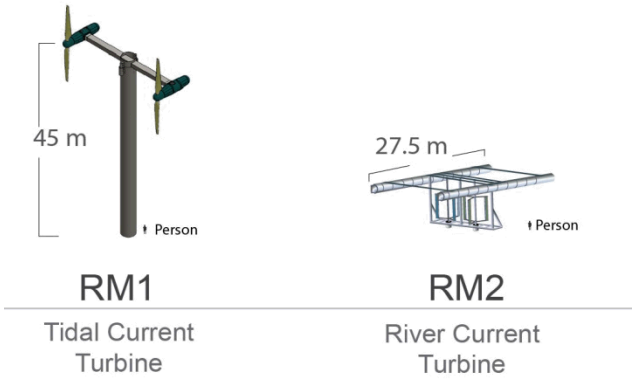
SAND2014-3558C

Methodology for Design and Economic Analysis of Marine Energy Conversion (MEC) Technologies



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2nd Marine Energy Technology Symposium
METS2014, Seattle, WA

Background

Motivation: No non-proprietary MHK devices for technical and economic evaluation

Project Deliverables:

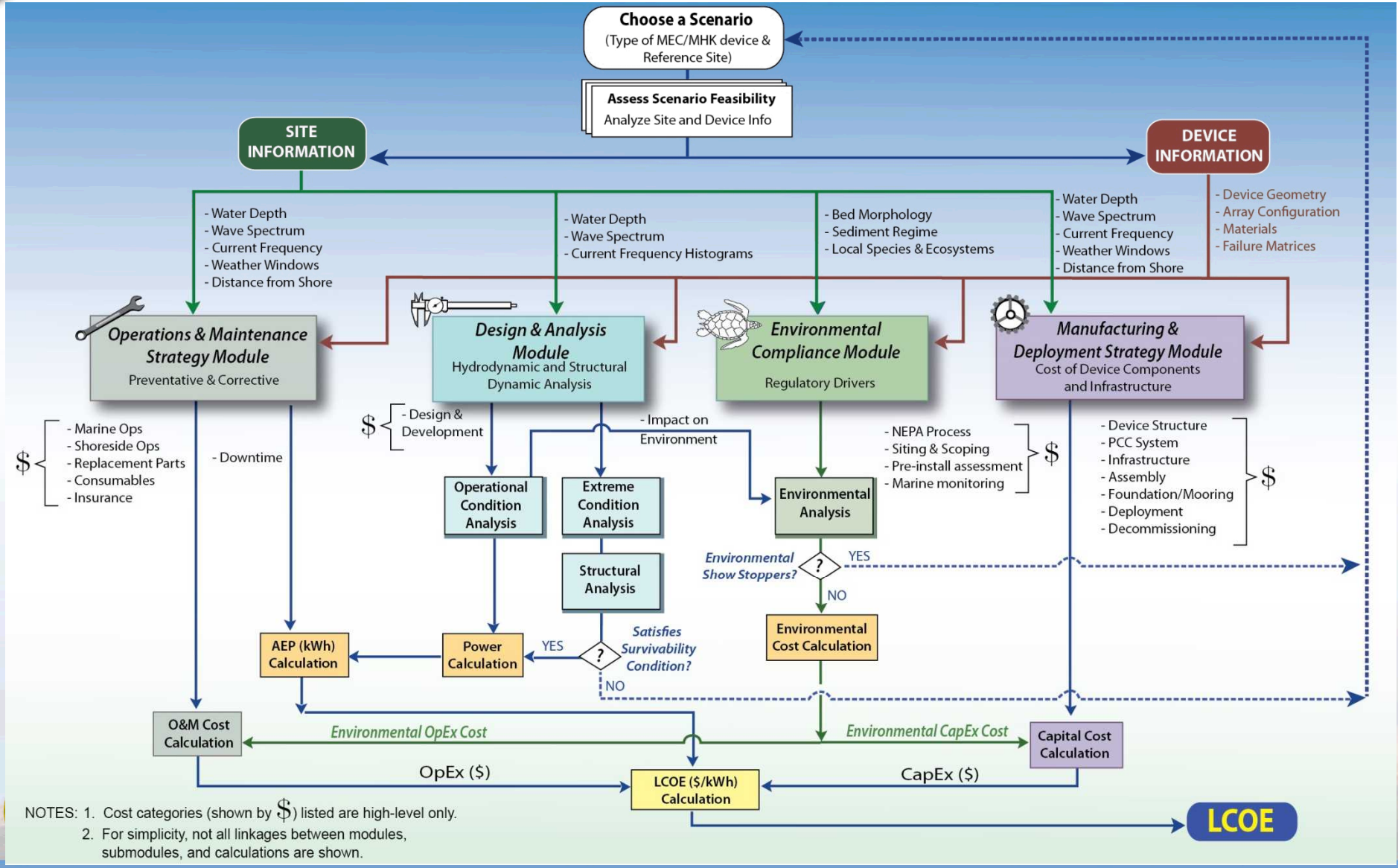
- Methodology to evaluate technical and economic viability of MHK technologies
- Reference model (RM) point designs paired with resource sites for technical and economic assessment
  - Benchmarks for performance and costs, identifying key technical hurdles and cost drivers needing more focused study
  - Physical model data sets to document validation of open source design tools

Technical Approach

- Device point designs simple and robust (no cutting-edge innovation, TRL 3-4)
- Considered power and structural performance, power conversion chain (PCC) design, anchoring and mooring design, manufacturing and deployment, O&M, environmental compliance and costs
- Applied cost reduction curves to estimate levelized cost of energy (LCOE) for multiple-unit commercial scale array deployments

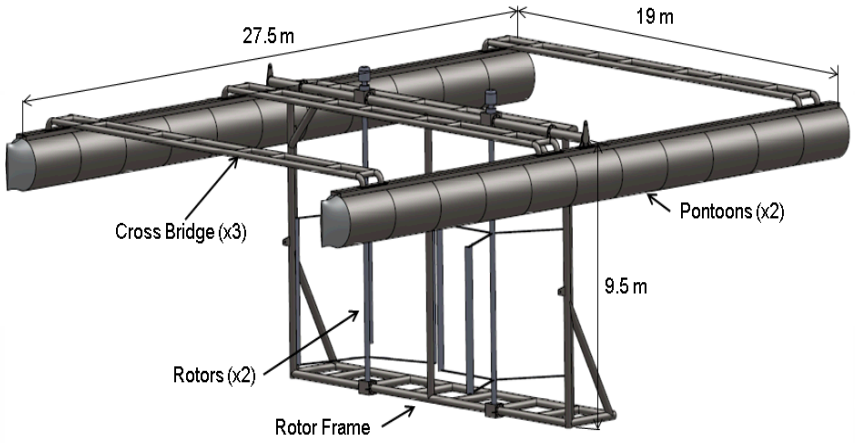
Point designs simple, robust and thorough

Methodology

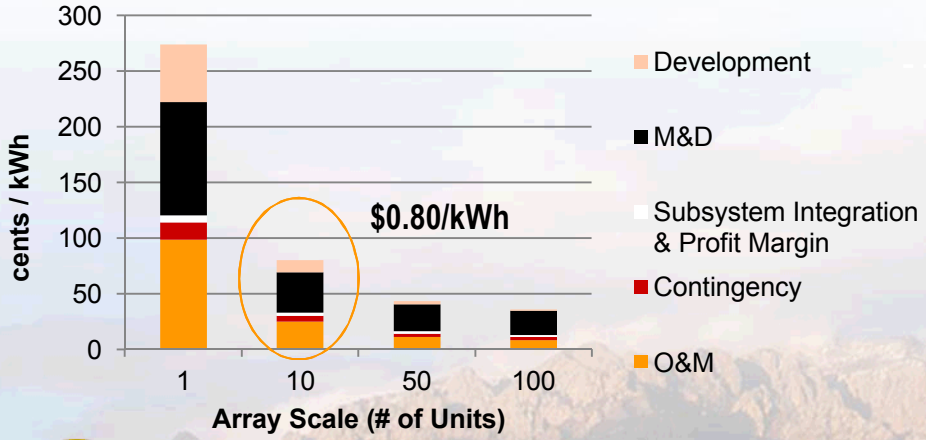


RM2: River Current Turbine

Power rating	100 kW (2x50 kW rotors)
Deployment location	Baton Rouge, LA
Rotor diameter	6.5 m
Capacity factor	0.3
Rotor power coefficient	0.38
Rotor type	Variable speed
Operational flow speeds	0.7 m/s – 2.6 m/s



LCOE estimates (100 kW/unit)



LCOE breakdown (10-unit array)

	cents/kWh	% of total LCOE
Development	11.0	13.7%
M&D	36.3	45.2%
Subsystem Integration & Profit Margin	3.0	3.7%
Contingency	5.0	6.3%
O&M	25.0	31.1%
Total	80.3	100.0%

Detailed design geometries, performance specifications and cost breakdowns

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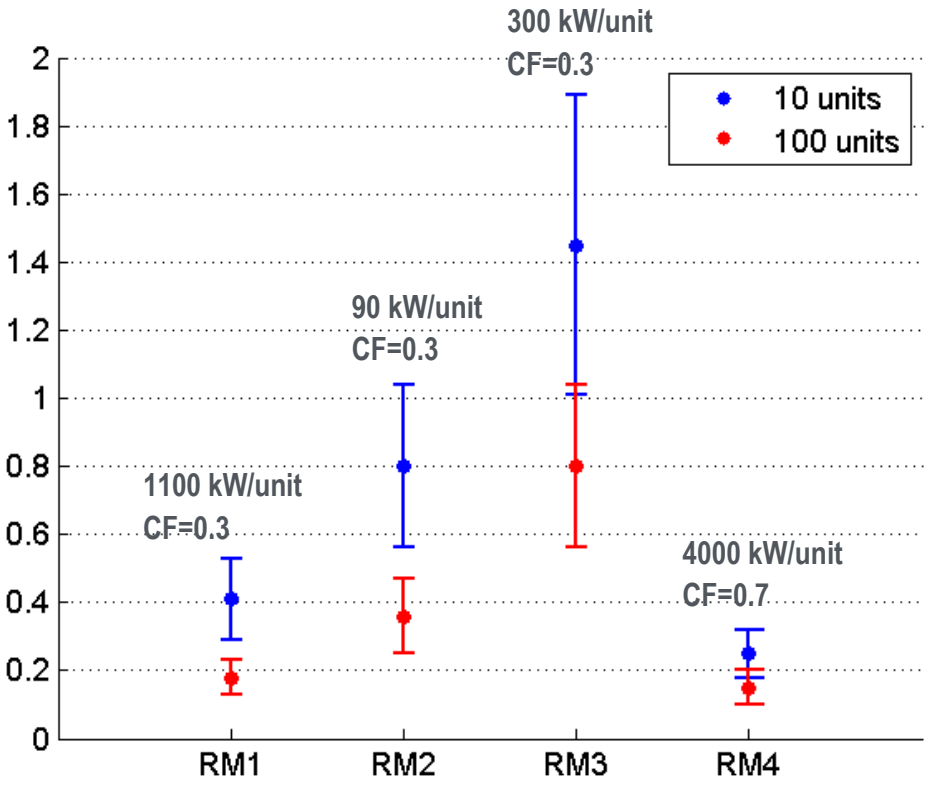
LCOE Estimates in $/kWh



LCOE sensitive to installed capacity and capacity factor (CF)

Significant LCOE reductions with project size

Power conversion chain (PCC) and structural components highest cost drivers all RMs

Mooring system and deployment costs for RM3 significant

Advanced controls critical for improving RM3 point absorber energy capture

Benchmarked LCOE, cost drivers and needs for technological innovation

RMP Web Site

- OpenEI link to SNL's Water Power Program RMP web site (http://energy.sandia.gov/rmp)
- RM project report
- Supplementary reports
- SolidWorks geometry files
- Experimental model validation data files
- Journal articles
- Conference publications and presentations

Thank You

- Research made possible by support from the Department of Energy's (DOE) Energy Efficiency and Renewable Energy (EERE) Office's Wind and Water Power Technologies Office.
- Sandia is a multi-program laboratory managed and operated by Sandia Corporation, a Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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