Net Metering

Scott Gates

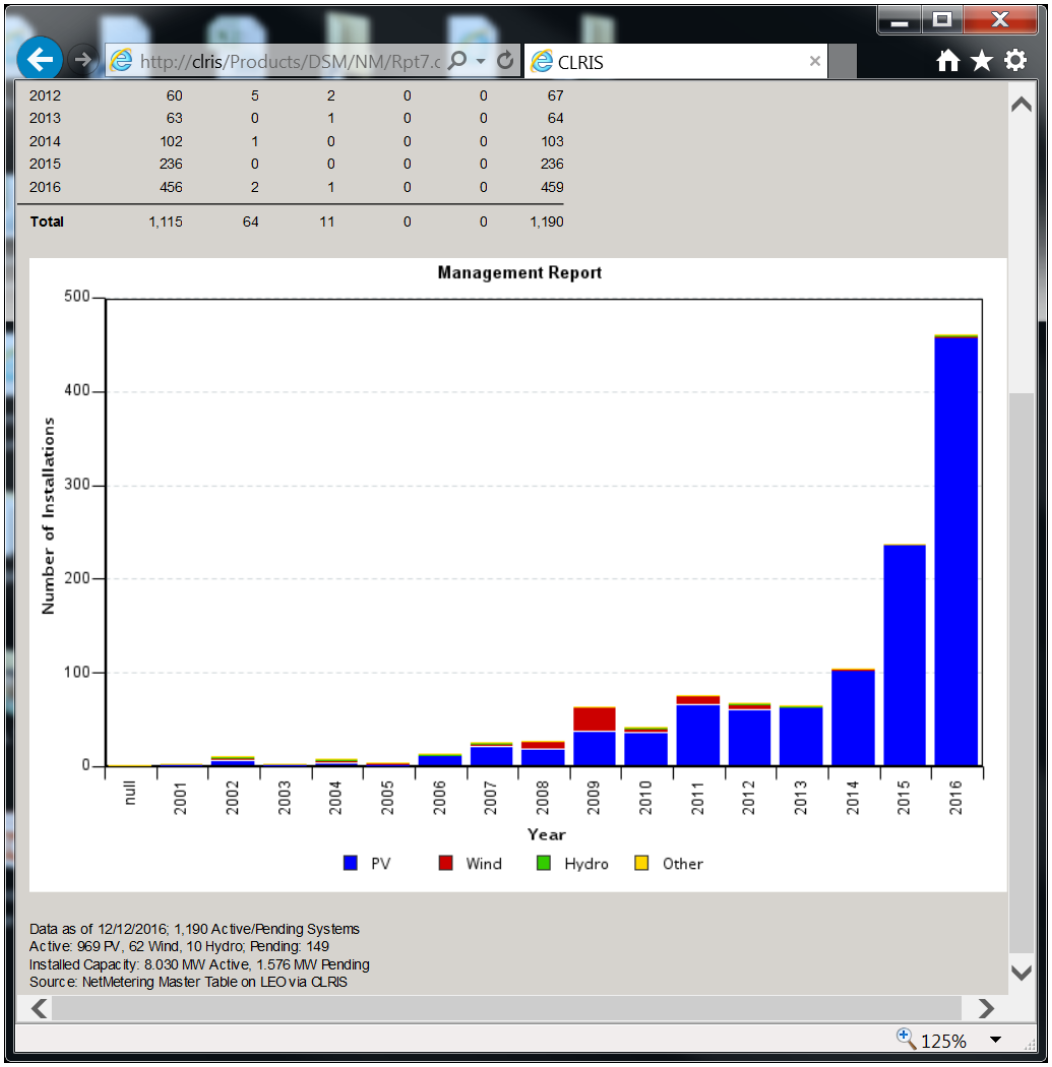
Renewable Energy Specialist

Overview

Net Metering Tariff allows customers to install on-site renewable generation to offset their own use. Includes wind, solar, hydro, biomass, geothermal and fuel cells.

First, keep it safe for everyone

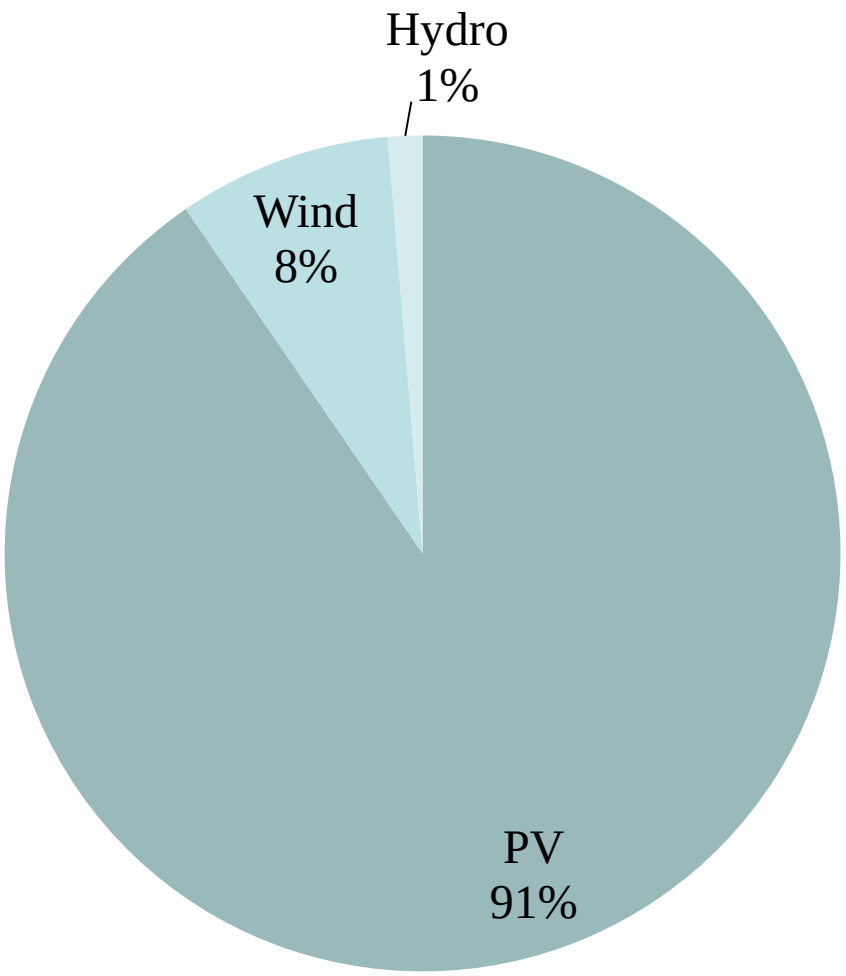
Net Metering Growth



Common Customer Questions

- What are the rules?
- How does the meter work?
- How much will my system generate?
- How will it appear on my bill?

Systems by Technology Type



Rules

- Rules for net metering governed by Schedules 84 and 72
- Residential and small commercial can connect up to 25 KW
- Large commercial, industrial and irrigation up to 100 KW
- Schedule 5 (Time of Day) may not participate
- Once completed, meter placed on a Rate 84 Service Schedule
- Demonstration projects: If a customer does not want to feed back, and the system size is less than 2% of maximum demand, can install up to 25 KW and remain on regular rate (no net meter installed)
- It’s a tariff, not a contract. It is subject to change.

Excess Generation and Billing

- Overproduction at the end of a billing cycle appears as a kWh credit on next bill, customers still have to pay service and other fees
- Credits do not expire
- Under some, limited circumstances, customers with excess generation may transfer it to a different meter one time per year

Next Read Date: 01/06/2015

Meter Readings Previous	Meter Readings Current	Meter constant	kWh Used
9763	8863	1	-100

CR = Credit kWh = Kilowatt-hour PCA = Power Cost Adjustment kW = Kilowatt BLC = Base Load Capacity

Net Metering kWh Credit Balance	Your net metering kWh credit balance is 372.

Technical Requirements

- Follow the application process (forms and a fee)
- UL1741 or IEEE1547 listed inverter preferred
- Visible, lockable disconnect on customer side of meter
- **MUST PASS A STATE ELECTRICAL INSPECTION**

Residential/Small Commercial Systems

- About 84 percent of all systems
- Rate 01 and 07
- Limited to 25 KW
- Single meter system, measures net only

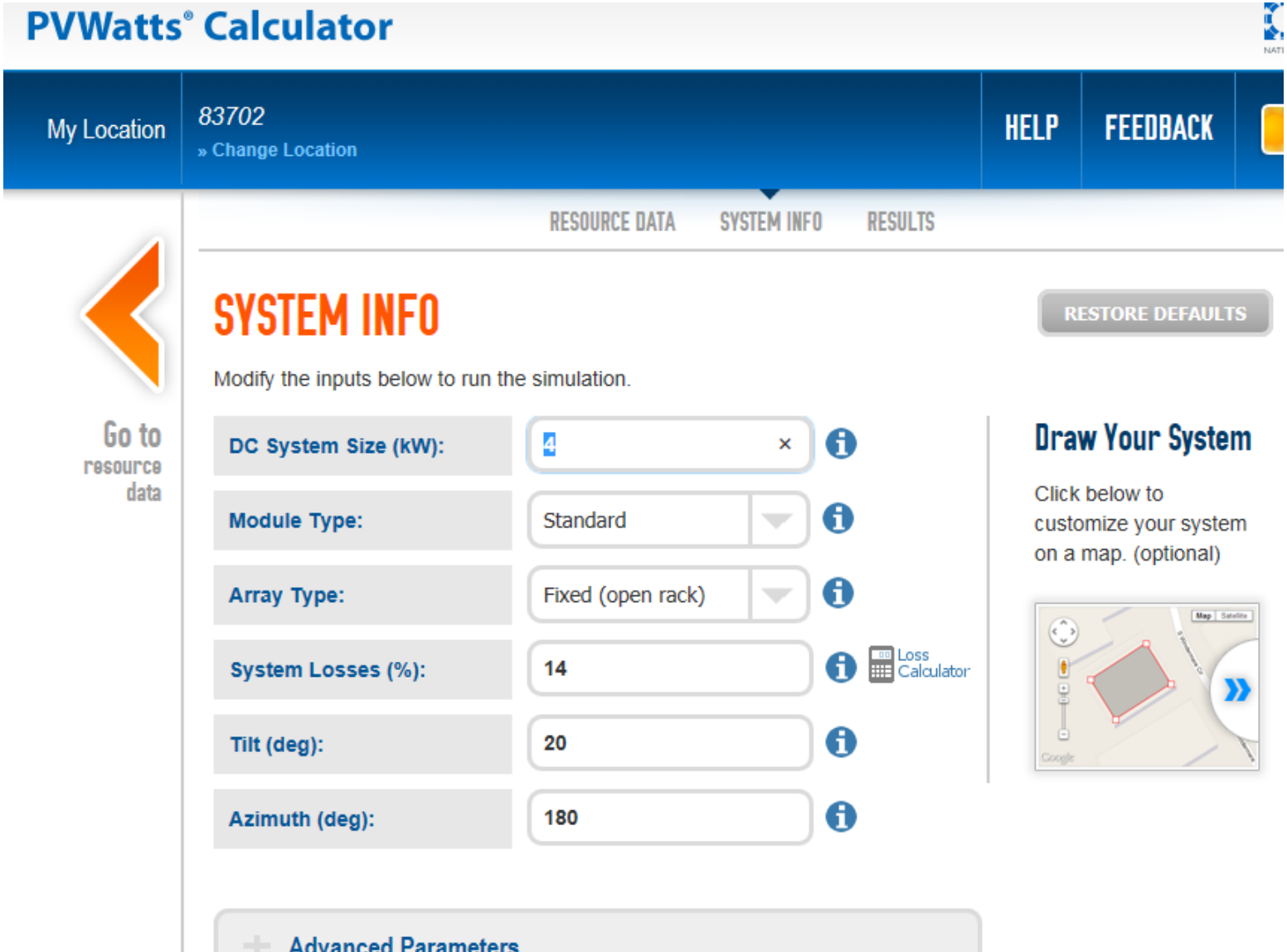
Commercial

- Open to 9, 19 and 24
- 2 meter system with consumption and production meter
- Limited to 100 KW max
- Process differs slightly with production meter install before system is complete. Customer required to lock off system until final inspection.
- Commercial customers can see exactly what the system produces.

Solar vs. Hydro Production

		PV Watts CF 16.6%	CF = 77%
	System Size	Solar output kWh/yr	Hydro kWh/yr
	1kW	1455	6745
	2kW	2911	13490
	5kW	7276	33726
	7kW	10187	47216
Average House	8kW	11642	53961
	10kW	14553	67452
	25kW	36382	168630
Actual Production	25kW		166848

PV Watts
pvwatts.nrel.gov



Low Head Hydro worksheet

SMALL HYDRO OVERVIEW/SPREADSHEET

Contact:
Lun W. House, Ph.D.
Co-Director Hydro Collaborative
office: 530.676.8956
cell: 530.409.9702
lwhouse@ucdavis.edu

BACKGROUND

The two vital factors impacting hydroelectric potential are how much water is flowing past the turbine and the pressure the water is exerting on the turbine.
Flow is measured in volumes per time (gallons per minute, cubic feet per second, liters per second, etc.).
Pressure is measured in pounds per square inch (psi) or, in hydro vocabulary, is typically expressed as "head", which is measured in height (feet or meters). One foot of height = 0.433 psi
The key equation to remember is the following:
Power = Head x Flow x Gravity ***watts = meters x liters per second x meters per second squared***
where power is measured in watts, head in meters, flow in liters per second, and gravity in meters per second squared. The acceleration due to gravity is approximately 9.81 meters per second per second
For most calculations, rounding acceleration due to gravity to 10 meters/second squared is acceptable

To calculate how much hydro power is available at a site:
If you have a flow of 20 liters per second with a head of 15 meters (or if a flow of 15 l/s and a height of 20m)
15 x 20 x 9.81 = 2,943 Watts

In North America, and in some other parts of the world, we use English units.
With English units the hydro power equation becomes:
Power = Head x Flow /10 ***watts = feet x gallons per minute / 10.***
where power is measured in watts, head in feet and flow in gallons per minute.
If you have a flow of 20 gallons per minute with a head of 15 feet:
15 x 20 / 10 = 30 Watts

SPREADSHEET

Below is a hydro-power calculator using North American Units for an in-conduit application:

Inputs

Flow: (gallon/minute)	5000	[1 US gallon/minute = 0.06308 l/s = 0.00223 cubic feet/second]
Pipe Diameter (inches)	24	
Pressure in (psi)	120	[1 psi = 2.31 feet)
Pressure out (psi)	80	[1 psi – 2.31 feet)

Results:

Velocity (feet/second)	3.55	fps	
Power (watts)	46,200	kW	theoretical maximum

Turbine/Generator Adjustment

The above calculation is the theoretical maximum power available. In the real world, we have efficiency losses in both the turbine and generators (typically 40% or so). So we need to modify the power equation to account for these losses:
Power = Head x Flow /10 x e where e = combined operating efficiency of hydro turbine and gene

Input

Turbine/generator efficiency e: 60 %

Results:

Power (watts): 27,720 kW — Turbine/generator output

Annual Production

To get an idea of the amount of income/value of the electricity produced annually, put in the value of the electricity below:

Input

Value of Electricity: $0.10 $/kWh

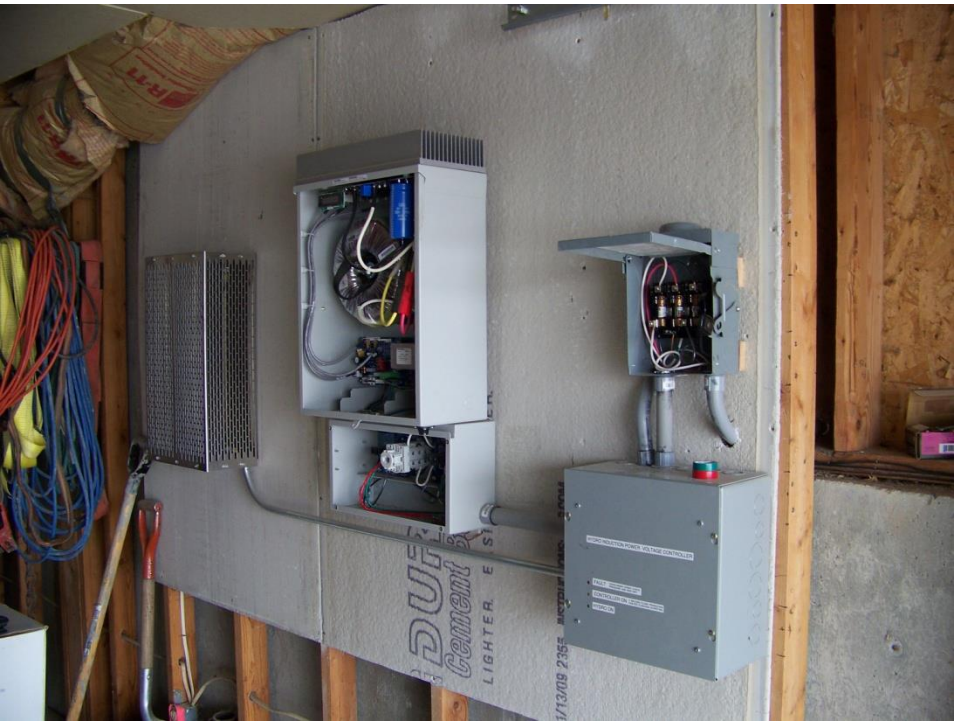
Results:

Annual kWh produced: 242,827 kWh/year
Value of KWh produced: $24,282.72 $ per year

Notes:
This spreadsheet is for illustrative purposes only. To get an accurate evaluation of your site you'll need
- pressure change profiles throughout the year
- water flow change profiles throughout the year
- detailed turbine/generator efficiencies
- more detailed pipe characteristics to determine flow (type and characteristics of pipe)
- changes in the price/value of electricity throughout the year.

Agriculture Solar installations

Residential Small Hydro installations



5 kW Residential Hydro

Collection pond or Reservoir

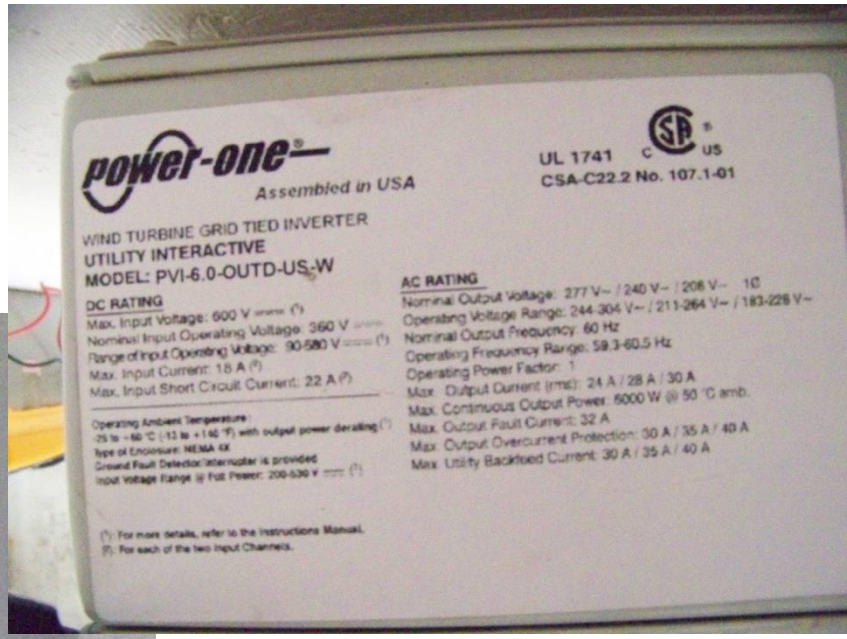
Intake

Penstock

Hydro generator and turbine

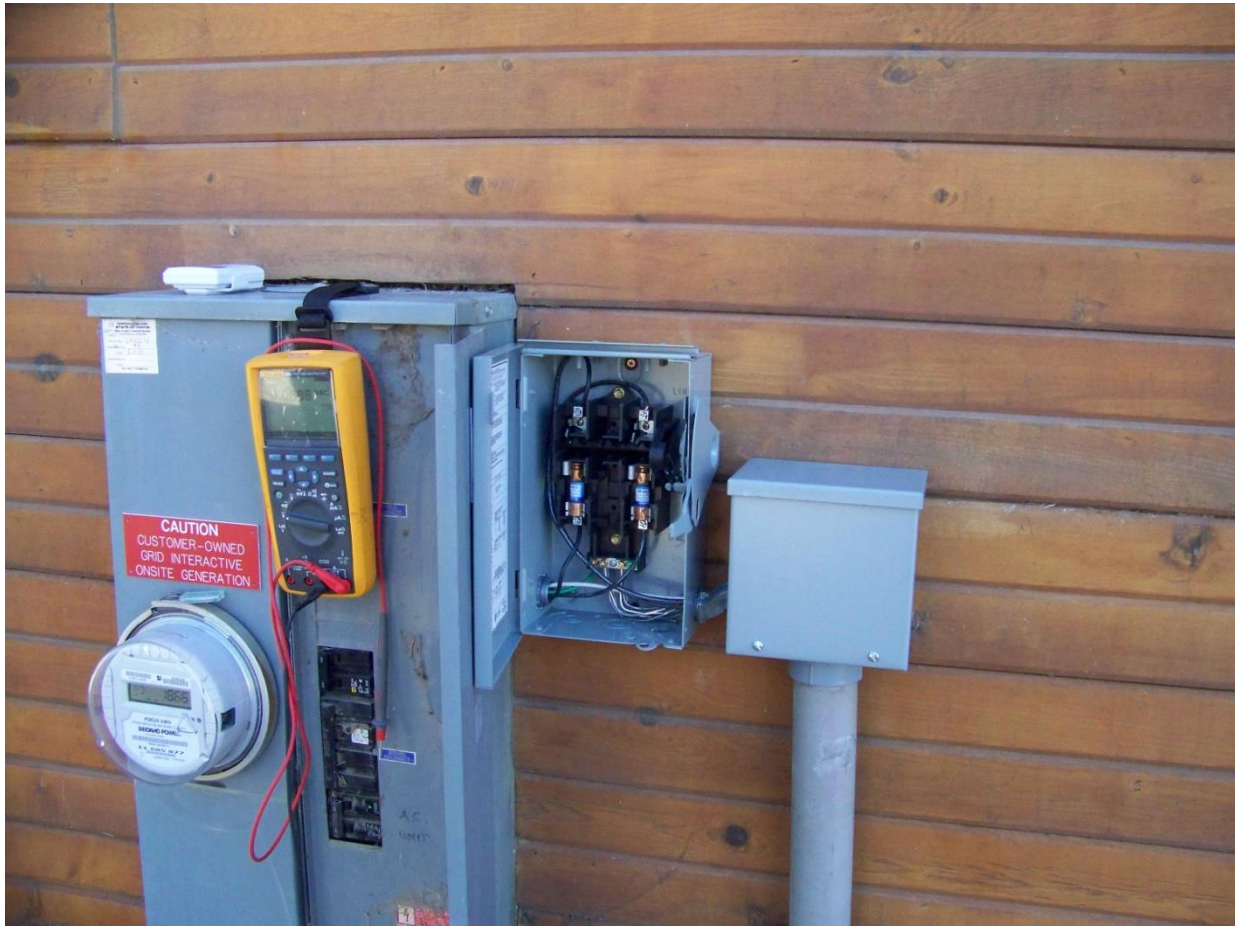
Generator controls

Transformation and Grid Protection



Tailrace

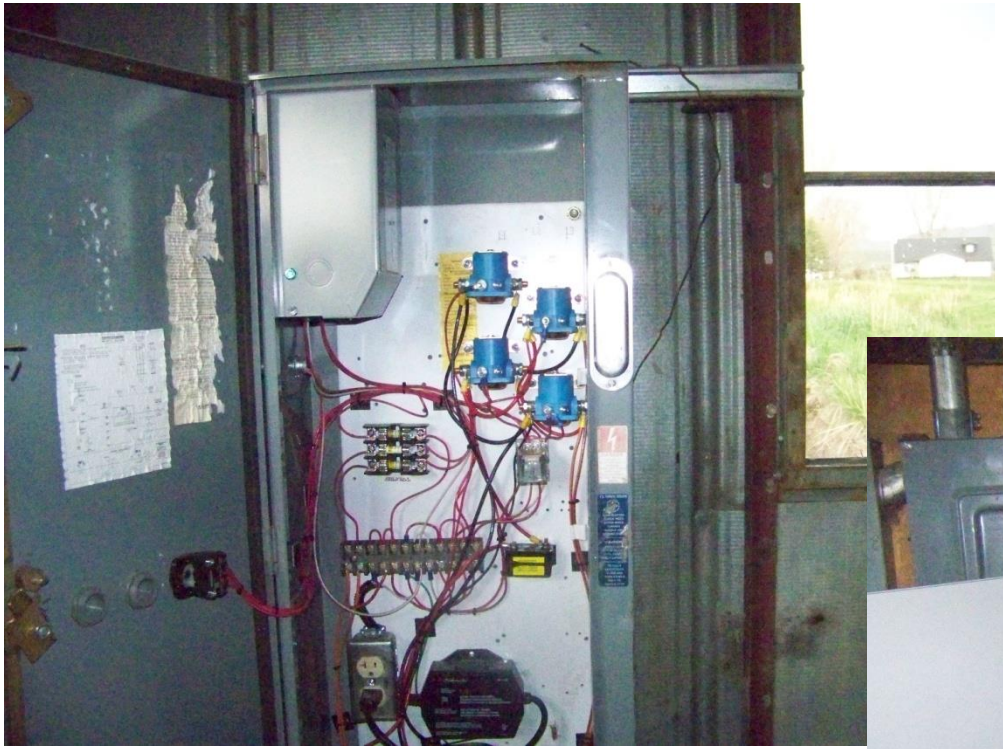
Interconnection

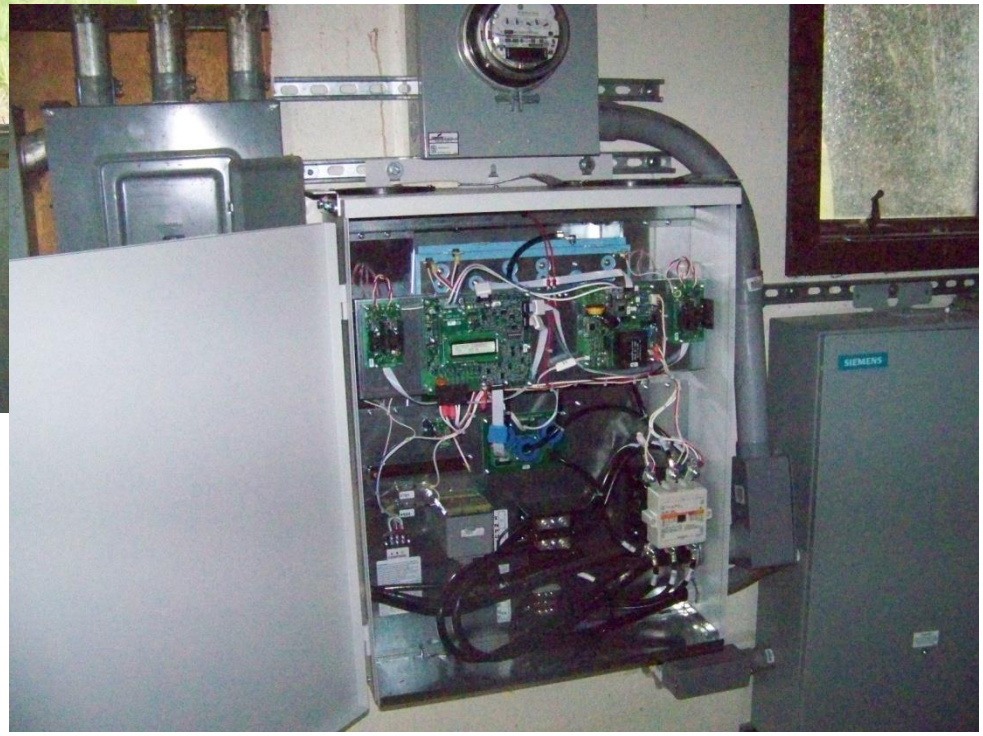


Load

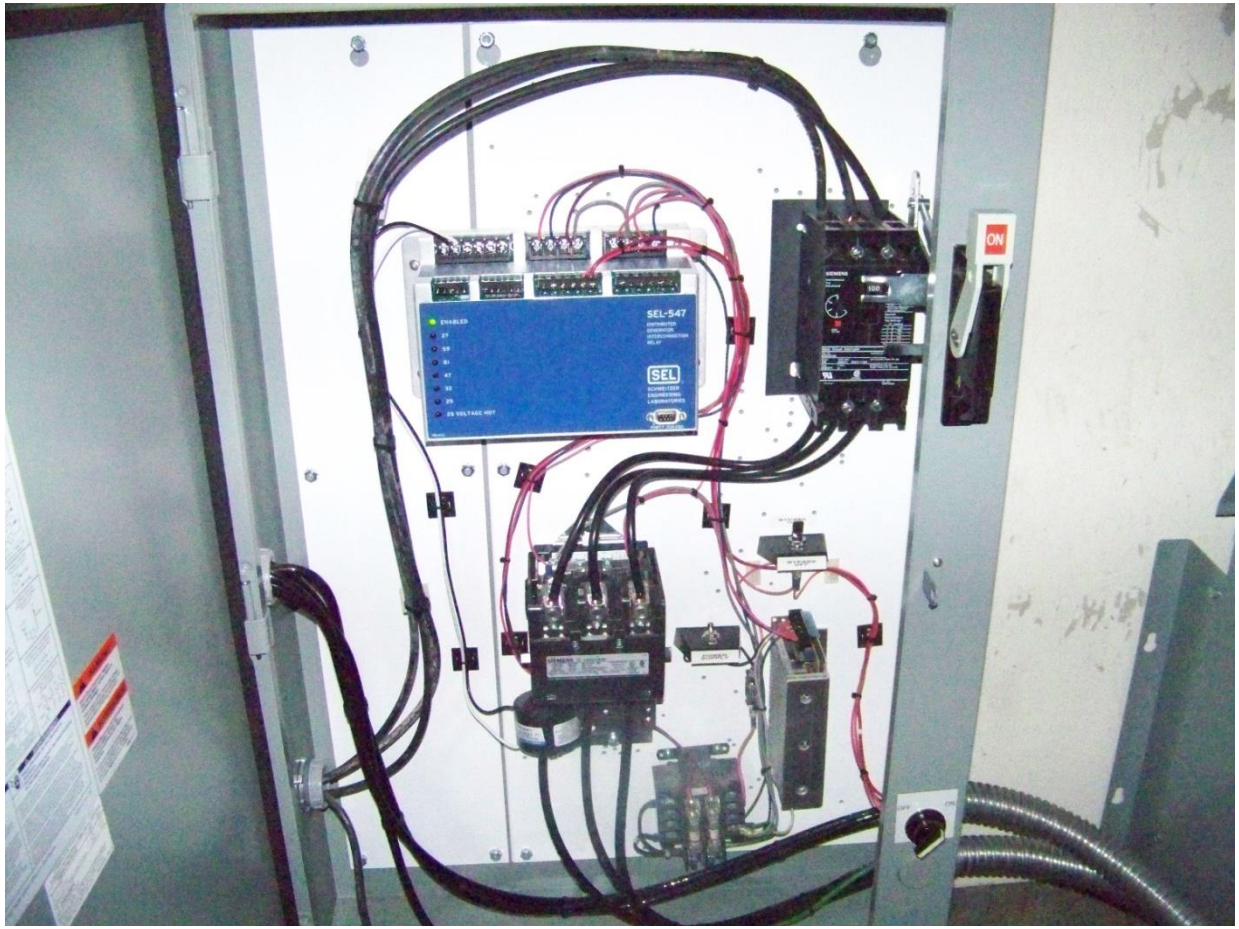
25 kW AC Hydro unit

Generator controls



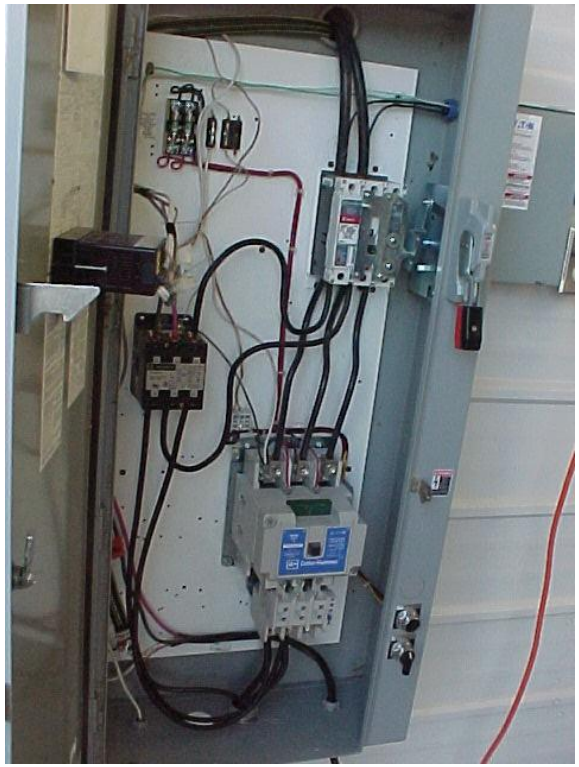


Grid protection



Intake, penstock and Tailrace

2 – 25 kW AC Hydro units



Pond and intake

Web sites and Resources

- For Net Metering Rates and Requirements and Applications and Forms. www.idahopower.com and search for Net Metering.
- For PV production from NREL on PVWatts http://pvwatts.nrel.gov
- For the Idaho Office of Energy Resources for both solar and hydro information www.energy.idaho.gov
- For Small Hydro Overview /Spreadsheet http://smallhydro.ucdavis.edu/tools/small-hydro-spreadsheet/

Net Metering Phone and Email

208-388-2559

netmetering@idahopower.com