Rev3

FSPP – Freshwater Seapower Platform
Réiteach ar Ghanntanas Uisce Inis Oírr ?

Status Quo

- The present system of shipping water is expensive
  - **the annual cost is ~ €130k per year at €40 per m3 (4c per litre)**
- It is unsustainable ~ **91 tonnes per year CO2 emissions**
- It has a negative impact on the tourist experience:- water supply concerns, road blockages, pump noise
- Inevitable Climate Change will make the situation much worse

The Wave Energy Proposal

- Use a single Freshwater Seapower Platform (FSPP) to pump high pressure raw seawater ashore
- Connect to a standard containerised **Reverse Osmosis Desalination** plant which supplies drinking water into the existing storage
- There are **no energy costs and no emissions**
- The estimated amortised cost is ~ **€55k per year at €12.50 per m3 (1.25c per litre)**
- The FSPP is designed to provide water all the year around, saving Irish Water / the tax payer **€75k each year**

A Joint Effort

All of the following will be asked to endorse the EU funding application and will have a part to play in implementing the project : -

- **Inis Oírr Sustainable Energy Committee**
- **Aran Islands Energy Co-Op**
- **Inis Mean Sustainable Energy Committee**
- Sustainable Energy Authority of Ireland (SEAI)
- Foreshore Licence Unit, Wexford
- Department of Communications, Climate Action & Environment
- Irish Water
- Coffey Group, Athenry
- SmartBay (Marine Institute)
- Foynes Engineering Ltd, Limerick
- Tarrea Queen Enterprises & Ardrahan Precision, Co. Galway
- Olimotion Ltd Pump Manufacturing, Leitrim
- RPS Ltd, Ross an Mhíl
- OSCS Ltd, Ballina
- Rockall Solutions, Kinvara
- Factory Automation Ltd, Bray

The Inis Oírr Project- in Brief

Stage 1 Pilot - Prove the System at the National Test Site in Galway Bay (Smartbay)

- Design, build, launch at sea, pump seawwater and demonstrate desalination
- Estimated overall length **20m**
- Estimated drinking water production rate = **1,694m3 per year**
- Demonstrates Reverse Osmosis Desalination **on board**
- Hose / feed water connection/umbilical trials on the device
- No water connection to shore for Stage 1
- Detailed performance and efficiency data over a ~60 day trial period
- Project **Cost €1.1 million**
- Project **Timespan 22 months**

Stage 2 - Pre-Commercial Deployment at Inis Oírr

- Objective: Supply drinking water to the island *at a lower cost* than the present shipping method
- Following consultation with local fishermen, the Marine Institute wave climate section and FLU, select a suitable site for the WEC (preliminary discussions with the FLU are ready in progress)
- Transfer the Pilot device from SmartBay to **Inis Oírr**
- Connect to a containerised on-shore desalination plant and storage reservoir

An Fhoireann

Joe Murtagh B.Eng MIEI, Head of Engineering, Director, Inventor ; has 42 years as a structural design engineer, with 28 years specifically in the R&D industry working on innovation within the marine energy sector. Joe also has held previous senior mechanical engineering management roles with Liebherr, Bord Na Móna, Hydam, and for the Wavebob Ltd. He has consulted to a number of other marine energy projects. Joe is vastly experienced with all aspects of mechanical engineering and detailed design activities. He has designed, built, moored, operated and recovered 3 full-scale WECs on 6 occasions

- Detailed Engineering Calculations (Structural, Mechanical, Hydraulic)
- Design to Eurocode, DNV-GL standards, creation of Basis of Design literature.
- Design Engineering for a wide range of structures (e.g. framework structures, lattice members, chassis weldments, bolted assemblies)
- Small and large component design (e.g. bolts, lugs, pressure vessels), Hydraulic system design (e.g. pumps, accumulators, valves)

Cian Murtagh M.Eng, Project Engineer, Director: is responsible for decision making and managing the team. He has a masters in Mechanical Engineering and a member of the Institute of Engineers of Ireland. Expertise include involvement with control systems and SCADA systems with Earthtech Ltd. and then, since 2008, worked full time in the wave energy industry in the area of research and design. He has carried out numerous hydrostatic calculations for floating structures, designed and built on-shore test rigs, and innovative small scale WEC and PTO prototypes. His Master of Engineering thesis was on the subject of geared PTO systems for wave energy converters. His skills also include controlling project costs and planning, and developing project specifications

- Mechanical Engineering Design and Calculations
- Structural Design Calculations, Procedural documentation, Reporting
- Load Cases Assessment, LCOE, FMEA, LCA Assessments for Renewable Sector

Sorcha Sheehy B.Eng MIEI, Civil Engineer, Project Manager; with 16 years experience in the fields of Engineering and Contract management. She has experience in the successful delivery of EU and national projects. She has a keen understanding of hydrodynamics and wave energy first principles and has practical experience in the launching and maintenance of real-sea wave energy test rigs off the west coast of Ireland.

- Civil & Structural Engineer, Design Engineering
- Contract Management, Knowledge of National and EU legislation and regulations
- Procurement and Financial Reporting (for national and EU projects)
- Day-to-day Sea Power Ltd. company activities

TL

Tom Lyne, **Director**, Principle Shareholder, Inventor

Co-invented the Seapower Platform and is an experienced Civil/Structural Engineer involved with the MWP wave energy converter in the 1990s among many other civil engineering and business projects. He is a business entrepreneur. He has co-funded the development of Sea Power Ltd. since becoming a director in 2008. Tom has experience in project planning and developing, reviewing bids from contractors, and from a technical point of view providing structural engineering knowledge.

Eamon Howlin, **CEng CMarEng MIMarEST**, Offshore Operations Manager

A Chartered Engineer with over 30 years' of hands on and practical offshore experience. He has worked for both oil and gas industry majors and renewable energy companies. In the oil and gas industry his clients have included large North Sea EPC contractors such as Technip and Statoil with whom he worked extensively in both the British and Norwegian sectors providing engineering consultancy services on subsea hardware installation and inspection, repair and maintenance projects. In the marine renewables industry Eamon has worked on innovative wave energy projects working both as an offshore engineer for Aquamarine Power in the Orkneys and Seapower Ltd in Galway Bay and also as a marine consultant to WES *(Wave Energy Scotland – 2016/2018)* and the Irish OEDU *(Offshore Energy Development Unit - 2010).*

Ralph Burke, CEng MIEI MED, Electrical and Controls Engineer

A chartered engineer with 33 years experience in the electrical and instrumentation field. Ralph's role in Seapower Platform projects is to provide SCADA, communications, and electrical design experience on relevant subsystems including detailed design works and providing electrical balance of plant for the PTO, and the control system. Ralph was the lead electrical engineer in the previous SPP deployment into the Irish National Test Site, and commissioned the electrical, control, communications, IP camera, and SCADA software for that successful offshore deployment of the Seapower Platform.

Sea Power Ltd - An Comhlucht

- 3 Irish director shareholders: Tom (70%), Joe(20%) and Cian(10%)

- Development funding to date mainly through SEAI Grants, WES (Scotland) contracts and owner investment.

- The Seapower Platform (including the on-board pumping system) is protected by **Granted** world patents.
  (Example: US9429135 and WO2011147949A2)

- Since 2008 we have been developing large utility scale versions of the device to compete directly with wind energy. Huge cost and performance advances now allows us bring to market a smaller scale, efficient, seawater desalination version for use by island and coastal communities.

- The core **value** in the business is with the team members but also with close bonds with a wide range of experts whose combined skills are necessary to make wave energy happen in Ireland.

An Cruthúnas

The FSPP (Freshwater Seapower Platform) baseline machine has **already been deployed, installed and tested** in a 25 metres of water in the Marine Institute SmartBay test site. The device was fully and remotely monitored for a period of 155 days. This machine was **fully autonomous** and the power was measured successfully. The performance results coincides with prior testing carried out in wave tanks (e.g. UCC Cork, Portaferry QUB, Strathclyde Glasgow and FloWave in Edinburgh as well as by several rounds of numerical analysis.

The machine **survived two harsh winter storms** with waves and wind far exceeding those likely to be experienced at potential target sites such as the Aran Islands

The power take off system (high pressure pumps for RO plant) have been **developed and tested successfully** in a lab environment on *three* occasions. These testing programmes were funded by the Irish Government energy agency, **SEAI**.

(MADE IN IRELAND)

seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Renewable Risk Advisers

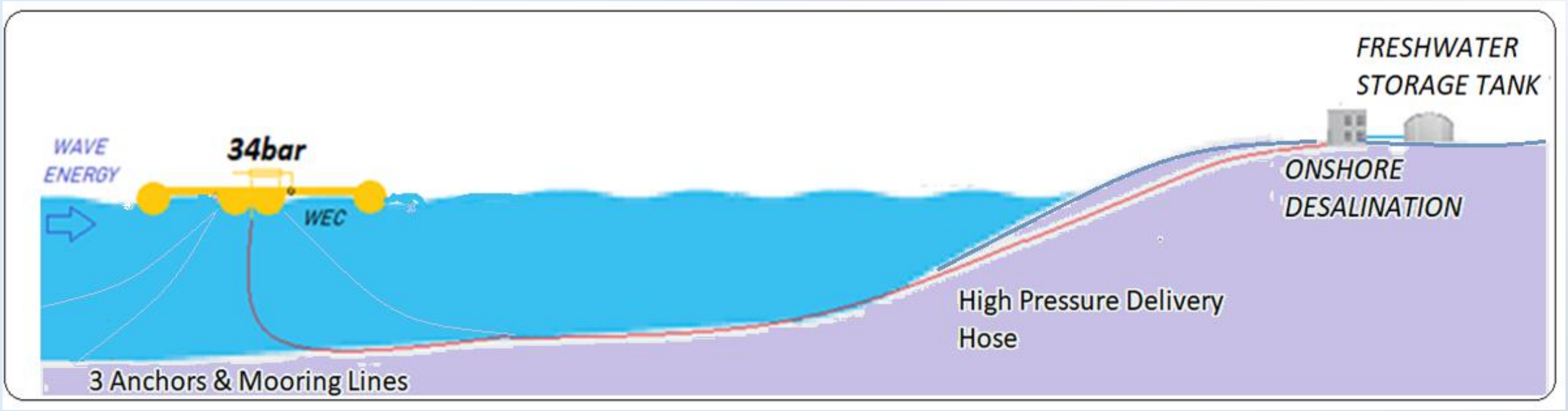
FOYNES ENGINEERING LTD

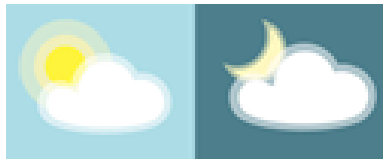
SMARTBAY

Marine Institute
Foras na Mara

An Teicneolaíocht

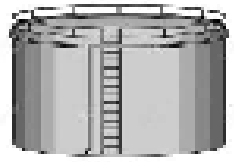
- The device is very simple. It is basically a wave driven mechanical pump. No electricity is generated. The pumps deliver high pressure raw seawater at 34 atmospheres (500psi) to a standard Reverse Osmosis Plant on shore. Energy Recovery doubles this pressure to the 68 atm required to desalinate raw, high TDS seawater.
- This Plant may be located close to the existing or new storage reservoir. The ocean provides the energy required!





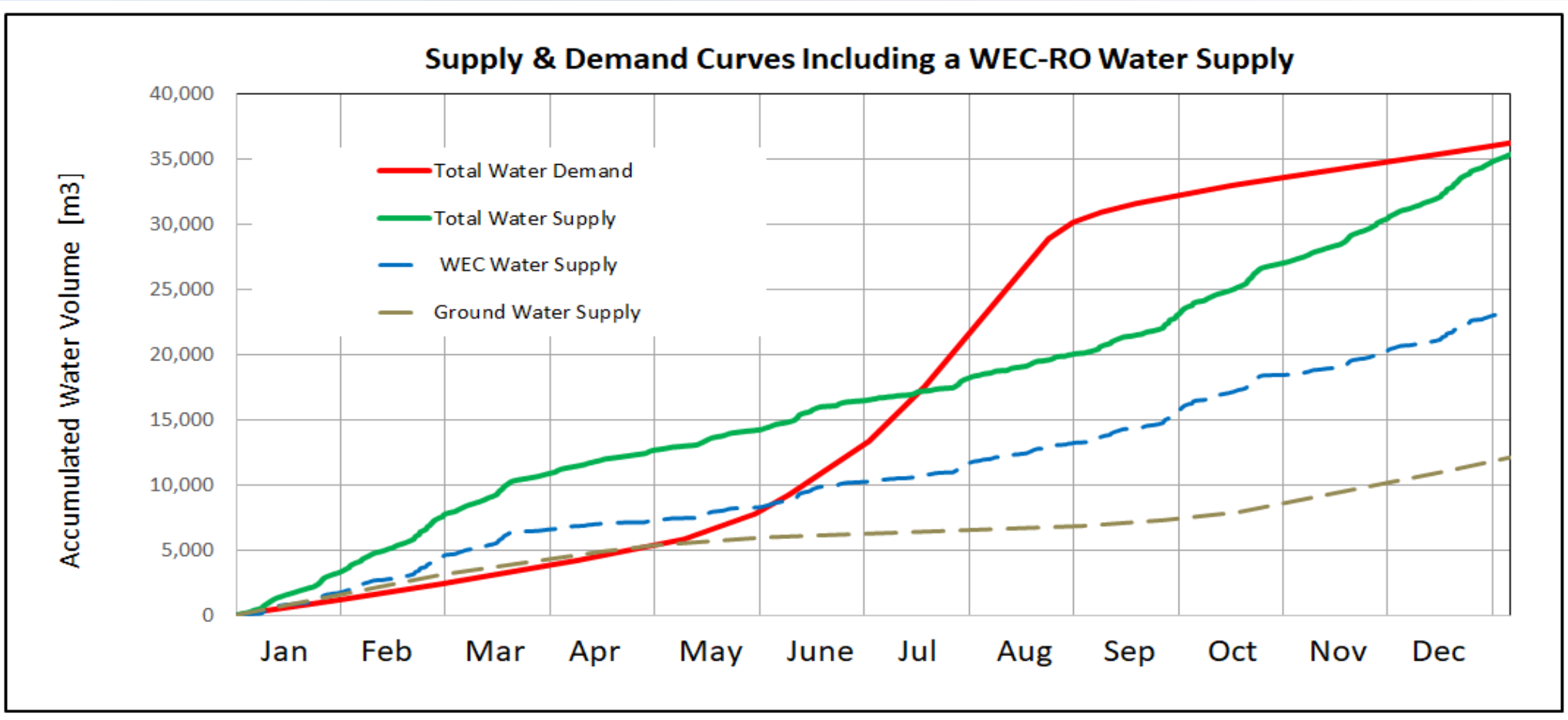
24hr Day/Night Operation

No Diesel Required



Works with existing water storage systems

Supply and Demand on Inis Oírr – Mar Shampla…..



- The highly non-linear, annual water demand curve (solid RED line) is known. Note the sharp rate-increase during the Summer.
- The variable ground water supply (dashed BROWN line) is estimated here but can be confirmed by Irish Water.
- The Sea Power output (dashed BLUE line) is added to the ground water supply (solid Green line) to meet the annual demand.
- Examining the relationship between the Red and Green lines, determines the required capacity of the reservoirs.

- The Technology is **Scalable.**
- A future device, **50m long** would satisfy **all** the water needs of Inis Oírr
- 2 or 3 devices, **50m long** would satisfy **all** the needs of **all 3 islands**
- The proposed Pilot device, **20m long** will save **€75k** per year and **91 tonnes CO_2**
- It works Day and Night, Summer and Winter, in Calm Winds and Howling Storms, no need for Grid electricity and no need for diesel

WEC (FSPP)

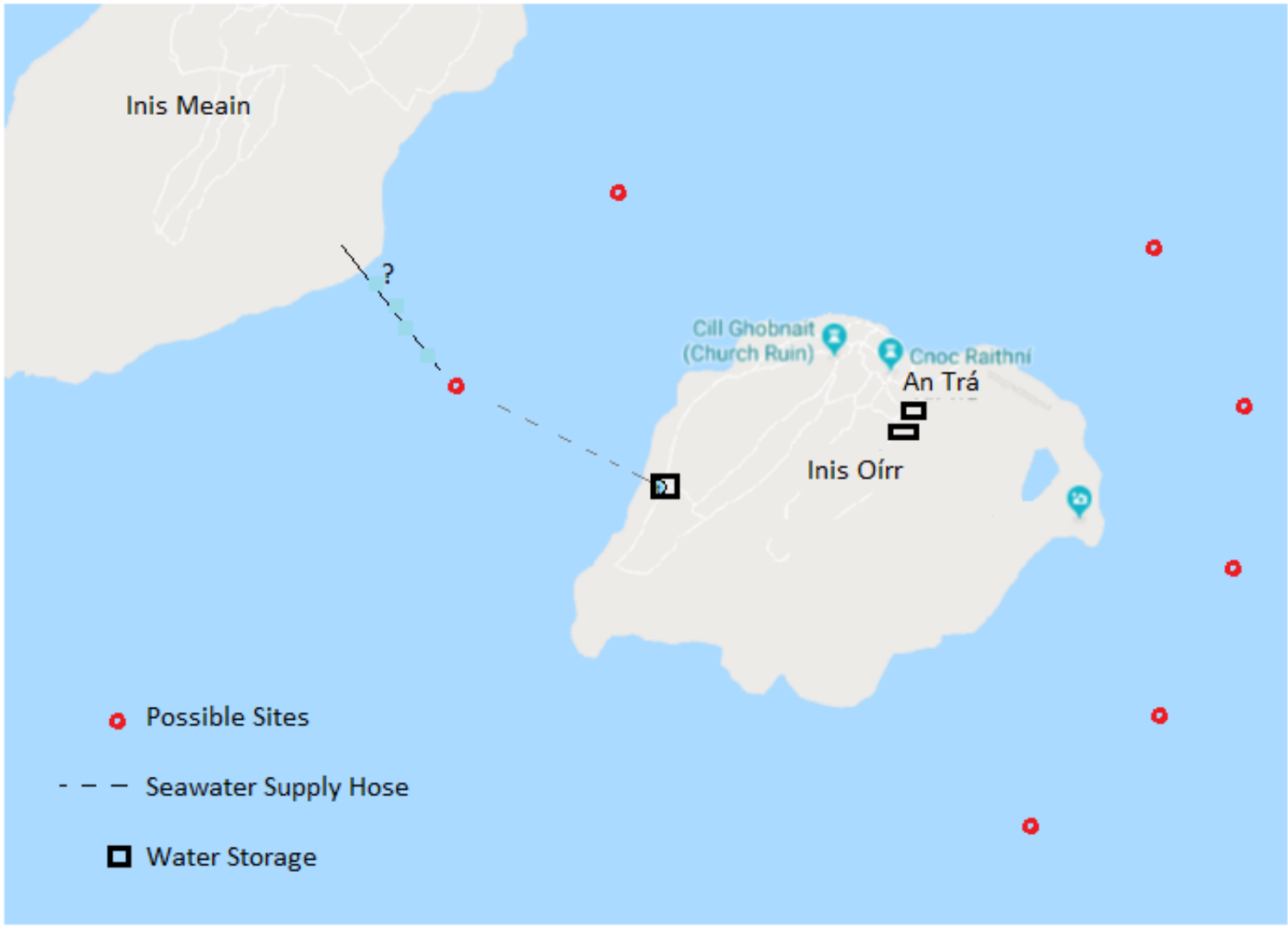
+

ONBOARD OR ONSHORE DESALINATION

+

EXISTING RESERVOIR

Cén áit?



- The Seapower Platform can be installed anywhere within a depth range of 25m to 50m depth.
- Exact location determined by local expertise, fishermen, subject to FLU
- Annual average wave energy densities of between 10kW/m and 20kW/m are available and vary depending on location
- The Marine Institute will also be asked to determine possible locations around the island.
- The device can be launched and recovered in a matter of a couple of hours. Typical distance offshore is between 500m and 1.5km as shown.
- Existing or new infrastructure for water storage tanks can be used.
- Fully autonomous operation but small number of jobs in low-level monitoring and security

Tuilleadh Eolais

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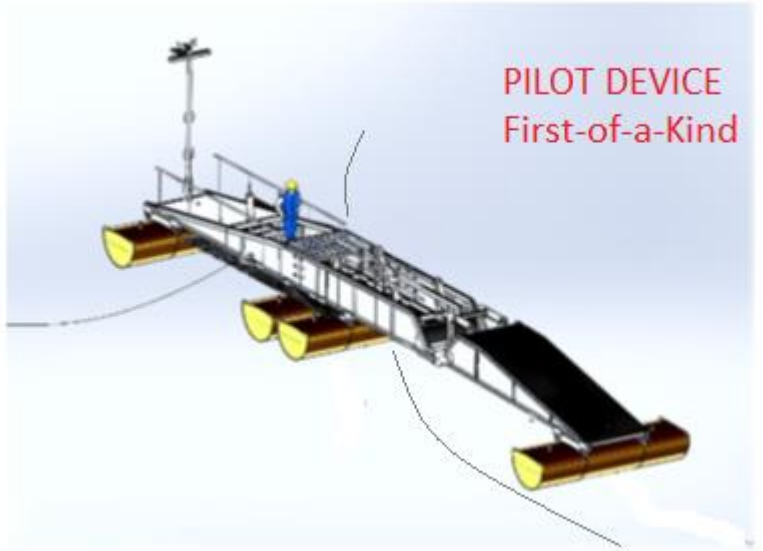

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