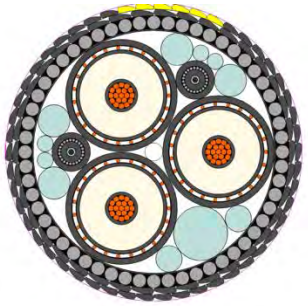
Institution: 3U Technologies, LLC



Past Projects

- OSU PacWave South – Wave Energy Test Site; Operational
- OSU PacWave North – Dynamic Cable Monitoring Berths
- Florida Atlantic University – Gulf Stream Ocean Current Test Facility (Ph1)
- Lake Worth, FL – Gulf Stream Marine Energy Feasibility Study
- Eastport Tidal Pilot Project – Permitting and Licensing Support for Subsea Infrastructure

Facility Capabilities

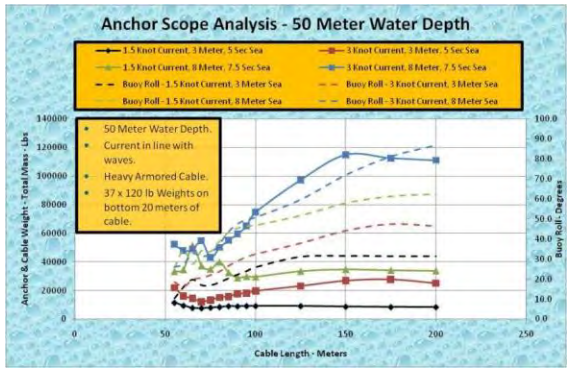
Type of expertise	*Description*
Subsea Cable Infrastructure SME's	*Proposal – Survey – Desktop Studies - Procurement – Installation – Commissioning*
Cable Shore Landing	Horizontal Directional Drilling; Beach Manhole; Direct Burial
Subsea Power/Data Cable System	Connectors, Specs, Testing, Conceptual Design – Procurement - Installation
Planning and Cost Analysis	End-to-End Power/Data Transmission System
Procurement Support – Technical Requirements	Source Identification; Proposal support and review; contract support
Risk Analysis	Technical options/risks; Schedule; Cost

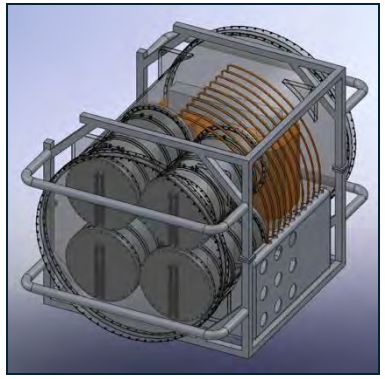
Facility Notes

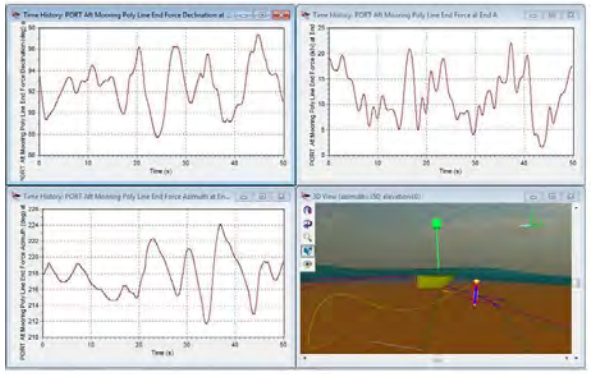
- *Customer Technical Representative – Subsea System SME's*
- *Scope tailored to meet specific project requirements*
- *Projects typically include a mix of operations-based expertise with engineering analysis*
- *Mechanical – Electrical – Control System Engineering Expertise*

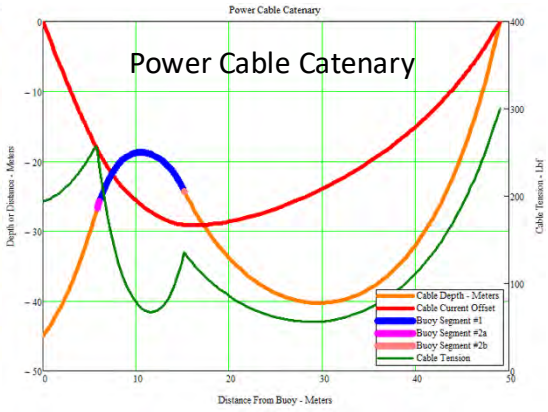
Don Welch, dwelch@3utech.com, Mobile: (301) 452-3152; www.3utech.com

Institution: 3U Technologies, LLC









Facility Capabilities	
Type of Modeling/Analysis	*Description*
Analysis of site and subsea route data	Bathymetric, geophysical, geotechnical, survey data
Dynamic analysis – cable, anchor, buoy	Orcaflex – cyclical loading, cable catenary, tension analysis – install, procurement, maintenance, and repair ramifications.
Structural Analysis	Finite Element Analysis; Interfaces, 3D Modeling
Subsea Transmission System	Cable conceptual design – specs, procurement, testing, install, protection; Subsea Connectors/Interconnects
Mooring/Anchoring	Size, configuration, installation, maintenance
Cost and Risk Analysis	Cost, Technical, Schedule Options and Impacts

Past Projects

- OSU PacWave South – Wave Energy Test Site; Operational
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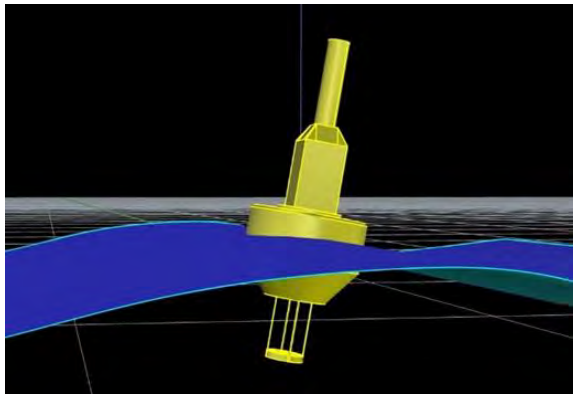
- Eastport Tidal Pilot Project – Permitting and Licensing Support for Subsea Infrastructure

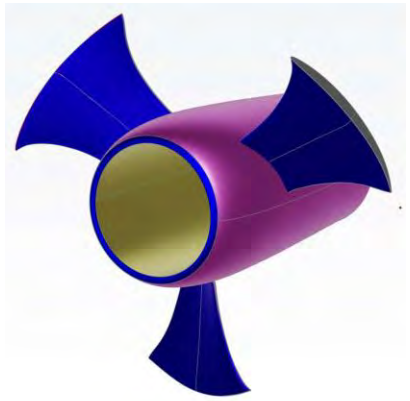
Facility Notes

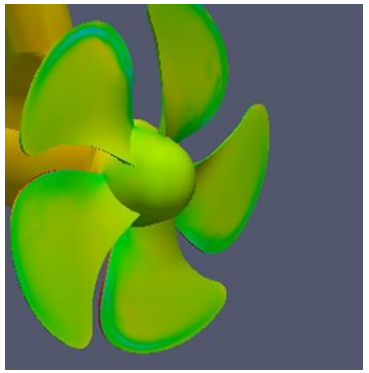
- *Customer Technical Representative – Subsea System SME's*
- *Scope tailored to meet specific project requirements*
- *Operations based expertise drives engineering analysis and options*
- *Mechanical – Electrical – Control System Engineering Expertise*

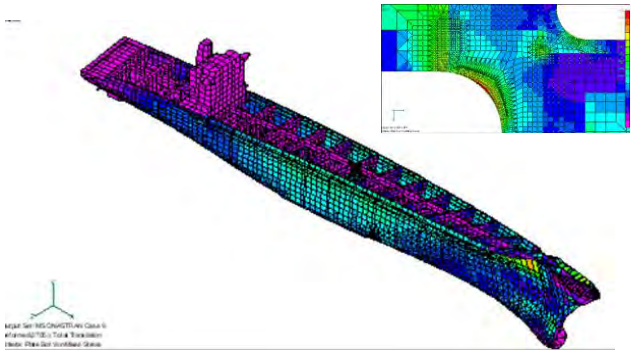
Don Welch, dwelch@3utech.com, Mobile: (301) 452-3152; www.3utech.com

American Bureau of Shipping (ABS)









Past Projects

- Ocean Survivability Analysis of a Wave Energy Converter that Powers Marine Aquaculture.
- Assessing structure integrity of a self-reactive point absorber subjected to extreme sea conditions.

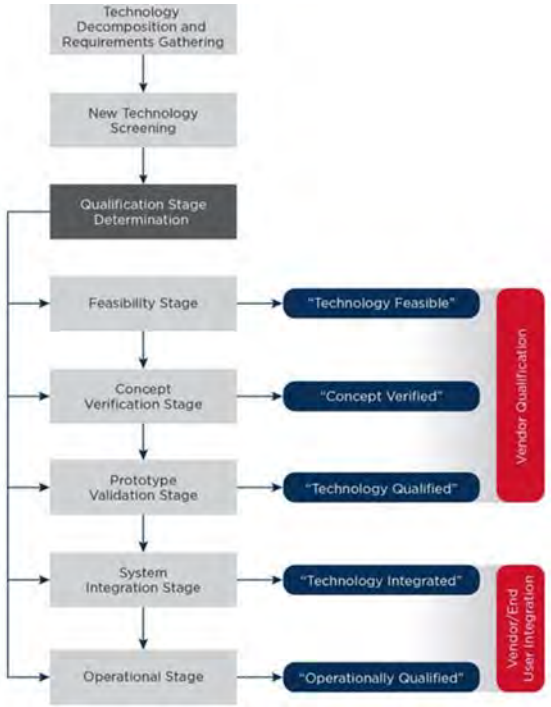
Facility Capabilities

- *Structural strength analysis*
- *Fatigue analysis*
- *Extreme event modeling at deployment location*
- *Fluid-structure interaction modeling*
- *Mooring dynamics simulation*
- *Array Integration Modeling*
- *Turbine blade geometry optimization*
- *Third party verification/validation of conformance to applicable engineering and other technical standards*
- *New technology qualification/certification*

Type of modeling	***Software***
Hydrodynamic	*Ansys AQWA, Orca Flex*
CFD	*OpenFOAM, Star-CCM+*
FEM	NX Nastran via FEMAP, ABAQUS, ANSYS

Shirlyn (Xi-Ying) Zhang, xyzhang@eagle.org, www.eagle.org

American Bureau of Shipping (ABS)



Facility Capabilities	
Category	***Description of Support***
Class Qualification/ Certification (IEC/ABS standards)	*Enables classification of* • *Approval in Principle* • *Novel Concepts* • *New Technology Qualification*
Stakeholder Engagement	Form Industry advisory board
Workshops/HAZID/ HAZOP	Detect risk issues and provide a report summarizing the risk workshop and the risk registry the team developed

Past Projects

- xWave New Technology Qualification and Path to Certification
- New Technology Qualification for a Small-Scale Wave Energy Converter Powering Offshore Aquaculture

Facility Notes

- *Scheduling*: review period is apr. 4 weeks each round.
- *Business types supported*: private companies and academic institutions in supporting their development of marine energy technology.

Shirlyn (Xi-Ying) Zhang, xyzhang@eagle.org, www.eagle.org

Kelson Marine Co.

Past Projects

- DOE WPTO: NeuralWEC program on novel control methods for a lightweight WEC
- ARPA-e SHARKS: Supported turbine developers

Facility Capabilities	
Type of expertise	*Description*
Design Space Exploration	Front-End Engineering Design of platforms, moorings, and subsystems.
Test Support	Sensor selection, DAQ integration, monitoring and post-processing.
Data Processing	Power performance, motions, metocean.
Marine Materials	Leveraging shipbuilding, composites, and hands-on marine system prototyping.
Structural Design	Knowledge of construction, fabrication, and assembly techniques for maritime industry.

Facility Notes

- *Scheduling*: Flexible
- *Future capabilities*: Turbine CFD modeling
- *User base*: Private industry, academia
- *Marine energy utilization*: 25%
- *Unique aspects*: Specialize in early-stage design and FEED studies for moored platforms

Doug Slocum, D.Slocum@KelsonMarine.com, KelsonMarine.com

Kelson Marine Co.

Facility Capabilities	
Type of modeling	*Software*
Metocean Analysis	Regional Ocean Modeling, In-House Extreme Value Analysis
FEA	Solidworks Environment
CFD	OpenFOAM, Simerics MP+
Mooring Design	OrcaFlex, In-House Hydrodynamics Codes
Platform Design	Rhino, Solidworks, Orca3D, CFD and Potential Flow Tools for Hydrodynamics
Data Analysis	In-House MATLAB and Python Tools

Past Projects

- DOE WPTO: NeuralWEC program on novel control methods for a lightweight WEC
- ARPA-e SHARKS: Supported turbine developers

Facility Notes

- *Scheduling*: Flexible
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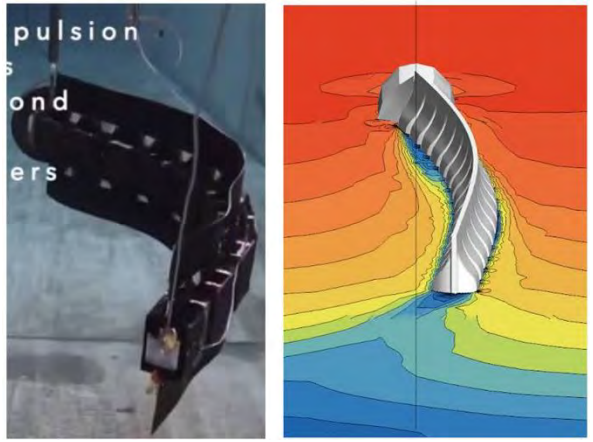
Doug Slocum, D.Slocum@KelsonMarine.com, KelsonMarine.com

Institution: Leadership Computing Facility at Oak Ridge National Laboratory

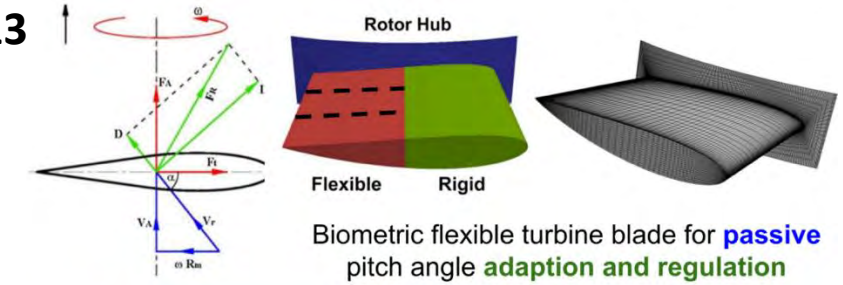
Past Projects

- Design optimization for ocean observing system (RFTS2)
- Flexible turbine blade design optimization (RFTS13)

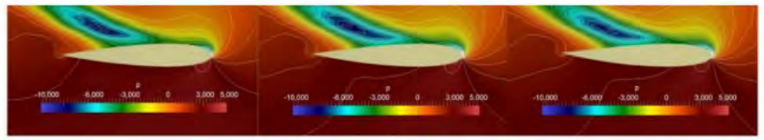
RFTS2



RFTS13

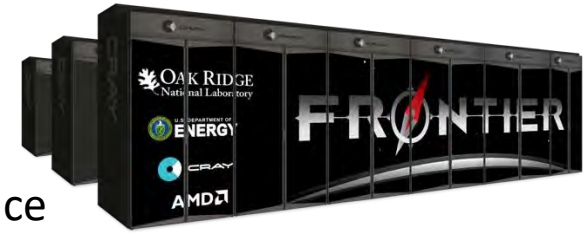


Biometric flexible turbine blade for **passive** pitch angle **adaption and regulation**



CFD simulations of various turbine configurations and flexibility

Facility Capabilities	
CFD	*ANSYS, OpenFOAM*



~ 10K AMD nodes

Facility Notes

- *Scheduling*: 2 months notice
- *Future capabilities*: Delft3D for tide and wave energy resource assessment (FY26)
- *User base*: Scientists and engineers in any fields who need high performance computing (HPC)
- *Marine energy utilization*: < 5%

Jiyong Lee, leej6@ornl.gov, https://www.olcf.ornl.gov/

Institution: ClimateTech Expertise Network (CEN)

ClimateTech Expertise Network

Facility Capabilities	
Category	*Description of Support*
Mentorship	Project-based sector and/or business expertise, 130+ mentors
Talent Matching	Funded, 120-hour trial projects to the derisk relationship between candidates and startups
Events	Investor and Corporate Connection events, Skills Labs (virtual webinars)
Peer Groups	Virtual networking meetings with other startup founders, facilitated by a mentor
Vendor Services	Funding to work on projects with tangible deliverables (TEA, CAD drawings, graphic design, etc.)

Past Project Examples

- Customer discovery project with a mentor to help the startup find the right product-market fit
- CFO talent matching trial project to support startup with fundraising round and derisk Key Hire relationship

Facility Notes

- *Scheduling*: Flexible timing, 100% virtual, rolling applications
- *Future capabilities*: Corporate connection events, Q4 2025
- *Business types supported*: Early stage (pre-seed to Series B)
- *Marine energy utilization*: Some startups in sector, looking to expand
- *Unique aspects*: Free for startups, 600+ startups served

Emma Spector, es3284@columbia.edu, www.ClimateStartupSupport.com

Institution: MarineSitu

Facility Capabilities	
Marine Monitoring	*End-to-end marine monitoring services, including deployment planning, monitoring system operation, machine learning model maintenance, data management, data analysis, and reporting*
Data Analysis	*Analysis of optical (including stereoscopic), active acoustic, passive acoustic, and related data for objects and features of interest (e.g., marine animal presence and behavior)*
Machine Learning Model Development	*Development of custom machine learning models for a variety of applications*

Past Projects

- UW-APL Turbine Lander (Oct ‘23 – Mar ‘24)
- Menter Mon Morlais Demonstration Project (Nov ‘24 – present)

Facility Notes

- *Scheduling*: 0-6 months in advance, depending on project complexity.
- *Future capabilities*: AI-enabled custom data processing pipelines.
- *User base*: Device developers, test sites, universities, and laboratories.
- *Marine energy utilization*: Extensive – often necessary for deployment.
- *Unique aspects*: System monitoring via dashboards, real-time alerting, and livestreams.

James Joslin| james@marinesitu.com| www.marinesitu.com

Institution: Lloyd's Register

Past Projects

- WaveRoller (2016)
- Flex Marine Power (2023)
- Global OTEC (2023)
- Quoceant (2024)
- Orbital Marine Power (2025)
- CETO WEC (ongoing)

Facility Capabilities	
Type of expertise	*IECRE Certification body – Wind and Marine energy*
Scope:	*Assessment of Marine energy conversion systems through Technology Qualification leading to Prototype Certification in accordance with IECRE requirements*
	IEC Standards (TC114)
	Authored several IECRE Operational documents for Marine energy

Facility Notes

- *Scheduling*: [*Three months in advance*]
- *Future capabilities*: [*Type certification (2026); Project certification (2027)*]
- *User base*: [*Technology developers, OEMs, Project developers*]
- *Marine energy utilization*: [*100%*]
- *Unique aspects*: [*only IECRE RECB with a scope in Wind and Marine energy, Leadership on IEC TC 114 and IECRE conformity assessment system*]

Contact name: Winston D'Souza, contact email: winston.dsouza@lr.org, facility website: www.lr.org

Institution: Lloyd's Register

Facility Capabilities	
Type of modeling	*Software*
Software expertise: (Structural and Pipelines)	*Ansys, SACS, STAADpro, RFEM, USFOS, Crackwise TWI, ABAQUS, Bladed*
(Mechanical)	*PV Elite*
(Geotechnical)	*OPILE and GRLweap*

Past Projects (non-Marine Energy related)

- ADDA Oil & Gas platform – Structural analysis (SACS, ABAQUS, & USFO)
- Inchcape Wind Turbine support platform – Structural analysis (Bladed, SACS and OPILE)
- Tennet Offshore substation platforms – Structural analysis (SACS, ABAQUS and OPILE)
- St Brieuc substation platform –Structural analysis (SACS and OPILE)
- East Anglia WTG platform – Structural analysis (Bladed, SACS, ANSYS and OPILE)

Facility Notes

- *Scheduling:* [*6 months in advance*]
- *Future capabilities:* [*Digital twin simulation and analysis*]
- *User base:* [*Technology developers, OEM, Project developers and Asset owners*]
- *Marine energy utilization:* [*20%*]
- *Unique aspects*: [*Industry experience, Representation on Standards and Codes committees, Access to commercial FEA software, IECRE RECB for Wind and Marine energy*]

Contact name: Trevor Butler, contact email: trevor.butler@lr.org, facility website: www.lr.org

Institution: Re Vision Consulting

Facility Capabilities	
Type of expertise	*Description*
Cost & Economic Modeling	Cost and Economic Assessment of Wave, Tidal, Ocean Current, River, and OTEC
Parametric Device Optimization	Parametrically driven Device Envelope Optimization
Installation and O&M Analysis	Marine Ops, Logistics, Costing
Manufacturing Process Optimization	Steel, Concrete, FRP, PTO

Past Projects – Total of 4 Teamer Projects Completed

- Techno-Economic Assessments
- Numerical Modeling (WEC-Sim + In-house tools)
- Marine Ops Planning
- Mfg. Optimization

Facility Notes

- *Scheduling*: 3 months
- *Future capabilities*: N/A
- *User base*: Wide Range of clients (government, industry, investors, utilities)
- *Marine energy utilization*: 60%
- *Unique aspects*: Over 20+ years of relevant R&D in Marine Energy

Mirko Previsic, mirko@re-vision.net, www.re-vision.net

Institution: Re Vision Consulting

Facility Capabilities	
Type of modeling	*Software*
FEA	*SolidWorks*
WEC Performance	WEC-Sim, WAMIT, In-House Tools
Optimal Control	MPC, Causal
Deterministic Sea Wave Prediction	In-House Algorithm Base
First Order Models	Various using Excel and Matlab

Past Projects – Total of 4 Teamer Projects Completed

- Techno-Economic Assessments
- Numerical Modeling (WEC-Sim + In-house tools)
- Marine Ops Planning
- Mfg. Optimization

Facility Notes

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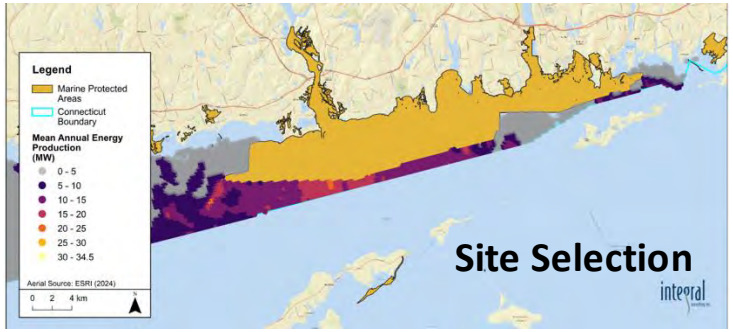
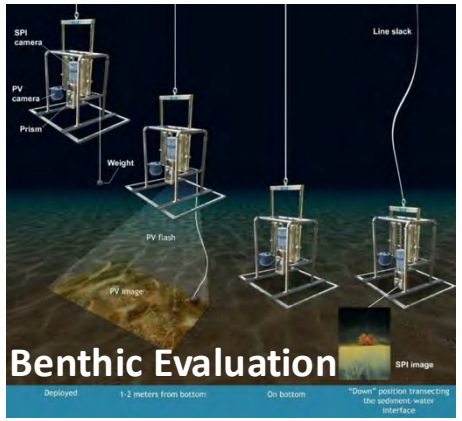
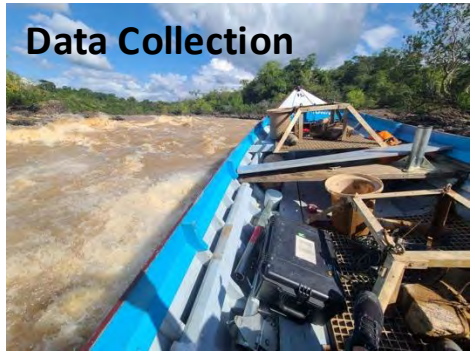
Mirko Previsic, mirko@re-vision.net, www.re-vision.net

Institution: Integral Consulting







Facility Capabilities	
Resource Characterization/ Site Selection	*Evaluation of energy resource in rivers and coastal sites with waves/tides*
Open Water Data Collection	*Hydrodynamics, waves, acoustics, sediment and water quality, turbulence*
Acoustics	Data collection and evaluation, directional and omnidirectional, marine mammal assessments
Benthic Characterization	Benthic habitat mapping via SPI –PV, erosion characterization via SEDflume

Past Projects

- **Acoustic Particle Velocity Measurements Around a Tidal Energy Turbine- Open Water RFTS**

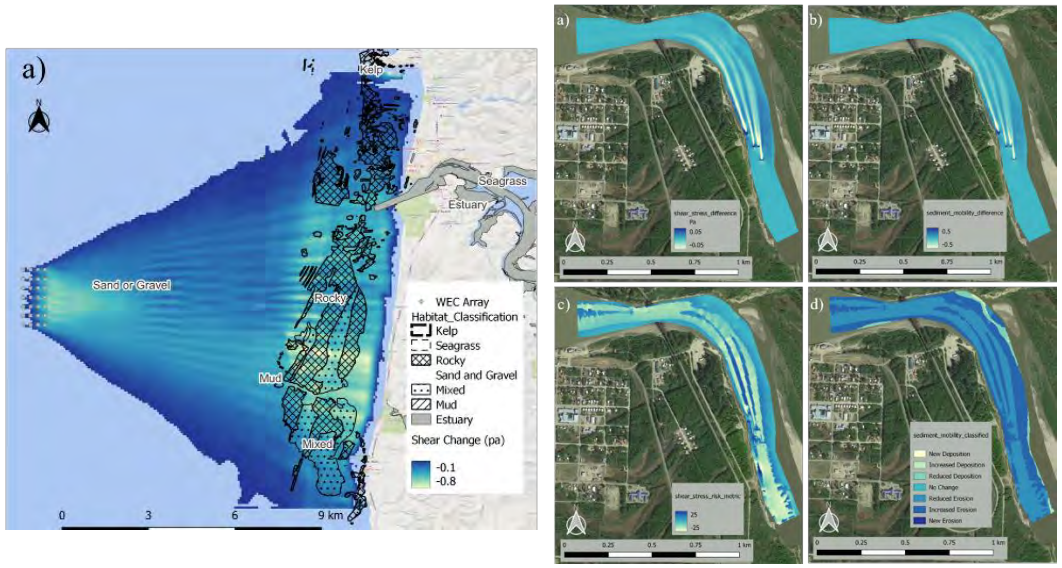
- **Future Island Impact – *Long Island Sound Resource Assessment- RFTS 11***

Facility Notes

- *Scheduling*: 1-2 months
- *Future capabilities*: Animal tagging/tracking, biological radar/imaging systems, vibracore sampling
- *User base*: Technology developers, national laboratories, site developers, Universities
- *Marine energy utilization*:
- *Unique aspects*: Own a suite of instruments

Samuel McWilliams, smcwilliams@integral-corp.com , www.integral-corp.com

Institution: Integral Consulting



Facility Capabilities	
Hydrodynamics	*Delft3D-CEC, Dflow-FM, ROMS, MIKE , EFDC*
Waves	*SWAN, SNL-SWAN, WaveWatch III*
Acoustics	Parabolic Equation, Ray Tracing, Normal Modes, COMSOL
Environmental Risk	Spatial Environmental Assessment Tool (SEAT)

Past Projects

- ***Rapid and cost-effective assessment of the feasibility of wave energy to support resilient desalination and power on Guam - RFTS 13***

- ***WEC and CEC site assessment tools; software application and training with SNL-SWAN and SNL-Delft3D-CEC- RFTS 13***

Facility Notes

- *Scheduling*: 1-2 Months
- *Future capabilities*: **Resource Assessment Dashboard- Rapid screening, Ambient Noise**
- *User base*: Industry partners, National Labs, Universities
- *Marine energy utilization*: WEC & CEC, Desalinization
- *Unique aspects*: Overlap with Field Data Collection

Samuel McWilliams, smcwilliams@integral-corp.com , www.integral-corp.com

University of Hawaii at Manoa: Hawai'i Marine Energy Center

Facility Capabilities	
Type of expertise	*Description*
wave forecasting	*Operate the 14-day wave forecast system for Hawaii, CNMI, Guam, American Samoa, Palau*
Wave hindcasting	Develop long-term wave hindcast for wave climate investigation and wave energy resource assessment
Wave energy resource characterization	Characterize wave energy resources following the IEC TS 62600-114 standards

Past Projects

Facility Notes

- *Scheduling*: 2025-2027
- *Future capabilities*: Seasonal-to-Interannual wave forecast; subseasonal-to-seasonal wave forecast
- *User base*: WEC developers, open-water site management teams
- *Marine energy utilization*:
- *Unique aspects*: numerical wave modeling

Ning Li, ningli@hawaii.edu

Oregon State University: WESRF

Facility Capabilities	
Type of expertise	*Description*
Power Electronics	Modeling, control, optimization, hardware
Power Systems	Modeling, protection, communication
Microgrid	System integration, HIL, multiphysics
Energy Storage	Real and virtual storage types
Electro-mechanics	Modeling and hardware demo
Hardware-in-the-loop	Power electronics (micro-sec to milli-sec) to power system timescales (sec to min)

Past Projects

- ARPA-E SHARKS Hydrokinetic multi-physics modeling
- WPTO WEC multi-physics equivalent-circuit modeling
- WPTO WEC/HKT microgrid modeling
- WPTO WEC/HKT reliability/health monitoring
- WPTO WEC power electronics design tool
- WPTO HydroWIRES power system modeling
- Navy microgrid+energy storage design tool

Facility Notes

- *Scheduling*: one quarter in advance
- *Future capabilities*: WEC/HKT power electronics and reliability design tool
- *User base*: gov agency, national lab, regional industry
- *Marine energy utilization*: almost exclusively dedicated for ME
- *Unique aspects*: comprehensive multi-physics and multi-timescales with hardware or HIL support

Prof. Yue Cao, yue.cao@oregonstate.edu, https://wesrf.engr.oregonstate.edu/

Oregon State University: WESRF

Facility Capabilities	
Type of modeling	*Software*
Power Electronics	Simulink, PLECS, LTspice, Firmware
Power Systems	MATLAB, PowerWorld, PSS-e, HOMER
Microgrid	MATLAB/Simulink multi-physics
Energy Storage	MATLAB/Simulink, battery/supercap/virtual
Electro-mechanics	MATLAB/Simulink, Autodesk, ANSYS
Hardware-in-the-loop	OPAL-RT, PLECS RT Box

Past Projects

- ARPA-E SHARKS Hydrokinetic multi-physics modeling
- WPTO WEC multi-physics equivalent-circuit modeling
- WPTO WEC/HKT microgrid modeling
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- WPTO HydroWIRES power system modeling
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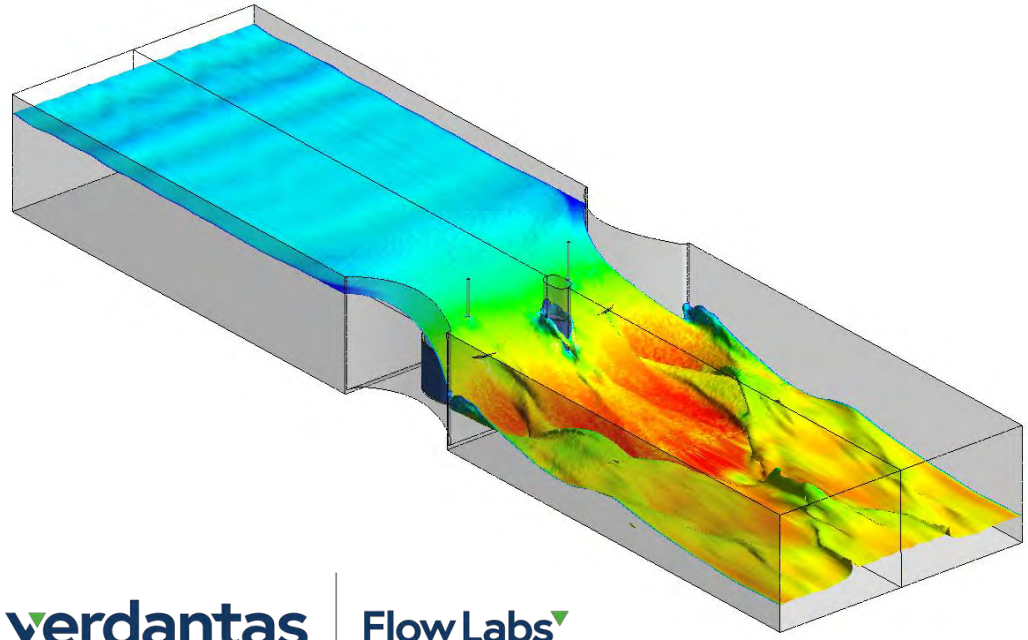
Verdantas Flow Labs: Numerical Modeling



verdantas | Flow Labs

Facility Capabilities	
Computational Fluid Dynamics (CFD)	*ANSYS Fluent: Free-surface and closed conduit modeling, multiphase, multiphysics, moving/rotating components*
	FLOW3D: Free surface flows, waves, moving/floating components
	HEC-RAS: River, canal, flood plane modeling
Analytical Modeling	Physics/first principles based custom tools created using Python or MATLAB/Octave.

Past Projects

- Emrgy Inc.: Performance Validation of Vertical Axis Hydrokinetic Turbine (RFTS 4)
- Hanna Wave Energy Primary Drives: Self-rectifying, Mono-Radial Impulse Turbine (RFTS 2)

Facility Notes

- *Scheduling*: 2-4 weeks
- *User base*: Conventional Hydropower, Coal, Natural Gas and Nuclear power facilities and operators, Manufacturing and Industrial Processing, Wastewater and Civil Infrastructure
- *Marine energy utilization*: 10%
- *Unique aspects*: Numerical Studies can be run in advance of, or in parallel with, physical test programs.

Dan Bateman, dbateman@verdantas.com, www.verdantas.com/solutions/flow-labs

Institution: Texas A&M University, Department of Ocean Engineering

Facility Capabilities	
Type of modeling	*Software*
Fully Nonlinear Fluid-Structure-Generator Interactions	*DualSPHysics (particle method) + hydroelasticity + nonlinear multi-body dynamics + generator dynamics*
Turbulence Model	Partially Averaged Navier-Stokes Equation
Hydrodynamics	3D panel-based diffraction and radiation (Boundary element method)
Nonlinear mooring coupled floating bodies dynamics	CHARM3D (similar to Orcaflex but include nonlinear mooring dynamics, fully coupled hydrodynamics up to 2nd order)

Past Projects

- DOE WPTO Project: SR-WEC
- NSF turbulence Project
- Various industry projects

Facility Notes

- *Scheduling*: Available
- *Future capabilities*: Can be tailored for individual projects
- *User base*: Academic researchers, industry personnel
- *Marine energy utilization*: vary from 30% to 80 %
- *Unique aspects*: Can be evolved through projects

Dr. HeonYong Kang, hykang@tamu.edu, https://engineering.tamu.edu/ocean/index.html

Institution: Stress Engineering Services, Inc.

Facility Capabilities	
Type of modeling	*Software*
FEA	*ABAQUS, ANSYS, LS-DYNA*
CFD	*Fluent, CFX*
Floating Systems (Coupled Global Analysis, VIV)	*OrcaFlex, Shear7, WAMIT, In-house software (RAMS, NeoSight)*
Fracture Mechanics	*Signal FFS, In-house software*
Structural/Modal Analysis	*SACS, SAP2000, RISA 3D*
Data Processing/Simulation	*MATLAB, Simulink, Python*

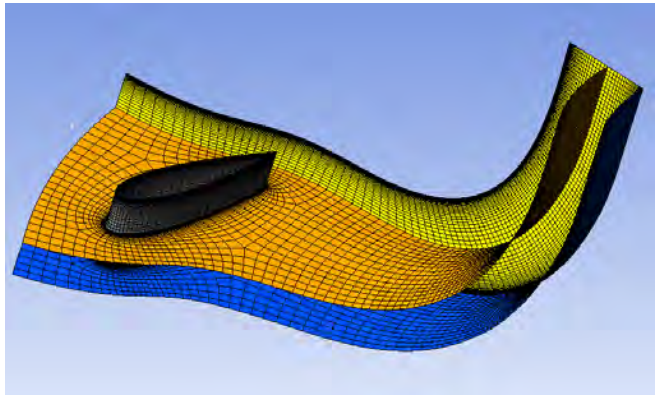
Past Projects

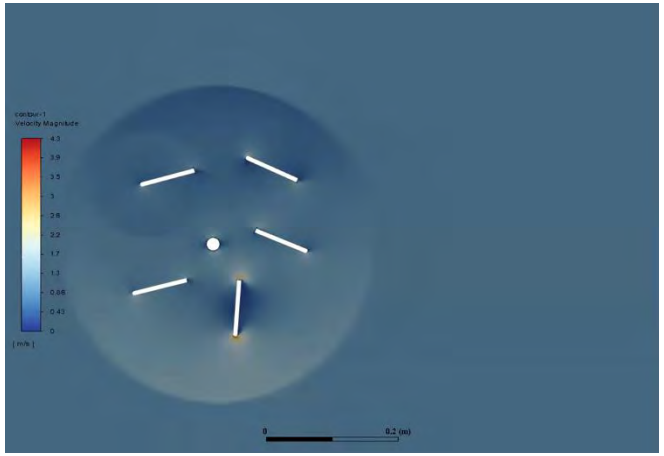
- Modular Group Helical Pile Anchor Structural Analysis (RFTS-10)
- Optimizing Corrosion Allowance and Fatigue Performance of Deeply Embedded Ring Anchor for Floating Marine Renewable Energy (RFTS-13)

Facility Notes

- *Scheduling*: 0 – 4 weeks lead time
- *Future capabilities*: Physics-based digital twin platforms, ongoing
- *User base*: Operators, OEMs, Start-ups, Technology Companies
- *Marine energy utilization*: ~80% offshore energy (mainly oil & gas)
- *Unique aspects*: We offer a full suite of support that includes testing, measurements/monitoring in addition to numerical analysis.

William Walker, PhD, william.walker@stress.com, https://www.stress.com/





Facility Capabilities	
Type of modeling	***Software***
Finite Element Analysis, rotordynamics	SolidWorks, Ansys Mechanical
Computational Fluid Dynamics- RANS, URANS, DES, LES, Multiphase flows, compressor/turbine aerodynamics	Ansys Fluent, CFX
One-way/two-way FSI- flutter analysis	Coupling Ansys mechanical and Fluent/CFX
Meshing	Fluent mesher, ICEM, Turbogrid
1-D modelling	AxStream suite
System modelling, thermodynamic cycle design	Numerical Propulsion System Simulation (NPSS)
High performance computing	HPC cluster with 23 CPU nodes, 1 GPU node

Past Projects

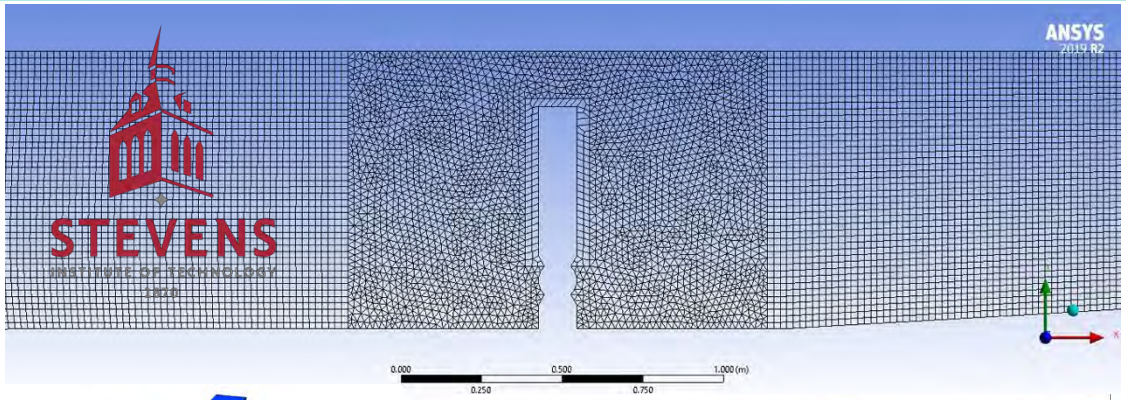
- TEAMERS: Reactive Reversible blade Turbine CFD model
- Centrifugal compressor FSI
- Multiphase turbine design

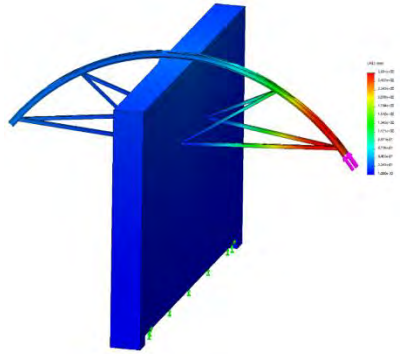
Facility Notes

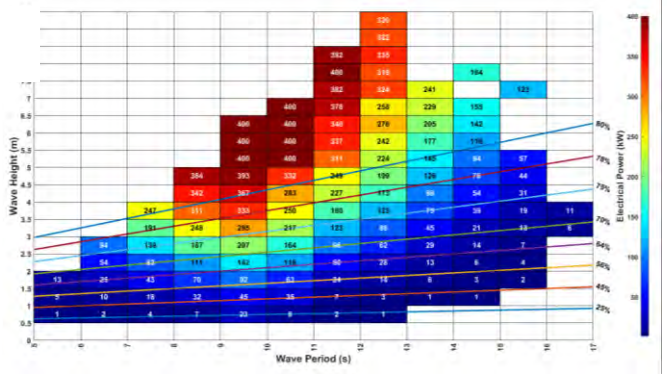
- *Scheduling*: Varies- contact us
- *Future capabilities*: Adding more CPU/GPU nodes
- *User base*: Industry, National Labs, Universities
- *Marine energy utilization*: Low

Dr. Subhra Shankha Koley, subhrashankha.koley@swri.org, facility website

Stevens Institute of Technology: Davidson Laboratory







Facility Capabilities	
Type of modeling	*Software*
FEA	*SolidWorks, ANSYS*
BEM	*ANSYS-AQWA, NEMOH*
CFD	*ANSYS-Fluent, OpenFOAM*
Mooring	*OrcaFlex*
Wave-to-Wire	Customized code (multi-fidelity)
HPC	46 servers with 2,752 cores

Past Projects

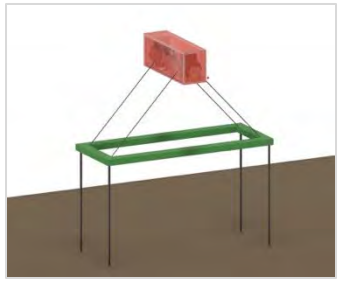
- DOE WPTO funded projects
- DOE Prize competitions (Power at Sea)
- DOE student competitions (MECC)
- SBIR/STTR projects
- WECs and current turbine modeling
- Blue economy projects

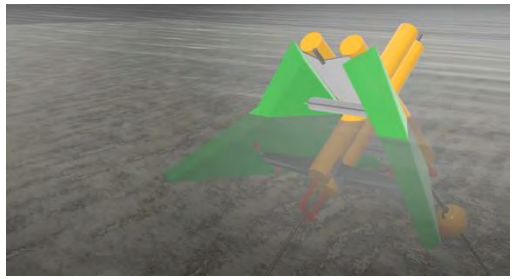
Facility Notes

- ***Scheduling***: We will try our best to adapt to client's schedule
- ***Future capabilities***: Hardware-in-the-loop testing & modeling with active control
- ***User base***: Rich experience in supporting academia, national labs and industry
- ***Marine energy utilization***: Excellent for wave energy converters and turbines
- ***Unique aspects***: Wave-to-wire multi-scale and multi-fidelity modeling

Facility Point of Contact: Dr. Muhammad Hajj(mhajj@stevens.edu) Dr. Jia Mi (jmi5@stevens.edu)

Institution: AMOG Consulting Inc





* Courtesy of Laminar Scientific

Past Projects

- TEAMER RFTS4: Analysis of a bi-concave buoy*
- TEAMER RFTS10: Analysis of a novel nearshore at-surface WEC*
- AMOG WEC:

Facility Capabilities	
Type of modeling	*Software*
Hydrodynamic Analysis	*OrcaFlex, OrcaWave, WAMIT*
Structural Analysis / FEA	*ANSYS, ABAQUS*
CFD	*STAR-CCM+*
Vortex Induced Vibrations (VIV)	*SHEAR7*

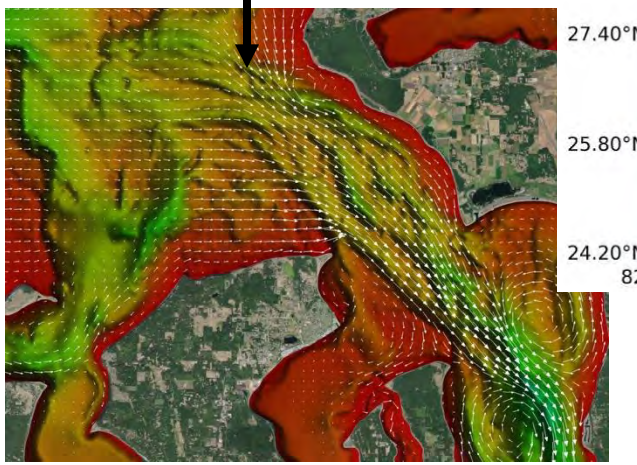
Facility Notes

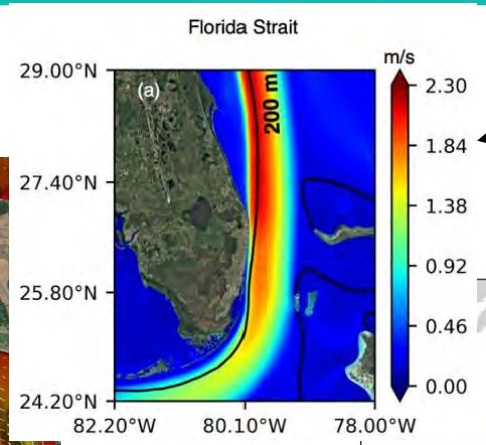
- *Scheduling*: 1-2 months
- *Future capabilities*: Additional IP for Analysis Methodologies resulting from ongoing Joint Industry Projects in Ocean Engineering
- *User base*: Floating Energy Operators including Renewable and Mineral Resources
- *Marine energy utilization*: 80%
- *Unique aspects*: Mooring Design, Computational Fluid Dynamics, Hydrodynamics, Vortex Induced Vibration, Structural, Mechanical and Marine Expertise

Andrew Kilner, P.E., Andrew.Kilner@amog.consulting, https://amog.consulting/

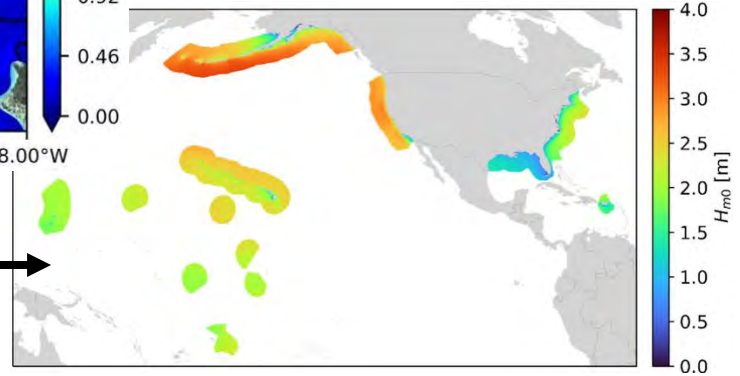
Pacific Northwest National Laboratory

Modeled tidal current (vectors) and bathymetry (contours) in Puget Sound, WA (from T. Wang)





Modeled 30-year mean ocean current speed in the Florida Strait (Park et al., 2025)



Modeled 42-year mean significant wave height in U.S. waters (Yang et al., 2023)

Facility Capabilities	
Type of modeling	*Software*
Tides	FVCOM, SCHISM
Waves	SWAN, WW3
Ocean Current	SCHISM, ROMS
OTEC	SCHISM
River	FVCOM

Past Projects

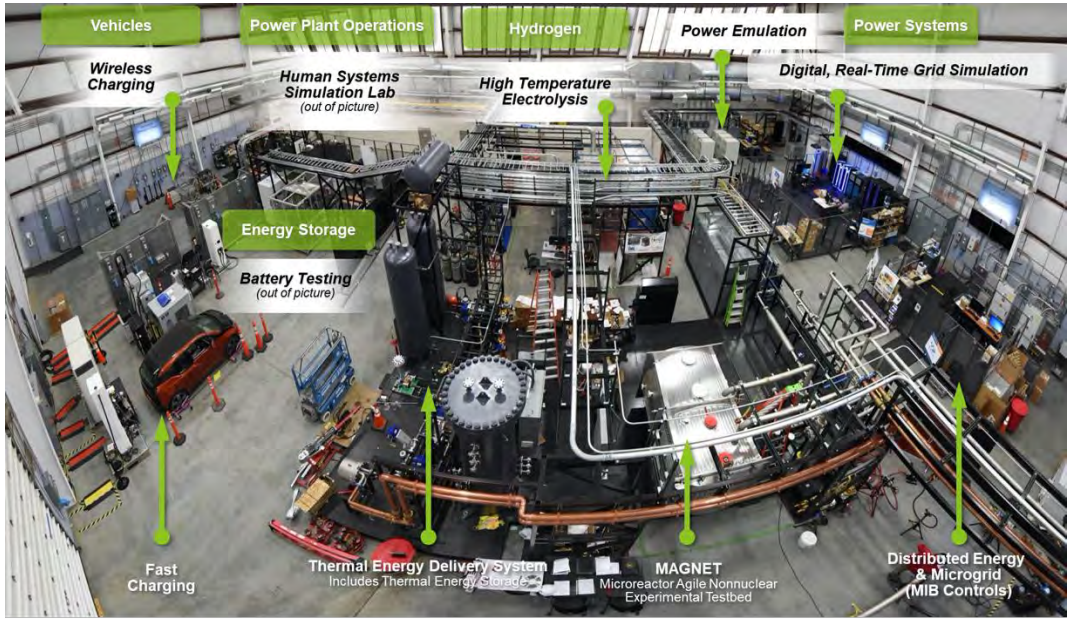
- Marine energy resource modeling: Maine, Long Island Sound, Cook Inlet, Salish Sea, Florida Current
- Numerical modeling tests account for 32% of the TEAMER projects PNNL has supported
- PNNL has supported 6 developers for 10 RTFS requests involving numerical modeling
- Modeling has been combined with other expertise (i.e., environmental/biological assessments)

Facility Notes

- *Scheduling*: 3+ month advance notice recommended
- *Future capabilities*: More efficient numerical modeling with AI, assessments to support environmental impact
- *User base*: Industry, academia, local communities
- *Unique aspects*: Modeling expertise in multiple formats/applications; High resolution regional modeling; Broad geographical reach; All marine energy sources; Peer-reviewed journal publications
- https://www.pnnl.gov/projects/ocean-dynamics-modeling

Preston Spicer, preston.spicer@pnnl.gov, Zhaoqing Yang, zhaoqing.yang@pnnl.gov

Institution: Idaho National Laboratory



System Integration Laboratory at INL

Past Projects

- Reliability Analysis and New Technology Qualification of an Integrated Tidal Energy Converter with an Infinitely Variable Transmission (New Teamer Project)
- Marine Energy Net Zero Microgrid Pre-Deployment Toolkit to Accelerate Resilience of Coastal Communities

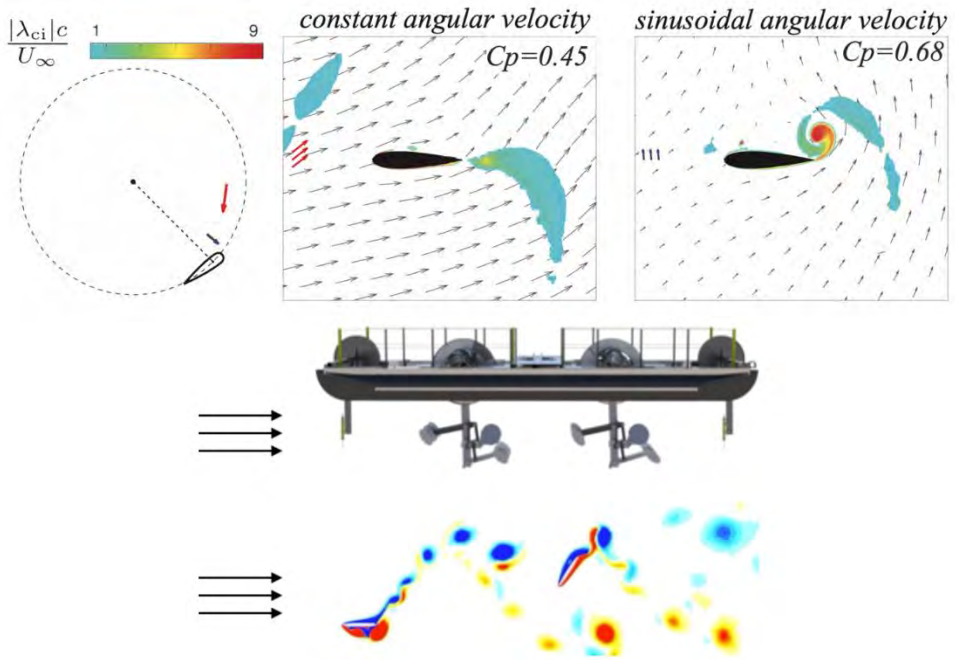
Facility Capabilities	
Technoeconomic Modeling	Xendee, HERON/FORCE
Reliability and Risk Analysis (FMEA, FTA, RCA, ETA, ALT)	EMRALD, SAPHIRE
Power System Modeling (RMS/EMT) and System Integration	PSS/E, MATLAB/SIMULINK, DigSILENT Powerfactory
Real-time Simulation and Power/Control Hardware-in-Loop Test	Real-Time Digital Simulator (RTDS), OPAL-RT, Grid Emulator
Grid/Microgrid Integration	Microgrid-in-a-Box (MIB)
Human System Interface and Automation	Human System Simulation Laboratory

Facility Notes

- *Scheduling*: 1-2 weeks
- *Future capabilities*: Integrated thermal electric experiments, FY26
- *User base*: INL researchers, Universities
- *Marine energy utilization*: Very limited
- *Unique aspects*: Capabilities are collocated with plug-and-play functionalities

Bikash Poudel, bikash.poudel@inl.gov, Idaho National Laboratory - TEAMER

University of Wisconsin-Madison: Computational Flow Physics/Modeling



Past Projects

- New facility, no past TEAMER projects
- Prior research includes:
- **Oscillating hydrofoils**: simulation, cooperation of foils
- **Cross-flow turbines** : non-sinusoidal control, dynamic stall, multi-turbine dynamics

Facility Capabilities	
Type of modeling	*Software*
CFD of time-dependent, blade-resolved flows: • *Dynamic stall, boundary layer physics* • *Wake interactions* • *Vortex-blade interactions*	*OpenFOAM* • *High priority access to 800 processor cores* • *Customized OpenFOAM libraries for non-trivial mesh motion, turbulence modeling* • *Passive and active moving rigid bodies / mesh motion with customized solvers*
Fluid-Structure Interaction (FSI)	Multiple structural solvers available (in-house/open source) within OpenFOAM for coupled solvers

Facility Notes

- *Scheduling*: at the time of TEAMER application
- *Future capabilities*: new codes are constantly being developed
- *User base*: primarily a research facility
- *Marine energy utilization*: 50%

Prof. Jen Franck, jafranck@wisc.edu, cfd.engr.wisc.edu

NREL: Marine Turbine Low/Mid-Fidelity Modeling

Facility Capabilities	
Type of modeling	*Software*
Coupled engineering	OpenFAST
Frequency domain	RAFT
Steady-state rotor	CC-Blade
Control co-design	CT-Opt
Rotor optimization	WISDEM

Past Projects

- Frequency domain analysis of a floating marine energy platform for optimization
- Mid-fidelity modeling of a non-traditional ocean current turbine
- Optimization of pitching and heaving characteristics of an oscillating hydrofoil

Facility Notes

- *Scheduling*: 3-6 months
- *Future capabilities*: Additional system geometries (i.e., multi-rotor)
- *User base*: Marine energy developers and researchers
- *Marine energy utilization*: ~100%
- *Unique aspects*: Open-source codes, developed in-house at NREL

Hannah Ross, hannah.ross@nrel.gov, https://www.nrel.gov/water/open-fast

NREL: Marine Turbine High-Fidelity Modeling

Facility Capabilities	
Type of modeling	*Software*
URANS CFD	Star-CCM+, OpenFOAM
LES CFD	AMR-Wind
Actuator line CFD	Star-CCM+, OpenFOAM, AMR-Wind
Fluid structure interaction	Star-CCM+

Past Projects

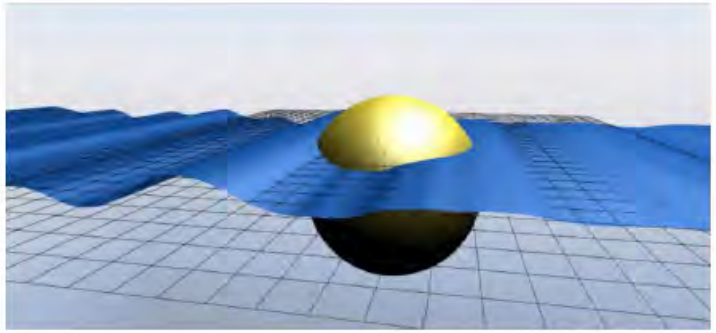
- Blade resolved analysis
  - Axial-flow turbine
  - Cross-flow turbine
  - Non-traditional multi-stage turbine
  - Kite and oscillating hydrofoil
- Actuator line analysis
  - Axial-flow turbine
  - Cross-flow turbine

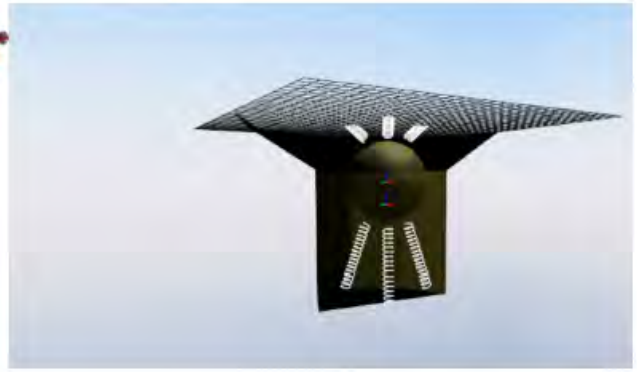
Facility Notes

- *Scheduling*: 3-6 months
- *Future capabilities*: ANSYS software suite
- *User base*: Marine energy developers and researchers
- *Marine energy utilization*: ~100%
- *Unique aspects*: Kestrel HPC cluster, in-house developed code (AMR-Wind) available for highly parallelized simulations

Will Wiley, will.wiley@nrel.gov, https://www.nrel.gov/hpc/

NREL: WEC Low/Mid-Fidelity Modeling





Past Projects

- Modeling of an inertial mass PTO WEC
- Modeling of an adaptive point-attenuator WEC

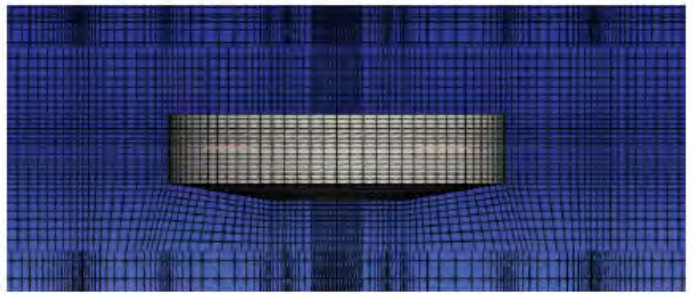
Facility Capabilities	
Type of modeling	*Software*
Time domain	HydroChrono, AQWA
Frequency domain	WAMIT, AQWA, Capytaine
Steady-state rotor	CC-Blade
Control co-design	CT-Opt
Rotor optimization	WISDEM

Facility Notes

- *Scheduling*: 3-6 months
- *Future capabilities*: HydroChrono/Capytaine coupling for FSI modeling
- *User base*: Marine energy developers and researchers
- *Marine energy utilization*: ~100%
- *Unique aspects*: Open-source codes, developed in-house at NREL

Mohamed Shabara, mohamed.shabara@nrel.gov, https://www.nrel.gov/water/wave-energy-conversion-modeling

NREL: WEC High-Fidelity Modeling



Facility Capabilities	
Type of modeling	*Software*
CFD	Star-CCM+, OpenFOAM, Fluent
FEA	Project Chrono, ANSYS
SPH	DualSPHysics, Chrono SPH
Fluid structure interaction	Star-CCM+, ANSYS, Project Chrono+DualSPHysics

Past Projects

- Extreme wave modeling with one-way FSI for a WEC
- Design and simulation of a directly pressurized wave-to-water desalination system

Facility Notes

- *Scheduling*: 3-6 months
- *Future capabilities*: Project Chrono coupling with OpenFOAM
- *User base*: Marine energy developers and researchers
- *Marine energy utilization*: ~100%
- *Unique aspects*: Kestrel HPC cluster, in-house codes

Mohamed Shabara, mohamed.shabara@nrel.gov, https://www.nrel.gov/hpc/

NREL: Techno-Economic Analysis (TEA)

Facility Capabilities	
Type of modeling	*Software*
Techno-economic (i.e., power performance and cost modeling)	• System Advisor Model (SAM) • MoorPy • Other in-house software, code, and data
Cost modeling	• Leverages in-house code and data • Supplier outreach to assist applicants in obtaining reliable quotes • Custom models based on data, physics, and/or processes
Levelized cost of energy (LCOE) and other marine energy cost and performance metrics	Leverages NREL's techno-economic software, code, and data to conduct LCOE analysis and/or estimate other marine energy metrics
IO&M modeling	Internal NREL code
Comparative analysis	Analysis to compare technologies, use cases, locations, etc.

Past Projects

- *Economic modeling and analysis of MADWEC wave energy converter:* Evaluated the techno-economics of the MADWEC technology for multiple end-use cases at multiple locations. Additionally, the analysis compared the power performance, economics, and installation, operation, and maintenance logistics of the MADWEC and two alternative power supply options (photovoltaic solar and battery energy storage).

Facility Notes

- *Scheduling*: 1-3 months
- *User base*: Industry (i.e., technology developers, project developers, component suppliers), academia, government research laboratories.
- *Marine energy utilization*: >95%
- *Unique aspects*: Lead lab supporting DOE WPTO for marine energy techno-economic research

Elena Baca, elena.baca@nrel.gov, https://www.nrel.gov/water/economic-analysis

NREL: Commercialization

Commercialization evaluation of Waves to Water Prize competitor designs and business strategies. Photo by Werner Slocum, NREL.

Past Projects

- State-Level Marine Energy Policy Case Study and Overview
- Deployment Readiness Framework (DRF)
- Marine Energy Commercialization Review: Evaluation of the Transition From Public to Private Capital
- Marine Energy Technology Development Risk Management Framework
- Energy Technology Innovation Partnership Project

Facility Capabilities	
Business Strategy	End-user analysis, business development pathways
Regulatory Landscape	State and federal marine energy authorizations and available incentives, adaptive management
Risk Management	Introductory training to co-development of a risk register and mitigation approaches
Community Engagement	Best practices, initial strategies and considerations
Storytelling	Funding opportunity review, supporting resources
VC Engagement	Approaches to identify and engage patient capital and connection with network as possible
Financial Modeling and Planning	Project cash flow, manage financial resources, and develop a fundraising strategy.

Facility Notes

- *Scheduling*: 1-2 months
- *Future capabilities*: All capabilities in TEAMER approvals currently
- *Business types supported*: All stages of development; tailor to developer
- *Marine energy utilization*: Primarily marine energy through the Water Power Deployment and Commercialization Team

Jenny Wiegele, jenny.wiegele@nrel.gov, nrel.gov/water

NREL/Sandia: TEDA (Technology Evaluation and Development Advisory)

Facility Capabilities	
Type of expertise	*Description*
Technology Performance Level (TPL) assessment	Assessment to evaluate the potential or promise of a technology to perform economically as a product when fully commercialized
Technology evaluation	Elucidation of the strengths and weaknesses of a technology as evidenced by TPL assessment
Technology development advisory	Recommendations for technology improvements that promote commercial economic viability

Past Projects

- Technology Performance Level (TPL) evaluation of WEC and CEC technologies under development by industry
- Customized TPL evaluation for prizes (Wave Energy Prize, Innovating Distributed Embedded Energy Prize)

Facility Notes

- *Scheduling*: 1-3 months
- *Future capabilities*: Adaptation to all PBE markets
- *User base*: Marine energy technology developers and researchers, prize administrators, investors, funding agencies
- *Marine energy utilization*: ~100%
- *Unique aspects*: Provides independent and unbiased third-party evaluation, valuable at all TSRs

Jochem Weber (jochem.weber@nrel.gov), Jesse Roberts (jdrober@sandia.gov)
https://tpl.nrel.gov

FAU SNMREC: Ocean Current Power Generation Simulator

Facility Instrumentation

- 30 HP (22.4 kW) dynamometer and VFDs
- 7,000 kW shaft-end torque meter
- 1 m^3 submerged drivetrain tank
- MCM/PHM system
- LabVIEW drive control and monitoring system w/ *in situ* Florida Current measurement rotor emulation module

Facility Characteristics	
Geometric and operating attributes	***Values***
Drive-side	*30 hp 208 VAC induction motor with 25:1 epicycloidal gearbox*
Machine-under-test	*30 hp 208 VAC VFD (or customer supplied)* *Max RPM: 1575* *Max Power: 15.5 kW*
Open or closed-loop	*30 hp 6.3 Ohm braking resistor bank*
Mounting base	*Vibration isolated and pitch/roll/height adjustable*

Facility Notes

- *Scheduling*: 3-6 months in advance
- *Future capabilities*: wave and turbulence modules by 2026
- *User base*: marine energy system developers and researchers
- *Marine energy utilization*: 100%
- *Unique aspects*: emulates rotors with measured Florida Current, available PHM system, key part of FAU ME system dev pipeline

Erick Busold, ebusold@fau.edu, https://snmrec.fau.edu/technology-testing/dynamometer.html

Institution: ICF Inc.

Facility Capabilities	
Category	*Commercialization*
Financial Modeling	*Projecting cash flows, techno-economic analysis, understanding tax credits*
Commercialization	*Grant proposal development, storytelling, pitch development, marketing & communications, stakeholder engagement, risk management*
Business Model	*Development & validation: Value proposition, customer discovery, business model canvas*
Team development	*Leadership & team building, conflict resolution*

Past Projects

- Offshore Wind NEPA: 20+ projects
- Grant Proposal & Project Development: U.S. DOE Adv. Manufacturing & Recycling Grant Readiness Technical Assistance Program for small/medium manufacturers
- Extensive maritime port support, e.g., Port Master Plan Update (Port of San Diego)

Facility Notes

- *Scheduling*: 2-4 weeks
- *Business types supported*: commercial/industrial business, utilities, and state/local/federal government agencies including Bureau of Ocean Energy Management (BOEM)
- *Unique aspects*: Energy markets, microgrids, grid interconnection, stakeholder engagement, environmental assessments, permitting, economic impact analysis, coastal community & energy resilience

Mary Dinh, mary.dinh@icf.com, https://www.icf.com/

Institution: VentureWell

VENTUREWELL®
idea to impact

Founded in 1995, VentureWell is a non-profit organization with a mission to foster science and technology innovation and entrepreneurship intended to address the most pressing challenges facing people and the planet. To date, we've trained and supported more than 18,000 innovators representing over 5,300 ventures that have raised over $7B in private and public investment.

Past examples:

- VentureWell worked with a startup that reduces costs for maritime shipping through robotics, ocean data, and propulsion. They used VentureWell's Product Readiness Roadmap and assessment to develop a plan for their software and new data collection technology, and is conducting interviews to better assess how to leverage key influencers as channel partners to access more sales.
- VentureWell worked with a startup developing an adaptive ocean wave energy device for off-grid, small-scale, low-power applications at sea. They participated in our E-Team program in 2020 while students at University of California San Diego. We provided them with their first grant funding along with formative customer discovery training. The company has secured SBIR funding from the National Science Foundation and the Department of Energy and now has 10 employees.
- From 2015 to 2024, 233 startups participated in VentureWell's Aspire Program. Of these participants, 70% raised funds—dilutive or non-dilutive—post-program, over 30% raised dilutive funds, and 81% are still active.

Facility Capabilities

Category	*Description of Support*
Business Development	• Product readiness assessments to develop technology development roadmaps and iterate based on customer discovery feedback • Customer discovery coaching and hypothesis testing to develop appropriate minimum viable products • Business model canvas development and iteration
Proposal and Pitch Consultation	• Guidance on using storytelling to strengthen proposals and pitches • Pitch deck feedback and development to communicate value proposition, business model, milestones, competitive advantage, and asks • Pitch delivery practice
Funding Continuity	• Fundraising strategy development to prioritize funding needs and potential sources through investor discovery and fundraising coaching • Strategic partnerships planning • Financial projections and milestone planning • Training on how to effectively manage funders long term and understand term sheet impacts

Facility Notes

- *Scheduling*: 2-3 months in so VentureWell can conduct a needs assessment and schedule the appropriate support necessary for applicants to meet their milestones.
- *Business types supported*: Early stage innovators, entrepreneurs, and researchers; TRL 2-6 (concept to piloting and early sales); ranging from pre-seed to Series A startups
- *Marine energy utilization*: supporting marine energy startups that are addressing hardware, software and hybrid technologies
- *Unique aspects*: VentureWell would conduct an initial needs assessment and matchmake the applicant to the appropriate VentureWell expert, who would serve as the portfolio manager and the point of contact. Additionally, VentureWell has an extensive network of investors, service providers, and subject matter experts that bolster our commercialization support work.

Tricia Compas-Markman, tcompas@venturewell.org, www.venturewell.org

Old Dominion University: OpenSeas Technology Innovation Hub

Past Projects

- DOE Commercialization Mentoring – Power at Sea , InDEEP, SBIR/STTR
- EDA i6 Grant – Blue Economy Startup Incubation and Acceleration (Full Spectrum)
- WindSite – Wind Energy Siting Tool
- Maritime Autonomous Systems Test Site
- NATO Innovation Challenge
- Cybersecurity Center of Excellence for Offshore Renewable Energy

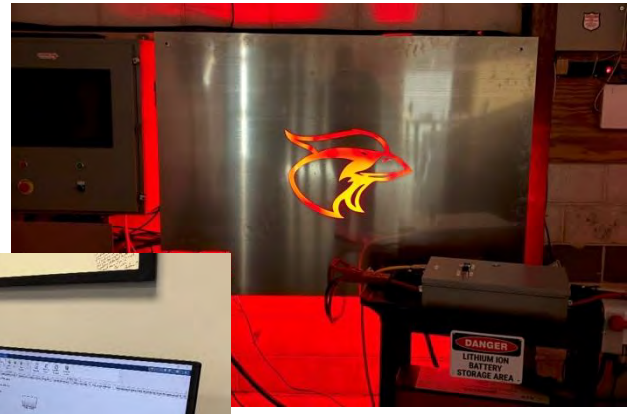
Facility Capabilities	
Category	*Description of Support*
Business Opportunity Assessment	Value Proposition Development, Customer Discovery, Market Analysis, Business Environment Analysis, Bus. Model Development and Validation
Bus. Opportunity Planning	Business / Program / Project Planning; Sales / Marketing Strategies; Business Infrastructure Development
Financial Planning	Revenue Modeling & Forecasting; Market Forecasting; Cash Flow Forecasting; Financial Requirements Identification
Funding Planning	Strategy Development; Identification of Stage Appropriate Funding Sources; Proposal and Pitch Development Support

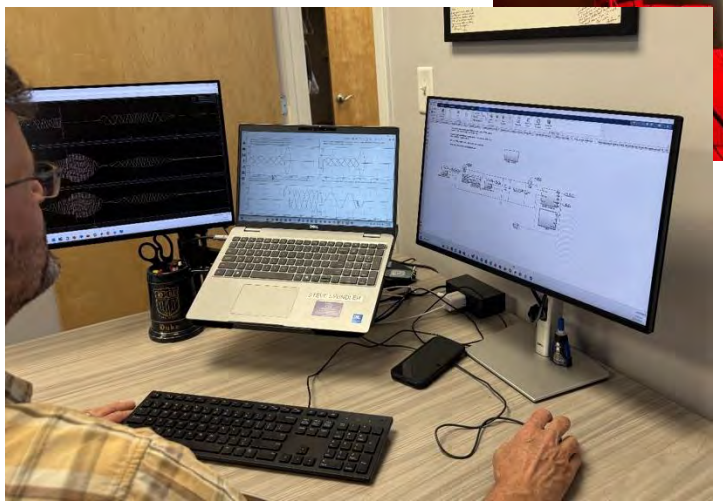
Facility Notes

- *Scheduling*: Flexible
- *Future capabilities*: Open Water Testing Capabilities (Fall 2025)
- *Business types supported*: Innovation Driven Ocean Economy Startups and New Business Lines
- *Marine energy utilization*: 50%
- *Unique aspects*: Robust Ocean Economy Ecosystem

Jerry Cronin, jcronin@odu.edu, https://openseashub.org

Cardinal Engineering, LLC





Examples of Past Projects

- TEAMER RFTS 11: “Investigation of Alternate Material Design Methods in WPS Ballast and Hull Systems”
- TEAMER RFTS 13: “Overvoltage Protection of Direct Drive WPS Electrical Components”

Facility Capabilities	
FEA and Structural Analysis	NASTRAN (NX and Inventor, with Femap), DYSMAS, ParaDyn, SDC Verifier, AFGROW, NASGRO
CFD	Rhino3D/Orca3D, Aegir, OpenFOAM
CAD	Solidworks, AutoCAD, Inventor
Electrical Modeling	SKM Power Tools, Matlab/Simulink
Electrical Testing	120/208VAC, up to 50kW
Systems Modeling	WEC-Sim, Matlab/Simulink

Facility Notes

- *Scheduling*: Roughly 3 months in advance.
- *Future capabilities*: Expanding electrical/power systems M&S, extending testing capabilities to 440V and above, Power Hardware in the Loop (PHIL).
- *User base*: Primary customer is DOD (Navy, Air Force, Space Force).
- *Marine energy utilization*: Historically 5% of revenue. We support marine energy developers via direct funding, DOE grants/FOA, and TEAMER.
- *Unique aspects*: Cross-disciplinary team able to provide analysis support and design input in topic areas ranging from structures, materials, mechanical systems, power systems, auxiliary systems, spanning the range of Hull, Mechanical, & Electrical (HM&E) Systems.

Doug Algera, dalgera@cardinaleng.com, www.cardinaleng.com

Institution: *yet2*

Facility Capabilities	
Category	*Description of Support*
Commercialization	*yet2* helps organizations understand their target markets, hone their Comparative Value Propositions™, and connect with resources.
Mentoring	*yet2* prepares founders to engage with and articulate their pitch to suppliers, customers and investors.
TEAMER-relevant Domain Depth	*yet2* has covered green industries for over 25 years building a network of hundreds of experts and thousands of startups in this sector.

Past Projects

- Marine Energy:
  - NREL InDEEP Prize
  - NREL Power at Sea Prize
  - Durable Eco-friendly Materials for Marine Environments
  - Ocean Freight Renewable Energy
- Commercialization:
  - Baker Hughes – Composite material for O&G seals
  - DuPont – Omega3 from yeast

Facility Notes

- *Scheduling*: 1 month preferred; able to engage on shorter notice
- *Future capabilities*: *yet2* capabilities are developed and refined to address the needs of our clients
- *Business types supported*: *yet2* works with researchers, startups, small- and medium-size enterprises as well as large companies
- *Marine energy utilization*: *yet2* helps organizations partner with each other and, for TEAMER, support commercialization efforts
- *Unique aspects*: *yet2* builds trust and asks the right questions to create effective commercialization pathways

Tom Pavilon, tpavilon@yet2.com, www.yet2.com

Institution: Rare Innovation

Facility Capabilities	
Category	*Description of Support*
Business Development	Business development, partnerships, and execution.
Marketing	Market research, Go-to-Market strategy, and marketing execution.
Financing Strategy	Non-diluted and private capital strategy and execution.

Past Projects

- Over $100 million in direct enterprise tech sales
- SBIR Phase III fundraise of $3 million
- 500+ technology engagements across our team
- 2011 DOE SBIR PhI Awardee
- Participated in multiple startup launches and exits

Facility Notes

- *Scheduling*: Project kickoff as early as one week
- *Future capabilities*: IP strategy, Fractional C-level officers
- *Business types supported*: All types of R&D businesses
- *Marine energy utilization*: 5+ SBIR funded client engagements
- *Unique aspects*: We actively engage your market to drive results

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