

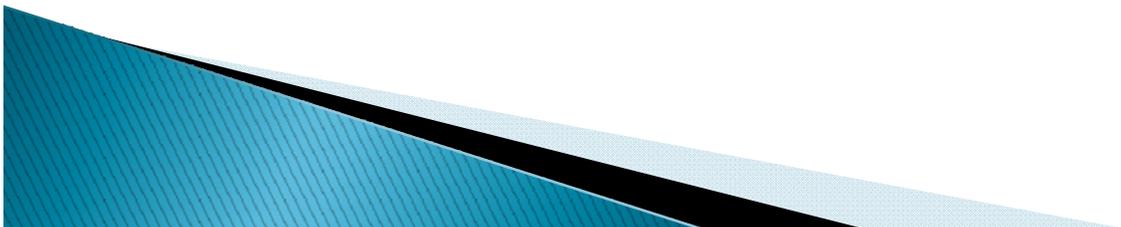
BC Hydro Import Market Assumption for PNW Resource Adequacy

November 20th, 2013

DRAFT

Outline

- ▶ BC Hydro Today
 - FY 2013
 - IPPs in BC
 - BC Interties
- ▶ 2010 Clean Energy Act
- ▶ 2013 Integrated Resource Plan
 - Plan for FY 2019



BC Hydro Today

- ▶ BC Hydro serves 95 percent of the population in British Columbia¹
- ▶ Load are split evenly between residential, commercial, and industrial customers²
- ▶ There is no merchant market in the province (IPPs are under contract with BC hydro)³
- ▶ Limited transfer capability into BC from Alberta (one 500-kV and two 139-kV lines)
 - AESO has been a net importer since 2002⁴
- ▶ BPA Northern Intertie – approximately 3,150 MW of transfer capability North to South; and 2,300 MW South to North
- ▶ The potential for the PNW to make market purchases from the North is mostly limited to purchasing from BC Hydro

BC Hydro FY 2013

- ▶ Peace River generation provided 22.7 percent of total generation
- ▶ Columbia River generation provided approximately 50 percent of total generation
- ▶ Net export sales of 1,270 aMW – hydroelectric generation in 2013 was 8.6 percent above average

LOADS FY 2013	
	aMW
Retail Load	5821.0
Sales	3536.0
Losses	588.9
	9945.9
RESOURCES FY 2013	
	aMW
Gordon Shrum	1812.6
Revelstoke	1114.2
Mica	898.7
Other Hydro	2123.6
BC Hydro Thermal	13.9
IPPs	1712.7
Short Term Purchases	2266.9
	9942.6
Source: 2013 BC Hydro Annual Report	

IPPs today in BC

- ▶ All under firm contract with BC (no merchant market)⁵
- ▶ On a planning basis, supply 22 percent of the energy load (11 percent of the capacity for FY 2019)
- ▶ Generation reliability for renewable resources is done on an ELCC basis (i.e. onshore wind has a 26 percent on peak capacity factor and wind energy is based on average) ⁶

IPPs in BC			
On-Line June 2013			
Type:	Number	aMW	Percent
Biogas	6	10.3	0.6%
Biomass	10	268.7	15.6%
Waste Heat	3	16.0	0.9%
Nat Gas	2	358.4	20.8%
MSW	1	15.0	0.9%
R of River Hydro	45	396.1	22.9%
Storage Hydro	11	544.6	31.5%
Wind	3	117.7	6.8%
		1726.8	

IPPs in BC			
In Development June 2013			
Type:	Number	aMW	Percent
Biogas	0	0.0	0.0%
Biomass	8	153.7	18.4%
Waste Heat	0	0.0	0.0%
Nat Gas	0	0.0	0.0%
MSW	0	0.0	0.0%
R of River Hydro	32	505.6	60.5%
Storage Hydro	3	41.7	5.0%
Wind	5	135.3	16.2%
		836.2	

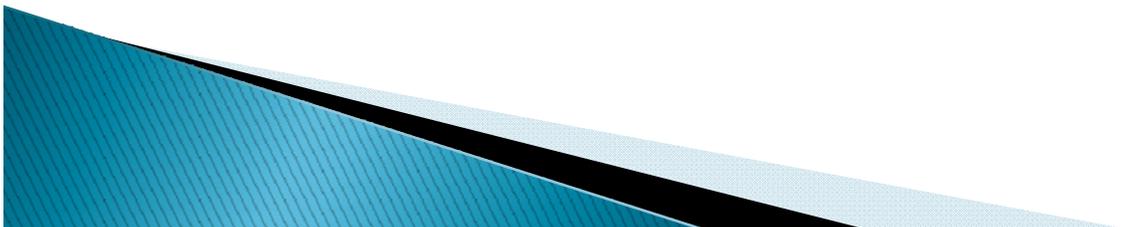
Clean Energy Act (2010)

▶ Energy Objectives

- Achieve electricity self-sufficiency (BC has been relying on imports to meet demand since the late 1990s)
 - Allows reliance on average water conditions
 - Prior 2007 Energy Plan required critical water conditions and energy surplus insurance of 340 aMW⁷
 - DSM serves 66 percent of load growth by 2020
 - Generate at least 93 percent with clean and renewable resources
 - Be a net exporter of electricity from clean and renewable resources (current policy is not to export under long term contracts)⁸
- ▶ Require 20 year, integrated resource plans (IRPs) every five years

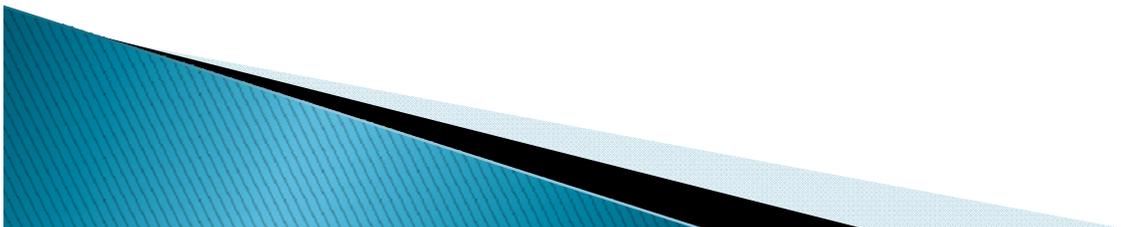
2013 IRP Process

- ▶ First draft was released in May 2012, the second draft was released in August 2013, and the final will be released in November 2013



2013 IRP: Load Growth⁹

- ▶ Loads grow from 6,500 aMW today to 7,711 aMW in 2019 (before DSM)
- ▶ Electric vehicle load modest – 160 aMW (by 2033)
- ▶ LNG facilities: assume compression will be gas-fired; station service (15% of the load will be electric)
 - 12 LNG terminals are in the planning stage
 - Expected load beginning in 2020 approximately 340 aMW (between 100 to 800 MW)



2013 IRP Resource Actions¹⁰

- ▶ Central role of conservation
 - CEA requires that 66 percent of load growth be met with DSM
 - By 2019, DSM increases by 673 aMW / 1090 MW
- ▶ Site C recommended
 - COD in 2024; (582 aMW / 1,100 MW) for \$7.8 billion dollars
 - Environmental Impact Study submitted in FY 2013
- ▶ Optimize IPP portfolio
 - Defer, downsize, terminate
 - With DSM no need for energy until 2027¹¹
 - U.S. power markets don't support BC renewable exports (long run marginal cost is \$135 per MWhr)
- ▶ Bridging Options for Capacity
 - Capacity needed by 2021 and Site C not available until 2024
 - Canadian Entitlement / Market Options (but may not meet self-sufficiency requirements of CEA)

2013 IRP Contingency Plans¹²

- ▶ High Load Growth and Low DSM could result in 1,700 MW capacity deficit in 2023 (before Site C)
- ▶ CEA requires 93 percent of the power system to be clean or renewable (already at 5 percent natural gas – little headroom left)¹³
 - Advance capacity at Revelstoke (500 MW) and GM Shrum (220 MW)
 - Investigate Natural Gas siting (possibly near the planned LNG facilities)
 - Demand Response programs (have not been successful in the past)

BC Hydro Planning for 2019¹⁴

- ▶ Use average water planning (5,568 aMW / 11,584 MW) per CEA
- ▶ Non-firm energy in planning (468 aMW) is backed up by non-firm purchases
- ▶ Includes 'Resource Smart' upgrades in base plan:¹⁵

Resource Smart' Upgrades			
Hydro Plant	In-Service	MW	MW Cummulative
Revelstoke Unit 5	2011	500	500
Shrum Units 6 to 8	2013	90	590
Mica 5 and 6	2016	925	1515
John Hart	2018	127	1642
Ruskin	2018	114	1756

BC Hydro Energy Plan for 2019:

BC HYDRO 2019 PLAN			
ENERGY	aMW	Percent	
Heritage Hydro	5088.0	71.4%	
Non-Firm / Mrkt Allow	468.0	6.6%	
Burrard	0	0.0%	
IPP Resources	1574.5	22.1%	
Total Supply (a)	7130.6		
Demand (b)	7710.6		
Deficit (c = a - b)	-580.0		
IPP New / Renew -termination / deferrals (d)	173.6		
Smart Metering Theft Reduction (e)	22.0		
Voltage Optimization (f)	34.7		
Conservation (g)	672.7		
Load Resource Balance (h = c + d + e + f + g)	323.1		
Load Resource Balance without Non-Firm / Market Purchases:	-145.0		

BC Hydro Capacity Plan for 2019:

BC HYDRO 2019 PLAN			
		MW	
Heritage Hydro		11,584	
IPP		1,241	
Reserves (14%)		(1,774)	
Total Supply (a)		11,051	
Demand (b)		12,230	
Deficit (c = a - b)		(1,179)	
IPP New / Renew		147	
- termination / deferrals (d)			
Smart Metering			
Theft Reduction (e)		26	
Voltage Optimization (f)		1	
Conservation (g)		1,090	
Load Resource Balance		85	
(h = c + d + e + f + g)			
Notes: LNG load starts in 2020 114 aMW / 120 MW			
system goes energy deficit in 2022 and capacity in 2020			
(with DSM)			
Capacity for renewable IPPs based on ELCC			

Conclusions for PNW Resource Adequacy:

- ▶ BC Hydro is a winter peaking utility with approximately 50 percent of their hydro generation in the Columbia Basin, and therefore lacks complete diversification with the PNW
- ▶ BC Hydro reliance on average water planning and power markets in critical water make it more unlikely that they could sell power in PNW critical water periods
- ▶ The disposal of the Canadian Entitlement *energy* is not specifically addressed, but it is similar in size to the non-firm / market purchase allowance in their plan
- ▶ The CEA allows BC Hydro to develop renewable energy projects for export, but can't be supported with current market conditions¹⁶

Footnotes:

1. BC Hydro Annual Report page 6
2. 2013 Integrated Resource Plan, Pages 2-7, 2-8, and 2-9
3. Comparison between the Ventyx Data Base and BC IPP plant list (see footnote #5)
4. Alberta Electric System Operator Long Term Transmission Plan (filed June 2012) pages 47 and 78
5. IRP Page 3-32

IPPs currently supplying power: <https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/independent-power-producers-calls-for-power/independent-power-producers/independent-power-producers-currently-supplying-power-to-bc-hydro.pdf>

IPPs in development: <https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/independent-power-producers-calls-for-power/independent-power-producers/independent-power-producers-with-projects-currently-in-development.pdf>

6. IRP Page 3-5, 3-32
7. IRP Technical Advisory Committee Summary Brief; meeting #5 February 28 & 29, 2012
8.
https://www.bchydro.com/content/dam/hydro/medialib/internet/documents/news/press_releases/clean_energy_act/background_cea_export_policy.pdf
9. IRP Pages 2-10 to 2-15
10. IRP Pages 8-3 to 8-5
11. IRP Page 8-23
12. IRP Page 8-5
13. IRP Page 3-53
14. IRP Appendix 8a
15. IRP Page 3-66
16. IRP Page 8-80