



# OpenHydro

OREG – Annapolis Basin | 13 May 2009

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## Agenda

1. **Open-Centre Turbine**
2. **EMEC**
  - **Research Structure**
  - **Subsea Installation**
3. **Supply Chain**
4. **Commercial Developments**
5. **Financials**

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# Open-Centre Turbine

## Open-Centre Turbine

- ❑ The key to the Open-Centre Turbine lies in the simplicity of the design.
- ❑ If a turbine is to survive in the marine environment it is essential that it be both simple and robust.
- ❑ Technology under development since early 1990s.



# Open-Centre Turbine



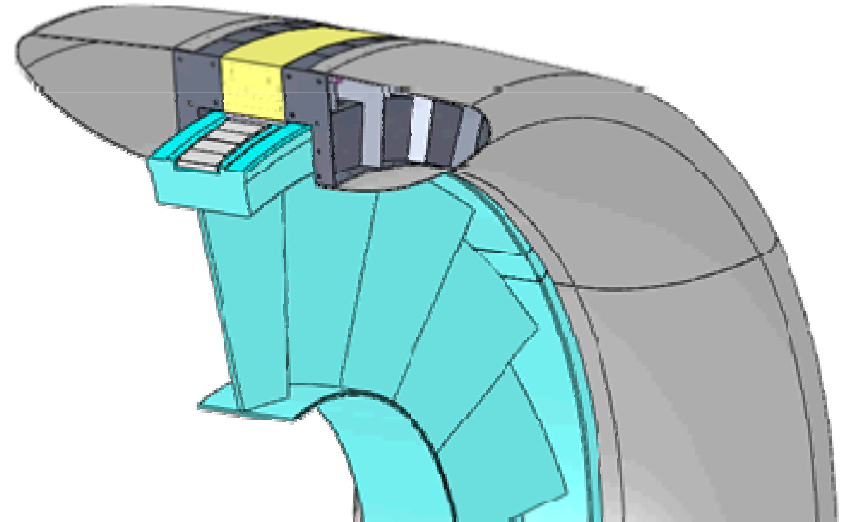
Please click on image to play video

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# Open-Centre Turbine

## Technology

1. Simple construction with only one moving part and no seals.
2. No requirement for a gearbox.
3. No maintenance between overhauls.



## Environmental

1. Open-Centre provides an exit route for marine life.
2. Design avoids the need for oils, greases or other lubricating fluids.
3. Retention of rotor blades within the outer housing.

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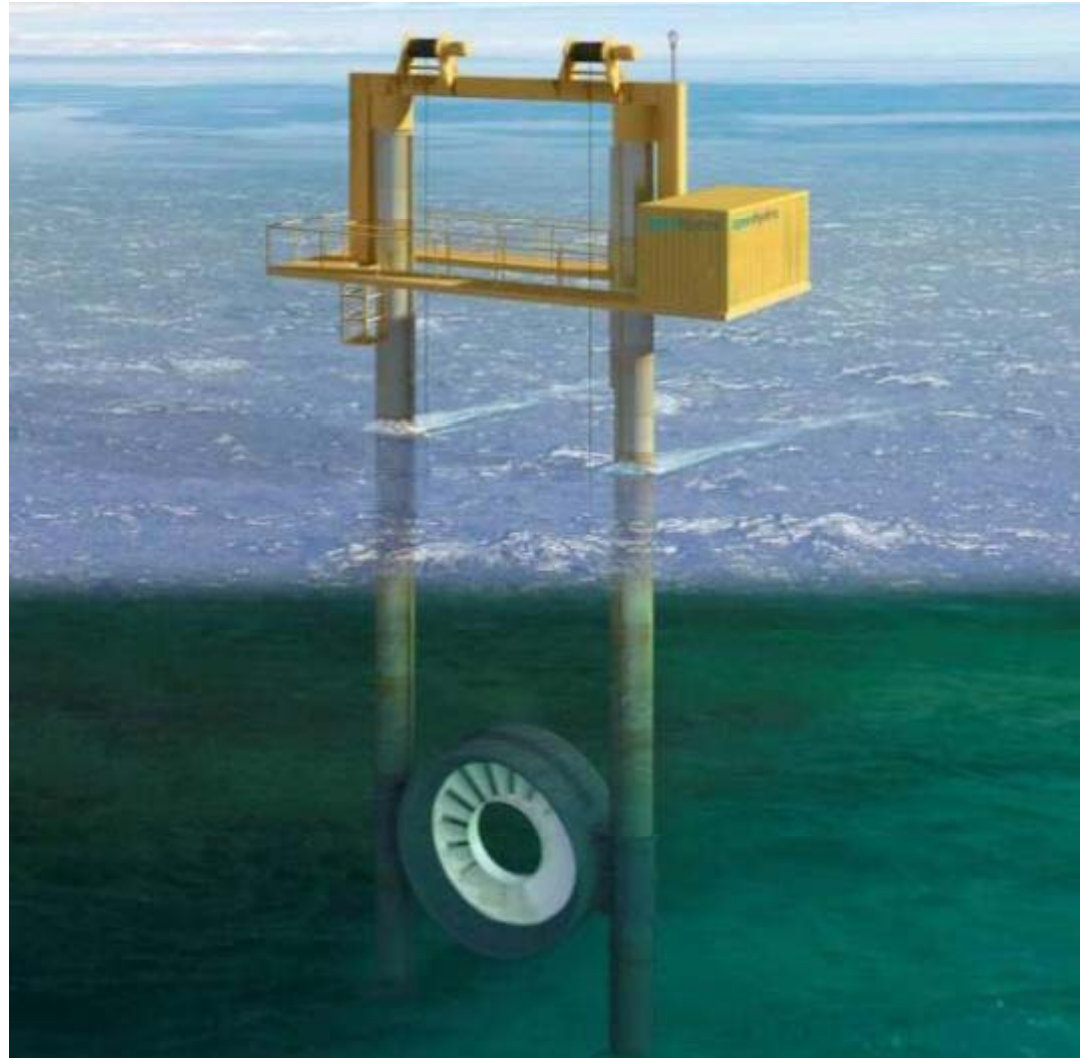
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# EMEC Research Structure

## Tidal Turbine Research Structure

- ❑ Research & Development (R&D) structure for testing the Open-Centre Turbine.
- ❑ Ability to raise and lower turbines for inspection.
- ❑ Ability to exchange turbines to test latest developments.



# EMEC Research Structure

## Installation Works (2006)



# EMEC Research Structure

## Grid Connection

- ❑ 500m of subsea cable was recovered and relayed to OpenHydro's platform to complete the 11kV grid connection.

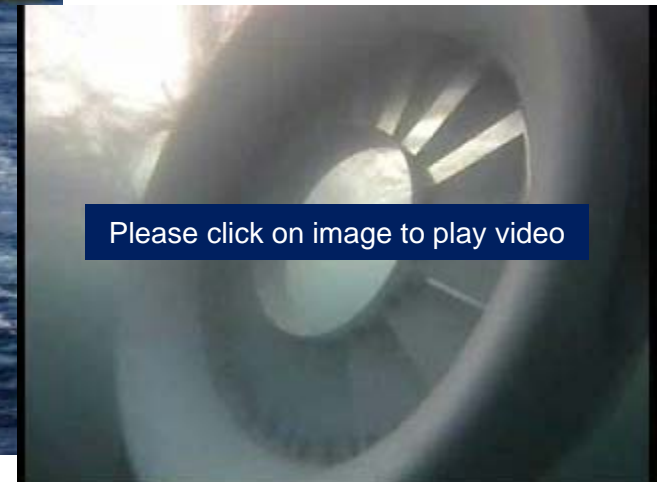


# EMEC Research Structure



## Grid Operation

- ❑ First company to connect and generate onto UK national grid (May 2008).



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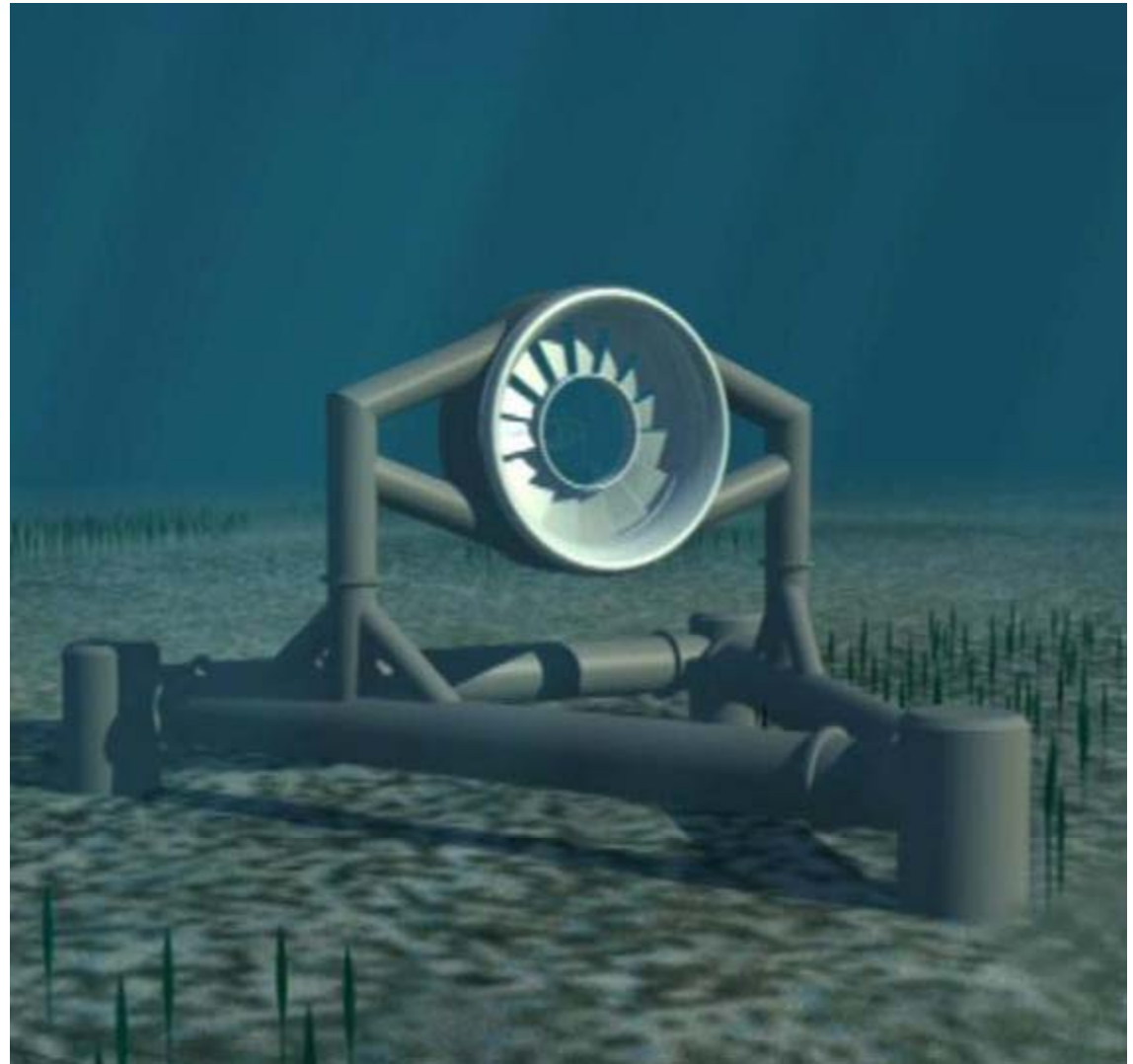
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# EMEC Subsea Installation

## Subsea Deployment

- ❑ OpenHydro's vision is for turbines mounted on the seabed.
- ❑ During 2008, OpenHydro built and deployed its first subsea base at EMEC.



# EMEC Subsea Installation

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# EMEC Subsea Installation



# EMEC Subsea Installation



# EMEC Subsea Installation

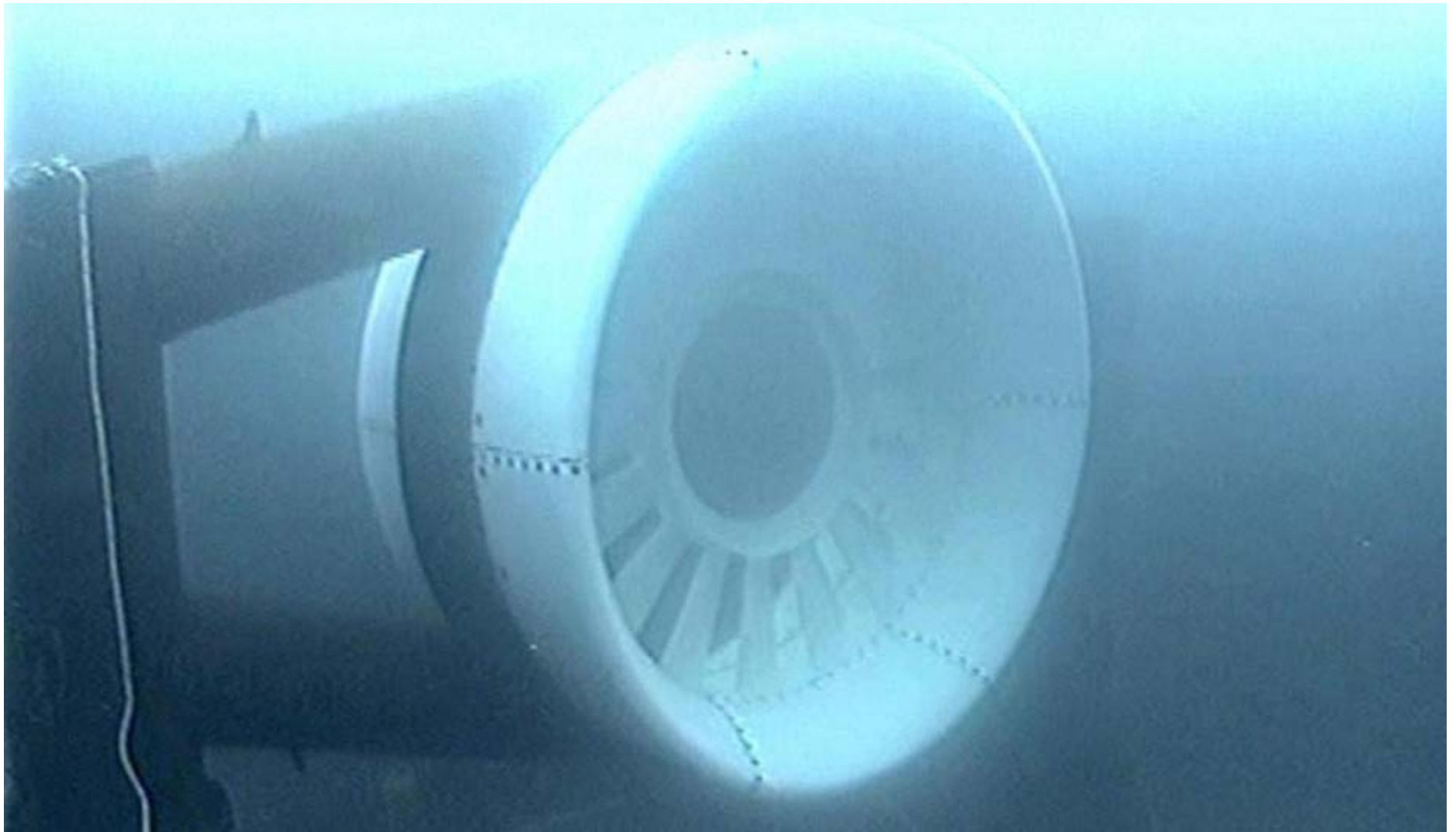


# EMEC Subsea Installation



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# EMEC Subsea Installation



# EMEC Subsea Installation

## Lessons Learnt

- ❑ Our experience has shown us that the appropriate equipment for installing tidal turbines does not exist in the general marine market.
- ❑ This new deployment method turns a difficult and lengthy project of many months into a quick and cost-efficient single day operation.
- ❑ A cost effective deployment method is essential for developing commercial farms.



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# Turbine

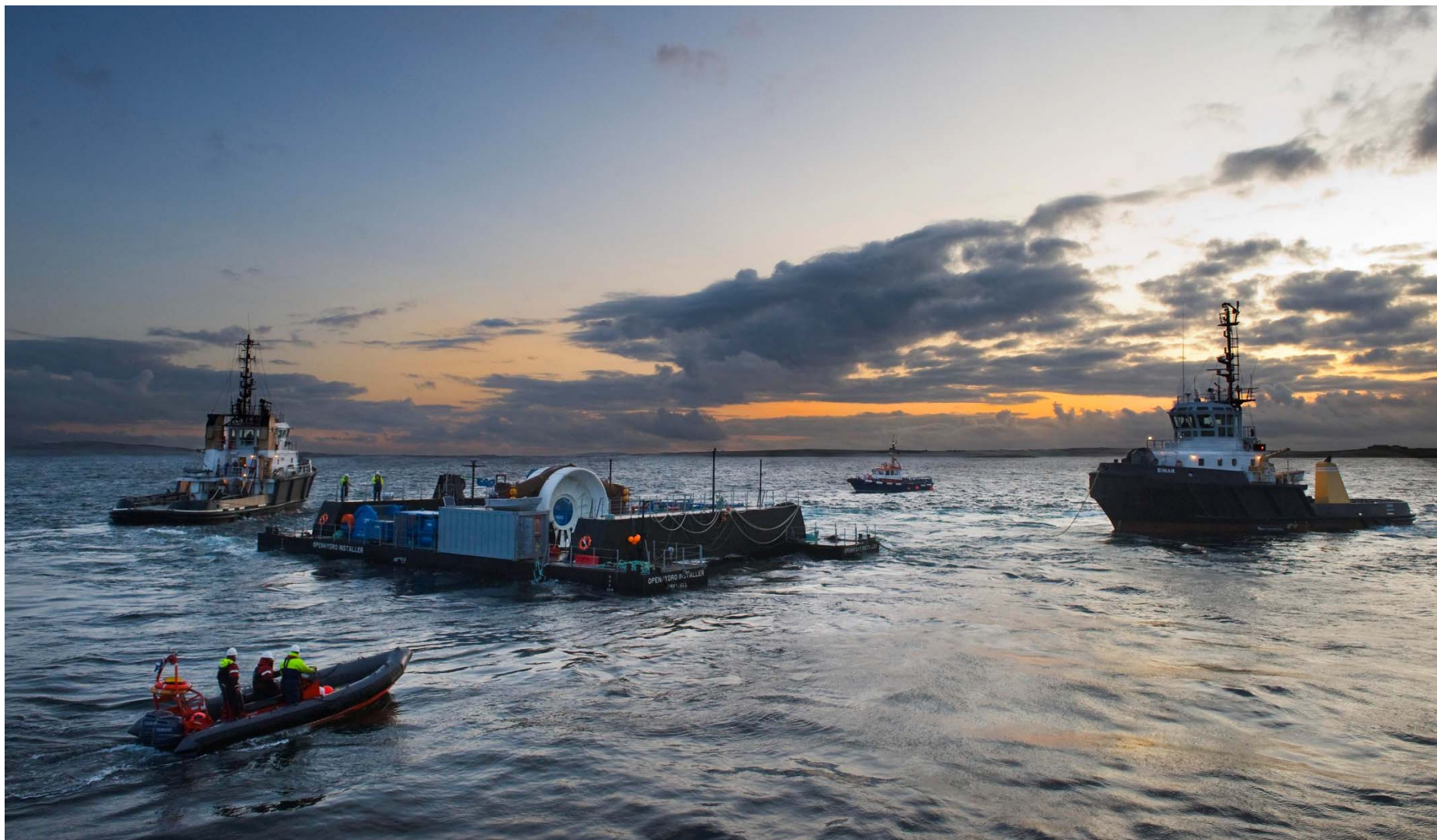
- ❑ Irish manufacture, global supply chain
- ❑ Assembly vs. component manufacture
- ❑ Preferable to locate manufacturing and O&M facility close to site
- ❑ Skills & capabilities readily available within Nova Scotia



# Subsea Base & Mobilisation



# Marine Equipment

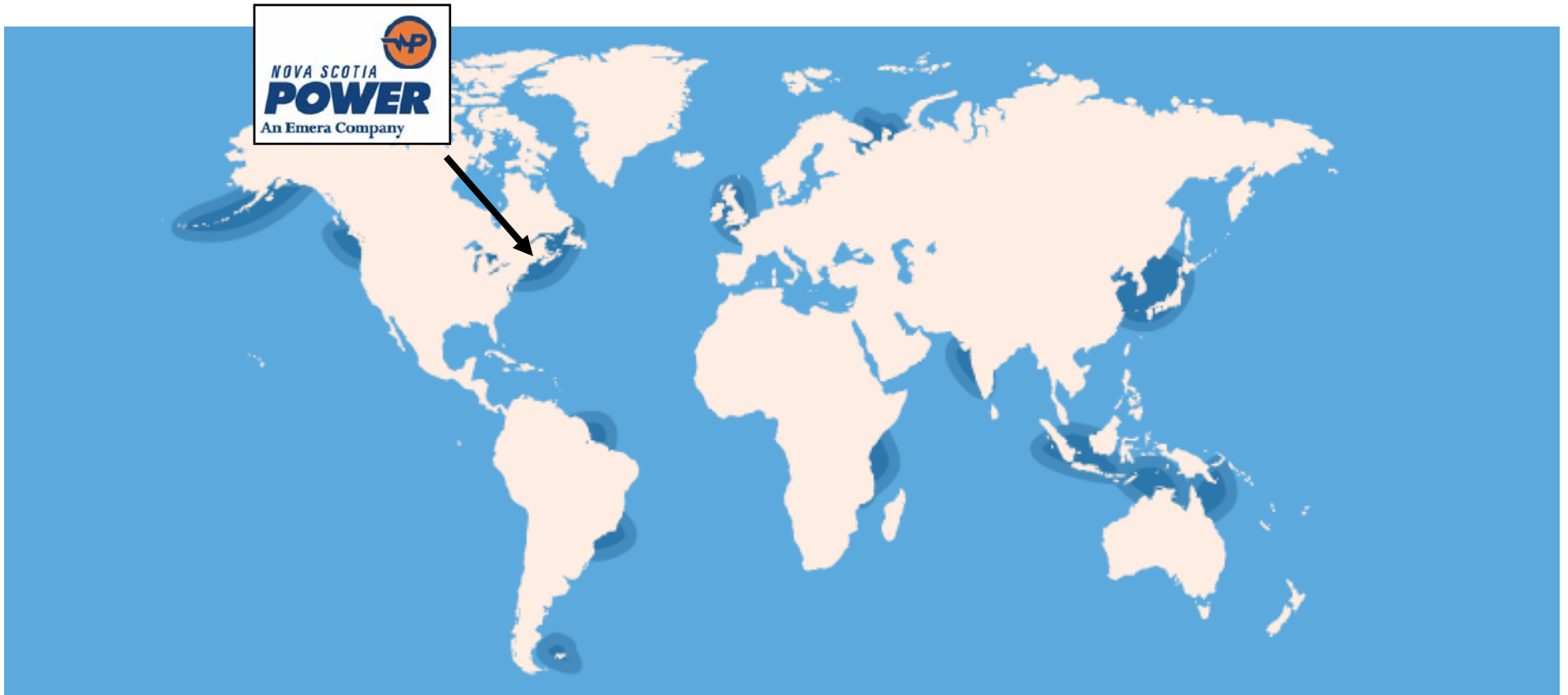


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# Commercial Developments

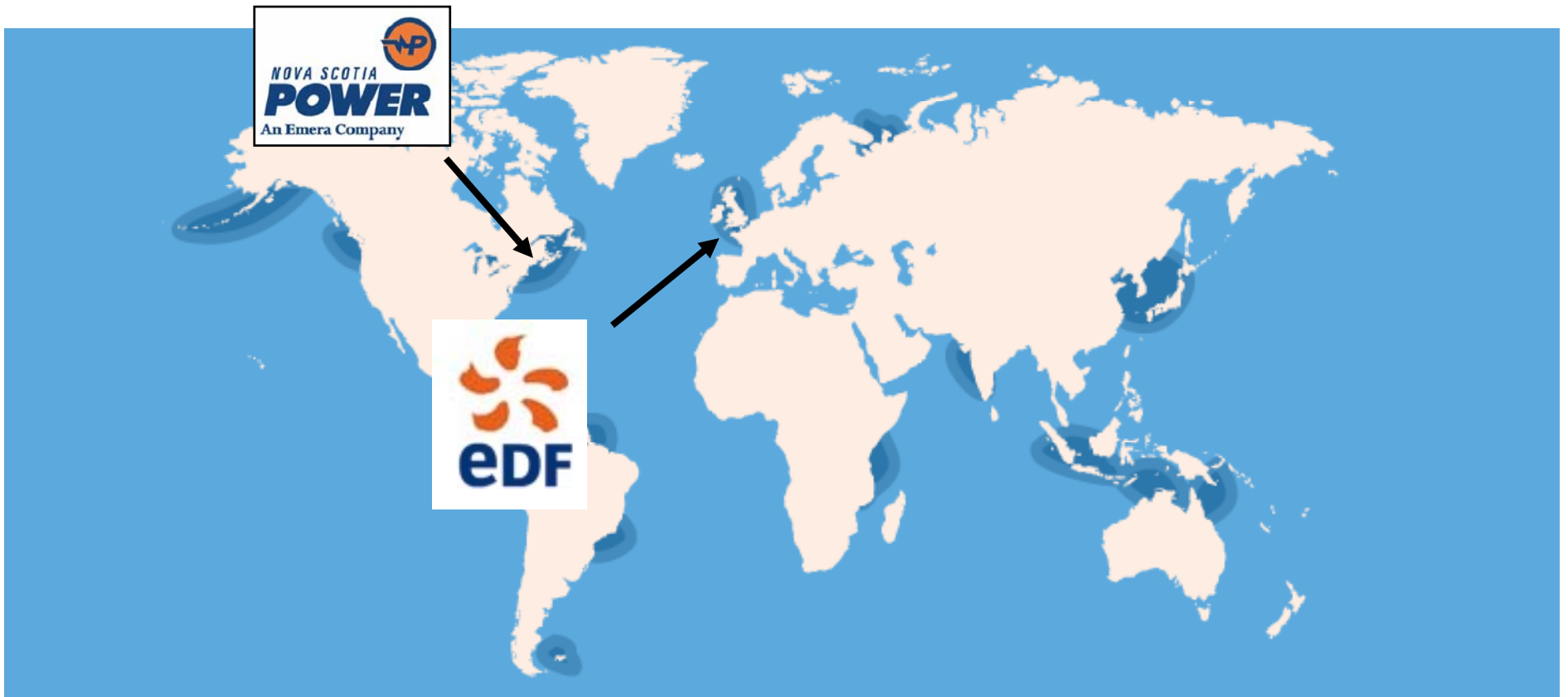
## Nova Scotia Power Inc (NSPI)



- ❑ Install 1 MW in Bay of Fundy (October 2009); plans to scale up to utility scale farm.

# Commercial Developments

## Electricite De France (EDF)



- ❑ Installation of array of large Open-Centre Turbines for EDF in Brittany site (2011).

# Commercial Developments

## Alderney Renewable Energy (ARE)



- ❑ OpenHydro holds 20% investment in ARE; site with potential to develop 3GW.

# Commercial Developments

## Pentland Firth (Scotland)

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- ❑ OpenHydro in joint application as part of Pentland Firth licensing round.

# Commercial Developments

SnoPUD

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- ❑ OpenHydro selected by SnoPUD for showcase tidal project in the US.

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# Open-Centre Turbine

## Funding

- ❑ OpenHydro has raised €52m since 2004 over four rounds.
- ❑ Most recent funding was for €40m completed in 2007.



# Open-Centre Turbine

## Funding

- ❑ Key investors include:
  - Founding shareholders.
  - One51 (Irish renewable investment group).
  - Emera (leading Canadian energy company).
  - Large group of high net worth investors.
  
- ❑ OpenHydro plan to raise further finance in 2009/2010.



# Commercial Developments

## Economics

- ❑ OpenHydro will initially produce energy at offshore wind levels.
  
- ❑ Key drivers of this cost include:
  - Capital cost           €1.6m per MW
  - O&M                    5% of CAPEX
  
- ❑ Energy produced is predictable.





**Thank you**

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