

Small Hydro

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Unused Small Hydro Locations



Pressure Reduction Valves



Irrigation Drops



Non-Powered Dams

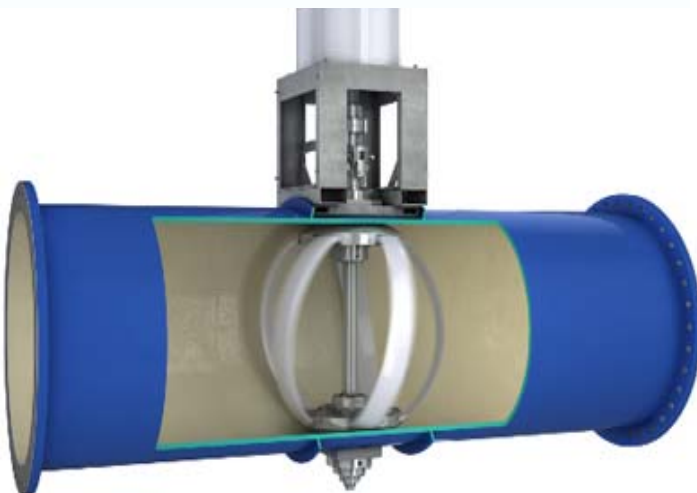
Some New Small Hydro Technologies



HydroEngine (Irrigation drops)

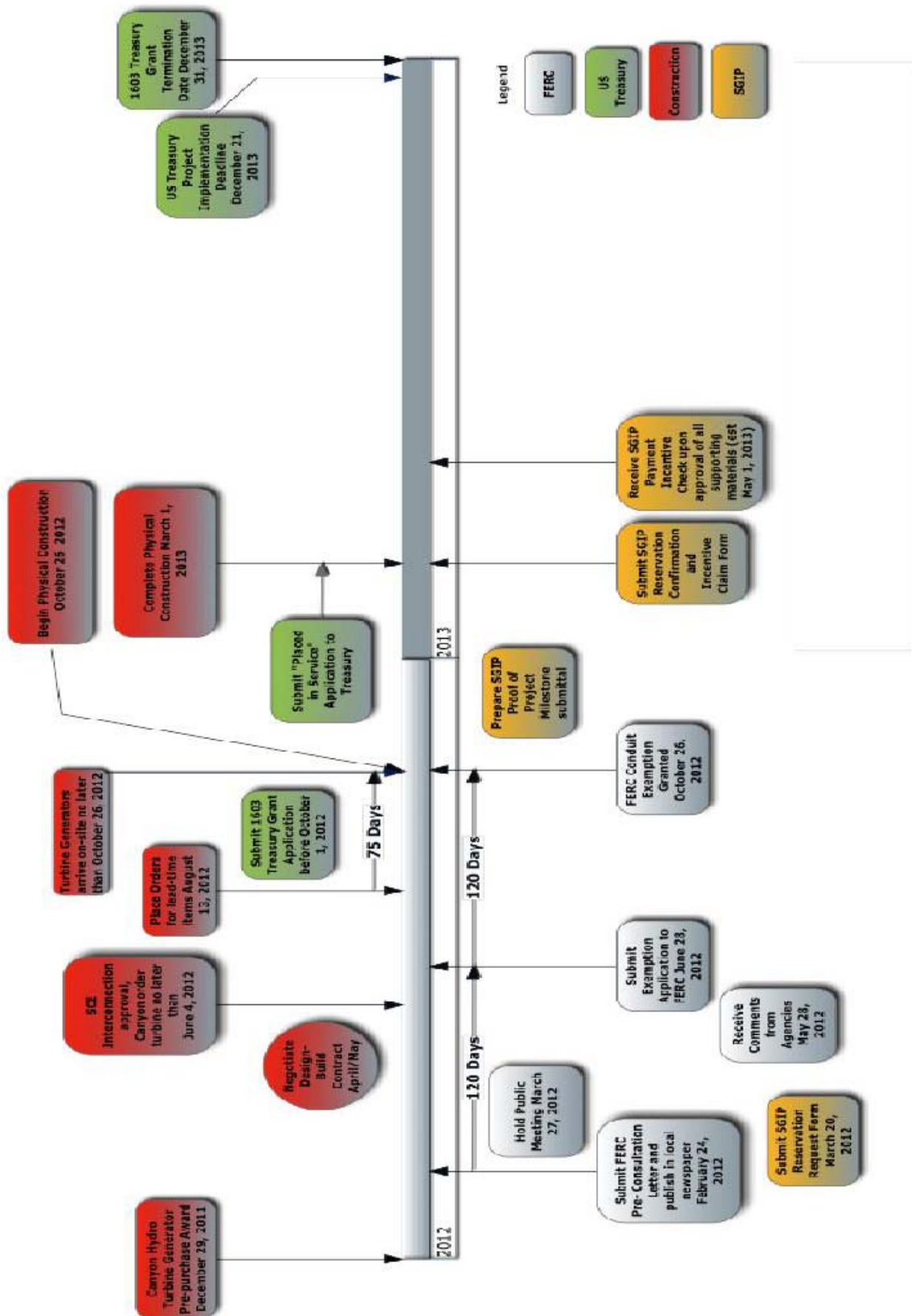


Pump as turbine (In-conduit)



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.