

WECC  
Generator Model Validation Program  
at  
Idaho Power Company

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# IPCo Generation

- IPCo has
  - 17 Hydroelectric Plants – 47 generators
  - 2 Gas Turbine Plants – 4 generators
  - 1 Combined Cycle Plant – 2 generators
  - 1 Diesel Generator Plant – 2 generators
- Total # of generators is 55
- 29 of the 55 are BES generation
  - BES: Connected at 100kV and above
  - Unit => 20MVA (or)
  - Plant aggregate => 75MVA

## WECC Generator Testing Program

### Certificates of Compliance & Status for the IPCO Generating Units

**updated:  
October 30, 2007**

**current  
certificates of compliance**

Plant	Unit #	Issue Date	Expiration Date	Status / notes
American Falls	1, 2, 3	12/7/2000	12/7/2005	<b>test report ( 2nd round ) accepted by WECC on 10/30/2006 (certificate to be issued in April 2007)</b>
Milner	1, 2	12/7/2000	12/7/2005	Tested (2nd round) in February 2006- Report (rev 2) issued on 5/11/2007 - Waiting for Report verification by planning
Twin Falls	1	? / 2006		<b>OVERDUE !!! (Generation needs to make arrangements to produce report and submit to planning for review. -- Tests completed in February of 2005 -- Generation plans to complete reports within the year _____ )</b>
Twin Falls	2 (large unit)	4/7/2006	4/7/2011	<b>test report ( 2nd round ) accepted by WECC on ~10/2005 (certificate issued in April)</b>
Shoshone Falls	1, 2, 3			n.a.
Clear Lake	1			n.a.
1000 Springs	1, 2, 3			n.a.
Upper Salmon "B"	1, 2			n.a.
Upper Salmon "A"	3, 4			n.a.
Lower Salmon	1, 2, 3, 4	4/7/2006	4/7/2011	<b>test report ( 2nd round ) accepted by WECC on 3/1/2006 (certificate issued in April)</b>
Upper Malad	1			n.a.
Lower Malad	1	4/2/2005	4/7/2010	ok
Bliss	1, 2, 3	4/21/2004	4/21/2009	ok
C J Strike	1, 2, 3	12/5/2001	12/5/2006	Tested (2nd round) in December 2006- Report issued on 5/3/2007 - Waiting for Report verification by planning
Swan Falls	1, 2	4/2/2005	4/7/2010	ok
Cascade	1, 2			n.a.
Brownlee	1, 2, 3, 4	4/7/2006	4/7/2011	<b>test report ( 2nd round ) accepted by WECC on 3/10/2006 (certificate issued in April)</b>
Brownlee	5	4/1/2008	4/1/2013	test report (2nd round) completed. - report issued (9-17-2007) & approved by planning (10-18-2007) and WECC (10-30-2007)
Oxbow	1, 2, 3, 4	4/7/2006	4/7/2011	<b>test report ( 2nd round ) accepted by WECC on 3/1/2006 (certificate issued in April)</b>
Hells Canyon	1, 2, 3	4/7/2006	4/7/2011	<b>test report ( 2nd round ) accepted by WECC on 1/9/2006 (certificate issued in April)</b>
Danskin	1, 2	4/1/2007	4/1/2012	<b>( 1st round ) accepted by WECC on 5/30/2006 (certificate to be issued in April 2007)</b>
Bennett Mountain	1	? / 2005		<b>OVERDUE !!! (Generation needs to make arrangements to produce report and submit to planning for review. -- Tests completed in February of 2005 -- Generation plans to complete reports within the year _____ )</b>

Test completed , report issued & approved by Planning & WECC

These tests will be done when construction is completed

Test completed and report issued-- Transmission Planning aproval pending

Testing completed but reports not yet issued

Testing of these units is not required

Test completed, report issued & approved. -- waiting for WECC to issue or renew certificate

*Testing is required for all generators rated 10 MVA and above or belonging to a facility with aggregate capacity of 20MVA or larger, that are connected to the transmission system at 60 kV or higher.*

Power Plant	WECC		Grid Connection Voltage (kV)	Plant Aggregate Capacity (MVA)	Unit (MVA)	Unit #	Certificate Issue Date	Certificate Expiration Date	Certificate Notes	Last MOD-012 test date	Test Date Notes	Last System Planning Submission	Submission Notes	Return to Operation
American Falls	60025/AMFLS /1	AFPR1	138	102.6	34.2	1	4/30/2012	4/30/2017	AF 1,2	4/12/2011	GE Lou Hannett	7/21/2011		4/3/2014
American Falls	60025/AMFLS /2	AFPR2	138	102.6	34.2	2	4/30/2012	4/30/2017	AF 1,2	4/12/2011	GE Lou Hannett	7/21/2011		4/3/2014
American Falls	60025/AMFLS /3	AFPR3	138	102.6	34.2	3	4/29/2011	4/30/2016	AF 3	4/13/2010	IPCO Eric Bakie Testing 13-14Apr10, 04-05May10	8/20/2010		4/3/2014
Milner	60246/MILNER /1	MLPR1	138	60.7	48	1	4/29/2009	4/29/2016	Exemption request sent 1/3/14, granted 2/4/14		GE Dan Leonard R 19Mar07	3/19/2007	Assume report date	
Milner	60246/MILNER /2	MLPR2	138	60.7	12.7	2	4/29/2009	4/29/2016	Exemption request sent 1/3/14, granted 2/4/14		GE Dan Leonard R 19Mar07	3/19/2007	Assume report date	
Twin Falls	60352/TWINFALS/1	TFPR1	138	56.18	9.38	1	4/29/2009	4/29/2015	Exemption request sent 1/3/14, granted 2/4/14			4/8/2008	GE report dated 8May08 IPCO Supplemental 8Apr09	
Twin Falls	60353/TWINFALS/1	TFPR2	138	56.18	46.8	2	4/29/2009	4/29/2015	Exemption request sent 1/3/14, granted 2/4/14			6/9/2008	EPRI report dated 23Sep05 IPCO PSS report 9jun08	
Shoshone Falls	n/a	SFPR1	46	13.6	0.6	1	na	na						
Shoshone Falls	n/a	SFPR2	46	13.6	0.5	2	na	na						
Shoshone Falls	60116/SHSNFALS/1	SFPR3	46	13.6	12.5	3	na	na						
Clear Lake	n/a	CLPR1	46	3.13	3.13	1	na	na						
Thousand Springs	n/a	TSPO1	46	10	1.25	1	na	na						
Thousand Springs	n/a	TSPO2	46	10	1.25	2	na	na						
Thousand Springs	n/a	TSPO3	46	10	7.5	3	na	na						
Upper Salmon "A"	60361/U SAMN 1/1	US121	138	18	9	1	na	na						
Upper Salmon "A"	60362/U SAMN 2/1	US122	138	18	9	2	na	na						
Upper Salmon "B"	60363/U SAMN 3/1	US343	138	18	9	3	na	na						
Upper Salmon "B"	60364/U SAMN 4/1	US344	138	18	9	4	na	na						
Lower Salmon	60201/L SAMN 1/1	LSPR1	138	70	17.5	1	4/30/2013	4/30/2018						
Lower Salmon	60202/L SAMN 2/1	LSPR2	138	70	17.5	2	4/28/2010	4/29/2015	WECC list			6/1/2009	GE R1 report dated 1Jun09	
Lower Salmon	60203/L SAMN 3/1	LSPR3	138	70	17.5	3	4/30/2013	4/30/2018						
Lower Salmon	60204/L SAMN 4/1	LSPR4	138	70	17.5	4	4/30/2013	4/30/2018						
Upper Malad	n/a	UMPR1	46	8.4	8.4	1	na	na						
Lower Malad	60196/L MALAD /1	LMPR1	138	15.5	15.5	1	4/30/2013	4/30/2018						
Bliss	60036/BLISS 1/1	BSPO1	138	86.25	28.75	1	4/28/2010	4/29/2015	WECC list					
Bliss	60037/BLISS 2/1	BSPO2	138	86.25	28.75	2	4/28/2010	4/29/2015	WECC list					
Bliss	60038/BLISS 3/1	BSPO3	138	86.25	28.75	3	4/28/2010	4/29/2015	WECC list			7/5/2013		1/7/2013
C J Strike	60321/STRIKE 1/1	SKPR1	138	90	30	1	4/28/2010	4/29/2015	WECC list	8/19/2009	GE Lou Hannett Testing 19-20Aug09 R3 7Oct09	10/7/2009	Assume report date	
C J Strike	60322/STRIKE 2/1	SKPR2	138	90	30	2		4/29/2019	Expected		GE Lou Hannett 3May07	11/6/2013	Assume report date	5/10/2013
C J Strike	60323/STRIKE 3/1	SKPR3	138	90	30	3	4/30/2012	4/30/2017		3/21/2011	GE Lou Hannett	7/29/2011		
Swan Falls	60331/SWANFALL/1	SWPO1	138	28.6	14.3	1	4/30/2013	4/30/2018						
Swan Falls	60331/SWANFALL/2	SWPO2	138	28.6	14.3	2	4/30/2013	4/30/2018						
Brownlee	60096/BRWNL 1 /1	BLPR1	230	650.44	100.11	1	4/30/2012	4/30/2017		6/11/2011	GE Lou Hannett	3/12/2014		2/20/2014
Brownlee	60097/BRWNL 2 /1	BLPR2	230	650.44	100.11	2	4/30/2012	4/30/2017		6/11/2011	GE Lou Hannett	3/12/2014		9/17/2013
Brownlee	60098/BRWNL 3 /1	BLPR3	230	650.44	100.11	3	4/30/2012	4/30/2017		6/11/2011	GE Lou Hannett	3/12/2014		5/16/2013
Brownlee	60099/BRWNL 4 /1	BLPR4	230	650.44	100.11	4	4/30/2012	4/30/2017		6/11/2011	GE Lou Hannett	3/12/2014		9/17/2013
Brownlee	60100/BRWNL 5 /1	BLPR5	230	650.44	250	5	4/28/2010	4/29/2015	WECC list	3/18/2007	GE Lou Hannett/Dan Leonard R2 23Jun08 Testing 18Mar07	6/23/2008	Assume report date, emails May09 regarding extra year of certification	

# IPCO Generator Model Validation Program

Early WECC Testing and model development was completed by GE, John Undrill, for the generators located in the Hell's Canyon Complex; Brownlee, Oxbow and Hell's Canyon power plants, 12 generators.

The balance of the IPCo units which meet the WSCC Model Validation Policy requirements were tested by the generation engineers at the direction of the System Planning engineers. The System Planning Engineer developed the models.

# IPCO Generator Model Validation Program

In 2005, Power Production Engineering group was notified by the System Planning Group that it could no longer develop the generator dynamic models required by WECC Model Validation Policy.

The Power Production Group developed a Model Validation Program to meet the on going requirements of the WECC Model Validation Policy.

# IPCO Generator Model Validation Program

The IPCo Generator Model Validation Program had three components;

1. Contractors
2. The development of a Modeling Engineer
3. Permanently Installed Signal Recording Equipment, (DFR) Digital Fault Recorders

# IPCO Generator Model Validation Program

## Contractors:

The cost of hiring a contractor varies substantially. At that time of the IPCo program development three bids were secured, the unit price for model validation ranged from a low of \$15K each to a high of \$50K for each generating unit.

In addition to the cost of the contractor, contractor availability, i.e. the contractors ability to meet the testing schedule and the model submittal deadline was a concern as contractors have other clients.

# IPCO Generator Model Validation Program

Contractors (cont):

As most of you are aware unit outages for testing must be coordinated with several other groups. Additional concerns complicating the testing schedule of Hydro units include river water conditions and river constraints.

# IPCO Generator Model Validation Program

## Development of a Modeling Engineer

The hiring and development of a modeling engineer became an important piece of the Model Validation Program.

The Modeling Engineer responsibilities would initially include:

1. Program management. Early on this included MOD-010 and MOD-012 data submittals to the (TO). As standards have matured and WECC modified policy, crafting Criteria the Modeling Engineer is required to stay abreast of regulatory changes.

# IPCO Generator Model Validation Program

Development of a Modeling Engineer (cont)

2. Review Contractor Model Validation reports ensuring the report meets the expectations of the (TO) System Planning Engineers. Work as a liaison between the TO and the contractor to resolve issues and answer questions regarding the model development and the test report.

# IPCO Generator Model Validation Program

Development of a Modeling Engineer (cont)

3. Learn to test the generator and develop the dynamic models for PSLF.

Learn GE PSLF – GE offers several classes on the software and model development.

Learn generator model development – Kestrel Engineering group training or University of Idaho ECE 520: Advanced Electrical Machinery

# IPCO Generator Model Validation Program

## Development of a Modeling Engineer (cont)

Training is really a function of the engineer you hire to fill the role. One of the byproducts of this is that your engineer learns AVR and governors very well.

# IPCO Generator Model Validation Program

Permanently Installed Signal Recording Equipment, (DFR)  
Digital Fault Recorders

This option was by far the most controversial piece of the plan for a couple of reasons. First, the equipment is expensive, and expensive to install. Second, it requires monitoring of adjacent line action to attempt to validate the model.

# IPCO Generator Model Validation Program

Permanently Installed Signal Recording Equipment, (DFR)  
Digital Fault Recorders

Investigation of this option took some time, correspondence with Planners, and WECC finally provided led to a limited risk test project.

The idea to use permanently installed equipment is now being adopted by System Planners to monitor generation on their systems. The use of SynchroPhasors (PMU) to monitor plants is gaining acceptance.

# IPCO Generator Model Validation Program

Permanently Installed Signal Recording Equipment, (DFR)  
Digital Fault Recorders

While this option has not blossomed to provide Least work option to validate generator models as hoped there are some additional benefits to a DFR installation.

Monitoring of plant control systems to ensure equipment operation is a expected.

Provide insight into governor action and AVR action in response to system faults as well as other system anomalies.