# Small Hydro

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Presented at Renewable Research and Development, American Recovery and Reinvestment Act, and Financing Workshop

Docket No. 12-IEP-1D

June 6, 2012

# Unused Small Hydro Locations

Pressure Reduction Valves

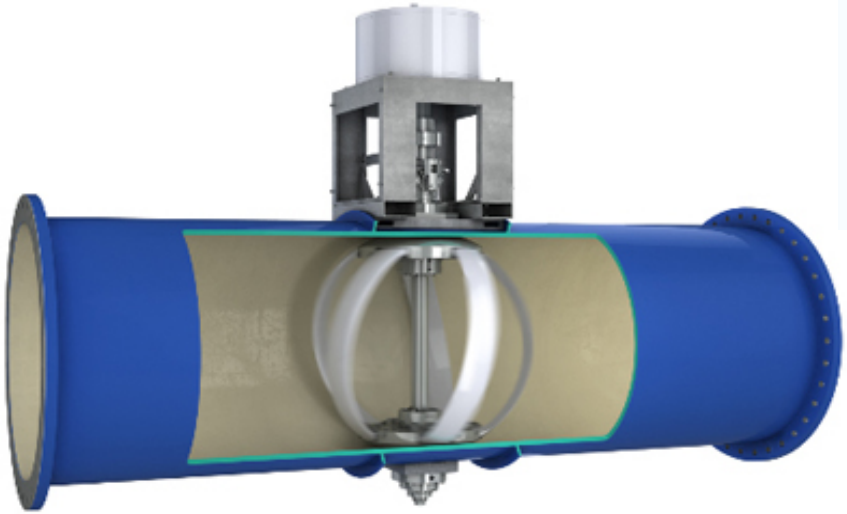
Irrigation Drops

Non-Powered Dams

# Some New Small Hydro Technologies

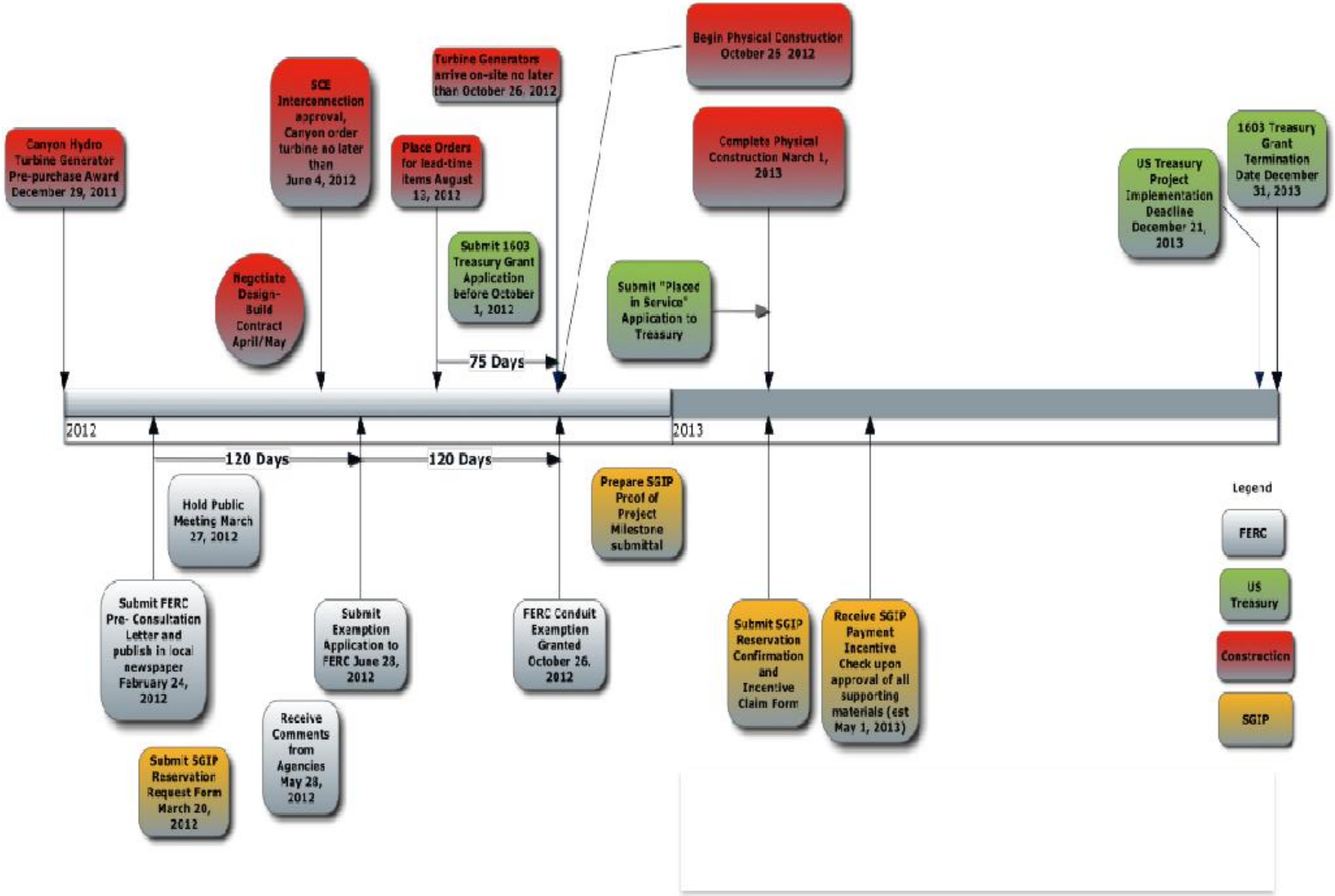
HydroEngine (Irrigation drops)

Pump as turbine (In-conduit)



Powerpipe (In-conduit)

# Sample Development Timeline



# Responses to Committee Questions

- Small hydro Overview
  - Amount of energy available = Pressure (head) times flow. Custom turbine development works for 1+ MW projects, not cost effective for smaller projects.
  - CA resource potential: 2006 CEC report - 250 MW, 2008 ACWA testimony - 500-750 MW, 2012 EDCWA - 1,000 MW
- Development timeline –
  - About two years for simple installation
    - FERC conduit/small hydro exemption takes 9-12 months
- Hurdles
  - FERC conduit exemption
  - Interconnection costs
    - $50,000+ for simple interconnection (Rule 21). (Do we really need a dedicated ground bank for hydro - adds an additional $40,000+)? Distribution line cost $50-80/linear ft.
- Government programs
  - California
    - SGIP – requires on site demand, probably does not allow irrigation drops
    - Feed In Tariff - price uncertainty with new FIT (Re-MAT)
    - RES-BCT - rate design and escalation assumptions
    - RAM – too small to effectively participate
- Technology costs
  - Full costs = 6-10 cents/kWh
  - Regulatory (including interconnection) adds about 2.5 cents/kWh
    - FERC Exemption - 0.6-1 cents/kWh
    - Interconnection – 1-1.7 cents/kWh
    - CEQA - .3 cents/kWh
- Commercialization
  - Pump as turbine currently commercial
  - Other new technologies are not in commercial production, awaiting orders
  - In general, sites below 100 kW are not cost effective investments, but a majority of the PRV in-conduit sites fall < 100 kW
- What can be done to enhance this technology
  - FERC exemption (HR 795- exempts from exemption hydro units < 1.5MW; HR 3680 – exempts from exemption in conduit < 5MW)
  - Interconnection – standardize interconnection requirements for small hydro
  - FIT – price certainty necessary for economic development
  - Access to funds – most small hydro sites in California owned by public entities.
  - Technology – standardized, mass produced turbine/generators still not actualized.