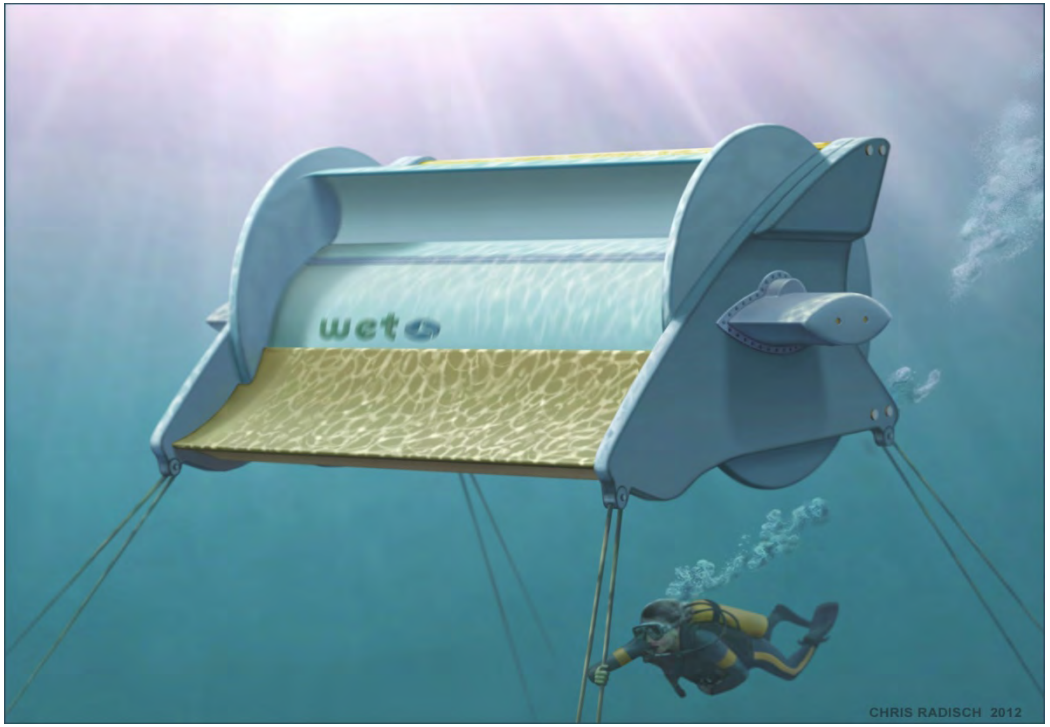
Waterotor Energy Technologies Inc.

- Waterflow Becomes Power –

Briefing to the Offshore Renewables Task Force; National Ocean Industries Association



16 March 2012

Waterotor Energy Technologies

Anthony J. **(Tony) Asterita**

Washington DC Operations
1108 Villamay Blvd.
Alexandria, VA 22307
703-768-3580; tonyj@waterotor.com

Company Profile

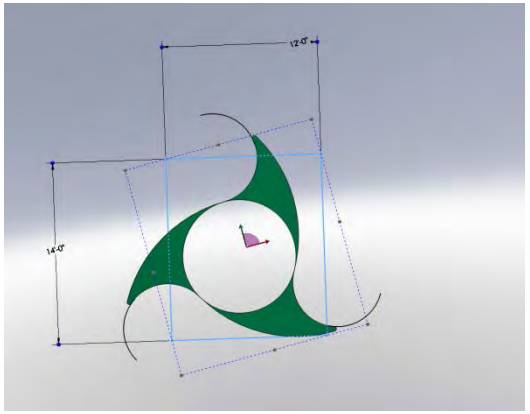
- Early stage with small, committed ‘family’ of investors
- Directed and managed by an experienced core team
- Vision - Economically viable renewable energy systems that enable new global energy markets
- Developed and tested ‘Waterotor’, a breakthrough technology that harvests electrical power from slow flows, beyond the ability of existing systems
- Business model evolving; focus on burn rate and capturing initial orders
- ‘End game’ is profitable income from licensing, royalty, sale of technology & joint ventures

w.e.t

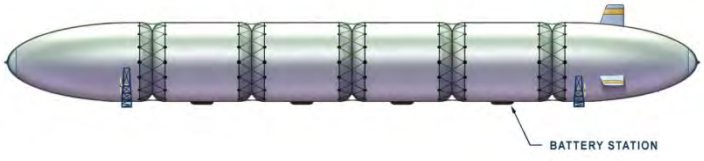
WATER ENERGY TECHNOLOGIES INC

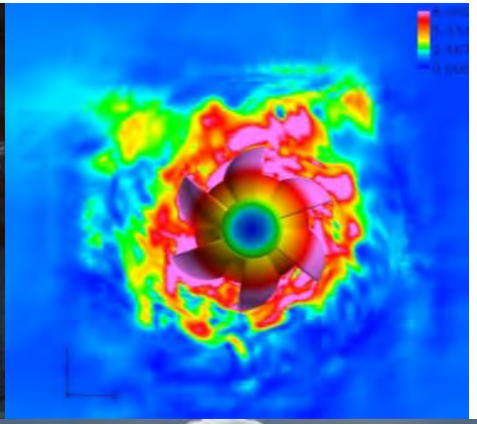
Elevator Pitch

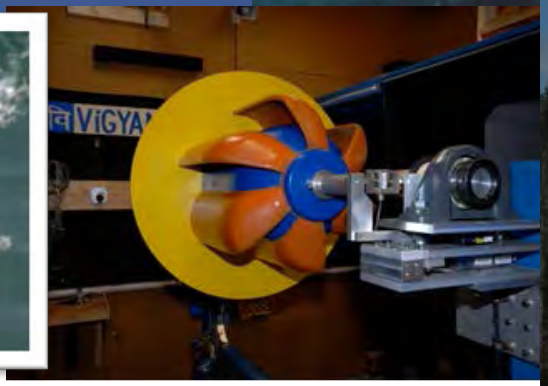
- We focus on developing economically viable renewable energy solutions
- We validated Waterotor with a 5 cents per kilowatt-hour
  - verified with field tests
- We are ready to demonstrate with a preproduction prototype as prelude to market insertion
- Performance in slow flows opens new markets on a global scale – beyond the capability of competing systems



20+ years Experience with Rotating Aerospace Structures and Economical Energy Devices

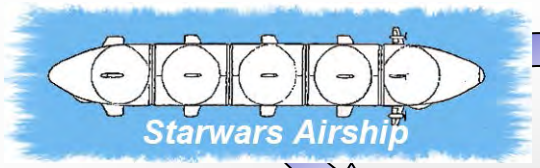






- Rotating-sphere airship
- Airship Technology
- Wind rotors and Waterotors

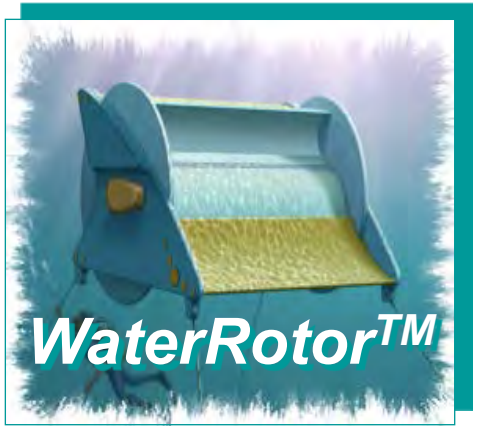
Technology Evolution … Two Paths



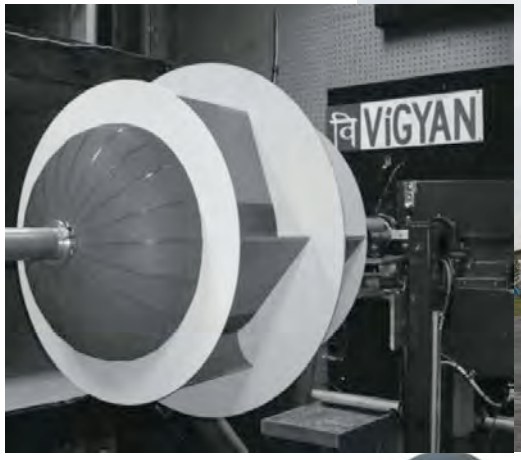
Platform Path

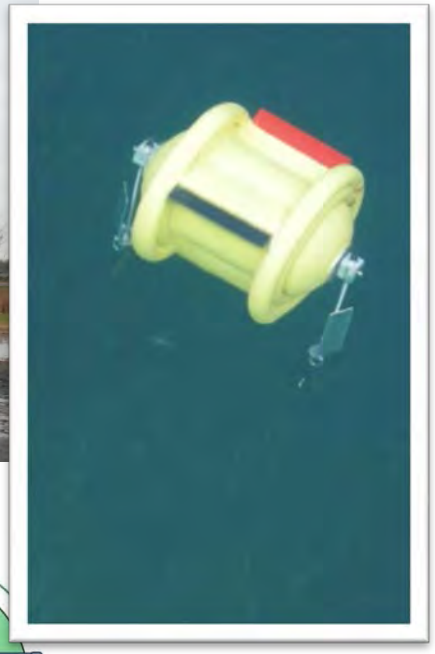
Aero Energy Path

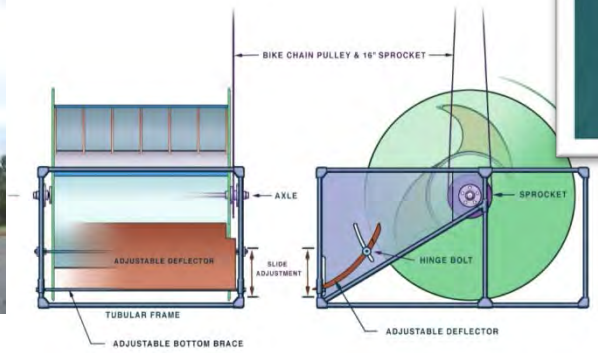
Hydro Energy Path



Waterotor Development History



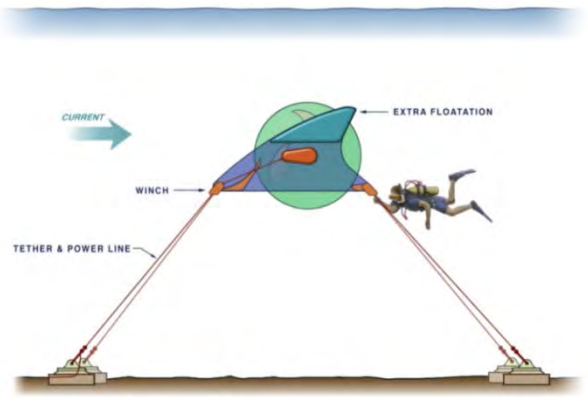


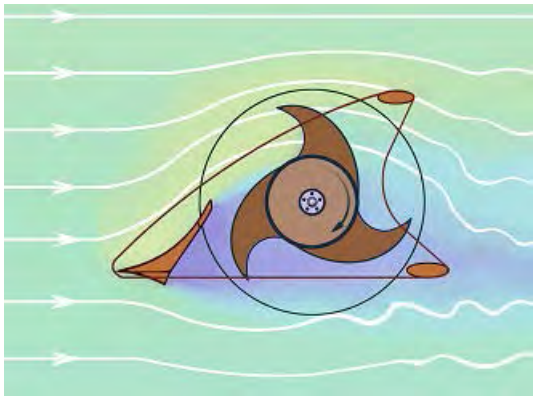


R&D & tests in design, fluid flow, hydrodynamics and Structures

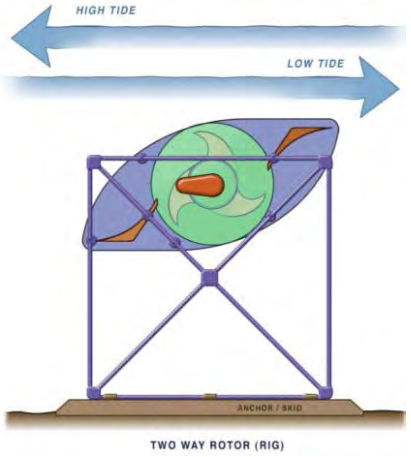
2007 – 2009 Experiments, Studies, Analysis
2010 – Initial Verification Testing
2010 – Patent Applications (world –wide)
2011 – Prototype Demonstrations &Validation
2012 – Prototype testing, initial sales

Waterotor Description





One-way



Two-way

- Low-Head Hydrokinetic System with optimum design
- Three-vane drum rotor with unique design that rotates about a horizontal axis in response to water flowing from 1.7 mph to over 10 mph
- Rotational energy is converted to electrical power through on-board generators and transferred by cable to shoreline, then stored, or used
- Ballast sustains the Waterotor which descends or ascends to depth for best currents. Anchors and / or buoys secure the device

Low-Head Hydrokinetic System Types

Vertical Axis

- Slow rotation, torque driven
- Lower efficiency
- Shallow & deepwater
- Simple anchoring
- Environmentally friendly
- Deflects debris
- Omni-directional

Horizontal Axis

- Rapidly spinning, speed driven
- Higher efficiency
- Deepwater
- Requires fixed Moorings
- Fish kill concerns
- Susceptible to debris
- Uni-directional

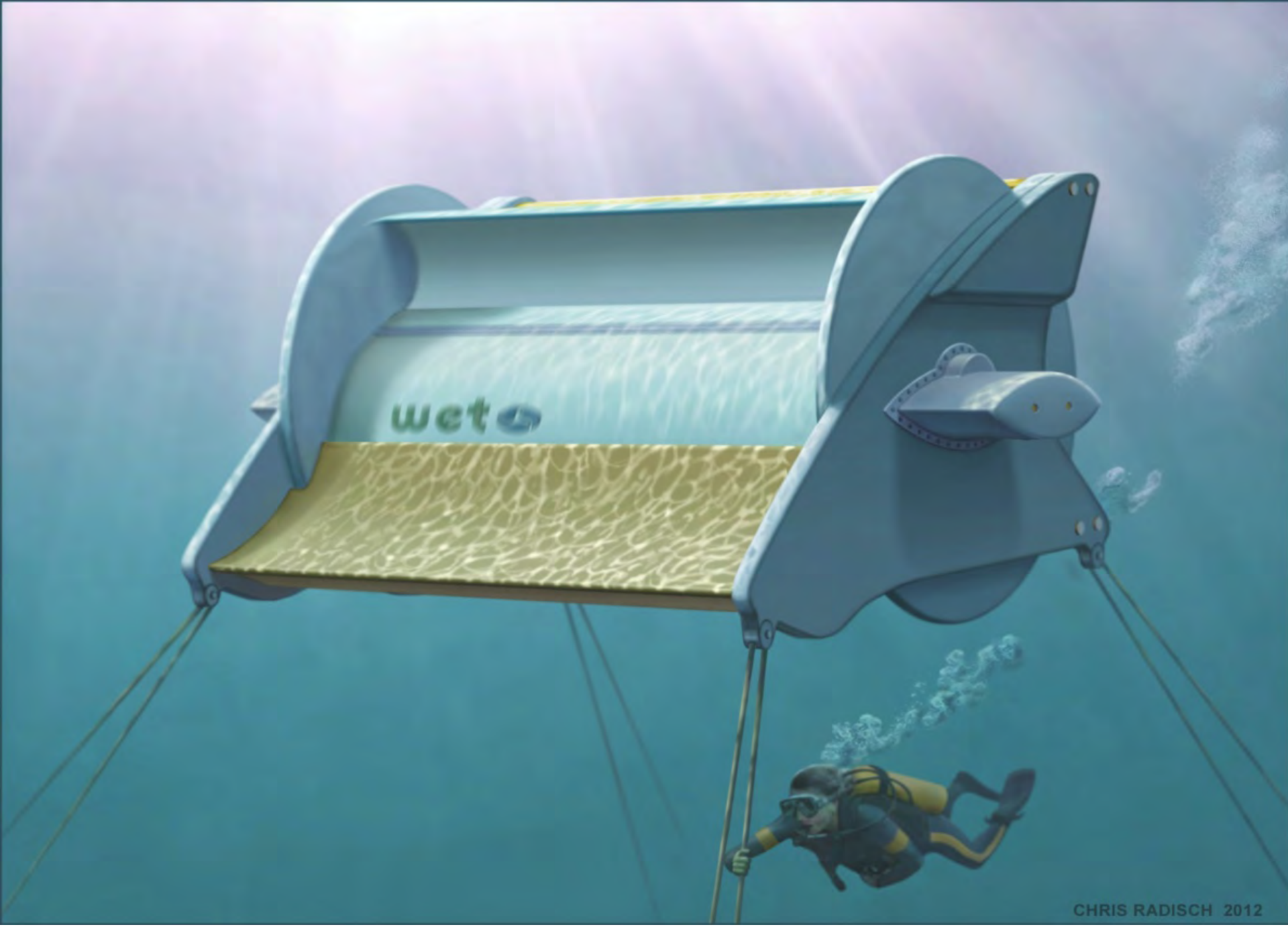
Waterotor - Vertical Axis System; Rotated Horizontally

Waterotor Advantages

- Scalable from kilowatt to megawatt outputs
- Wide water flow speed range
- Simple bottom fixtures
- Mobile for easy deployment

- Environmentally friendly; no fish kill; deflects debris via natural boundary layer
- Can be applied in clusters for increased power
- Inexpensive to deploy and operate (5 cents/kW-hr)

Resolves the Market 'Pain' for an Economical Renewable Solution


wet
CHRIS RADISCH 2012

First Test
1.7 mph Flow

Test

Water test Alpha 9 Aug 2011:
Gallop Canal (St. Lawrence System)

Observations:

Water Flow :	52	ft in		22	sec	2.36364 ft/sec	1.6096364 mph	
RPM:	10		10	6	sec per revolution	10.47198 ft per revolution		1.74533 ft/sec
disc diameter	4	ft						
Pull force	22	lbs						
Blade dia	3.33333333	ft						
Torque	44	lb- ft						
HP	**0.08380952**		**0.062521905**	**KW**				
frontal area	13.3333333	sq ft						
rotational speed – blade		1.745329252	ft/sec					
TSR	0.73840853							

in S-I Units:

Water Flow :	15.8496	m		22	sec	0.72044 m/sec	1.6115441 mph	
RPM:	10		10	6	sec per revolution	0.972878 m per revolution		0.16215 m/sec
disc diameter	1.2192	m						
Pull force	9.979024	Kg						
Blade dia	1.016	m						
Torque	6.08321303	N-m						
Power output	**62.4725401**	**W**	**0.083743351**	**HP**				
frontal area	1.23870667	sq m						
Power available	**231.592961**	**W**	**0.310446329**	**HP**				
rotational speed – blade		0.531976356	m/sec			0.10472		
TSR	0.73840853							
Cp	0.2697515							

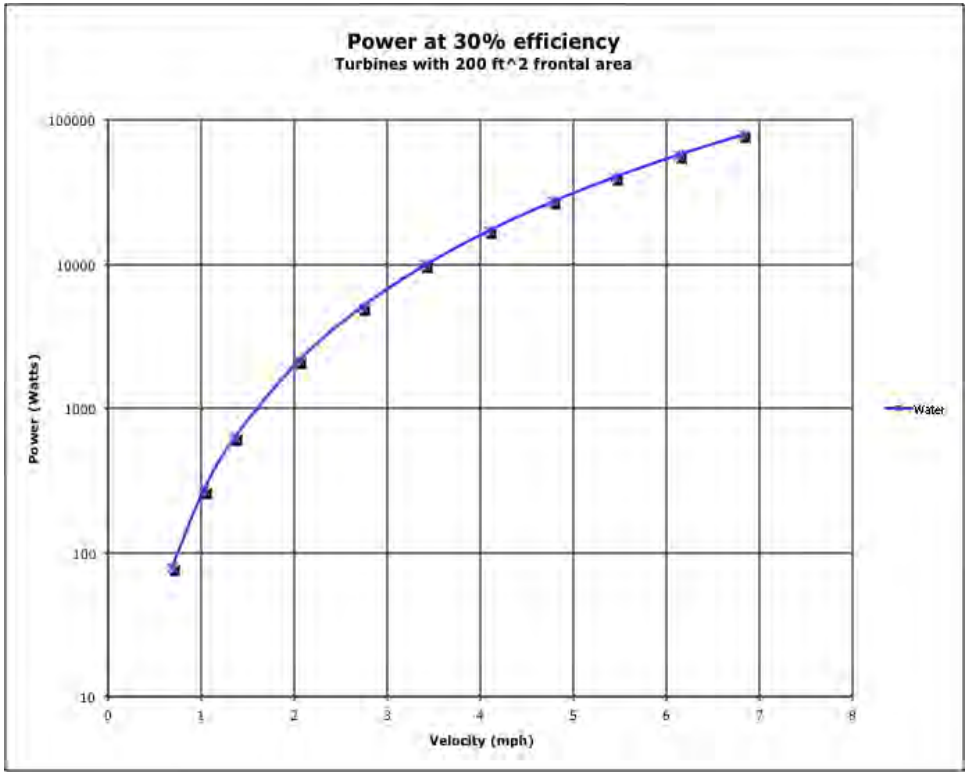
1 inch = 0.025 4 meter
1 feet = 0.304 8 meter
1 meter/second = 2.236 936 292 1 mile/hour (mph)
1 lb. lbs = 0.453 592 37 kilogram
1 pound foot = 1.355 817 952 newton meter
1 square foot = 0.092 903 04 square meter

Second Test
3 mph Flow

Waterotor 5 kW test rotor mounted on custom built pontoons. Automated controls lower the Waterotor into the flow

Waterotor Demonstrated High Efficiency in Both Tests

Testing verified efficiency of 30%, close to maximum practical limits and beyond the capability of existing systems - a result of unique vane design



- *Efficiency is defined as power output divided by the total energy of the captured flow*
- *Betz limit of 59% is theoretical maximum*
- *Waterotor efficiency of 30% is 4 times greater than standard drum-type rotors*
- *Efficiency is directly related to low cost per kilowatt-hour & economical viability*

Design ⟶ Efficiency ⟶ Economical viability

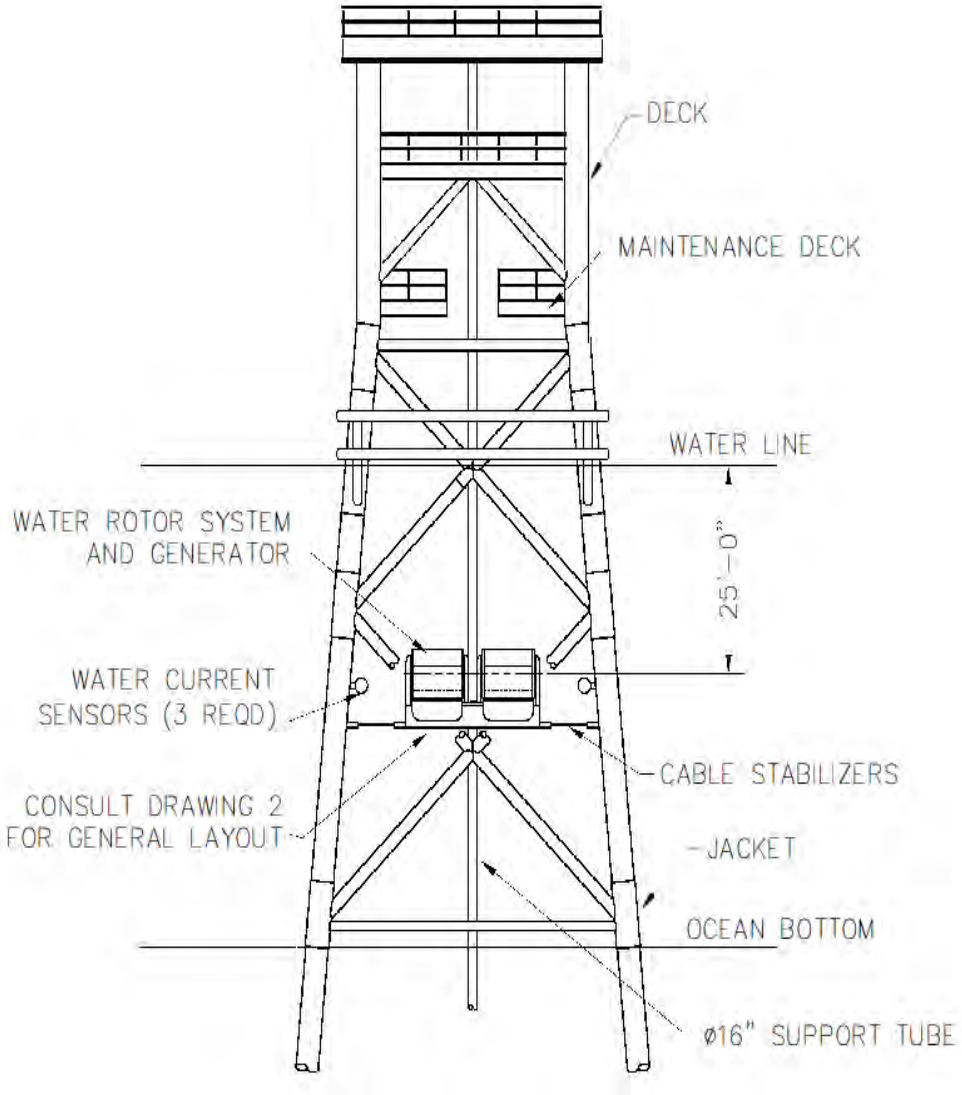
Next Step

Real World operational testing of a preproduction Waterotor as a prelude to market insertion

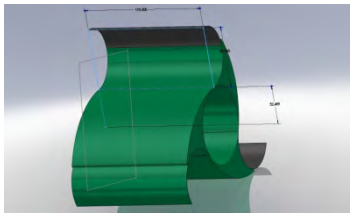
Preproduction Testing
Waterotor Test Rig

- Test Platform for preproduction units
- In Gulf, 10 miles south of Galveston, Texas
- Flow averages 3 mph for 48 weeks each (Univ. of Houston study)
- Production readiness & customer demos late 2012
- Prelude to first orders

Waterotor Installation



- Mounted 25 ft below surface and locked on indexing table for directional control
- Sensors indicate flow direction and speed
- Winch at deck level to raise for maintenance
- Provide 20 kW to deck for monitoring & distribution



Gulf Oil Rig Platform Market

How To Resolve The Market's 'Pain'

- Reduce dependency on solar and wind systems which have low availability
- Reduce dependency on diesel fuel which is expensive, manpower intensive, and requires long-lead permits and approvals
- Waterotor coupled with diesel an interim solution
- Applications:
  - Extract oil from 'depleted' wells – Power to raise oil from 200-ft level to surface
  - Unmanned platforms – Power for lights, fog horns, repeaters (liability issues / hazard to navigation)
  - Manned platforms – Separators, pumps, cranes. on-board systems

More than 6,000 Waterotors required for this market segment

Philippine Market Opportunity

- More than 20 million citizens without power
- Typical of other island nations in the region
- Dispersed villages with 200 to 500 inhabitants
  - Unreachable by grid systems
- Pilot project being developed with Gov't

More than 2,000 Waterotors required for this market segment

Follow-on Market Potential 2015

Ref: AltProfits 2009

	Capacity (GW)	**Market Size ($B)**	***Market Growth*** (5 years)	***W.E.T Potential*** (<1% Market Share)
Small Hydro ***(1 to 10 Mw)***	110	38.5	**16%**	***$350M***
Large Hydro ***(10 Mw & higher)***	945.8	331	***5%***	***$2.5B***

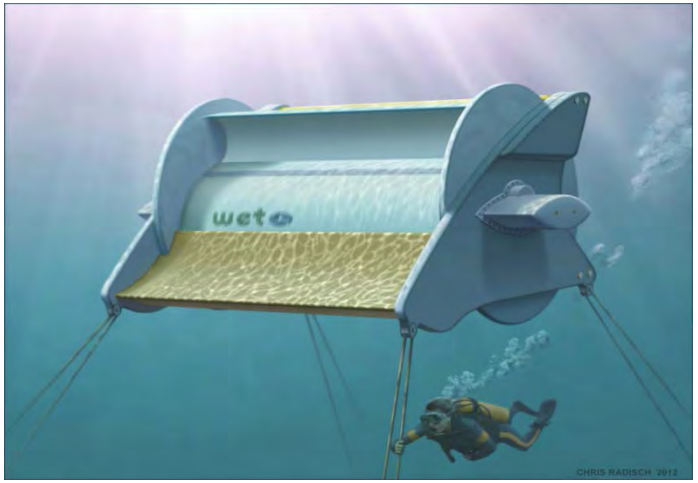
Small Hydro Waterotors will be deployed in tidal estuaries and ocean currents

Large Hydro Waterotors will be deployed in major ocean currents such as the Florida Straits and Gulf Stream

Initial Waterotor Products

- 5 kW & 10 kW commercial Waterotors
  - First Deliverables Late 2012
- 20 kW commercial and industrial Waterotors

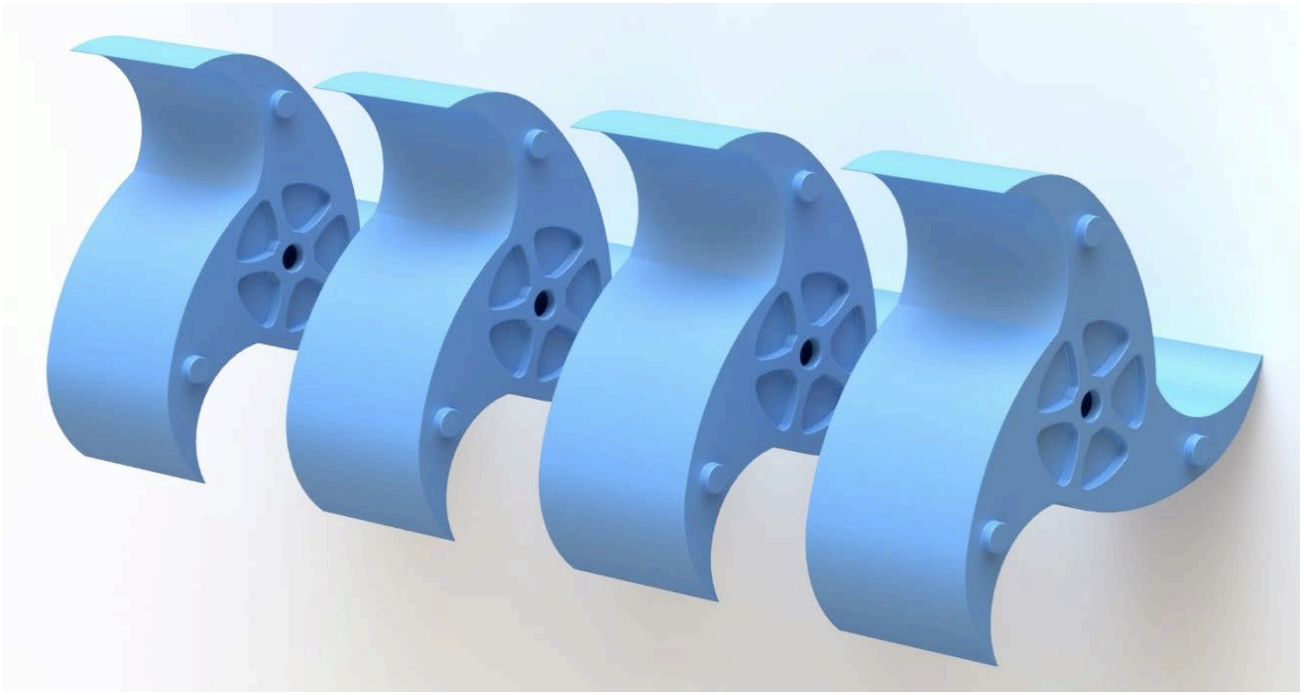
  First Deliverables 2013
- 200+ kW Waterotors
  - Development to pre-production,18 months

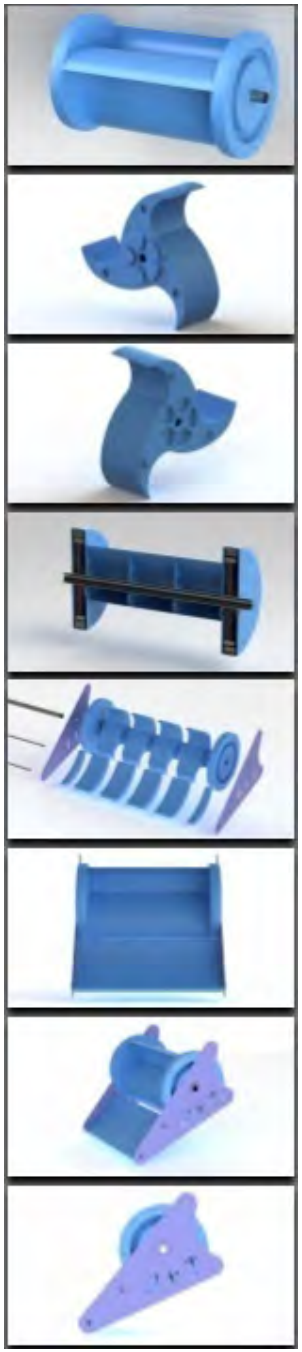


Manufacturing

- RTS is a successful manufacturer with facilities in Canada and USA; uses 'Roto-mold' as core to their processes
- RTS represents a low cost breakthrough for Waterotors; allows attractive cost margins
- RTS is manufacturer of Waterotor sizes up to 20+ kW to meet Gulf Coast & Philippine Markets
- Future manufacturing to be independently contracted to the best assessed companies, world-wide

Roto-mold Modular Approach Tailored Manufacturing





Shown here are four Waterotor vane elements; in this example each element provides a forth of the total power. Additional elements increase power output accordingly . This modular approach facilitates manufacturing flexibility to match market demands.

Status

- Technology breakthrough enables new markets
- Focus on Gulf and Philippine markets
- Testing to date verified performance
- Operational (Preproduction) testing is next
- Initial Manufacturer on-board
- Final investment round discussions ongoing
  - Founders shares available - no dilution or resale restrictions
  - JV, licensing, royalties & sale of technology are options
  - Subscription and Shareholder agreement available

Thank You

Questions?

Contact Info:

Anthony J. (Tony) Asterita

Director, Waterotor Energy Technologies

703-768-3580 (O)

408-489-1401 (M)