MITEN

Maritime Tidal Energy Networks

NEC Energy , LLC

Associate of Rancocas Pathways

Registered 501c3 - CH406100

CLIMATE

CONSCIENCE

Develop new projects, repurpose port/maritime infrastructure, design co-processed bio-feeds, execute power purchase agreements, explore new technologies, and advance a number of adaptive options that produce lower-emission solutions.

International Maritime Organization (IMO) has set a **Goal to Reduce Carbon Emissions in international shipping by 40% by 2030 and reach Net Zero Carbon Emissions** by 2050

Nick Ellis, Principle of Amazon's Climate Pledge Fund
" By investing Amazon can show ship and tugboat owners real commercial viable technology's for reaching Net Zero by 2050"

Market for Public-Purpose Community Microgrids

Ship stacks emit greenhouse gases (GHGs) such as carbon dioxide (CO 2), and air pollutants, including PM 2.5 (particulate matter with aerodynamic diameter less than 2.5 μm), sulfur oxides (SO x), nitrogen oxides (NO x), and volatile organic compounds (VOCs).

Maritime Vessels and Tugboats account for up to 4% of global total of Green House Gas Emissions

Exxon Mobile stresses increased cooperation, communication and consultation among stakeholders, is necessary to fulfill the IMO's goals.

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Maritime Zero Carbon Emissions anchors OPPORTUNITY

Control of Carbon Emissions

Current maritime emissions control attack emission outputs… Cumbersome economics !

Since 2011 World container-ship fleet grew 25%; increased capacity by 80%, Bulk fleet by 65%. Emissions increase !

Maritime emissions control transitions of fuel inputs must match Zero Carbon Emissions… Requires Clean Fuel !

MITEN Promotes Zero Carbon Goals in the Maritime

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Nomenclature of Maritime Tidal Energy Networks

Adapting and enhancing vintage technology to modern day microgrids to achieve sustainable and future zero carbon emission goals in the United States maritime and tugboat industry's.

Target markets and public-purpose community areas to establish aggregated maritime microgrids in global Ports along East Coast USA Mid Atlantic maritime highway (NJ, PA, DE, MD).

Latest mobile phone technology for 365/24/7 access to tidal energy networks, microgrids, and charging stations based on market operating schedules and port volumes. Enhanced efficiencies equal cost savings.

Conveyance, convenience and conservation based on supply and demand patterns of cargo movements, warehousing, just in time supply chains, ports and tugboat operating schedules.

Expand partnerships with tugboat companies, ports, terminals, berths, shipping agencies, exporters, government and communities.


Mid-Atlantic Marine Highway
Harrisburg
Susquehanna River
Pennsylvania
Delaware River
Trenton
Fairless KMI
Philadelphia Port
Port of Wilmington
Port of Camden
Port of Paulsboro
Delaware River
(147 miles of liner market)
NJ/PA
Terminals/ Piers/Wharfs
Warehouses
Market Nodes
Bainbridge Warehouse Cluster
Maryland
Aberdeen Proving Grounds
Port of Salem
South Jersey
C & D Canal
Atlantic Ocean
Port of Baltimore
Dover AFB
Terminals/ Piers/Wharfs
Warehouses
Market Nodes
Annapolis
Dover
Delaware Bay
Delaware
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The U.S. Marine Highway system currently includes 31 "Marine Highway Routes" that serve as extensions of the surface transportation system. Each all-water route is designated by the Secretary of Transportation and offers relief to landside corridors suffering from traffic congestion, excessive air emissions or other environmental challenges.

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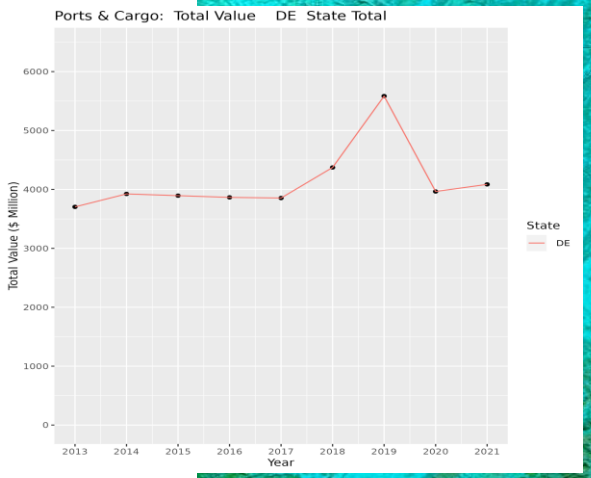

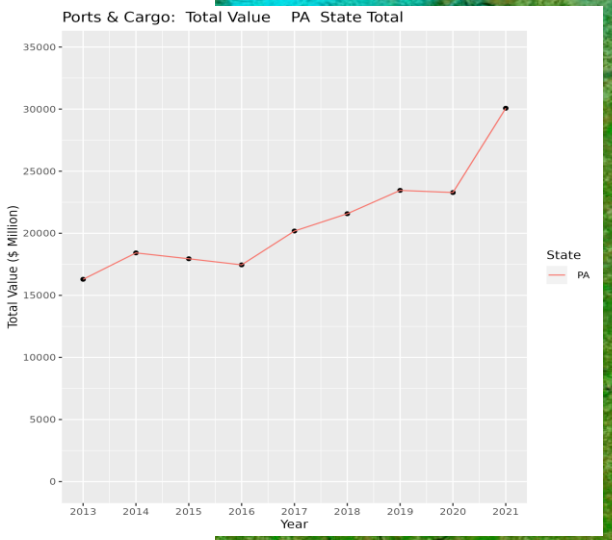

Harrisburg

Head of Maritime Commerce Trenton

Port of Philadelphia

Northern Chesapeake Bay Center of Commerce

Port of Wilmington

Port of Camden

C & D Canal

Port of Salem

Port of Baltimore

Delaware Bay

Atlantic City

Delmarva Ports

Washington DC

Chesapeake Bay

Ocean City

Mid-Atlantic Ports and Markets

Port of Richmond

Port of Norfolk

One-Touch Maritime Access Service

Member and Subscription Services

Vetted , professional access protocols
Secure controlled access
Public-Purpose Community Microgrids

Digital Access 24/7/365

Licensed access for subscribers
Different levels of subscription access

Guaranteed Schedules at Charging Stations

Mobile app/Digital twin with GPS
Charging stations photo access protocols

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Key Differences from Diesel Powered Vessels and Tugboats

Optimized High Tech GPS Logistics Software

MITEN is CLEAN POWER

Enhances development of market trend of electric powered vessels and tugboats.

MITEN user friendly. Power availability gauged from cell phone and digital twin.

MITEN greater efficiencies of tugboat operations transforms clean power maritime operations.

MITEN phased in deployment by terminals, port and Public-Purpose community microgrids

MITEN FEATURES
Scaled to Site Locations

Tidal Energy and Tidal Turbines

Solar Energy Panels

Wind Turbines

Biomass Energy

Other

Maritime: Maritime power systems, such as those installed in ships, ferries, vessels, and other maritime devices, operate in islanded mode at sea and grid-connected mode at port. Therefore, maritime MGs are true commercial microgrids that are affordable and have a prospective market. Maritime MGs are growing increasingly important as ships become more electrical

Reference: Jin Z., Sulligoi G., Cuzner R., Meng L., Vasquez J.C., Guerrero J.M. Next-generation shipboard dc power system: Introduction smart grid and dc microgrid technologies into maritime electrical networks IEEE Electrif. Mag., 4 (2) (2016), pp. 45-57

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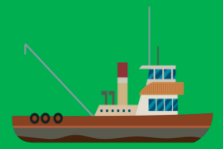
Key Operations

1.

Optimized Charging Times



2.

Remote diagnostics and SMART Systems

3.

Focus on customers, computer coordinated

4.

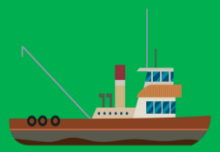
Profits augmented by digital twin

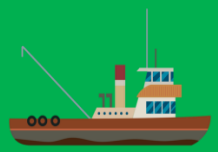
5.

Network collaborative design w industry

6.

On Demand Services

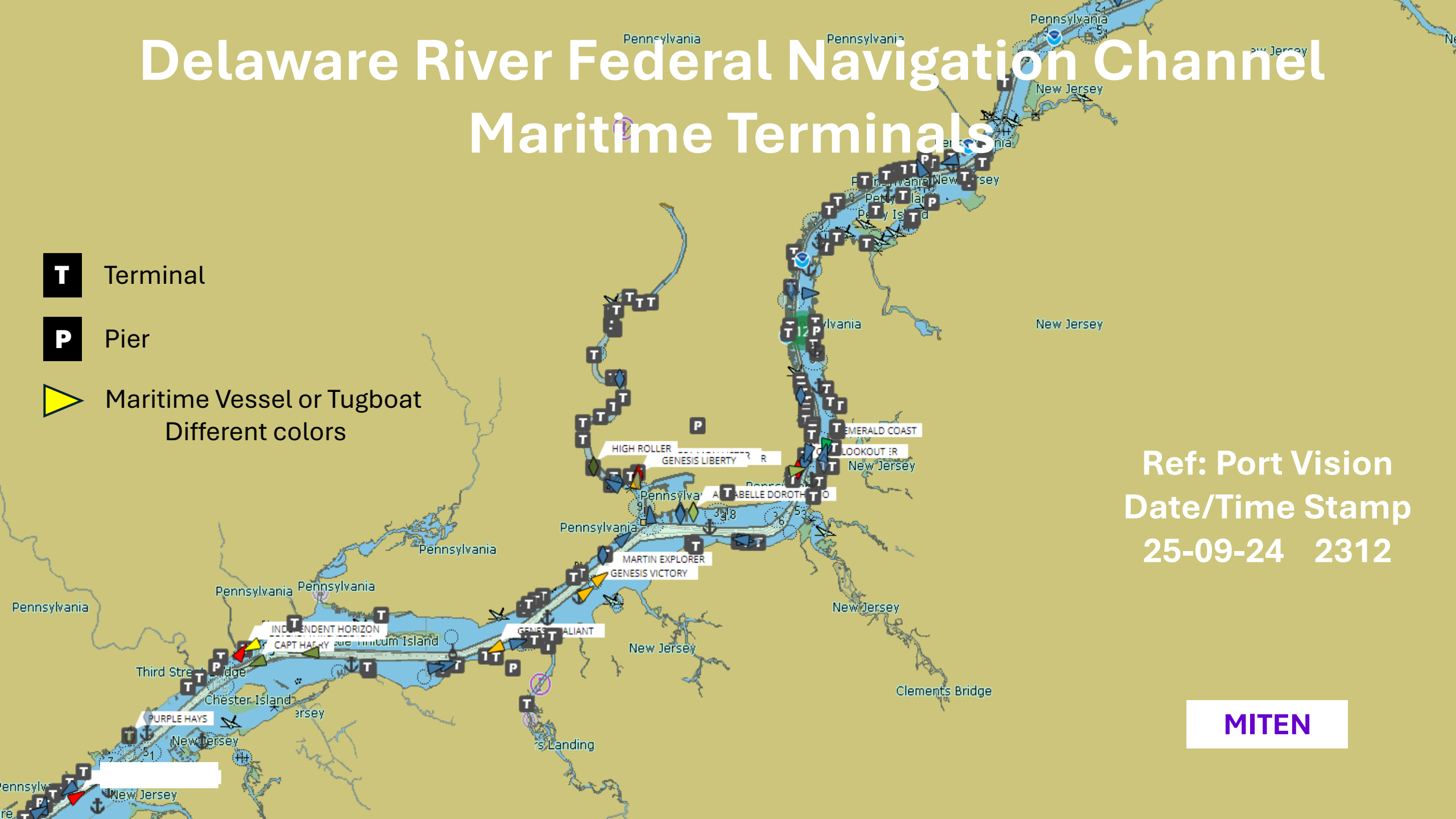




7.

Transformative technology associated markets

Delaware River Federal Navigation Channel
Maritime Terminals



Ref: Port Vision
Date/Time Stamp
25-09-24 2312

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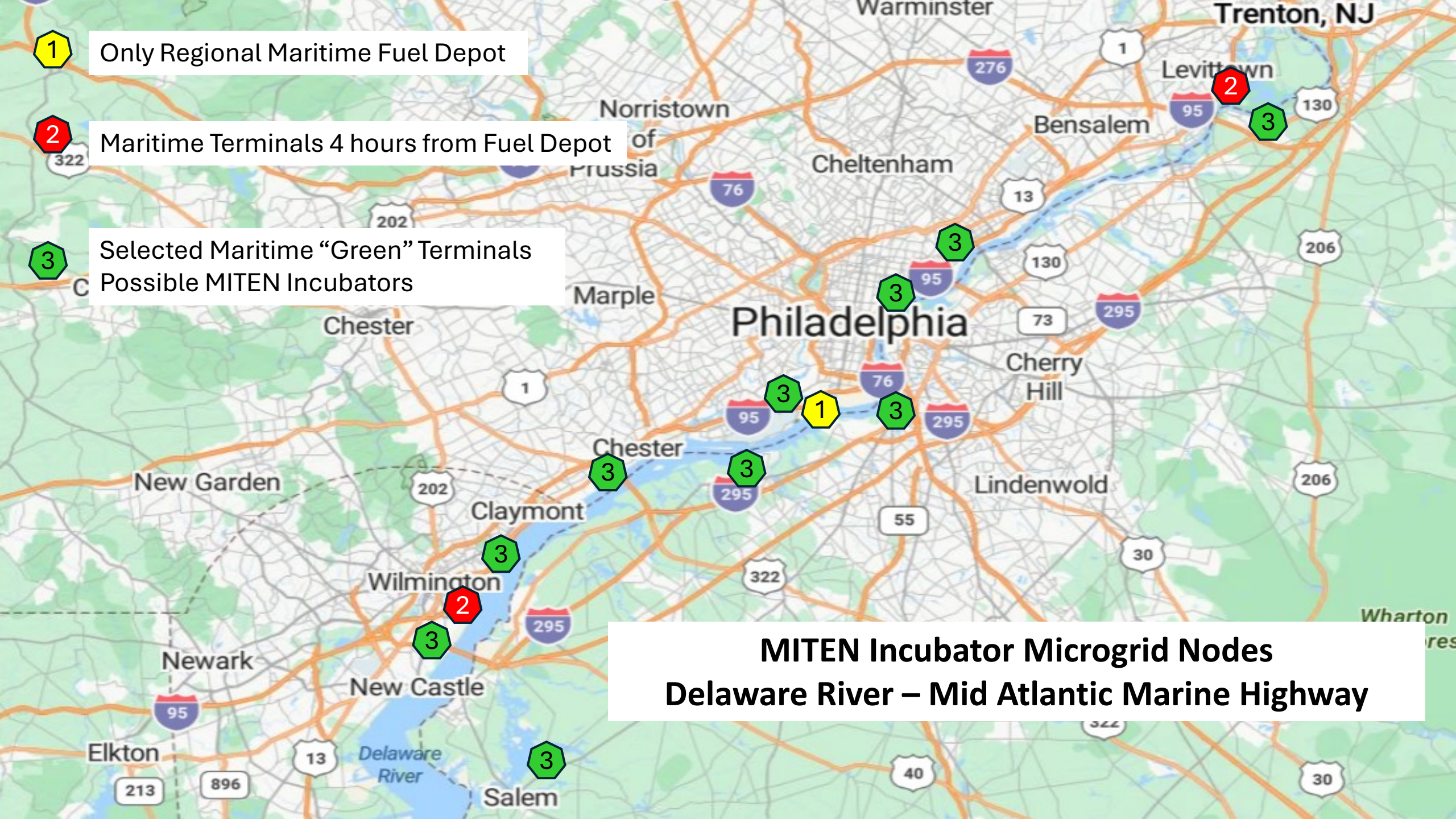
1
Only Regional Maritime Fuel Depot
2
Maritime Terminals 4 hours from Fuel Depot
3
Selected Maritime "Green" Terminals
Possible MITEN Incubators
Warminster
Trenton, NJ
Norristown
Bensalem
Cheltenham
Marple
Chester
Philadelphia
Cherry Hill
New Garden
Claymont
Lindenwold
Wilmington
Newark
New Castle
Elkton
Delaware River
Salem
MITEN Incubator Microgrid Nodes
Delaware River – Mid Atlantic Marine Highway

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Principles of Operations

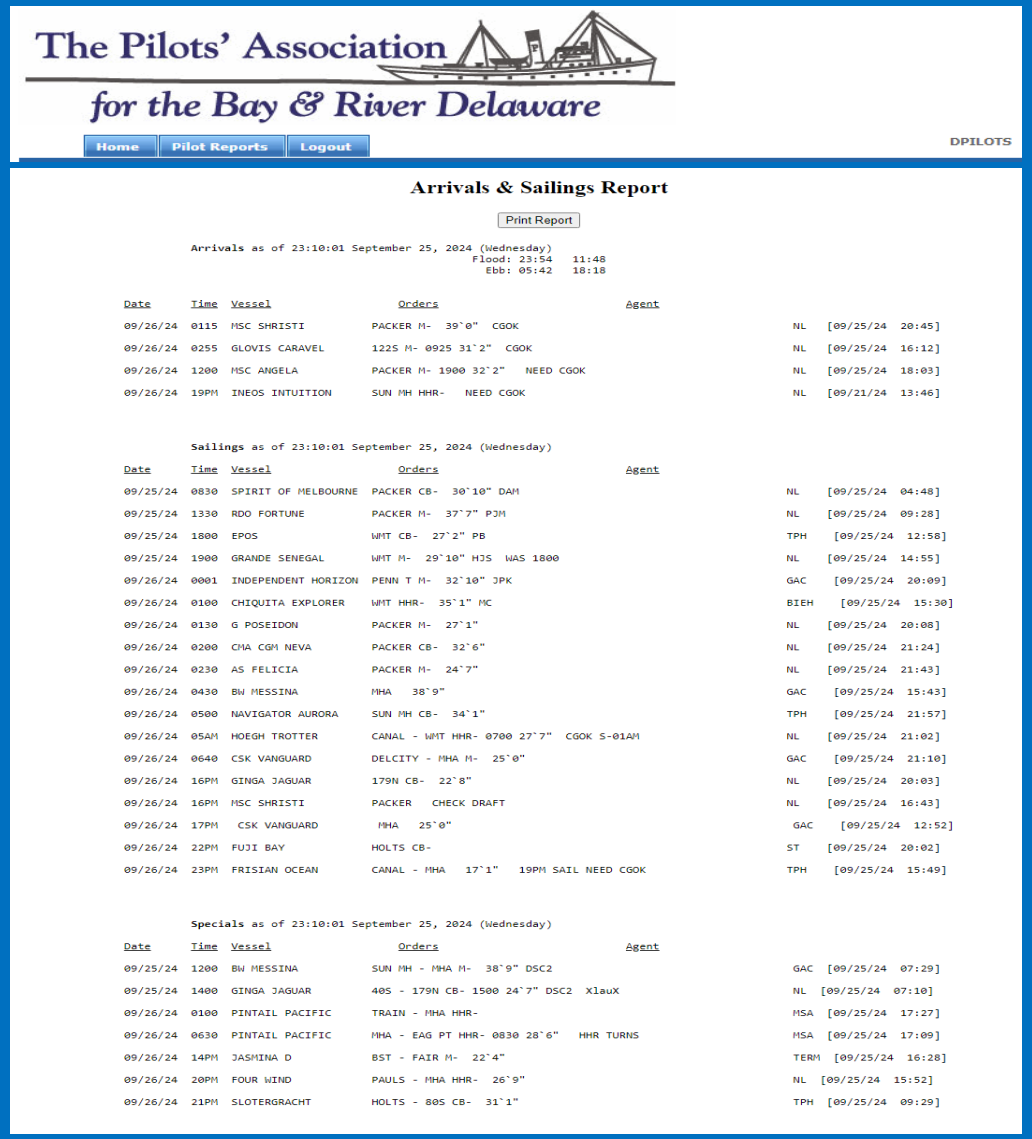
1 Tug leaves home pier and fuel depot. Dispatched South to Port of Wilmington. On station for 36 hours. Includes crew times of 12 hours on/12 hours off. Crew stays onboard tugboat. Await next job. Tugboat stationary.

CRUX

Tide powered aggregated microgrids with electric charging stations can be used by tugs during the down time of 12 hours. 12 hours for tugboats to recharge power. Recharging time varies based on tugboat positions.

48 Hours of Tugboat Operations

3	2400-0500	Dispatched Port of Wilmington Crew 12 hour shift starts
	0500 – 1200	4 jobs sailing or landing tankers.
	1200-2400	**Crew Out of time. Tugboat stationary for 12 hours. Remains at POW.**
3	2400-1200	5 jobs in POW.
	1200-2400	**Crew Out of time. Tugboat stationary for 12 hours. Remains at POW**
2	2400	Dispatched 8 hours up Delaware River to Northern terminals. In down time can recharge power.



The Pilots' Association for the Bay & River Delaware

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DPILOTS

Arrivals & Sailings Report

Print Report

Arrivals as of 23:10:01 September 25, 2024 (Wednesday)

Flood: 23:54 11:48
Ebb: 05:42 18:18

Date	Time	Vessel	Orders	Agent	
09/26/24	0115	MSC SHRISTI	PACKER M- 39`0" CGOK	NL	[09/25/24 20:45]
09/26/24	0255	GLOVIS CARAVEL	122S M- 0925 31`2" CGOK	NL	[09/25/24 16:12]
09/26/24	1200	MSC ANGELA	PACKER M- 1900 32`2" NEED CGOK	NL	[09/25/24 18:03]
09/26/24	19PM	INEOS INTUITION	SUN MH HHR- NEED CGOK	NL	[09/21/24 13:46]

Sailings as of 23:10:01 September 25, 2024 (Wednesday)

Date	Time	Vessel	Orders	Agent	
09/25/24	0830	SPIRIT OF MELBOURNE	PACKER CB- 30`10" DAM	NL	[09/25/24 04:48]
09/25/24	1330	RDO FORTUNE	PACKER M- 37`7" PJM	NL	[09/25/24 09:28]
09/25/24	1800	EPOS	WMT CB- 27`2" PB	TPH	[09/25/24 12:58]
09/25/24	1900	GRANDE SENEGAL	WMT M- 29`10" HJS WAS 1800	NL	[09/25/24 14:55]
09/26/24	0001	INDEPENDENT HORIZON	PENN T M- 32`10" JPK	GAC	[09/25/24 20:09]
09/26/24	0100	CHIQUITA EXPLORER	WMT HHR- 35`1" MC	BIEH	[09/25/24 15:30]
09/26/24	0130	G POSEIDON	PACKER M- 27`1"	NL	[09/25/24 20:08]
09/26/24	0200	CMA CGM NEVA	PACKER CB- 32`6"	NL	[09/25/24 21:24]
09/26/24	0230	AS FELICIA	PACKER M- 24`7"	NL	[09/25/24 21:43]
09/26/24	0430	BW MESSINA	MHA 38`9"	GAC	[09/25/24 15:43]
09/26/24	0500	NAVIGATOR AURORA	SUN MH CB- 34`1"	TPH	[09/25/24 21:57]
09/26/24	05AM	HOEGH TROTTER	CANAL - WMT HHR- 0700 27`7" CGOK S-01AM	NL	[09/25/24 21:02]
09/26/24	0640	CSK VANGUARD	DELCITY - MHA M- 25`0"	GAC	[09/25/24 21:10]
09/26/24	16PM	GINGA JAGUAR	179N CB- 22`8"	NL	[09/25/24 20:03]
09/26/24	16PM	MSC SHRISTI	PACKER CHECK DRAFT	NL	[09/25/24 16:43]
09/26/24	17PM	CSK VANGUARD	MHA 25`0"	GAC	[09/25/24 12:52]
09/26/24	22PM	FUJI BAY	HOLTS CB-	ST	[09/25/24 20:02]
09/26/24	23PM	FRISIAN OCEAN	CANAL - MHA 17`1" 19PM SAIL NEED CGOK	TPH	[09/25/24 15:49]

Specials as of 23:10:01 September 25, 2024 (Wednesday)

Date	Time	Vessel	Orders	Agent	
09/25/24	1200	BW MESSINA	SUN MH - MHA M- 38`9" DSC2	GAC	[09/25/24 07:29]
09/25/24	1400	GINGA JAGUAR	40S - 179N CB- 1500 24`7" DSC2 XlauX	NL	[09/25/24 07:10]
09/26/24	0100	PINTAIL PACIFIC	TRAIN - MHA HHR-	MSA	[09/25/24 17:27]
09/26/24	0630	PINTAIL PACIFIC	MHA - EAG PT HHR- 0830 28`6" HHR TURNS	MSA	[09/25/24 17:09]
09/26/24	14PM	JASMINA D	BST - FAIR M- 22`4"	TERM	[09/25/24 16:28]
09/26/24	20PM	FOUR WIND	PAULS - MHA HHR- 26`9"	NL	[09/25/24 15:52]
09/26/24	21PM	SLOTERGRACHT	HOLTS - 80S CB- 31`1"	TPH	[09/25/24 09:29]

Utilization Predictability

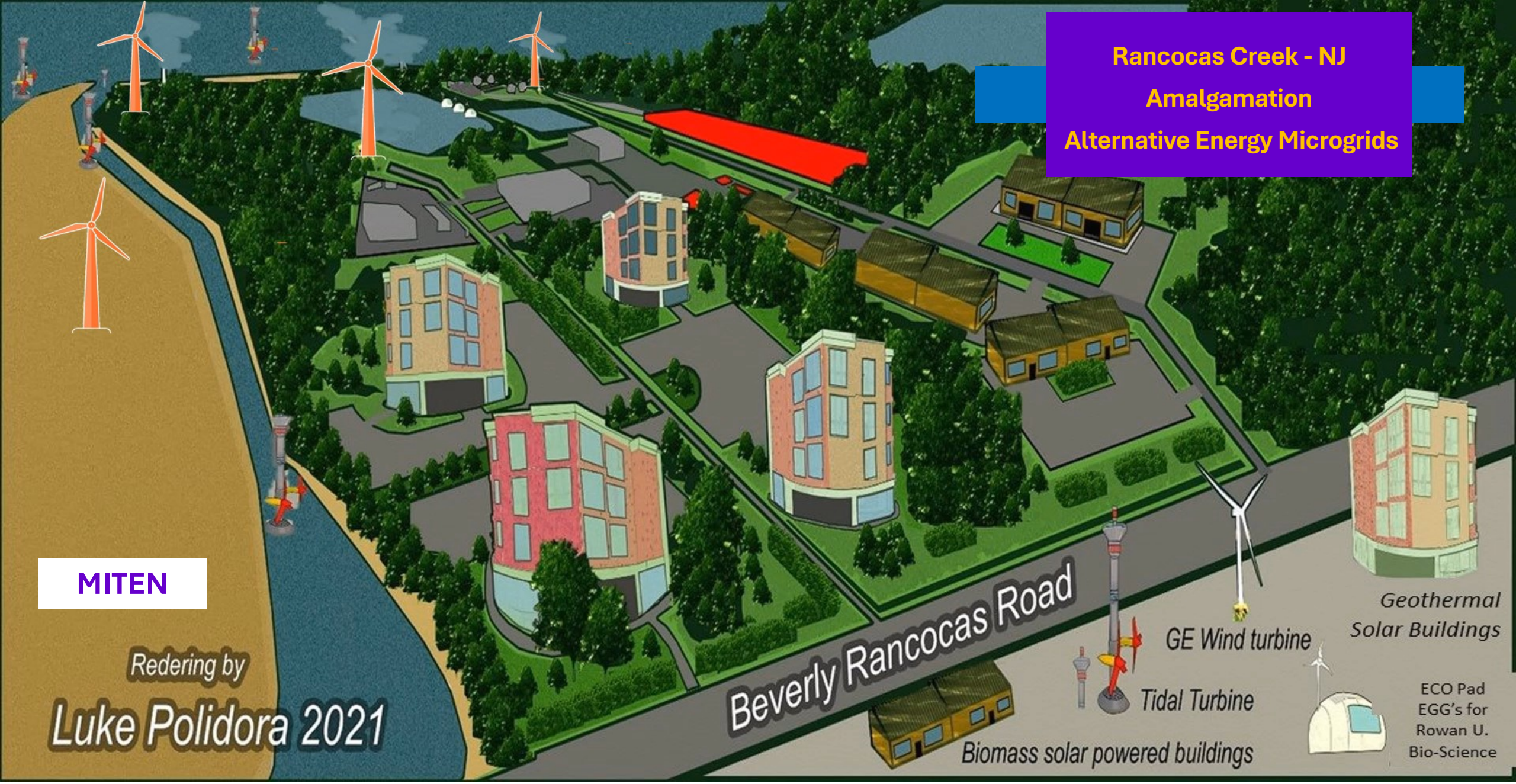
Pattern of

Tugboat and Commercial Vessel Movement

24 Hour Arrival and Departures Schedule

Each job requires 2 tugboats, line handlers,

a docking master and a river pilot


Rancocas Creek - NJ
Amalgamation
Alternative Energy Microgrids
MITEN
Redering by
Luke Polidora 2021
Beverly Rancocas Road
GE Wind turbine
Tidal Turbine
Biomass solar powered buildings
Geothermal
Solar Buildings
ECO Pad
EGG's for
Rowan U.
Bio-Science

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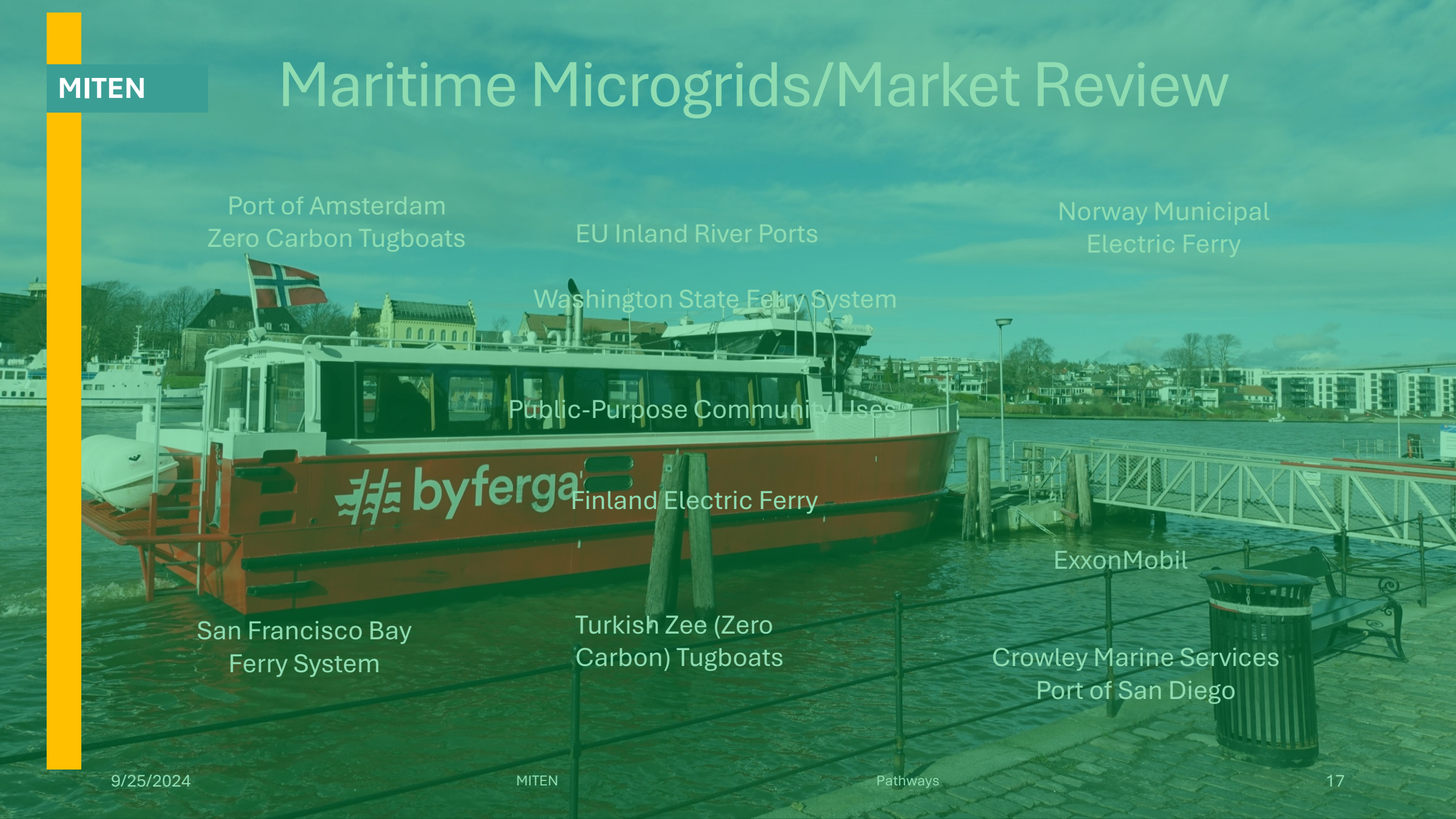
Maritime Microgrids/Market Review



Port of Amsterdam
Zero Carbon Tugboats

EU Inland River Ports

Norway Municipal
Electric Ferry

Washington State Ferry System

Public-Purpose Community Uses

Finland Electric Ferry

ExxonMobil

San Francisco Bay
Ferry System

Turkish Zee (Zero
Carbon) Tugboats

Crowley Marine Services
Port of San Diego

Benefits for Users

Meet IMO Zero Carbon Emissions Control

Partnerships through Civic Engagement

Audits

Reduced Noise Levels

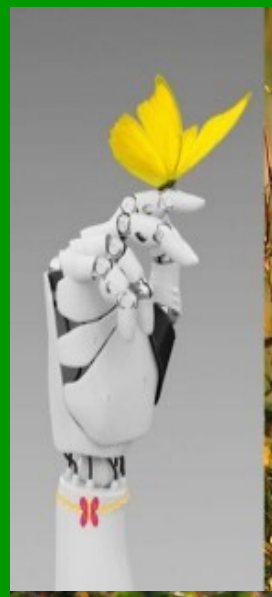
Power Electronics Convertor Topologies

Multi-Use Natural Resource Architecture

Conservation

Civic Engagement

Zero Carbon Ethos



Natural resources transformed for human use, feed, cloth, shelter and power transport us

Gifford Pinchot, 1st head of the US Forest Service

Community Engagement Forge Partnerships

DIGITAL TWIN

CREATIVITY

Ideas, alternatives, possibilities

Lateral thinking

Community

PROCESS

Thinking about thinking

Planning for action

Engagement

DIGITAL TWIN

DIGITAL TWIN

FACTS

Information and data

Neutral and objective

What do I know?

How will I get the information I need?

De Bono Thinking hats

CAUTION

Caution, critical thinking

Why something may not work

Stakeholders

DIGITAL TWIN

DIGITAL TWIN

FEELINGS

Intuition, hunches

My feelings right now

No reasons are given

BENEFITS

Optimism

Positives, plus points

Logical reasons are given

DIGITAL TWIN

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Tidal energy holds potential that is comparable to wind power.

US Army “Parameters” # 6
2008


Sustainability
Lamberton
Pier 2/3
Delaware River Ports
Rancocas Creek
Port of Salem
Delaware River
Tidal Energy Sites
Ref: 2014 State of NJ Tidal Energy Report
Port of Baltimore
Maryland
Microgrid
Market
Washington DC
Delmarva
Microgrid
Market
DIGITAL
TWIN
DYNAMICS
Virginia Northern Neck
Microgrid Market

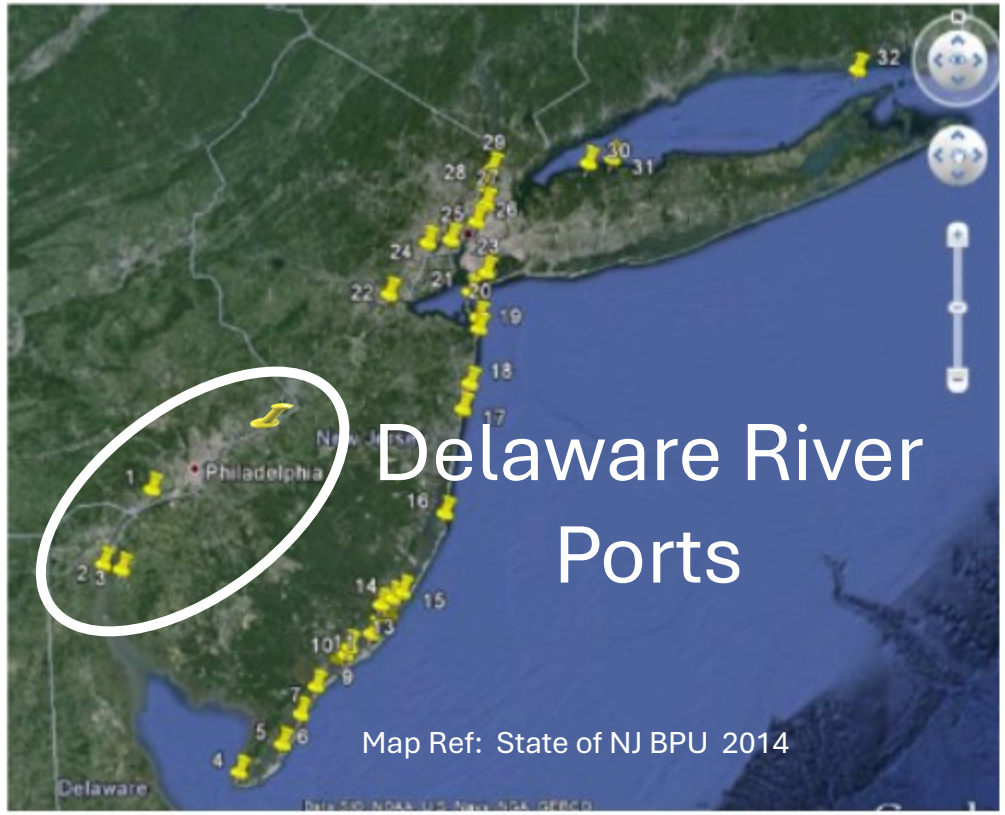

Table 6 Potential sites of tidal power

No.#	Name	Nearby bridge	Distance to bridge (m)
1	Chester Island	Commodore Barry Bridge	0
3	Hickory Island	Penns Neck Bridge	0
5	Anglesea	Grassy Sound Bridge	0
6	Townsends Inlet	Townsends Inlet Bridge	0
7	Corson Inlet	Corson's Inlet Bridge	0
8	Great Egg Harbor Inlet	Ocean Dr Bridge	0
9	Longport	JFK Memorial Bridge	0

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Sites for Possible Tidal Energy Units: Delaware River
Ref: State of New Jersey Bureau of Public Utilities - 2014

No.#	Name	Location (lat.,lon.)	Power density range(W/m²)	Area (m²)	Depth range (m)	Distance to Environ. Zone (m)
T1	Port of Paulsbord	39°51'6.69"N; 75°15'10.61"W	157.3~285.1	1420000	10.2~16.8	2865
T2	Deepwater point (port)	39°41'53.14"N; 75°30'40.66"W	154.1~222.4	2112000	10.7~18.2	2623
T3	Port Norris Marina	39°14'10.32"N; 75° 1'30.09"W	157.8~239.2	46320	2.0~2.0	0
T4	Lighthourse Pointe Marina	38°59'25.10"N; 74°50'2.56"W	153.7~264.1	23580	2.0~4.2	ü

No.#	Name	Location (lat.,lon.)	Power density Range(W/m²)	Area (m²)	Depth range (m)	Distance to Environ. Zone (m)
S1	Chester Island	39°50'4.66"N; 75°21'37.64"W	257.7~404.9	1977600	8.8~16.8	324
S2	Pennsville Township	39°37'42.50"N; 75°34'39.43"W	250.2~300.5	192000	13.8~18.3	1199
S3	Pea Patch Island	39°35'34.43"N; 75°33'49.08"W	251.0~492.0	180750	6.75~17.7	1305

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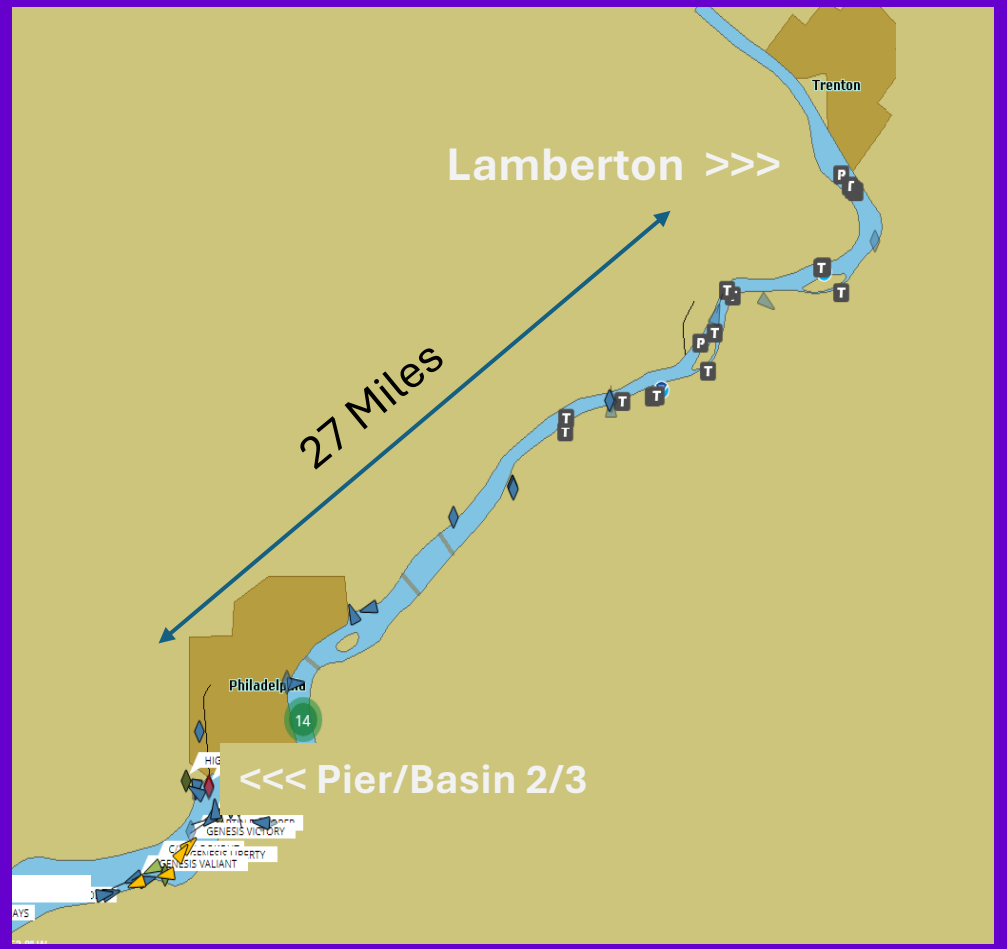
First Service Area – Maritime Microgrids

Pier/Basin 2/3



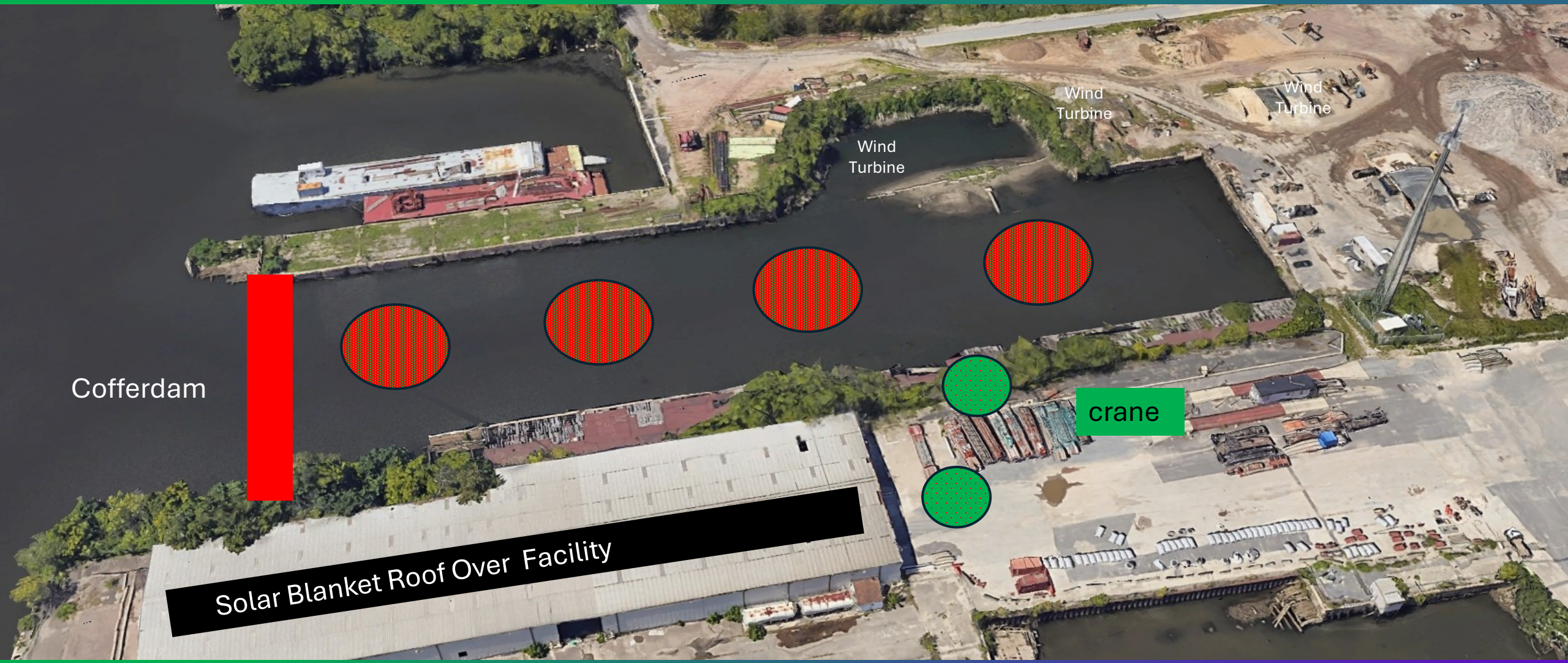
Lamberton

Direct Access to Federal Navigation Channel


FDR Skatepark
Schuylkill River
95
95
95
Pier/Basin 2/3
Philadelphia
Naval Shipyard
Industrial Park

Tidewater Tidal Energy "Energy Rose Blossoms"

Pier / Basin 2/3



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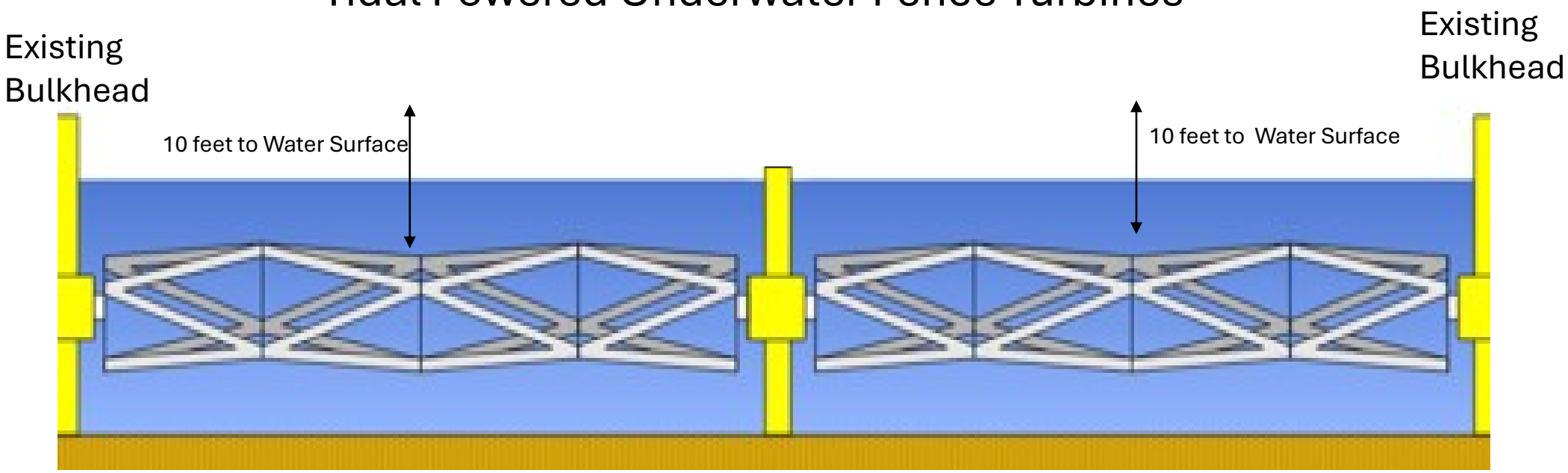
Pier Based Tide Water Energy Piston

Tidal Powered Underwater Fence Turbines



Elevation In-Line Tidal Current Below Surface View
Pier Based Tide Water Energy Barrage

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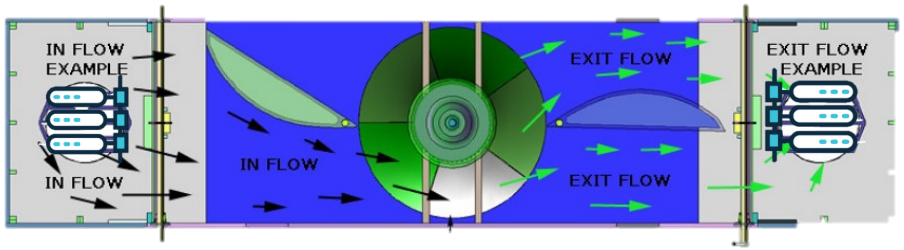
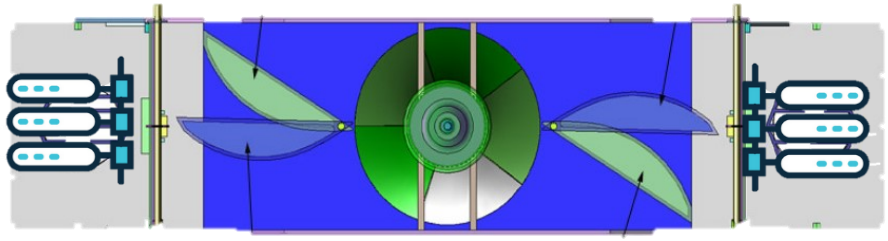
Single “Spud” Platforms

Risdon Carbon Fiber Prototype

Scaled to Site Specific Delaware River Tidewater Locations Through Linked Quidbits Sensor Network

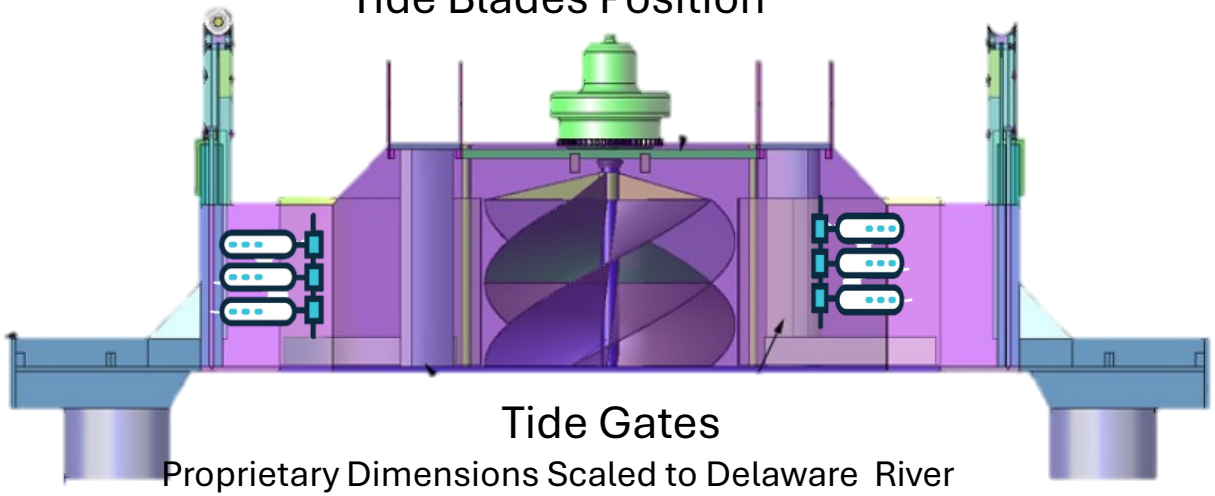


GIANT



GIANT

Tide Blades Position



Tide Gates

Proprietary Dimensions Scaled to Delaware River Site Locations

Next Door to Lamberton 1:
1.23 million square feet
State of the Art Logistics Park

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Integrated Maritime Microgrid Charging Stations

Public-Purpose Maritime Community Microgrid
Port of San Diego

Microgrid is a Value Added Service

Power Purchase Agreements
Specific to Market Demands

Power Generation Natural Resources

Tidal
Wind
Solar
Battery Storage
Hydropower
Biomass
Generators

Public-Purpose Community Microgrids

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Benefits of Maritime Service Area Microgrids

	Pier/Basin 2/3	Lamberton 1
Tidal Piston	y	Y
Secure	y	y
Proximity	y	Y
Connection to Grid	y	y
Environmental Impacts	N	N
Permitting	y	y
Tug Access/Tug Stations/Tug Docking	Y	Y
Needs Improvements	Y	Y
EPA Grant review	Y	Y
Wind Turbine	Y	N
Solar Energy	Y	Y
Tidal forces	Y	Y
Other	Y	Y

Demand Forecast - Growth

Micro-Grids Placed in Locations of High Demand

Maximizes charging times; during predictable cyclic operating trends and patterns.

Looking at the Market

Focus on the On-Demand Market Patterns - 2024

Value of Global Microgrids exceeds 63.2 Billion a Year by 2028

2035, microgrids are envisioned to be essential building blocks of the future electricity delivery system to support resilience, decarbonization, and affordability.

Amplify Public-Purpose Community Microgrids

Ref: Department of Energy/Sandia National Laboratory/Lawrence Livermore Laboratory

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Future Market Optimizations

Common Response to Tackle a Unique Mix of Opportunities

Enhanced GPS Digital Twin Technology

Premium prices for on demand charging

Discounted microgrid access

Electric ferry services

Operating costs lowered, economies of scale

Hybrid microgrid charging stations

Other

Decentralized Team

Gene Johnson, Retired NJ State Trooper. Owner of NEC Energy LLC, a registered Minority Owned Disadvantaged Small Business

John Anderson, BSc. Director NEC Energy/Director Rancocas Pathways. Maritime advocate and maritime bulk shipping business owner since 1987.

Max Coar, PhD., PE

Board of Directors Rancocas Pathways

Per diam ad hoc consultations with maritime, tidal energy, alternative energy experts

E³: Energy Environment and Education

Rowan University
Atlantic Cape Community College
Atlantic County Utility Authority
Rancocas Pathways
Rowan College at Burlington County
South Jersey Land & Water Trust

Progress to Date: Initiated MITEN January 2021

SBIR Department of Energy Phase 1 Grant Submission
EPA Grant Award (contact John Anderson, text 609-456-9344 for details)
Partnership with Rowan University
First hand, in depth onsite review of day to day maritime operation patterns on area of operations
Curriculum developed
Working model of Gene Johnson's digital twin designed. Engineering changes ongoing
Structure added to the process
Political and community advocacy
Robust local, multi-state, City and Federal governmental affair networking
Public forums
Environmental Resource Inventory's
Prototype tidal energy Risdon turbine modified, constructed, tested, evaluated
Numerous community and student outreach programs
Site reviews
Partnership with Israeli associate engineering and alternative energy firm
Maritime networking enhanced through day to day maritime operations
Ongoing discussions w GE on tidal and wind turbines
Rancocas Creek pilot multi-use microgrid and liner tidal energy and hydro energy network designed, developed, sited
Other

Financials Investments
More is Done with Less

$ 500,000.00 to 2.5 million.....Target A

$ 2.5 million to 5 million.....Target B

$ 5 million to 10 million.....Target C

$ 10 million to 20 million.....Target D

$ 20 million to 40 million.....Target E

Sliding Scale Targeted Investment

- ✓ Complete engineering studies
- ✓ Connection of digital twin
- ✓ Hire staff
- ✓ Complete local, State, Federal permits
- ✓ Enhance civic engagement/community stewardship
- ✓ Select final designs of amalgamated Microgrids
- ✓ Purchase/Acquisition/Lease at sites
- ✓ Place final designs
- ✓ Connect to grid
- ✓ Full scale operations

ROI

Best case scenario

Realistic scenario

Worst case scenario

MITEN

Maritime Tidal Energy Networks

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