

# Lucid Energy, Inc.

NWHA

September 23, 2011



Lucid Energy is a renewable energy company producing clean, reliable, low cost electricity from gravity fed water transmission pipes.



# Product Development Partnership



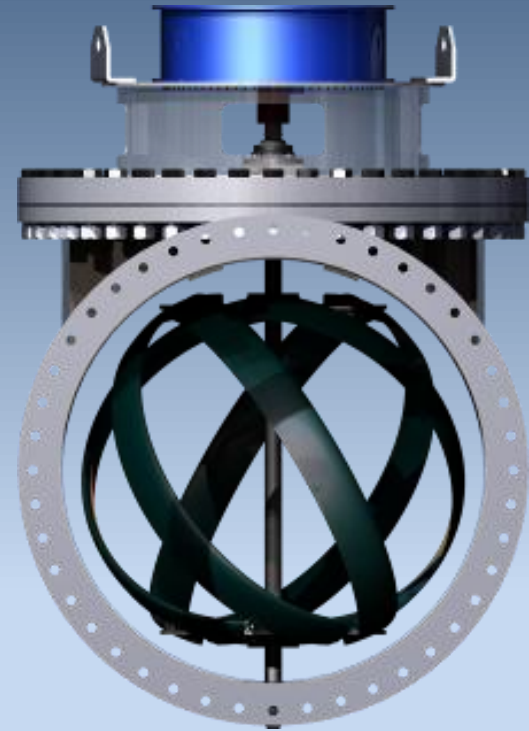
A leading manufacturer of large diameter, high-performance steel pipe

An innovator in low-solidity hydrokinetic turbine design

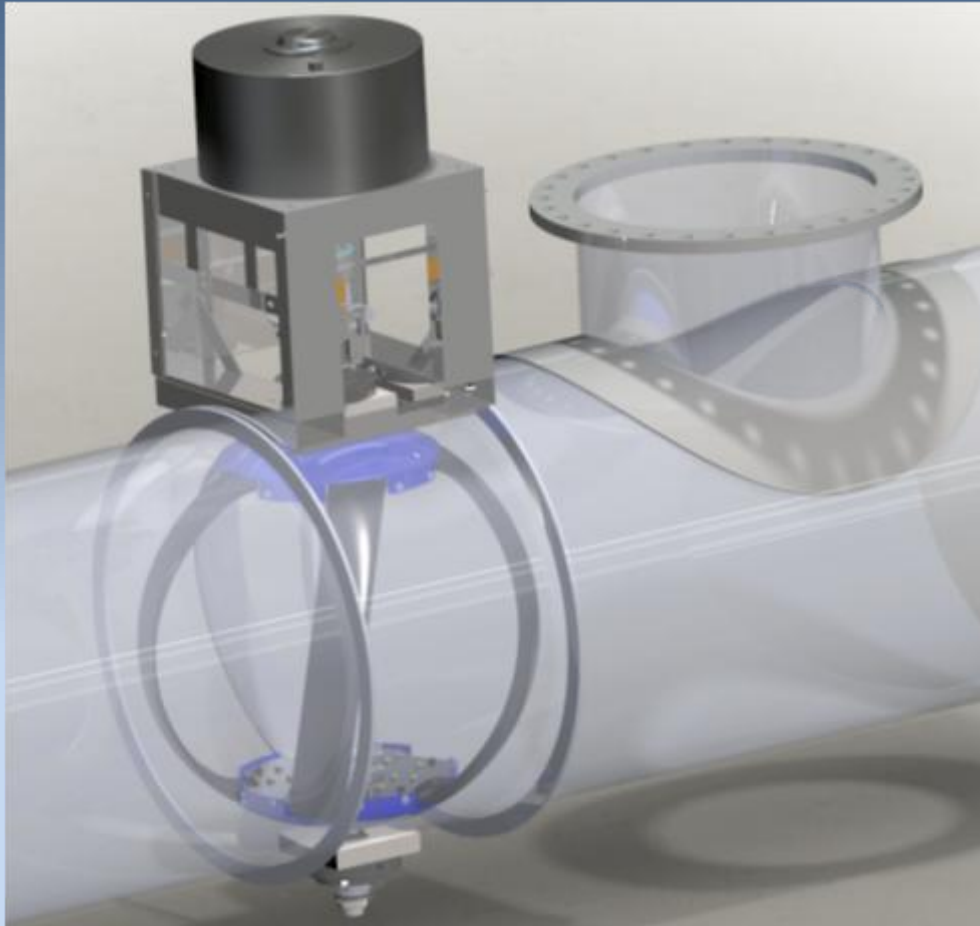


# Northwest PowerPipe™

- 🌀 An innovative vertical axis in-conduit turbine technology.
- 🌀 Captures excess head pressure and transforms that energy into electricity.
- 🌀 Generation during demand.
- 🌀 Poses no threat to fish or wildlife.
- 🌀 Qualifies for FERC in-conduit exemption.



# PowerPipe is low cost and easy to deploy



\* Lower cost than alternative wind and solar solutions

## Key Attributes:

- 🔄 Generates clean, reliable, low cost electricity from excess pipeline pressure
- 🔄 Designed to install multiple turbines in series to maximize energy generation
- 🔄 Remote monitoring capability to minimize operating expense, improve reliability
- 🔄 Scalable to pipe diameters 24"-96"
- 🔄 High capacity factor compared to other renewables



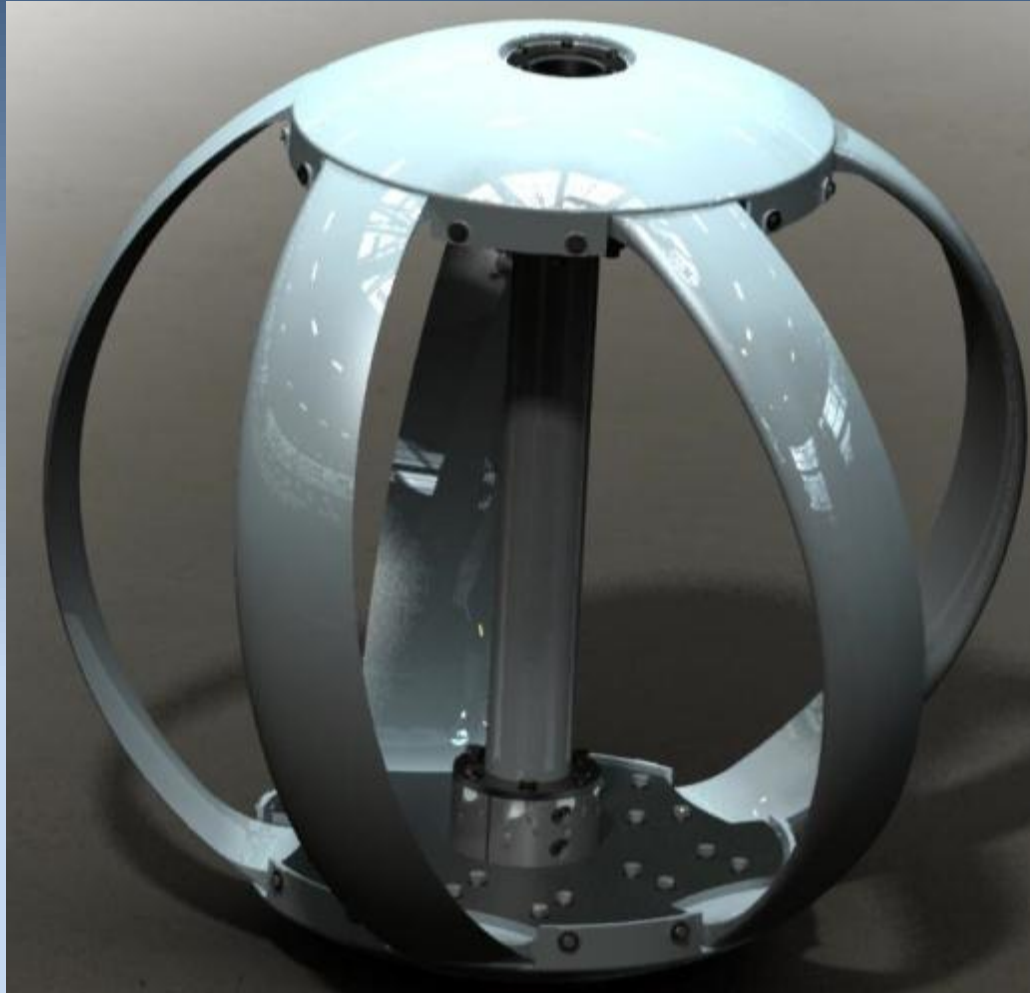
# PowerPipe reduces operating costs

- 🔄 6% of energy in the US and 20% in California is used to move water
- 🔄 Energy is many water utilities' single largest expense, often 40%-50%
- 🔄 PowerPipe gives municipal water operators an opportunity to lower electricity costs



Water Transmission Pipeline

# PowerPipe Customers



- 🌀 Municipal Water & Waste Water Utilities
- 🌀 Water Transmission Agencies
- 🌀 Irrigation Districts
- 🌀 Industrial Effluent Emitters
- 🌀 Thermo Electric Plant Cooling Systems

# Prototype Testing – UWRL – June 2010



## Testing Parameters:

- 🌀 New Hub design
- 🌀 Blade articulation
- 🌀 Covered hub brackets
- 🌀 Custom matched generator
- 🌀 Serial turbine spacing

## Results:

- 🌀 Significant Power Increase
- 🌀 Efficiency Improvement
  - 🌀 Turbine
  - 🌀 Generator

# Riverside Pilot Project



- Client: City of Riverside
- Installed: March, 2011
- Objective: To conduct field test under “real world” conditions for durability evaluation and proof of concept.
- Flow: 30,000 GPM

# Riverside Pilot Project

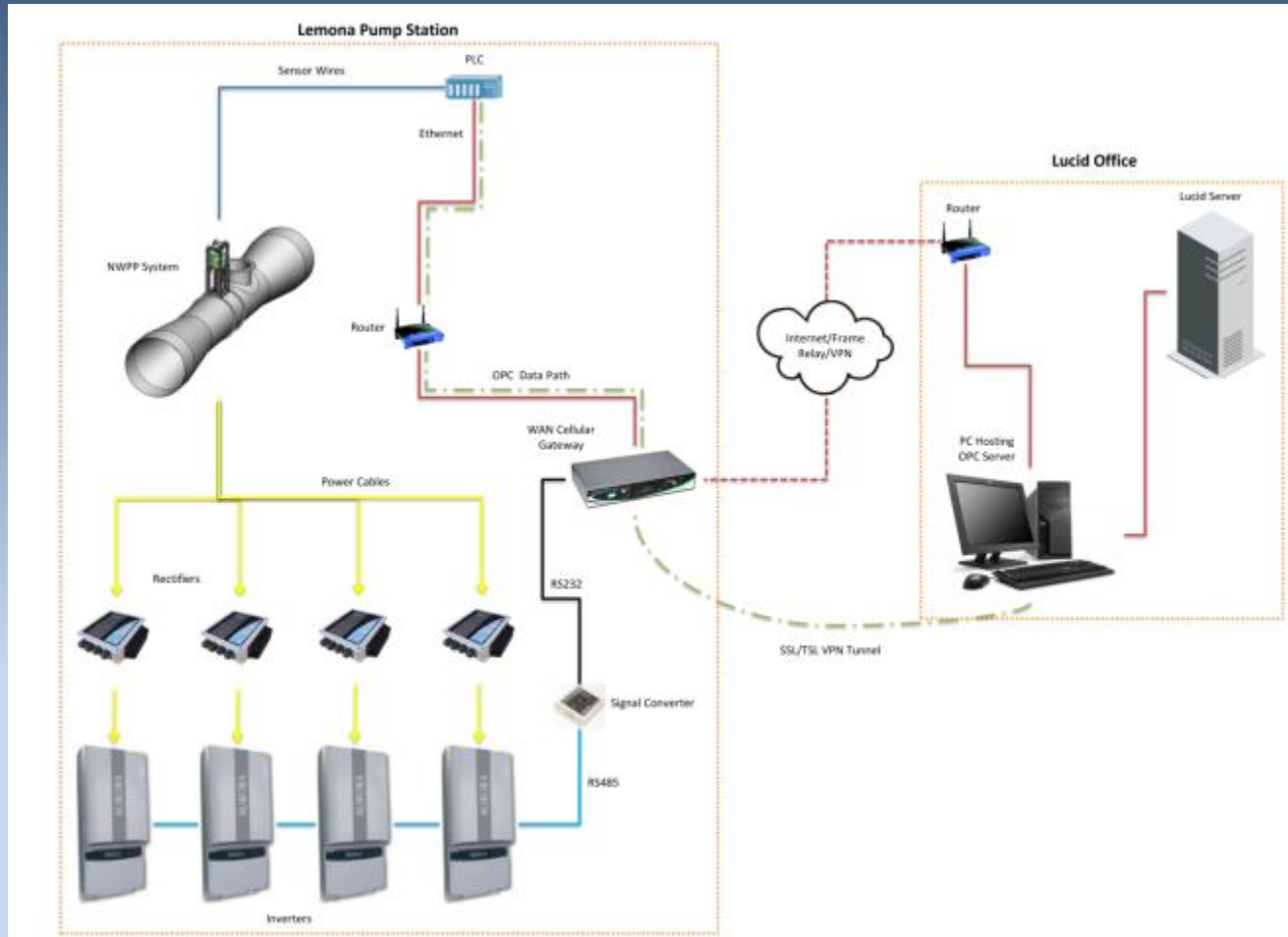
Third generation system results March 2011 - present

- Over 3,500 hours of continuous operation
- 28 MWh of grid-fed electricity generated to date
- 32 million revolutions



PowerPipe Installed  
Lemona Pump Station - Riverside, CA

# Remote Monitoring and Control



**Lucid**

## Lucid PowerPipe Performance Table

*Single Turbine Installation*

Diameter (Inches)	Max Power (KW)	Minimum Flow Required (MGD)	Pressure Loss @ Max Power (PSI)	Pressure Loss - Turbine Stopped (PSI)
24	16	20	5 - 10	0.5
36	35	45	5 - 10	0.5
42	55	64	5 - 10	0.5
48	70	80	5 - 10	0.5
60	105	125	5 - 10	0.5

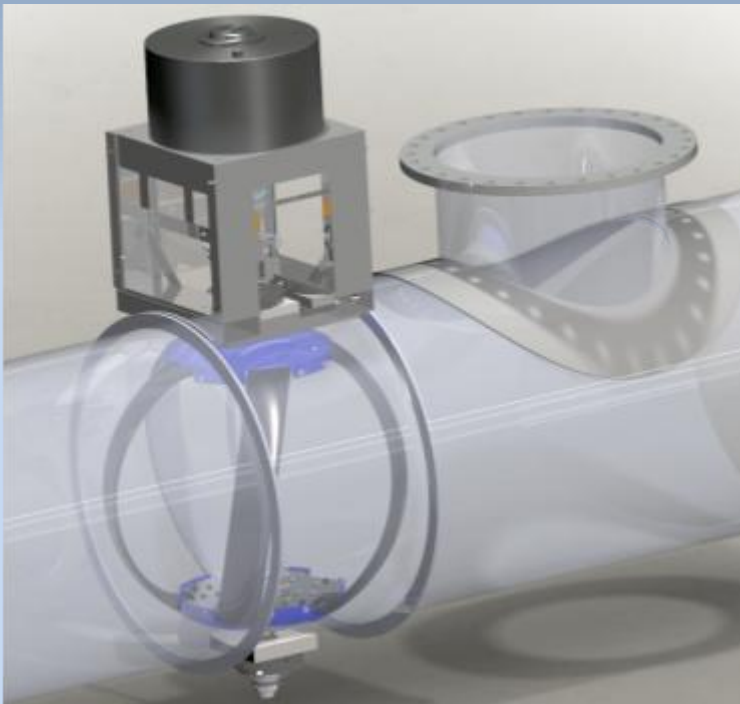
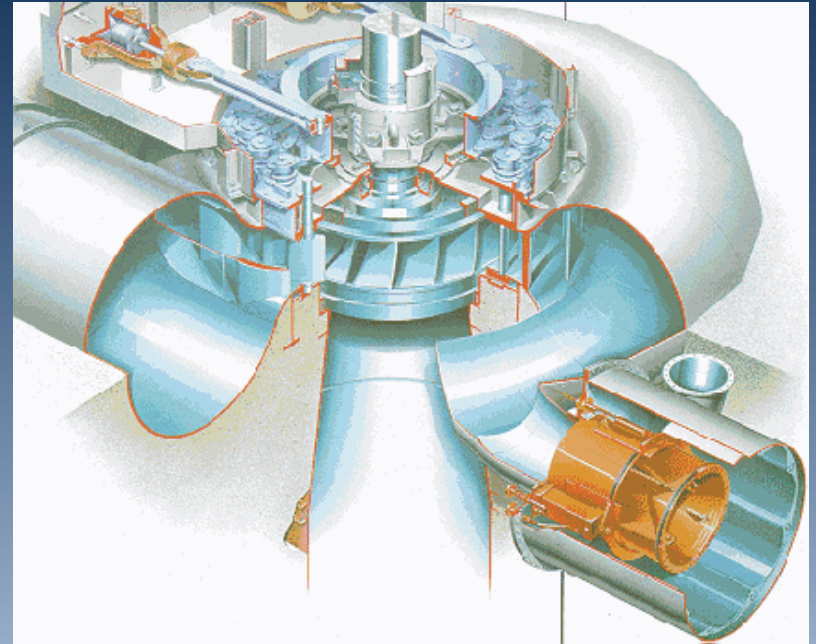
*Figures are per installed unit and assume sufficient flow rates*



# Competition

## Conventional Hydropower

- Very complex system infrastructure
- Deplete all pipeline pressure
- Require pipeline bypass
- Narrow operating range



## Lucid's PowerPipe

- 🌀 Simple, in-pipe technology
- 🌀 Extracts marginal head pressure
- 🌀 Requires no bypass
- 🌀 Complete installation in a day
- 🌀 Grid connected in a week



# New & Rehab Pipelines = Opportunity

## U.S. Water Pipelines:

- 🔄 Significantly decayed
- 🔄 70 years old on average
- 🔄 Many over 100 yrs old
- 🔄 750 miles new large pipe/year

## Water utilities want to:

- 🔄 Increase efficiency
- 🔄 Minimize energy cost
- 🔄 Extend infrastructure life
- 🔄 Source renewable energy
- 🔄 Minimize embedded energy

“The EPA estimates that the nation’s drinking water systems require an investment of \$334.8 billion over the next two decades with most of the money needed to improve transmission and distribution systems.”





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