

**Small Hydroelectric**  
renewable power generation

# Small Hydroelectric Energy Recovery Technologies MCWRA

NLine Energy, Inc.  
October 15, 2014



# Agenda

- About NLine Energy
- Technologies
- Site considerations
- Environmental
- Regulatory
- Interconnection
- Tariffs, Finance & Grants
- Development process
- Comments & Questions





# NLine Energy:

## What We Do

- Small hydropower development company
  - *“With an integrated product and full-service development approach, we harness wasted energy found in man-made conveyance systems that create cost-effective renewable electricity, increase system efficiency and offset greenhouse gas emissions for California water agencies”*
- Headquartered in El Dorado Hills, California
- Class A General Engineering contractor
- ACWA Approved Preferred Provider



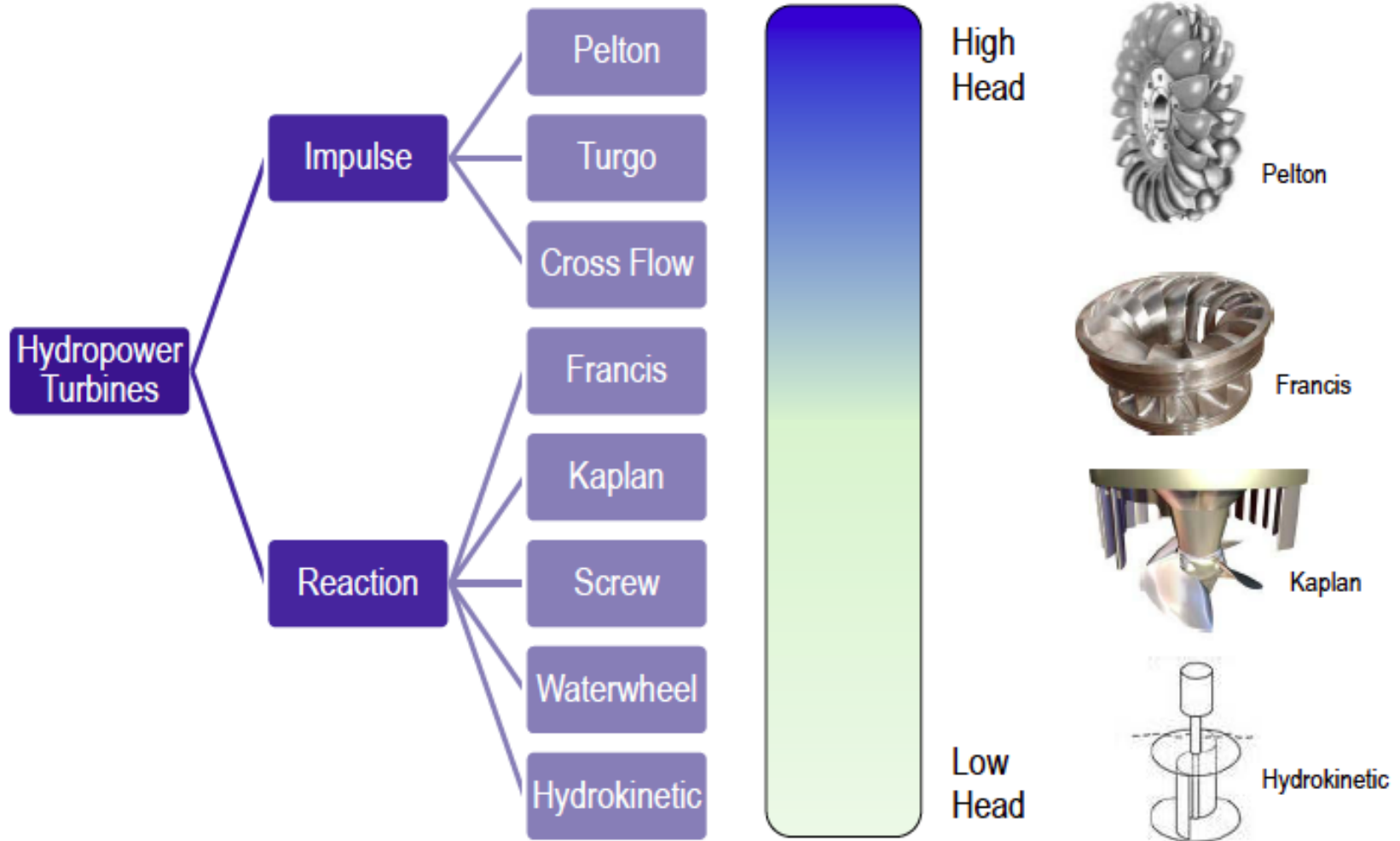
# Hydropower Technology

## “Tidbits”

- Proven technologies
  - Long-term service life
  - High efficiencies
  - Low maintenance costs
- Newer technologies
  - “Off-the-Shelf” vice custom built
  - Smaller
  - Modular
  - Intelligent
  - Less civil costs
  - Cost effective



# Traditional Hydropower Turbine Technologies





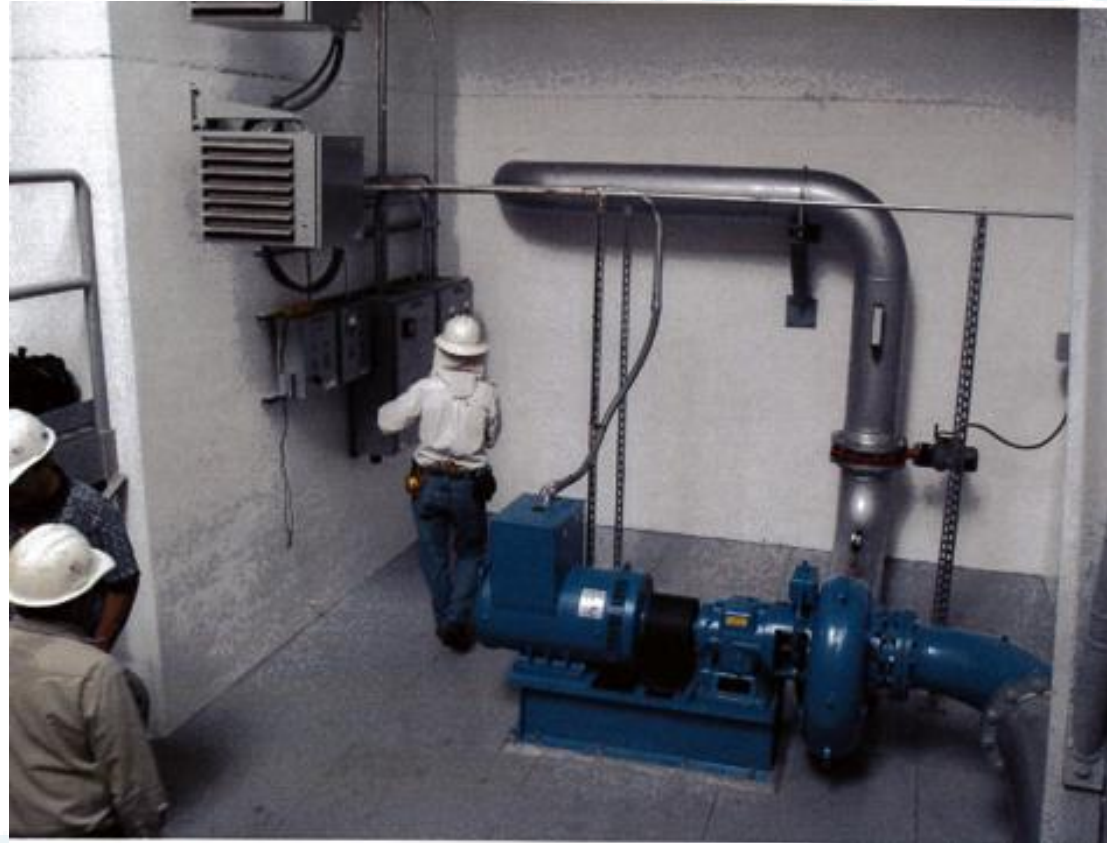
# High-Head Turbine Technologies

- Pressure reducing valves/vaults, energy dissipation devices, sleeve valves, turnouts, etc.
- Minimum average flow  $>4$  cfs
- Minimum head differential  $>150$  feet
- Operates 35-100% annually



# Pump-As-Turbines

- “Pumps-in-reverse”
- High efficiencies
- Narrow operating envelopes
- Cost effective



# Low-Head Turbine Technologies

- Canals, check structures, dam/reservoir environmental flows, spill, large diameter transmission lines, etc...
- Head  $>3$  feet, but  $<150$  feet
- Flows  $>50$  cfs
- Operation during irrigation season or other flow regime





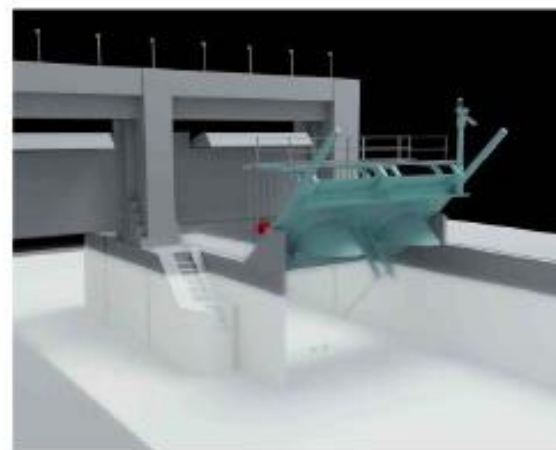
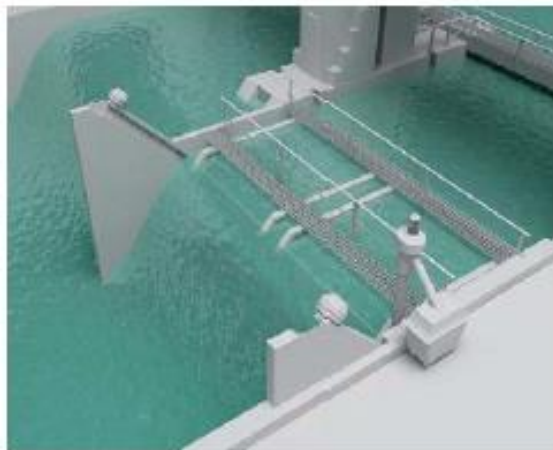
# M2J Technologies: Very Low Hydro (VLH)



Submerged VLH in Working Position



VLH in Withdrawn Maintenance Position



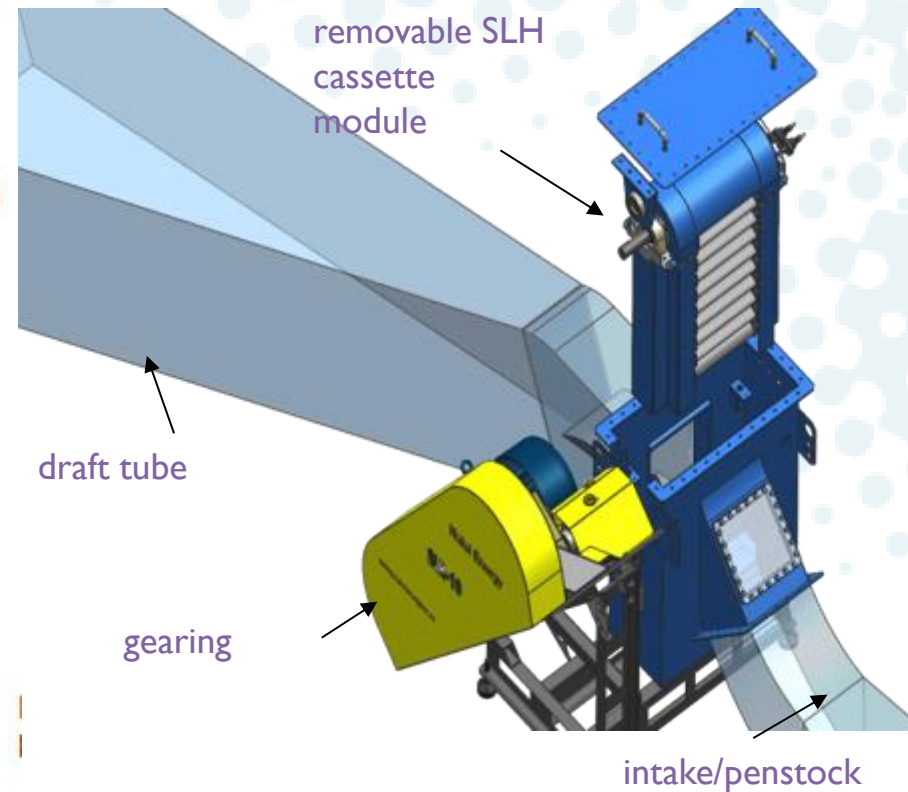
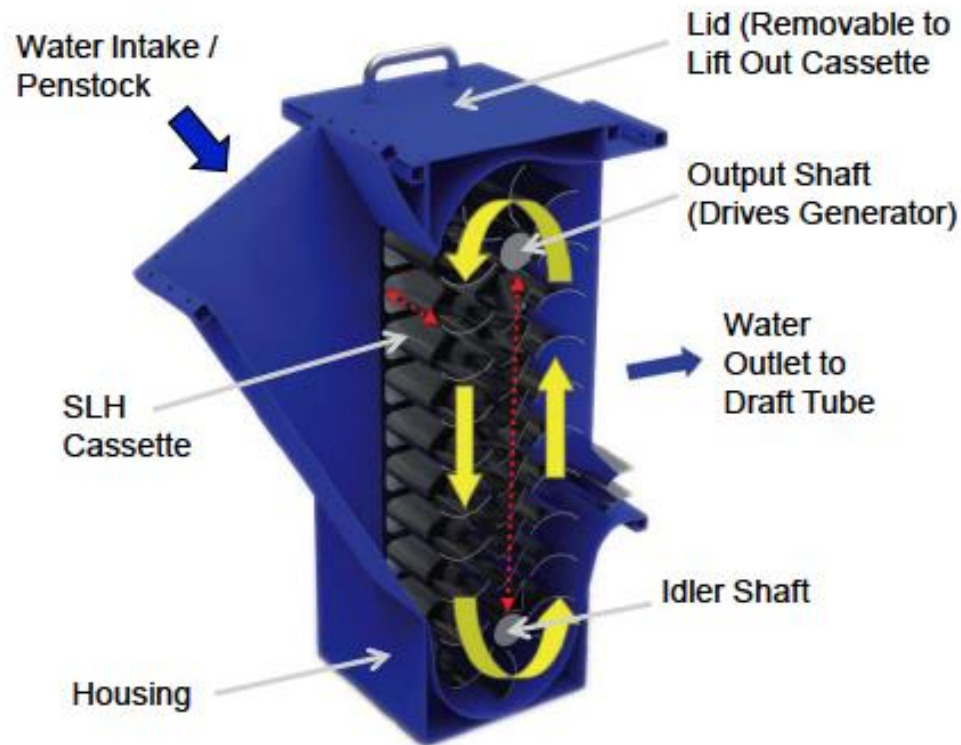


# Hydrodynamic (Archimedes) Screw Turbine





# Natel Energy's HydroEngine

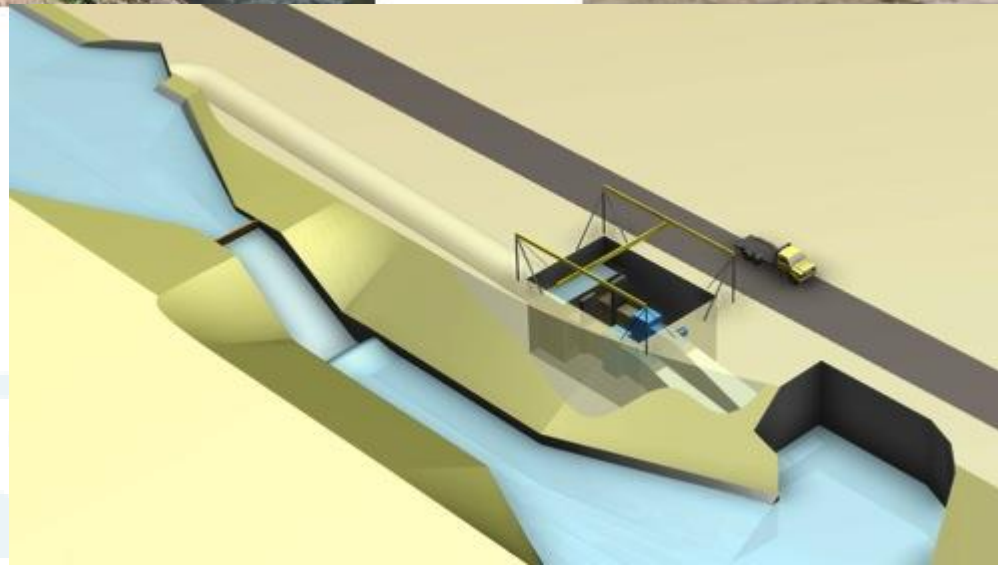


# Natel Energy: Configurations

Before

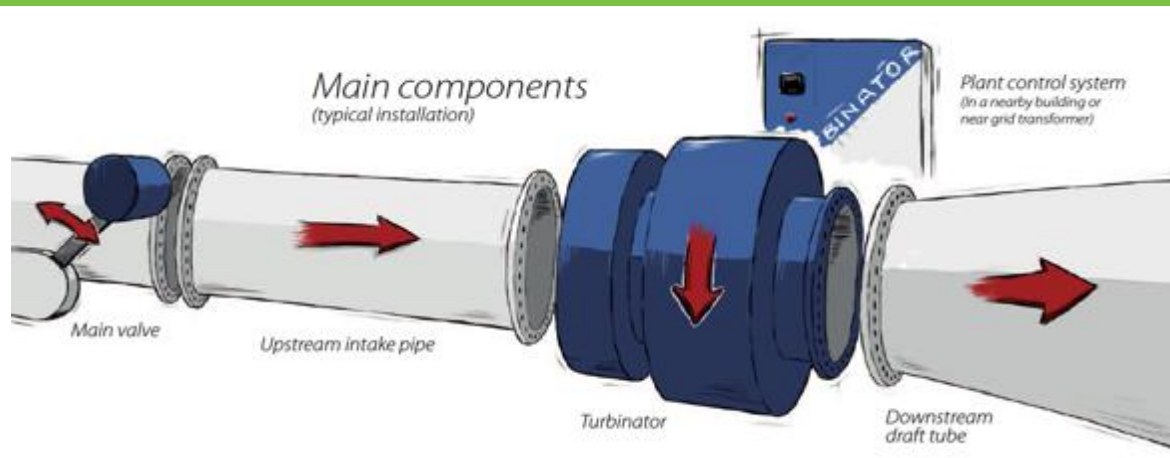


After





# CleanPower

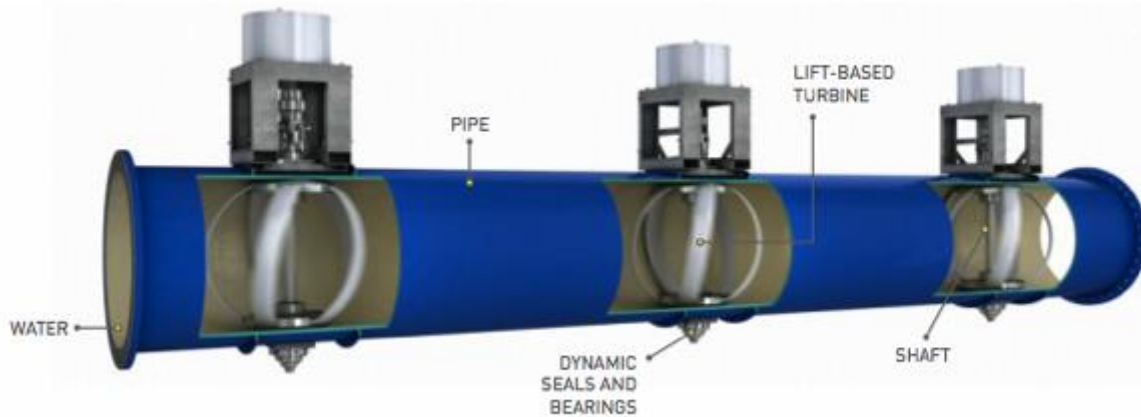


# Hydrokinetic Turbine Technologies

- Canals, effluent drops, transmission pipelines, etc...
- Head <12 feet or N/A
- Velocity, rather than flow



# Lucid Energy's PowerPipe





# Instream Energy Systems







# Site Selection: Other Considerations

- **Operating Profile** – Timing of flows over days, months, seasons, years
  - Do you have verifiable data?
- **Available head** – Constant versus dynamic
  - Does pressure correlate with flow?
- **Existing load** – WTP, WWTP, pump stations, office buildings
  - If no, how far is the closest electric line?
- **Future growth and demand**
  - Does your District have a CIP and/or master plan?



**Generated Electricity**



**NLINE ENERGY™**  
**WATERS<sup>SM</sup>**

Water to Energy Recovery System



**Web-Based Portal**



**Sensors**



**Electronic Controls**



**Energy Storage**



**Data  
Communications  
Server**



**Off-Site Server**



**Turbine Generator**



**Sensors**



**Environmental &  
Security Equipment**



**Bypass and Fail-Safes**

- Wireless Connection
- Wired Connection
- Two-Way Control
- Optional Connection

# Other Considerations

- **Qualified Renewable Resource**
  - Addresses RPS, AB 32 and Governor's DG Plan
  - Generates Renewable Energy Credits
- **FERC Notice of Intent (Exemption)**
- **CEQA Categorical Exemption**
- **Qualifies for CPUC Self-Generation Incentive Program**
- **Qualifies for Net-Energy Metering, RES-BCT and other financing tariffs**



EVERY DROP OF ENERGY®

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