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The Capul Island Ocean Power Project: A Milestone for Philippines Renewable Energy

June 16, 2023

"The mighty ocean stands before us, its power waiting to be unlocked by those who valiantly forge ahead."

I. **What is Tidal In-Stream Technology**
II. **Ocean Energy Potential and Status of Development In the Philippines**
III. **The Capul Ocean Project**
IV. **Implementation Strategy**
V. **Challenges**

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I. What is Tidal In-Stream Technology

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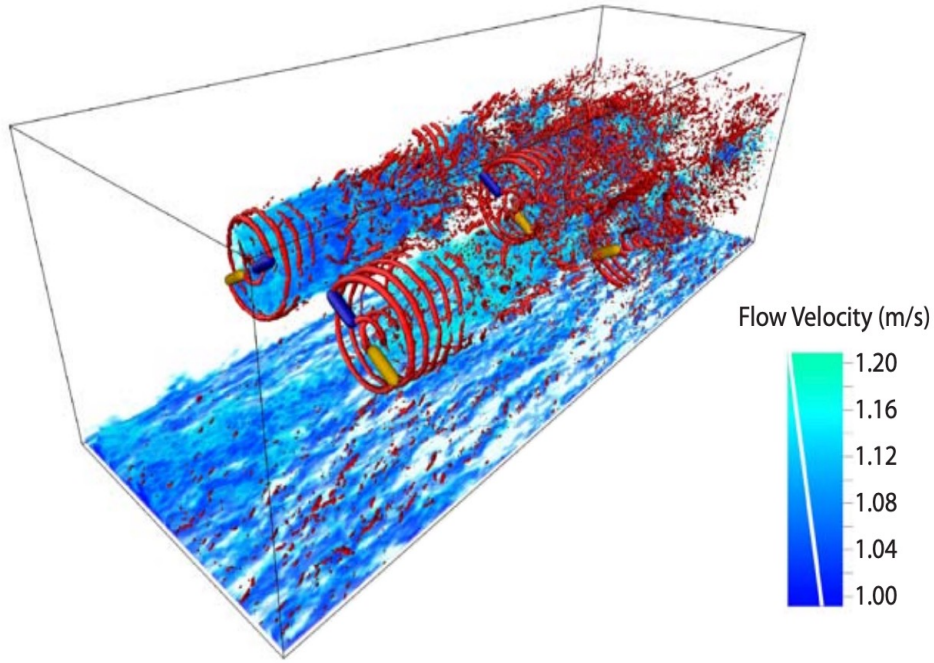
- Also called tidal current technology, it utilizes the **flow of water** to generate electricity.
- Also takes advantage of the natural ebb and flow of water caused by the gravitational fields of the earth, moon, and sun.
- Tidal currents are often magnified by the characteristics of the site such as headlands, inlets and straits, or by the bathymetry when water flows through a narrow channel.



A visualization of data from a large-eddy simulation of the flow of water through an array of tidal current turbines shows the low-speed flow (blue) in the turbine wakes and near the bottom of the tidal channel. Vortices caused by the turbine blades are shown in red, spiraling behind the turbines. In this simulated array, the turbines within a row are staggered, and each turbine rotates in the opposite direction of its upstream neighbor. Illustration by Matt Churchfield, NREL

Courtesy of NREL (www.nrel.gov)

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II. Ocean Energy Potential and Status of Development in the Philippines

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NREL's Thermoplastic Blade Research Dives Deep With Verdant Power's Tidal Energy Turbines (https://www.nrel.gov/news/program/2021/tidal-power-turbine-blade-new-york.html)

- An ocean resource assessment conducted by Mindanao State University in the 1980s indicated that the theoretical potential of ocean energy in the Philippines could be as much as **170 GW of electricity generation capacity**.
- Pursuant to the Philippines Renewable Energy Act (RA 9513), **70.5 MW of installation capacity** was proposed in the 2013-2030 Philippine Energy Plan.
- The latest National Renewable Energy Program 2020-2040 sets the installation target for ocean energy at **71 MW.**

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II. Ocean Energy Potential and Status of Development in the Philippines

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Table 1. NREP, 2011-2030 Installation Targets vs. Actual, in MW

Technology	2010 Baseline Installed Capacity	Target		Actual	
		Installed Capacity Addition, 2011-2030	Installed Capacity by 2030	Installed Capacity Addition, 2011-2019	Installed Capacity as of 31 December 2019
Biomass	39	277	316	470	363
Geothermal	1,966	1,495	3,461	83	1,928
Solar	1	284	285	958	921
Hydropower	3,400	5,394	8,794	195	3,760
Wind	33	2,345	2,378	410	427
Ocean	0	71	71	0	0
Total*	**5,438**	**9,865**	**15,304**	**2,115**	**7,399**

*Due to rounding, some totals may not correspond to the sum of the separate figures

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III. The Capul Ocean Project

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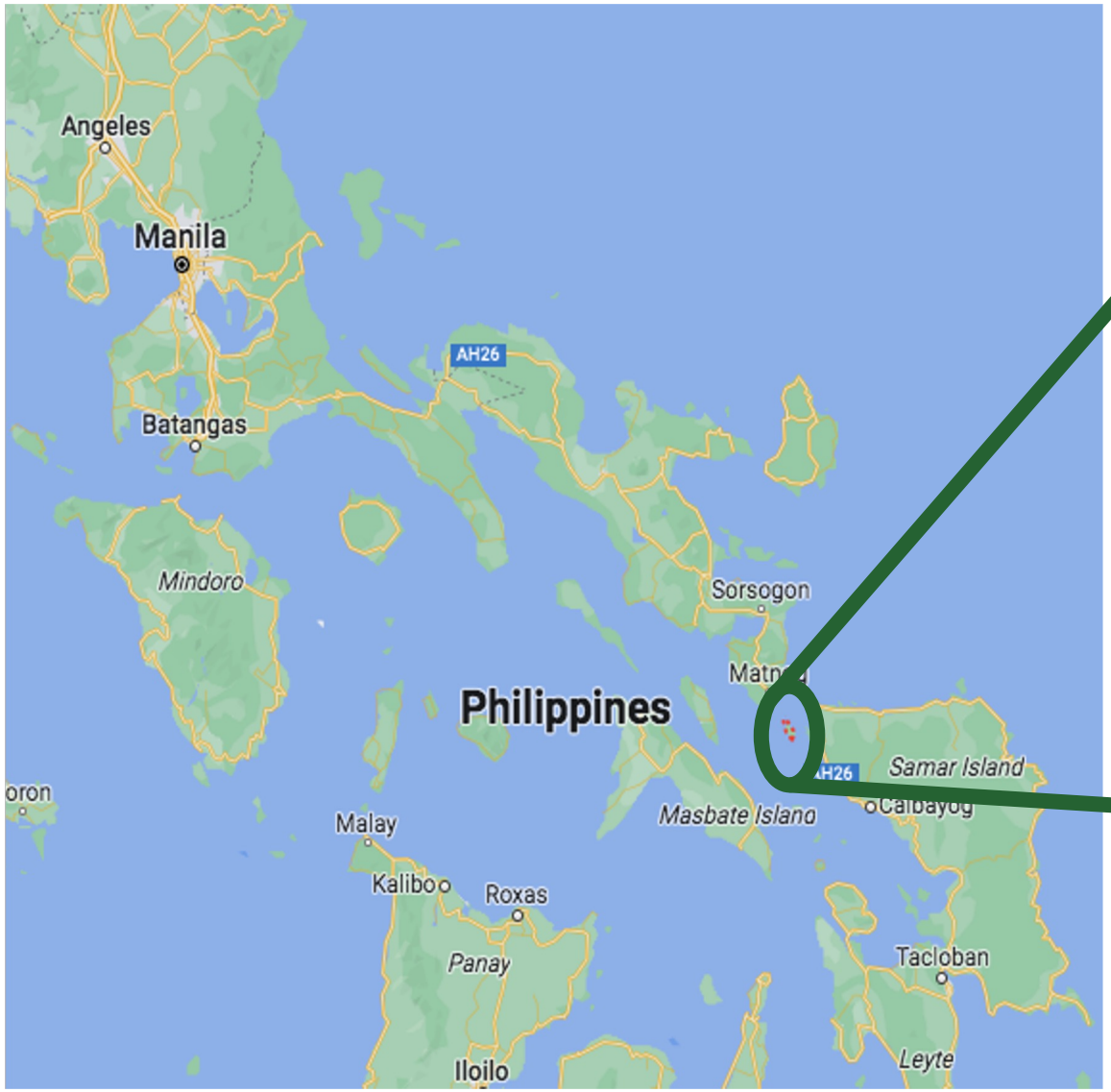

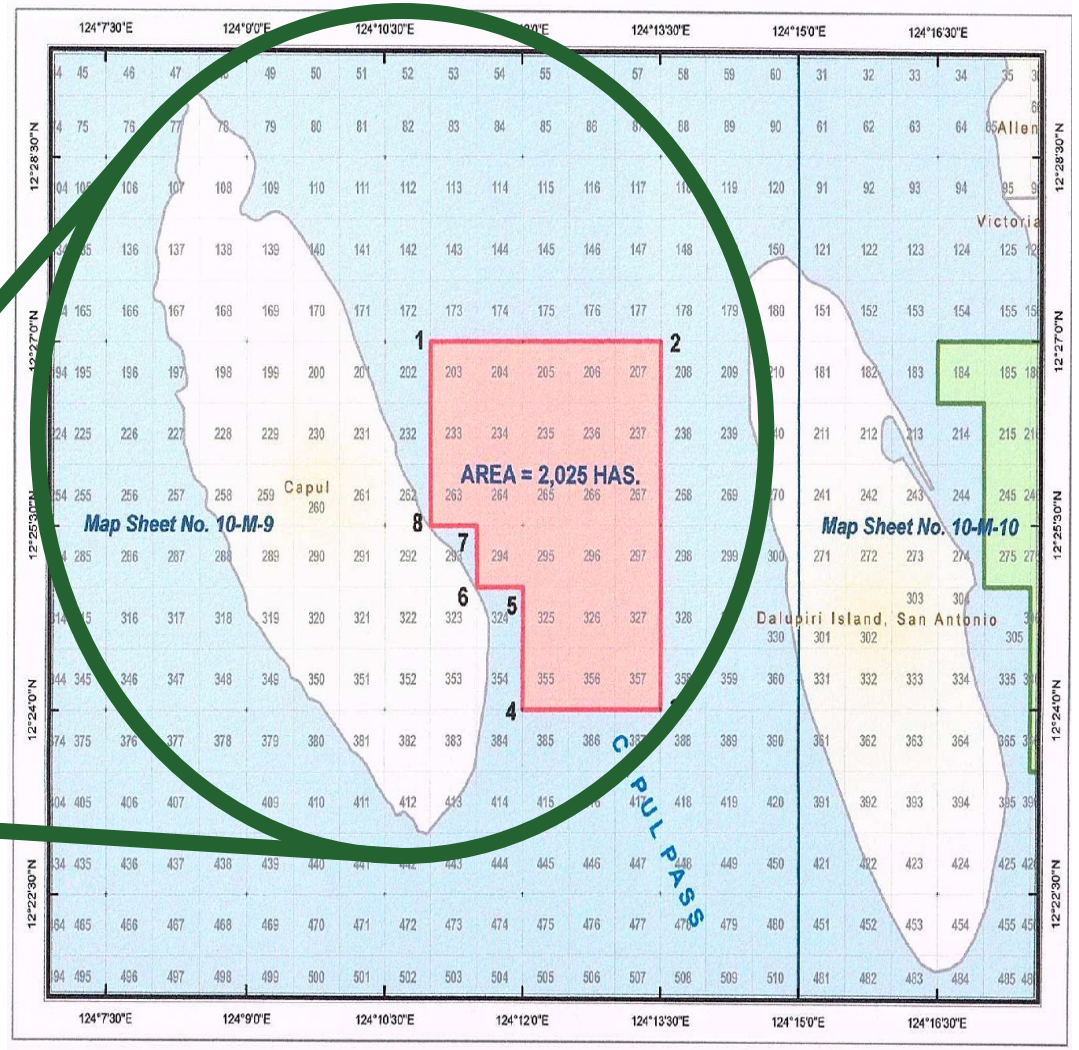

Contract Area

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III. The Capul Ocean Project

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Capul Island Data:

- Land area: 35.56 km^2
- No. of barangays: 12
- Population: 12,323 (as of 2020)
- Main Sources of Livelihood: fishing and farming

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- Peak Demand: **427 kW** in 2022
- Power Supply: Diesel generators operated by the National Power Corporation – Small Power Utilities Group **(NPC-SPUG)**
- Distribution Utility: Northern Samar Electric Cooperative **(NORSAMELCO)**
- Power Outages: reached a frequency of **35 times in a month** (July to August 2019) with **33 outage hours**
- **Target Ocean Power installation: 1 MW**

Capul Diesel Power Plant

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2013:

Award of Service Contract

2014-2015:

Tidal Current Modelling & Simulation, Site Resource Assessment, Preliminary Front-End Engineering Design

2016:

Demographics Survey of San Bernardino Strait and project site, Initial Study on integration of tidal power into Capul electrical grid, Multi-beam Bathymetric Survey

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III. The Capul Ocean Project

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2017:

Public Consultation, Hydrodynamic Modeling and Simulation

2018:

Seabed Characterization, Declaration of Commerciality

2020:

Confirmation of Commerciality by DOE

2021:

Conduct of Distribution Impact Study

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III. The Capul Ocean Project

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2023:

EPC Tender, Start of Detailed Engineering Design

2024-2025:

Financial Close, Manufacture of Turbines, Installation, Testing and Commissioning

2025/2026:

Start of Commercial Operations

IV. Implementation Strategy

1. As a New Power Provider (NPP)

- Replace NPC-SPUG and take over the generation function in Capul Island
- Supply power to NORSAMELCO
- Receive payment of the True Cost Generation Rate

2. As a Microgrid System Provider under the Microgrid Systems Act (RA 11646)

- Microgrid System Provider installs, operates and maintains a microgrid system
- Microgrid system covers both generation and distribution and provides electricity direct to the end-users

V. Challenges

1. **Relatively new technology with limited track record for large-scale generation**

2. **Difficulty in resource assessment and verification:** dependent on weather conditions, costly

3. **High EPC cost:** now at $4-6M per MW (from $8M per MW more than a decade ago); can go gown to $2.5-5M per MW
    - Compared to Solar: approx. $1M per MW
    - Compared to Wind: approx. $1.3M per MW

4. **Limited Financing Options**

"For most of history, man has had to fight nature to survive; in this century he is beginning to realize that, in order to survive, he must protect it."

- Jacques-Yves Cousteau, renowned oceanographer

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Thank you.