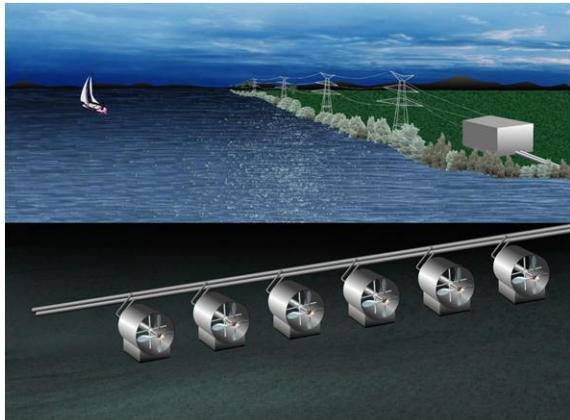


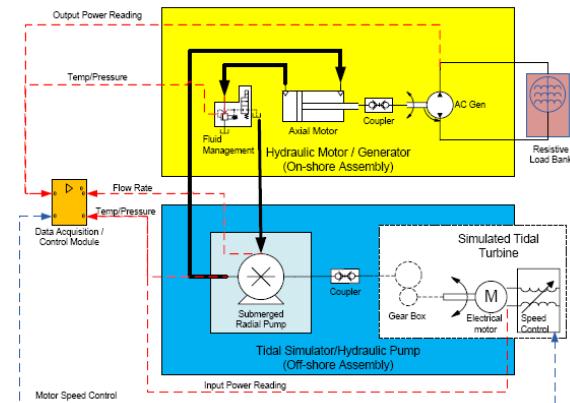
Tidal Energy System for On-shore Power Generation

**Sunlight Photonics Inc.,
NASA-Jet Propulsion Lab.,
Atlantis Resources Corp.,
Maine Maritime Academy,
Rutgers University**

System Approach



TRL4 Demo



Tidal Energy System for
On-shore Power Generation

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Sept 22, 2011

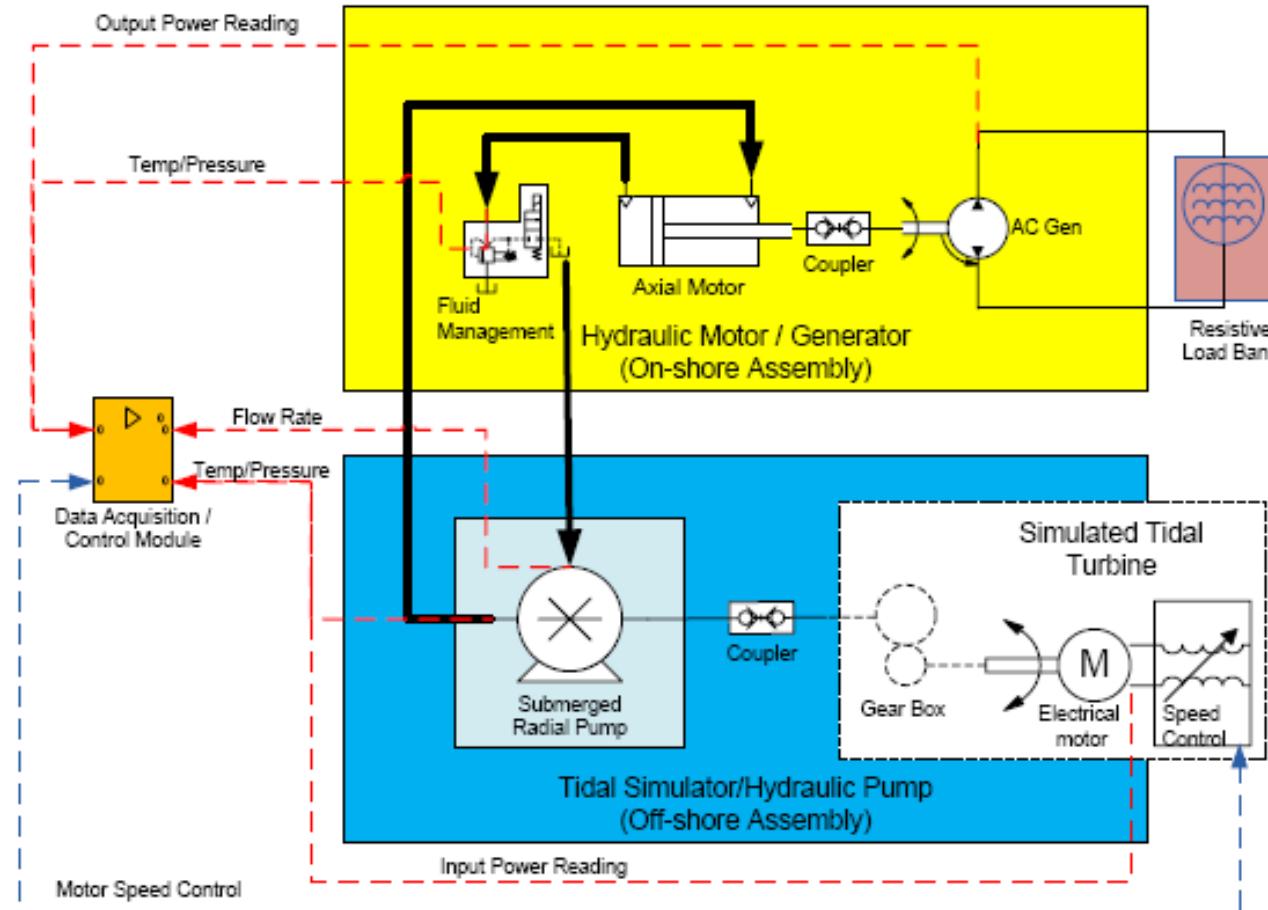
- This Project addresses a novel MHK tidal energy approach which can have high reliability, low LCOE and is positioned for rapid development and deployment
- The goal is to design, build and test a TRL4 system, using COTS, demonstrating the feasibility of MHK power generation, employing hydraulic transfer from a submerged turbine/pump for on-shore electrical generation. This design eliminates submerged electronics and gears which are major reliability issues in current systems
- In a parallel effort, designed to accelerate subsequent development, the performance and cost of full-scale systems (>10MW) for USA sites is modeled using COTS
- Subcontractor, Atlantis Resources Corp., is experienced and ready to support rapid commercialization of the technology and implement MHK deployments

- The TRL4 system is designed to demonstrate, in the laboratory, the practicality of hydraulic energy transfer from a tidal turbine (simulated by a variable speed drive) via the flow of pressurized environmentally friendly fluid, from a submerged hydraulic pump to an on-shore hydraulic motor coupled to an electric generator. Data acquisition and control is implemented to extract the performance data under different simulated tidal conditions
- The key aspect of the system is the elimination of submerged electronics and high ratio gears, present in current MHK systems. This will enable long-lived and cost-effective MHK energy solutions
- The Project is designed with a view to rapid commercialization. Larger versions (up to >1MW) of the components used in the TRL4 system are available and are used in our modeling. Given this availability and the teams experience, it is envisioned that we can move rapidly from TRL4, through marine demonstrations, to TRL 8/9

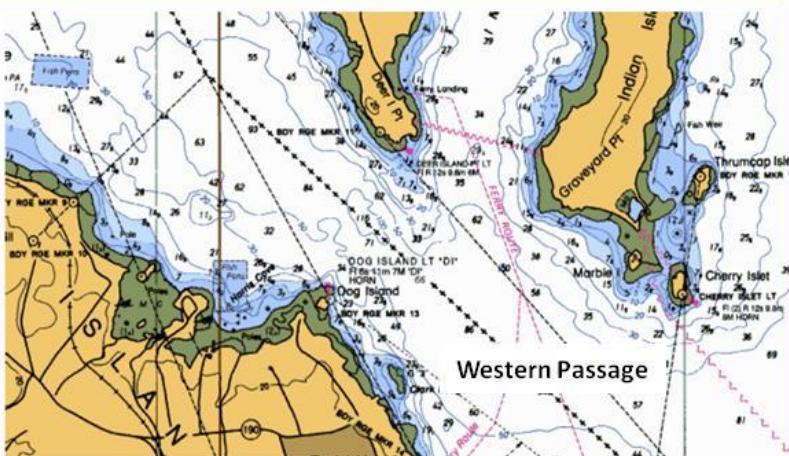
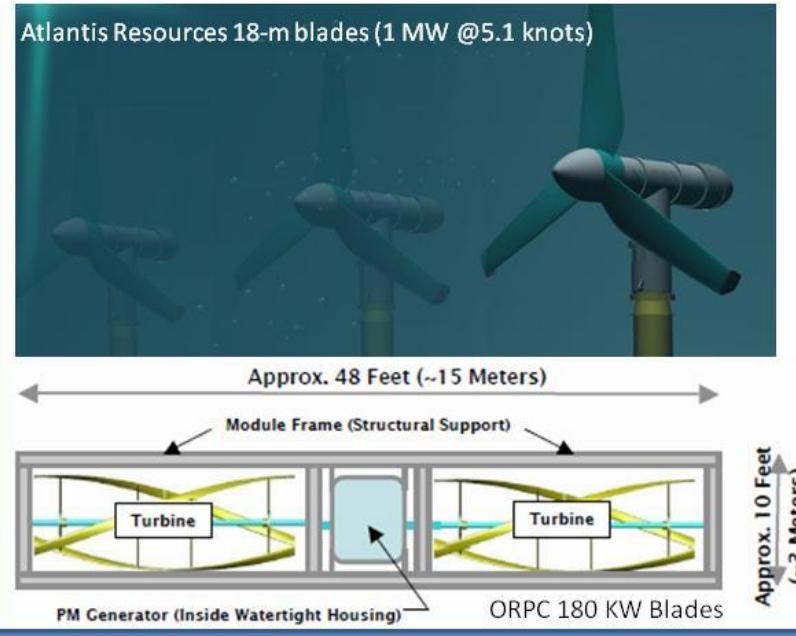
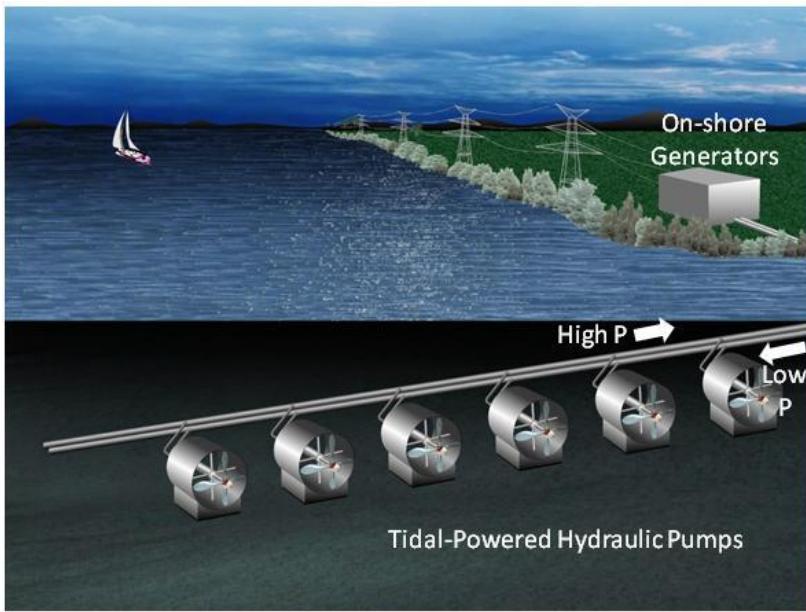
TRL4 Schematic

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy



Full Scale System Modeling



- A scalable, tidal-powered system is being sized and modeled. First consideration is given to a 10 MW system for deployment in Maine's Western Passage.
- The baseline blade is Atlantis Resources 18-m diameter, 1 MW blade. The backup is a ORPC 180 KW blade.
- The blades will power gearless, hydraulic pumps sending pressurized, environmentally-friendly, fluid to shore, to generate a constant, high RPM, electrical output for connection to a high voltage grid at Eastport.
- All gears and subsurface electronics are eliminated.
- System life is 20 years, with a 5 year maintenance cycle.
- System can be ready for commercialization following offshore demonstrations targeted for the next phase

Schedule

- Initiation date: 9/1/2010
- Planned completion date: 2/29/2012
- FY11 Milestones
 - TRL4 system design, procurement & integration completed (4QFY11)
 - TRL4 laboratory and tank testing commenced (4QFY11)
 - TRL3 large scale system studies commenced (3QFY11)
- F12 Milestones
 - TRL4 optimization, testing and evaluation completed (2QFY12)
 - TRL3 large system studies completed (2QFY12)
 - Final report (March 2012)
- Go/no-go decision points
 - None in this phase, final evaluations will provide go/no-go information for off shore demonstration in next phase.

Budget:

- The budget is unchanged except for some reallocations between equipment and supply categories, reflecting the final TRL4 design. There is no impact to the project plan.
- Approximately 75% of the budget has been expended to date

Budget History

FY2009		FY2010		FY2011	
DOE	Cost-share	DOE	Cost-share	DOE	Cost-share
N/A	N/A	N/A	N/A	\$300,000	\$75,000