Feasibility Study on Green Hydrogen Potential in Maldives and Development of a National Roadmap for Sustainable Energy Transition | Progress

CTCN Advisory Board Meeting

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Prepared by

MANIFOLD
Advancing Net Zero Markets

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Content

Why GH2 for Maldives

Grid Structure: Mostly small, isolated grid islands; Greater Malé connected via local grid, other islands largely standalone (DG sets)

Energy mix: >90% of electricity generated from imported diesel

Policy Target: 33% RE generation mix target by 2028 as part of Maldives Energy Sector Roadmap

Emissions: Total ~2.4 Million tonnes CO2 (2022); energy and transport together account for 90% of national GHG emissions

GH2 Potential: Can store solar, stabilise island microgrids, and replace diesel for power production

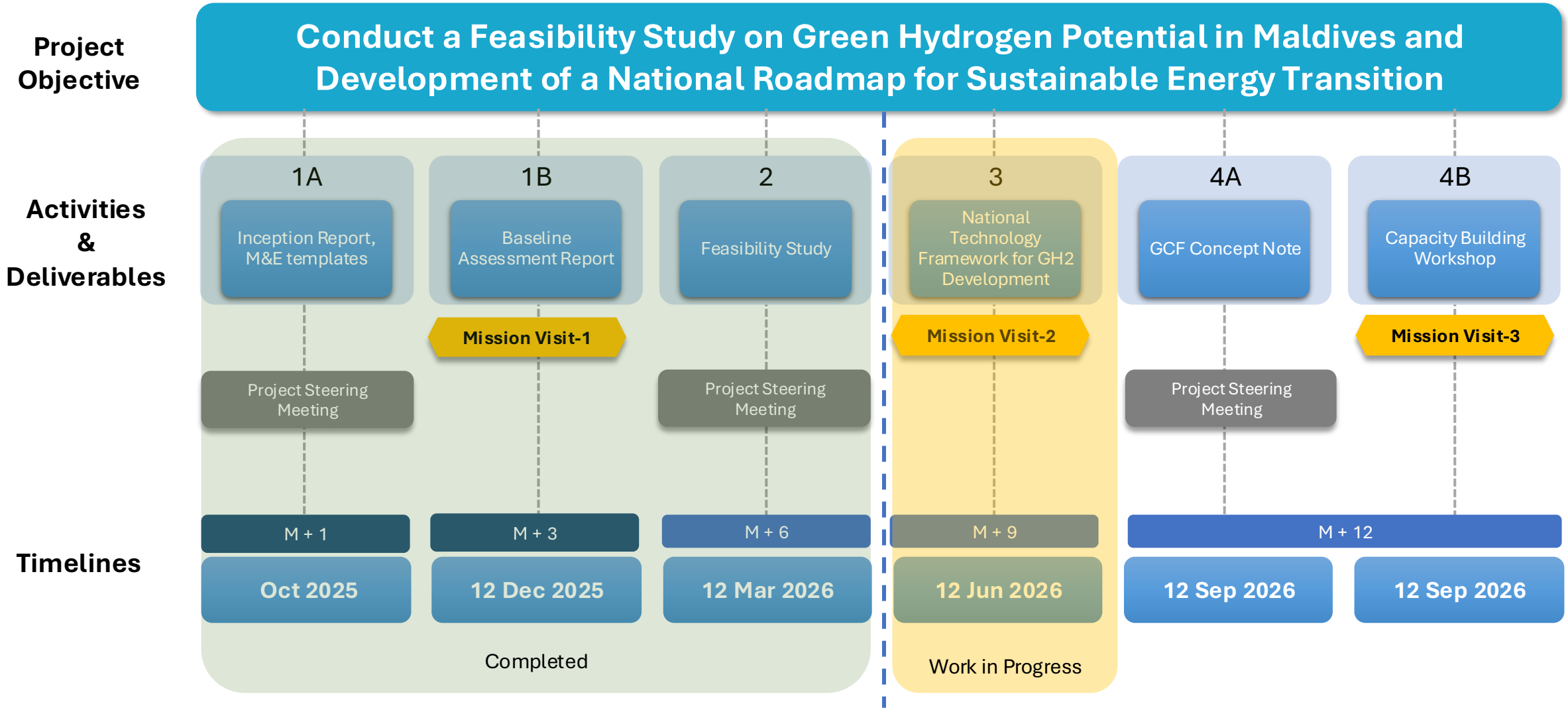
Reliability: Direct replacement of Diesel ➔ able to provide Base load ➔ leverage Maldives small and isolated grids

Independence: Fossil Fuels import reduction ➔ Energy Security and Diversification (even if it's not cheapest to begin)

Scalability: Allow harness Ocean (beyond land scarcity) for larger RE and long storage ➔ (on-demand) dispatchable RE

Decarbonization: Produce Big and move to Smalls (Hub and Spoke model) ➔ Deep Decarbonization

Project Activities & Timelines | Progress



Key Challenges for GH2 in Maldives

RE Scale up

Limited ability to scale renewable energy deployment due to challenges in operationalizing existing projects, coupled with low confidence in the scalability of emerging technologies that remain unproven in island conditions

Market & Economics

High upfront costs and limited local experience necessitate pilot projects to validate techno-economics and establish parity pathways with diesel

Institutional Capacity

Limited in-country technical expertise across energy, transport, and water sectors. Key stakeholders like Stelco, Fenaka, URA, Ministry emphasized on criticality of structured training and capacity-building programs

Infrastructure & Financing

RE and GH2 infrastructure financing remains challenging. Past RE projects have faced after-sales and contractual issues. Grid upgrades will also be required for future integration

Policy & Regulation

No dedicated national GH2 policy or safety standards yet. While hydrogen is referenced in the broader energy roadmap, a clearer implementation pathway and RE-linked incentives are needed

Key Findings

Supply Economics | LCOH $/kg (2025 vs 2030)

Archetype 1: Outer Island Microgrid

- **WHEN:** Where solar is VERY Limited
- **WHERE:** 157 outer islands (FENAKA)
- **HOW:** Import H_2 from hubs → FC replaces DG directly

10 → 6.68

Archetype 2: Resort Hydrogen Integration

- **WHEN:** Solar is 50-70%
- **WHERE:** 190 resort islands
- **HOW:** Solar + Battery + H_2+FC for the last 30%

7 → 4.32

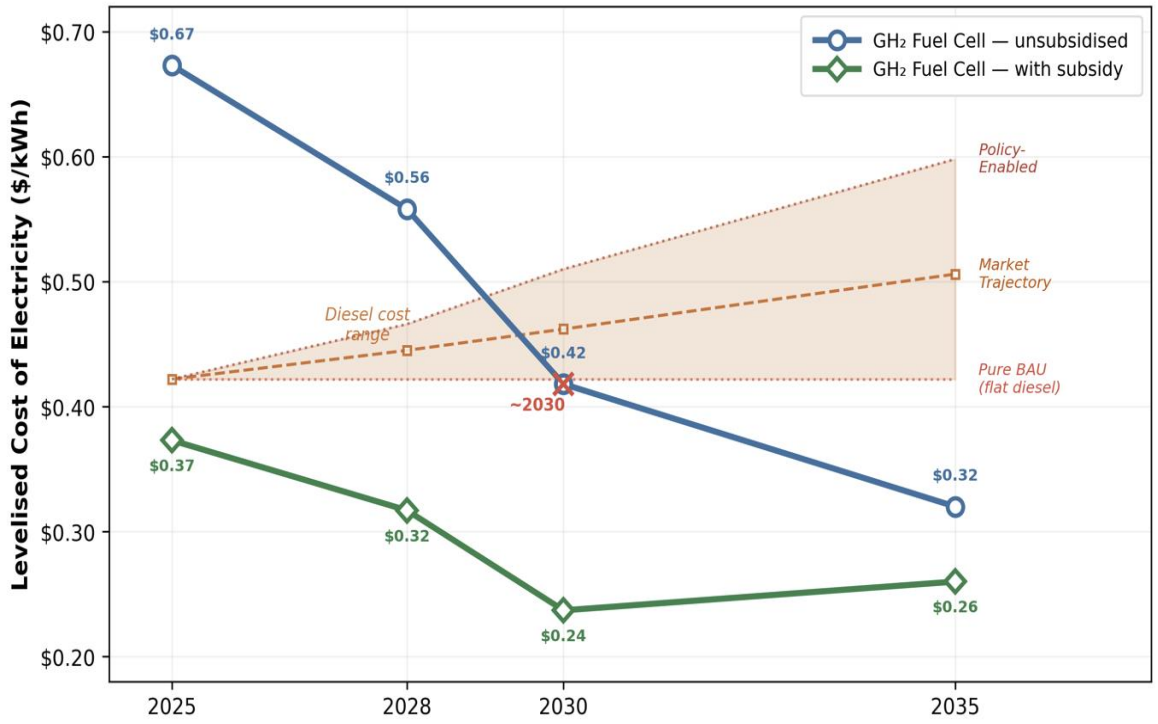
Archetype 3: Greater Male

- **WHEN:** After solar+BESS saturate OR direct import
- **WHERE:** Greater Malé (130 MW STELCO)
- **HOW:** Green ammonia import → co-fire in existing turbines (10-20% blend

2 → 1.53

Demand Prioritization

Use Case-1: Power Generation



Green hydrogen achieves cost parity with diesel for **power generation** by approximately 2030 without subsidy, and as early as 2025 with policy support

Key Findings

The cumulative capital requirement is $198 million through 2030 and $485 million through 2035, dominated by solar PV (~55%) and electrolyzers (~25%).

Phased Implementation Strategy

36 t/yr

Demonstration (2026–2027)

- **Pilot projects:** 1–2 installations: one resort micro-plant (Soneva or Six Senses) and one FENAKA outer island fuel cell replacement
- **Marine demonstration:** H_2-ICE ferry retrofit on a single MTCC high-speed route
- **Scale:** 2 plants, 0.70 MW electrolyzer, ~$1.9M CAPEX + $3–5M for enabling activities

3,505 t/yr

Scale-up (2028–2030)

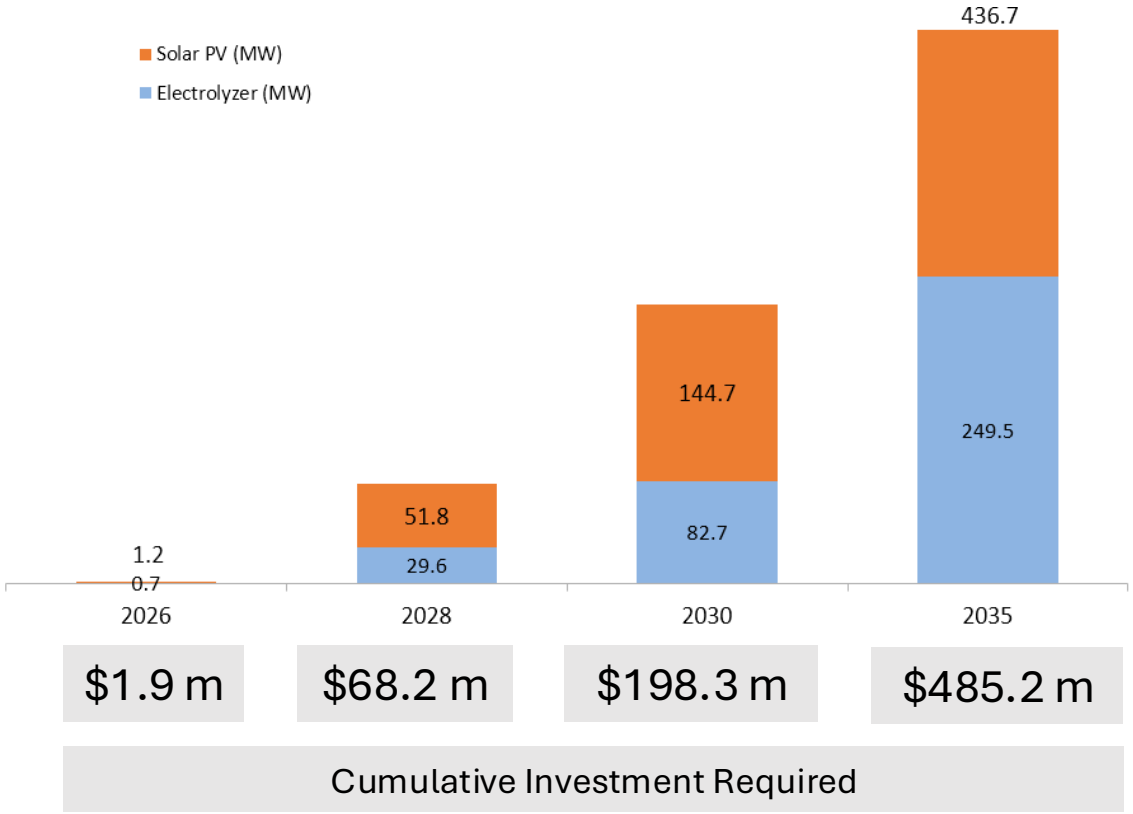
- **Greater Malé hub:** 1 × Large plant (15 MW initial, expanding to 45 MW) at Thilafushi–Gulhifalhu corridor
- **Addu City hub:** 1 × Medium plant (4 MW, expanding to 10 MW)
- **Distributed deployment:** 10 resort micro-installations + 5 outer island small plants at FENAKA's highest-cost sites
- **Scale:** 18 plants, 82.7 MW electrolyzer, cumulative CAPEX per Table 5-1

8,355 t/yr

Expansion (2030–2035)

- **Capacity growth:** Expand to 35 plants, 250 MW electrolyzer, 437 MW solar PV
- **Sector broadening:** Full MTCC fleet coverage; STELCO ammonia co-firing at commercial scale
- **Technology evolution:** Evaluate liquid hydrogen or LOHC for long-distance inter-atoll transport
- **Regional potential:** Assess export opportunities to neighbouring SIDS (Sri Lanka, Mauritius)

Investment Roadmap and Capacity Deployment (Medium Scenario)



Thank You

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