



NORCAN
HYDRAULIC TURBINE INC.



Norcan Hydraulic Turbine Inc.

Climate Change Solution Provider

Richard Norrena



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Climate Change Solutions

Norcan offers climate change solutions for all of the Kyoto mechanisms:

- Clean Development Mechanisms
- Joint Implementation Projects
- Certified Emissions Reduction Credits

Delivering reductions in GHG emissions.



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Outline

- Corporate Information
- Innovation - Leading Edge Technology
- Climate Change Solutions
 - Increased Power Production
 - Remote Production Advantages



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Corporate Data

- Established in 1992
- Serving the hydro-electric industry in Canadian, U.S. and international markets
- Specializing in 400 kW to 15 MW projects
- Custom runner designs
- Design, manufacture, installation & maintenance capabilities



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Leading Edge Technology

Introducing Norcan as a player in Canada's Innovation Agenda



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Leading Edge Technology

Investment in software and equipment:

- Computational Fluid Dynamics (CFD) abilities
- Various Geometry editors
- CNC machining processes

Have allowed Norcan to take major steps forward in the small-hydro design field.



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CFD Designed Runner



CFD designed Francis runner

- Shorter design cycles
- Economically feasible for smaller sites
- Theoretical Design to Product realization with 100% accuracy



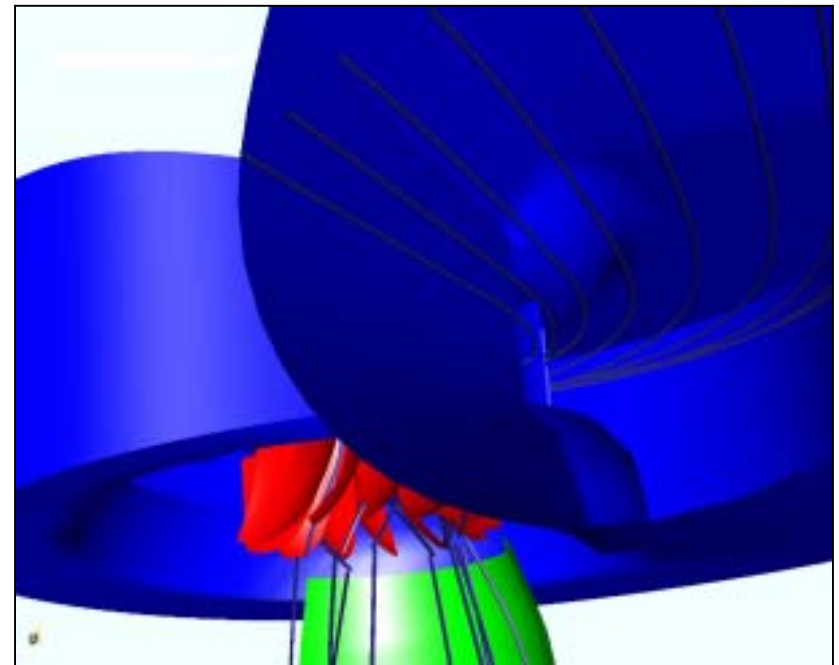
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The Geometries are then used to create a virtual hydraulic laboratory:

- Preliminary Runner designs created
- Auxiliary components introduced (directional vanes)
- Complete hydro-site recreated
- Final runner geometry chosen

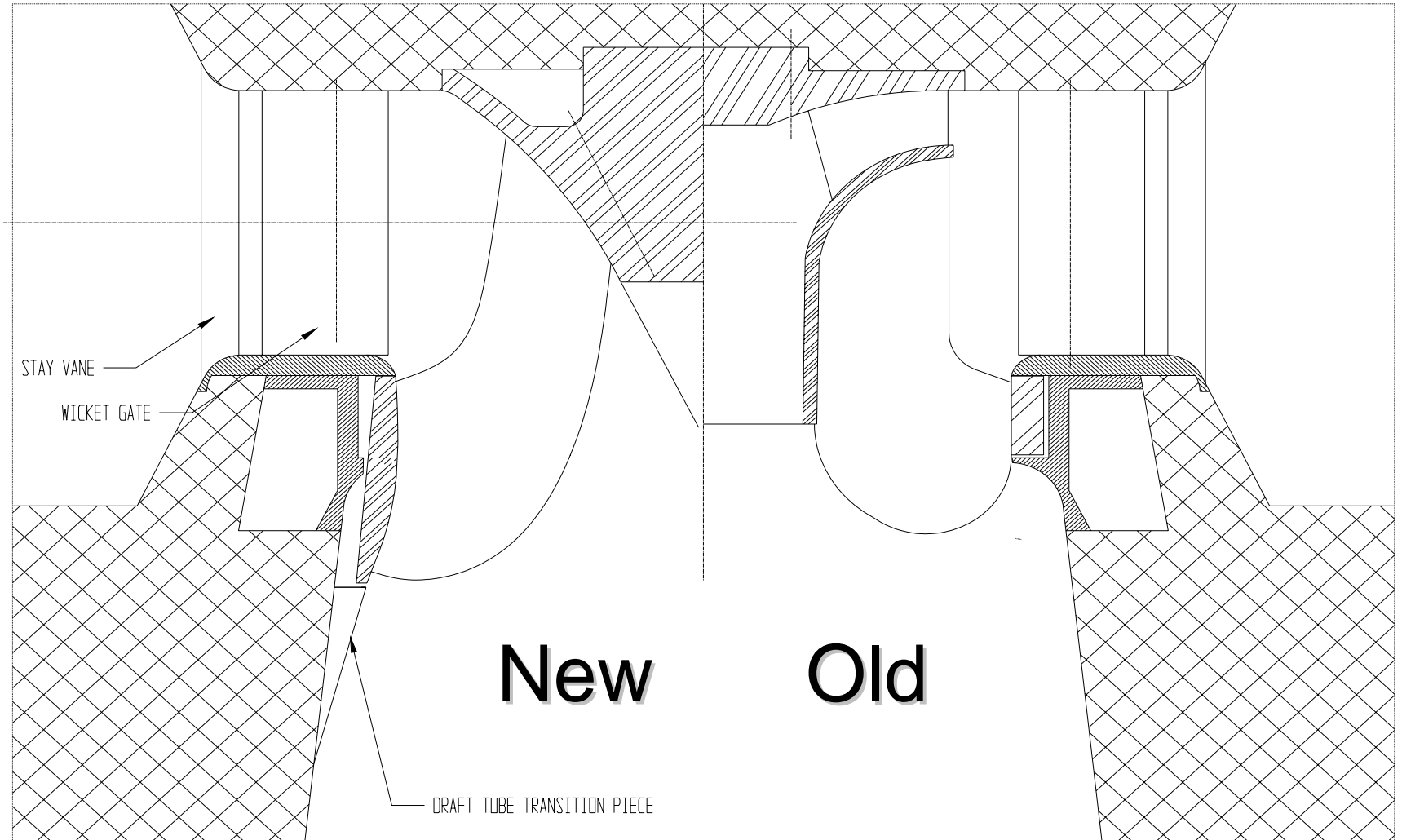


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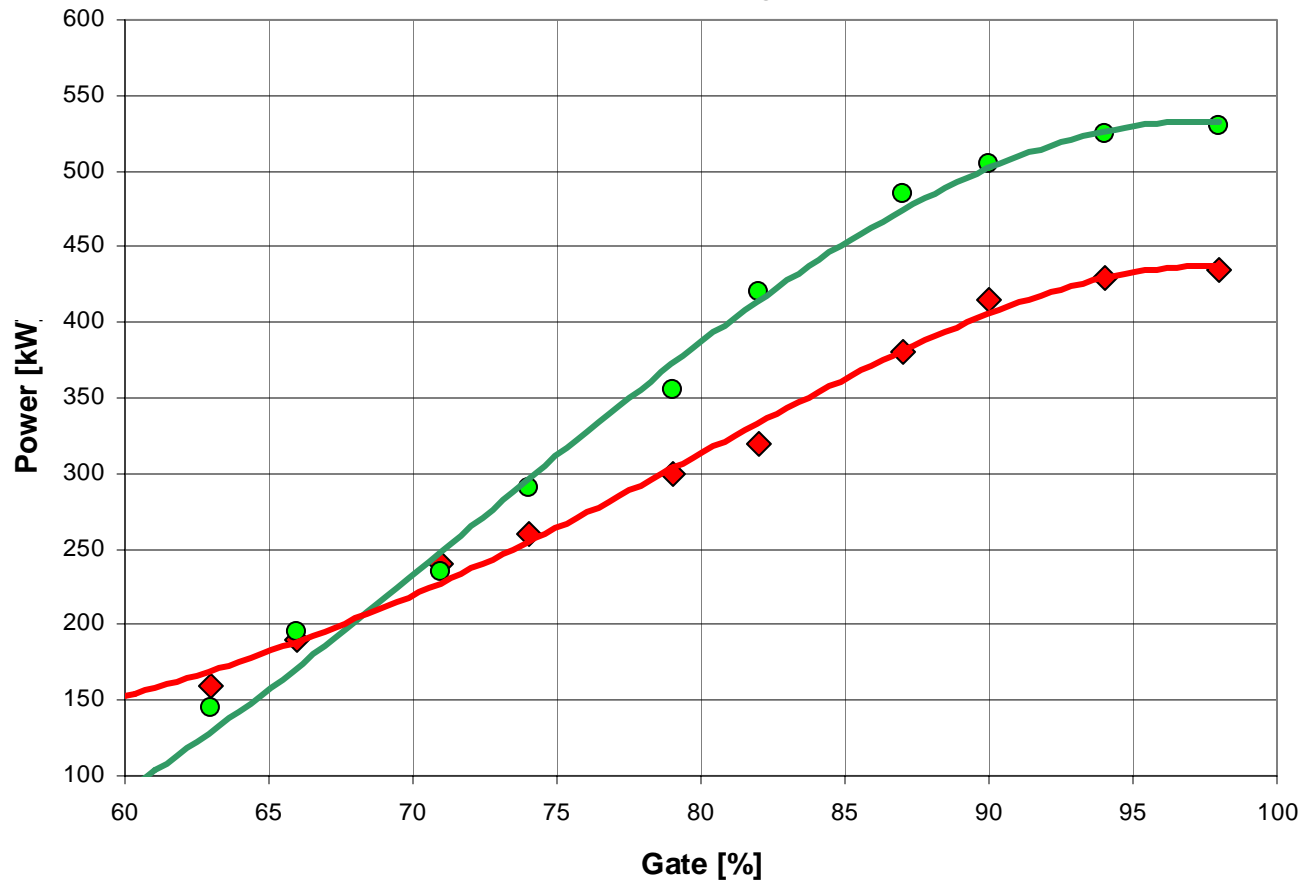
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Field test
Salmon Falls – CFD design results



AFTER

BEFORE



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Final Product

- Average increases in generator outputs of 20-30%
- Increase in overall runner efficiencies
- Improved operating conditions (less cavitation)

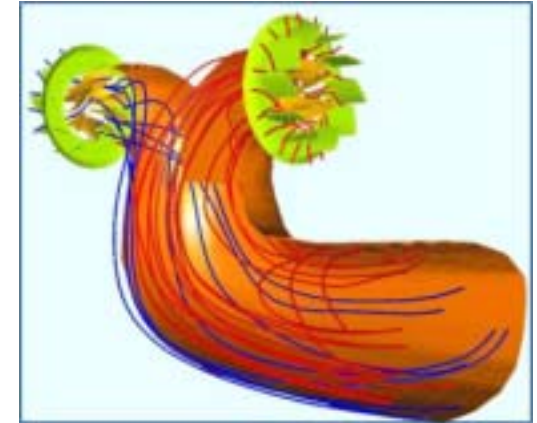


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Case Study - Energy Ottawa



Energy Ottawa Powerhouse #2

Chaudiere Falls (Ottawa), Ontario

Replacement of 4 Double Horizontal Francis Units, Including Camelbacks and Distributors.

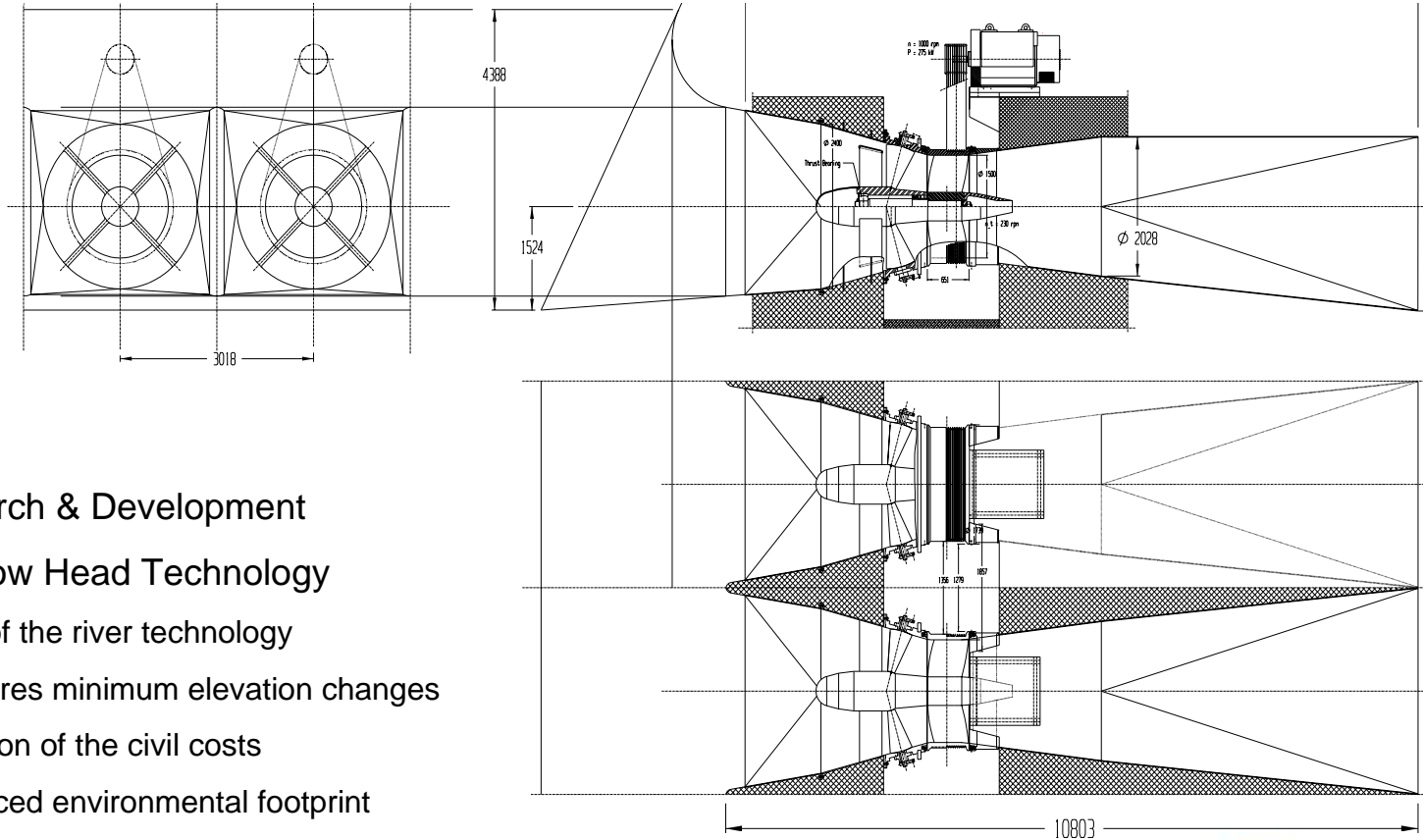
Generator Output:

Before: 1.390 MW

After: 1.850 MW



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Research & Development

Ultra-low Head Technology

- Run of the river technology
- Requires minimum elevation changes
- Fraction of the civil costs
- Reduced environmental footprint



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Climate Change Solutions

Generating Emission Reductions



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Unleashing Site Potential

- Retrofitting existing sites
- Maximizing potential power
- Limited environmental impacts
- Reducing the number of new sites needed
- Allowing sites to remain productive for local communities
- Co-benefits such as reductions of SO_x , NO_x and Particulate Matter (PM)

Harvesting the low hanging fruit



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GHG Emission Reduction Calculations

Average Emissions
Coal Power Generation

Co ₂	1.0250 Kg/kWh
So ₂	0.0029 Kg/kWh
No _x	0.0027 Kg/kWh

Harvesting the low hanging fruit



Replacement Francis Runners
Ottawa Hydro



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Remote Production Advantages

Locations in developing countries now have access to clean energy:

- Reduced infrastructure costs
 - limited need for transmission lines
- Stable power, separate from national grids
- Improving general living conditions
- Contributing to sustainable development
- Sites may be developed for flood prone areas



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