Grenada Seawater Air Conditioning (SWAC) PPP Project

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Presentation to the MCDF: Workshop on Innovations in PPP Transaction Design

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Disclaimer

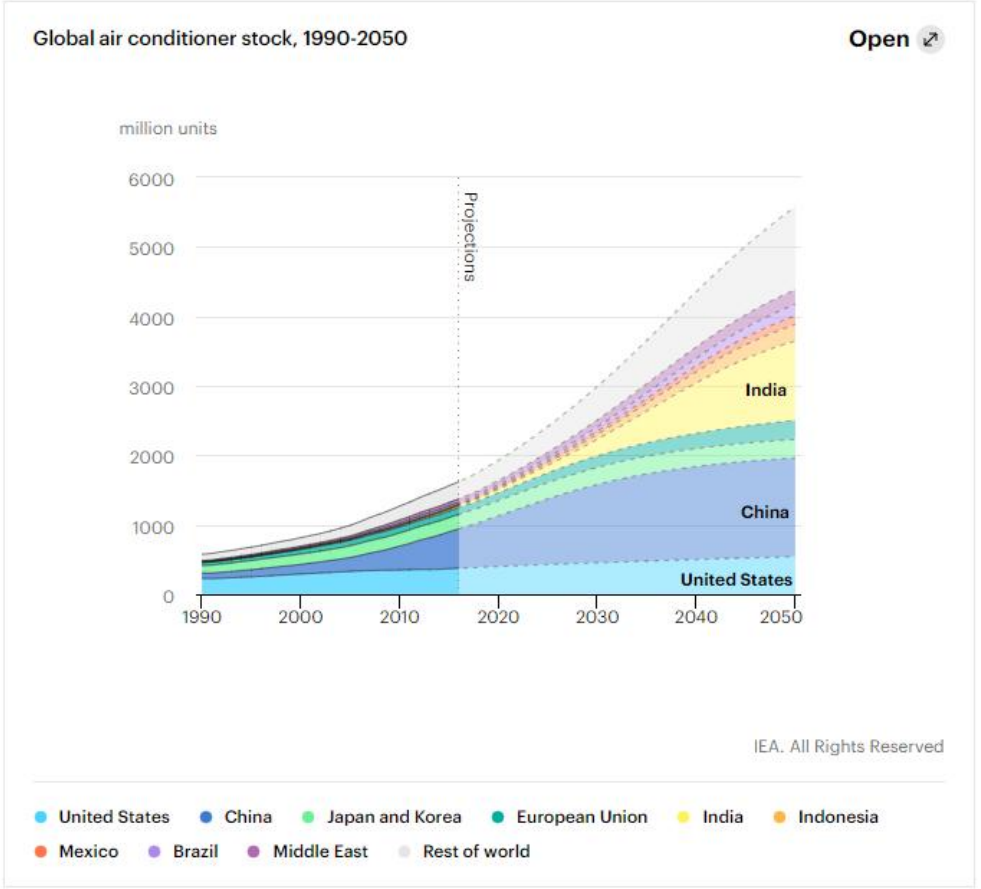
Grenada SWAC PPP project is under preparation, and the team is exploring different structuring options. Information in these slides is indicative.

Project is led by Government of Grenada,
Mr. Leslie Smith, Director, Renewable Energy,
Ministry of Climate Resilience, the Environment and Renewable Energy.

Supported by the World Bank team (Jonathan Coony and Ashok Sarkar).
Jyoti Bisbey is a climate finance & PPP consultant to the World Bank project team.

The global cooling challenge

- Energy demand expected to triple by 2050 (IEA)
- Cooling demand is the fastest-growing source of energy consumption in buildings worldwide and currently accounts for **16% of global electricity** use in this sector.
- Stock in buildings will grow to 5.6 billion by 2050, up from 1.6 billion
- In Latin America and the Caribbean (LAC), this demand could double by 2040 if efficiency measures are not implemented, placing greater pressure on energy systems and the region's climate commitments.



Operational and planned sea water cooling systems demonstrate reliability

Halifax, Canada
Purdy's Wharf office and commercial complex
Various offices and data centers

Cornell, USA
Cornell Lake Source Cooling Project
Cooling Cornell University
Operational since: 2000
Capacity: 70 MW

Toronto, Canada
Deep Lake Water Cooling system
Operational since: 2015
Capacity: 140 MW

Hawaii
Natural Energy Laboratory
First SWAC system in the world
Operational since: 1974

French Polynesia/Tahiti
CHPF Hospital in Papeete
Operational since: 2022
Capacity: 6 MW

Luxury Resort Tetiaroa
Operational since: 2013
Capacity: 4 MW

InterContinental Resort Bora Bora
Operational since: 2006

Curacao
Zakito District Cooling
2021 Winner of the global district energy climate awards
Capacity: 10 MW

Rio de Janeiro
Museum of Tomorrow
Operational since: 2015

The Netherlands
Amsterdam district cooling
Operational since: 2010
Capacity: 60 MW

Marseille
Thalassia
Successful operation since 2016 launch

Sweden
Stockholm district cooling
Operational since: 2010
Capacity: 84 MW

Bahrain
District cooling
Operational since: 2008

Maldives
Malé and Hulhumalé

Kumejima, Japan
Deep Seawater Research Institute
Operational since: 1999

Hong Kong, China
Kai Tak District Cooling
Operational since: 2013
Capacity: 284 MW

Singapore
Marina Bay
Zero disruptions since 2006

Reunion
St. Denis/Marie district cooling
EDF/ADEME Project

Egypt
El Alamein district cooling
UNEP Project

Sydney, Australia
Sydney Opera House
Seawater cooling since opening in 1973

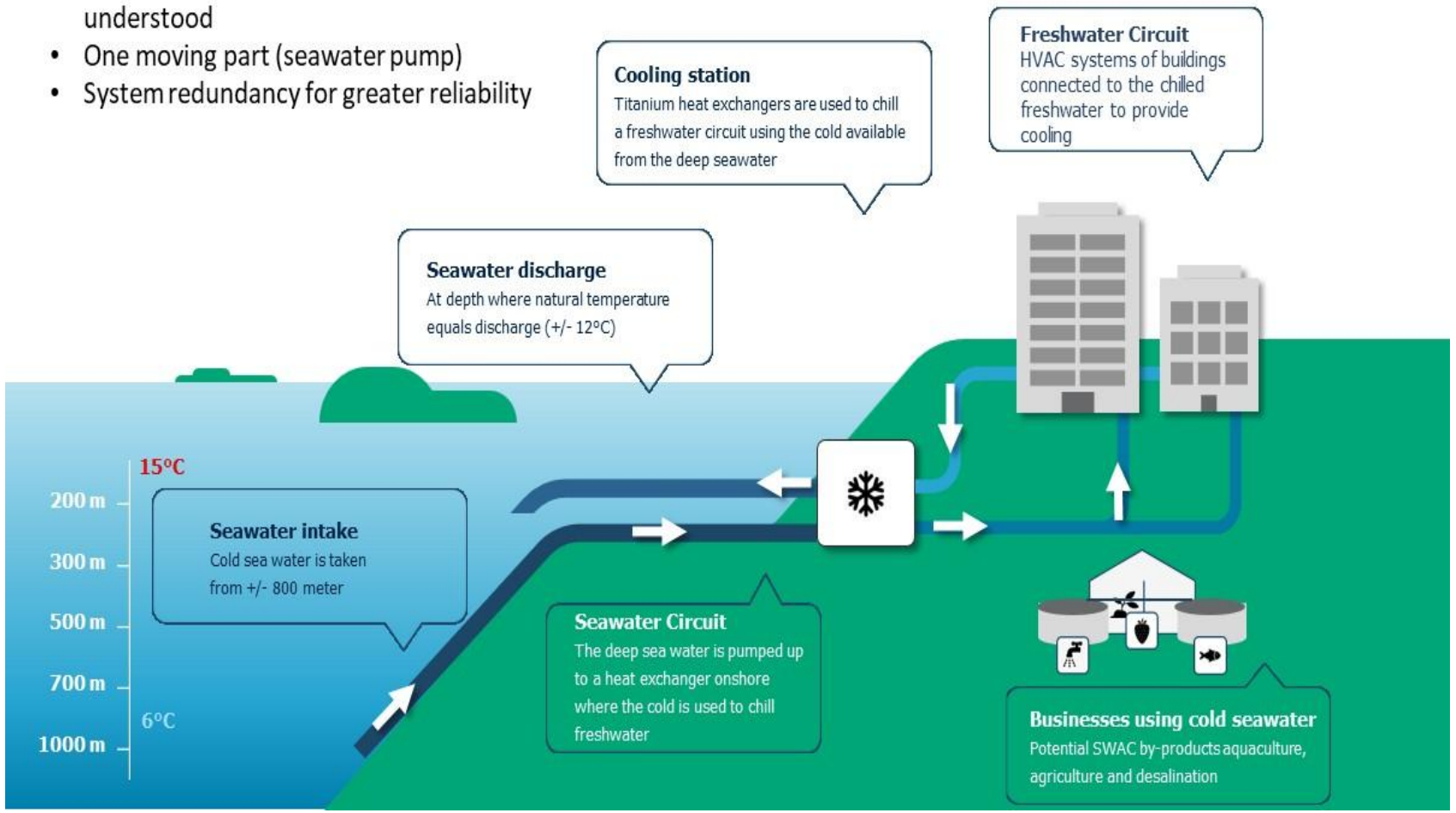
Operational SWAC

SWAC under development / Proposed

Grenada Seawater Air Conditioning (SWAC) Project

SWAC Design

- Technology off-the-shelf and well-understood
- One moving part (seawater pump)
- System redundancy for greater reliability

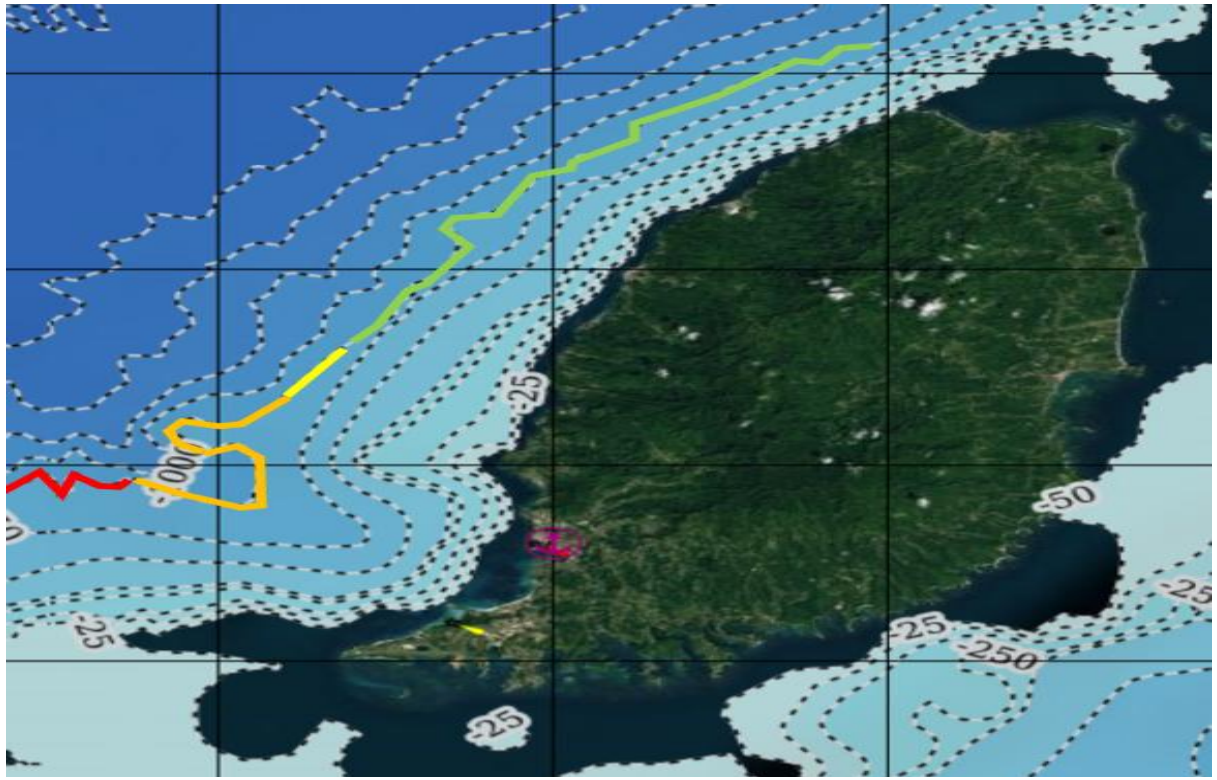


- Cooling accounts for 60% of electricity use and 1/3 of emissions
- Job creation during construction and operation
- 21,000 barrels of fuel avoided annually
- 100% elimination of refrigerant use
- 83% reduction in electricity use for cooling
- 30% lower lifetime costs than mechanical chillers
- US$75 million in lifetime savings
- Zero HFC use, supporting Kigali Plan.
- Strong alignment with NDC targets and National Cooling Action Plan
- Potential co-benefits in aquaculture, agriculture, desalination

Preferred location of the SWAC facility

The Lime appears the most suitable for a successful SWAC system with access to deep water and existing off takers:

- Maurice Bishop International Airport
- St Georges University
- Resorts

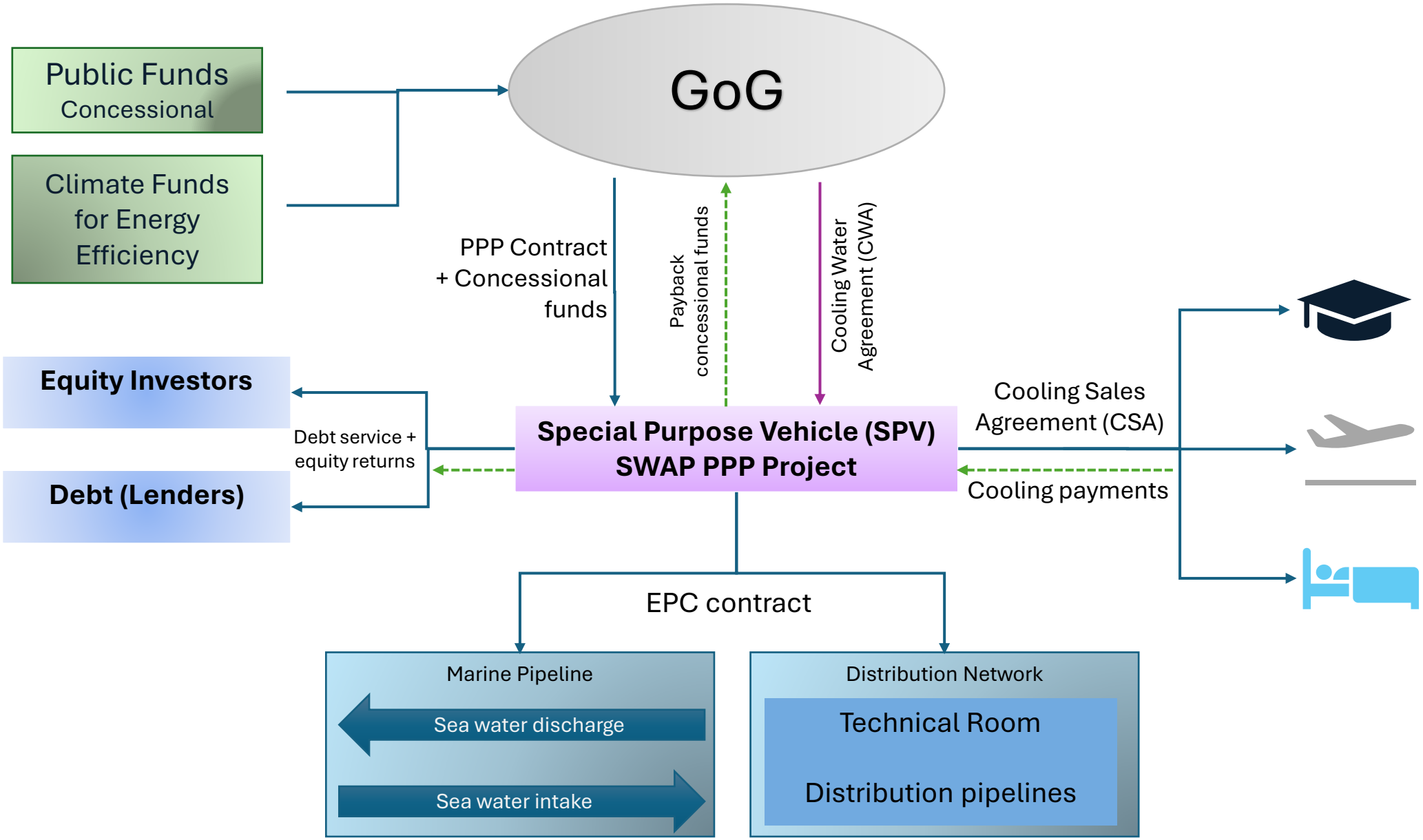


SWAC Project Design and Development

Total CapEx: US$ 50 million

PARAMETER	FINDING
Access to deep cold seawater	☑ Access to deep, cold seawater at depth of 900 m
Technical design	☑ Marine pipeline length (7 km) and diameter (<1 m) possible
Financial assessment and feasibility	☑ Lifetime cooling cost 20+ % less than conventional chillers
Cooling customer demand and interest	☑ Four customers showing interest w/ sizable demand and proximity
Environmental assessment	☑ Pipeline deployment and thermal discharge pose no red flags
Financial governance, sources and operations	☑ PPP structure to blend public and private investments
Blue Economy businesses supported	☑ Analysis of aquaculture, enhanced agri and RO using deep seawater

Indicative PPP model: Design-Build-Finance-Operate (DBFOM)



Indicative Key Performance Indicators

KPI Category	Examples of Key Metrics	Primary Purpose
Service Delivery	Availability (%), capacity delivered, outage frequency, response time	Protect reliability and link payments to outputs
Efficiency & Environment	Coefficient of performance (COP), kWh per tons of refrigeration (TR)-hour, CO_2 avoided, peak load reduction	Ensure energy savings and climate benefits
Commercial & Financial	Tariff cap, billing accuracy, collection rate, demand variance	Maintain affordability and manage fiscal risk
Asset & Resilience	Maintenance compliance, asset condition, storm recovery time	Preserve long-term asset value and resilience
Governance & Fiscal Risk	Reporting compliance, health & safety (H&S) metrics, contingent liabilities	Strengthen oversight and transparency

Innovations

Zero-refrigerant cooling system at national scale
Integration of marine engineering and district cooling technologies
Bringing demand side upfront in the structuring and procurement
Hybrid model combining project finance (SPV) with revolving fund
Strong sovereign-backed capital protection mechanism
Leveraging private sector and private capital mobilization (PCM)
Demonstration project for SIDS, the Caribbean, Indian Ocean and Pacific Islands
First mover advantage and higher hurdle -> World Bank and climate funds to take such risks

Blue Economy Innovation Hub

Support local and international businesses to create companies that use that use the cold temperature, purity and mineral content of deep seawater (DSW) to create businesses

- **Reverse Osmosis (RO) Desalination:** Generation of potable water via RO using DSW and feedstock which reduces need for pre-treatment and produces water of exceptional purity

- **Controlled Environment Agriculture:** Production of agricultural products in a greenhouse using DSW to maintain ideal temperatures year-round at low-cost

- **Aquaculture:** Production of fish, targeting the ornamental markets, via a recirculating aquaculture system (RAS) using DSW as a cold, pathogen-free water

- **Photovoltaic (PV) Cooling:** Improving output of PV cells in an adjacent solar farm by 15-20% via cooling with DWS

- **Gourmet Salt Production:** Using RO concentrate as feed to crystallize and package food-grade premium salt

- **Marine research and conservation:** The deep seawater provides excellent opportunities for a range of research and scientific projects

- **Sargassum:** While sargassum causes problems, its production can provide consistent feedstock to biofuel companies

Indicative Next steps

Early Market Engagement: July 2026

Secure concessional funds to leverage private capital mobilization (PCM): Q2 2026-Q2 2027

Procurement of Private Partner: Q1-Q2 2027

PPP Contract Signing: Q2-Q3 2027

Thank you!

Jyoti Bisbey, Executive Committee Member, World Association of PPP units and professionals (WAPPP)

Read WAPPP Blog, “Making a business case for private participation in SWAC and district cooling”

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