

**OREG 2009
Spring Event**

**Bay of Fundy Tidal Energy Forum:
Working Together for Sustainable
Success**

**Russell Stothers
Chief Operating Officer**

May 13, 2009

Agenda

- Clean Current Overview
- Race Rocks Tidal Turbine
- Bay of Fundy Tidal Turbine
- Supply Chain Requirements
 - Design Stage
 - Manufacturing & Deployment Stages
- Supply Chain Challenges
 - Cost
 - Schedule
 - Level of Experience

Clean Current Development History

2001

- Applied for ducted turbine generator patent

2002-03

- Built and tested a 0.5 m and 1.0 m prototype in freshwater

2004

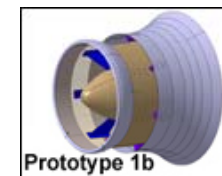
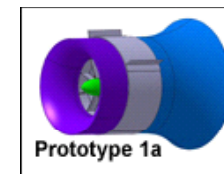
- Applied for flow enhancement patent
- Tested 1 m prototype at Institute of Ocean Technology (Newfoundland) towing tank

2006

- Applied for fault-tolerant permanent generator patent
- Built and tested flood fault-tolerant permanent magnet generator
- Deployed Race Rocks demonstration tidal turbine. Tidal currents > 7 knots in an ecological reserve

2008

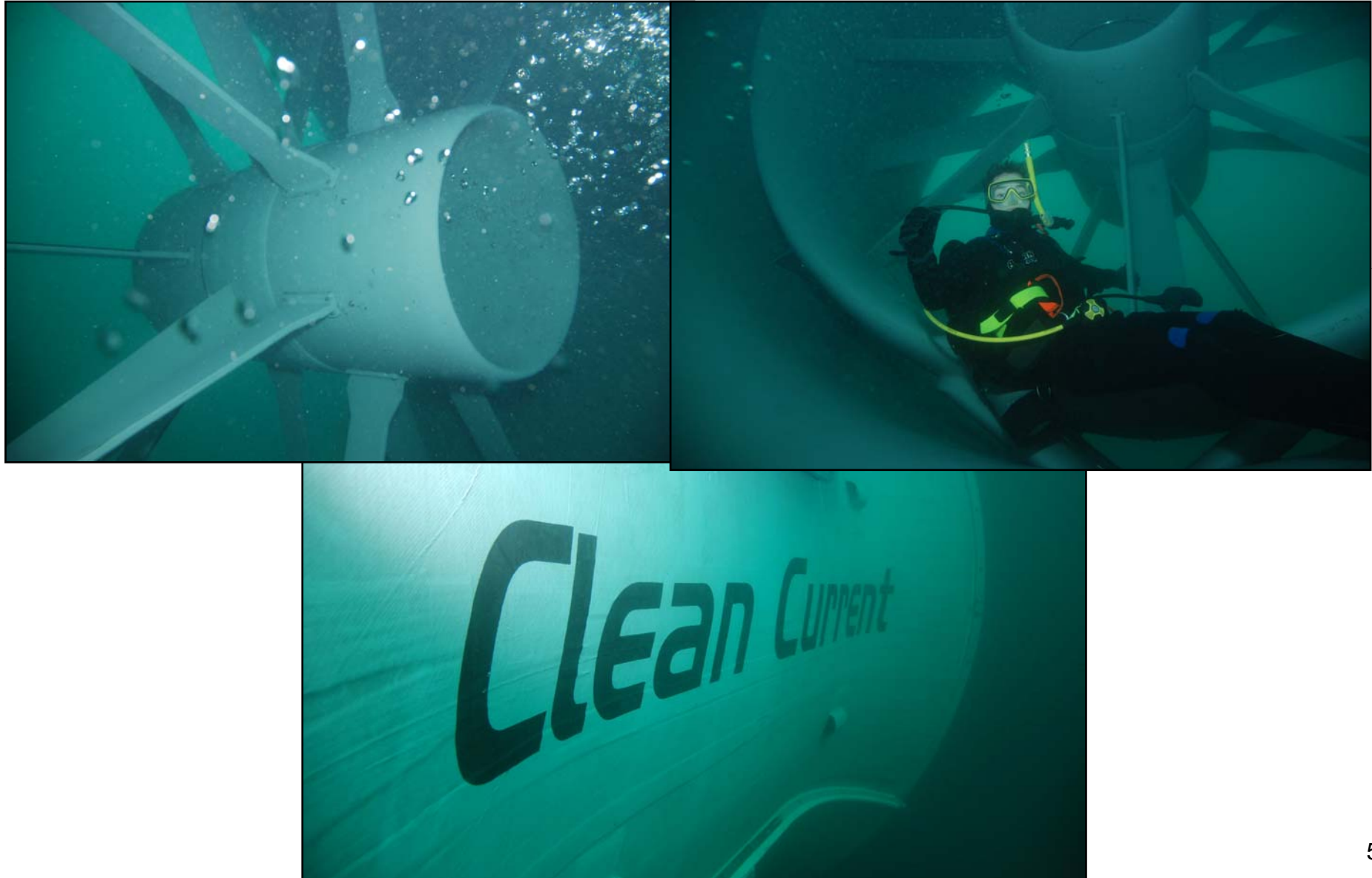
- Selected as one of three participants in Bay of Fundy commercial demonstration
- Applied for subsequent generator patents



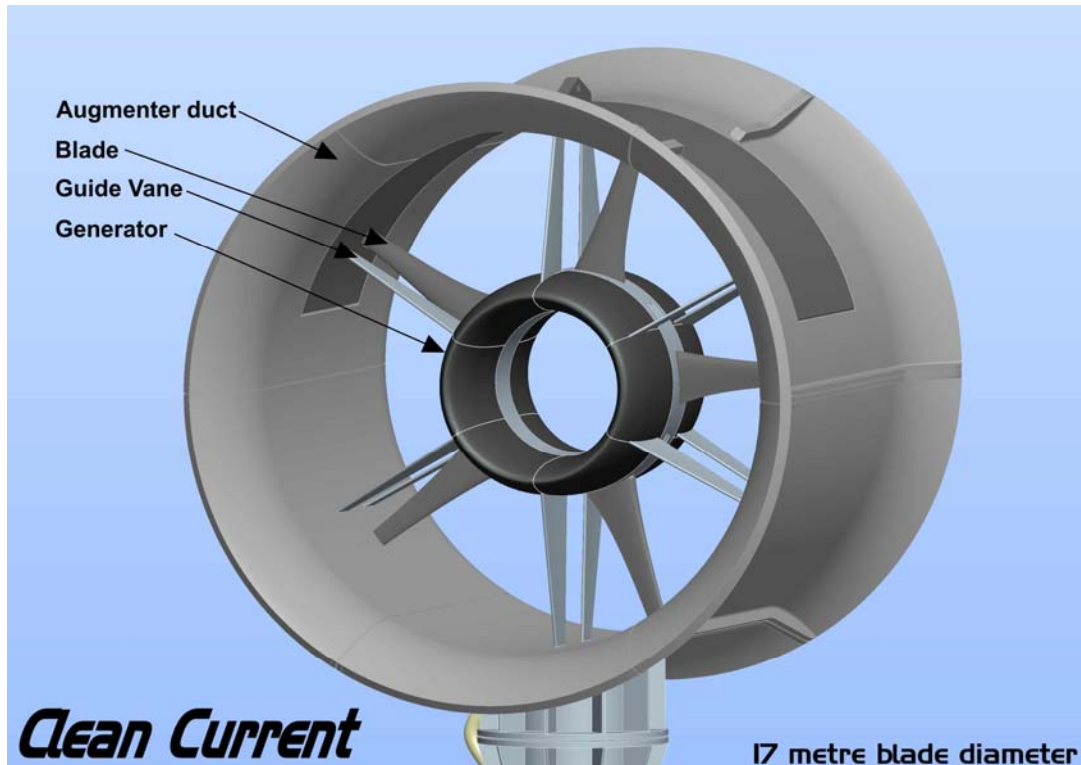
Race Rocks - Installations & Retrievals



Race Rocks - Operation & Inspection

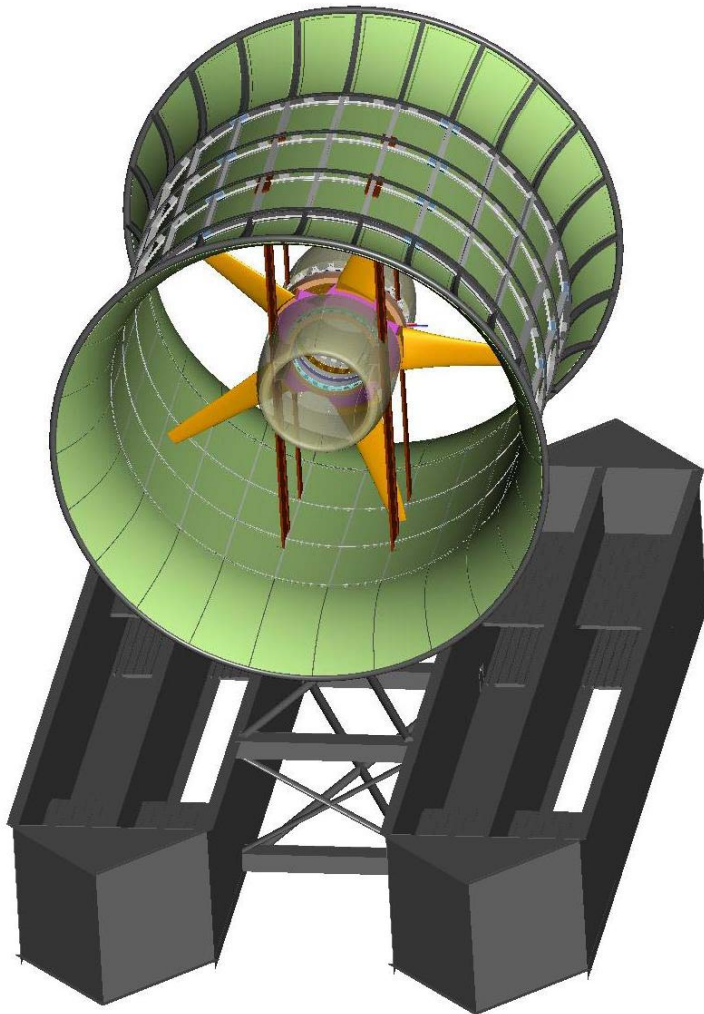


Bay of Fundy Demonstration Unit



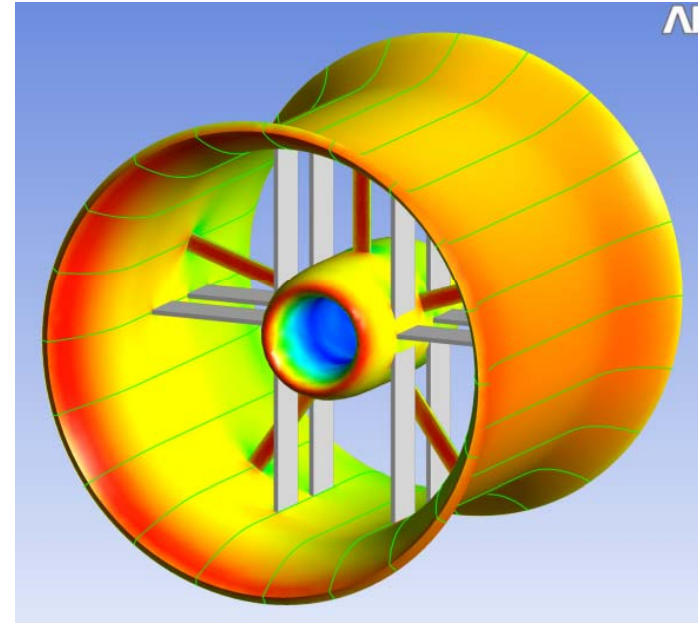
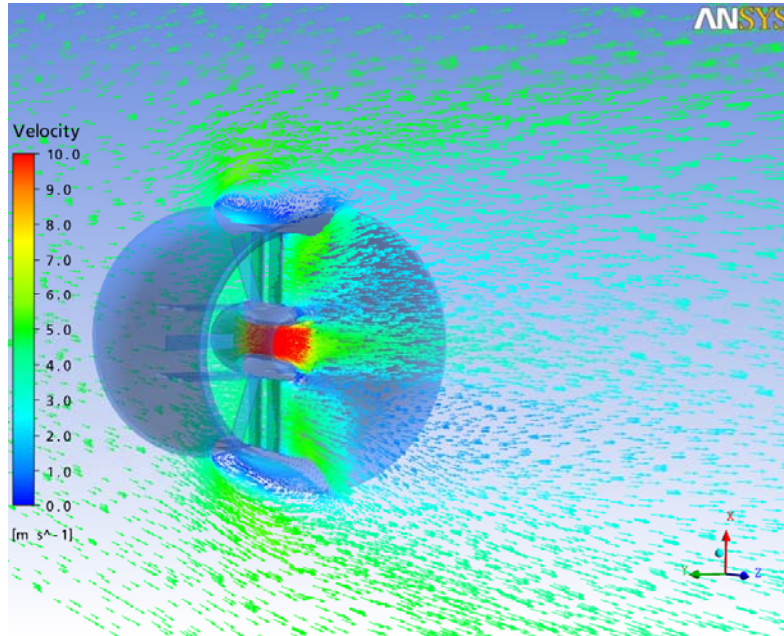
- Simplified design - enhances reliability
- Augmenter duct
 - Increased power
 - Corrects directional changes, controls turbulence
- Flooded PM hub generator

Tidal Device on Gravity Base



- Steel gravity base structure is preferred option
- Less challenging deployment & retrieval
- Can be tailored to site requirements

Turbine Design & Analysis



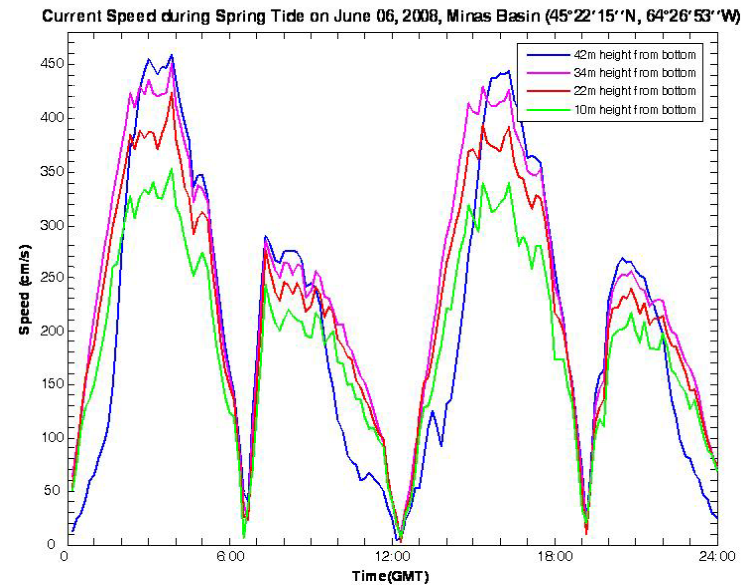
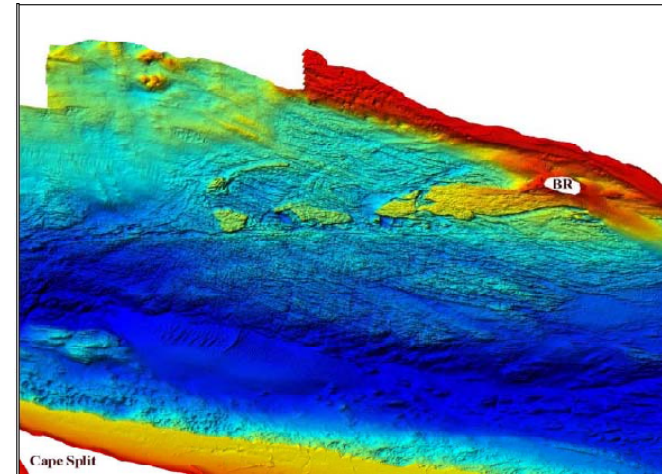
Site characteristics → Fluid flow analysis → Structural analysis

Supply Chain – Design Stage

Critical supply chain requirements

- Metocean Data
- Geophysical Data
- Geotechnical Data
- Environmental Data

Best sourced locally



Supply Chain – Manufacture & Assy

Core technology manufacture by company

- Turbine
- Generator
- Bearing system

Large components dictate
manufacture near site

- Ducting
- Foundation
- Blades

Final assembly performed at
tidewater



Supply Chain – Marine Operations

Local experience will play a major role

- Supply vessels
- Tugboats
- ROV's

Maintenance Activities

- Unlikely to be performed on site
- Require local infrastructure



Supply Chain Challenges

Cost

Be careful of experience base

- Oil and gas industry
- Wind energy industry

Cost Drivers

- Very few off the shelf components
- Build/spend here funding requirements
- Remote site issues
- Cost of buying one at a time

Supply Chain Challenges

Schedule

- Competition with wind & offshore oil & gas
- Very few off the shelf components
- Long lead time items
- Remote site issues

Experience

- New industry
- Relevance of wind & oil and gas industries
- Trained labour force

Clean Current Power Systems

- **Great opportunity for local supply chain**
- **Experience gained applicable to locations worldwide**

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