

TA-6619 REG: Marine Aquaculture, Reefs, Renewable Energy, and Ecotourism for Ecosystem Services

Context

The Majuro Tank Farm, operated by the Marshalls Energy Company (MEC) is the largest bulk fuel storage facility between Guam and east Asia. The tank farm is more than 40 years old and is threatened by rising sea levels and severe meteorological events exacerbated by climate change. The RMI Energy Security Project was approved in 2018¹ to provide improved climate resilience of the MEC tank farm, but this project is effectively just a “band-aid” when major surgery is required. The proposed climate-proof fuel storage project (the Project) will deliver a long-term solution via floating storage and off-loading, which can be implemented with financial support from the Energy Transition Mechanism (ETM) being piloted in Southeast Asia.² The Project will demonstrate a financing mechanism for scale up in the region, taking advantage of the International Maritime Organization’s (IMO) regulations which became effective at the beginning of 2020.

Solution

A Climate-proof Tank Farm That Pays for Itself

The onshore tank farm should ultimately be abandoned and replaced with a floating system which will not be vulnerable to sea level rise. Floating energy infrastructure is not new: floating production, storage, and off-loading (FPSO) operations are common in the offshore petroleum industry.³

Technology

Used tankers will be retrofitted in accordance with industry best practices to perform floating storage and offloading (FSO) operations under MEC ownership and management. The converted tankers will be retrofitted with solar PV and wind systems for daily operations and “hotel” load; any surplus renewable energy output could be used for charging electric/hybrid boats and to produce hydrogen, ammonia, and other high-value chemicals which can be sold into existing markets. Regenerative marine aquaculture and reef cultivation will be added on to the floating tank farm operation. A living breakwater will be considered for the ocean side of the existing tank farm for further climate-proofing.

Business Model

The Project will demonstrate how the economic value of avoided greenhouse gas emissions can be monetized to support climate proof energy infrastructure. MEC can procure used tankers and retire them from international shipping service prematurely, following the ETM “cash-for-clunkers” principles. Retiring a typical Panamax class vessel 10 years early will avoid 0.5 million tons CO₂ (net) from avoided fuel consumption and replacement with an IMO-2050 compliant vessel. At \$1/Liter the avoided fuel cost is \$250 Million (net); at \$50/ton CO₂, the avoided emissions value is \$25 Million; salvage value is about \$5 Million.⁴ ADB’s job as “Asia’s Climate Bank” is to help monetize enough of the avoided fuel cost and avoided CO₂ emissions to pay for the Project and deliver a truly climate-proof solution which is financially self-sustaining, with spin-off scalability in the form of converting other ships to “MARES arks.” The addressable market for early retirement of ships subject to IMO regulations is as much as 10,000 vessels through 2030, with potential greenhouse gas reductions of 5 Billion tons CO₂ from avoided fuel consumption alone. In the absence of a functional carbon market transaction, the proposed Project will effectively “weaponize” the ETM for climate finance.

PROJECT SUMMARY

PROJECT NAME:

**Republic of the Marshall Islands
Climate Proof Fuel Storage**

CAPITAL COST:

Initial budget estimated at \$10 million to be financed from Energy Transition Mechanism

DEVELOPER:

Government of Republic of the Marshall Islands

PROJECT HOST:

Marshalls Energy Corporation

GEOGRAPHICAL LOCATION:

Majuro Tank Farm

TYPE OF PROJECT:

Repurposing energy infrastructure for climate proof operations, offshore RE development, and other MARES operations

PROJECT TIMELINE:

2023-2026

¹ ADB. 2018. *Marshall Islands: Energy Security Project*. [49450-011: Energy Security Project | Asian Development Bank \(adb.org\)](#)

² ADB. 2021. *Accelerating the Clean Energy Transition in Southeast Asia*. [55124-001: Accelerating the Clean Energy Transition in Southeast Asia | Asian Development Bank \(adb.org\)](#)

³ ADB has funded floating LNG import terminals in Bangladesh and Pakistan.

⁴ The salvage value assumes tanker mass of 25,000 tons and market price for scrap steel of \$200 per ton.

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ADB will provide technical assistance to define the specifics of the program which could be paid in part from funds mobilized via the ETM. ADB assistance could include: (i) conducting an initial desk-top proof-of-concept assessment; (ii) preparing a methodology for the carbon finance transaction and subsequent carbon credit transactions, or an alternate natural capital credit instrument, with financing underpinned by ADB's ETM; (iii) procuring and retrofitting tankers for FSO operations; tankers might be donated from an international petroleum or shipping industry partner (e.g., BP or Maersk), or otherwise procured via a reverse auction; and (iv) brokering a carbon or natural capital credit transaction to secure the best outcome for RMI. A win-win outcome requires that RMI and the original tanker owner will share the carbon credits; the actual split can be determined in the process of tanker procurement.

Successful demonstration of the ETM financing model will be “weaponized” for regional scale-up of ship conversion, with a global market of more than 50,000 vessels subject to the IMO regulations. Converted tankers and other ships can operate as MARES arks supporting regenerative marine aquaculture, cultivated reefs, and ecotourism, creating new revenue streams and possibilities for “blue carbon” transactions. Converted ships can ultimately be retired and sunk as cultivated reefs (wrecks-to-reefs / W2R) or sold into the scrap metal markets as per business-as-usual practices. The ETM financing mechanism is also applicable to retrofit and/or replacement of smaller vessels operating in-country.

Financing

The Project will be funded by monetizing the value of avoided emissions from petroleum fuels, as noted above, with a benchmark value of \$25 Million. ADB has at least 3 possible funding options:

- (i) funds raised from blue bonds issued in 2021, which have not yet been used to finance any projects; the funds would need to be provided to RMI on concessional terms (i.e., reimbursable grant for initial Project development and implementation);
- (ii) the ETM noted above, which would monetize the value of avoided fuel consumption and avoided greenhouse gas emissions accruing from early retirement of the tanker(s); and
- (iii) ADB's new carbon fund announced at COP26; in keeping with prior ADB carbon fund operations, ADB should be able to procure 25-50% of the carbon credits and assist the project owner in auctioning the balance of the credits.

Between these 3 options, it should be possible to mobilize sufficient funds to pay for the conversion to floating storage and further retrofits to create MARES arks, as well as final retirement as W2R. Grant funds in the ongoing Country Operations Business Plan (COBP) may also be available to facilitate preparation and processing of the Project. Non-traditional donor participation will also be considered.

Results

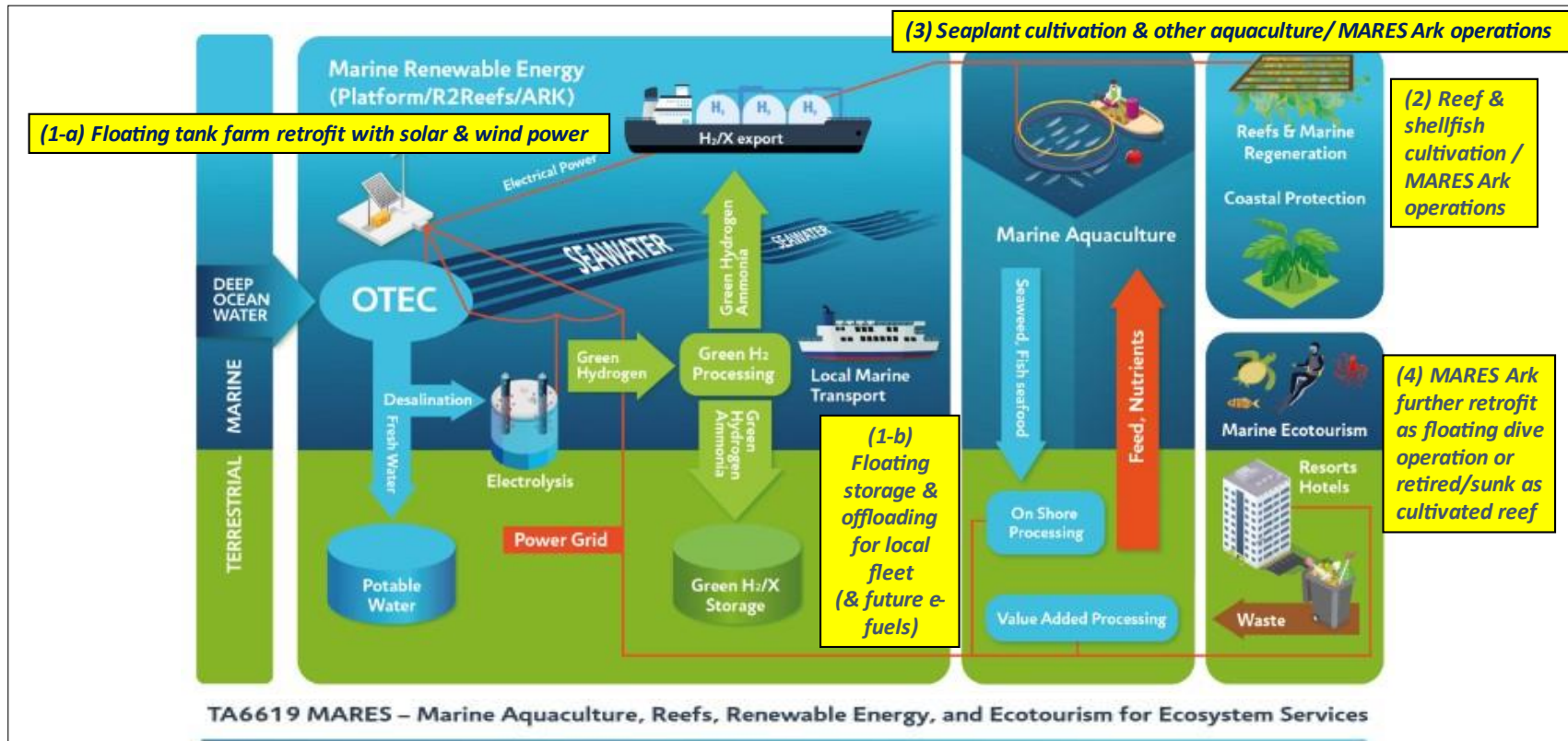
The Project will be a win for the tanker owner via 10 years of avoided fuel burn, plus the potential dividend from carbon credits: combined these would be worth much more than the salvage value of the tanker. The Project will be a win for RMI because the tank farm can become truly climate resilient, and the Project pays for itself. This approach is consistent with RMI's participation in the Pacific Blue Shipping Partnership and is scalable as other ships in the RMI and other DMCs could be converted to MARES arks.

Lessons Learnt

Traditional concrete and rebar solutions for climate proofing of coastal infrastructure are an interim solution at best for the Majuro tank farm (a “band aid”). The proposed approach is fully consistent with existing industry practices for FSO operations, and also consistent with nature-based defense strategies. The ultimate retirement of converted tankers as reefs is consistent with global practice: there are more than 1900 wrecks-to-reefs (W2R) globally of which more than 1700 are in the US.

Developer

The government of RMI is the counterpart for RETA 6619. MEC will be the implementing agency for the Project. Corporate partners will be identified to source the tanker(s) and to participate in the financial transactions. RETA 6619 will support a “proof of concept” assessment to confirm that a regulatory pathway exists and to explore funding options; assuming a positive outcome, additional support would be mobilized for project preparation consistent with the ADB RMI Country Operations Business Plan (COBP).



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Financial pro forma

Item	2023	2024	2025	2026	2027	***	2032	2033
Tanker acquisition, retrofit & FSO Operations								
Capital cost - ETM funding covers the acquisition cost	0							
Retrofit	-2500000	0	0	0	0		0	0
O&M costs	0	-250000	-250000	-250000	-250000		-250000	-250000
Revenue on storage & offloading operations (1000 bbls diesel/day X \$0.05/gallon)	0	756000	756000	756000	756000		756000	756000
Balance (Revenue - Cost)	-2500000	506000	506000	506000	506000		506000	506000
Renewable Energy on top sides								
Capital cost - upfront engineering	-500000							
Capital cost: Solar PV 250 kW @ \$1.5/W		-375000	0	0	0		0	0
Capital cost: Wind 500 kW @ \$5/W		0	-2500000	0	0		0	0
Revenue solar @ \$350/MWh			122500	122500	122500		122500	122500
Revenue wind @ \$350/MWh				490000	490000		490000	490000
Balance (Revenue - Cost)	-500000	-375000	-2377500	612500	612500		612500	612500
Total Capital Cost	\$(3,000,000)	\$(375,000)	\$(2,500,000)	\$ -	\$ -		\$ -	\$ -
Total Free Cashflow	\$(3,000,000)	\$ 131,000	\$(1,871,500)	\$ 1,118,500	\$ 1,118,500		\$ 1,118,500	\$1,118,500
IRR - 7%	12.3%							
NPV - 7%	\$1,234,950							

Note: *** numerical values are the same for years 2027 through 2032
Cost for vessel acquisition, retrofit, and routine O&M costs are indicative and subject to change.