

What's New in Hydrogeneration



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Potential

- DOE – 21,000 MW at existing dams (only 3% of 79,000 dams in US produce hydropower): 19,000 MW from 1-30 MW.
- NHA – 60,000 MW available in the next 15 years
- California – 250 MW small hydro available on existing open channel drops (CEC 2005 report)
- California - 250-500 MW from in-conduit (House, 2005)



Unused Hydro Potential

- Existing Dams



- Canal Drops



- Canals



Why the Resurrection of Interest in Small Hydro?

- Changes in Policies
- Changes in Technology
- Changes in Regulation
- Changes in Power Delivery Options



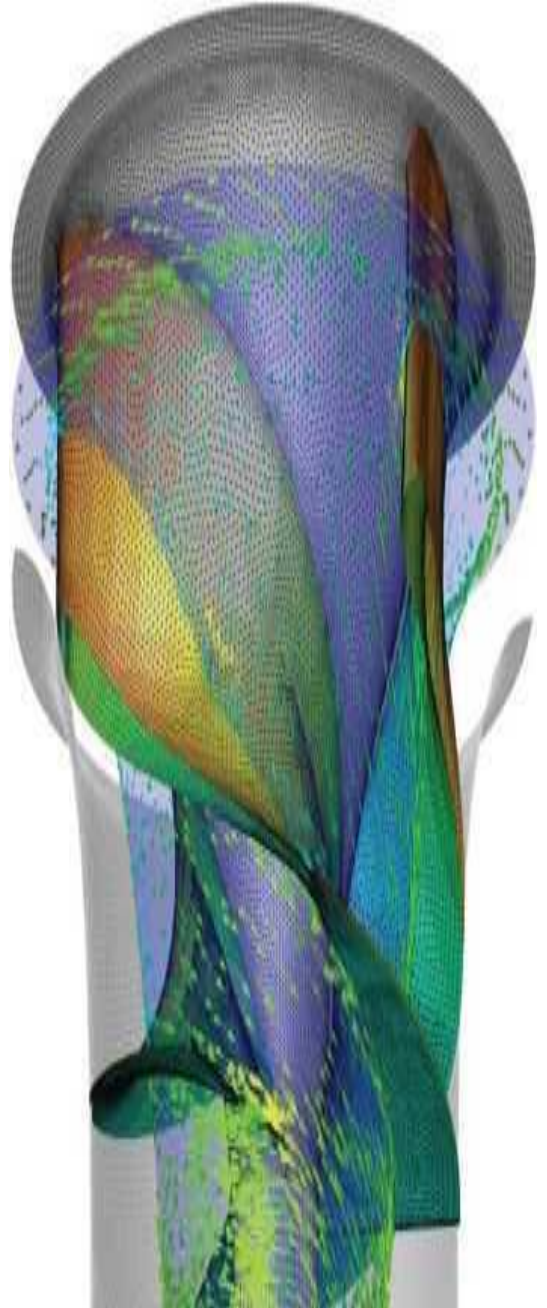
Changes in Policies

- Carbon/GHG interest
- Carbon footprint
- Efficiency emphasis
- Renewable Portfolio Standards

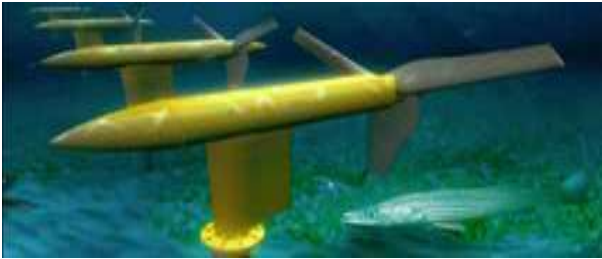


New Fish Friendly Turbines

- Alden Turbine –
Developed under the U.S. Department of Energy's (DOE) Advanced Hydro Turbine Systems (AHTS) program by Alden Research Laboratory. Corkscrew design, 3 blades, 200-400 rpm. 40,000 fish up to 18 inches have safely gone through. Estimated 96-98% fish survival rate. Voith Hydro commercializing.
- Kaplan – 5/6 blades
- Francis – 14/18 blades



Hydrokinetic Turbines



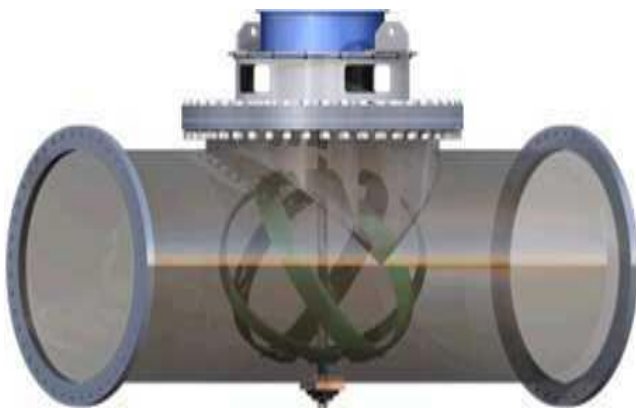
Verdant Power



Electric Kite



N.W.T. Power Corp.



Powerpipe

Power Delivery Options/ Payments



- Many sites were not developed or abandoned due to the lack of a purchaser and/or the prices paid for electricity.
- FIT (Feed in Tariffs)
- TRECs (Tradeable Renewable Energy Credits)
- RAM (Renewable Auction Mechanism)

RAM (Renewable Auction Mechanism)



- December decision D10-12-048 in proceeding R08-08-009
- Highlights
 - renewable- resource projects of less than 20 MW
 - Auctions would take place twice a year, with four solicitations (PG&E 102.5MW per auction - total of 420.9MW)
- Standard Contract: Each utility will develop its own standard RAM contract. The contracts must contain standard terms and conditions:
 - Project must be online within 18 months of contract execution, with one allowable 6-month extension for regulatory delays.
 - Development deposit for projects 5 MW and smaller = \$20/kW. For projects 5-20 MW = \$60/\$90/kW for intermittent and baseload resources.
 - Performance deposit for projects < 5 MW: conversion of development deposit to performance deposit. For projects at least 5 MW: 5% of expected total project revenues.
- Market-based Pricing:
 - Sellers compete for a contract in a renewable auction mechanism.
 - Bids are selected by least-cost price first until the auction capacity is reached. Projects will be compared against similar product type: baseload, peaking, intermittent.
 - Price (and contract) is not negotiable and is paid as bid.
- Project Eligibility and Viability: Solicitations include project viability screening.
 - Project Capacity: Up to 20 MW
 - Project Location: In one of the utility's service territories
 - Site Control: 100% site control through (a) direct ownership, (b) lease or (c) an option to lease or purchase that may be exercised upon award of a RAM contract
 - Development Experience: One member of the development team has (a) completed at least one project of similar technology and capacity or (b) begun construction of at least one other similar project
 - Commercialized Technology: Project is based on commercialized technology
 - Interconnection Application: Interconnection application has been filed
- Current Appeals
 - Current law prohibits requiring utilities to procure above-MPR resources after they exhaust their abovemarket funds cap
 - Renewables portfolio standard law specifies that utilities cannot be required to procure more than 20 percent renewables

TRECs (Tradeable Renewable Energy Certificates)



- Tradable renewable energy credits represent the renewable attributes associated with renewable energy generation. They can be purchased by a utility and traded separately from the underlying energy produced by a renewable generating facility. These energy credits can then be applied, by the utility, toward their renewable energy compliance goals.
- Key aspects of the decision include:
 - PG&E, SCE, and SDG&E may meet no more than 25% of their RPS compliance requirement with TRECs. This limitation sunsets on December 31, 2013.
 - All TRECs must be associated with RPS-eligible energy generated on or after January 1, 2008.
 - All TRECs must be tracked in WREGIS to be used for RPS compliance.
 - In order to be used for RPS compliance, TRECs may be retained in active sub-accounts in WREGIS for no more than three calendar years (inclusive of the year in which the electricity associated with the RECs was generated) after the electricity associated with the RECs was generated.
 - TRECs for which an IOU pays more than \$50/TREC (essentially \$50/MWh) may not be used for RPS compliance. This price cap will sunset on December 31, 2013.

FIT (Feed In Tariff)



- Standard contract (tariff) and established prices. PG&E tariff E-SRG.
- 104.6 MW available in PG&E territory
- Eligible Renewable Generation: the electric generation facility must be an eligible renewable energy resource as defined in PU Code Section 399.12, which covers all renewable generation technologies, including solar, wind, geothermal, biomass, biogas, small hydro, and fuel cells that use renewable fuels.
- Size: not more than 1.5 MW per generator.
- Contract Term: 10, 15, or 20 years.
- Full Buy/Sell or Excess Sales: SCE, PG&E and SDG&E offer the customer the choice of either full buy/sell or excess sales, to be selected by the customer. The excess sales option first offsets load and then exports any excess generation to the utility.
- Initial Operation: The utility has the right to terminate the contract if the seller has not achieved commercial operation in 18 months from execution date. The seller must be given reasonable notice and opportunity to address concerns before termination is effective.
- Interconnection: Participants must follow the FERC-approved small-generator interconnection procedures if interconnecting to the transmission grid, or Commission-approved Rule 21 if interconnecting to the distribution grid. In all cases, the utility must respond to an interconnection request on a timely basis and without unreasonable delay.

FIT Values 20 year contract example - 2011 start date

PG&E	TOU Factor			Price Paid*		
	Super Peak	Shoulder	Night	Super Peak	Shoulder	Night
Jun-Sep	2.2049	1.12237	0.68988	\$ 0.2227	\$ 0.1133	\$ 0.0697
Oct-Feb	1.05783	0.93477	0.76384	\$ 0.1068	\$ 0.0944	\$ 0.0771
Mar-May	1.14588	0.84634	0.64235	\$ 0.1157	\$ 0.0855	\$ 0.0649
	noon to 8 pm weekday	7am to noon, 9-10pm weekdays, 7 am to 10 pm weekends	midnight to 6am, 10pm to midnight			
				* 2011 MPR =	\$ 0.10098	

source: <http://www.waterandenergyconsulting.com/downloads.html>



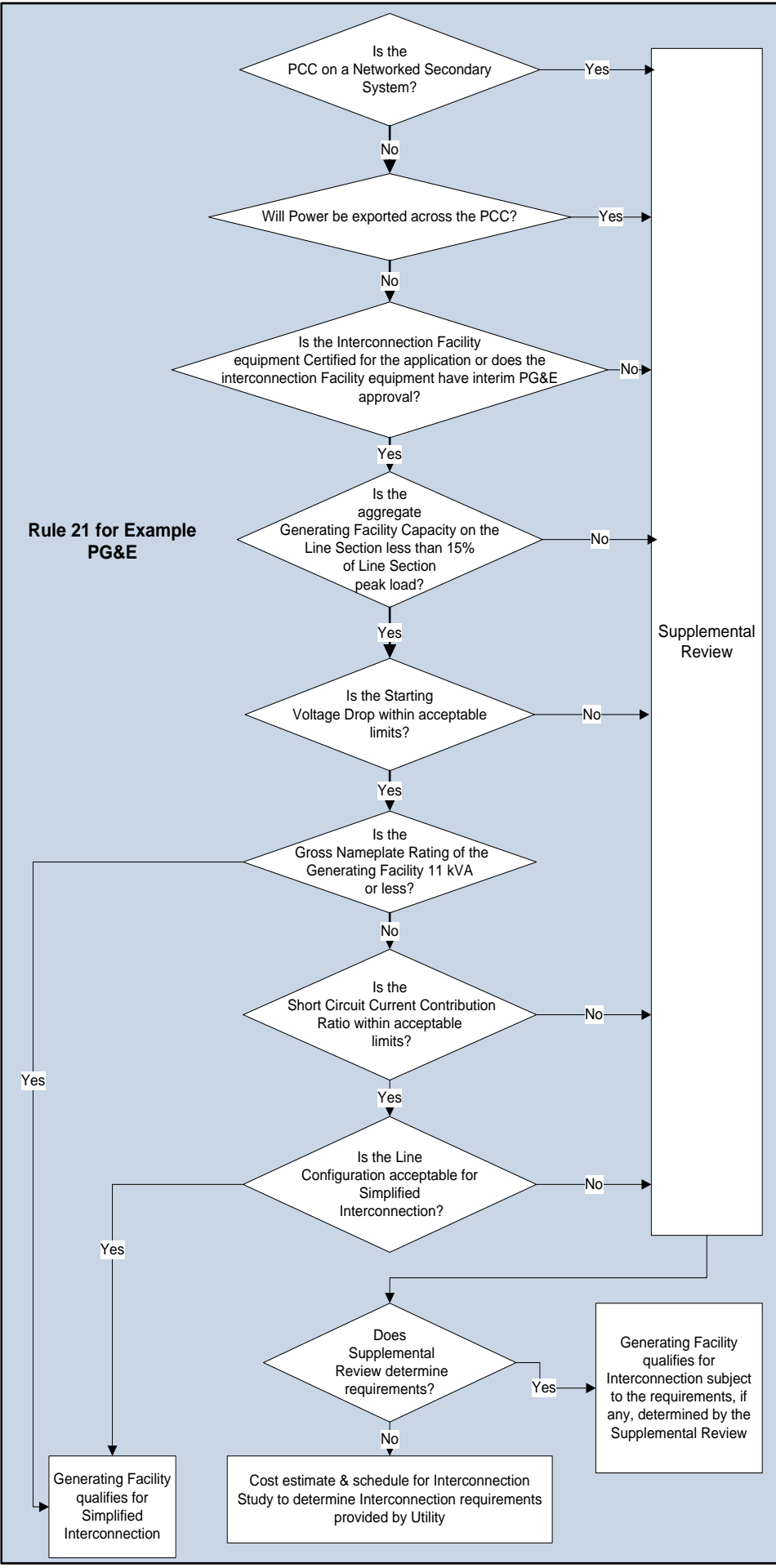
Issue 1: FERC License

Requirements

- FERC License (exemption) required if use surface water and connect to the grid.
 - Pursuant to section 23(b)(1) of the Federal Power Act (FPA), hydropower projects must be licensed, or granted an exemption from licensing, pursuant to the FPA (unless the applicant has a valid pre-1920 federal permit) if the project:
 - Is located on a navigable waterway of the United States;
 - Occupies lands of the United States;
 - Uses surplus water or waterpower from a government dam; or
 - Is located on a stream over which Congress has Commerce Clause jurisdiction (navigable waterway), is constructed or modified on or after August 26, 1935, and affects the interests of interstate or foreign commerce.
- FERC issues three types of development authorizations: conduit exemptions, 5-megawatt (MW) exemptions, and licenses.
 - A small conduit hydroelectric facility up to 15 megawatt (MW) (up to 40 MW for certain municipal projects) using a man-made conduit operated primarily for non-hydroelectric purposes may be eligible for a conduit exemption. Cannot be on federal land.
 - 5MW exemption must be install at a non-federal, pre-2005 dam, or at a natural water feature.
- If you are developing a new site and are unsure whether your project meets any of the criteria, contact FERC staff through the Small Hydro Hotline at 1-866-914-2849. You may also file a Declaration of Intention and the Commission will determine if your proposed project must be authorized. If you have an existing project or dam, you may request a Declaratory Order from the Commission to determine whether your project is jurisdictional and must be licensed or exempted pursuant to the FPA.
- Expect a conduit exemption to take 6 months or more and cost upwards of \$60,000. Licensing takes years and \$\$\$.

Issue 2: Interconnection Requirements

Connect At
Distribution Level:
CPUC Rule 21
Interconnection



FERC Small Generator Interconnection Procedures Screens



- Order 2006 (et seq.) required all public utilities that own, control, or operate facilities under FERC's jurisdiction to file standard interconnection procedures (the SGIP) and a standard interconnection agreement (the SGIA) to interconnect generating facilities up to 20 megawatts (MW).
- The FERC SGIP contains the technical procedures that a small generator and utility must follow when connecting the generator to utility lines subject to FERC jurisdiction. The standards include provisions for three levels of interconnection based on generator size:
 - The "10 kW Inverter Process" for certified, inverter-based systems no larger than 10 kW,
 - The "Fast Track Process" for certified systems no larger than 2 MW
 - The default "Study Process" for systems no larger than 20 MW, including those that fail to pass the fast track screens

Connect At Transmission Level: FERC SGIP

-Small Generator
Interconnection Procedures
(SGIP)

- System-side of meter
- For systems up to 20 MW
- Three processes under SGIP

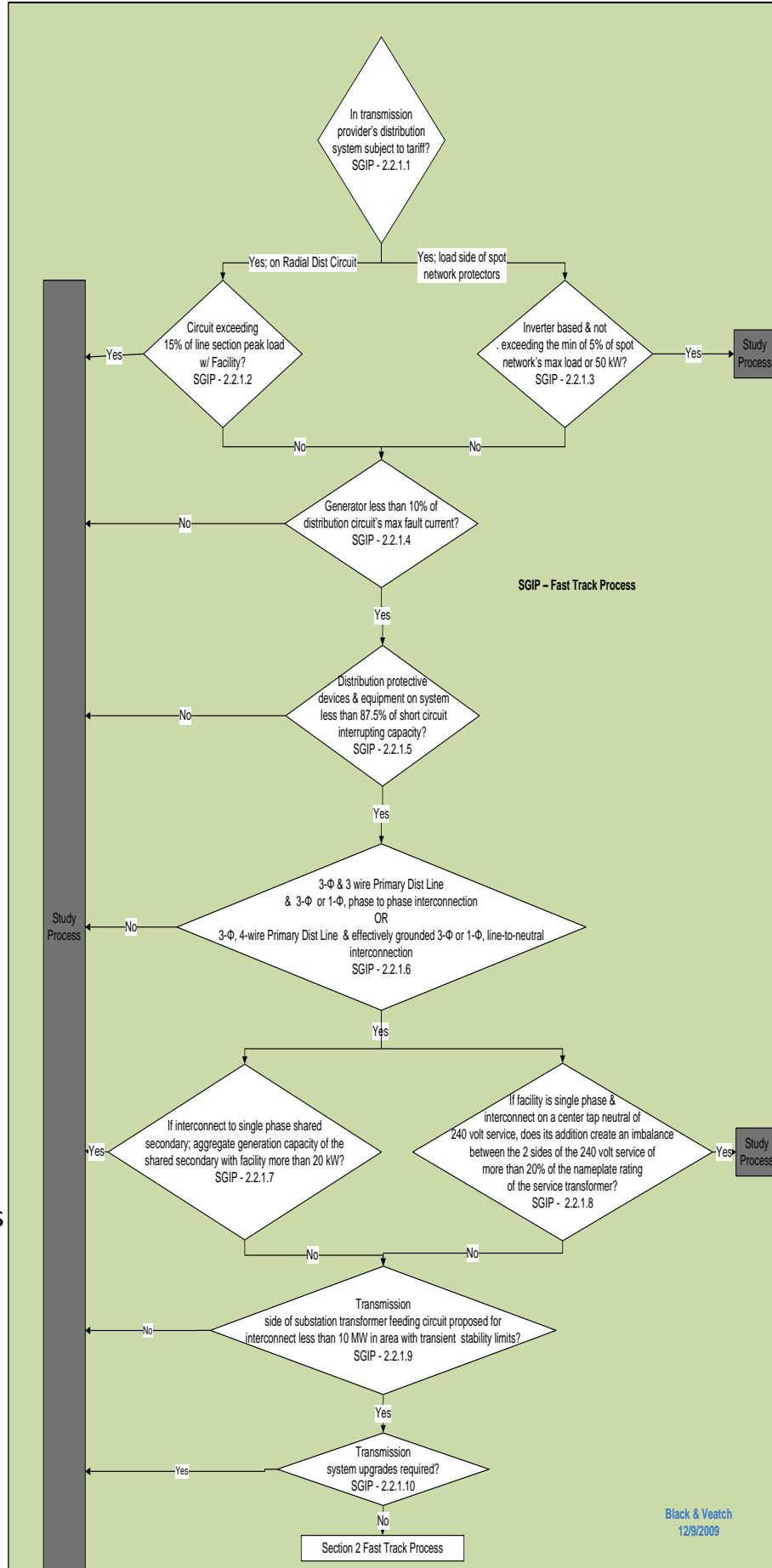
-- **10 kW Inverter Process** -
for systems 10 kW or under
with certified inverters

-- **Fast Track Process** - for
certified small generation
facilities 2 MW or smaller

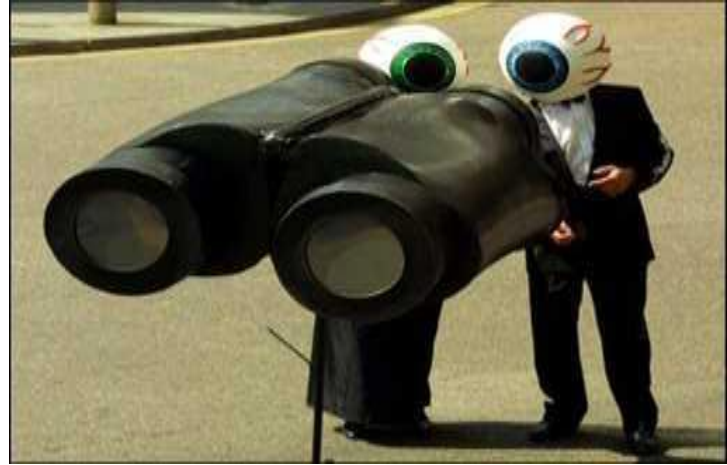
-- **Study Process** - for
systems over 2 MW or
projects not qualified for
processes listed above

Screens:

- Circuit doesn't exceed system set points (generation, fault current, etc)
- One of two basic types of Interconnection to Primary Distribution Line
- No construction of facilities by the Transmission Provider on its own system to accommodate project



Things To Keep Track Of



- Federal legislation last session
 - S.3570 - Hydropower Improvement Act of 2010. establishes a competitive grants program and directs the Department of Energy to produce and implement a plan for the research, development and demonstration of increased hydropower capacity. The bill also gives the FERC authority to streamline the permitting and review process for hydropower projects, and calls for studies on pumped-storage sites and the potential for development at Bureau of Reclamation facilities
 - S.3570 - Hydropower Renewable Energy Development Act of 2010. Hydro is classified as renewable energy - (1) classify certain hydropower production facilities as a renewable resource for purposes of the tax credit for producing electricity from renewable resources; and (2) eliminate the one-half reduction in the tax credit rate for hydropower facilities.
 - H.R.5922 - Small-Scale Hydropower Enhancement Act of 2010. Federal Power Act exemption qualifications for any proposed hydroelectric project that seeks to use a conduit to generate power that does not exceed 1.5 megawatts.
- CPUC
 - Re-DEC (Renewable Energy Distributed Energy Initiative)
 - Distributed Generation Proceeding
 - CEC - IEPR



Recommendations

- Identify potential sites
- Identify potential technologies
- Determine potential power and energy generation, and profile of generation
- Identify where the power will go, and who it is being delivered/sold to
- Identify how project is going to interconnect to grid
- Identify permits/licenses needed
- Remember – there are lots of new opportunities out there for small hydro generation
- And more are becoming available all the time.