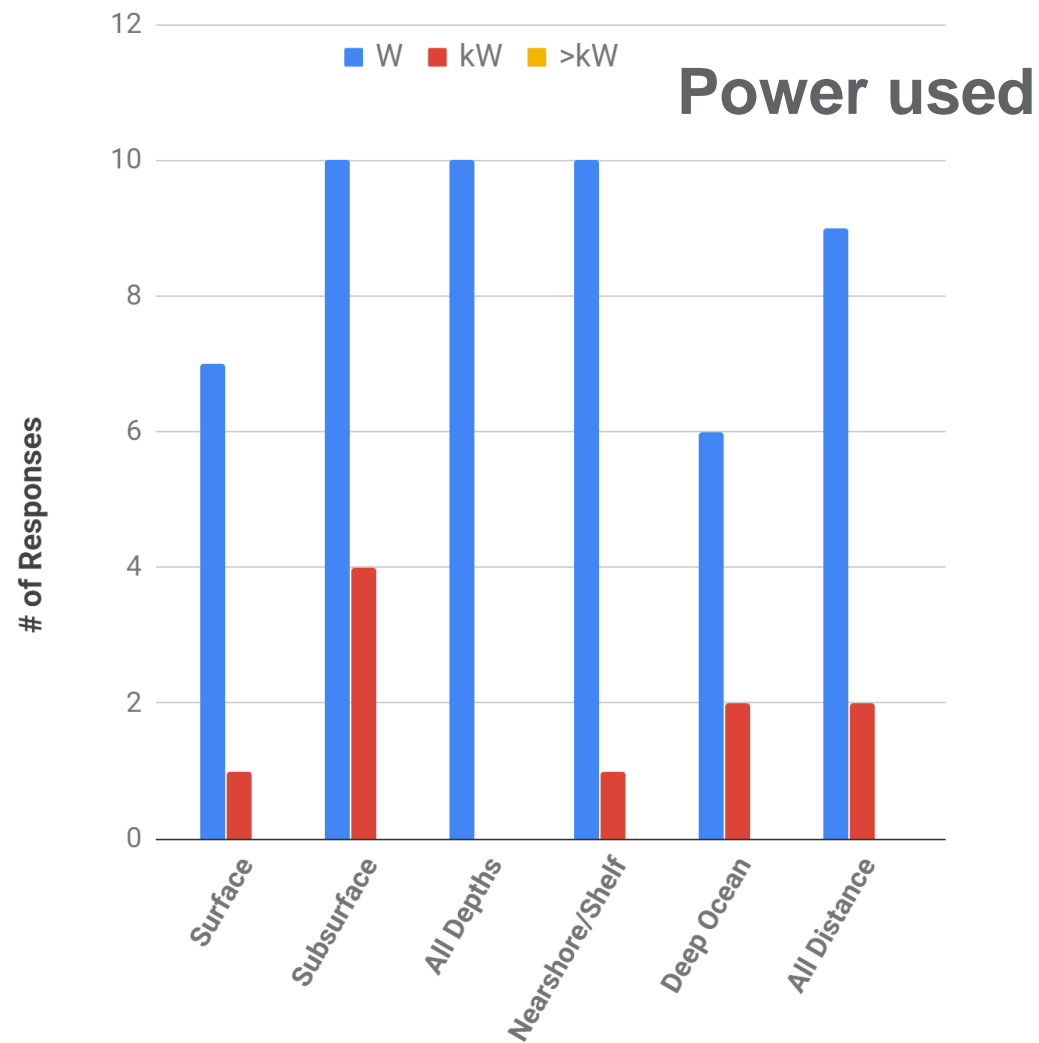
From 50 interviews & surveys, respondents listed or discussed sensors and platforms. Their typical power requirements are categorized:



Most sensors identified run on 10 W or less

Power Used vs Power Wanted

Most use W and want more W, but the majority of deep ocean users want kW. Some nearshore users seek >kW for HF radar arrays & vehicle charging.



Prizes and Challenges

- Use of prizes to attract researchers – not the usual suspects
- Short timeframes, specific goals and stage-gates
- Waves to Water (desalination using wave energy) open now
<https://americanmadechallenges.org/wavestowater/>
- Use American Made Challenge platform
- Others to follow in PBE



Thank you!

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