BC hydro

Integrated Resource Plan

Appendix 6A

Portfolio Results

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1 Introduction

Chapters 4 and 6 of the Integrated Resource Plan (**IRP**) discuss the approach, key input assumptions and, summary of analytical results that underpin the Recommended Actions in the IRP Action Plan. This Appendix presents detailed results from the IRP analysis, including portfolio composition, results and Present Value (**PV**) cost differences, as well as environmental and economic development attributes. Results are organized by topics consistent with the structure of Chapter 6.

2 Reading the Portfolio Output Sheets

Chapter 4 describes the approach and key input assumptions used to create portfolios using System Optimizer (**SO**). Appendix 4C provides descriptions of SO and other Resource Planning Models. Chapter 6 presents summary of analytical results. For each of the portfolios created and discussed in Chapter 6, a set of portfolio output sheets was produced and included in this Appendix. The analysis done in SO is in calendar years; therefore, the information on the portfolio output sheets are also shown in calendar years (F2024 load is modeled as 2023). Each set of portfolio output sheets contains the following information:

(a) **Input Assumptions**: the top section of the first page of each set of portfolio output sheets is a set of tables showing key modelling input assumptions

- **Load:** Low, mid or high load forecast, and liquefied natural gas (**LNG**) loads scenario. “Expected LNG” refers to 3000 GWh/360 MW and “High LNG” refers to 6,600 GWh/ 800 MW. For both scenarios, LNG load was assumed to begin in 2018 (F2019) when the portfolios were created. The timing assumption for LNG load has since been modified for the rest of the IRP to reflect latest information.

- **DSM[1]:** DSM Options 1 to 3; with low, mid or high saving levels. Combination of the Load and DSM assumptions defines the gap sizes. “Constant” or “extrapolated” refers to how the 20-year DSM option was extended to 30 years. Refer to the footnote in section 6.3.4 of the IRP for more details.
- **Market Scenario:** Scenarios 1 to 5, with different natural gas, electricity, GHG and REC price forecasts as described in Chapter 5 of the IRP
- **Site C:** The inclusion or exclusion of Site C as a resource option and its timing.
- **Thermal Resources:** The inclusion or exclusion of natural gas-fired generation as a resource option. All portfolios create meet the 93 per cent clean or renewable objective. For non-LNG portfolio, the natural gas-fired generation option modeled is SCGT as capacity resource. For LNG portfolios, the type of natural gas-fired generation option modeled and specific assumptions used are referenced in the table on the same row under the heading, “Other”.
- **Other:** Additional details on input assumptions; for example:
  - “7% IPP CoC” refers to the IPP cost of capital assumption of 7 per cent real
  - “$10 Wind adder” means that wind integration cost of $10/MWh is modelled
  - “Capacity bridging before F2024” means that the capacity gap before 2023 (F2024) is filled by relying on market/Canadian Entitlement
  - “LNG Prior to Site C Supply Option 1” refers to the Supply Pption 1 described in section 6.5 of the IRP

[1] DSM: Demand-Side Measures

- "Energy and Capacity bridging before Site C, LNG LT Supply Option (i)." Refers to the LNG long term supply option (i) described in section 6.5 of the IRP

(b) **PV of the Portfolio Cost**: immediately below the "Input Assumptions" tables, on the left of the portfolio output sheet is a table showing PV of portfolio costs broken down by cost components. The portfolio costs were calculated by SO.

- As described in section 4.4 of the IRP, portfolios for this IRP were created for the planning period from year 2016 to 2040 (i.e., F2017 to F2041).[2]
- The PVs as shown are calculated by discounting all cash flows to January 2013 and presented in January 2013 constant dollars (i.e., F2013$).
- The PVs are broken down into three components: generation and transmission resource costs (incremental resources), trade revenue (from spot market) and DSM Option cost. The aggregated sum of these is the Total Portfolio Cost. DSM Option Cost shown is DSM Total Resource Cost (**DSM TRC**) reflective only of regional transmission and distribution capacity benefits for BC Hydro. Explanation of the TRC is provided in section 3.3.4.1 of the IRP.

(c) **Resource Mix:** immediately below the PV table, and on the left of the portfolio output sheet are tables showing the total dependable capacity and firm energy for future supply-side resources (i.e., incremental supply) selected for the period 2016 through 2020, 2016 through 2030, and 2016 through 2040.The resources selected by the SO model are broken down into the resource categories of "Wind", "Run of River", "Other" and "Site C"[3]. The "Other" category

[2] The three years prior to F2017 are within the operational timeframe for which long-term planning actions have limited impact. Therefore, resources for these three years are assumed common across all portfolios and are not modelled.

[3] Note that the firm energy for Site C is about 4,700 GWh but 5,100 GWh (based on average water condition) is presented here to reflect the expected planning contribution from Site C on the Load Resource Balance.

includes resources such as Revelstoke 6, pumped storage, thermal, and biomass.

(d) **DSM Level:** immediately below the "Resource Mix" tables is a table showing the level of DSM savings modeled; DSM savings are presented in energy savings achieved by 2020, 2030 and 2040, with the associated capacity savings in the corresponding timeframes. Savings shown are at the system level reflecting transmission and distribution loss savings.

(e) **Clean Objective (percentage):** immediately below the "DSM Level" table is a table summarizing the statistics (percentage) of clean resources in relation to total resources during the planning period

- The percentage was calculated in two ways: (i) based on generation as simulated by the SO model (operational view) and (ii) based on firm energy contribution of system resources (planning view). The average annual percentage over the planning period and the lowest annual percentages observed over the planning period are shown.
- The Clean Objective calculation reflects the change by regulation to the 93 per cent Clean or Renewable Objective to exclude electricity used to serve LNG from the objective. The clean percentage is considered to be the ratio between the clean electricity generated less clean electricity used to serve LNG and total electricity generated less electricity used to serve LNG. Specifically:
  - In planning to meet the clean objective, BC Hydro would plan its system such that ratio between the firm energy of all system clean resources less firm clean energy relied upon to meet LNG demand and total firm energy of all system resources less firm energy relied upon to meet LNG demand is greater than or equal to 93 per cent.
  - In operating its system, BC Hydro would gauge whether the clean objective is met by calculating the ratio between the generation of all

system clean resources less clean generation that meets LNG demand and total generation from all system resources less generation that meets LNG demand, and then by comparing that ratio to 93 per cent

(f) **Transmission Expansion:** immediately below the "Clean Objective" table is a list of incremental transmission options/resources selected for the portfolio and the corresponding timing. Detailed description of the transmission options can be found in Chapter 3 of the IRP and Appendix 3A Resource Options Report. The transmission region abbreviations used in the output sheets are listed in Table 1. Note that the North Coast region is further broken into North Coast and Bob Quinn region for the purpose of SO modeling, increasing the number of transmission regions from the ten identified in the Resource Options Report to eleven.

Table 1 Transmission Region Abbreviations

Transmission Region
CI – Central Interior
EK – East Kootenay
KN – Kelly/ Nicola
LM – Lower Mainland
NC – North Coast
PR – Peace River
SE – Selkirk
VI - Vancouver Island
BQN – Bob Quinn
MCA – Mica
REV – Revelstoke

(g) **Resources Selected:** the right side of the page, below the "Input Assumptions" tables is a list that displays future/incremental supply-side resources selected by the SO model

- **Year:** the year in which the resource is selected by the SO model

- **Zone:** the transmission region/zone within which the resource is located (see Table 1 for an explanation of the abbreviations)
- **Resource:** description of the resource selected; MSW refers to municipal solid waste. In instances where multiple gas units are selected in a single year by the SO model, the impact of these gas-fired generation resources is aggregated and shown as a single line item. For simplicity, GMS Units 1- 5 capacity increase is modeled as a single 220 MW addition without reflecting the one unit per year addition profile.
- **Capacity:** installed capacity and dependable capacity (effective load carrying capability, i.e., ELCC, is shown for small hydro and wind resources)
- **Energy:** Total (i.e., average) energy and firm energy
- **UEC/UCC:** the unit energy cost (**UEC**) and unit capacity cost (**UCC**) are shown for each selected energy-rich and capacity-rich resource respectively for high level comparison. The UEC shown includes wind integration cost, soft cost adder and network upgrade cost where applicable. . The UCC shown for capacity rich resources also include soft cost adder and network upgrade cost where applicable. UCC reflects fixed costs only. The operating costs of gas resources are not shown because the cost for gas resources varies from year to year depending on the forecasted natural gas price. More sophisticated calculations were used in the model when calculating the portfolio PV.

(h) **Four Graphs:** Results of each portfolio are concluded by four graphs illustrating the following aspects in the entire resource stack (i.e., including existing, committed, planned and incremental/future resources)[4]:

[4] Note that the load lines shown on the graphs reflect the additional energy requirement from pumped storage units where applicable, and therefore the load lines shown can be higher than the load forecast shown in Chapter 2.

- **Dependable Capacity:** Supply/Demand Balance: shows the annual peak demand after DSM compared to the stack of capacity (dependable capacity/ELCC) from supply-side resources which has been adjusted/reduced to reflect/account for system reserve margin requirements.
- **Firm Energy:** Supply/Demand Balance: shows the annual energy load after DSM compared to the stack of firm energy capability from supply side resources. The percentage of clean resources over total resources based on firm energy capability is also shown for each year.
- **Simulated Generation and Load:** shows the annual energy load after DSM compared to the stack of simulated generation. The percentage of clean simulated generation over total simulated generation is also shown for each year.
- **Spot Market Imports and Exports:** shows the energy purchase (import) and sale (export) simulated by the SO model, as well as the annual net energy export throughout the study period

3 Portfolio Analysis – Demand-Side Measures

Section 6.3 of the IRP presents the analyses that tests different levels of DSM savings.

3.1 Modelling Assumptions

Figure 1 illustrates the modelling assumptions that underpinned the portfolios discussed in section 6.3 of the IRP unless otherwise noted.

Figure 1 Modelling Map – DSM

Modelling Map				
Uncertainties/Scenarios				
Market Prices	Scenario 2 Low	Scenario 1 Mid	Scenario 3 High	
Load Forecast	Low	Mid	High	
DSM deliverability	Low	Mid	High	
LNG Load Scenarios	Prior to Expected LNG	800 GWh	3000 GWh	6600 GWh
Resource choices				
Usage of 7% non-clean	Yes	No		
Site C (all units in) timing	F2024	F2026	No Site C	
Modelling Assumptions and Parameters				
BCH/IPP Cost of Capital	5/7	5/6		
Pumped Storage as Option	Yes	No		
Site C Capital Cost	Base	Base plus 10%		
Wind Integration Cost	$5/MWh	$10/MWh	$15/MWh	
	shows the modeling assumptions			

3.2 Portfolio PV Differences

Table 2 provides details supporting the portfolio PV difference shown in section 6.3 of the IRP:

Table 2 Portfolio PV for DSM analysis

Section in the IRP	Portfolio type	Portfolio description and name* Portfolio PV (M$) (A)	Portfolio description and name* Portfolio PV (M$) (B)	PV Difference (M$) (A minus B)
6.3.4.1 Option 2/DSM Target with and without Site C	Clean Generation	DSM 2 (extrapolated) Without Site C M&M_1NC_NN0_05Q 7,043	DSM 2 (extrapolated) With Site C M&M_1LC_NN0_05Q 6,416	630
	Clean Generation	DSM 2 Without Site C MFM_1NC_NN0_05Q 7,967	DSM 2 With Site C MFM_1LC_NN0_05Q 7,215	750
	Clean + Thermal Generation	DSM 2 (extrapolated) Without Site C M&M_1NT_NN0_05Q 6,308	DSM 2 (extrapolated) With Site C M&M_1LT_NN0_05Q 6,160	150
6.3.4.2 Option 2/DSM Target with Site C vs. DSM 3 without Site C	Clean + Thermal Generation	DSM 3 Without Site C MCM_1NT_NN0_05Q 7,204	DSM 2 With Site C MFM_1LT_NN0_05Q 6,886	320
6.3.4.2 DSM Option 3 vs. Option 2/DSM Target (both with Site C)	Clean Generation	DSM 3 With Site C MCM_1LC_NN0_05Q 7,478	DSM 2 With Site C MFM_1LC_NN0_05Q 7,215	260
6.3.4.3 DSM Option 1 vs. Option 2/DSM Target (both with Site C)	Clean Generation	DSM 1 With Site C MIM_1LC_NN0_05Q 7,308	DSM 2 With Site C MFM_1LC_NN0_05Q 7,215	90
6.3.4.3 DSM Option 1 vs. Option 2/DSM Target (both without Site C)	Clean Generation	DSM 1 Without Site C MIM_1NC_NN0_05Q 8,293	DSM 2 Without Site C MFM_1NC_NN0_05Q 7,967	330

* Unless otherwise noted, the DSM savings for the options referred to in this table were extended to 30 years using the "constant" assumption method described in footnote of section 6.3.4 of the IRP.

3.3 Portfolio Output

The portfolio output sheets of these portfolios are included on the following pages.

Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option 1(constant)	Scenario 1	ISD fixed F2024	Excluded (clean energy only)	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	6,034
PV of Trade Revenue - $ millions	(1,662)
PV of DSM Option cost - $ millions	2,936
PV of Total Portfolio Cost - $ millions	7,308

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	25	1,100	1,125
Firm Energy (GWh)	0	0	211	5,103	5,314

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	500	10	2,125	1,100	3,735
Firm Energy (GWh)	7,026	175	1,014	5,103	13,319

DSM Level in:

2020	6,120 GWh	1,196 MW
2030	10,302 GWh	1,985 MW
2040	10,895 GWh	2,078 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Shunt compensation at WSN KLY	PR to KN	650
2028	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2028	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147
2038	500kV circuit 5L14 between WSN and KLY	CI to KN	2120
2039	500kV circuit 5L8 between GMS and WSN	PR to CI	1470

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2028	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2029	BCH_LM	MSW2_LM	25	24	208	208	92
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2032	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2033	BCH_PR	Wind_PC21	99	26	371	371	112
2033	BCH_PR	Wind_PC28	153	40	591	591	111
2034	BCH_PR	Wind_PC13	135	35	541	541	113
2034	BCH_PR	Wind_PC16	99	26	377	377	116
2034	BCH_PR	Wind_PC19	117	30	441	441	113
2035	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2036	BCH_VI	MSW1_VI	12	12	100	100	127
2036	BCH_VI	Biomass_VI	30	30	239	239	142
2036	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2037	BCH_PR	Wind_PC09	207	54	713	713	122
2037	BCH_PR	Wind_PC15	108	28	382	382	119
2037	BCH_PR	Biomass_PR	28	28	223	223	141
2037	BCH_LM	Biomass_LM	30	30	239	239	143
2038	BCH_PR	Wind_PC14	144	37	527	527	117
2038	BCH_PR	Wind_PC20	159	41	610	610	119
2038	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2039	BCH_PR	Wind_PC11	126	33	473	473	122
2039	BCH_PR	Wind_PC41	45	12	155	155	122
2039	BCH_PR	Wind_PC42	63	16	219	219	122
2040	BCH_PR	Wind_PC18	138	36	486	486	123
2040	BCH_VI	Wind_VI14	35	9	114	114	135

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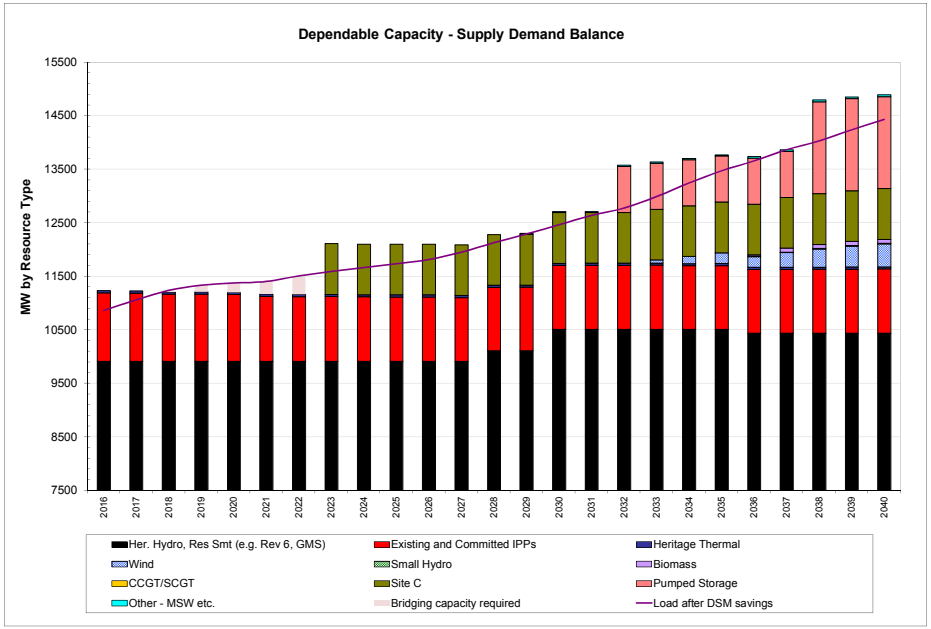

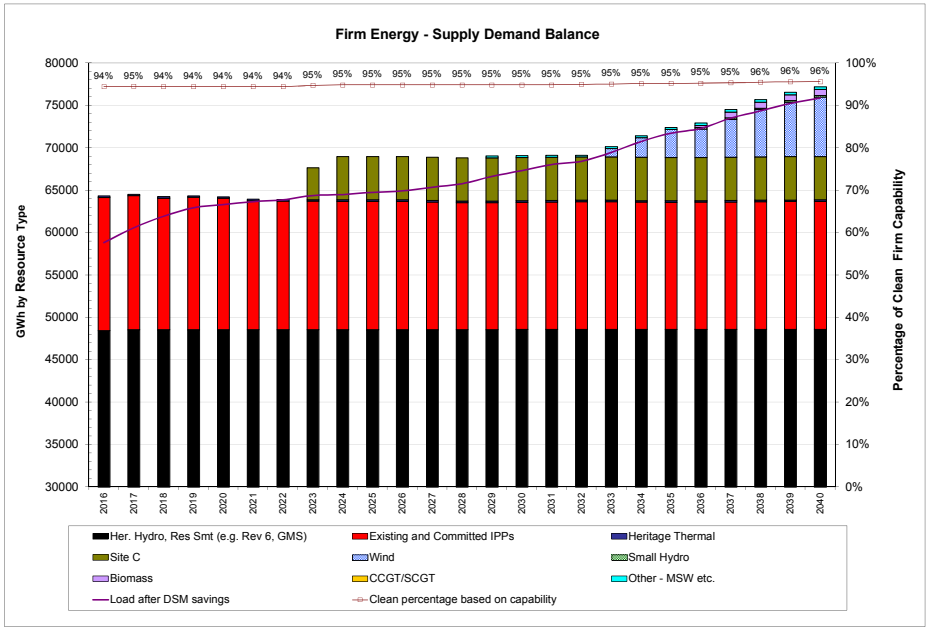

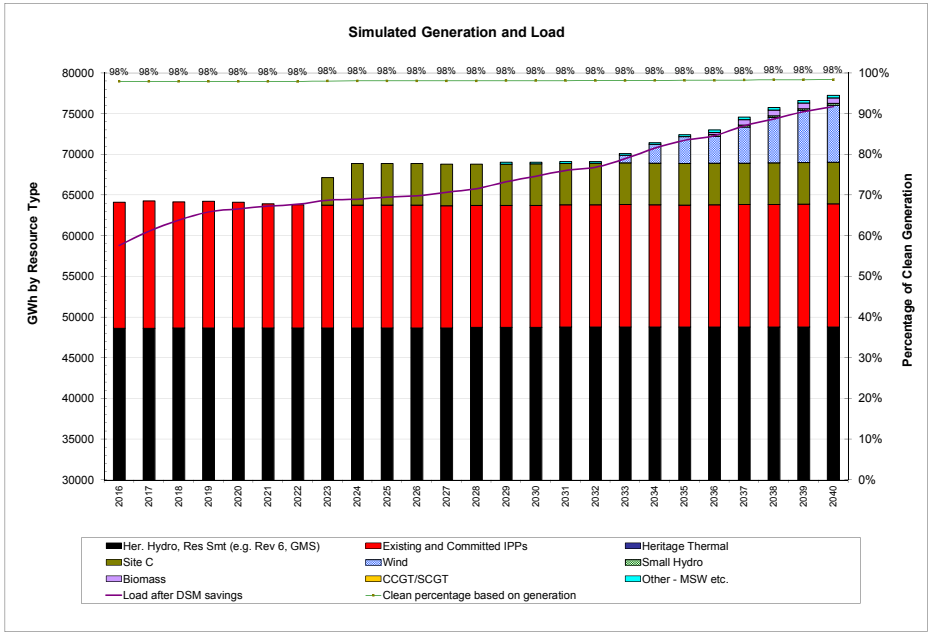

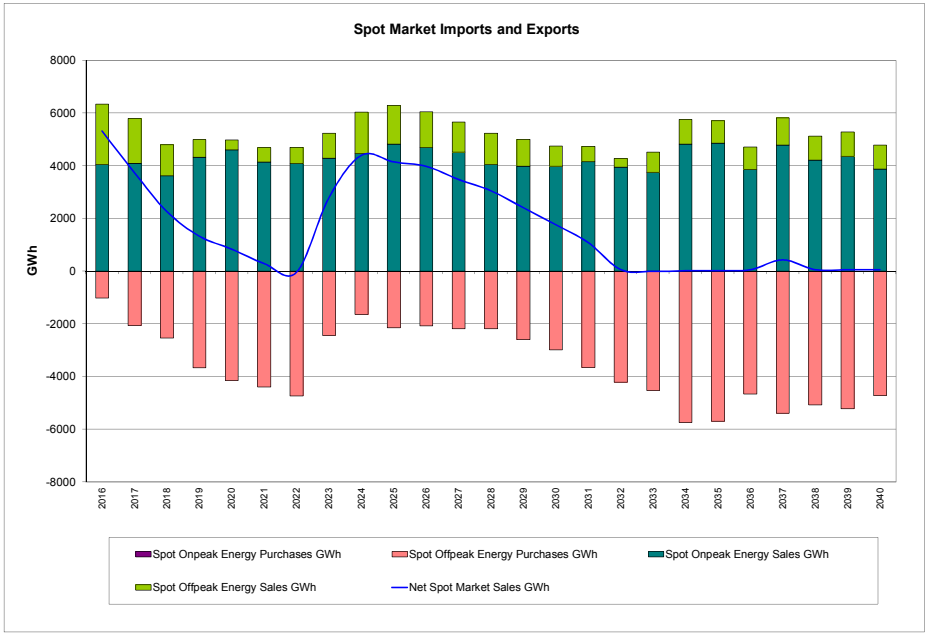

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option 1(constant)	Scenario 1	Not included	Excluded (clean energy only)	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	6,549
PV of Trade Revenue - $ millions	(1,191)
PV of DSM Option cost - $ millions	2,936
PV of Total Portfolio Cost - $ millions	8,293

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	264	0	1,037	0	1,300
Firm Energy (GWh)	3,842	0	312	0	4,154

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	853	57	2,270	0	3,180
Firm Energy (GWh)	11,241	783	2,171	0	14,195

DSM Level in:

2020	6,120 GWh	1,196 MW
2030	10,302 GWh	1,985 MW
2040	10,895 GWh	2,078 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Series compensation of 5L91 and 5L98	SE to KN	147
2031	Shunt compensation at WSN KLY	PR to KN	650
2034	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2034	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2037	500kV circuit 5L14 between WSN and KLY	CI to KN	2120

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2023	BCH_LM	MSW2_LM	25	24	208	208	92
2023	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2025	BCH_PR	Wind_PC21	99	26	371	371	112
2026	BCH_PR	Wind_PC28	153	40	591	591	111
2026	BCH_VI	MSW1_VI	12	12	100	100	127
2027	BCH_PR	Wind_PC16	99	26	377	377	116
2027	BCH_PR	Wind_PC19	117	30	441	441	113
2027	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2028	BCH_PR	Wind_PC13	135	35	541	541	113
2029	BCH_PR	Wind_PC14	144	37	527	527	117
2029	BCH_PR	Wind_PC15	108	28	382	382	119
2030	BCH_PR	Wind_PC20	159	41	610	610	119
2031	BCH_PR	Wind_PC09	207	54	713	713	122
2032	BCH_PR	Wind_PC41	45	12	155	155	122
2032	BCH_PR	Wind_PC42	63	16	219	219	122
2033	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2034	BCH_PR	Wind_PC18	138	36	486	486	123
2034	BCH_PR	Wind_PC48	152	40	505	505	128
2034	BCH_PR	Biomass_PR	28	28	223	223	141
2034	BCH_NC	Wind_NC09	334	87	1,026	1,026	135
2034	BCH_VI	Wind_VI12	48	12	150	150	135
2034	BCH_VI	Wind_VI14	35	9	114	114	135
2034	BCH_VI	Biomass_VI	30	30	239	239	142
2034	BCH_LM	Biomass_LM	30	30	239	239	143
2035	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2036	BCH_PR	Wind_PC11	126	33	473	473	122
2036	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2037	BCH_PR	Wind_PC26	126	33	416	416	127
2037	BCH_VI	Run of River VI 100_110	119	29	352	451	120
2037	BCH_LM	Run of River LM 100_110	102	18	258	330	115
2038	BCH_PR	Wind_PC06	243	63	761	761	131
2039	BCH_PR	Wind_PC27	110	29	332	332	136
2039	BCH_PR	Wind_PC40	117	30	349	349	137
2039	BCH_VI	Wind_VI15	41	11	124	124	143
2040	BCH_NC	Biomass_NC	13	13	104	104	147
2040	BCH_CI	Biomass_CI	41	41	327	327	147
2040	BCH_KN	Biomass_KN	30	30	239	239	151
2040	BCH_SE	Biomass_SE	33	33	263	263	141
2040	BCH_EK	Biomass_EK	28	28	223	223	149
2040	BCH_REV	Wind_SI12	186	48	544	544	141

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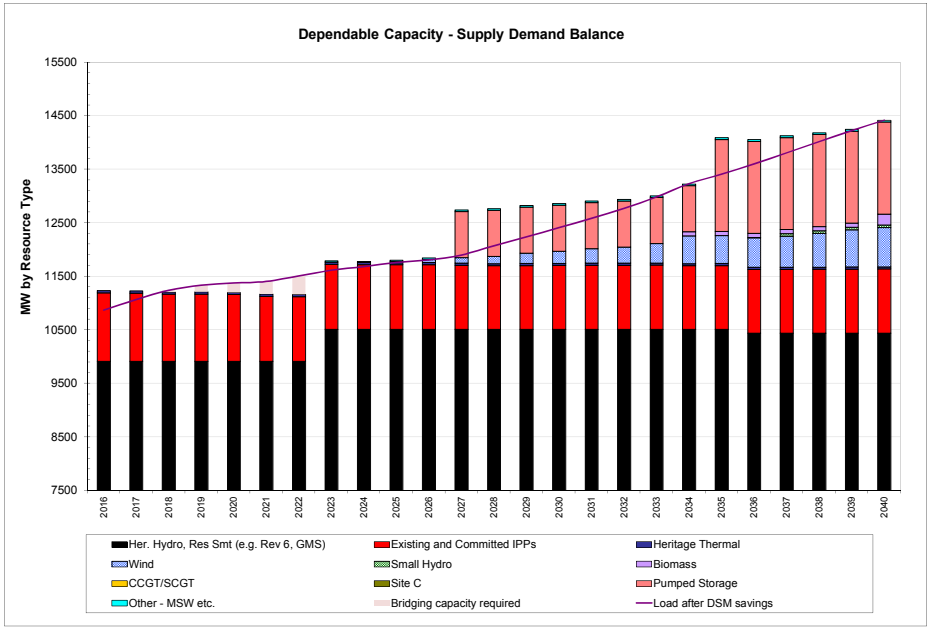

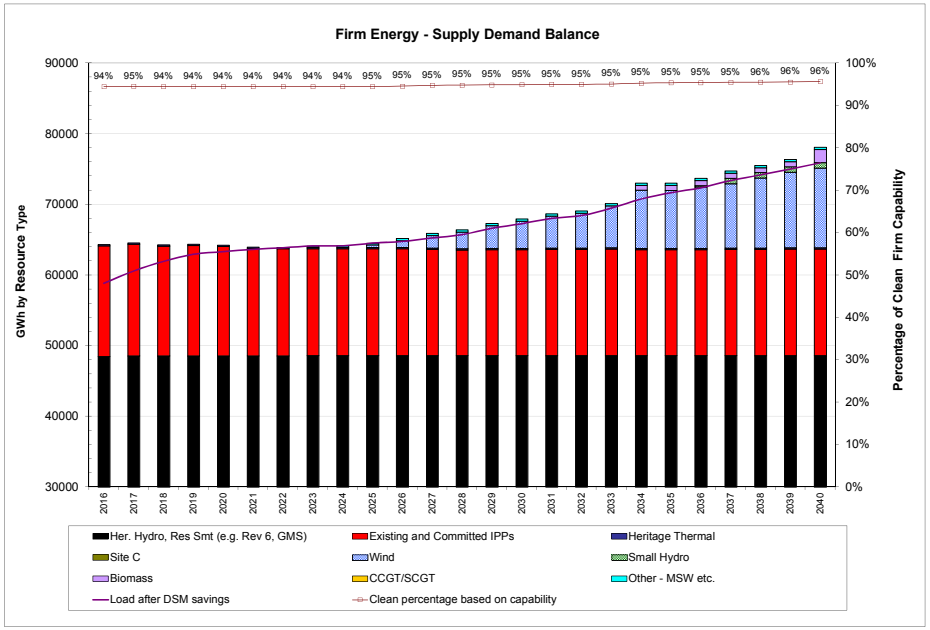

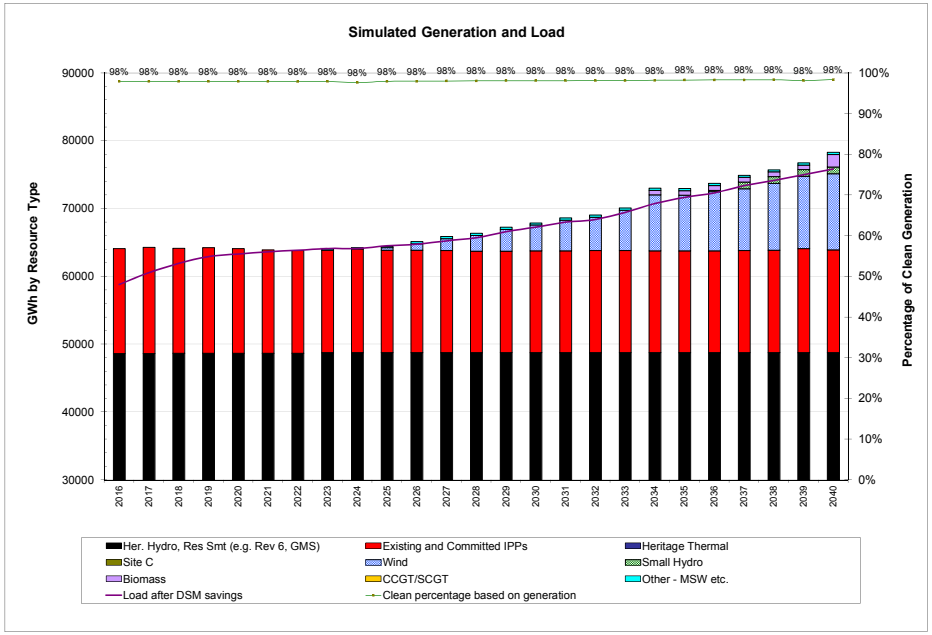

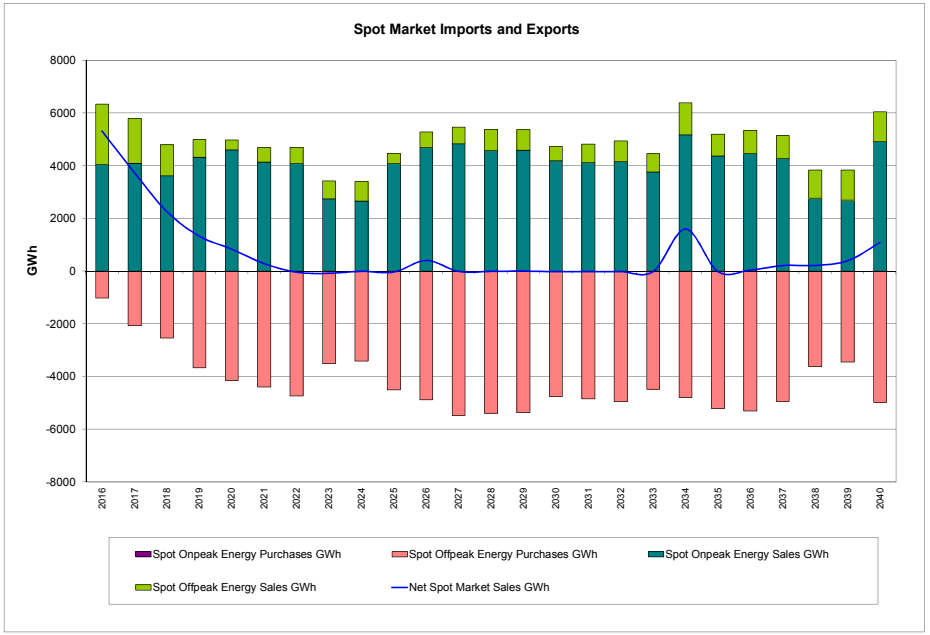

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(constant)	Scenario 1	ISD fixed F2024	Excluded (clean energy only)	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	5,902
PV of Trade Revenue - $ millions	(1,944)
PV of DSM Option cost - $ millions	3,257
PV of Total Portfolio Cost - $ millions	7,215

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	1,100	1,100
Firm Energy (GWh)	0	0	0	5,103	5,103

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	500	10	2,097	1,100	3,707
Firm Energy (GWh)	7,026	175	791	5,103	13,096

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	11,154 GWh	2,110 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Shunt compensation at WSN KLY	PR to KN	650
2029	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2029	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147
2038	500kV circuit 5L14 between WSN and KLY	CI to KN	2120
2039	500kV circuit 5L8 between GMS and WSN	PR to CI	1470

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2029	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2031	BCH_LM	MSW2_LM	25	24	208	208	92
2032	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2033	BCH_PR	Wind_PC28	153	40	591	591	111
2033	BCH_VI	MSW1_VI	12	12	100	100	127
2034	BCH_PR	Wind_PC13	135	35	541	541	113
2034	BCH_PR	Wind_PC19	117	30	441	441	113
2034	BCH_PR	Wind_PC21	99	26	371	371	112
2035	BCH_PR	Wind_PC14	144	37	527	527	117
2035	BCH_PR	Wind_PC16	99	26	377	377	116
2036	BCH_PR	Wind_PC15	108	28	382	382	119
2036	BCH_VI	Biomass_VI	30	30	239	239	142
2037	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2037	BCH_PR	Wind_PC41	45	12	155	155	122
2037	BCH_PR	Wind_PC42	63	16	219	219	122
2037	BCH_LM	Biomass_LM	30	30	239	239	143
2038	BCH_PR	Wind_PC11	126	33	473	473	122
2038	BCH_PR	Wind_PC20	159	41	610	610	119
2038	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2039	BCH_PR	Wind_PC09	207	54	713	713	122
2039	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2040	BCH_PR	Wind_PC18	138	36	486	486	123
2040	BCH_VI	Wind_VI14	35	9	114	114	135

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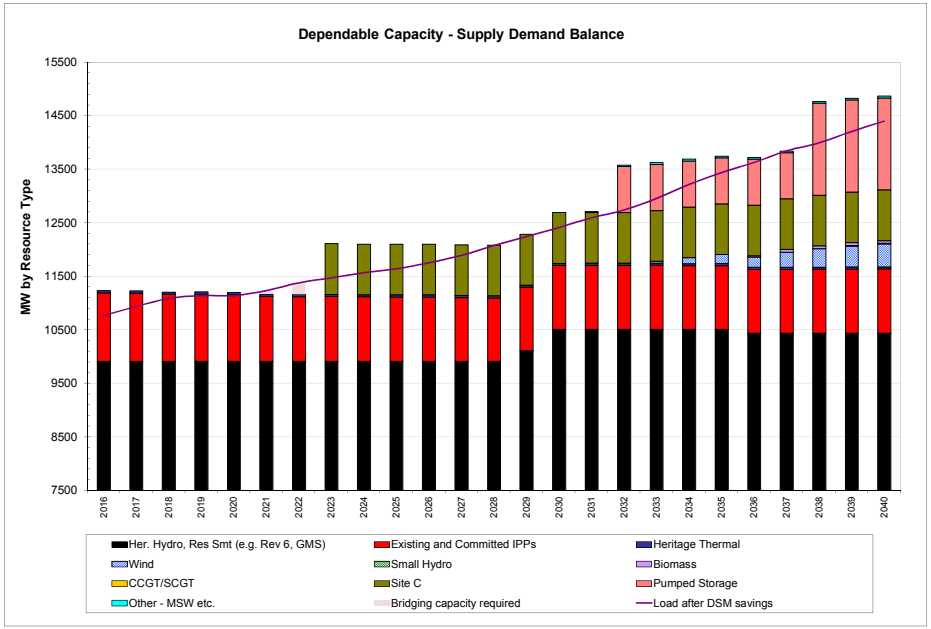

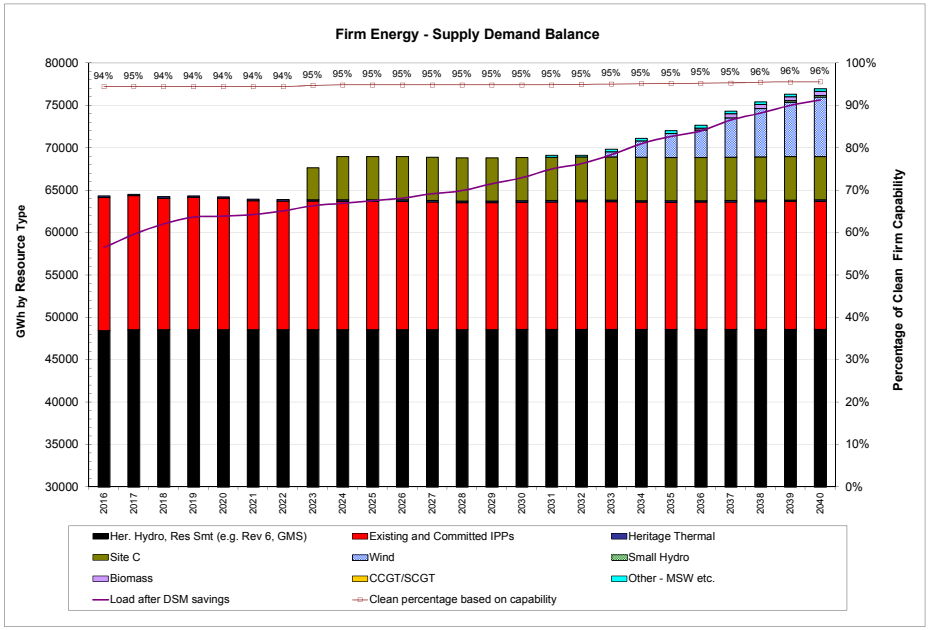

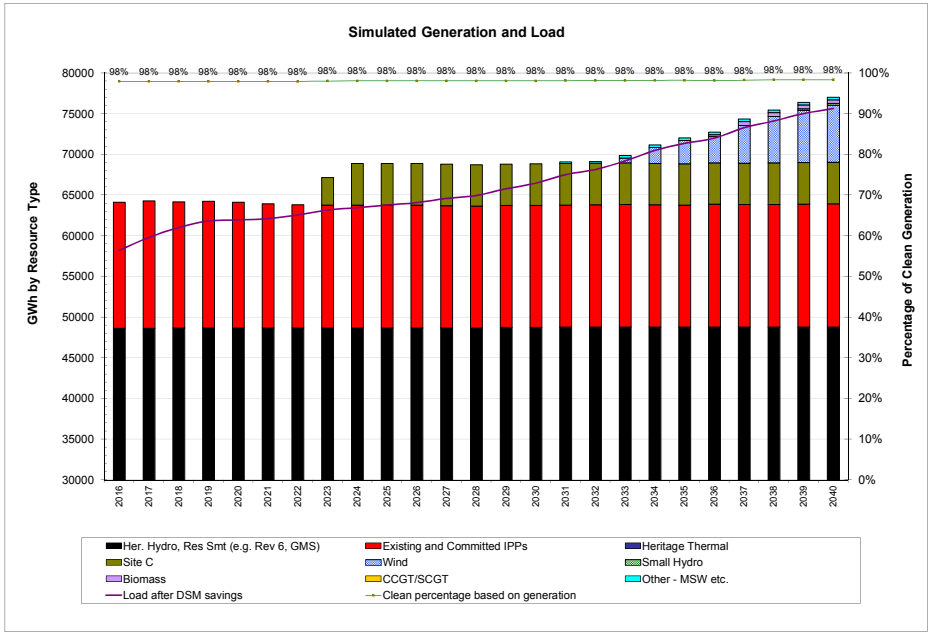

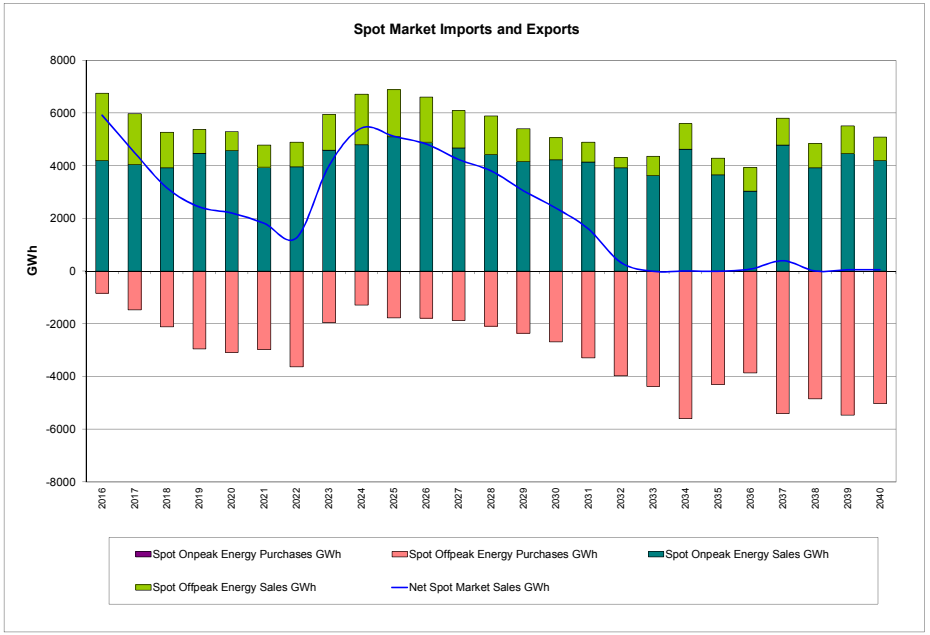

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(constant)	Scenario 1	ISD fixed F2024	Included	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	5,607
PV of Trade Revenue - $ millions	(1,977)
PV of DSM Option cost - $ millions	3,257
PV of Total Portfolio Cost - $ millions	6,886

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	1,100	1,100
Firm Energy (GWh)	0	0	0	5,103	5,103

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	341	10	2,092	1,100	3,543
Firm Energy (GWh)	4,865	175	2,205	5,103	12,349

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	11,154 GWh	2,110 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	97%	94%
Lowest %	96%	93%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Shunt compensation at WSN KLY	PR to KN	650
2029	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2029	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147
2033	500 kV circuit 5L46 between KLY and Cheekye	KN to LM	1384
2040	500kV circuit 5L14 between WSN and KLY	CI to KN	2120

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2029	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2031	BCH_LM	MSW2_LM	25	24	208	208	92
2032	BCH_KN	100 MW SCGT KN	309	294	450	450	88
2033	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2034	BCH_KN	100 MW SCGT KN	309	294	450	450	88
2035	BCH_PR	Wind_PC28	153	40	591	591	111
2035	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2035	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2036	BCH_PR	Wind_PC14	144	37	527	527	117
2036	BCH_PR	Wind_PC19	117	30	441	441	113
2036	BCH_PR	Wind_PC21	99	26	371	371	112
2036	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2036	BCH_VI	MSW1_VI	12	12	100	100	127
2037	BCH_PR	Wind_PC13	135	35	541	541	113
2037	BCH_PR	Wind_PC16	99	26	377	377	116
2037	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2038	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2039	BCH_PR	Wind_PC20	159	41	610	610	119
2040	BCH_PR	Wind_PC15	108	28	382	382	119
2040	BCH_VI	Biomass_VI	30	30	239	239	142

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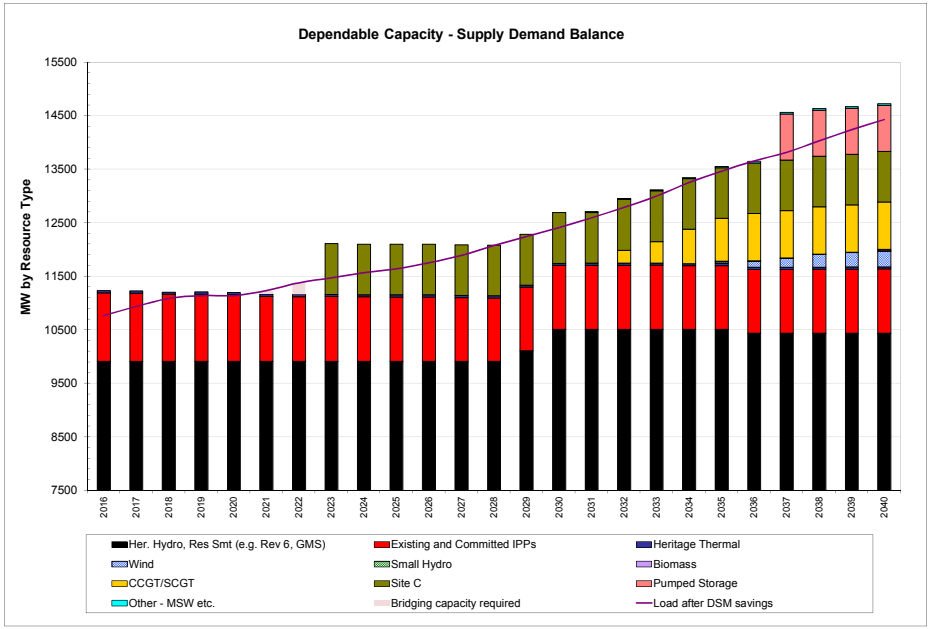

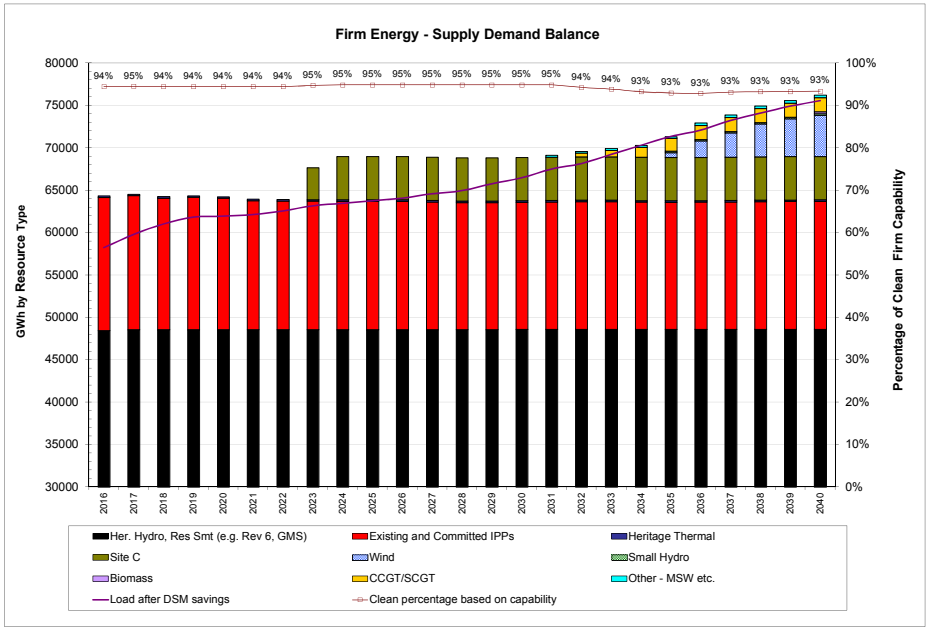

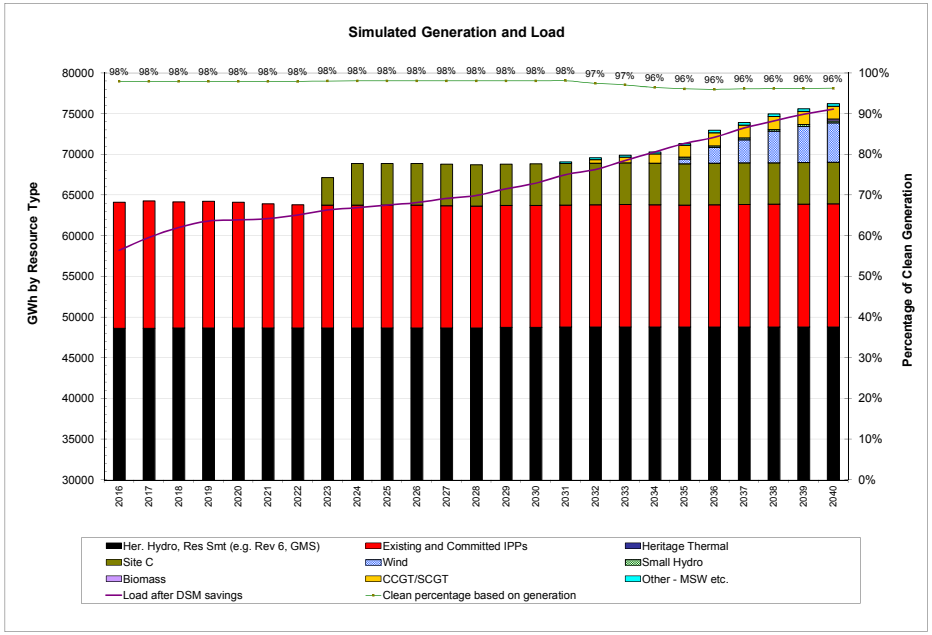

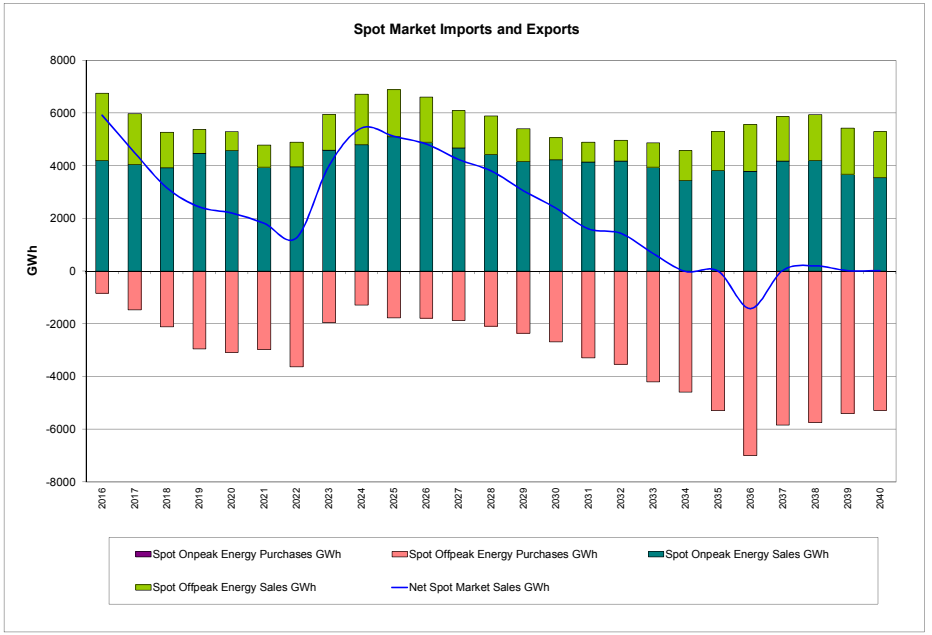

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(constant)	Scenario 1	Not included	Excluded (clean energy only)	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	6,091
PV of Trade Revenue - $ millions	(1,381)
PV of DSM Option cost - $ millions	3,257
PV of Total Portfolio Cost - $ millions	7,967

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	194	0	1,037	0	1,231
Firm Energy (GWh)	2,850	0	312	0	3,162

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	832	57	2,270	0	3,159
Firm Energy (GWh)	10,996	783	2,171	0	13,949

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	11,154 GWh	2,110 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	97%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Series compensation of 5L91 and 5L98	SE to KN	147
2031	Shunt compensation at WSN KLY	PR to KN	650
2034	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2034	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2037	500kV circuit 5L14 between WSN and KLY	CI to KN	2120

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2023	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2026	BCH_VI	MSW1_VI	12	12	100	100	127
2026	BCH_LM	MSW2_LM	25	24	208	208	92
2027	BCH_PR	Wind_PC13	135	35	541	541	113
2027	BCH_PR	Wind_PC21	99	26	371	371	112
2027	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2028	BCH_PR	Wind_PC19	117	30	441	441	113
2029	BCH_PR	Wind_PC14	144	37	527	527	117
2029	BCH_PR	Wind_PC16	99	26	377	377	116
2030	BCH_PR	Wind_PC28	153	40	591	591	111
2031	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2032	BCH_PR	Wind_PC20	159	41	610	610	119
2032	BCH_VI	Wind_VI12	48	12	150	150	135
2033	BCH_PR	Wind_PC09	207	54	713	713	122
2033	BCH_PR	Wind_PC15	108	28	382	382	119
2034	BCH_PR	Wind_PC06	243	63	761	761	131
2034	BCH_PR	Wind_PC18	138	36	486	486	123
2034	BCH_PR	Wind_PC26	126	33	416	416	127
2034	BCH_PR	Wind_PC41	45	12	155	155	122
2034	BCH_PR	Wind_PC42	63	16	219	219	122
2034	BCH_PR	Biomass_PR	28	28	223	223	141
2034	BCH_VI	Wind_VI13	35	9	106	106	140
2034	BCH_VI	Wind_VI14	35	9	114	114	135
2034	BCH_VI	Biomass_VI	30	30	239	239	142
2034	BCH_LM	Biomass_LM	30	30	239	239	143
2035	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2036	BCH_PR	Wind_PC11	126	33	473	473	122
2036	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2037	BCH_NC	Wind_NC09	334	87	1,026	1,026	135
2038	BCH_PR	Wind_PC48	152	40	505	505	128
2038	BCH_VI	Wind_VI15	41	11	124	124	143
2038	BCH_LM	Run of River LM 100_110	102	18	258	330	115
2039	BCH_PR	Wind_PC27	110	29	332	332	136
2039	BCH_VI	Run of River VI 100_110	119	29	352	451	120
2040	BCH_NC	Biomass_NC	13	13	104	104	147
2040	BCH_CI	Biomass_CI	41	41	327	327	147
2040	BCH_KN	Biomass_KN	30	30	239	239	151
2040	BCH_SE	Biomass_SE	33	33	263	263	141
2040	BCH_EK	Biomass_EK	28	28	223	223	149
2040	BCH_REV	Wind_SI12	186	48	544	544	141

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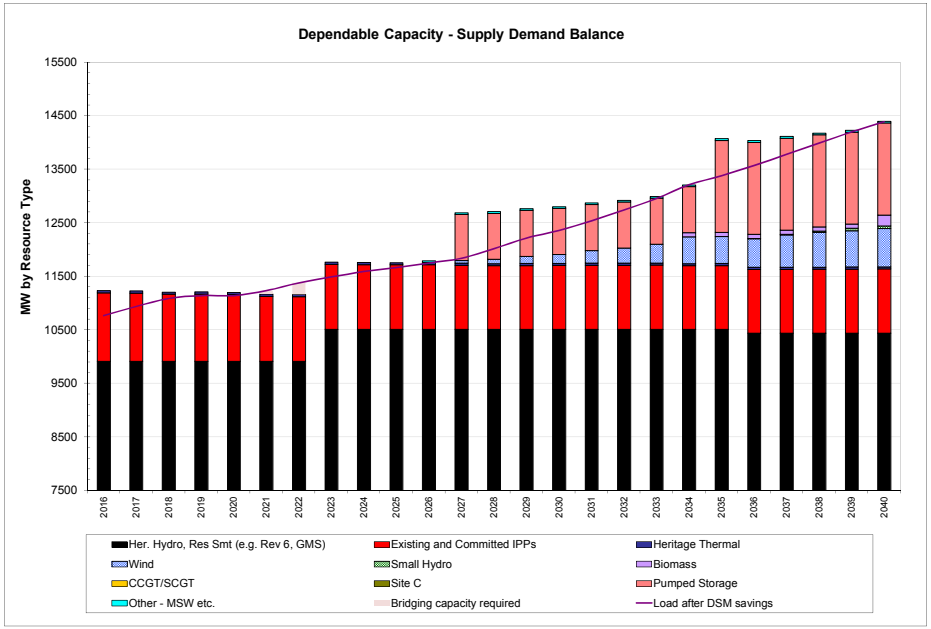

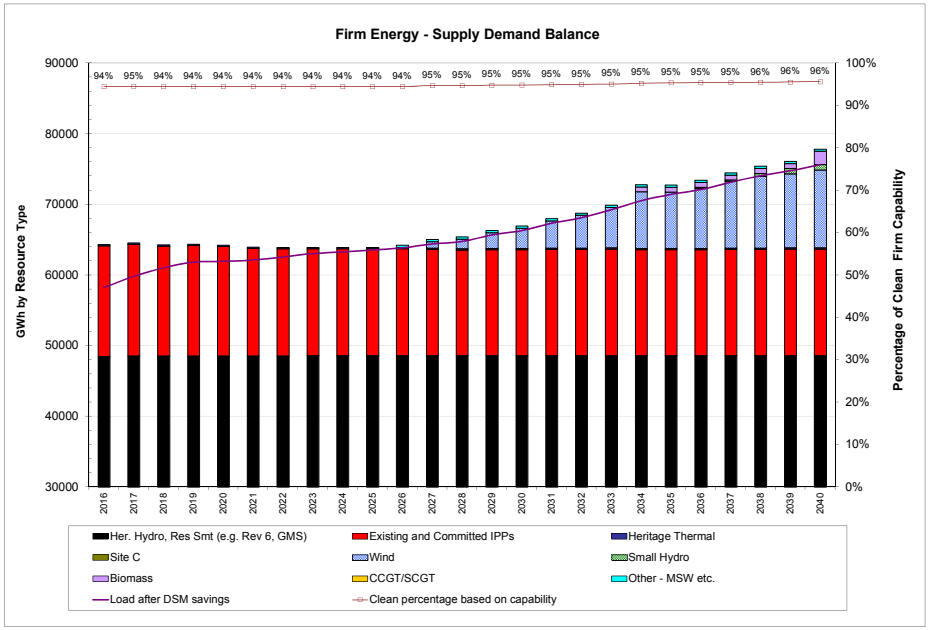

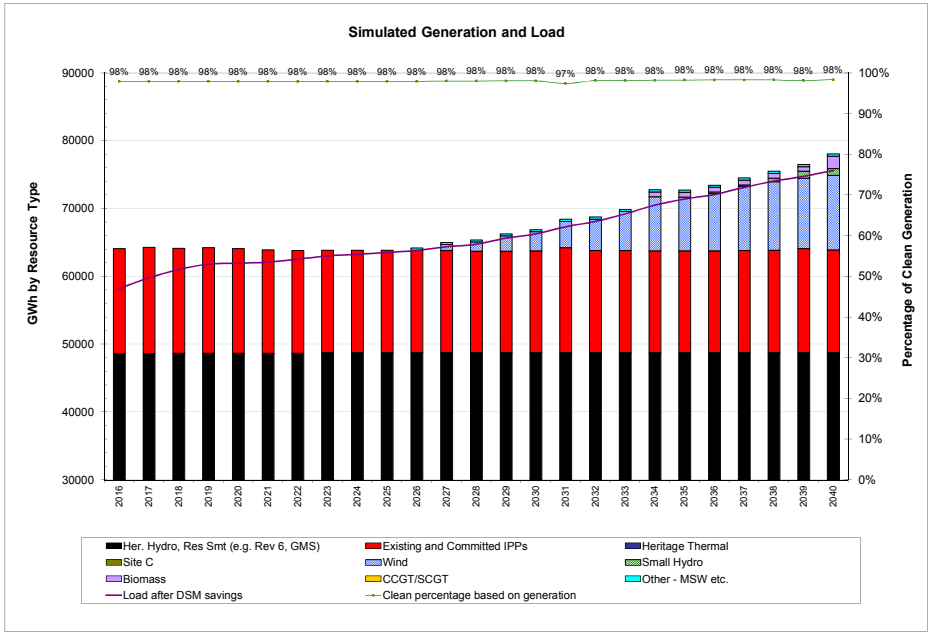

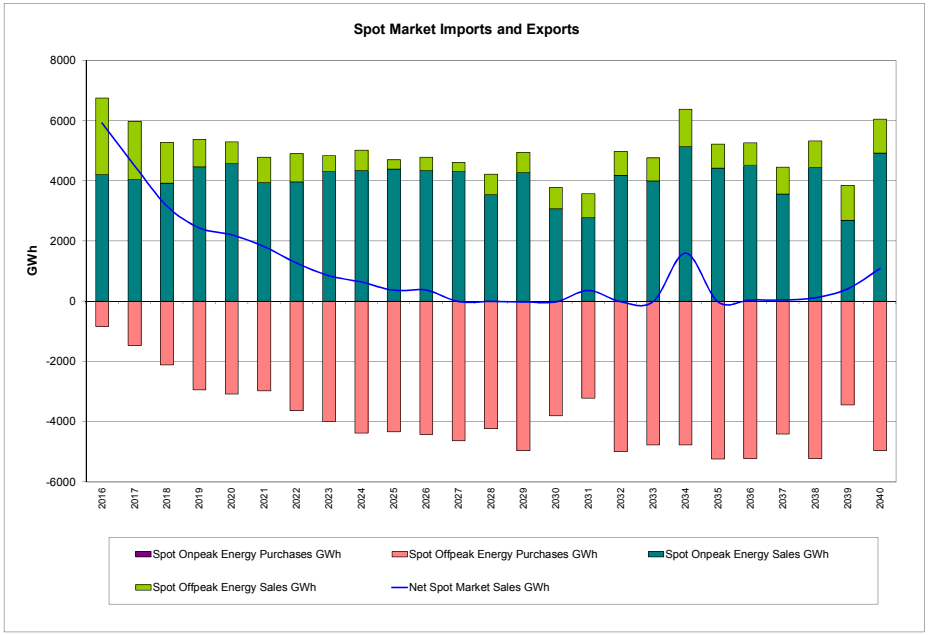

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Excluded (clean energy only)	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	5,096
PV of Trade Revenue - $ millions	(1,935)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	6,416

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	1,100	1,100
Firm Energy (GWh)	0	0	0	5,103	5,103

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	283	0	1,097	1,100	2,480
Firm Energy (GWh)	4,029	0	791	5,103	9,923

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Shunt compensation at WSN KLY	PR to KN	650
2029	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2029	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2029	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2032	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2034	BCH_PR	Wind_PC28	153	40	591	591	111
2034	BCH_LM	MSW2_LM	25	24	208	208	92
2035	BCH_PR	Wind_PC19	117	30	441	441	113
2035	BCH_PR	Wind_PC21	99	26	371	371	112
2036	BCH_PR	Wind_PC16	99	26	377	377	116
2037	BCH_PR	Wind_PC13	135	35	541	541	113
2037	BCH_VI	MSW1_VI	12	12	100	100	127
2038	BCH_VI	Biomass_VI	30	30	239	239	142
2038	BCH_LM	Biomass_LM	30	30	239	239	143
2039	BCH_PR	Wind_PC14	144	37	527	527	117
2040	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2040	BCH_PR	Wind_PC41	45	12	155	155	122

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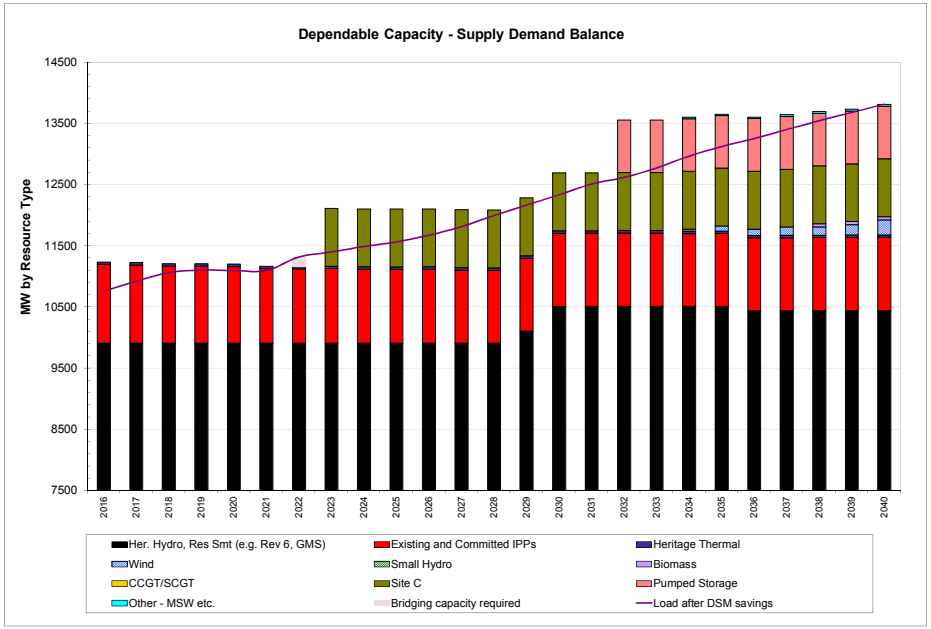

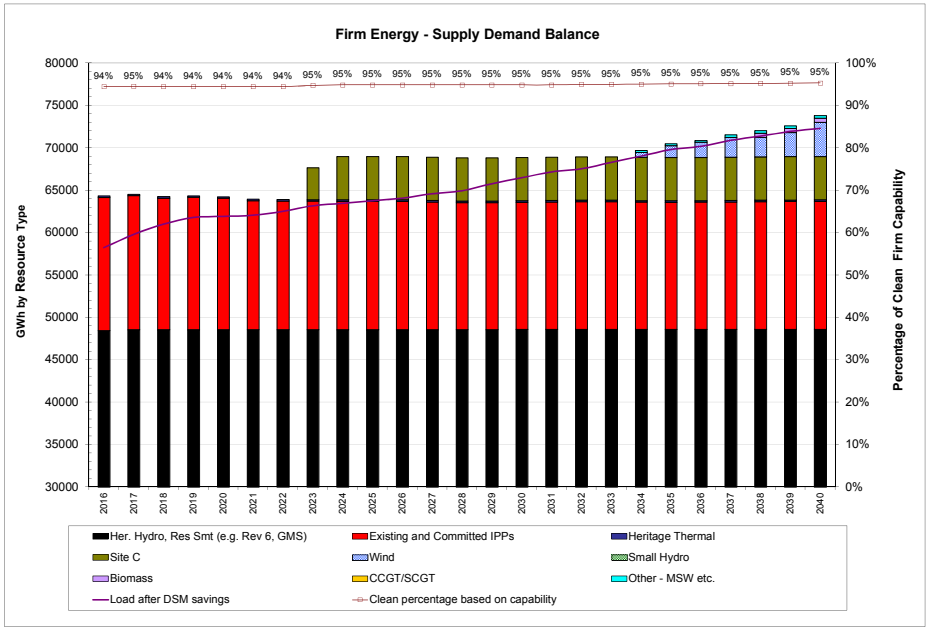

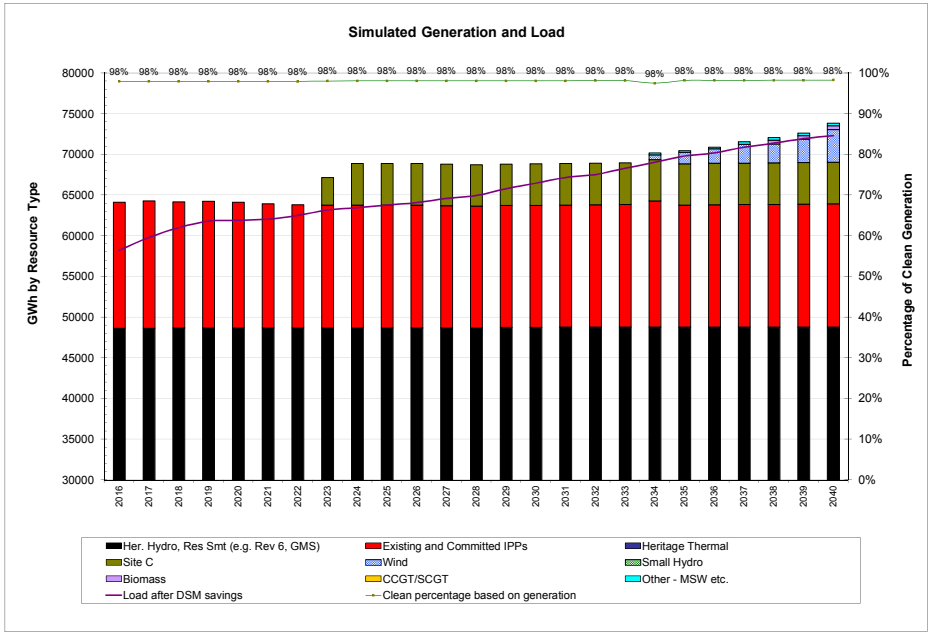

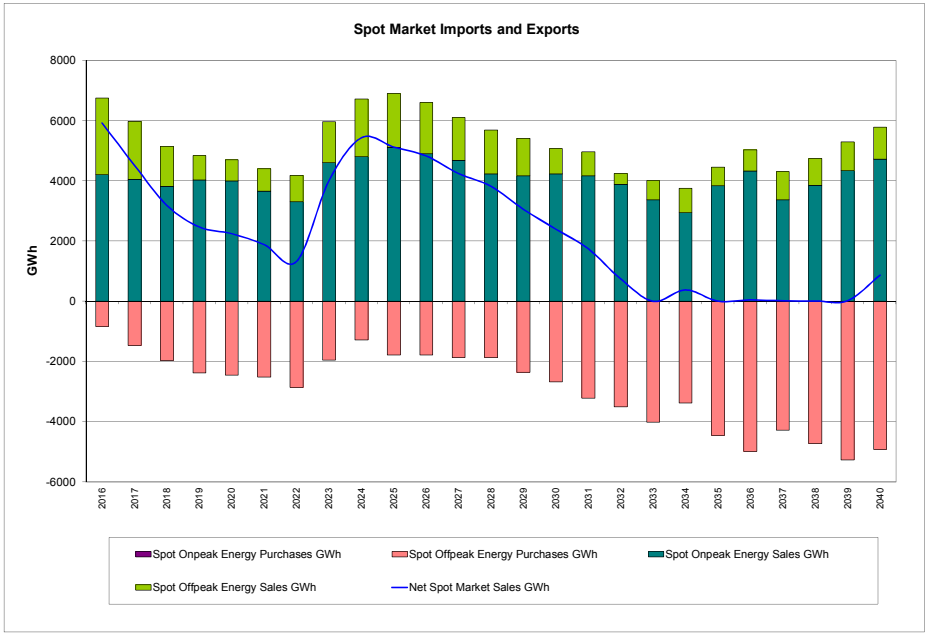

M&M_1LC_NN0_05Q

Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 1	Not included	Excluded (clean energy only)	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	5,119
PV of Trade Revenue - $ millions	(1,330)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	7,043

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	194	0	1,037	0	1,231
Firm Energy (GWh)	2,850	0	312	0	3,162

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	594	10	2,158	0	2,762
Firm Energy (GWh)	8,203	175	1,277	0	9,656

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Series compensation of 5L91 and 5L98	SE to KN	147
2032	Shunt compensation at WSN KLY	PR to KN	650
2035	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2035	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2023	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2027	BCH_PR	Wind_PC13	135	35	541	541	113
2027	BCH_PR	Wind_PC21	99	26	371	371	112
2027	BCH_PR	Wind_PC28	153	40	591	591	111
2027	BCH_LM	MSW2_LM	25	24	208	208	92
2028	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2029	BCH_PR	Wind_PC16	99	26	377	377	116
2029	BCH_PR	Wind_PC19	117	30	441	441	113
2030	BCH_PR	Wind_PC14	144	37	527	527	117
2030	BCH_VI	MSW1_VI	12	12	100	100	127
2031	BCH_PR	Wind_PC20	159	41	610	610	119
2031	BCH_PR	Wind_PC41	45	12	155	155	122
2032	BCH_PR	Wind_PC15	108	28	382	382	119
2033	BCH_PR	Wind_PC09	207	54	713	713	122
2034	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2035	BCH_PR	Wind_PC18	138	36	486	486	123
2035	BCH_PR	Wind_PC42	63	16	219	219	122
2035	BCH_PR	Biomass_PR	28	28	223	223	141
2035	BCH_VI	Wind_VI12	48	12	150	150	135
2035	BCH_VI	Wind_VI14	35	9	114	114	135
2035	BCH_VI	Biomass_VI	30	30	239	239	142
2035	BCH_LM	Biomass_LM	30	30	239	239	143
2036	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2037	BCH_PR	Wind_PC11	126	33	473	473	122
2037	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2038	BCH_PR	Wind_PC26	126	33	416	416	127
2038	BCH_VI	Wind_VI13	35	9	106	106	140
2039	BCH_PR	Wind_PC48	152	40	505	505	128
2040	BCH_SE	Biomass_SE	33	33	263	263	141

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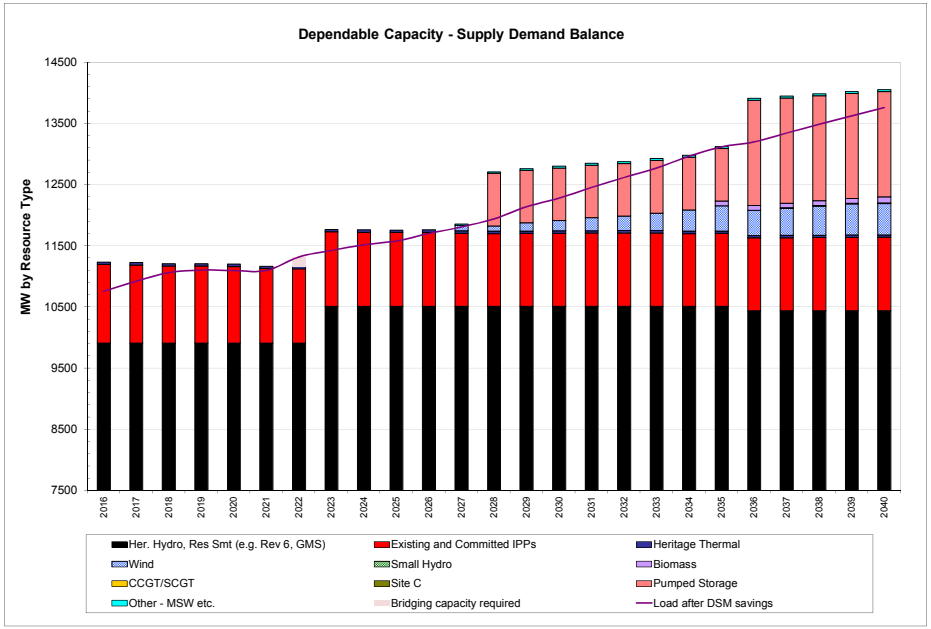
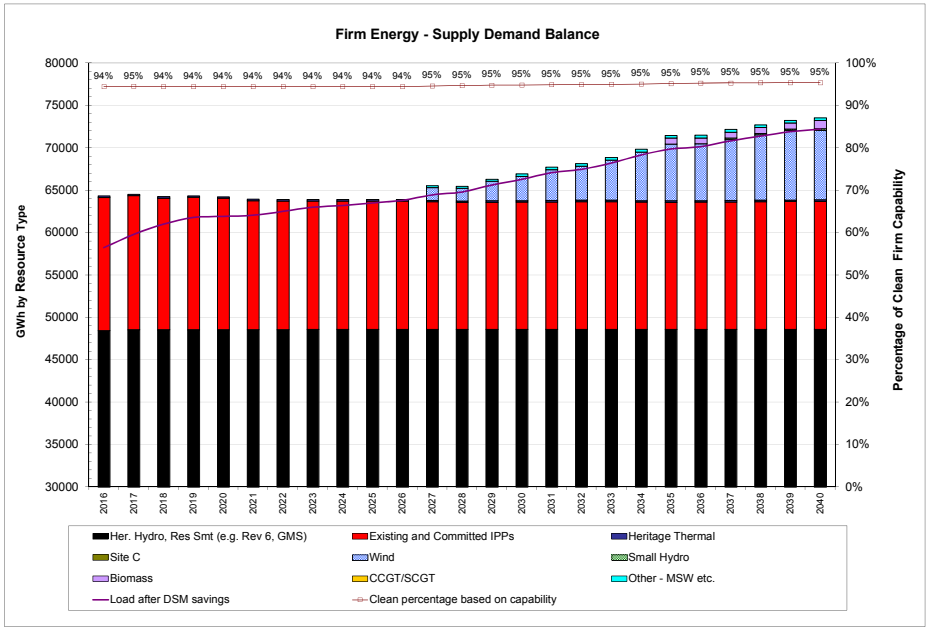
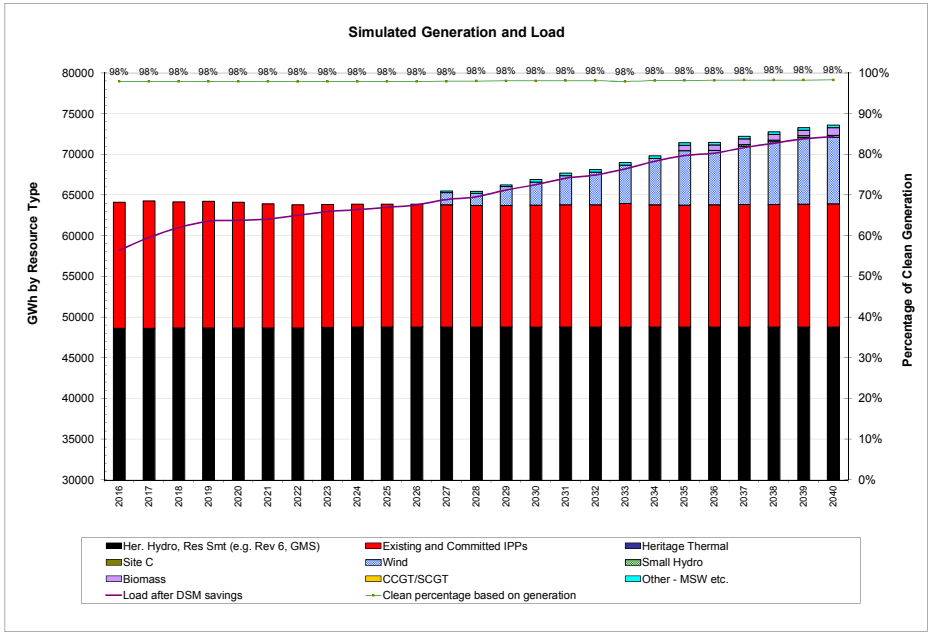
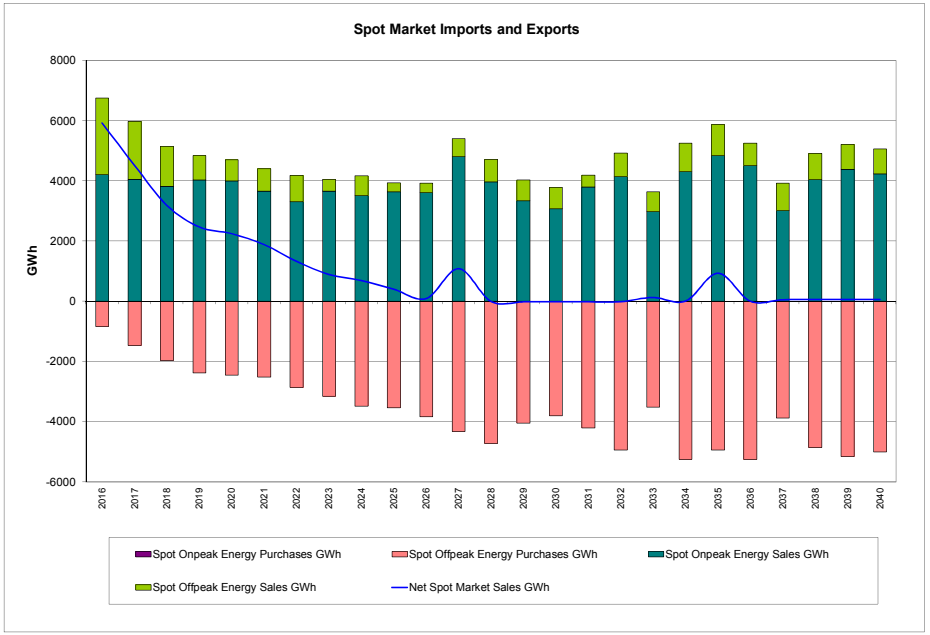








M&M_1NC_NN0_05Q

Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Included	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	4,885
PV of Trade Revenue - $ millions	(1,979)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	6,160

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	1,100	1,100
Firm Energy (GWh)	0	0	0	5,103	5,103

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	133	0	1,999	1,100	3,232
Firm Energy (GWh)	1,932	0	2,055	5,103	9,090

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2029	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2033	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2034	BCH_KN	100 MW SCGT KN	309	294	450	450	88
2035	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2036	BCH_KN	100 MW SCGT KN	309	294	450	450	88
2037	BCH_PR	Wind_PC19	117	30	441	441	113
2037	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2038	BCH_PR	Wind_PC14	144	37	527	527	117
2038	BCH_PR	Wind_PC28	153	40	591	591	111
2038	BCH_VI	MSW1_VI	12	12	100	100	127
2038	BCH_VI	Biomass_VI	30	30	239	239	142
2038	BCH_LM	MSW2_LM	25	24	208	208	92
2039	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2040	BCH_PR	Wind_PC21	99	26	371	371	112

DSM Level in:

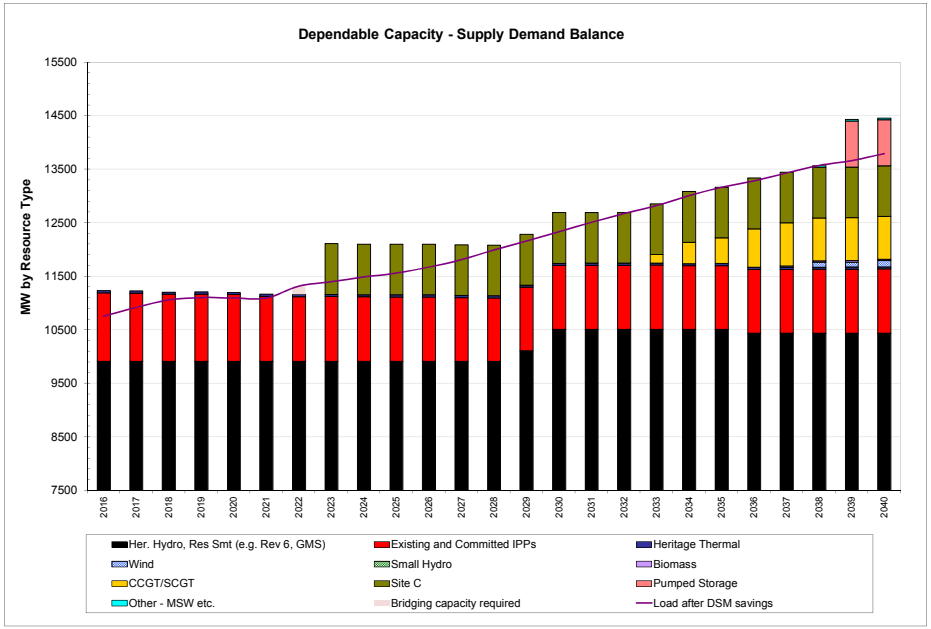
2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

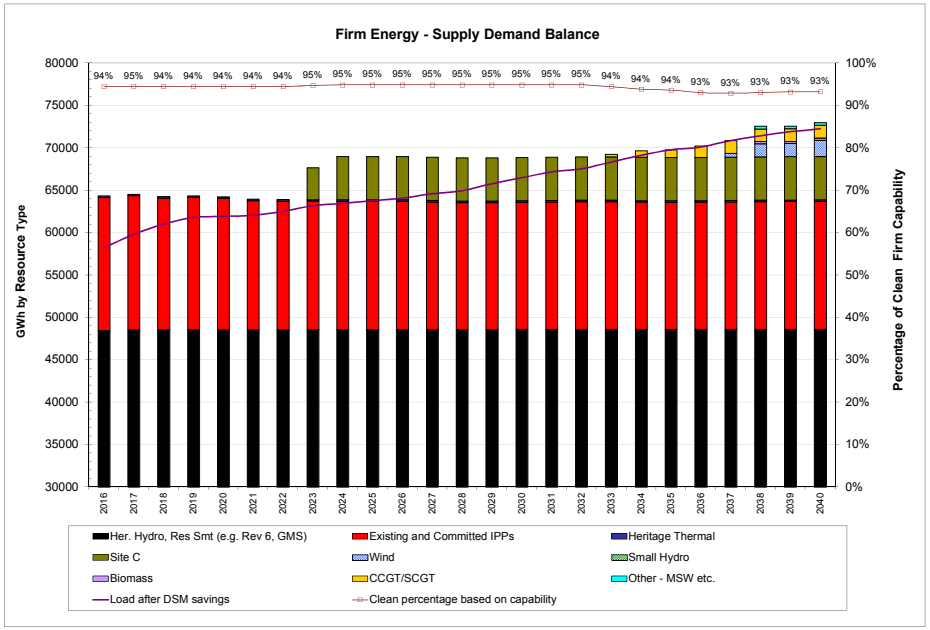
Clean Objective (%) - performance during the period 2016-2040

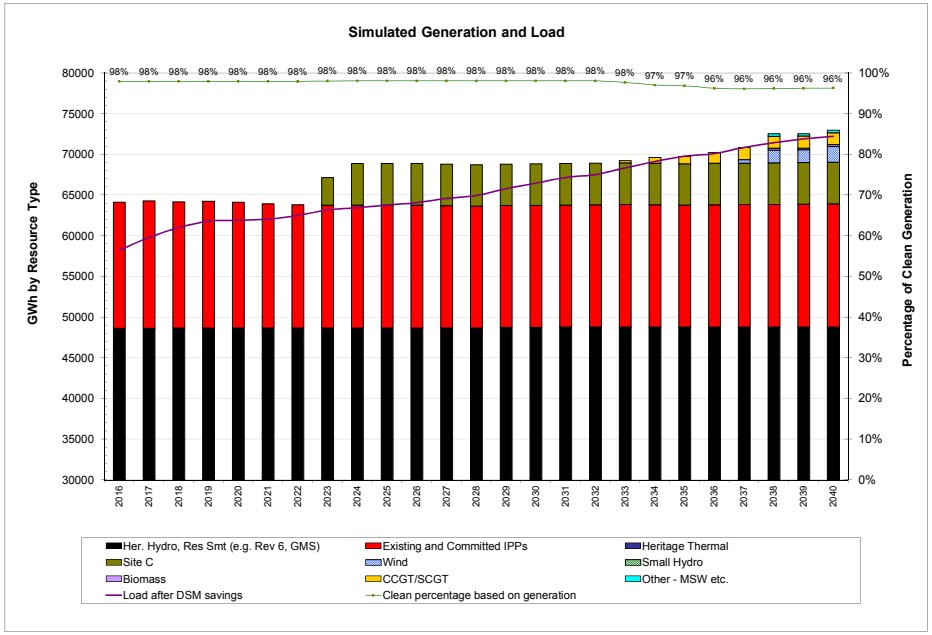
	Based on Generation	Based on Firm Capability
Average %	98%	94%
Lowest %	96%	93%

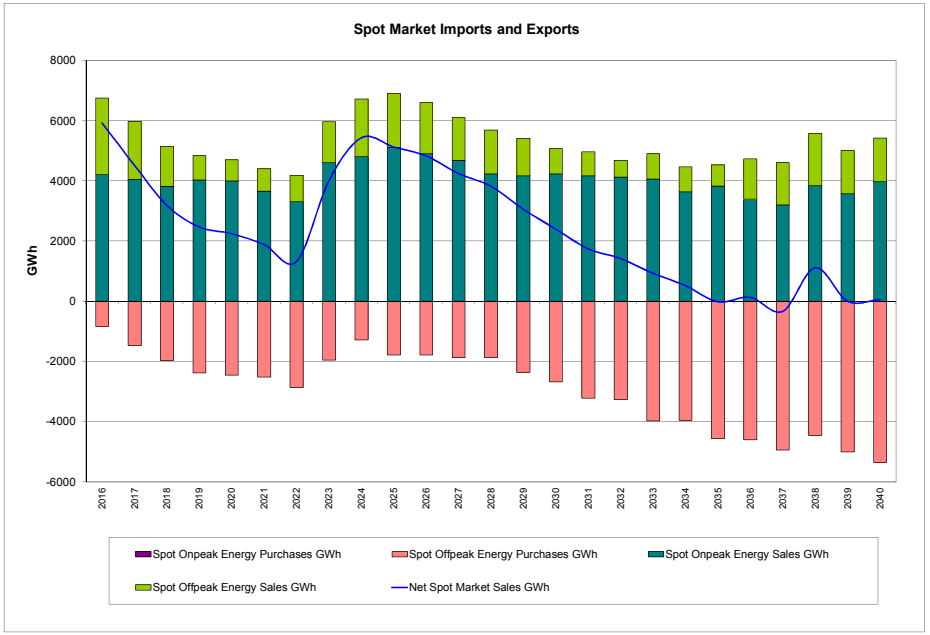
Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Shunt compensation at WSN KLY	PR to KN	650
2029	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2029	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147
2033	500 kV circuit 5L46 between KLY and Cheekye	KN to LM	1384









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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 1	Not included	Included	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	4,389
PV of Trade Revenue - $ millions	(1,336)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	6,308

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	78	0	689	0	767
Firm Energy (GWh)	1,114	0	1,365	0	2,478

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	461	10	2,029	0	2,499
Firm Energy (GWh)	6,471	175	2,294	0	8,940

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	97%	94%
Lowest %	96%	93%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Series compensation of 5L91 and 5L98	SE to KN	147
2029	Shunt compensation at NIC and MDN	KN to LM	570
2034	Shunt compensation at WSN KLY	PR to KN	650
2038	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2038	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2023	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2027	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2027	BCH_VI	MSW1_VI	12	12	100	100	127
2027	BCH_LM	MSW2_LM	25	24	208	208	92
2028	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2028	BCH_VI	Wind_VI12	48	12	150	150	135
2029	BCH_PR	Wind_PC28	153	40	591	591	111
2029	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2030	BCH_PR	Wind_PC21	99	26	371	371	112
2030	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2031	BCH_PR	Wind_PC13	135	35	541	541	113
2031	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2032	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2032	BCH_PR	Wind_PC19	117	30	441	441	113
2032	BCH_VI	Biomass_VI	30	30	239	239	142
2032	BCH_LM	Biomass_LM	30	30	239	239	143
2033	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2034	BCH_PR	Wind_PC14	144	37	527	527	117
2034	BCH_PR	Wind_PC16	99	26	377	377	116
2035	BCH_PR	Wind_PC20	159	41	610	610	119
2036	BCH_PR	Wind_PC15	108	28	382	382	119
2037	BCH_PR	Wind_PC09	207	54	713	713	122
2038	BCH_PR	Wind_PC11	126	33	473	473	122
2039	BCH_PR	Wind_PC41	45	12	155	155	122
2039	BCH_VI	Wind_VI14	35	9	114	114	135
2039	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2040	BCH_KN	100 MW SCGT KN	206	196	300	300	88

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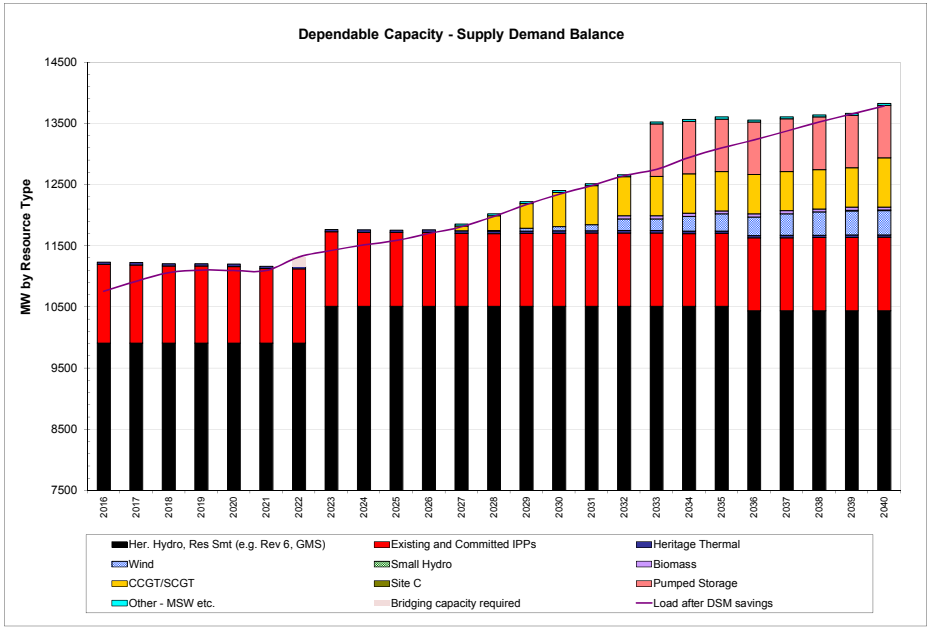

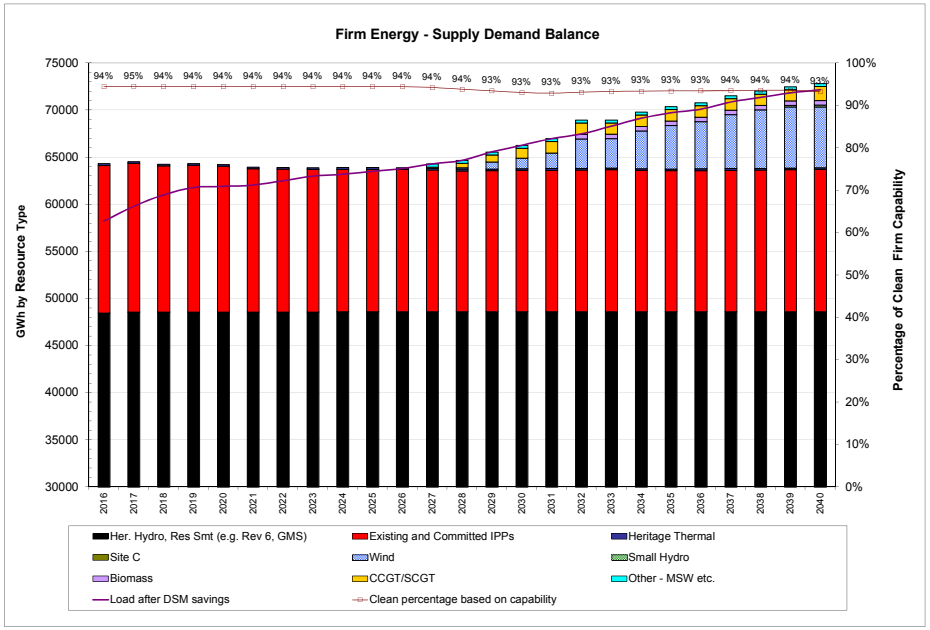

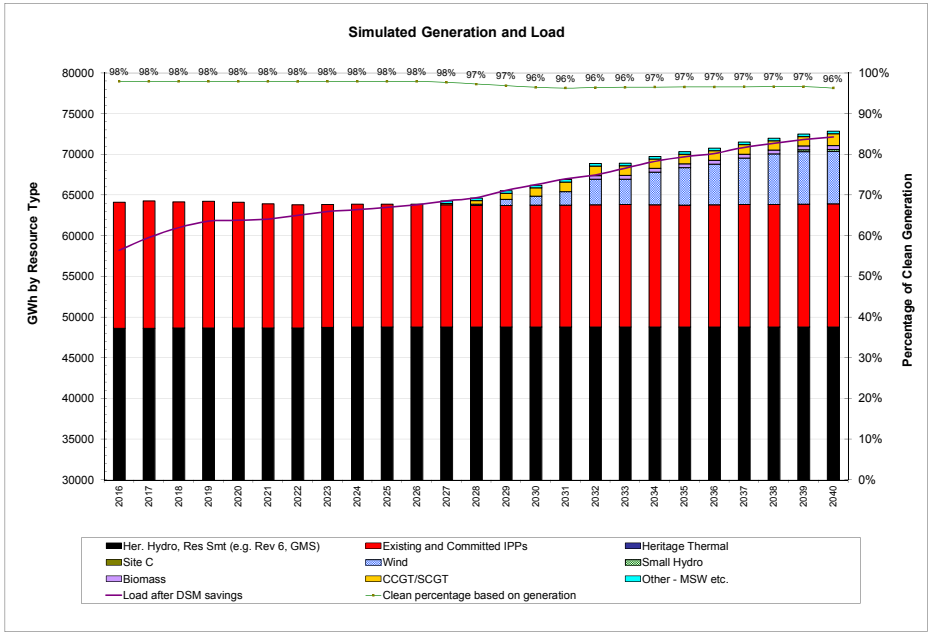

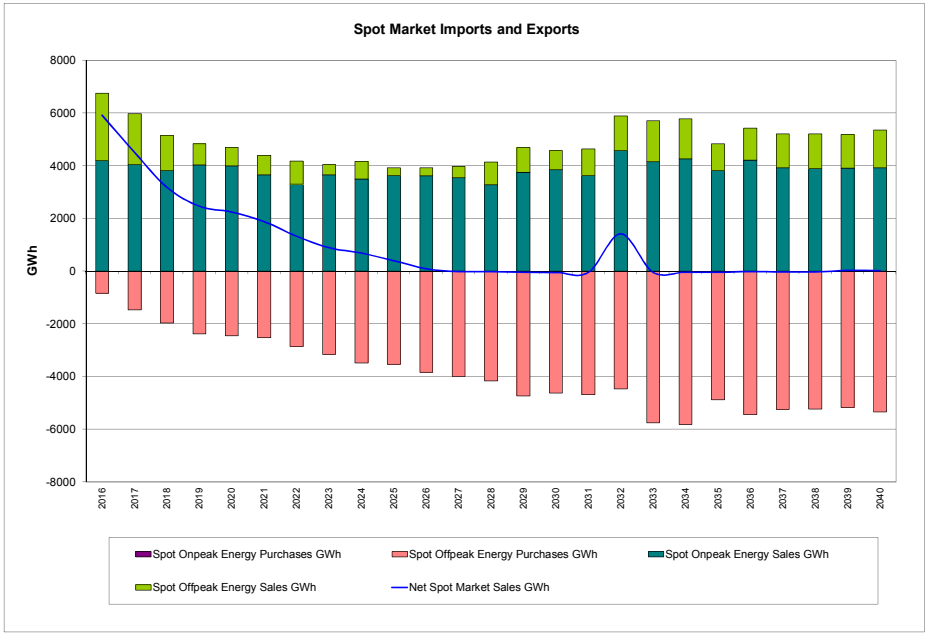

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option 3(constant)	Scenario 1	ISD fixed F2024	Excluded (clean energy only)	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	5,787
PV of Trade Revenue - $ millions	(2,150)
PV of DSM Option cost - $ millions	3,841
PV of Total Portfolio Cost - $ millions	7,478

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	1,100	1,100
Firm Energy (GWh)	0	0	0	5,103	5,103

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	491	0	2,097	1,100	3,688
Firm Energy (GWh)	6,914	0	791	5,103	12,808

DSM Level in:

2020	8,299 GWh	1,511 MW
2030	11,410 GWh	2,129 MW
2040	11,413 GWh	2,143 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Shunt compensation at WSN KLY	PR to KN	650
2029	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2029	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147
2038	500kV circuit 5L14 between WSN and KLY	CI to KN	2120
2039	500kV circuit 5L8 between GMS and WSN	PR to CI	1470

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2029	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2032	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2033	BCH_PR	Wind_PC21	99	26	371	371	112
2033	BCH_LM	MSW2_LM	25	24	208	208	92
2034	BCH_PR	Wind_PC13	135	35	541	541	113
2034	BCH_PR	Wind_PC16	99	26	377	377	116
2034	BCH_PR	Wind_PC19	117	30	441	441	113
2035	BCH_PR	Wind_PC15	108	28	382	382	119
2035	BCH_PR	Wind_PC28	153	40	591	591	111
2036	BCH_PR	Wind_PC14	144	37	527	527	117
2036	BCH_VI	MSW1_VI	12	12	100	100	127
2037	BCH_PR	Wind_PC09	207	54	713	713	122
2037	BCH_VI	Biomass_VI	30	30	239	239	142
2037	BCH_LM	Biomass_LM	30	30	239	239	143
2038	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2038	BCH_PR	Wind_PC11	126	33	473	473	122
2038	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2039	BCH_PR	Wind_PC20	159	41	610	610	119
2039	BCH_PR	Wind_PC41	45	12	155	155	122
2040	BCH_PR	Wind_PC18	138	36	486	486	123
2040	BCH_PR	Wind_PC42	63	16	219	219	122

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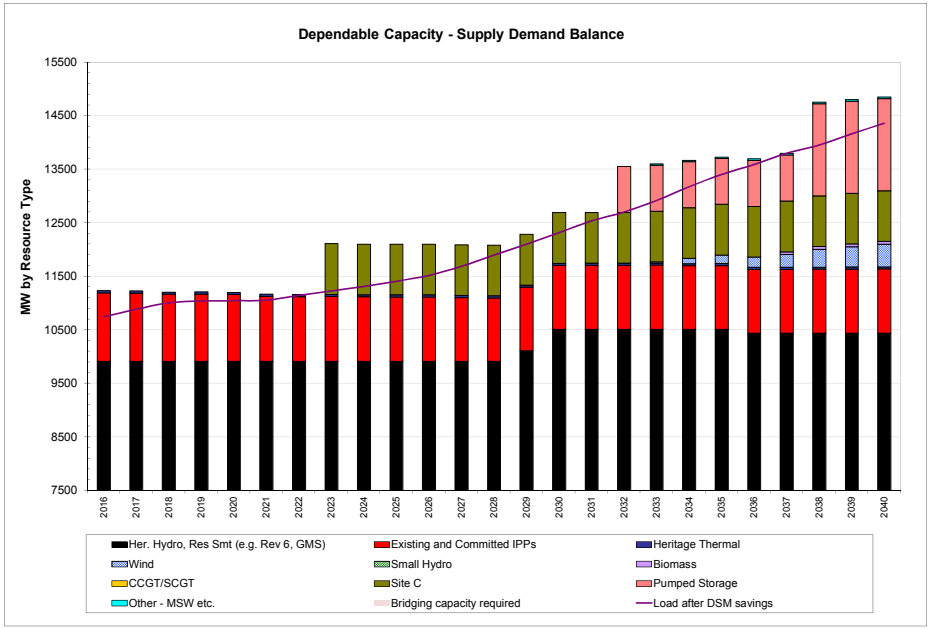

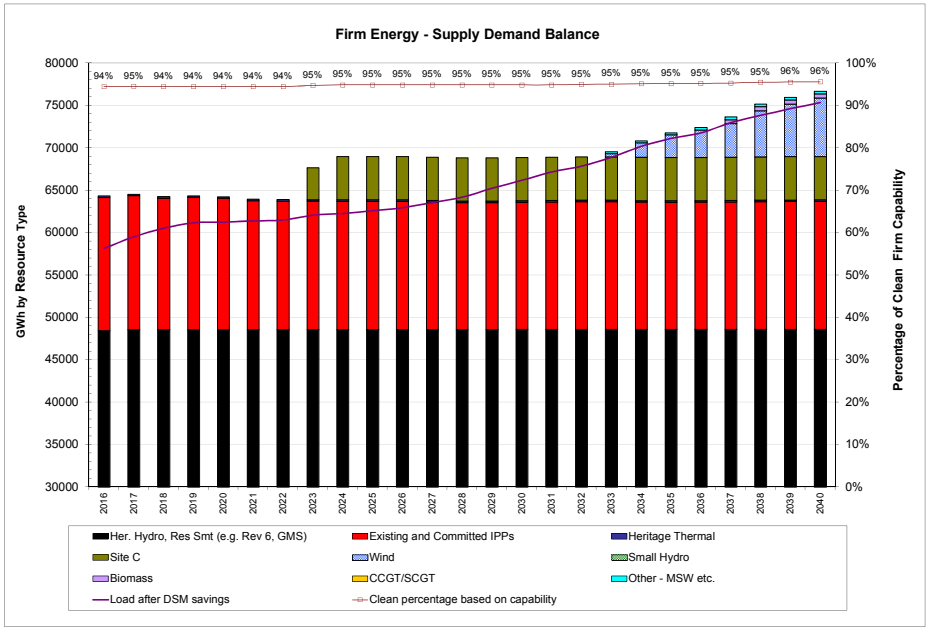

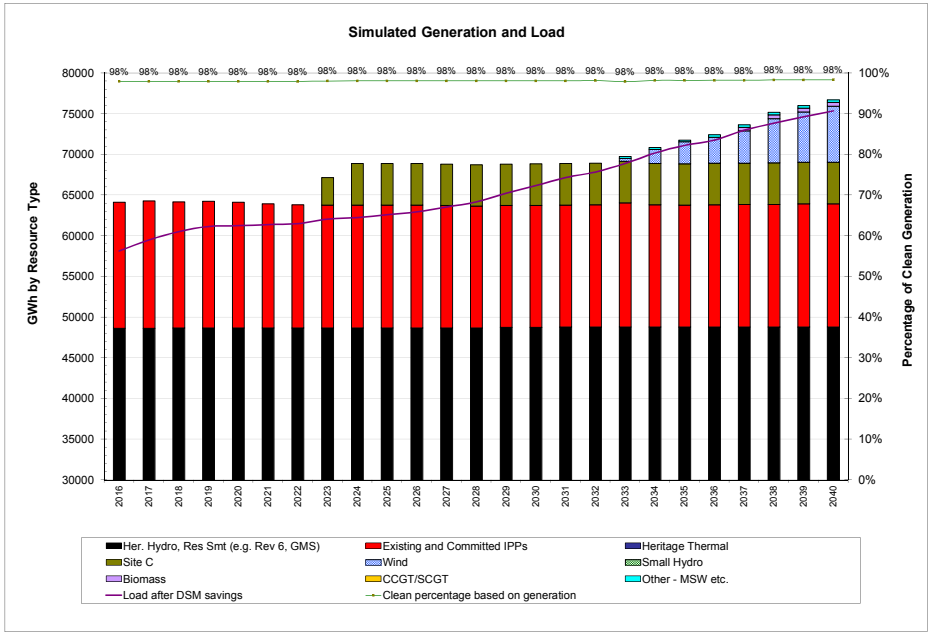

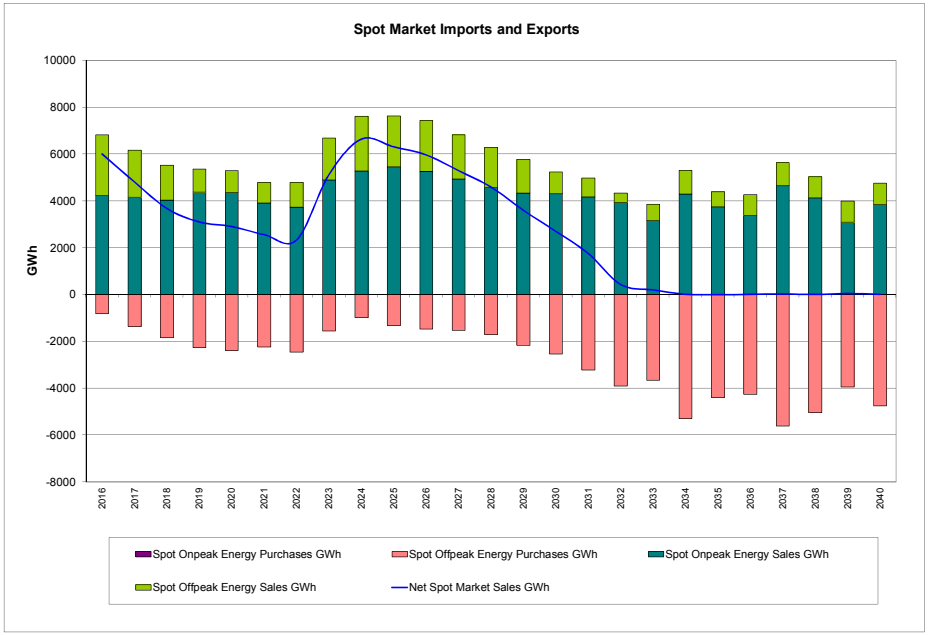

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option 3(constant)	Scenario 1	Not included	Excluded (clean energy only)	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	5,642
PV of Trade Revenue - $ millions	(1,529)
PV of DSM Option cost - $ millions	3,841
PV of Total Portfolio Cost - $ millions	7,955

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	180	0	1,037	0	1,217
Firm Energy (GWh)	2,628	0	312	0	2,941

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	774	57	2,270	0	3,101
Firm Energy (GWh)	10,341	783	2,171	0	13,295

DSM Level in:

2020	8,299 GWh	1,511 MW
2030	11,410 GWh	2,129 MW
2040	11,413 GWh	2,143 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2025	Series compensation of 5L91 and 5L98	SE to KN	147
2031	Shunt compensation at WSN KLY	PR to KN	650
2034	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2034	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2037	500kV circuit 5L8 between WSN and KLY	CI to KN	2120

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2025	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2028	BCH_PR	Wind_PC28	153	40	591	591	111
2028	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2028	BCH_LM	MSW2_LM	25	24	208	208	92
2029	BCH_PR	Wind_PC13	135	35	541	541	113
2029	BCH_PR	Wind_PC19	117	30	441	441	113
2029	BCH_PR	Wind_PC41	45	12	155	155	122
2030	BCH_PR	Wind_PC14	144	37	527	527	117
2030	BCH_PR	Wind_PC21	99	26	371	371	112
2030	BCH_VI	MSW1_VI	12	12	100	100	127
2031	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2032	BCH_PR	Wind_PC20	159	41	610	610	119
2033	BCH_PR	Wind_PC11	126	33	473	473	122
2033	BCH_PR	Wind_PC15	108	28	382	382	119
2033	BCH_PR	Wind_PC16	99	26	377	377	116
2034	BCH_PR	Wind_PC09	207	54	713	713	122
2034	BCH_PR	Wind_PC18	138	36	486	486	123
2034	BCH_PR	Wind_PC26	126	33	416	416	127
2034	BCH_PR	Wind_PC42	63	16	219	219	122
2034	BCH_VI	Wind_VI12	48	12	150	150	135
2034	BCH_VI	Wind_VI14	35	9	114	114	135
2034	BCH_VI	Biomass_VI	30	30	239	239	142
2034	BCH_LM	Run of River LM 100_110	102	18	258	330	115
2034	BCH_LM	Biomass_LM	30	30	239	239	143
2035	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2036	BCH_PR	Wind_PC48	152	40	505	505	128
2036	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2037	BCH_NC	Wind_NC09	334	87	1,026	1,026	135
2038	BCH_PR	Wind_PC06	243	63	761	761	131
2038	BCH_VI	Wind_VI13	35	9	106	106	140
2039	BCH_PR	Wind_PC40	117	30	349	349	137
2039	BCH_KN	Biomass_KN	30	30	239	239	151
2039	BCH_SE	Biomass_SE	33	33	263	263	141
2040	BCH_PR	Biomass_PR	28	28	223	223	141
2040	BCH_NC	Biomass_NC	13	13	104	104	147
2040	BCH_CI	Biomass_CI	41	41	327	327	147
2040	BCH_EK	Biomass_EK	28	28	223	223	149
2040	BCH_VI	Run of River VI 100_110	119	29	352	451	120

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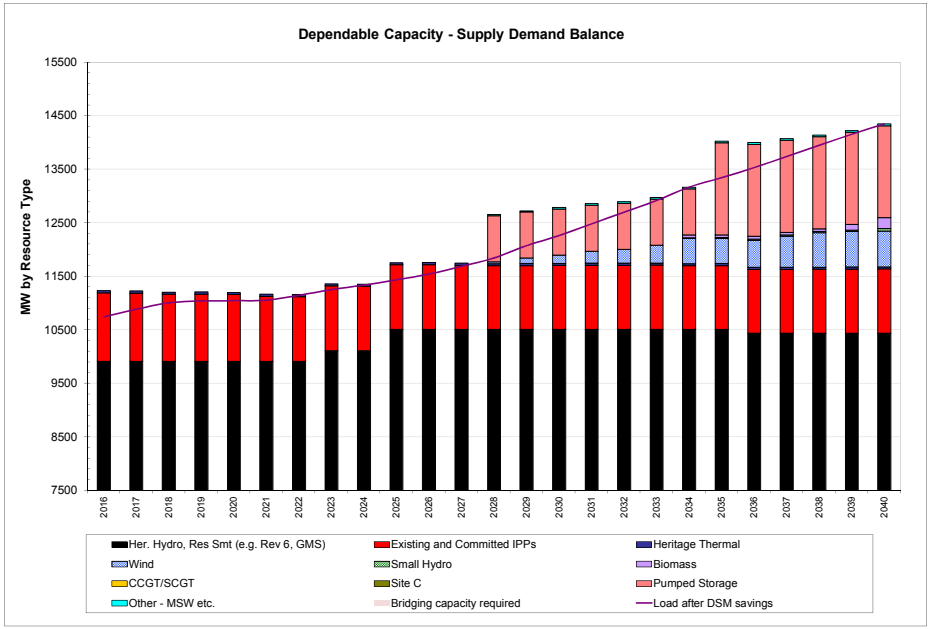

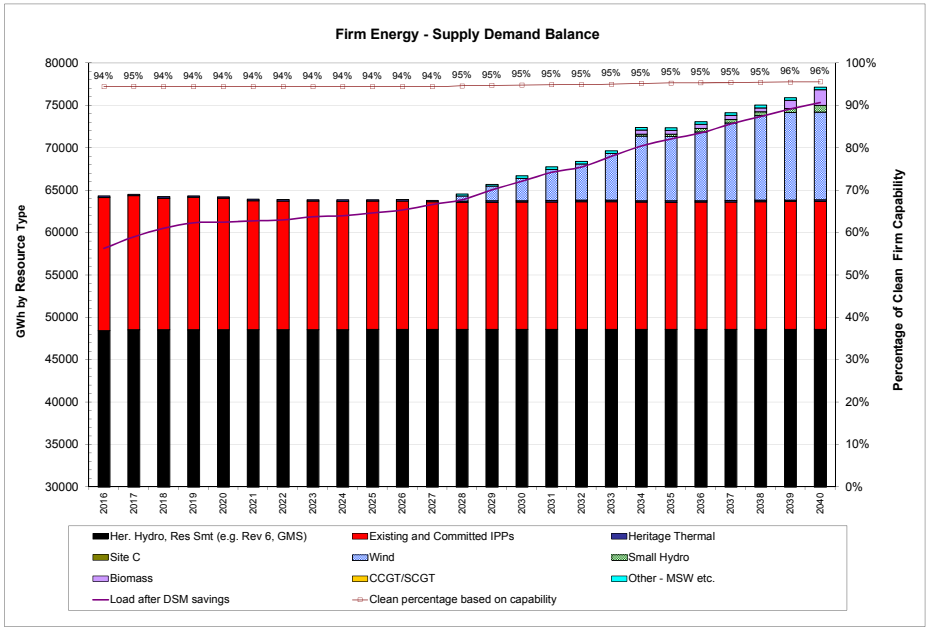

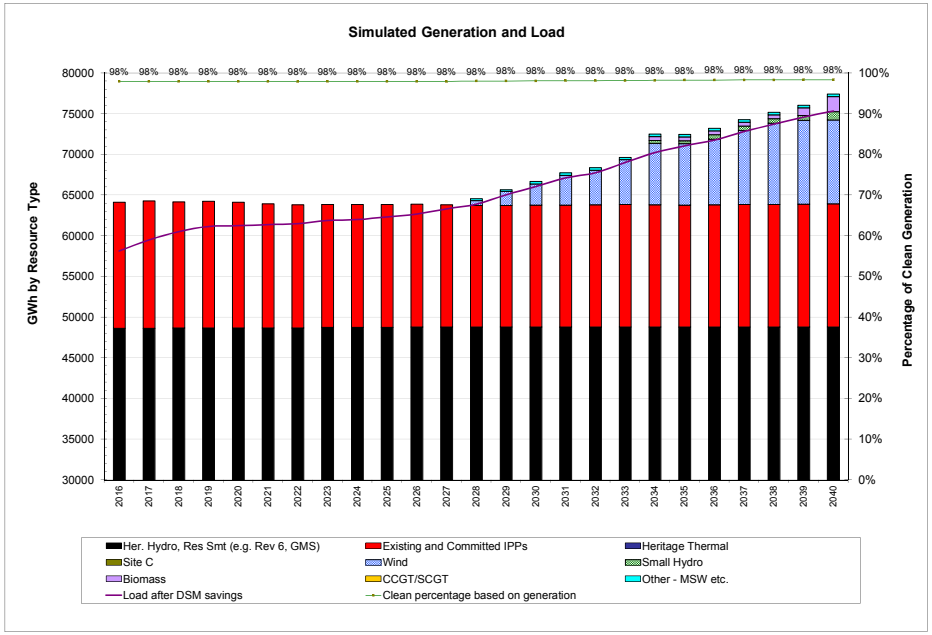

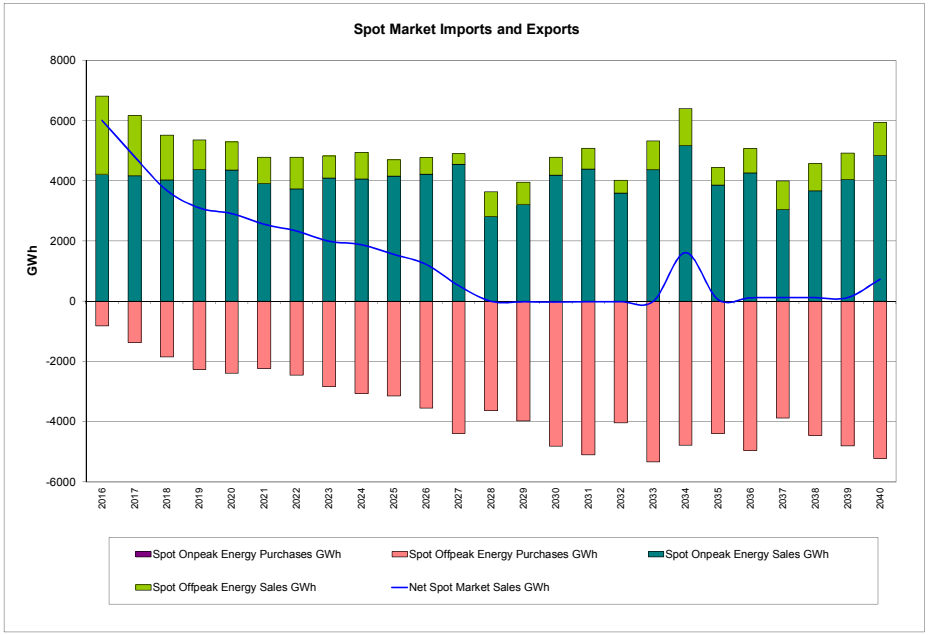

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option 3(constant)	Scenario 1	Not included	Included	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	4,895
PV of Trade Revenue - $ millions	(1,532)
PV of DSM Option cost - $ millions	3,841
PV of Total Portfolio Cost - $ millions	7,204

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	61	0	677	0	738
Firm Energy (GWh)	913	0	1,263	0	2,176

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	632	39	2,451	0	3,123
Firm Energy (GWh)	8,619	526	3,886	0	13,032

DSM Level in:

2020	8,299 GWh	1,511 MW
2030	11,410 GWh	2,129 MW
2040	11,413 GWh	2,143 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	97%	94%
Lowest %	96%	93%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2025	Series compensation of 5L91 and 5L98	SE to KN	147
2029	Shunt compensation at NIC and MDN	KN to LM	570
2033	Shunt compensation at WSN KLY	PR to KN	650
2035	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2035	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2025	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2028	BCH_KN	100 MW SCGT KN	309	294	450	450	88
2029	BCH_PR	Wind_PC21	99	26	371	371	112
2029	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2029	BCH_LM	MSW2_LM	25	24	208	208	92
2030	BCH_PR	Wind_PC13	135	35	541	541	113
2030	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2031	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2031	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2031	BCH_VI	MSW1_VI	12	12	100	100	127
2032	BCH_PR	Wind_PC14	144	37	527	527	117
2032	BCH_PR	Wind_PC28	153	40	591	591	111
2032	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2033	BCH_PR	Wind_PC15	108	28	382	382	119
2033	BCH_PR	Wind_PC16	99	26	377	377	116
2033	BCH_PR	Wind_PC19	117	30	441	441	113
2034	BCH_PR	Wind_PC11	126	33	473	473	122
2034	BCH_PR	Wind_PC20	159	41	610	610	119
2034	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2035	BCH_PR	Wind_PC09	207	54	713	713	122
2035	BCH_PR	Wind_PC42	63	16	219	219	122
2036	BCH_PR	Wind_PC18	138	36	486	486	123
2036	BCH_PR	Wind_PC41	45	12	155	155	122
2037	BCH_PR	Wind_PC26	126	33	416	416	127
2037	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2037	BCH_VI	Wind_VI12	48	12	150	150	135
2037	BCH_VI	Wind_VI14	35	9	114	114	135
2037	BCH_VI	Biomass_VI	30	30	239	239	142
2038	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2038	BCH_SE	Biomass_SE	33	33	263	263	141
2038	BCH_LM	Biomass_LM	30	30	239	239	143
2039	BCH_PR	Biomass_PR	28	28	223	223	141
2039	BCH_NC	Biomass_NC	13	13	104	104	147
2039	BCH_CI	Biomass_CI	41	41	327	327	147
2039	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2039	BCH_EK	Biomass_EK	28	28	223	223	149
2040	BCH_NC	Wind_NC09	334	87	1,026	1,026	135
2040	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2040	BCH_VI	Run of River VI 100_110	119	29	352	451	120

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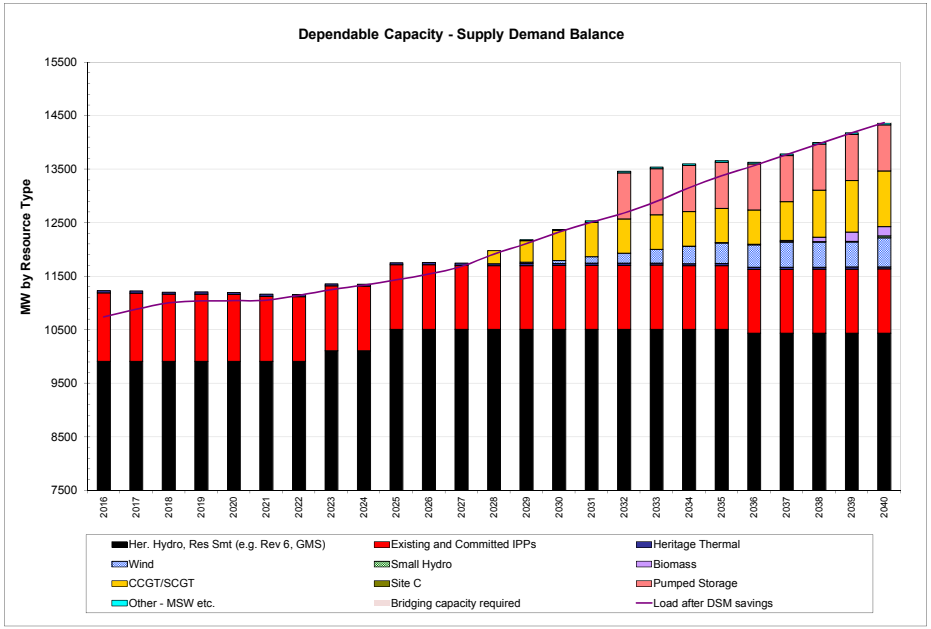

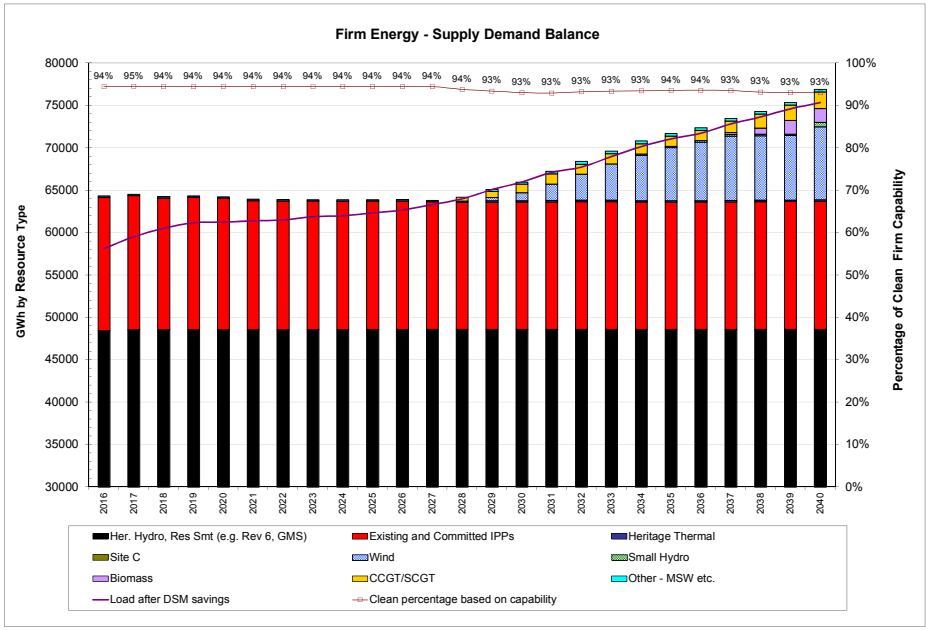

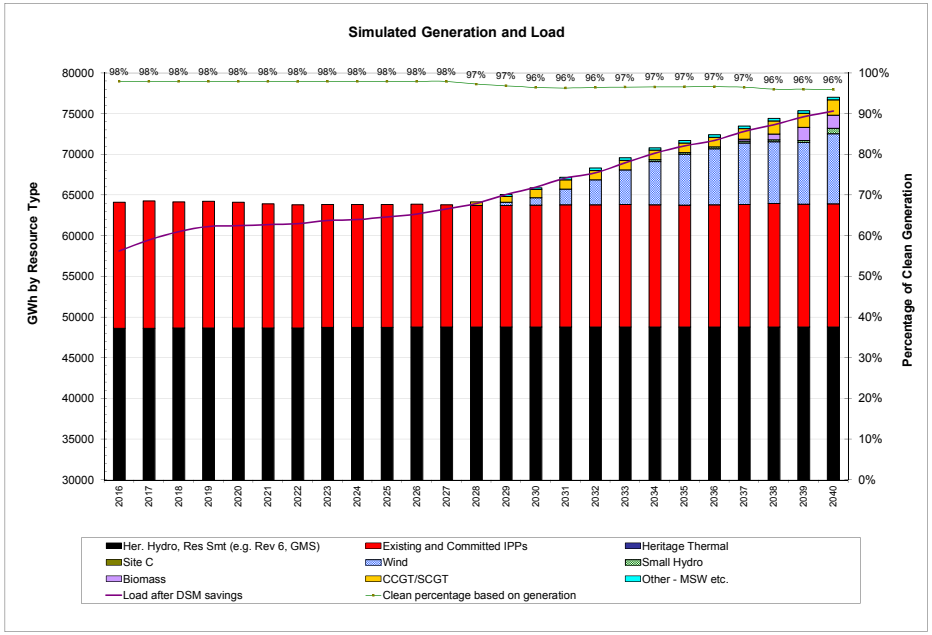

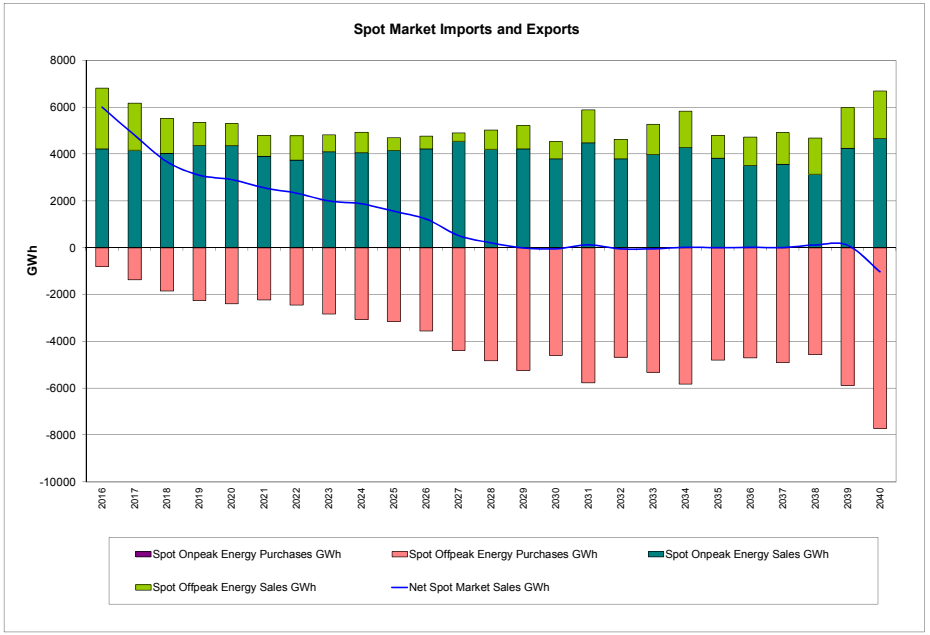

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4 Portfolio Analysis – Site C

Section 6.4 of the IRP presents the analyses that test the cost effectiveness of Site C.

4.1 Modelling Assumptions

Figure 2 illustrates the modelling assumptions that underpinned the base case portfolios discussed in section 6.4.3 of the IRP.

Figure 2 Modelling Map – Site C

Modelling Map				
Uncertainties/Scenarios				
Market Prices	Scenario 2 Low	Scenario 1 Mid	Scenario 3 High	
Load Forecast	Low	Mid	High	
DSM deliverability	Low	Mid	High	
LNG Load Scenarios	Prior to Expected LNG	800 GWh	3000 GWh	6600 GWh
Resource choices				
Usage of 7% non-clean	Yes	No		
DSM Options	DSM Option 1	DSM Target/ Option 2	DSM Option 3	
Site C (all units in) timing	F2024	F2026	No Site C	
Modelling Assumptions and Parameters				
BCH/IPP Cost of Capital	5/7	5/6		
Pumped Storage as Option	Yes	No		
Site C Capital Cost		Base	Base plus 10%	
Wind Integration Cost	$5/MWh	$10/MWh	$15/MWh	
	shows the modeling assumptions			

As discussed in section 6.4.4 of the IRP, another five sets of portfolios were created to test the sensitivity of the cost effectiveness of Site C to different 1) BC Hydro/IPP

cost of capital differential scenario; 2) market price scenarios; 3) Site C capital cost scenario; 4) wind integration cost scenario; and 5) gap sizes.

4.2 Portfolio PV Differences

Table 3 provides details supporting the portfolio PV difference shown in section 6.4.3 of the IRP: Site C Base Case.

Table 3 Portfolio PV for Site C Base Case Analysis

Sections in the IRP	Portfolio type	Site C Timing	Portfolios without Site C Portfolio name Portfolio PV (M$)	Portfolios with Site C Portfolio name Portfolio PV (M$)	PV Difference (M$) (w/o Site C minus w Site C)
6.4.3 Benefit of Site C - base case	Clean Generation	F2024	M&M_1NC_NN0_05Q 7,043	M&M_1LC_NN0_05Q 6,416	630
		F2026	M&M_1NC_NN0_05R 7,018	M&M_1LC_NN0_05R 6,142	880
	Clean + Thermal Generation	F2024	M&M_1NT_NN0_05Q 6,308	M&M_1LT_NN0_05Q 6,160	150
		F2026	M&M_1NT_NN0_05R 6,278	M&M_1LT_NN0_05R 5,886	390

Table 4 provides details supporting the portfolio PV difference shown in section 6.4.4.1 of the IRP: Site C Sensitivities - Cost of Capital Differential.

Table 4 Portfolio PV for Site C Sensitivities: Cost of Capital Differential

Sections in the IRP	Portfolio type	Cost of Capital for IPP (%)	Portfolios without Site C Portfolio name Portfolio PV (M$)	Portfolios with Site C Portfolio name Portfolio PV (M$)	PV Difference (M$) (w/o Site C minus w Site C)
6.4.4.1 Benefit of Site C - Cost of Capital Deferential	Clean Generation	6	M&M_1NC_NN0_0AQ 6,751	M&M_1LC_NN0_0AQ 6,332	420

Sections in the IRP	Portfolio type	Cost of Capital for IPP (%)	Portfolios without Site C Portfolio name Portfolio PV (M$)	Portfolios with Site C Portfolio name Portfolio PV (M$)	PV Difference (M$) (w/o Site C minus w Site C)
	Clean + Thermal Generation	6	M&M_1NT_NN0_0AQ 6,147	M&M_1LT_NN0_0AQ 6,127	20

Table 5 provides details supporting the portfolio PV difference shown in section 6.4.4.2 of the IRP: Site C Sensitivities – Market Prices.

Table 5 Portfolio PV for Site C Sensitivities: Market Prices

Sections in the IRP	Portfolio type	Market Scenarios	Portfolios without Site C Portfolio name Portfolio PV (M$)	Portfolios with Site C Portfolio name Portfolio PV (M$)	PV Difference (M$)
6.4.4.2 Benefit of Site C - - Market Prices	Clean Generation	Market Scenario 3	M&M_3NC_NN0_05Q 6,619	M&M_3LC_NN0_05Q 5,786	830
		Market Scenario 1 Base case	M&M_1NC_NN0_05Q 7,043	M&M_1LC_NN0_05Q 6,416	630
		Market Scenario 2	M&M_2NC_NN0_05Q 7,219	M&M_2LC_NN0_05Q 6,770	450
	Clean + Thermal Generation	Market Scenario 3	M&M_3NT_NN0_05Q 6,073	M&M_3LT_NN0_05Q 5,605	470
		Market Scenario 1 Base case	M&M_1NT_NN0_05Q 6,308	M&M_1LT_NN0_05Q 6,160	150
		Market Scenario 2	M&M_2NT_NN0_05Q 6,341	M&M_2LT_NN0_05Q 6,428	(90)

Table 6 provides details supporting the portfolio PV difference shown in section 6.4.4.3 of the IRP: Site C Sensitivities – Site C Capital Cost. Note that no additional portfolios were created for this comparison. The PV were calculated based of the base case portfolios but with the cost of Site C adjusted.

Table 6 Portfolio PV for Site C Sensitivities: Site C Capital Cost

Sections in the IRP	Portfolio type	Site C Timing	Portfolios without Site C Portfolio name Portfolio PV (M$)	Portfolios with Site C Portfolio name Portfolio PV (M$)	PV Difference (M$) (w/o Site C minus w Site C)
6.4.4.3 Benefit of Site C - Capital Cost	Clean Generation	F2024	7,043	6,683	360
		F2026	7,018	6,366	650
	Clean + Thermal Generation	F2024	6,308	6,427	(120)
		F2026	6,278	6,110	170

Table 7 provides details supporting the portfolio PV difference shown in section 6.4.4.4 of the IRP: Site C Sensitivities – Wind Integration Cost

Table 7 Portfolio PV for Site C Sensitivities: Wind Integration Cost

Sections in the IRP	Portfolio type	Wind Integration costs	Portfolios without Site C Portfolio name Portfolio PV (M$)	Portfolios with Site C Portfolio name Portfolio PV (M$)	PV Difference (M$)
6.4.4.4 Benefit of Site C - Wind Integration Cost	Clean Generation	$5/MWh	M&M_1NC_NN0_55Q 6,930	M&M_1LC_NN0_55Q 6,397	530
		$15/MWh	L&L_1NC_NN0_45Q 7,158	L&L_1LC_NN0_45Q 6,442	720

Table 8 provides details supporting the portfolio PV difference shown in section 6.4.4.5 of the IRP: Site C Sensitivities – Large and Small Gaps.

Table 8 Portfolio PV for Site C Sensitivities: Gap Sizes

Sections in the IRP	Portfolio type	Gap Size	Portfolios without Site C Portfolio name Portfolio PV (M$)	Portfolios with Site C Portfolio name Portfolio PV (M$)	Difference (M$)
6.4.4.5 Benefit of Site C Gap sizes	Clean Generation	Mid Gap with Expected LNG	M&M_1NC_2N0_05U 10,487	M&M_1LC_2N0_05U 8,642	1,850
		Mid Gap Base Case	M&M_1NC_NN0_05Q 7,043	M&M_1LC_NN0_05Q 6,416	630
		Small Gap	L&L_1NC_NN0_05Q 2,124	L&L_1LC_NN0_05Q 3,163	-1,040
	Clean + Thermal Generation	Large Gap	H&L_1NT_NN0_05Q 22,220	H&L_1LT_NN0_05Q 19,957	2,260
		Mid Gap with Expected LNG	M&M_1NT_2N0_05U 9,293	M&M_1LT_2N0_05U 8,035	1,260
		Mid Gap Base Case	M&M_1NT_NN0_05Q 6,308	M&M_1LT_NN0_05Q 6,160	150
		Small Gap	L&L_1NT_NN0_05Q 1,885	L&L_1LT_NN0_05Q 3,163	-1,280

4.3 Portfolio Output

The portfolio output sheets of these portfolios are included on the following pages.

Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Excluded (clean energy only)	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	5,096
PV of Trade Revenue - $ millions	(1,935)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	6,416

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	1,100	1,100
Firm Energy (GWh)	0	0	0	5,103	5,103

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	283	0	1,097	1,100	2,480
Firm Energy (GWh)	4,029	0	791	5,103	9,923

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2029	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2032	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2034	BCH_PR	Wind_PC28	153	40	591	591	111
2034	BCH_LM	MSW2_LM	25	24	208	208	92
2035	BCH_PR	Wind_PC19	117	30	441	441	113
2035	BCH_PR	Wind_PC21	99	26	371	371	112
2036	BCH_PR	Wind_PC16	99	26	377	377	116
2037	BCH_PR	Wind_PC13	135	35	541	541	113
2037	BCH_VI	MSW1_VI	12	12	100	100	127
2038	BCH_VI	Biomass_VI	30	30	239	239	142
2038	BCH_LM	Biomass_LM	30	30	239	239	143
2039	BCH_PR	Wind_PC14	144	37	527	527	117
2040	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2040	BCH_PR	Wind_PC41	45	12	155	155	122

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Shunt compensation at WSN KLY	PR to KN	650
2029	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2029	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147

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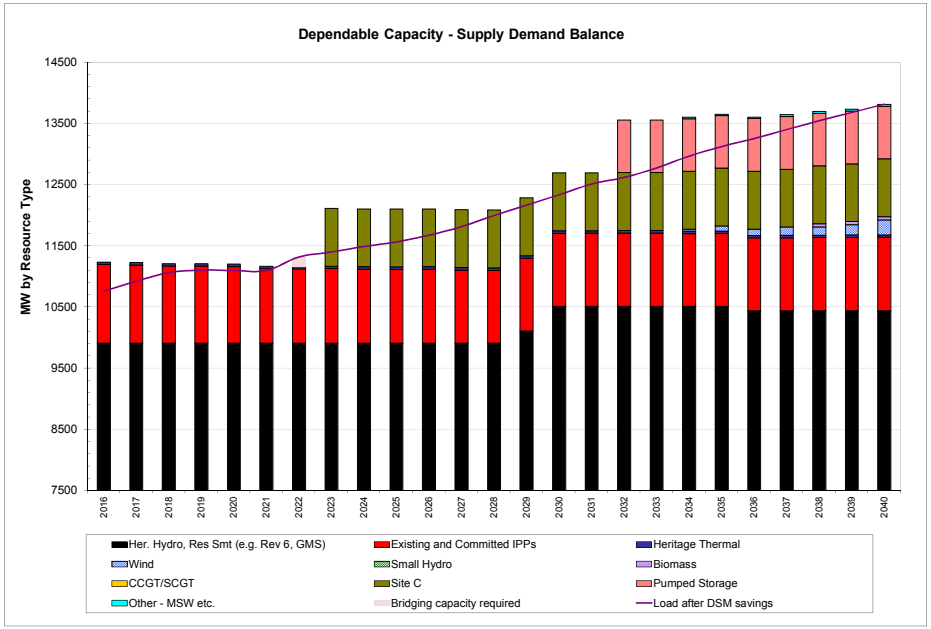

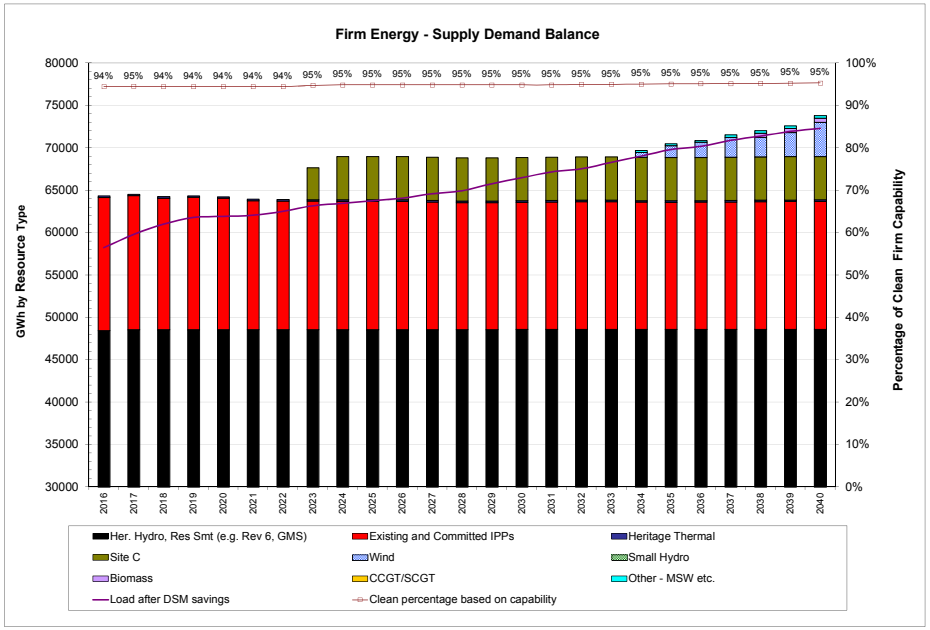

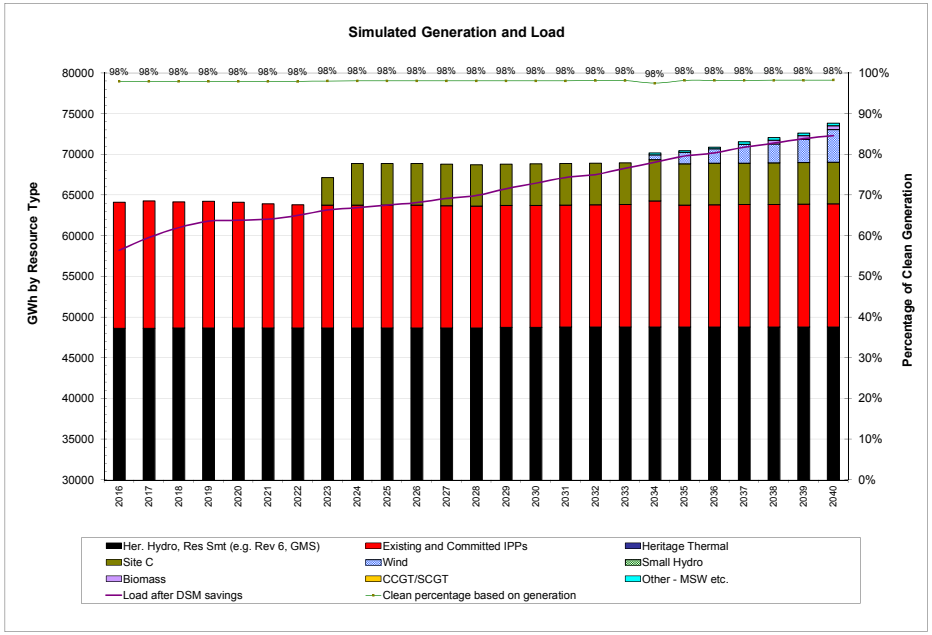

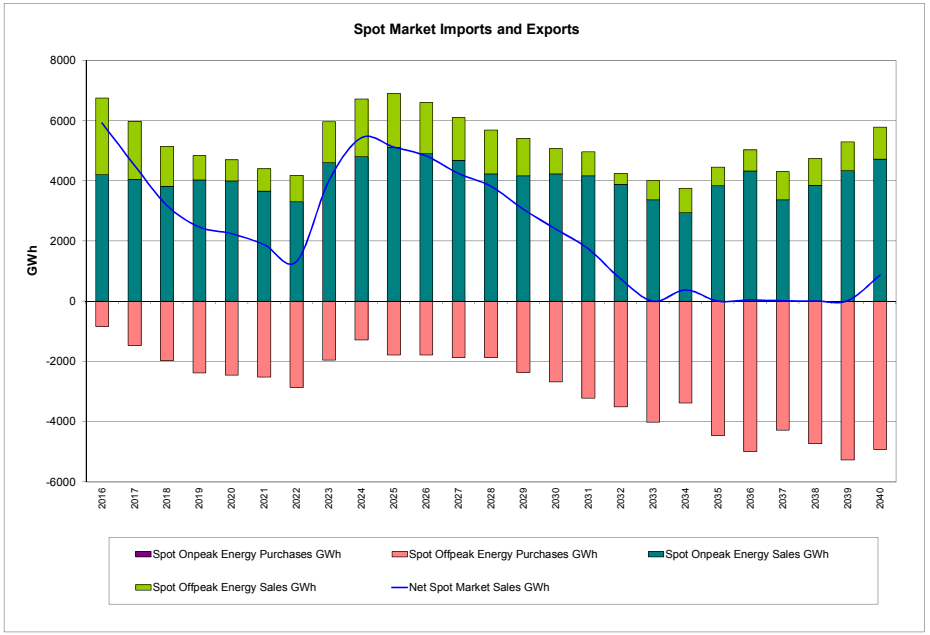

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 1	Not included	Excluded (clean energy only)	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	5,119
PV of Trade Revenue - $ millions	(1,330)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	7,043

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	194	0	1,037	0	1,231
Firm Energy (GWh)	2,850	0	312	0	3,162

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	594	10	2,158	0	2,762
Firm Energy (GWh)	8,203	175	1,277	0	9,656

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Series compensation of 5L91 and 5L98	SE to KN	147
2032	Shunt compensation at WSN KLY	PR to KN	650
2035	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2035	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2023	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2027	BCH_PR	Wind_PC13	135	35	541	541	113
2027	BCH_PR	Wind_PC21	99	26	371	371	112
2027	BCH_PR	Wind_PC28	153	40	591	591	111
2027	BCH_LM	MSW2_LM	25	24	208	208	92
2028	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2029	BCH_PR	Wind_PC16	99	26	377	377	116
2029	BCH_PR	Wind_PC19	117	30	441	441	113
2030	BCH_PR	Wind_PC14	144	37	527	527	117
2030	BCH_VI	MSW1_VI	12	12	100	100	127
2031	BCH_PR	Wind_PC20	159	41	610	610	119
2031	BCH_PR	Wind_PC41	45	12	155	155	122
2032	BCH_PR	Wind_PC15	108	28	382	382	119
2033	BCH_PR	Wind_PC09	207	54	713	713	122
2034	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2035	BCH_PR	Wind_PC18	138	36	486	486	123
2035	BCH_PR	Wind_PC42	63	16	219	219	122
2035	BCH_PR	Biomass_PR	28	28	223	223	141
2035	BCH_VI	Wind_VI12	48	12	150	150	135
2035	BCH_VI	Wind_VI14	35	9	114	114	135
2035	BCH_VI	Biomass_VI	30	30	239	239	142
2035	BCH_LM	Biomass_LM	30	30	239	239	143
2036	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2037	BCH_PR	Wind_PC11	126	33	473	473	122
2037	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2038	BCH_PR	Wind_PC26	126	33	416	416	127
2038	BCH_VI	Wind_VI13	35	9	106	106	140
2039	BCH_PR	Wind_PC48	152	40	505	505	128
2040	BCH_SE	Biomass_SE	33	33	263	263	141

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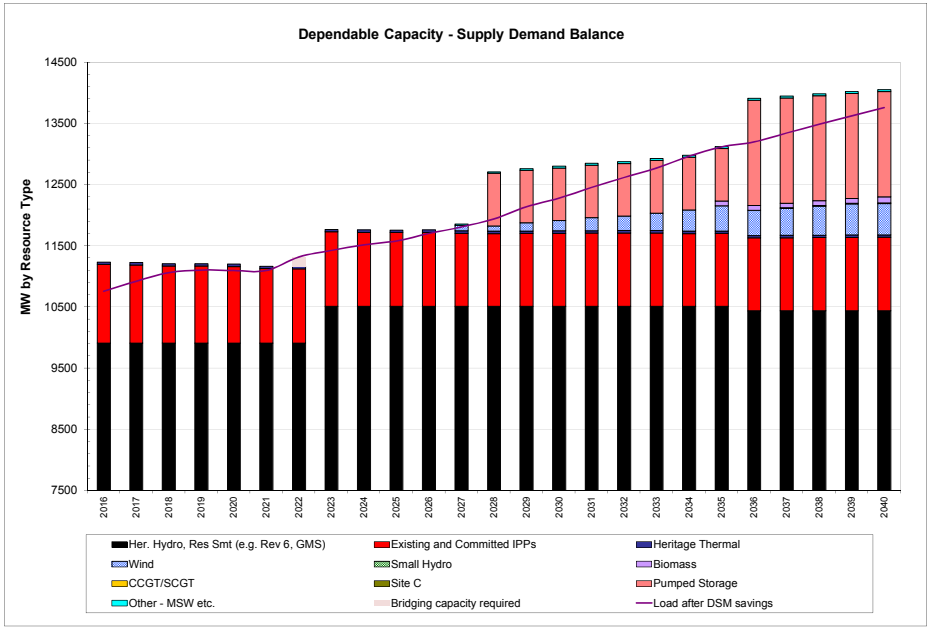
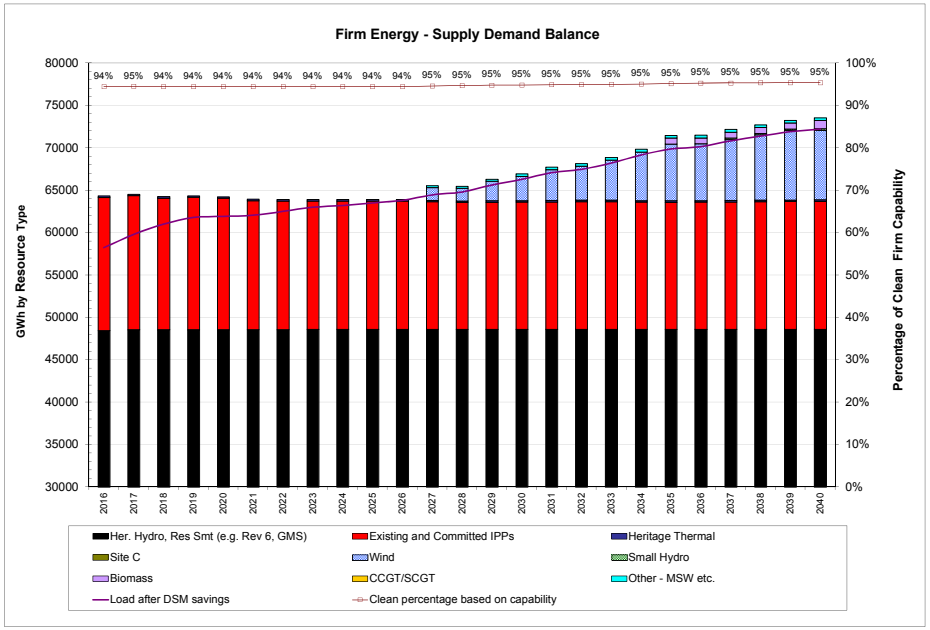
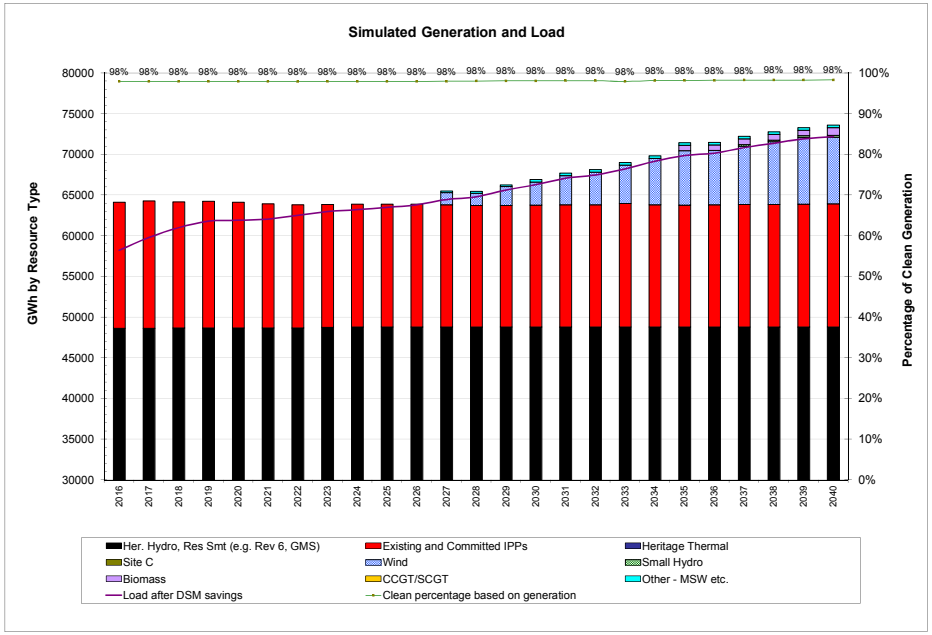
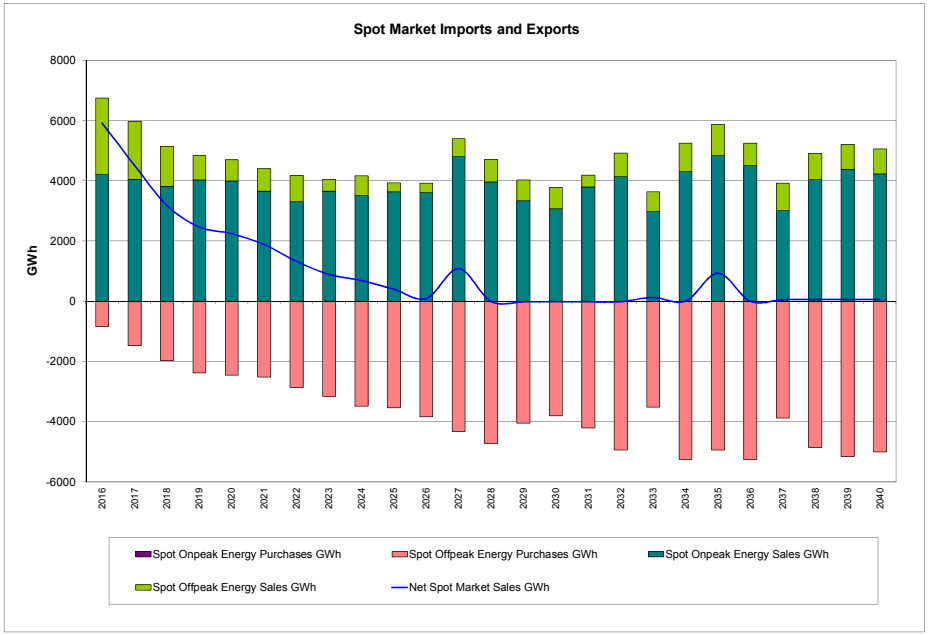








M&M_1NC_NN0_05Q

Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Included	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	4,885
PV of Trade Revenue - $ millions	(1,979)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	6,160

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	1,100	1,100
Firm Energy (GWh)	0	0	0	5,103	5,103

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	133	0	1,999	1,100	3,232
Firm Energy (GWh)	1,932	0	2,055	5,103	9,090

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2029	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2033	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2034	BCH_KN	100 MW SCGT KN	309	294	450	450	88
2035	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2036	BCH_KN	100 MW SCGT KN	309	294	450	450	88
2037	BCH_PR	Wind_PC19	117	30	441	441	113
2037	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2038	BCH_PR	Wind_PC14	144	37	527	527	117
2038	BCH_PR	Wind_PC28	153	40	591	591	111
2038	BCH_VI	MSW1_VI	12	12	100	100	127
2038	BCH_VI	Biomass_VI	30	30	239	239	142
2038	BCH_LM	MSW2_LM	25	24	208	208	92
2039	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2040	BCH_PR	Wind_PC21	99	26	371	371	112

DSM Level in:

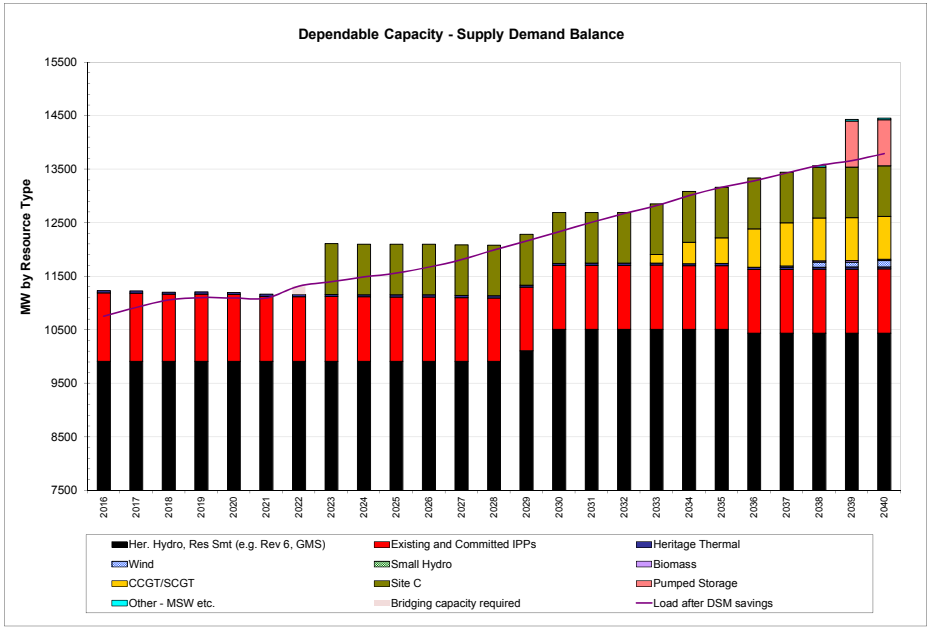
2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

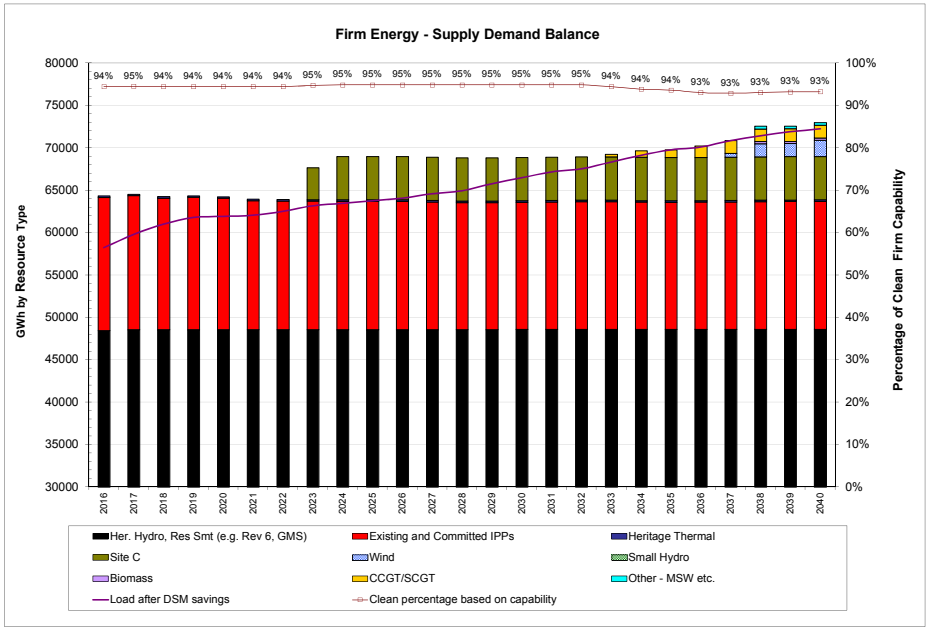
Clean Objective (%) - performance during the period 2016-2040

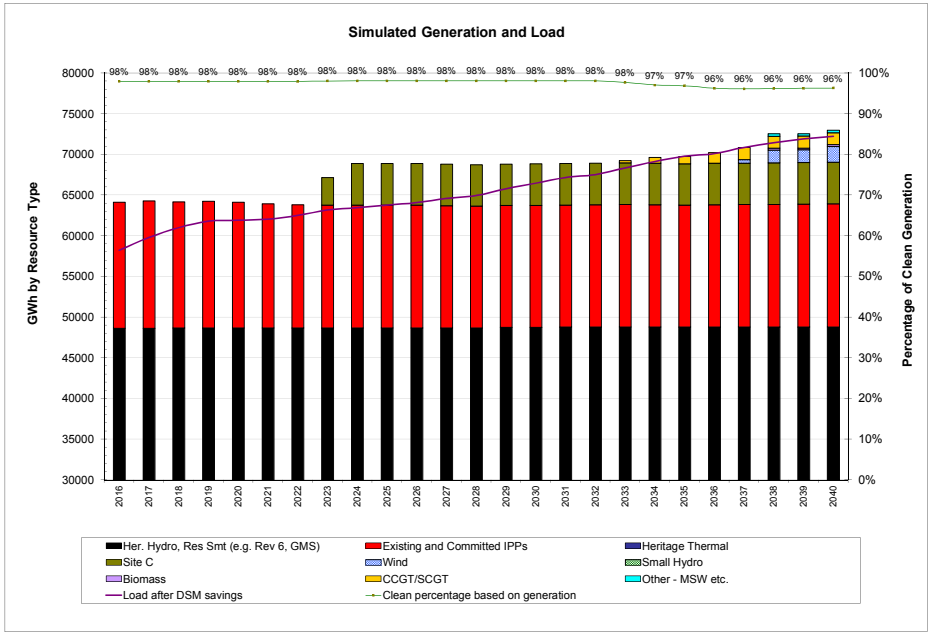
	Based on Generation	Based on Firm Capability
Average %	98%	94%
Lowest %	96%	93%

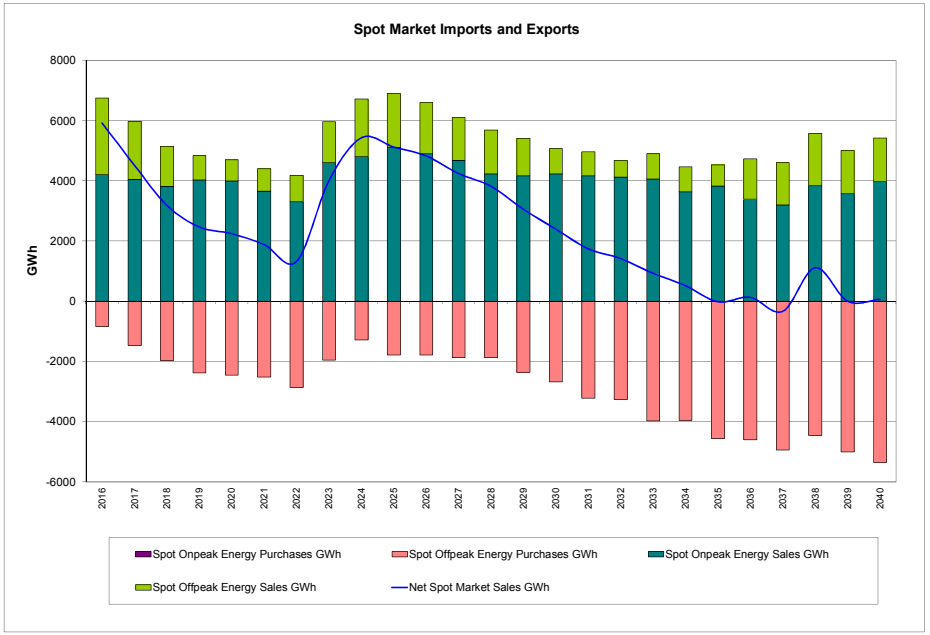
Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Shunt compensation at WSN KLY	PR to KN	650
2029	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2029	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147
2033	500 kV circuit 5L46 between KLY and Cheekye	KN to LM	1384









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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 1	Not included	Included	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	4,389
PV of Trade Revenue - $ millions	(1,336)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	6,308

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	78	0	689	0	767
Firm Energy (GWh)	1,114	0	1,365	0	2,478

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	461	10	2,029	0	2,499
Firm Energy (GWh)	6,471	175	2,294	0	8,940

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	97%	94%
Lowest %	96%	93%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Series compensation of 5L91 and 5L98	SE to KN	147
2029	Shunt compensation at NIC and MDN	KN to LM	570
2034	Shunt compensation at WSN KLY	PR to KN	650
2038	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2038	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2023	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2027	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2027	BCH_VI	MSW1_VI	12	12	100	100	127
2027	BCH_LM	MSW2_LM	25	24	208	208	92
2028	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2028	BCH_VI	Wind_VI12	48	12	150	150	135
2029	BCH_PR	Wind_PC28	153	40	591	591	111
2029	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2030	BCH_PR	Wind_PC21	99	26	371	371	112
2030	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2031	BCH_PR	Wind_PC13	135	35	541	541	113
2031	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2032	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2032	BCH_PR	Wind_PC19	117	30	441	441	113
2032	BCH_VI	Biomass_VI	30	30	239	239	142
2032	BCH_LM	Biomass_LM	30	30	239	239	143
2033	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2034	BCH_PR	Wind_PC14	144	37	527	527	117
2034	BCH_PR	Wind_PC16	99	26	377	377	116
2035	BCH_PR	Wind_PC20	159	41	610	610	119
2036	BCH_PR	Wind_PC15	108	28	382	382	119
2037	BCH_PR	Wind_PC09	207	54	713	713	122
2038	BCH_PR	Wind_PC11	126	33	473	473	122
2039	BCH_PR	Wind_PC41	45	12	155	155	122
2039	BCH_VI	Wind_VI14	35	9	114	114	135
2039	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2040	BCH_KN	100 MW SCGT KN	206	196	300	300	88

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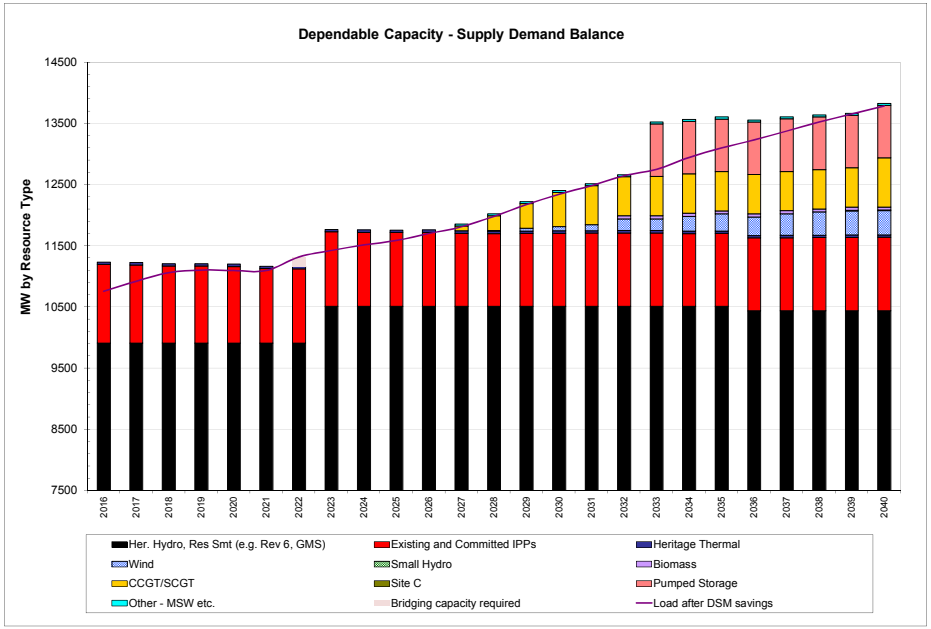

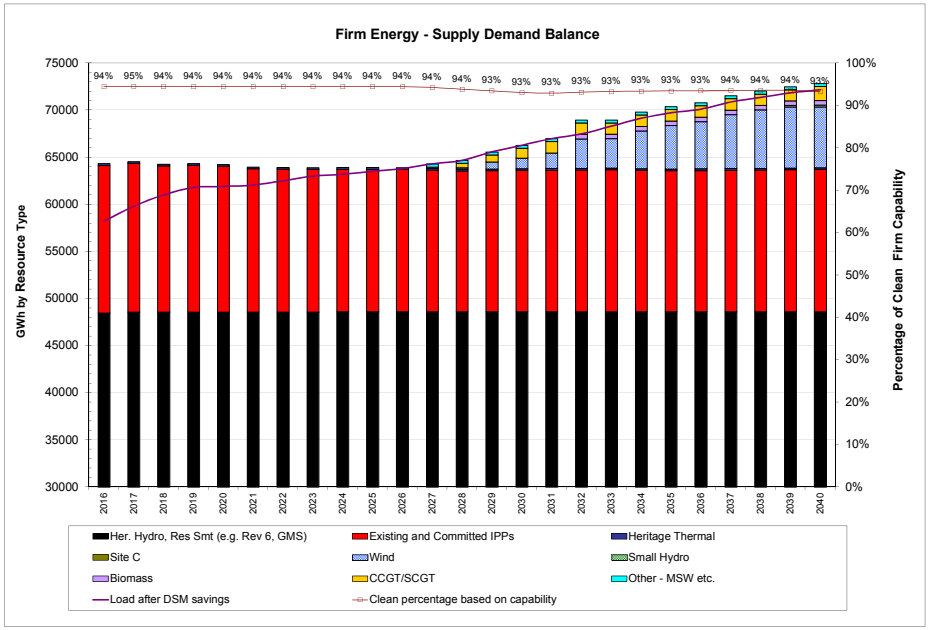

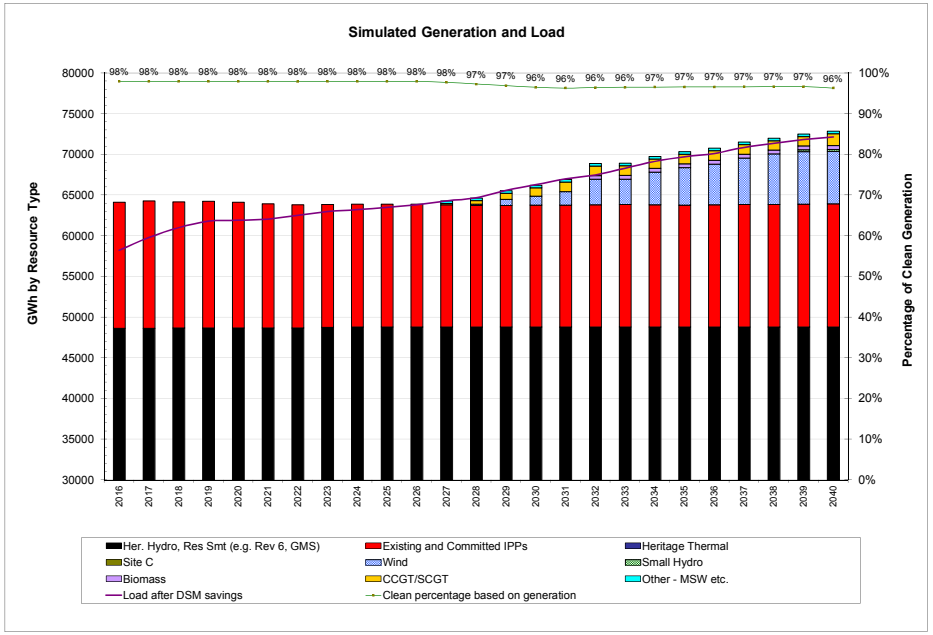

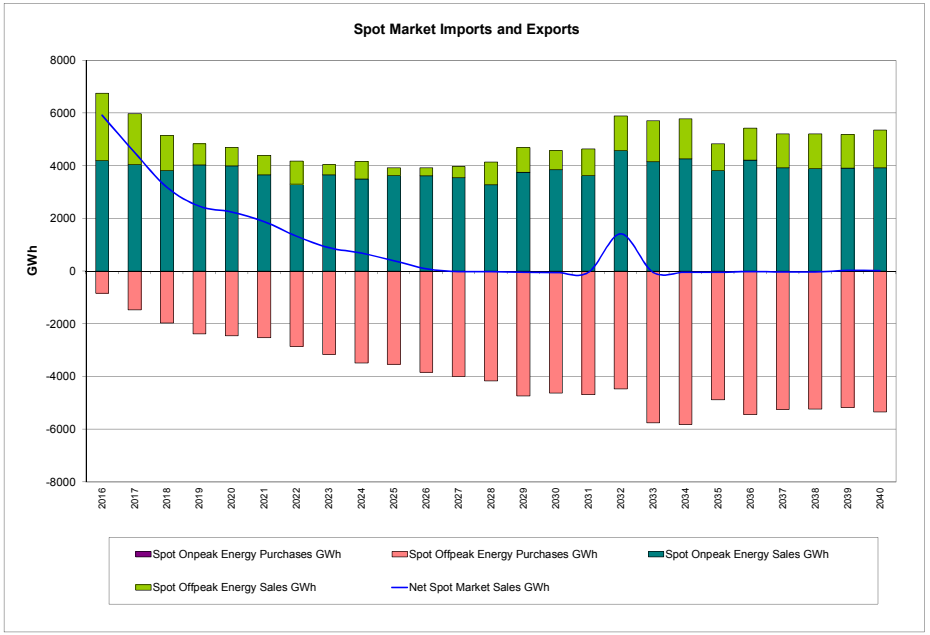

M&M_1NT_NN0_05Q

Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2026	Excluded (clean energy only)	7% IPP CoC, $10 wind adder, Capacity bridging before F2026

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	4,624
PV of Trade Revenue - $ millions	(1,737)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	6,142

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	1,100	1,100
Firm Energy (GWh)	0	0	0	5,103	5,103

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	283	0	1,097	1,100	2,480
Firm Energy (GWh)	4,029	0	791	5,103	9,923

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2025	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2029	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2032	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2034	BCH_PR	Wind_PC28	153	40	591	591	111
2034	BCH_LM	MSW2_LM	25	24	208	208	92
2035	BCH_PR	Wind_PC19	117	30	441	441	113
2035	BCH_PR	Wind_PC21	99	26	371	371	112
2036	BCH_PR	Wind_PC16	99	26	377	377	116
2037	BCH_PR	Wind_PC13	135	35	541	541	113
2037	BCH_VI	MSW1_VI	12	12	100	100	127
2038	BCH_VI	Biomass_VI	30	30	239	239	142
2038	BCH_LM	Biomass_LM	30	30	239	239	143
2039	BCH_PR	Wind_PC14	144	37	527	527	117
2040	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2040	BCH_PR	Wind_PC41	45	12	155	155	122

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2025	Shunt compensation at WSN KLY	PR to KN	650
2029	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2029	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147

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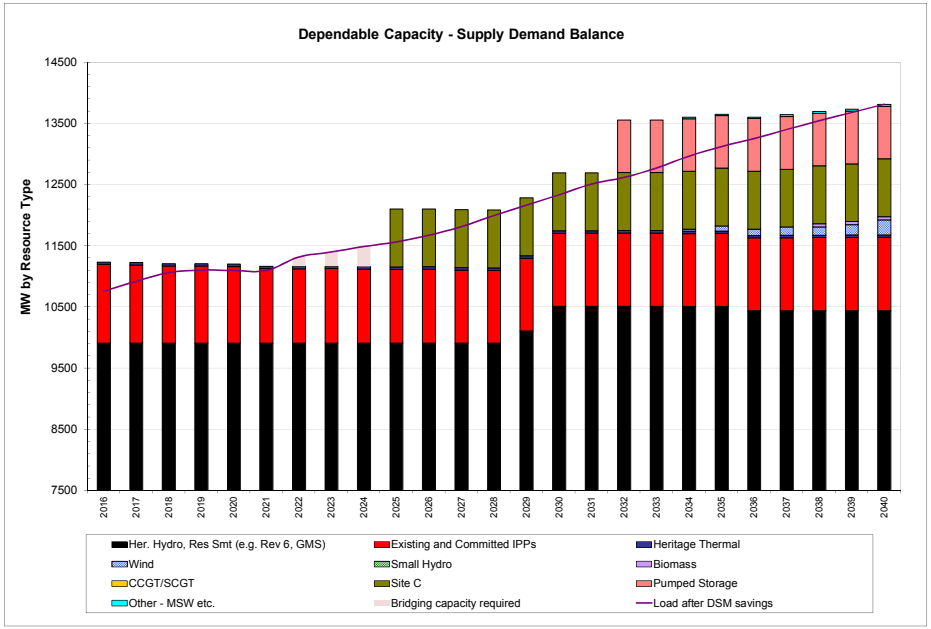

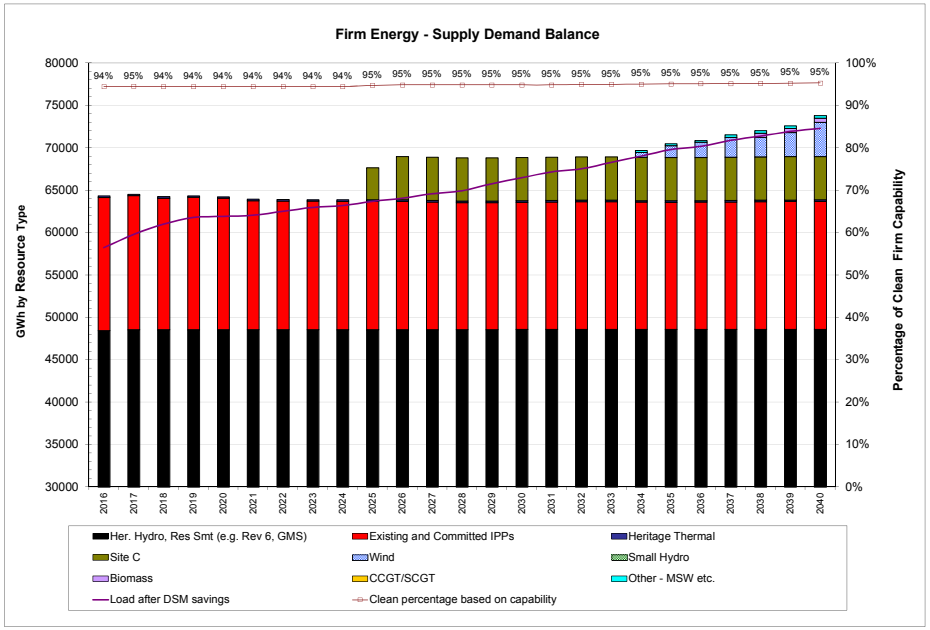

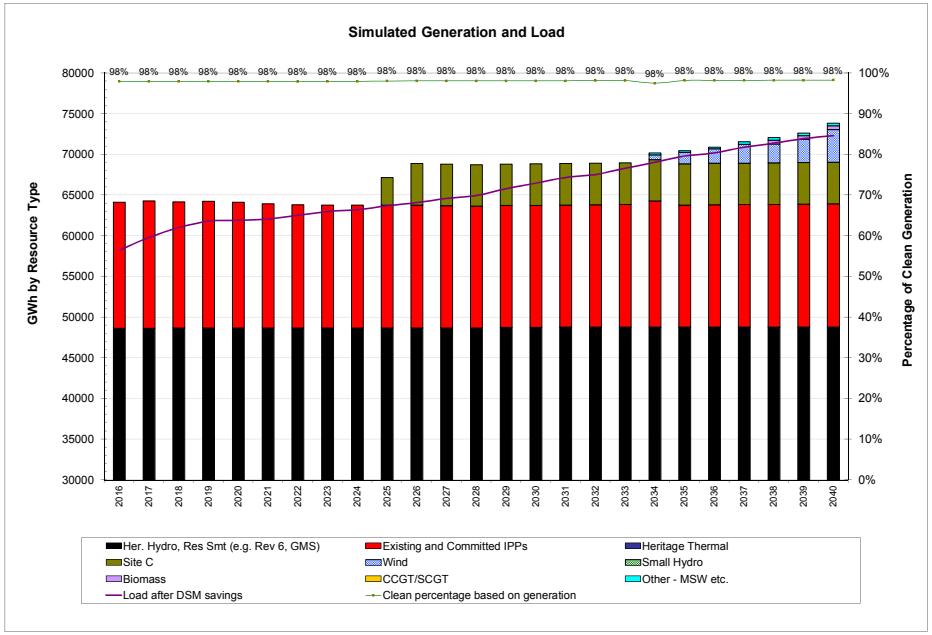

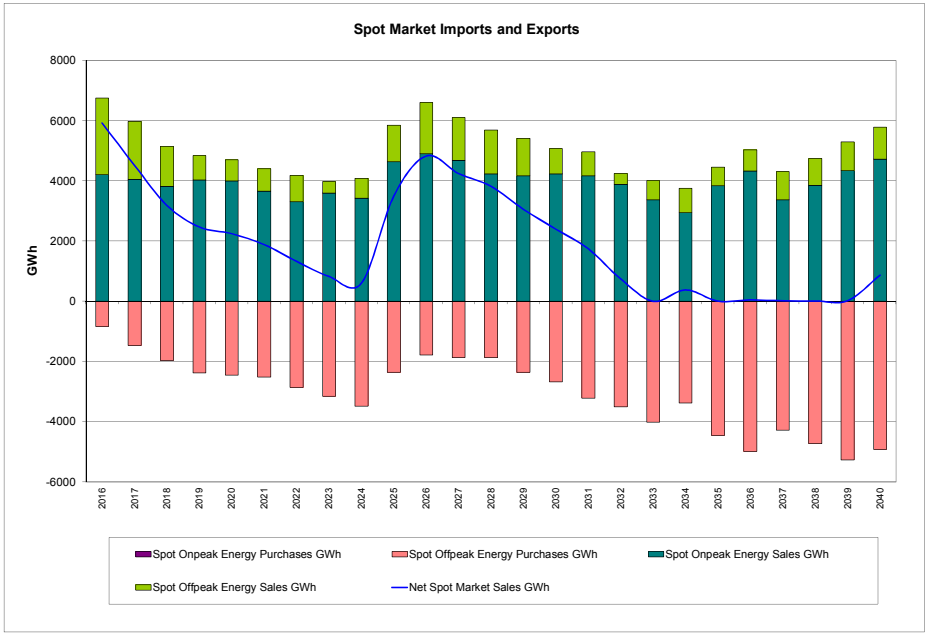

M&M_1KC_NN0_05R

Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 1	Not included	Excluded (clean energy only)	7% IPP CoC, $10 wind adder, Capacity bridging before F2026

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	5,089
PV of Trade Revenue - $ millions	(1,325)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	7,018

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	194	0	1,037	0	1,231
Firm Energy (GWh)	2,850	0	312	0	3,162

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	594	10	2,158	0	2,762
Firm Energy (GWh)	8,203	175	1,277	0	9,656

DSM Level in:

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Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
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Transmission Expansion

Year	Project Description	Between	Capacity - MW
2025	Series compensation of 5L91 and 5L98	SE to KN	147
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2035	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2035	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2025	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
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2029	BCH_PR	Wind_PC16	99	26	377	377	116
2029	BCH_PR	Wind_PC19	117	30	441	441	113
2030	BCH_PR	Wind_PC14	144	37	527	527	117
2030	BCH_VI	MSW1_VI	12	12	100	100	127
2031	BCH_PR	Wind_PC20	159	41	610	610	119
2031	BCH_PR	Wind_PC41	45	12	155	155	122
2032	BCH_PR	Wind_PC15	108	28	382	382	119
2033	BCH_PR	Wind_PC09	207	54	713	713	122
2034	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2035	BCH_PR	Wind_PC18	138	36	486	486	123
2035	BCH_PR	Wind_PC42	63	16	219	219	122
2035	BCH_PR	Biomass_PR	28	28	223	223	141
2035	BCH_VI	Wind_VI12	48	12	150	150	135
2035	BCH_VI	Wind_VI14	35	9	114	114	135
2035	BCH_VI	Biomass_VI	30	30	239	239	142
2035	BCH_LM	Biomass_LM	30	30	239	239	143
2036	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2037	BCH_PR	Wind_PC11	126	33	473	473	122
2037	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2038	BCH_PR	Wind_PC26	126	33	416	416	127
2038	BCH_VI	Wind_VI13	35	9	106	106	140
2039	BCH_PR	Wind_PC48	152	40	505	505	128
2040	BCH_SE	Biomass_SE	33	33	263	263	141

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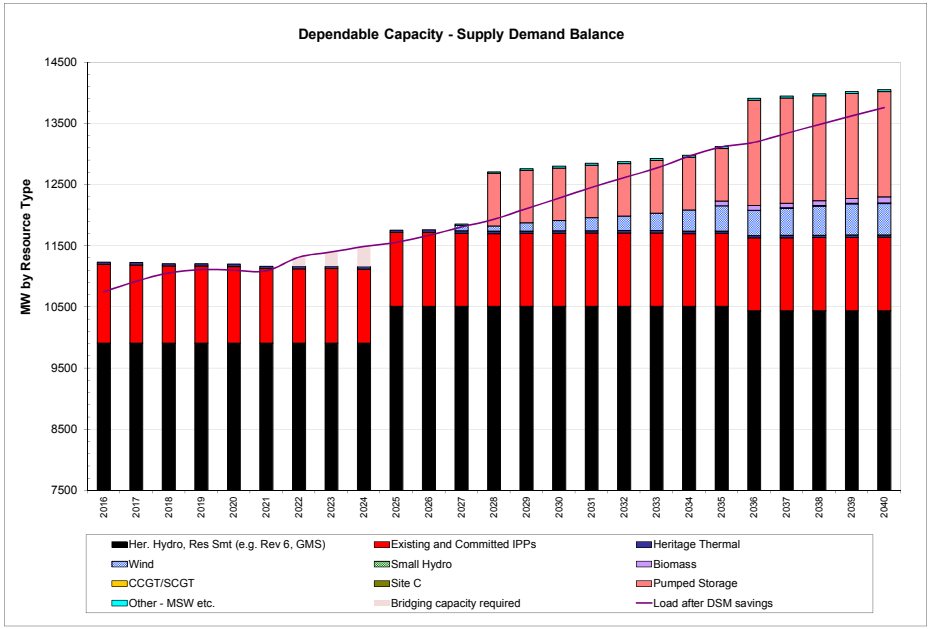

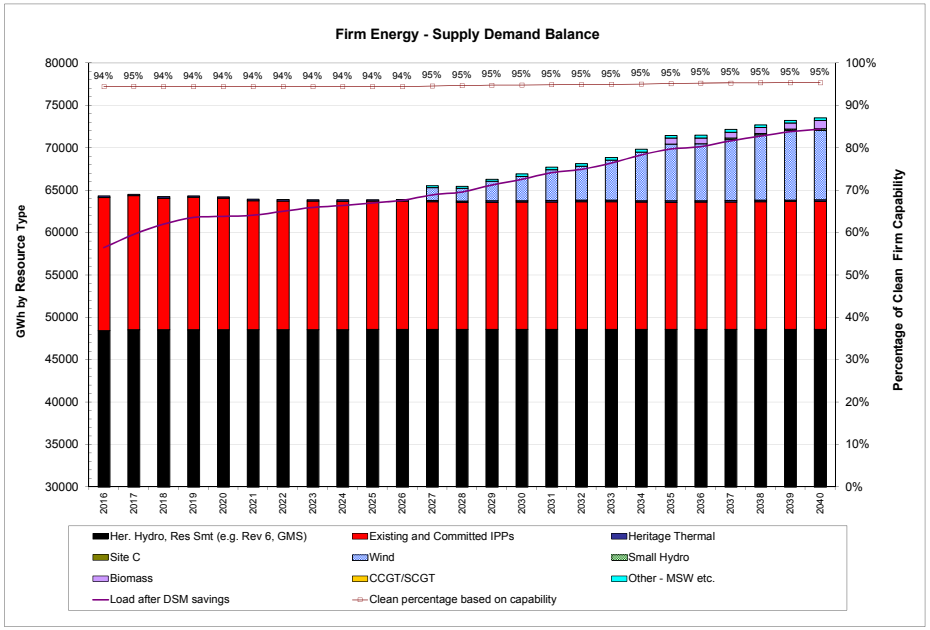

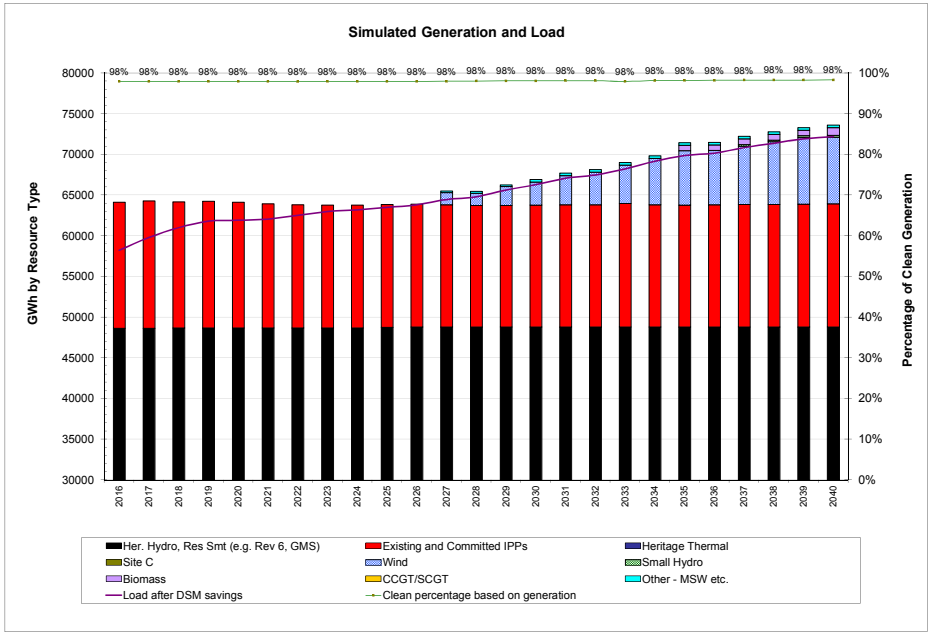

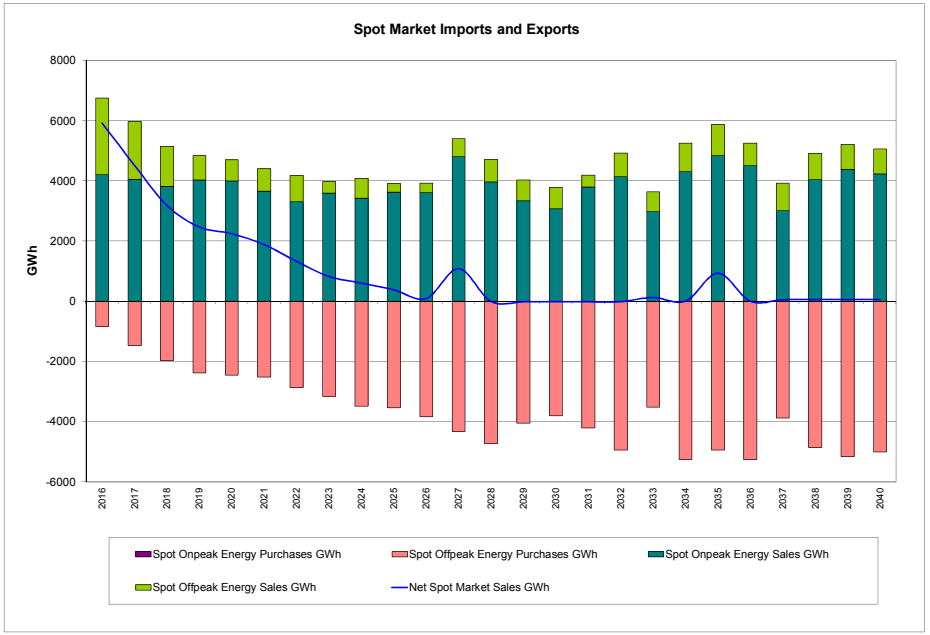

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2026	Included	7% IPP CoC, $10 wind adder, Capacity bridging before F2026

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	4,415
PV of Trade Revenue - $ millions	(1,784)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	5,886

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	1,100	1,100
Firm Energy (GWh)	0	0	0	5,103	5,103

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	133	0	1,999	1,100	3,232
Firm Energy (GWh)	1,937	0	2,055	5,103	9,095

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	94%
Lowest %	96%	93%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2025	Shunt compensation at WSN KLY	PR to KN	650
2029	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2029	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147
2033	500 kV circuit 5L46 between KLY and Cheekye	KN to LM	1384

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2025	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2029	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2033	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2034	BCH_KN	100 MW SCGT KN	309	294	450	450	88
2035	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2036	BCH_KN	100 MW SCGT KN	309	294	450	450	88
2037	BCH_PR	Wind_PC41	45	12	155	155	122
2037	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2037	BCH_VI	MSW1_VI	12	12	100	100	127
2037	BCH_LM	MSW2_LM	25	24	208	208	92
2038	BCH_PR	Wind_PC19	117	30	441	441	113
2038	BCH_PR	Wind_PC21	99	26	371	371	112
2038	BCH_PR	Wind_PC28	153	40	591	591	111
2038	BCH_VI	Biomass_VI	30	30	239	239	142
2039	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2040	BCH_PR	Wind_PC16	99	26	377	377	116

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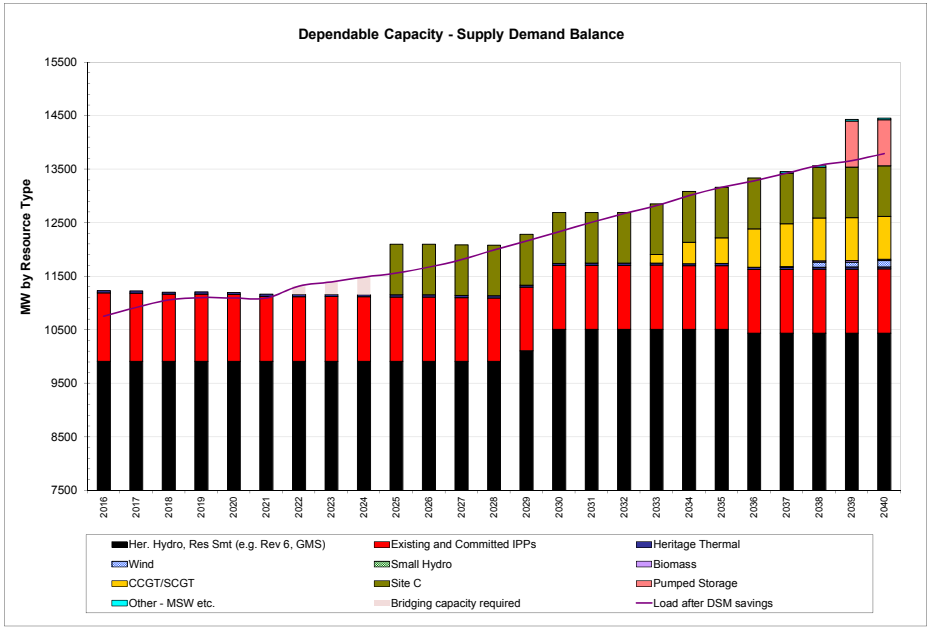

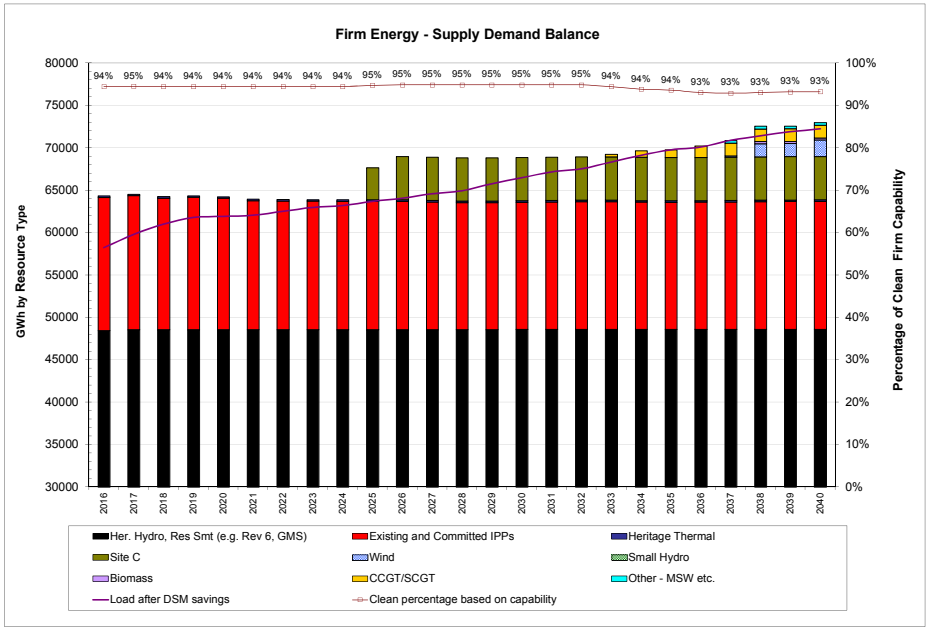

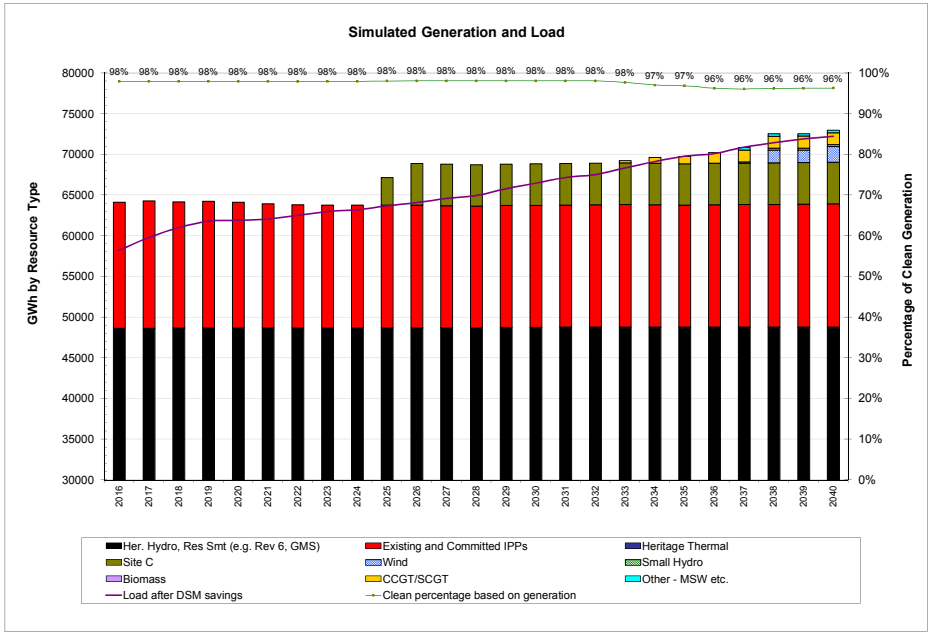

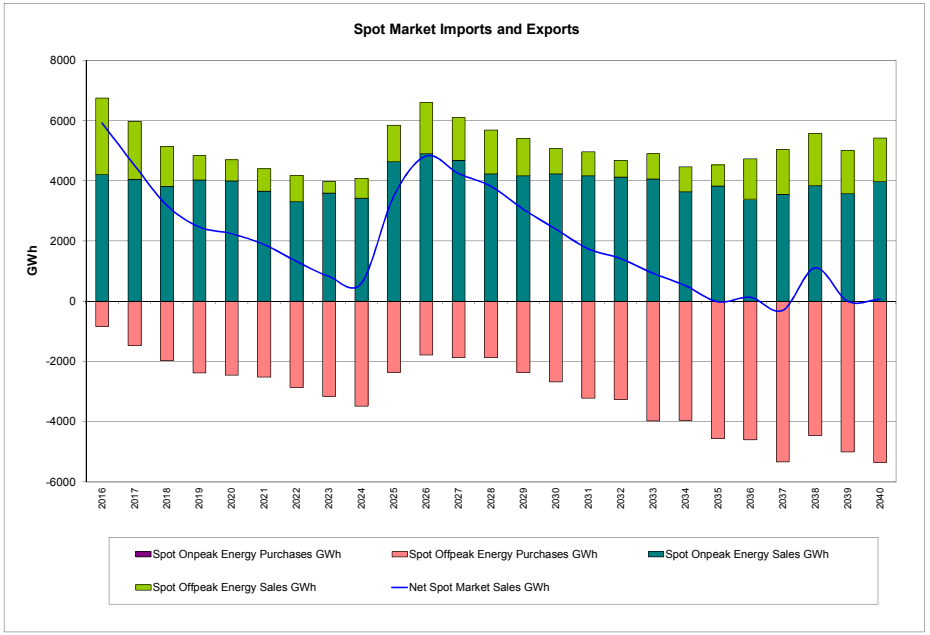

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 1	Not included	Included	7% IPP CoC, $10 wind adder, Capacity bridging before F2026

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	4,343
PV of Trade Revenue - $ millions	(1,320)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	6,278

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	70	0	626	0	696
Firm Energy (GWh)	1,033	0	1,454	0	2,486

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	461	10	2,029	0	2,499
Firm Energy (GWh)	6,471	175	2,294	0	8,940

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	97%	94%
Lowest %	96%	93%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2025	Series compensation of 5L91 and 5L98	SE to KN	147
2029	Shunt compensation at NIC and MDN	KN to LM	570
2034	Shunt compensation at WSN KLY	PR to KN	650
2039	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2039	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2025	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2025	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2027	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2027	BCH_VI	MSW1_VI	12	12	100	100	127
2027	BCH_LM	MSW2_LM	25	24	208	208	92
2028	BCH_KN	100 MW SCGT KN	309	294	450	450	88
2029	BCH_PR	Wind_PC28	153	40	591	591	111
2029	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2030	BCH_PR	Wind_PC19	117	30	441	441	113
2030	BCH_VI	Biomass_VI	30	30	239	239	142
2031	BCH_PR	Wind_PC21	99	26	371	371	112
2031	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2032	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2032	BCH_PR	Wind_PC16	99	26	377	377	116
2032	BCH_VI	Wind_VI12	48	12	150	150	135
2032	BCH_VI	Wind_VI14	35	9	114	114	135
2032	BCH_LM	Biomass_LM	30	30	239	239	143
2033	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2034	BCH_PR	Wind_PC13	135	35	541	541	113
2034	BCH_PR	Wind_PC15	108	28	382	382	119
2035	BCH_PR	Wind_PC20	159	41	610	610	119
2036	BCH_PR	Wind_PC41	45	12	155	155	122
2036	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2037	BCH_PR	Wind_PC09	207	54	713	713	122
2038	BCH_PR	Wind_PC14	144	37	527	527	117
2039	BCH_PR	Wind_PC11	126	33	473	473	122
2040	BCH_KN	100 MW SCGT KN	206	196	300	300	88

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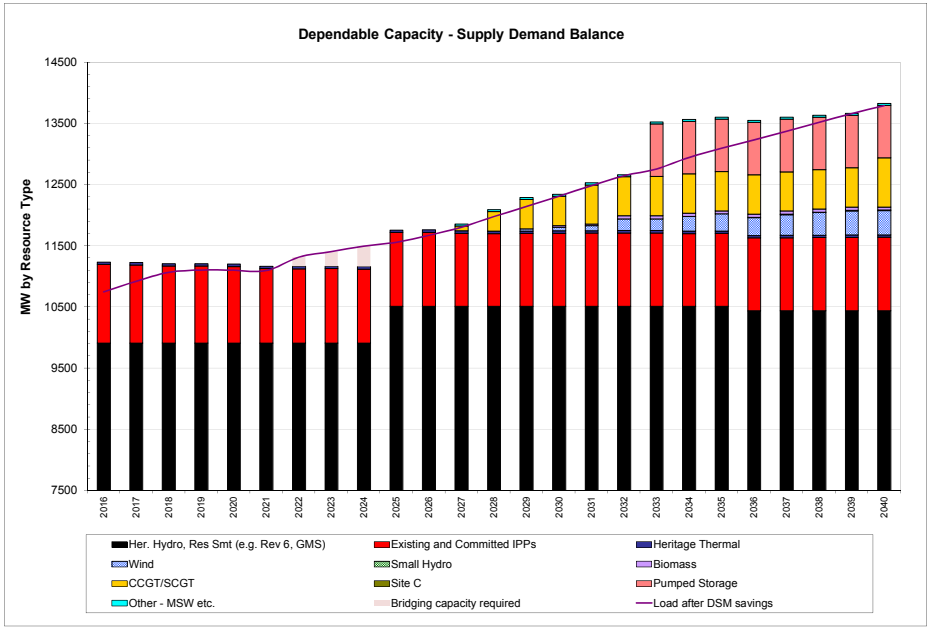

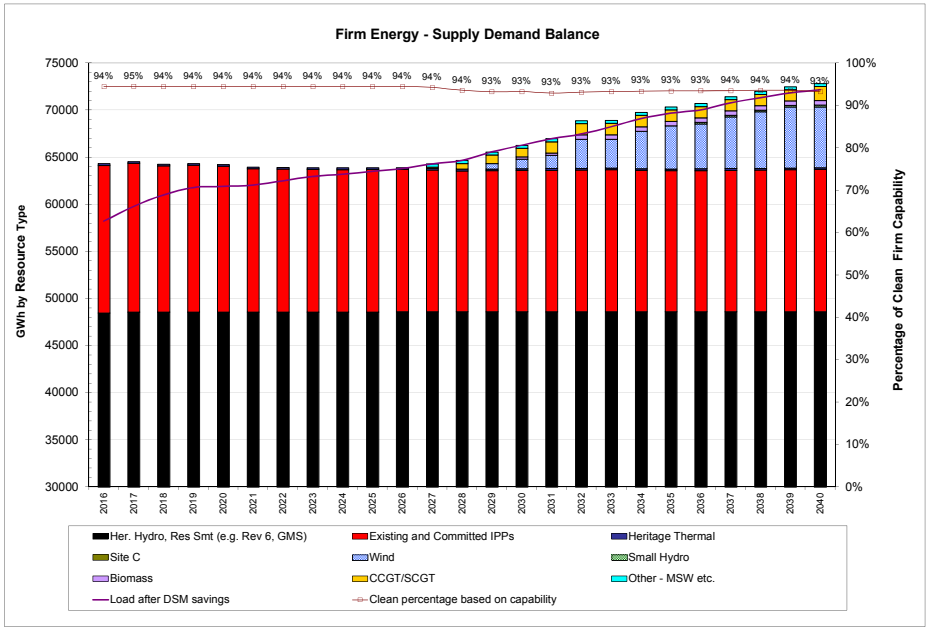

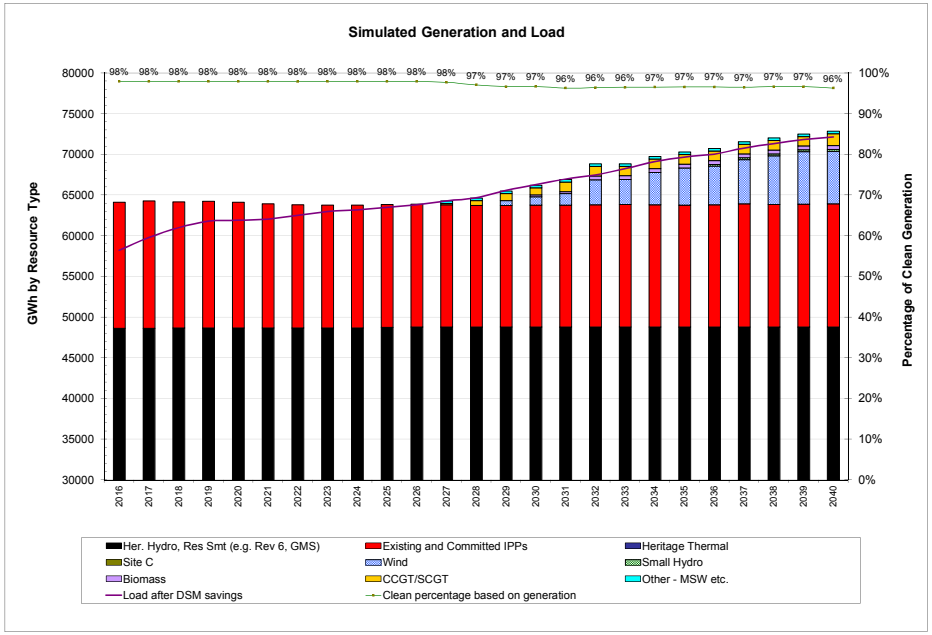

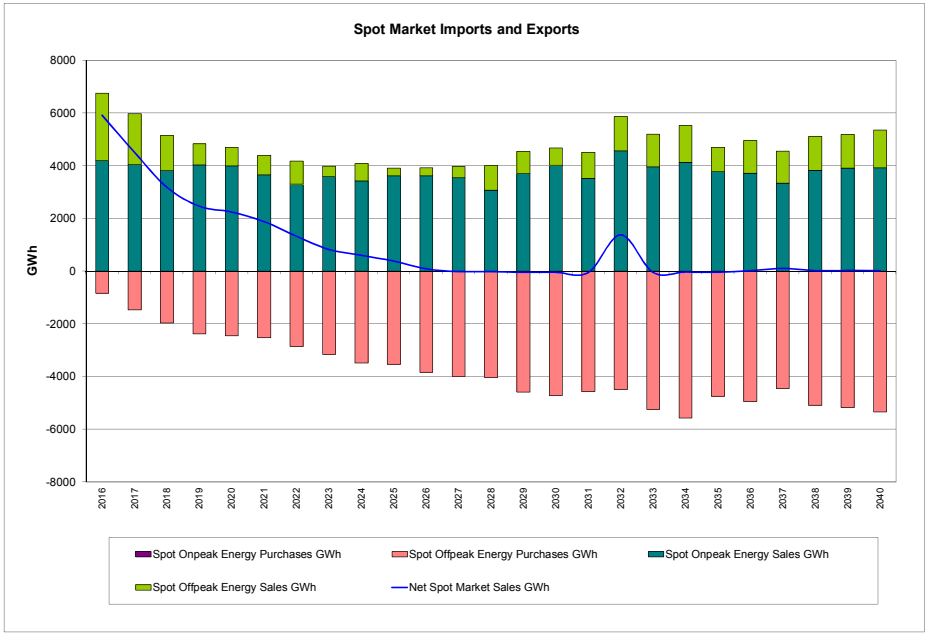

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Excluded (clean energy only)	6% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	5,017
PV of Trade Revenue - $ millions	(1,939)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	6,332

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	1,100	1,100
Firm Energy (GWh)	0	0	0	5,103	5,103

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	300	0	1,097	1,100	2,496
Firm Energy (GWh)	4,256	0	791	5,103	10,150

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Shunt compensation at WSN KLY	PR to KN	650
2029	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2029	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2029	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2032	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2034	BCH_PR	Wind_PC28	153	40	591	591	111
2034	BCH_VI	MSW1_VI	12	12	100	100	127
2034	BCH_LM	MSW2_LM	25	24	208	208	92
2035	BCH_PR	Wind_PC16	99	26	377	377	116
2035	BCH_PR	Wind_PC21	99	26	371	371	112
2036	BCH_PR	Wind_PC19	117	30	441	441	113
2037	BCH_PR	Wind_PC13	135	35	541	541	113
2038	BCH_VI	Biomass_VI	30	30	239	239	142
2038	BCH_LM	Biomass_LM	30	30	239	239	143
2039	BCH_PR	Wind_PC14	144	37	527	527	117
2040	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2040	BCH_PR	Wind_PC15	108	28	382	382	119

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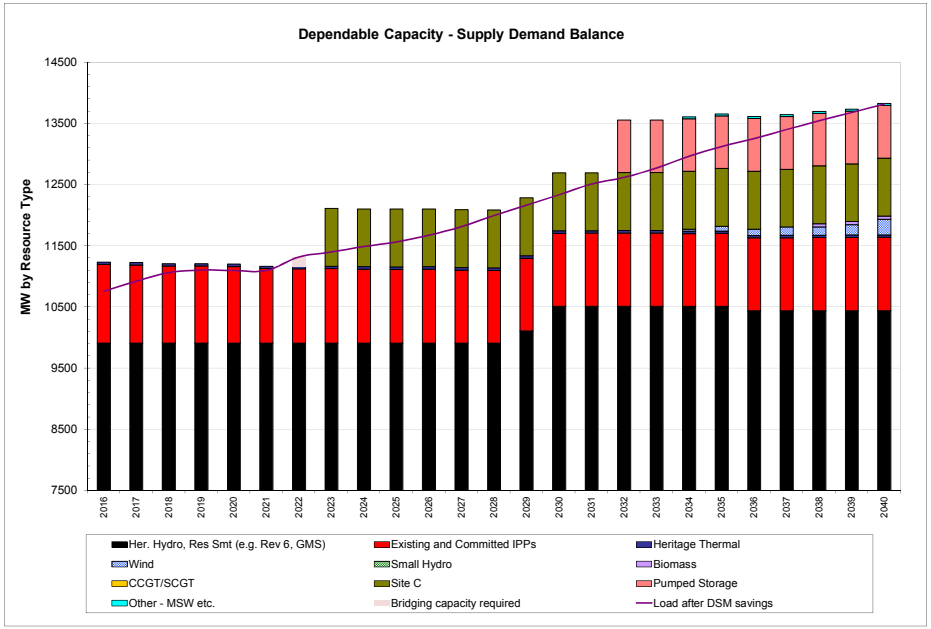

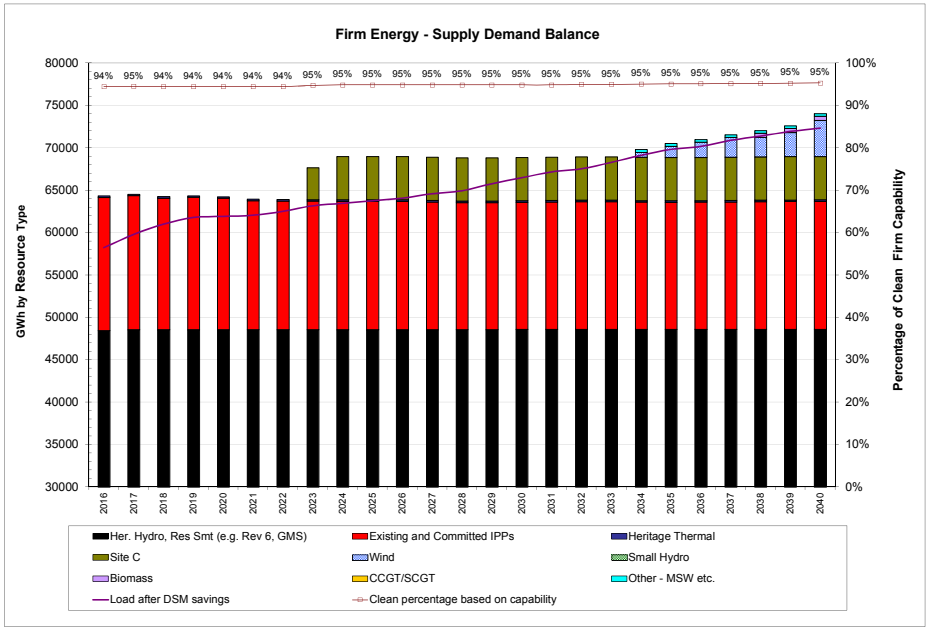

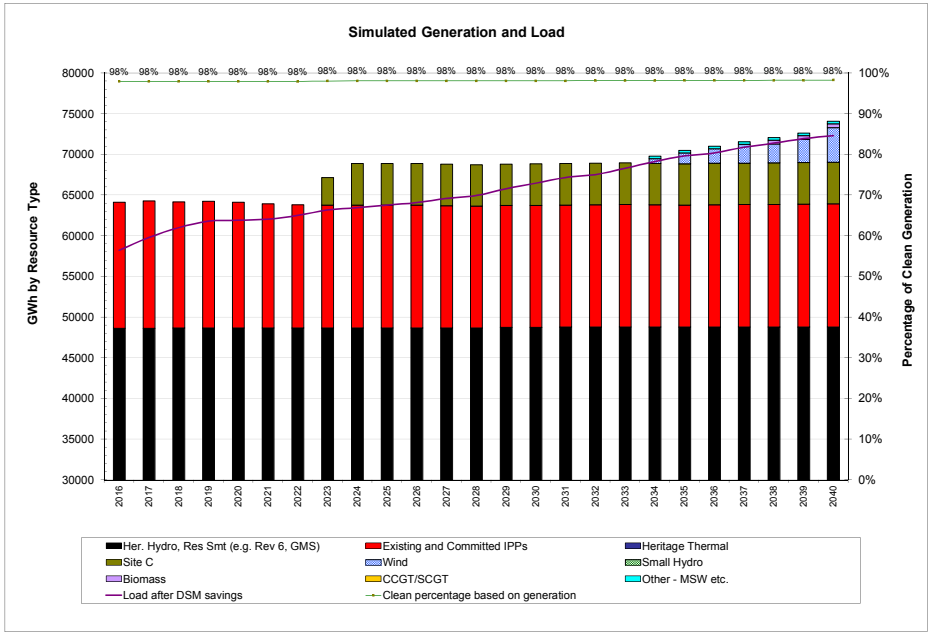

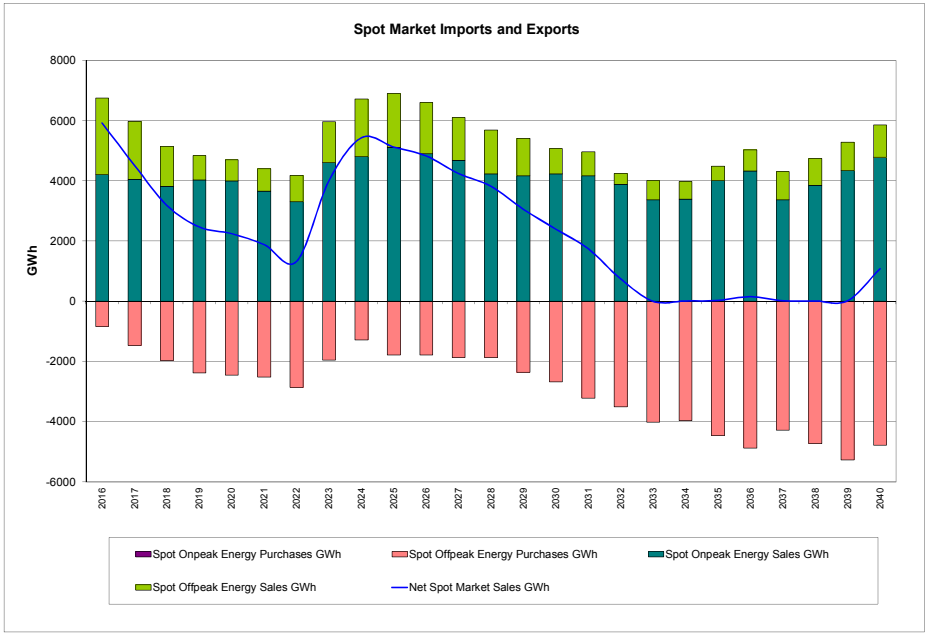

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 1	Not included	Excluded (clean energy only)	6% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	4,850
PV of Trade Revenue - $ millions	(1,354)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	6,751

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	194	0	1,037	0	1,231
Firm Energy (GWh)	2,850	0	312	0	3,162

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	585	39	2,130	0	2,754
Firm Energy (GWh)	8,099	526	1,054	0	9,679

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Series compensation of 5L91 and 5L98	SE to KN	147
2032	Shunt compensation at WSN KLY	PR to KN	650
2035	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2035	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2023	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2027	BCH_PR	Wind_PC16	99	26	377	377	116
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2027	BCH_PR	Wind_PC28	153	40	591	591	111
2027	BCH_VI	MSW1_VI	12	12	100	100	127
2027	BCH_LM	MSW2_LM	25	24	208	208	92
2028	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2029	BCH_PR	Wind_PC13	135	35	541	541	113
2029	BCH_PR	Wind_PC19	117	30	441	441	113
2030	BCH_PR	Wind_PC14	144	37	527	527	117
2031	BCH_PR	Wind_PC20	159	41	610	610	119
2031	BCH_PR	Wind_PC41	45	12	155	155	122
2032	BCH_PR	Wind_PC15	108	28	382	382	119
2033	BCH_PR	Wind_PC09	207	54	713	713	122
2034	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2035	BCH_PR	Wind_PC26	126	33	416	416	127
2035	BCH_PR	Wind_PC42	63	16	219	219	122
2035	BCH_VI	Run of River VI 100_110	119	29	352	451	120
2035	BCH_VI	Wind_VI12	48	12	150	150	135
2035	BCH_VI	Wind_VI14	35	9	114	114	135
2035	BCH_VI	Biomass_VI	30	30	239	239	142
2035	BCH_LM	Biomass_LM	30	30	239	239	143
2036	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2037	BCH_PR	Wind_PC11	126	33	473	473	122
2037	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2038	BCH_PR	Wind_PC18	138	36	486	486	123
2039	BCH_PR	Wind_PC48	152	40	505	505	128
2040	BCH_SE	Biomass_SE	33	33	263	263	141

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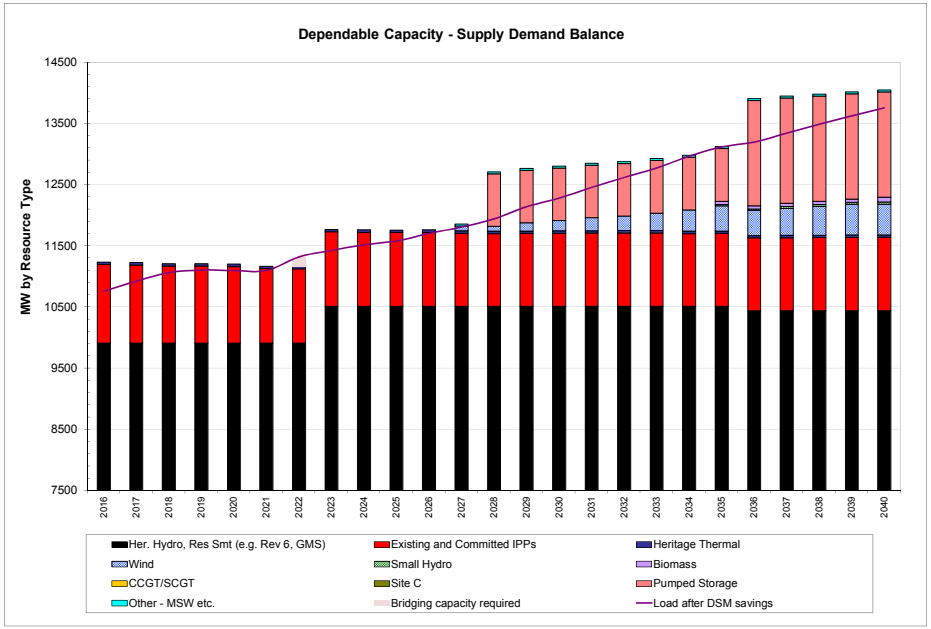

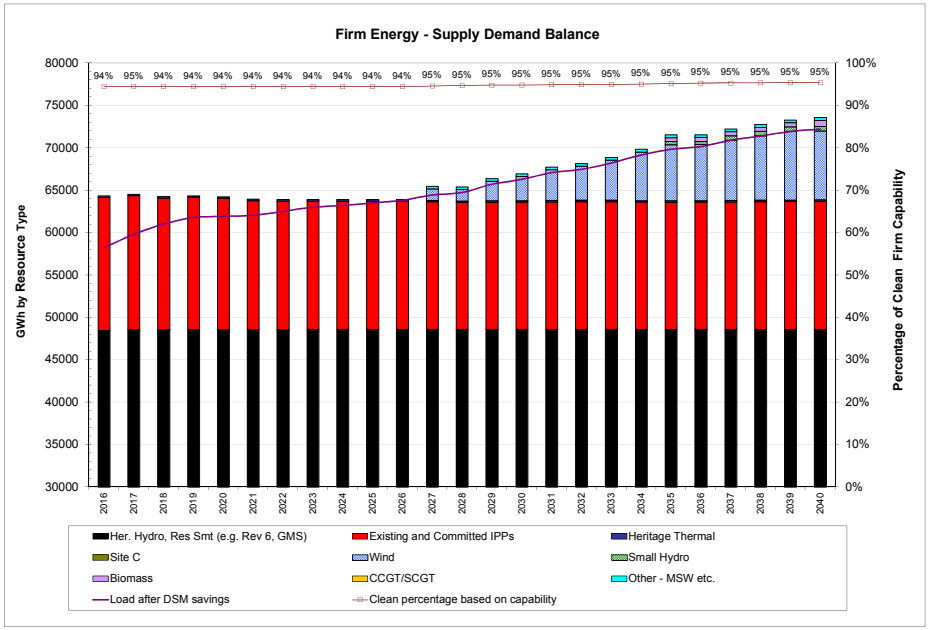

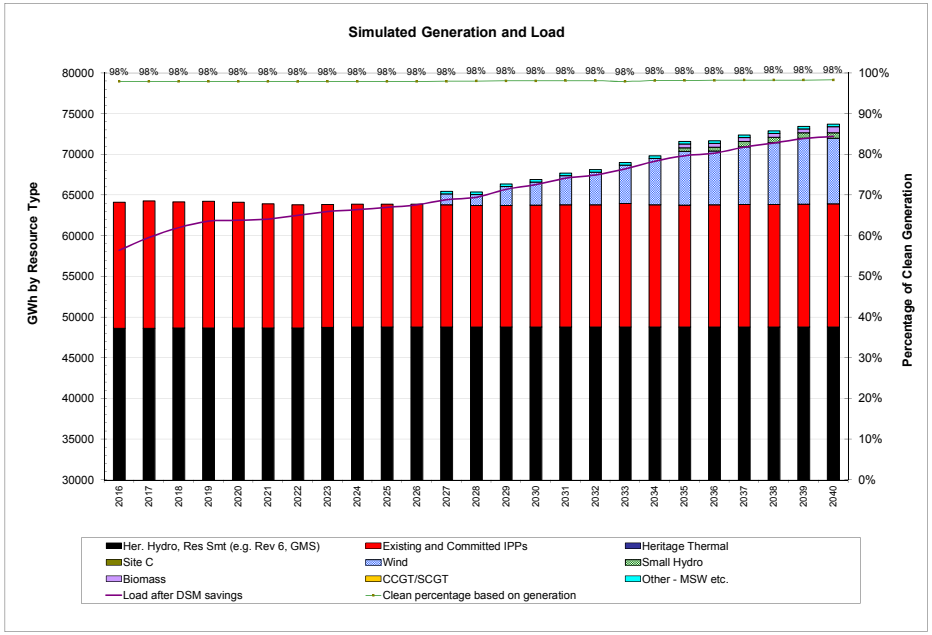

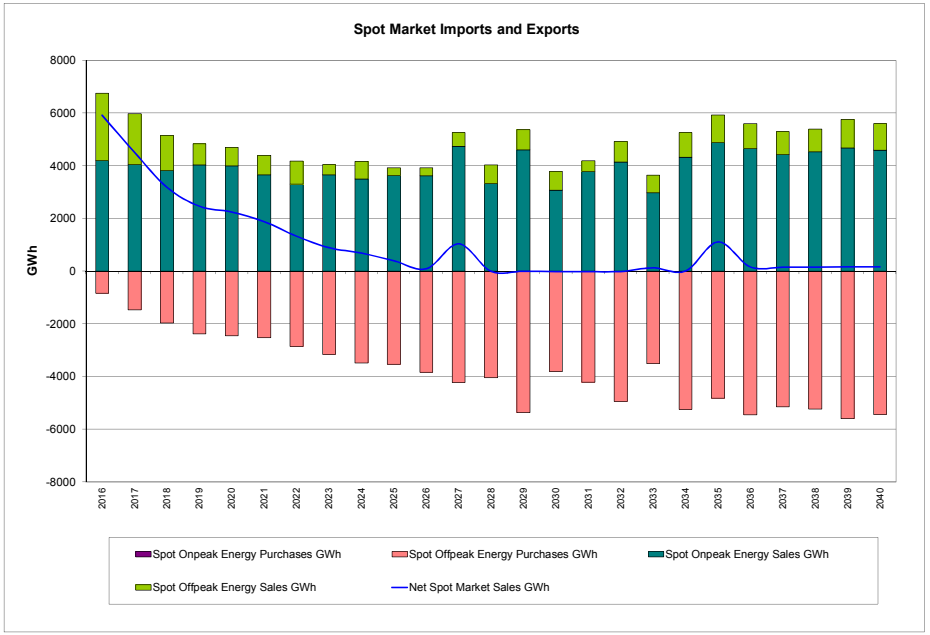

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Included	6% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	4,857
PV of Trade Revenue - $ millions	(1,985)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	6,127

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	1,100	1,100
Firm Energy (GWh)	0	0	0	5,103	5,103

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	124	0	1,999	1,100	3,223
Firm Energy (GWh)	1,779	0	2,055	5,103	8,938

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	94%
Lowest %	96%	93%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Shunt compensation at WSN KLY	PR to KN	650
2029	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2029	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147
2033	500 kV circuit 5L46 between KLY and Cheekye	KN to LM	1384

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2029	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2033	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2034	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2034	BCH_LM	MSW2_LM	25	24	208	208	92
2035	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2036	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2036	BCH_VI	MSW1_VI	12	12	100	100	127
2037	BCH_PR	Wind_PC41	45	12	155	155	122
2037	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2038	BCH_PR	Wind_PC19	117	30	441	441	113
2038	BCH_PR	Wind_PC21	99	26	371	371	112
2038	BCH_PR	Wind_PC28	153	40	591	591	111
2038	BCH_VI	Biomass_VI	30	30	239	239	142
2039	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2040	BCH_PR	Wind_PC42	63	16	219	219	122

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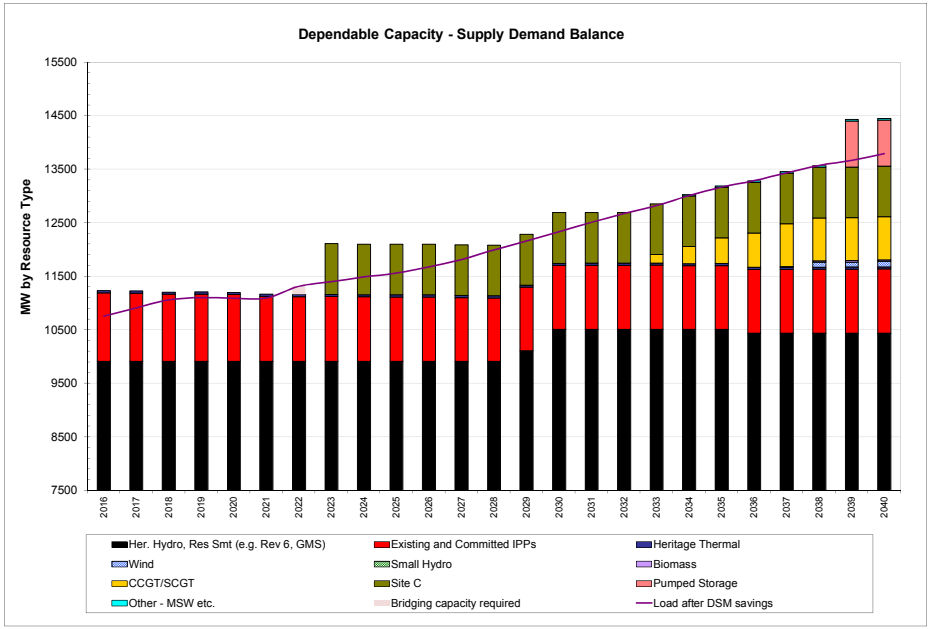

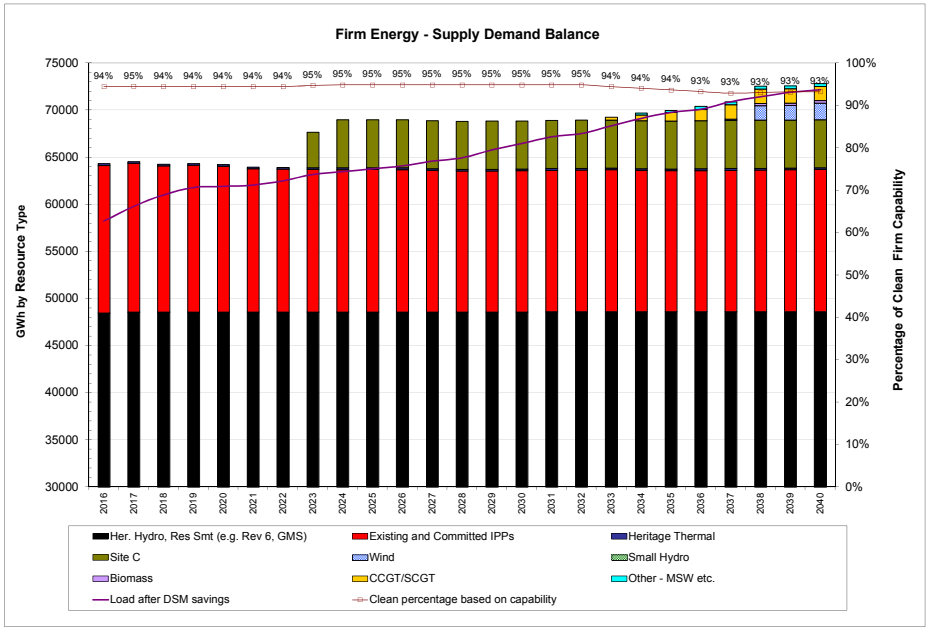

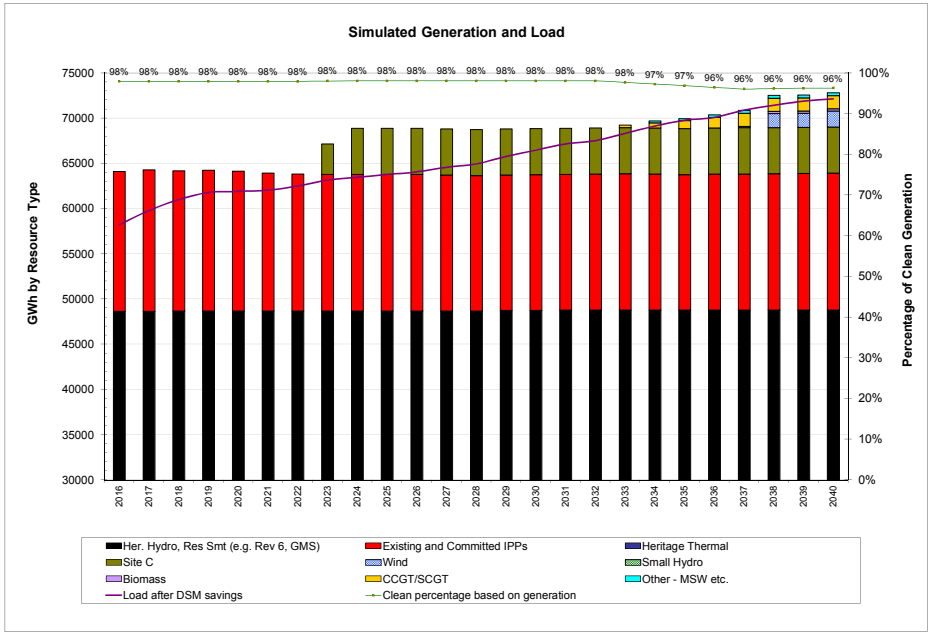

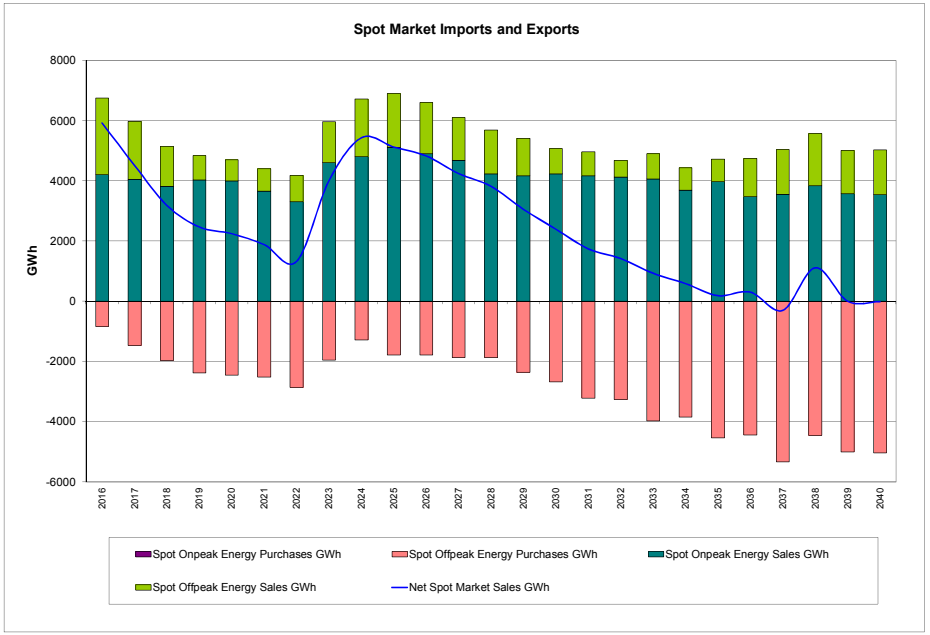

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 1	Not included	Included	6% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	4,229
PV of Trade Revenue - $ millions	(1,337)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	6,147

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	66	0	719	0	785
Firm Energy (GWh)	963	0	1,604	0	2,567

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	452	18	2,029	0	2,499
Firm Energy (GWh)	6,359	257	2,294	0	8,909

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	97%	94%
Lowest %	96%	93%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Series compensation of 5L91 and 5L98	SE to KN	147
2029	Shunt compensation at NIC and MDN	KN to LM	570
2034	Shunt compensation at WSN KLY	PR to KN	650
2038	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2038	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2023	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2027	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2027	BCH_VI	MSW1_VI	12	12	100	100	127
2027	BCH_LM	MSW2_LM	25	24	208	208	92
2028	BCH_KN	100 MW SCGT KN	309	294	450	450	88
2029	BCH_PR	Wind_PC28	153	40	591	591	111
2029	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2030	BCH_PR	Wind_PC21	99	26	371	371	112
2030	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2030	BCH_VI	Biomass_VI	30	30	239	239	142
2031	BCH_PR	Wind_PC19	117	30	441	441	113
2031	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2032	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2032	BCH_PR	Wind_PC13	135	35	541	541	113
2032	BCH_VI	Wind_VI12	48	12	150	150	135
2032	BCH_LM	Biomass_LM	30	30	239	239	143
2033	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2034	BCH_PR	Wind_PC14	144	37	527	527	117
2034	BCH_PR	Wind_PC16	99	26	377	377	116
2035	BCH_PR	Wind_PC20	159	41	610	610	119
2036	BCH_PR	Wind_PC15	108	28	382	382	119
2037	BCH_PR	Wind_PC09	207	54	713	713	122
2038	BCH_PR	Wind_PC11	126	33	473	473	122
2039	BCH_PR	Wind_PC41	45	12	155	155	122
2039	BCH_LM	Run of River LM 100_110	102	18	258	330	115
2040	BCH_KN	100 MW SCGT KN	206	196	300	300	88

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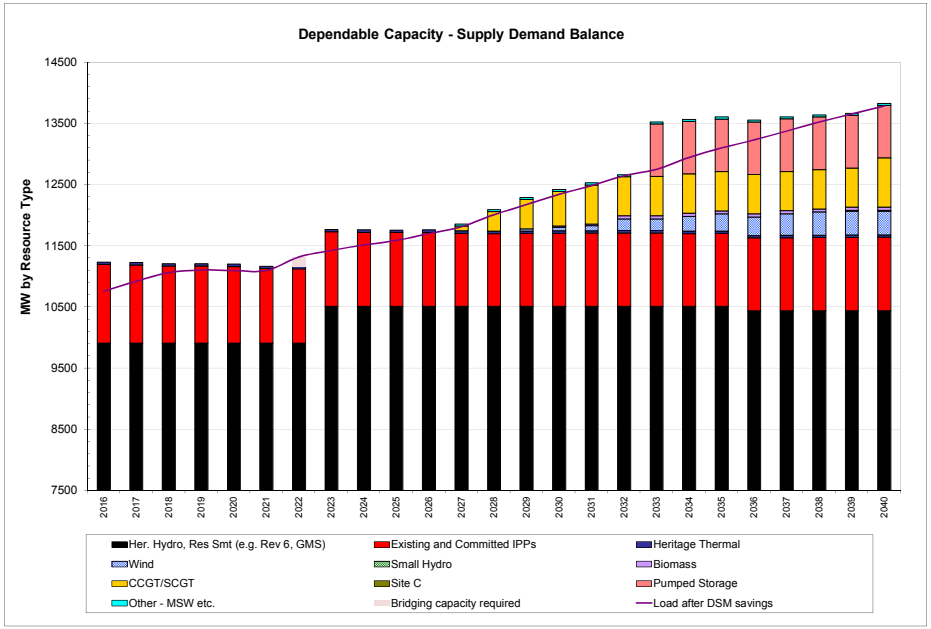

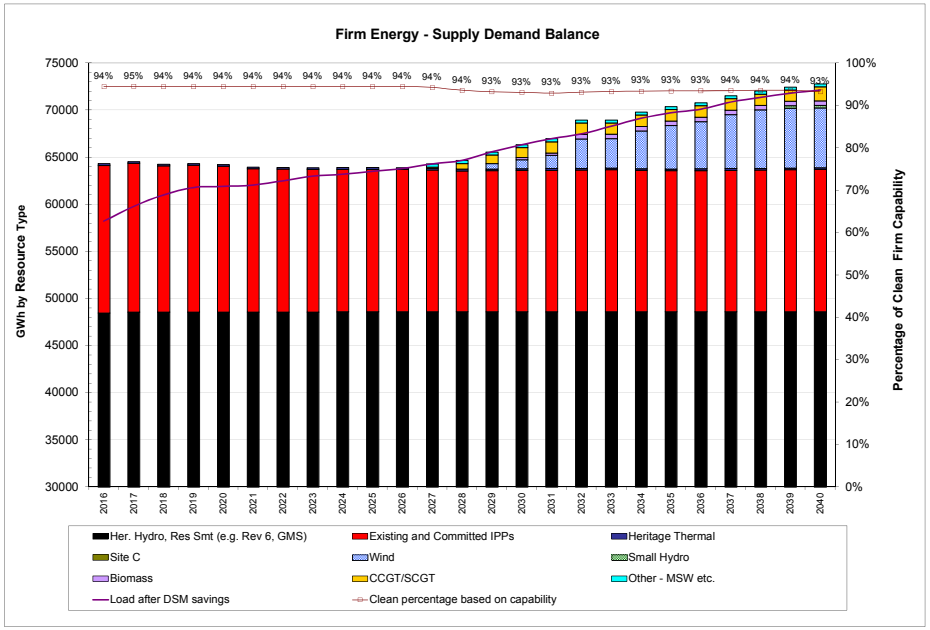

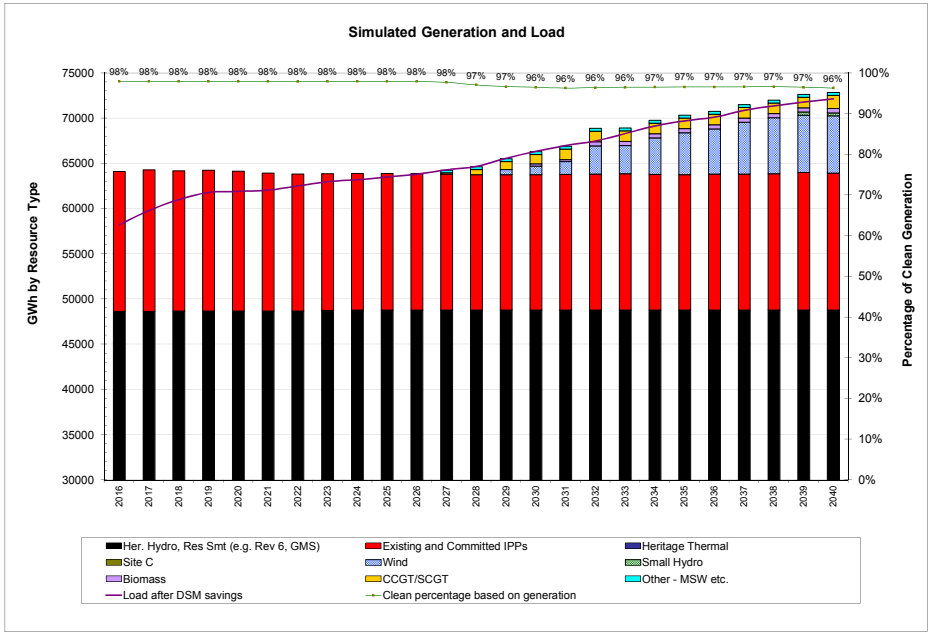

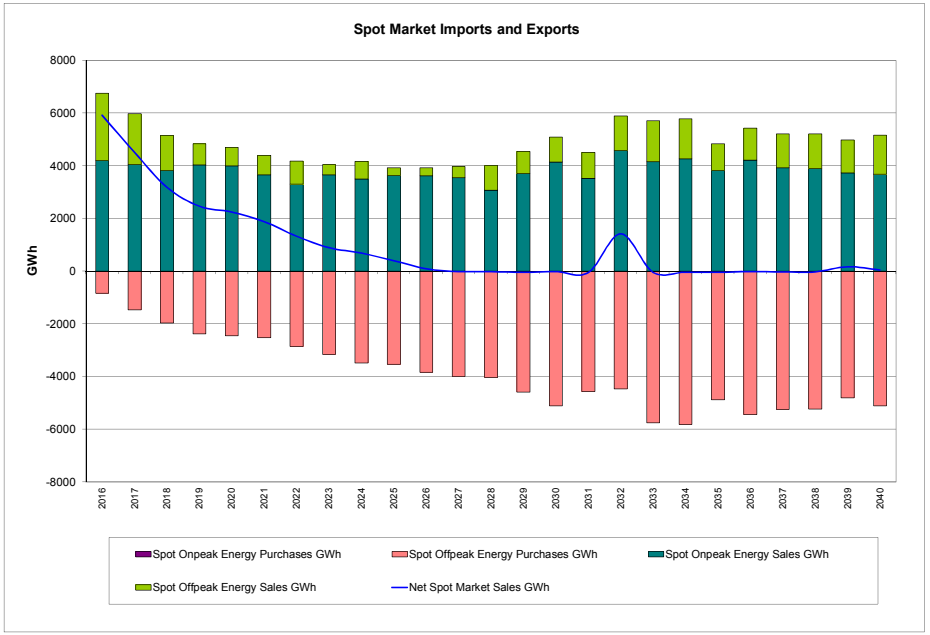

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 2	ISD fixed F2024	Excluded (clean energy only)	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	4,858
PV of Trade Revenue - $ millions	(1,343)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	6,770

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	1,100	1,100
Firm Energy (GWh)	0	0	0	5,103	5,103

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	222	0	1,158	1,100	2,480
Firm Energy (GWh)	3,232	0	1,277	5,103	9,613

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	97%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Shunt compensation at WSN KLY	PR to KN	650
2029	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2029	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2029	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2032	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2034	BCH_PR	Wind_PC28	153	40	591	591	111
2034	BCH_LM	MSW2_LM	25	24	208	208	92
2035	BCH_PR	Wind_PC13	135	35	541	541	113
2035	BCH_VI	MSW1_VI	12	12	100	100	127
2036	BCH_PR	Wind_PC21	99	26	371	371	112
2037	BCH_PR	Wind_PC16	99	26	377	377	116
2037	BCH_PR	Wind_PC19	117	30	441	441	113
2038	BCH_VI	Biomass_VI	30	30	239	239	142
2038	BCH_LM	Biomass_LM	30	30	239	239	143
2039	BCH_PR	Wind_PC15	108	28	382	382	119
2040	BCH_PR	Wind_PC14	144	37	527	527	117
2040	BCH_PR	Biomass_PR	28	28	223	223	141
2040	BCH_SE	Biomass_SE	33	33	263	263	141

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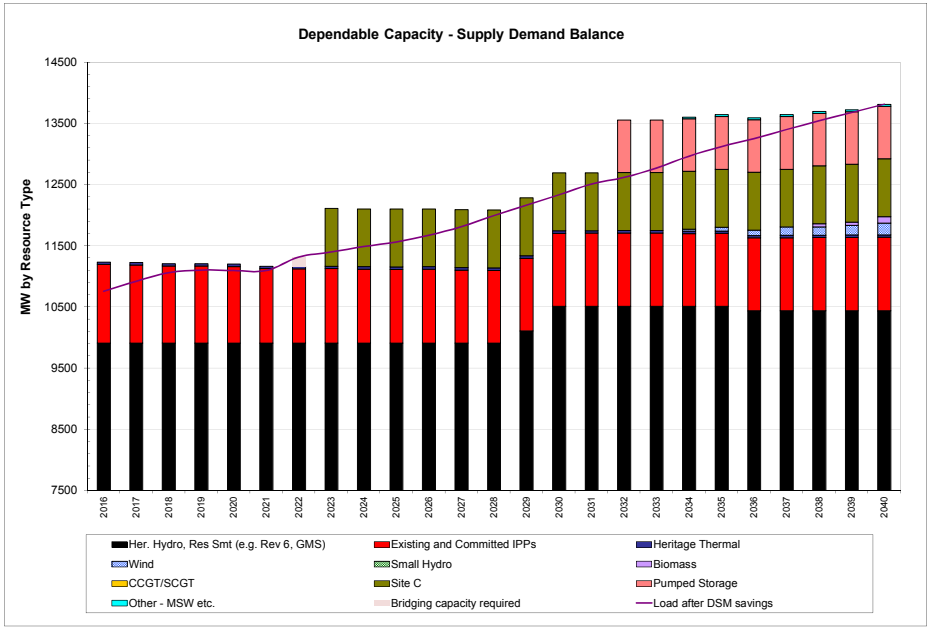

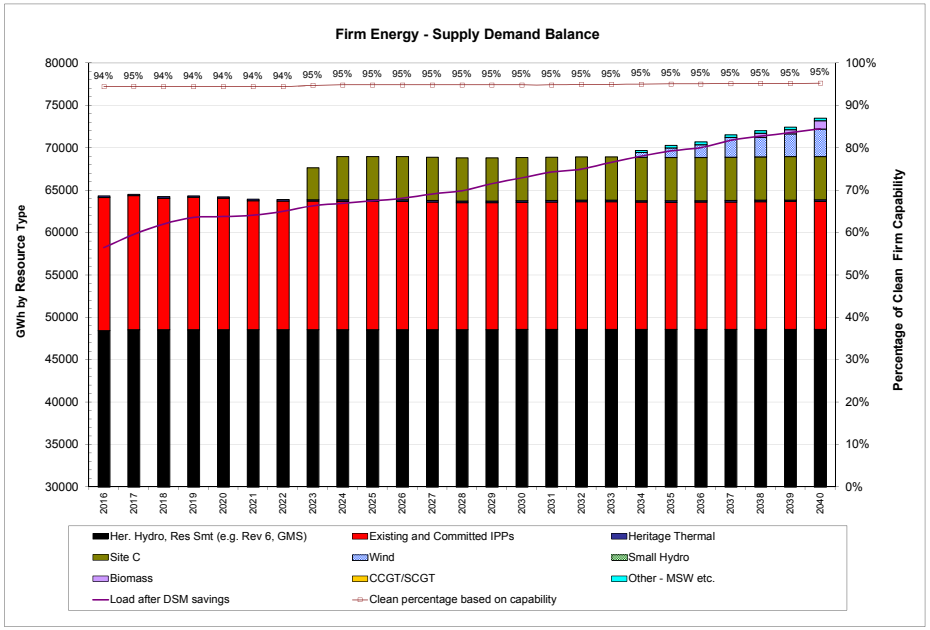

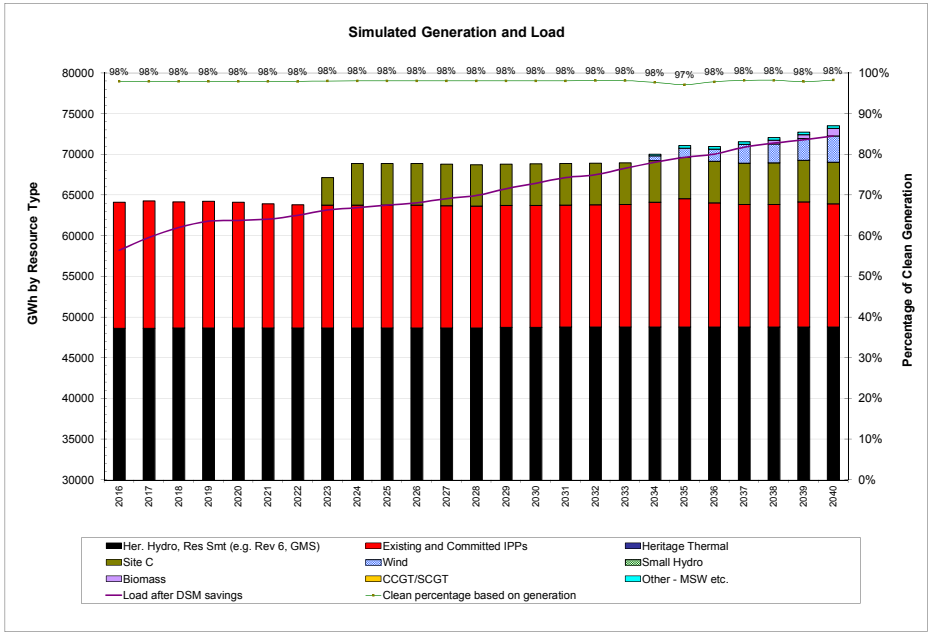

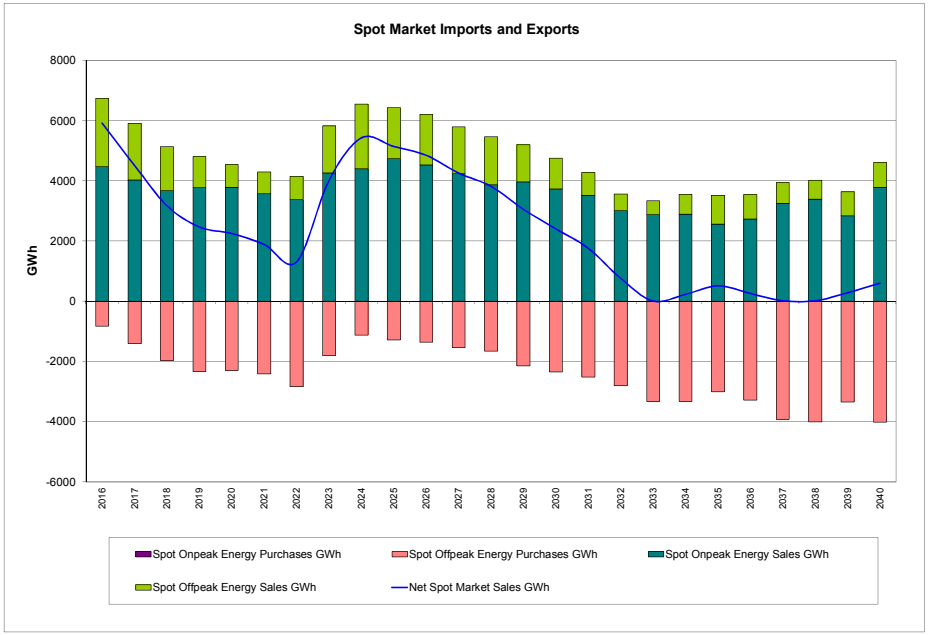

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 2	Not included	Excluded (clean energy only)	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	4,865
PV of Trade Revenue - $ millions	(901)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	7,219

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	194	0	1,037	0	1,231
Firm Energy (GWh)	2,850	0	312	0	3,162

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	594	0	2,171	0	2,765
Firm Energy (GWh)	8,203	0	1,381	0	9,584

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Series compensation of 5L91 and 5L98	SE to KN	147
2032	Shunt compensation at WSN KLY	PR to KN	650
2035	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2035	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2023	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2027	BCH_PR	Wind_PC19	117	30	441	441	113
2027	BCH_PR	Wind_PC21	99	26	371	371	112
2027	BCH_PR	Wind_PC28	153	40	591	591	111
2027	BCH_LM	MSW2_LM	25	24	208	208	92
2028	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2029	BCH_PR	Wind_PC13	135	35	541	541	113
2029	BCH_PR	Wind_PC16	99	26	377	377	116
2030	BCH_PR	Wind_PC14	144	37	527	527	117
2030	BCH_VI	MSW1_VI	12	12	100	100	127
2031	BCH_PR	Wind_PC09	207	54	713	713	122
2032	BCH_PR	Wind_PC15	108	28	382	382	119
2033	BCH_PR	Wind_PC20	159	41	610	610	119
2033	BCH_PR	Wind_PC41	45	12	155	155	122
2034	BCH_PR	Wind_PC18	138	36	486	486	123
2034	BCH_VI	Wind_VI12	48	12	150	150	135
2034	BCH_VI	Biomass_VI	30	30	239	239	142
2035	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2035	BCH_PR	Biomass_PR	28	28	223	223	141
2035	BCH_NC	Biomass_NC	13	13	104	104	147
2035	BCH_VI	Wind_VI14	35	9	114	114	135
2035	BCH_LM	Biomass_LM	30	30	239	239	143
2036	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2037	BCH_PR	Wind_PC11	126	33	473	473	122
2037	BCH_PR	Wind_PC42	63	16	219	219	122
2038	BCH_PR	Wind_PC26	126	33	416	416	127
2038	BCH_VI	Wind_VI13	35	9	106	106	140
2039	BCH_PR	Wind_PC48	152	40	505	505	128
2040	BCH_SE	Biomass_SE	33	33	263	263	141

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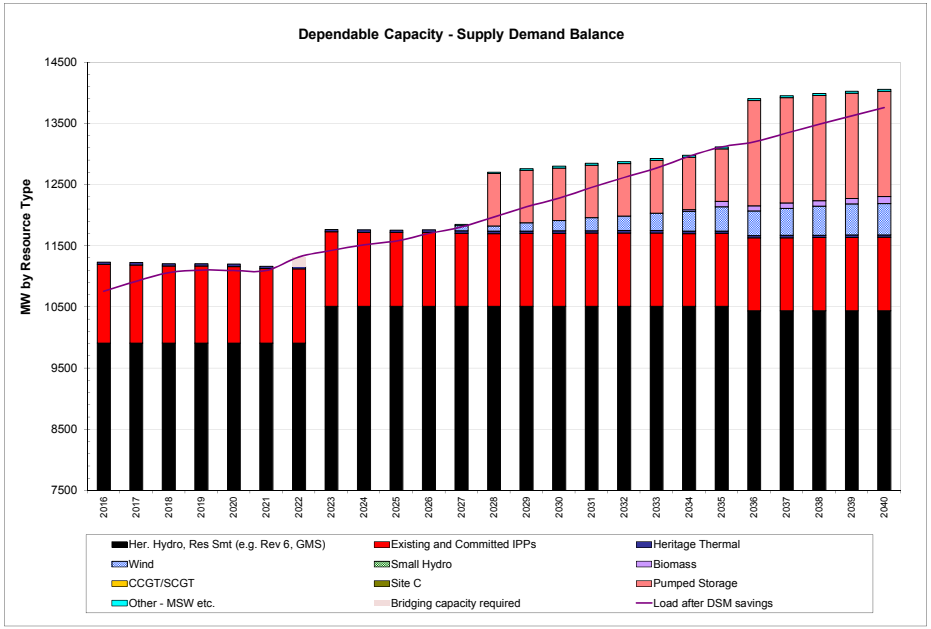

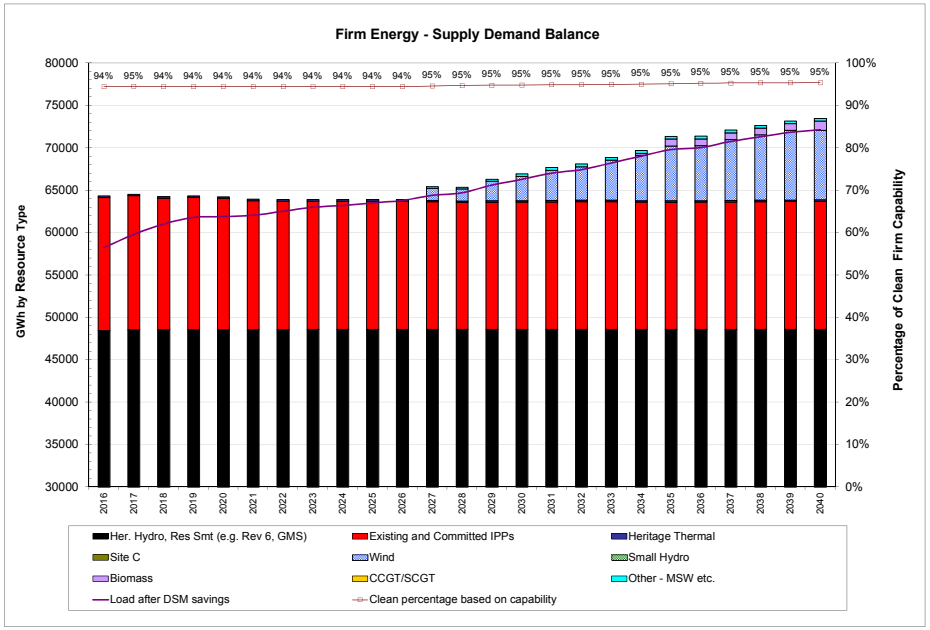

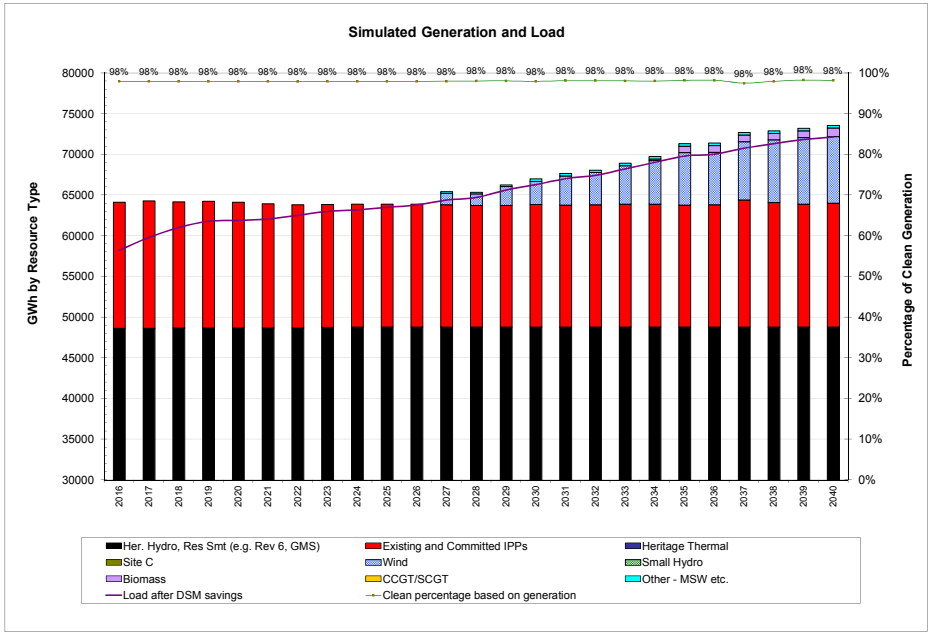

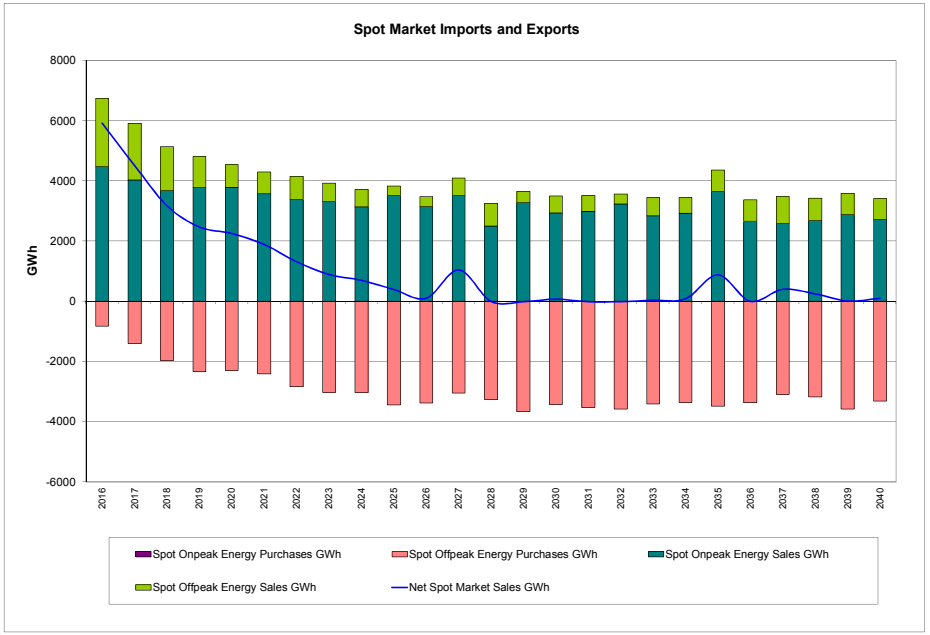

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 2	ISD fixed F2024	Included	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	4,520
PV of Trade Revenue - $ millions	(1,346)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	6,428

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	1,100	1,100
Firm Energy (GWh)	0	0	0	5,103	5,103

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	56	0	2,196	1,100	3,352
Firm Energy (GWh)	813	0	3,035	5,103	8,952

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	94%
Lowest %	96%	93%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Shunt compensation at WSN KLY	PR to KN	650
2029	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2029	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147
2034	500 kV circuit 5L46 between KLY and Cheekye	KN to LM	1384

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2029	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2033	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2034	BCH_KN	100 MW SCGT KN	309	294	450	450	88
2035	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2036	BCH_KN	100 MW SCGT KN	309	294	450	450	88
2037	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2037	BCH_VI	MSW1_VI	12	12	100	100	127
2037	BCH_LM	MSW2_LM	25	24	208	208	92
2038	BCH_PR	Biomass_PR	28	28	223	223	141
2038	BCH_NC	Biomass_NC	13	13	104	104	147
2038	BCH_SE	Biomass_SE	33	33	263	263	141
2038	BCH_VI	Biomass_VI	30	30	239	239	142
2038	BCH_LM	Biomass_LM	30	30	239	239	143
2039	BCH_PR	Wind_PC19	117	30	441	441	113
2039	BCH_PR	Wind_PC21	99	26	371	371	112
2039	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2040	BCH_LM	Pumped_Storage_LM	1000	1,000			126

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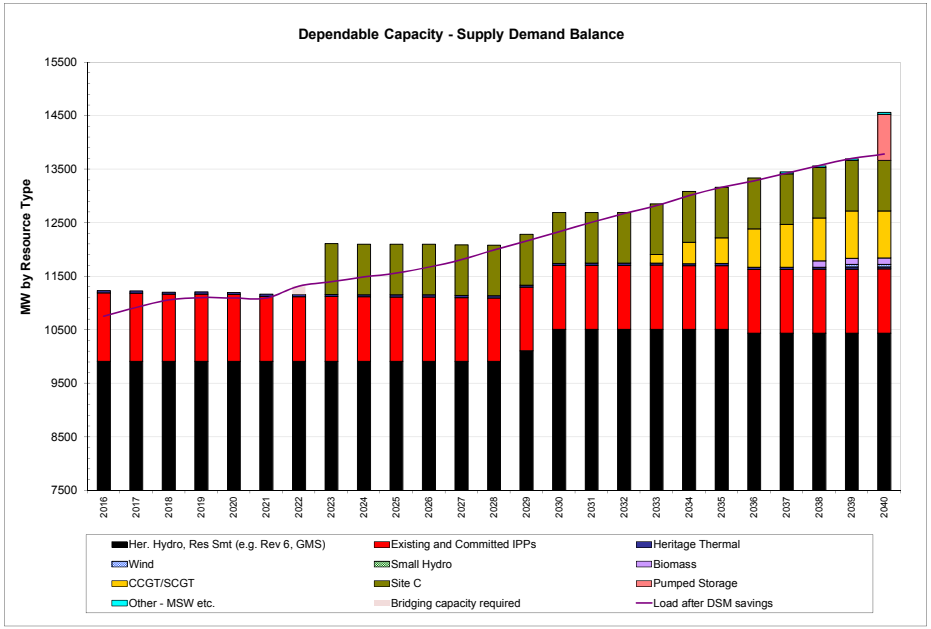

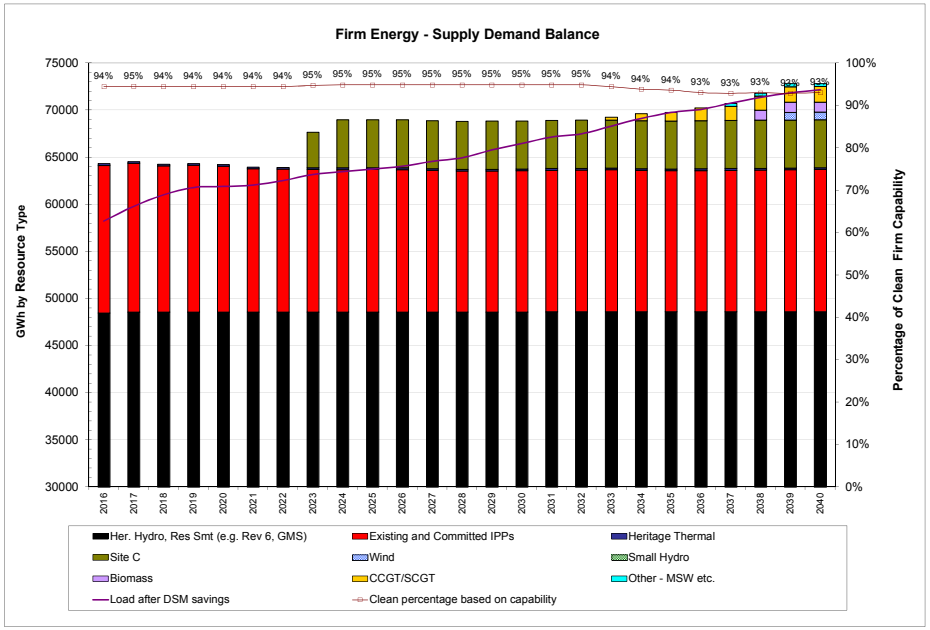

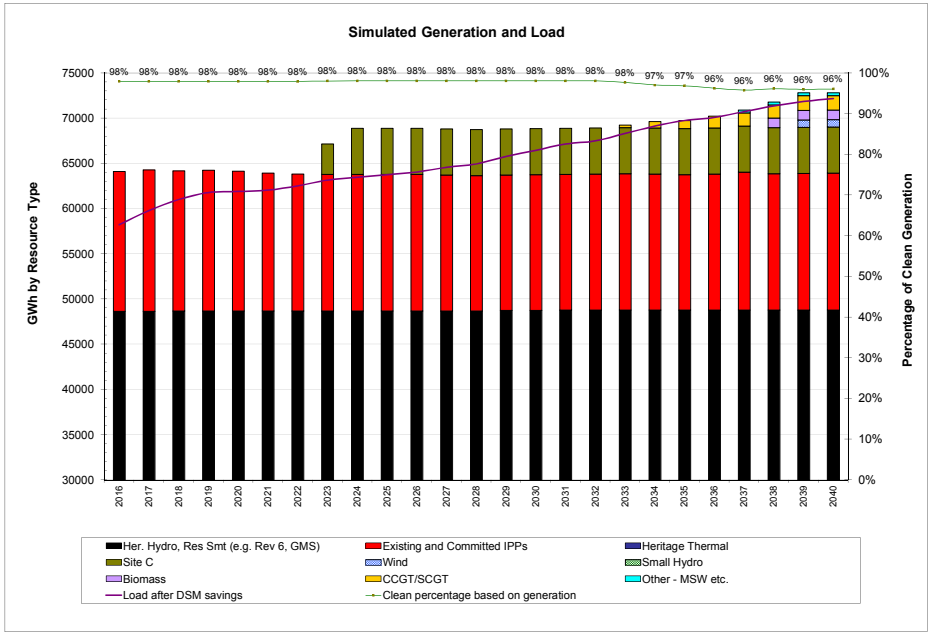

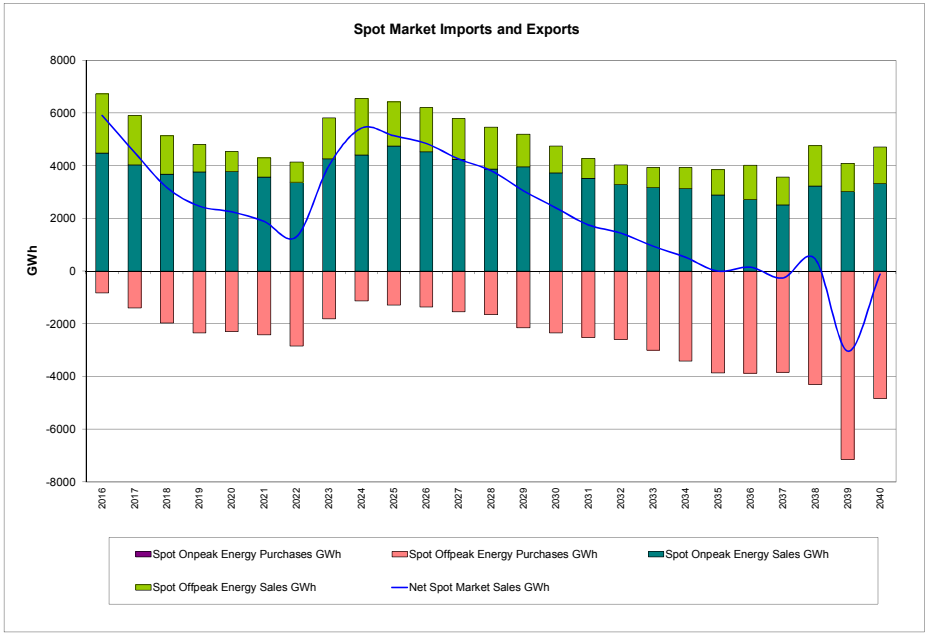

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 2	Not included	Included	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	3,949
PV of Trade Revenue - $ millions	(862)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	6,341

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	66	0	770	0	836
Firm Energy (GWh)	963	0	1,413	0	2,376

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	461	0	2,122	0	2,582
Firm Energy (GWh)	6,471	0	2,445	0	8,916

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	97%	94%
Lowest %	95%	93%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Series compensation of 5L91 and 5L98	SE to KN	147
2029	Shunt compensation at NIC and MDN	KN to LM	570
2035	Shunt compensation at WSN KLY	PR to KN	650
2039	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2039	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2024	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2026	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2027	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2028	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2028	BCH_LM	MSW2_LM	25	24	208	208	92
2029	BCH_PR	Wind_PC28	153	40	591	591	111
2029	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2030	BCH_PR	Wind_PC21	99	26	371	371	112
2030	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2031	BCH_PR	Wind_PC13	135	35	541	541	113
2031	BCH_LM	Biomass_LM	30	30	239	239	143
2032	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2032	BCH_VI	Wind_VI12	48	12	150	150	135
2032	BCH_VI	Wind_VI14	35	9	114	114	135
2032	BCH_VI	MSW1_VI	12	12	100	100	127
2032	BCH_VI	Biomass_VI	30	30	239	239	142
2033	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2033	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2034	BCH_PR	Wind_PC14	144	37	527	527	117
2034	BCH_PR	Wind_PC19	117	30	441	441	113
2035	BCH_PR	Wind_PC20	159	41	610	610	119
2036	BCH_PR	Wind_PC15	108	28	382	382	119
2037	BCH_PR	Wind_PC09	207	54	713	713	122
2038	BCH_PR	Wind_PC16	99	26	377	377	116
2038	BCH_PR	Wind_PC41	45	12	155	155	122
2039	BCH_PR	Wind_PC11	126	33	473	473	122
2040	BCH_KN	100 MW SCGT KN	206	196	300	300	88

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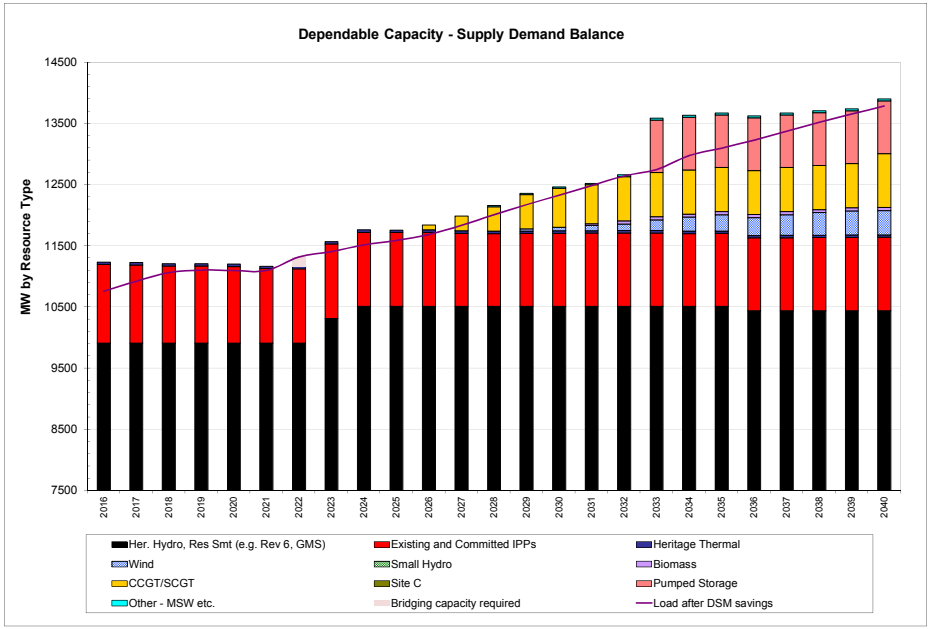

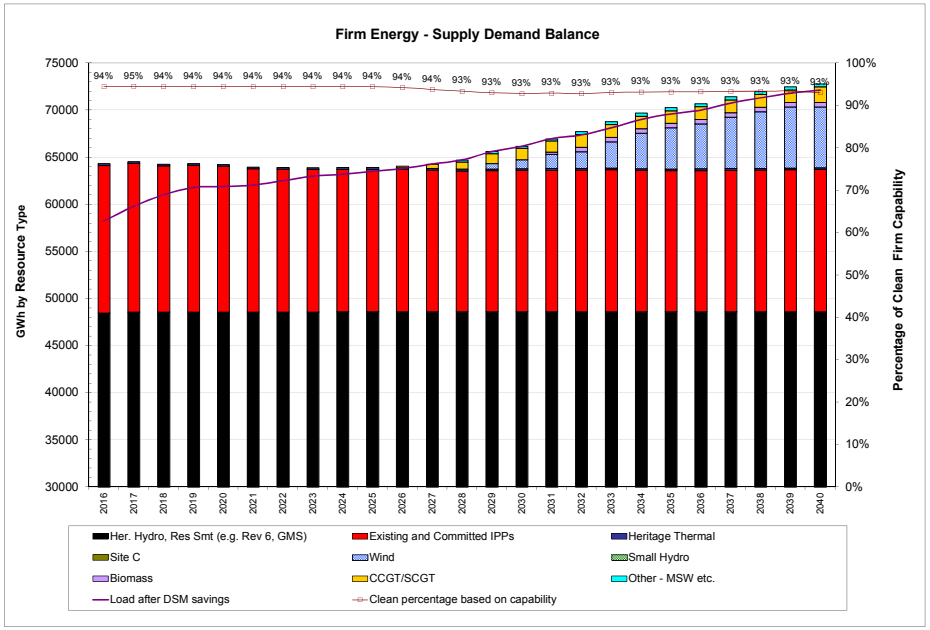

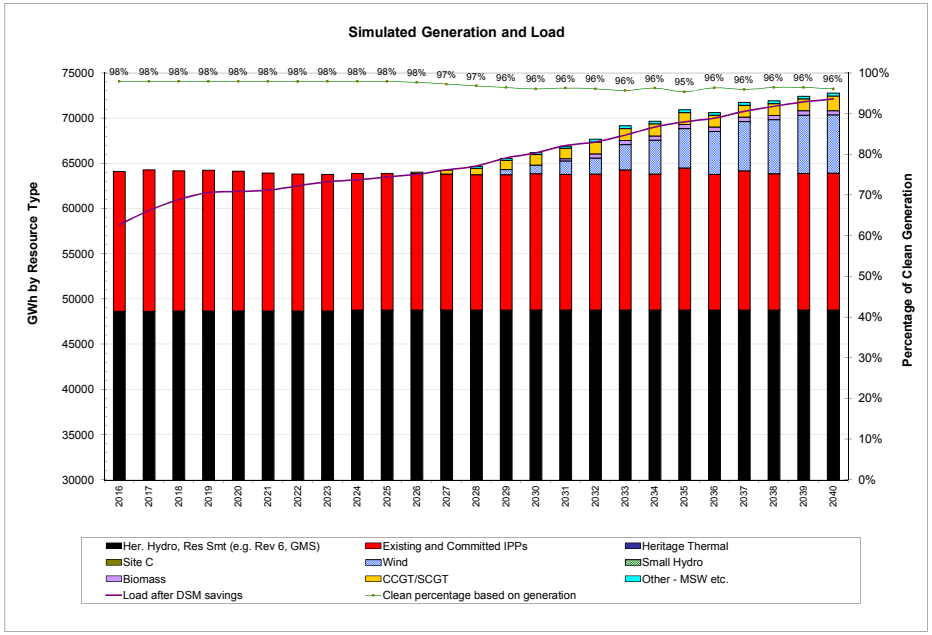

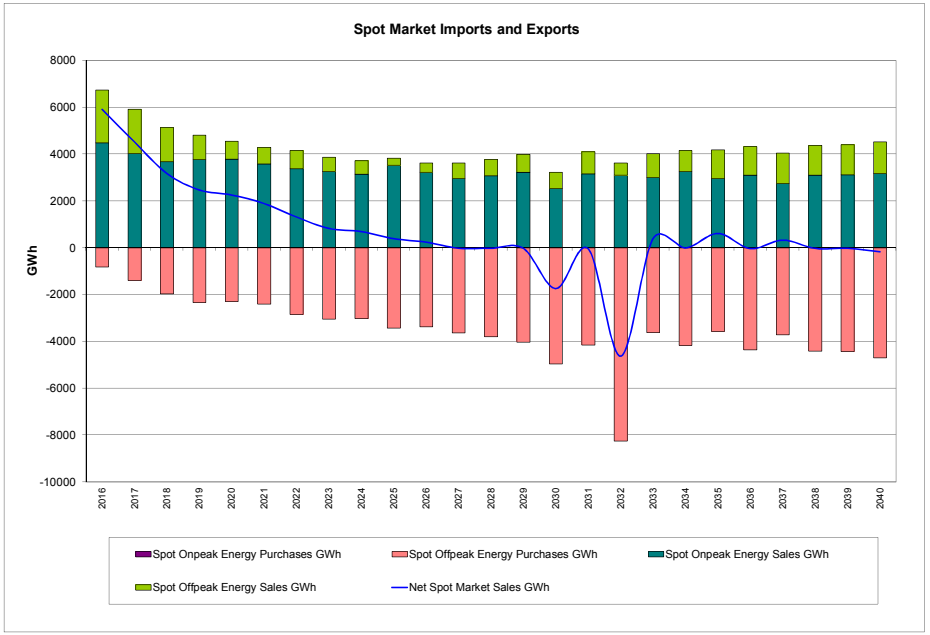

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 3	ISD fixed F2024	Excluded (clean energy only)	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	5,467
PV of Trade Revenue - $ millions	(2,936)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	5,786

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	1,100	1,100
Firm Energy (GWh)	0	0	0	5,103	5,103

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	300	10	1,085	1,100	2,494
Firm Energy (GWh)	4,256	175	689	5,103	10,224

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Shunt compensation at WSN KLY	PR to KN	650
2029	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2029	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2029	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2032	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2034	BCH_PR	Wind_PC19	117	30	441	441	113
2034	BCH_PR	Wind_PC21	99	26	371	371	112
2034	BCH_LM	MSW2_LM	25	24	208	208	92
2035	BCH_PR	Wind_PC28	153	40	591	591	111
2036	BCH_PR	Wind_PC16	99	26	377	377	116
2037	BCH_PR	Wind_PC13	135	35	541	541	113
2037	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2038	BCH_VI	Biomass_VI	30	30	239	239	142
2038	BCH_LM	Biomass_LM	30	30	239	239	143
2039	BCH_PR	Wind_PC14	144	37	527	527	117
2040	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2040	BCH_PR	Wind_PC15	108	28	382	382	119

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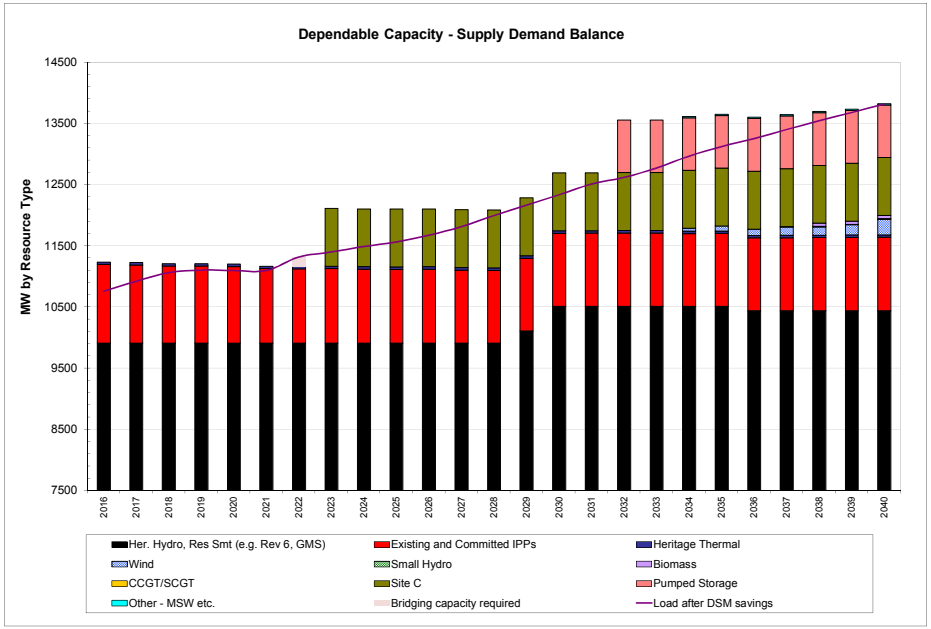

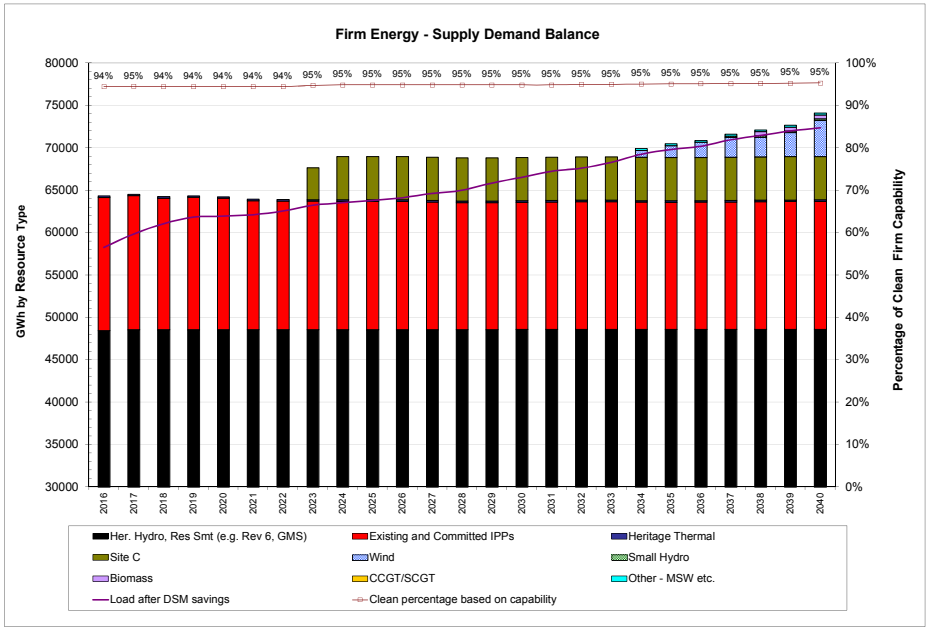

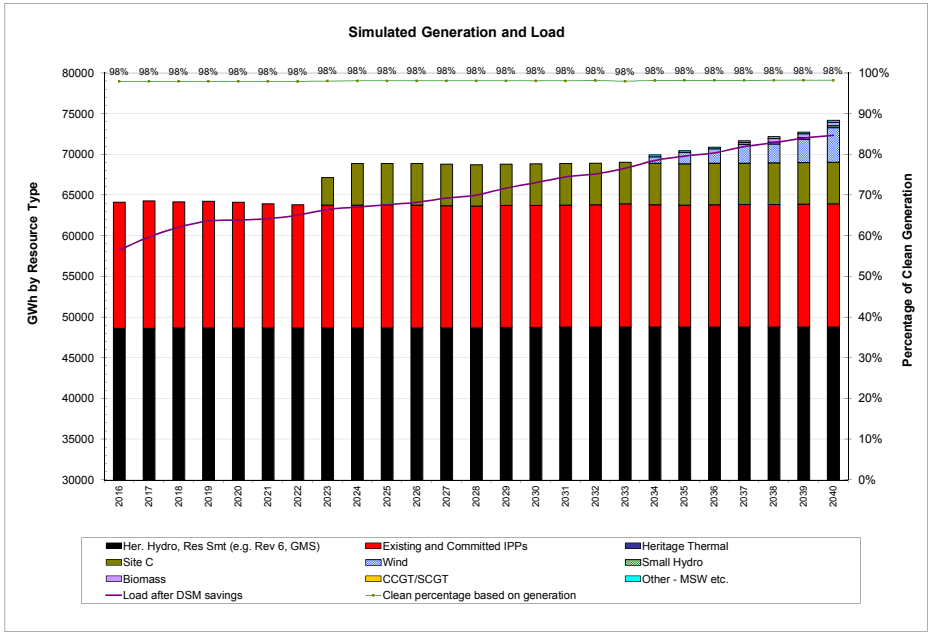

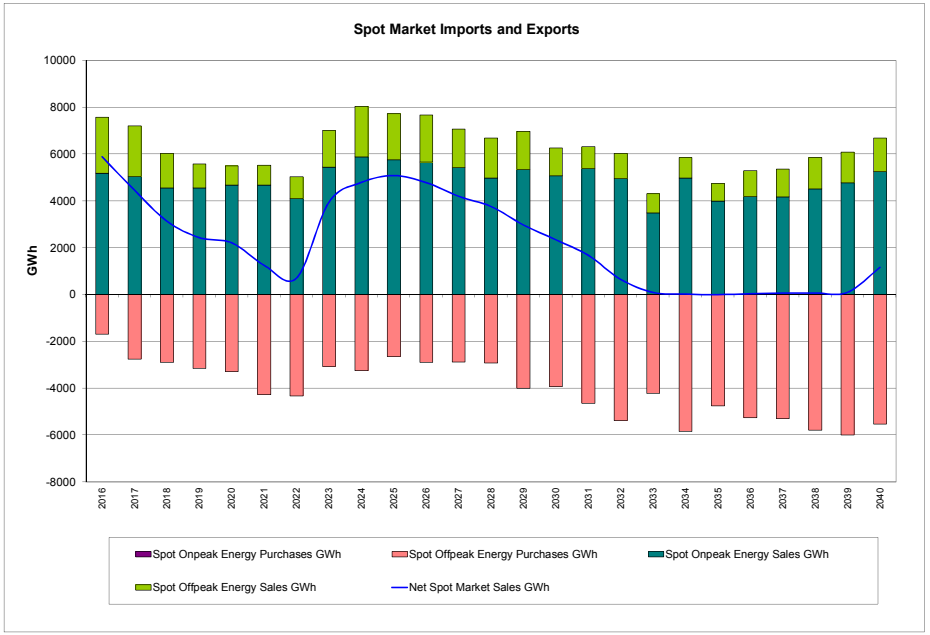

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 3	Not included	Excluded (clean energy only)	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	5,477
PV of Trade Revenue - $ millions	(2,113)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	6,619

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	194	10	1,037	0	1,241
Firm Energy (GWh)	2,850	175	312	0	3,337

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	585	39	2,130	0	2,754
Firm Energy (GWh)	8,099	526	1,054	0	9,679

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Series compensation of 5L91 and 5L98	SE to KN	147
2032	Shunt compensation at WSN KLY	PR to KN	650
2035	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2035	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2023	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2027	BCH_PR	Wind_PC19	117	30	441	441	113
2027	BCH_PR	Wind_PC21	99	26	371	371	112
2027	BCH_PR	Wind_PC28	153	40	591	591	111
2027	BCH_VI	MSW1_VI	12	12	100	100	127
2027	BCH_LM	MSW2_LM	25	24	208	208	92
2028	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2029	BCH_PR	Wind_PC13	135	35	541	541	113
2029	BCH_PR	Wind_PC16	99	26	377	377	116
2030	BCH_PR	Wind_PC14	144	37	527	527	117
2030	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2031	BCH_PR	Wind_PC20	159	41	610	610	119
2032	BCH_PR	Wind_PC15	108	28	382	382	119
2033	BCH_PR	Wind_PC09	207	54	713	713	122
2034	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2035	BCH_PR	Wind_PC18	138	36	486	486	123
2035	BCH_PR	Wind_PC41	45	12	155	155	122
2035	BCH_VI	Run of River VI 100_110	119	29	352	451	120
2035	BCH_VI	Wind_VI12	48	12	150	150	135
2035	BCH_VI	Wind_VI14	35	9	114	114	135
2035	BCH_VI	Biomass_VI	30	30	239	239	142
2035	BCH_LM	Biomass_LM	30	30	239	239	143
2036	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2037	BCH_PR	Wind_PC11	126	33	473	473	122
2037	BCH_PR	Wind_PC42	63	16	219	219	122
2038	BCH_PR	Wind_PC26	126	33	416	416	127
2039	BCH_PR	Wind_PC48	152	40	505	505	128
2040	BCH_SE	Biomass_SE	33	33	263	263	141

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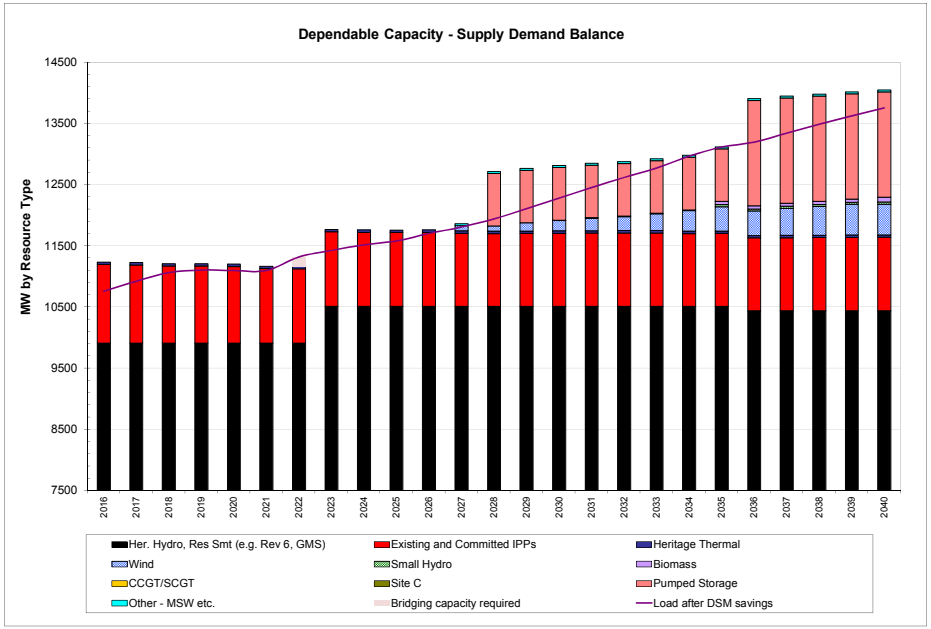

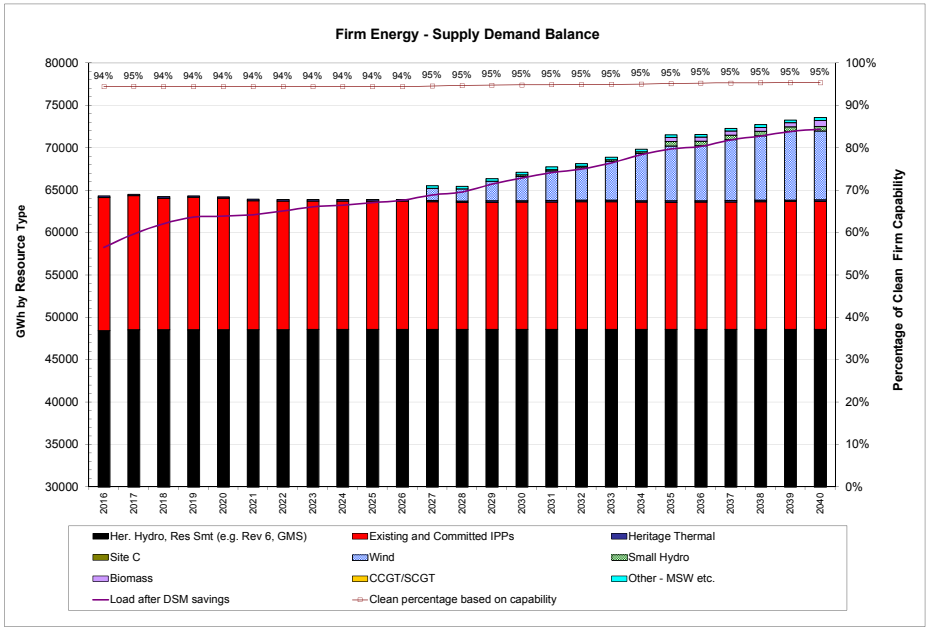

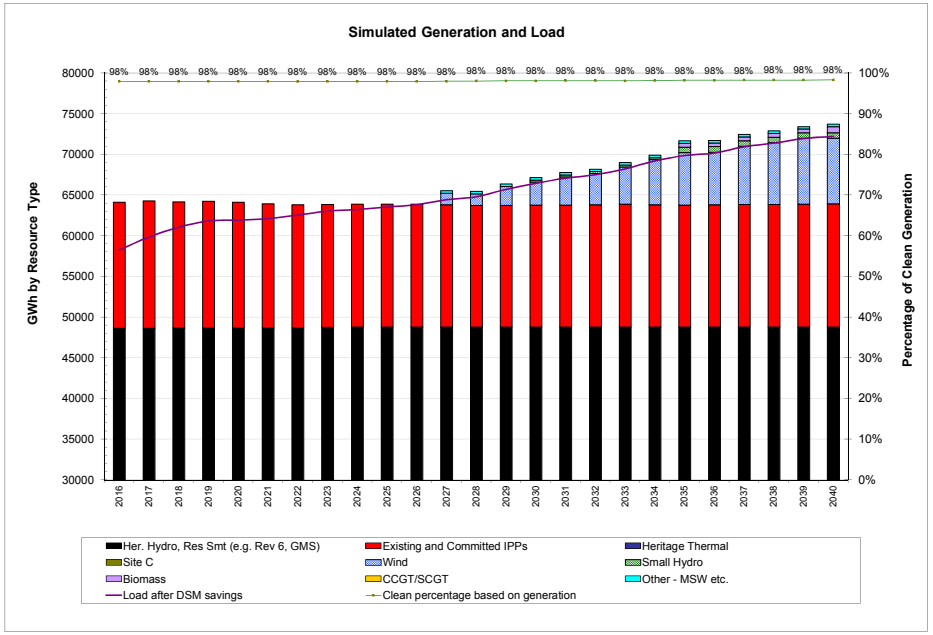

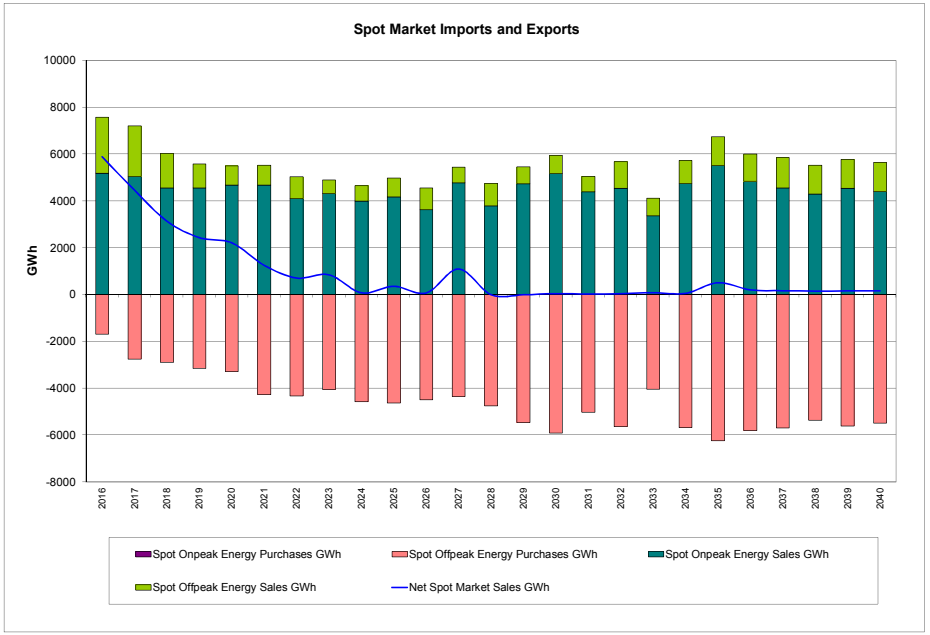

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 3	ISD fixed F2024	Included	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	5,315
PV of Trade Revenue - $ millions	(2,964)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	5,605

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	1,100	1,100
Firm Energy (GWh)	0	0	0	5,103	5,103

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	131	0	1,999	1,100	3,230
Firm Energy (GWh)	1,946	0	2,055	5,103	9,104

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	94%
Lowest %	96%	93%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Shunt compensation at WSN KLY	PR to KN	650
2029	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2029	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147
2034	500 kV circuit 5L46 between KLY and Cheekye	KN to LM	1384

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2029	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2033	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2034	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2034	BCH_LM	MSW2_LM	25	24	208	208	92
2035	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2036	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2036	BCH_VI	MSW1_VI	12	12	100	100	127
2037	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2037	BCH_VI	Biomass_VI	30	30	239	239	142
2038	BCH_PR	Wind_PC13	135	35	541	541	113
2038	BCH_PR	Wind_PC19	117	30	441	441	113
2038	BCH_PR	Wind_PC28	153	40	591	591	111
2039	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2040	BCH_PR	Wind_PC21	99	26	371	371	112

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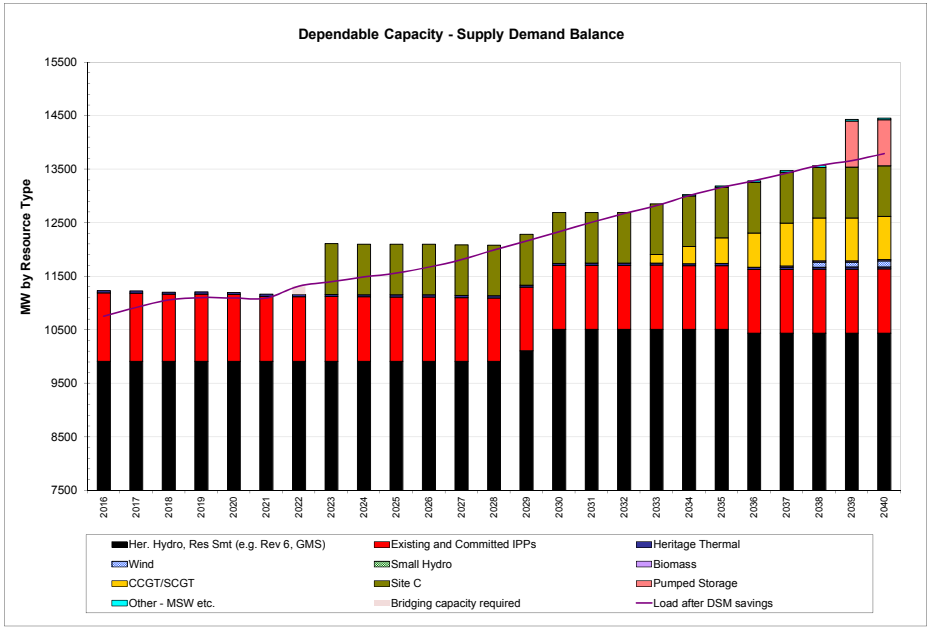

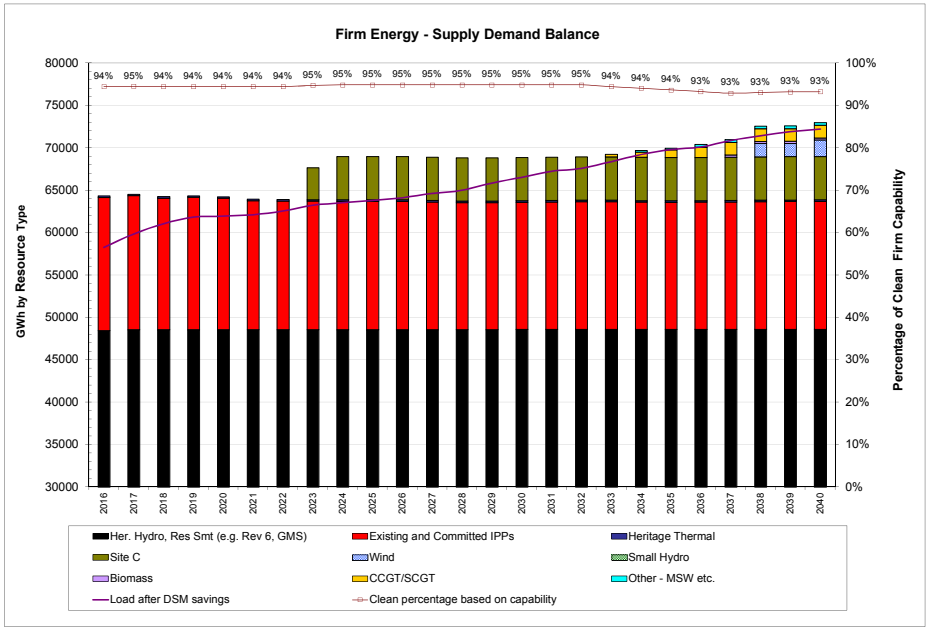

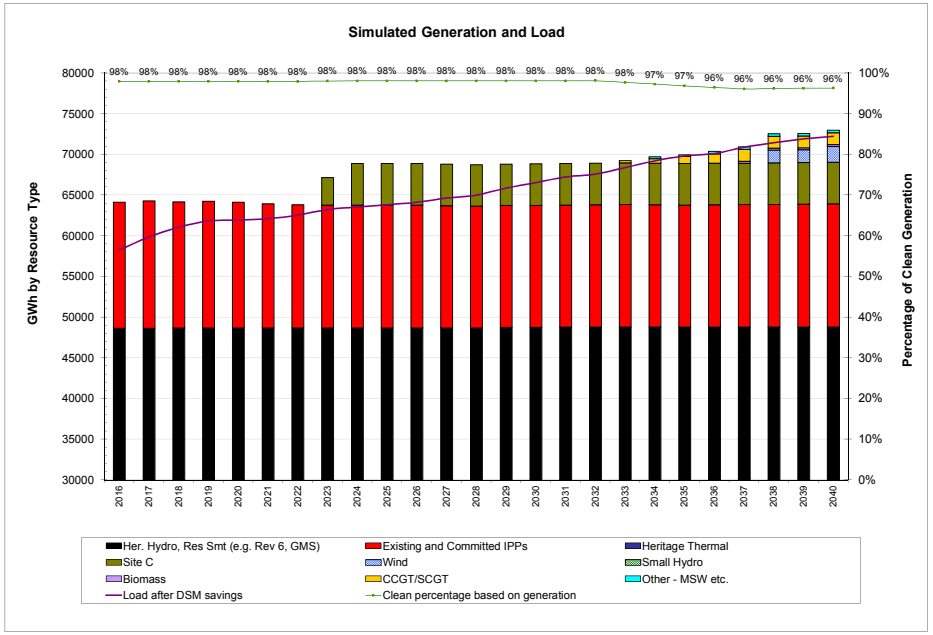

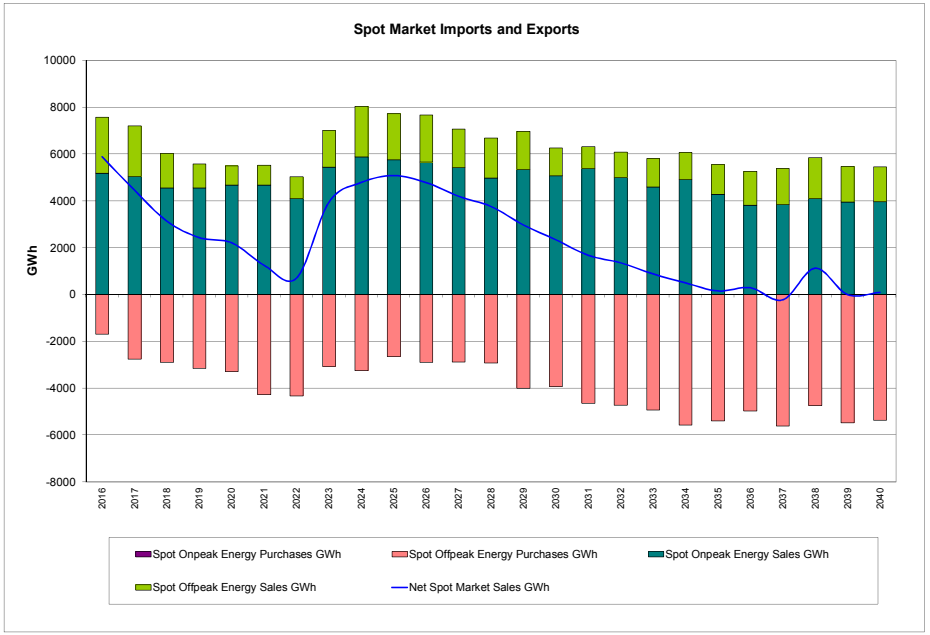

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 3	Not included	Included	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	4,891
PV of Trade Revenue - $ millions	(2,073)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	6,073

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	96	0	677	0	773
Firm Energy (GWh)	1,405	0	1,263	0	2,668

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	455	57	1,935	0	2,448
Firm Energy (GWh)	6,372	783	2,144	0	9,299

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	97%	94%
Lowest %	96%	93%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Series compensation of 5L91 and 5L98	SE to KN	147
2029	Shunt compensation at NIC and MDN	KN to LM	570
2034	Shunt compensation at WSN KLY	PR to KN	650
2040	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2040	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2023	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2027	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2027	BCH_LM	MSW2_LM	25	24	208	208	92
2028	BCH_KN	100 MW SCGT KN	309	294	450	450	88
2029	BCH_PR	Wind_PC21	99	26	371	371	112
2029	BCH_PR	Wind_PC28	153	40	591	591	111
2030	BCH_PR	Wind_PC19	117	30	441	441	113
2030	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2031	BCH_PR	Wind_PC13	135	35	541	541	113
2031	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2032	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2032	BCH_VI	MSW1_VI	12	12	100	100	127
2032	BCH_VI	Biomass_VI	30	30	239	239	142
2032	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2032	BCH_LM	Biomass_LM	30	30	239	239	143
2033	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2034	BCH_PR	Wind_PC14	144	37	527	527	117
2034	BCH_PR	Wind_PC16	99	26	377	377	116
2035	BCH_PR	Wind_PC20	159	41	610	610	119
2036	BCH_PR	Wind_PC15	108	28	382	382	119
2037	BCH_PR	Wind_PC09	207	54	713	713	122
2038	BCH_PR	Wind_PC41	45	12	155	155	122
2038	BCH_LM	Run of River LM 100_110	102	18	258	330	115
2039	BCH_VI	Run of River VI 100_110	119	29	352	451	120
2039	BCH_VI	Wind_VI12	48	12	150	150	135
2040	BCH_PR	Wind_PC18	138	36	486	486	123
2040	BCH_KN	100 MW SCGT KN	103	98	150	150	88

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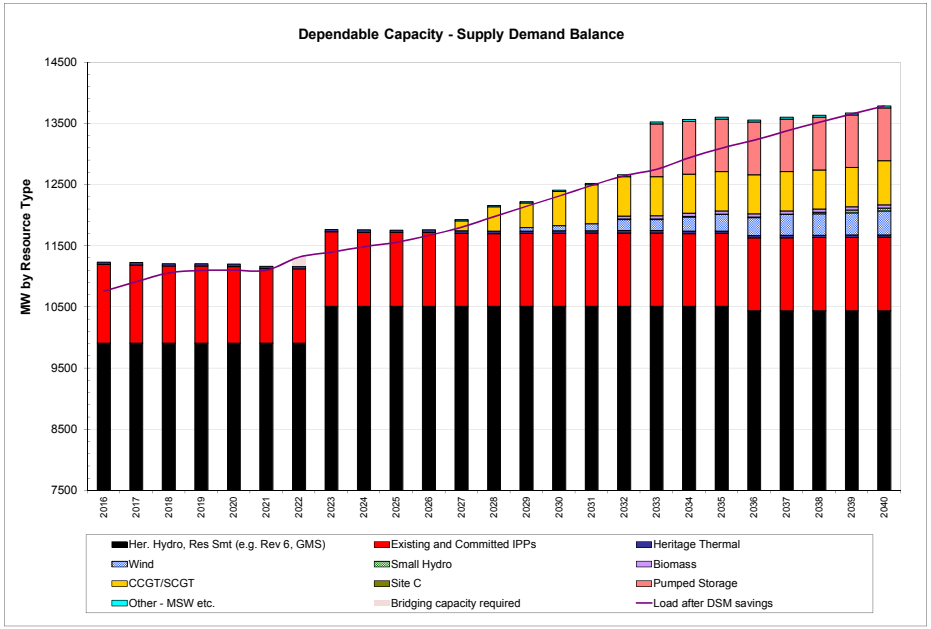

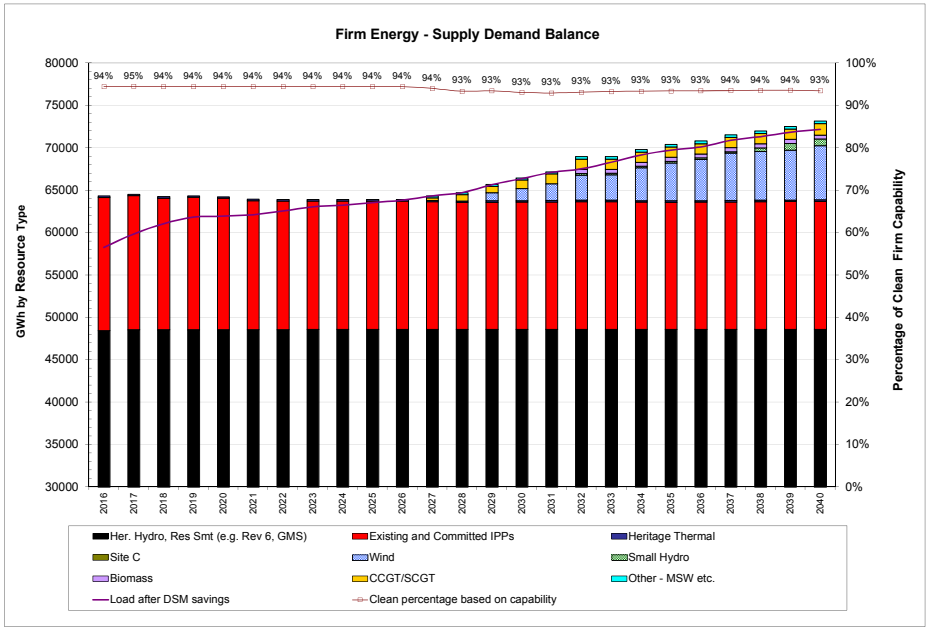

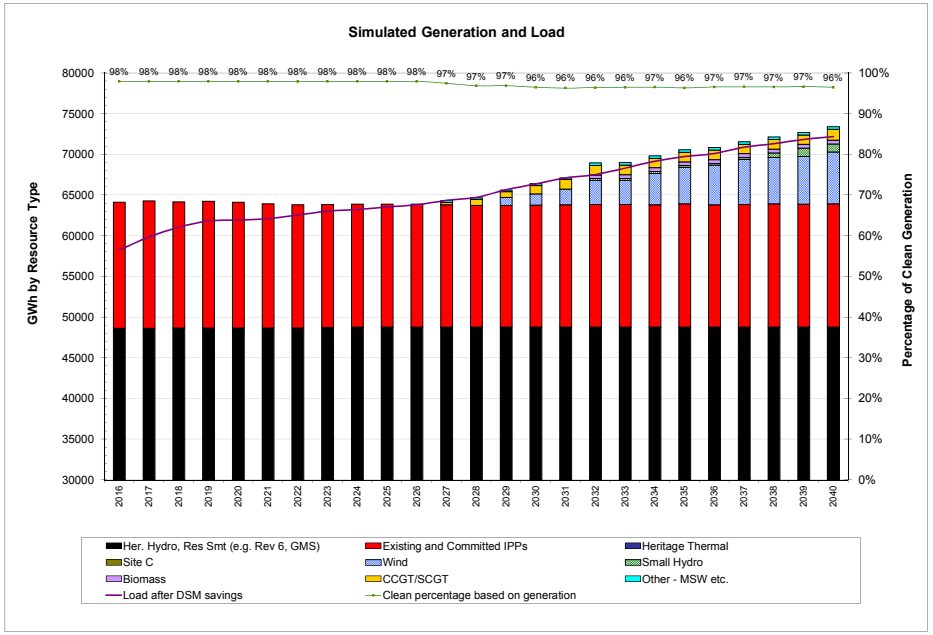

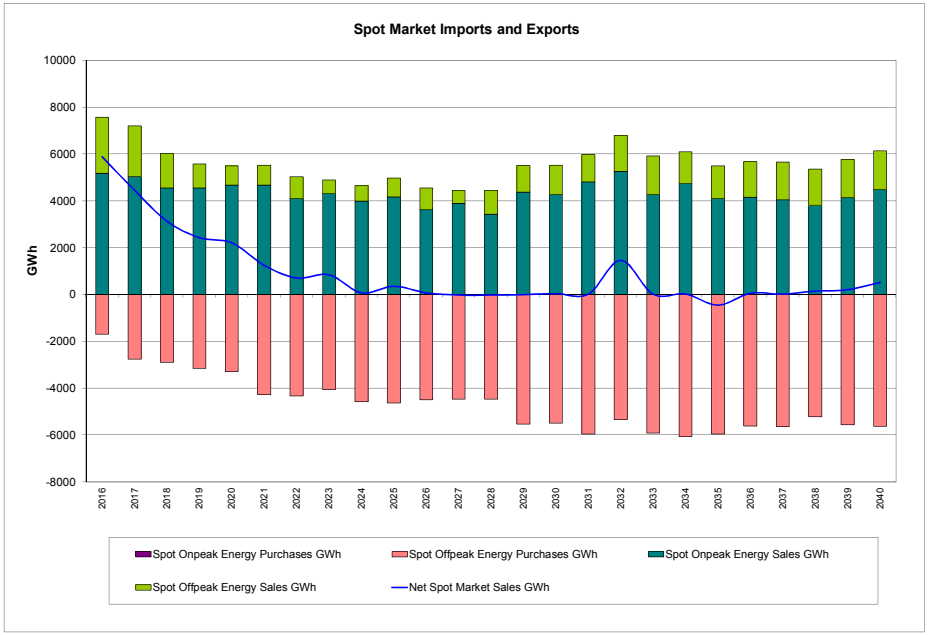

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Excluded (clean energy only)	7% IPP CoC, $15 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	5,125
PV of Trade Revenue - $ millions	(1,938)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	6,442

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	1,100	1,100
Firm Energy (GWh)	0	0	0	5,103	5,103

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	300	0	1,097	1,100	2,496
Firm Energy (GWh)	4,256	0	791	5,103	10,150

Resources Selected

Year	Zone	Resource	Capacity - MW Installed	Capacity - MW Dependable	Energy - GWh Firm	Energy - GWh Total	UEC / UCC $/MWh or $/kW-year
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2029	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2032	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2034	BCH_PR	Wind_PC28	153	40	591	591	116
2034	BCH_LM	MSW2_LM	25	24	208	208	92
2035	BCH_PR	Wind_PC19	117	30	441	441	118
2035	BCH_PR	Wind_PC21	99	26	371	371	117
2036	BCH_PR	Wind_PC16	99	26	377	377	121
2037	BCH_PR	Wind_PC13	135	35	541	541	118
2037	BCH_VI	MSW1_VI	12	12	100	100	127
2038	BCH_VI	Biomass_VI	30	30	239	239	142
2038	BCH_LM	Biomass_LM	30	30	239	239	143
2039	BCH_PR	Wind_PC14	144	37	527	527	122
2040	BCH_PR	Wind_PC10	297	77	1,023	1,023	123
2040	BCH_PR	Wind_PC15	108	28	382	382	124

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Shunt compensation at WSN KLY	PR to KN	650
2029	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2029	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147

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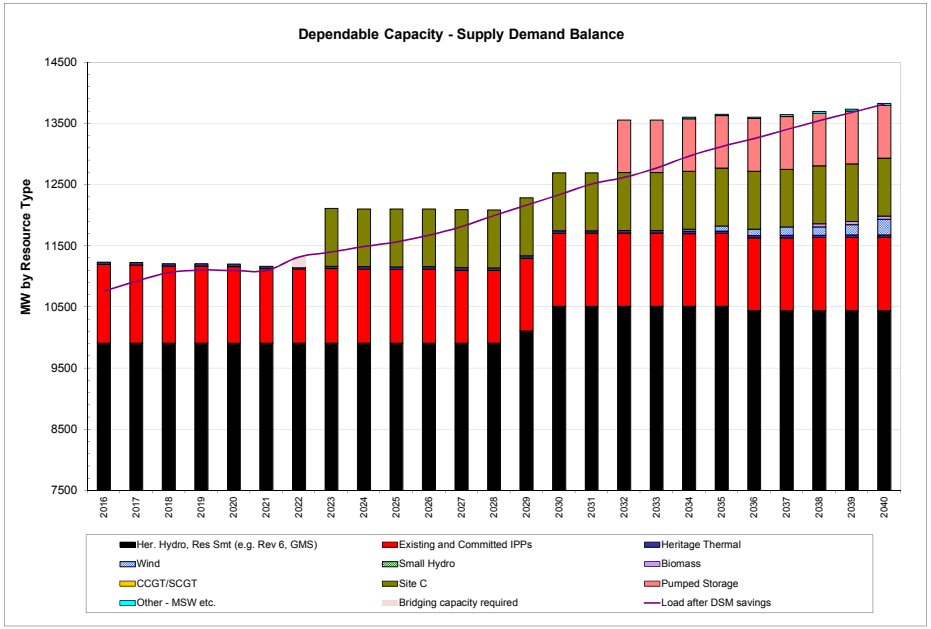

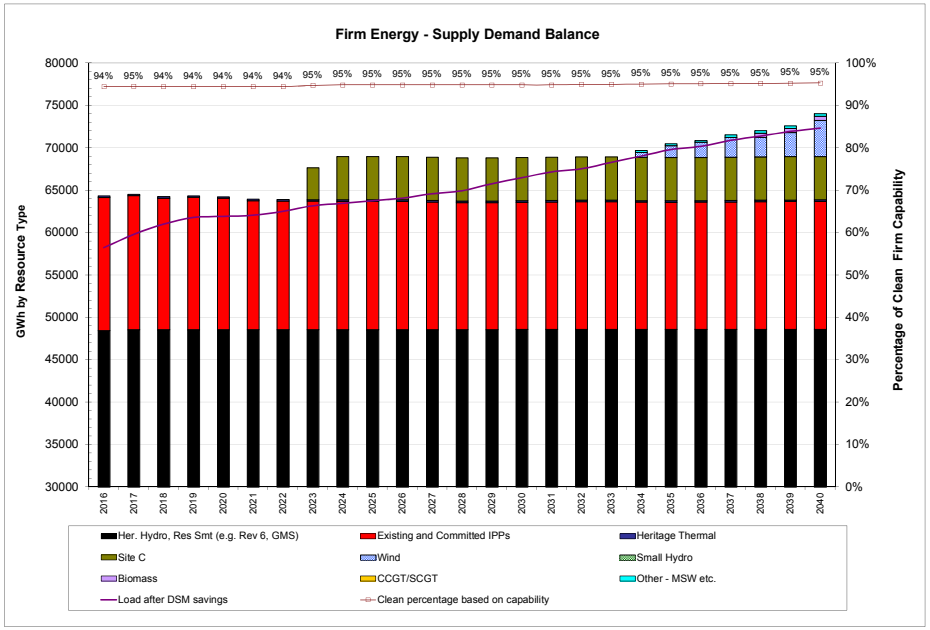

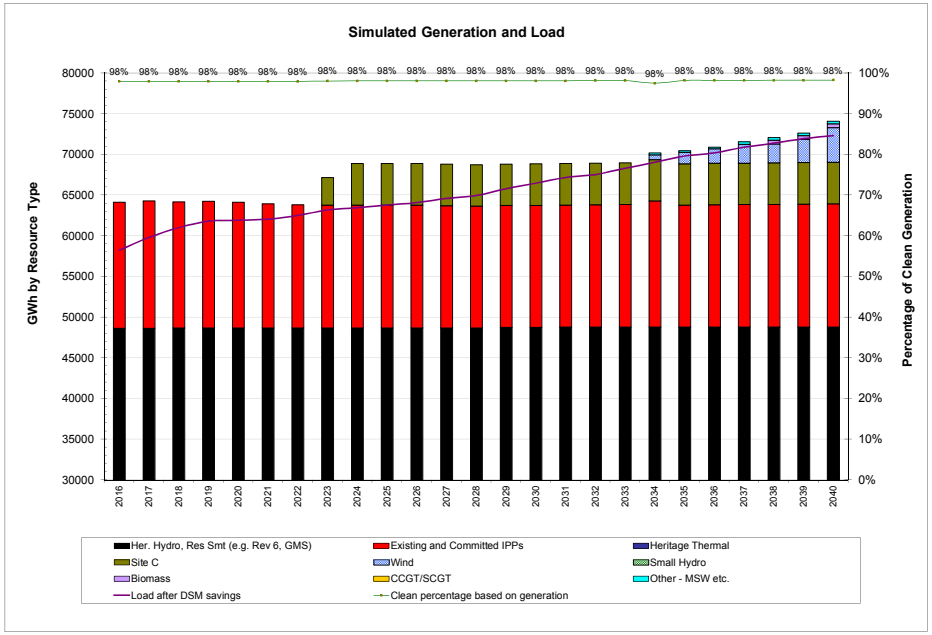

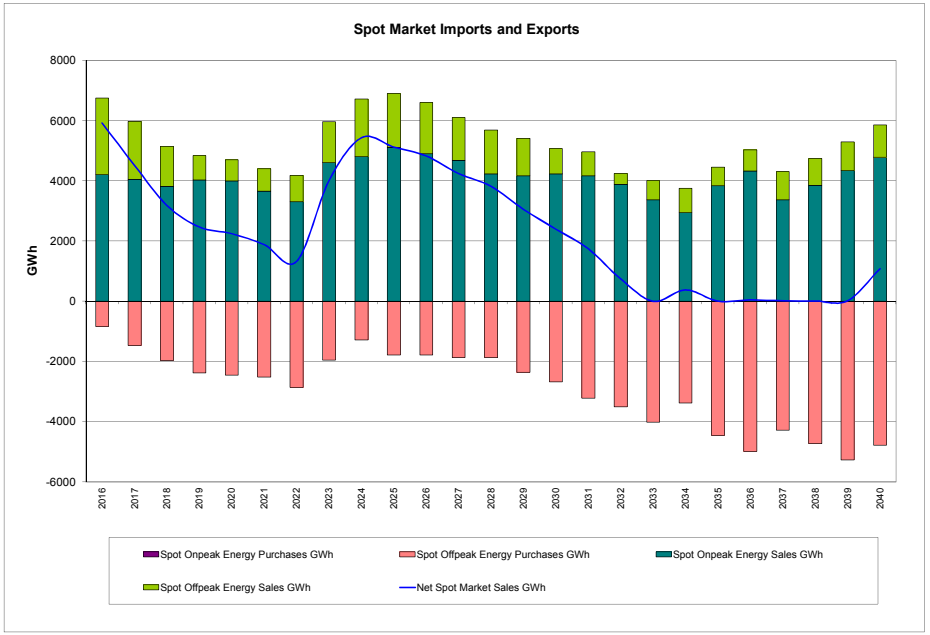

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 1	Not included	Excluded (clean energy only)	7% IPP CoC, $15 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	5,248
PV of Trade Revenue - $ millions	(1,345)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	7,158

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	194	0	1,037	0	1,231
Firm Energy (GWh)	2,850	0	312	0	3,162

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	537	57	2,158	0	2,752
Firm Energy (GWh)	7,481	783	1,277	0	9,541

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Series compensation of 5L91 and 5L98	SE to KN	147
2032	Shunt compensation at WSN KLY	PR to KN	650
2035	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2035	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2023	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2027	BCH_PR	Wind_PC13	135	35	541	541	118
2027	BCH_PR	Wind_PC19	117	30	441	441	118
2027	BCH_PR	Wind_PC21	99	26	371	371	117
2027	BCH_VI	MSW1_VI	12	12	100	100	127
2027	BCH_LM	MSW2_LM	25	24	208	208	92
2028	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2029	BCH_PR	Wind_PC16	99	26	377	377	121
2029	BCH_PR	Wind_PC28	153	40	591	591	116
2030	BCH_PR	Wind_PC14	144	37	527	527	122
2031	BCH_PR	Wind_PC20	159	41	610	610	124
2031	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2032	BCH_PR	Wind_PC15	108	28	382	382	124
2033	BCH_PR	Wind_PC09	207	54	713	713	127
2034	BCH_PR	Wind_PC10	297	77	1,023	1,023	123
2035	BCH_PR	Wind_PC41	45	12	155	155	127
2035	BCH_PR	Wind_PC42	63	16	219	219	127
2035	BCH_PR	Biomass_PR	28	28	223	223	141
2035	BCH_VI	Run of River VI 100_110	119	29	352	451	120
2035	BCH_VI	Wind_VI12	48	12	150	150	140
2035	BCH_VI	Biomass_VI	30	30	239	239	142
2035	BCH_LM	Biomass_LM	30	30	239	239	143
2036	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2037	BCH_PR	Wind_PC11	126	33	473	473	127
2037	BCH_LM	Run of River LM 100_110	102	18	258	330	115
2038	BCH_PR	Wind_PC18	138	36	486	486	128
2039	BCH_PR	Wind_PC26	126	33	416	416	132
2040	BCH_SE	Biomass_SE	33	33	263	263	141

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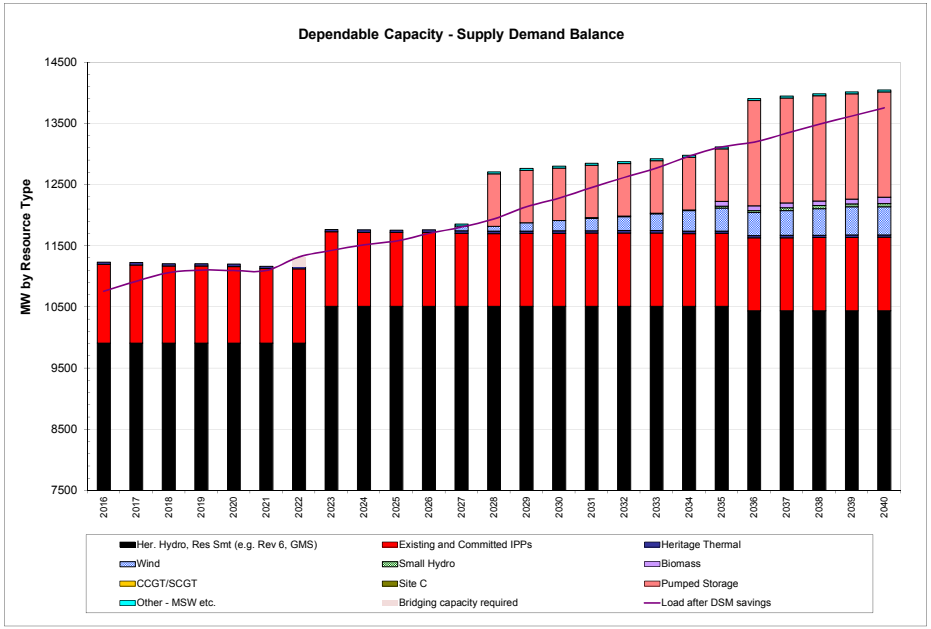

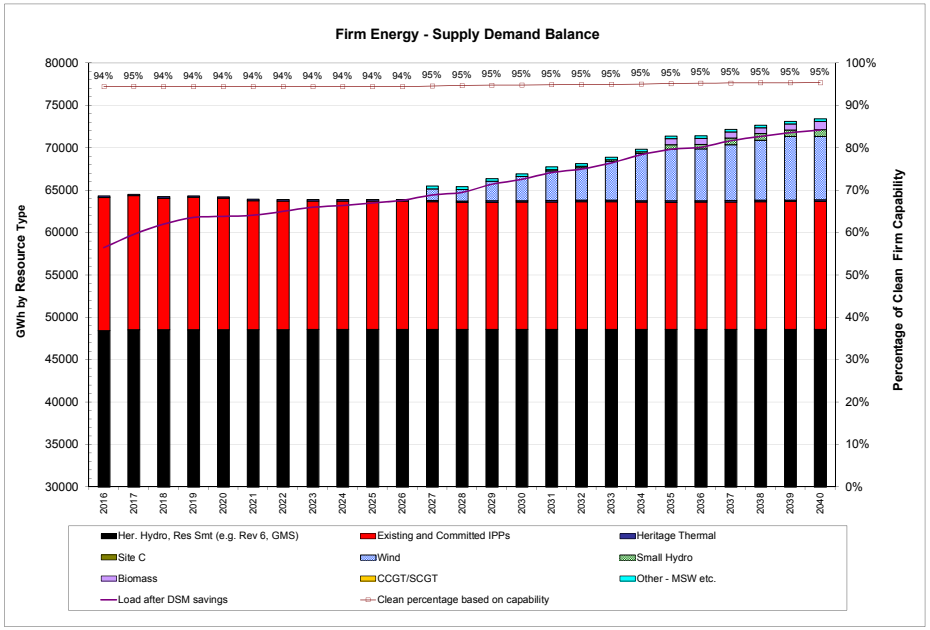

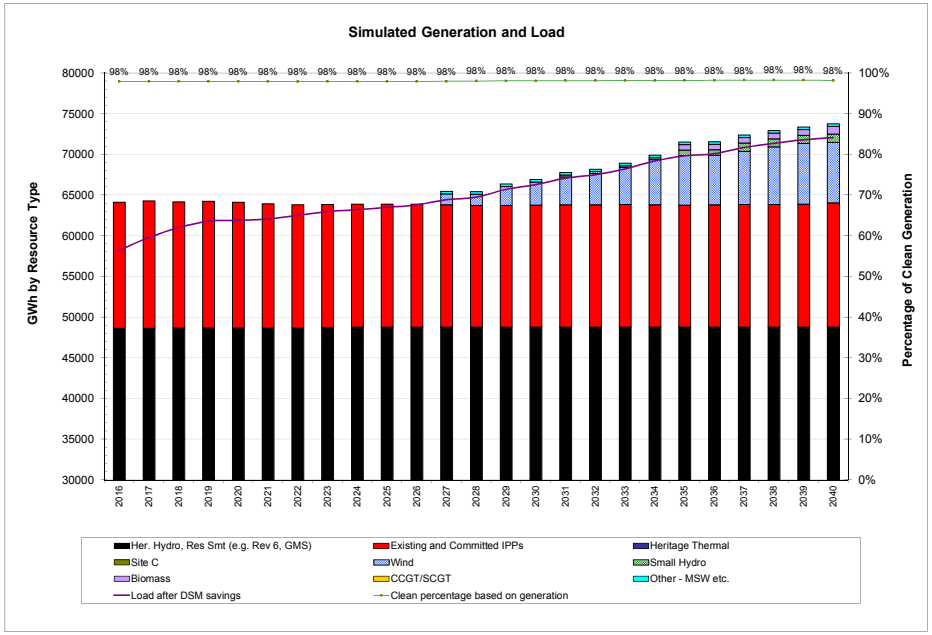

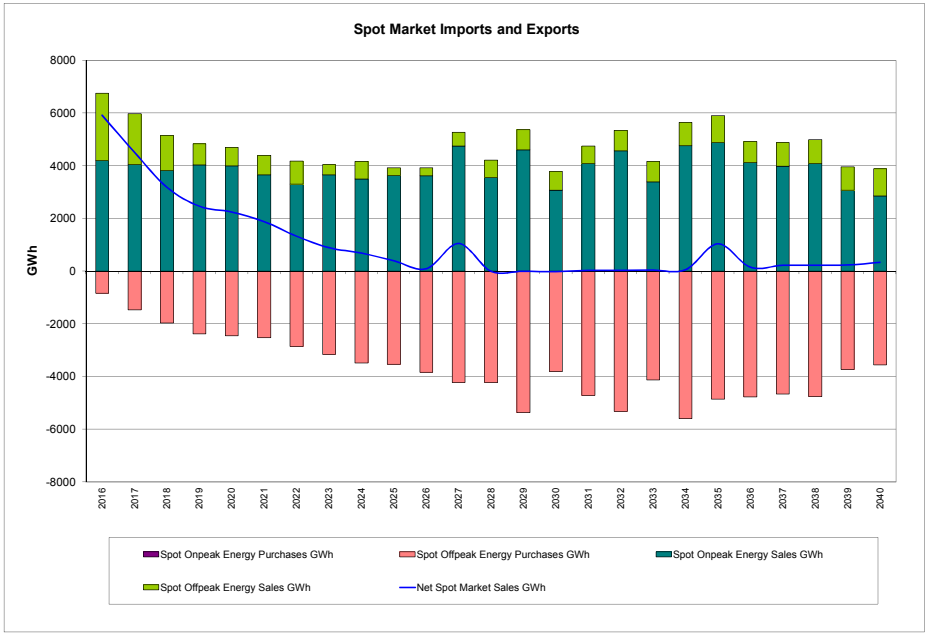

M&M_1NC_NN0_45Q

Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Excluded (clean energy only)	7% IPP CoC, $5 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	5,080
PV of Trade Revenue - $ millions	(1,938)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	6,397

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	1,100	1,100
Firm Energy (GWh)	0	0	0	5,103	5,103

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	300	0	1,097	1,100	2,496
Firm Energy (GWh)	4,256	0	791	5,103	10,150

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Shunt compensation at WSN KLY	PR to KN	650
2029	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2029	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2029	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2032	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2034	BCH_PR	Wind_PC21	99	26	371	371	107
2034	BCH_PR	Wind_PC28	153	40	591	591	106
2035	BCH_PR	Wind_PC19	117	30	441	441	108
2035	BCH_LM	MSW2_LM	25	24	208	208	92
2036	BCH_PR	Wind_PC16	99	26	377	377	111
2037	BCH_PR	Wind_PC13	135	35	541	541	108
2037	BCH_VI	MSW1_VI	12	12	100	100	127
2038	BCH_VI	Biomass_VI	30	30	239	239	142
2038	BCH_LM	Biomass_LM	30	30	239	239	143
2039	BCH_PR	Wind_PC14	144	37	527	527	112
2040	BCH_PR	Wind_PC10	297	77	1,023	1,023	113
2040	BCH_PR	Wind_PC15	108	28	382	382	114

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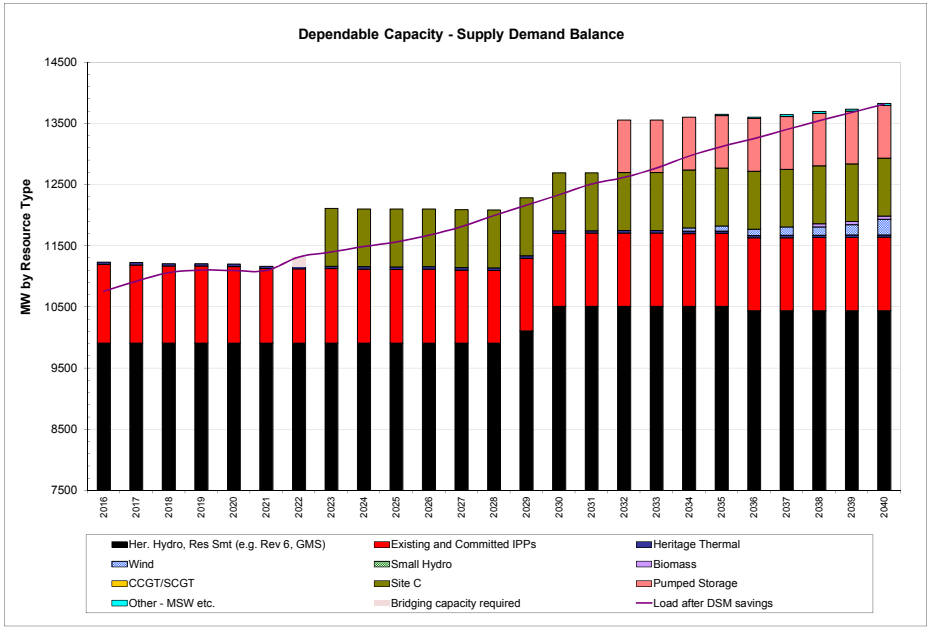

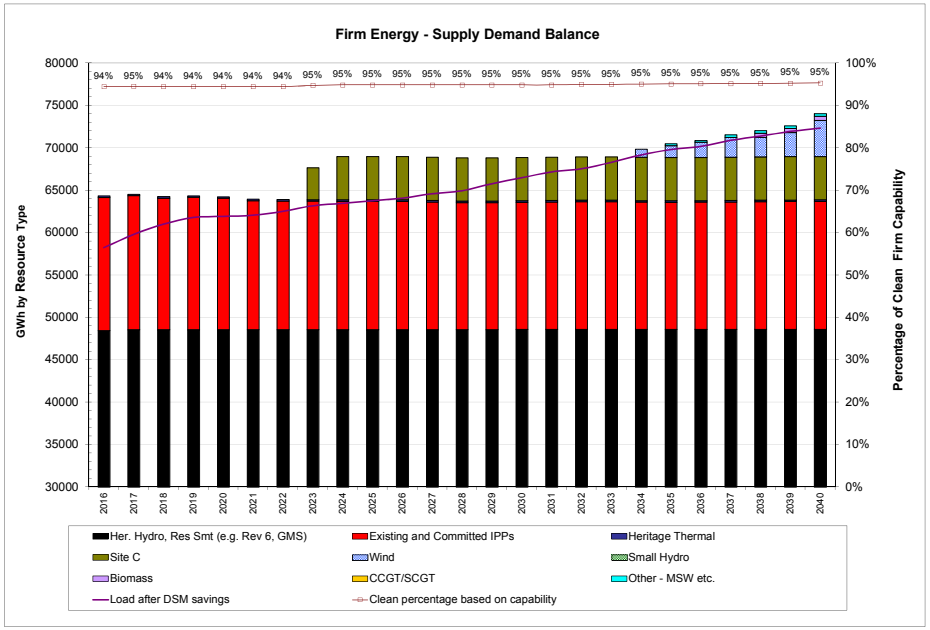

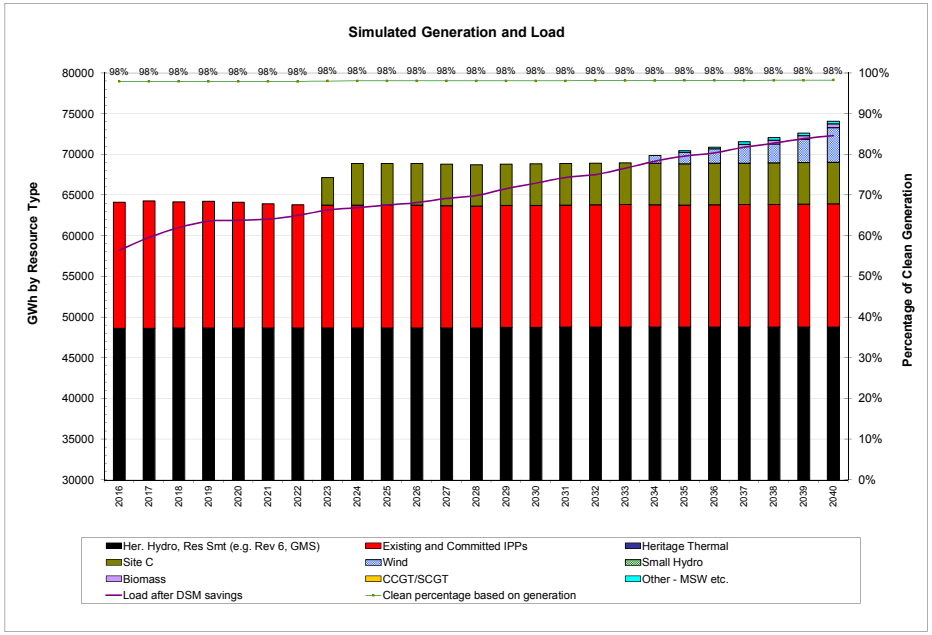

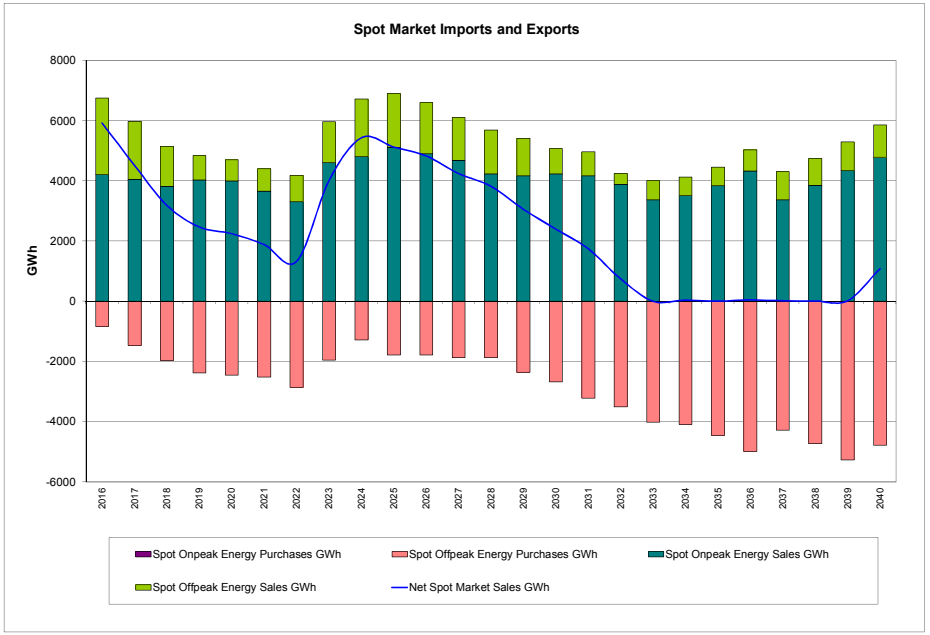

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & No LNG	Mid DSM-Option2(extrapolated)	Scenario 1	Not included	Excluded (clean energy only)	7% IPP CoC, $5 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	5,001
PV of Trade Revenue - $ millions	(1,325)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	6,930

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	194	0	1,037	0	1,231
Firm Energy (GWh)	2,850	0	312	0	3,162

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	625	0	2,130	0	2,754
Firm Energy (GWh)	8,558	0	1,054	0	9,612

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Series compensation of 5L91 and 5L98	SE to KN	147
2032	Shunt compensation at WSN KLY	PR to KN	650
2035	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2035	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2023	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2027	BCH_PR	Wind_PC16	99	26	377	377	111
2027	BCH_PR	Wind_PC21	99	26	371	371	107
2027	BCH_PR	Wind_PC28	153	40	591	591	106
2027	BCH_VI	MSW1_VI	12	12	100	100	127
2027	BCH_LM	MSW2_LM	25	24	208	208	92
2028	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2029	BCH_PR	Wind_PC13	135	35	541	541	108
2029	BCH_PR	Wind_PC19	117	30	441	441	108
2030	BCH_PR	Wind_PC14	144	37	527	527	112
2031	BCH_PR	Wind_PC20	159	41	610	610	114
2031	BCH_PR	Wind_PC41	45	12	155	155	117
2032	BCH_PR	Wind_PC15	108	28	382	382	114
2033	BCH_PR	Wind_PC09	207	54	713	713	117
2034	BCH_PR	Wind_PC10	297	77	1,023	1,023	113
2035	BCH_PR	Wind_PC18	138	36	486	486	118
2035	BCH_PR	Wind_PC26	126	33	416	416	122
2035	BCH_PR	Wind_PC42	63	16	219	219	117
2035	BCH_VI	Wind_VI12	48	12	150	150	130
2035	BCH_VI	Biomass_VI	30	30	239	239	142
2035	BCH_LM	Biomass_LM	30	30	239	239	143
2036	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2037	BCH_PR	Wind_PC11	126	33	473	473	117
2037	BCH_VI	Wind_VI14	35	9	114	114	130
2038	BCH_PR	Wind_PC48	152	40	505	505	123
2039	BCH_PR	Wind_PC27	110	29	332	332	131
2039	BCH_VI	Wind_VI15	41	11	124	124	138
2040	BCH_SE	Biomass_SE	33	33	263	263	141

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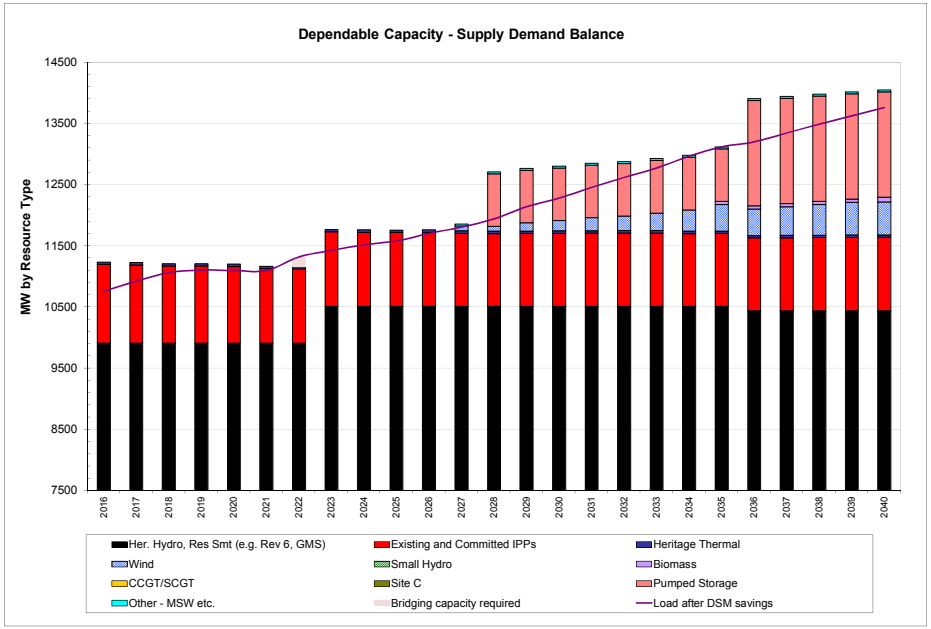

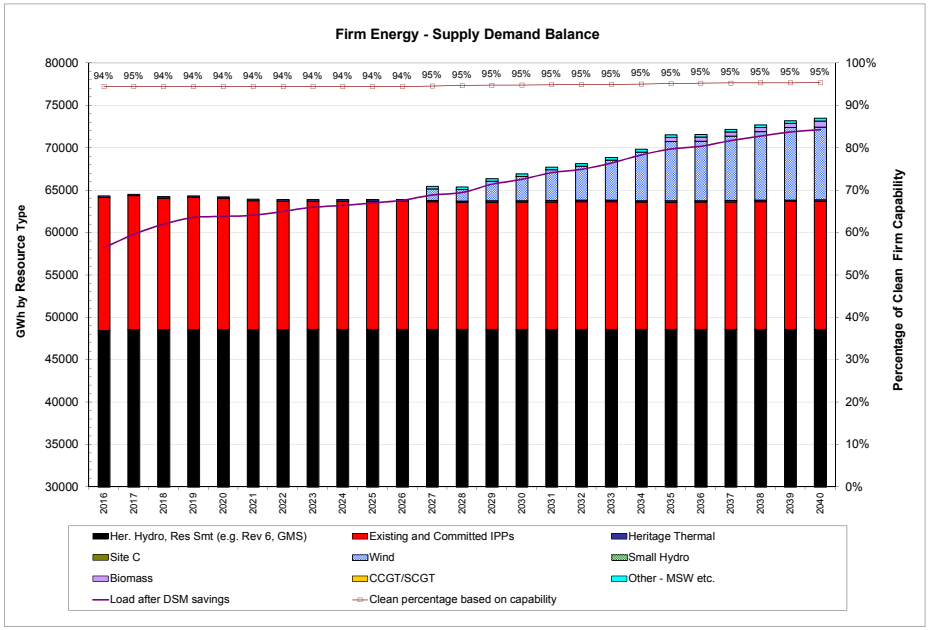

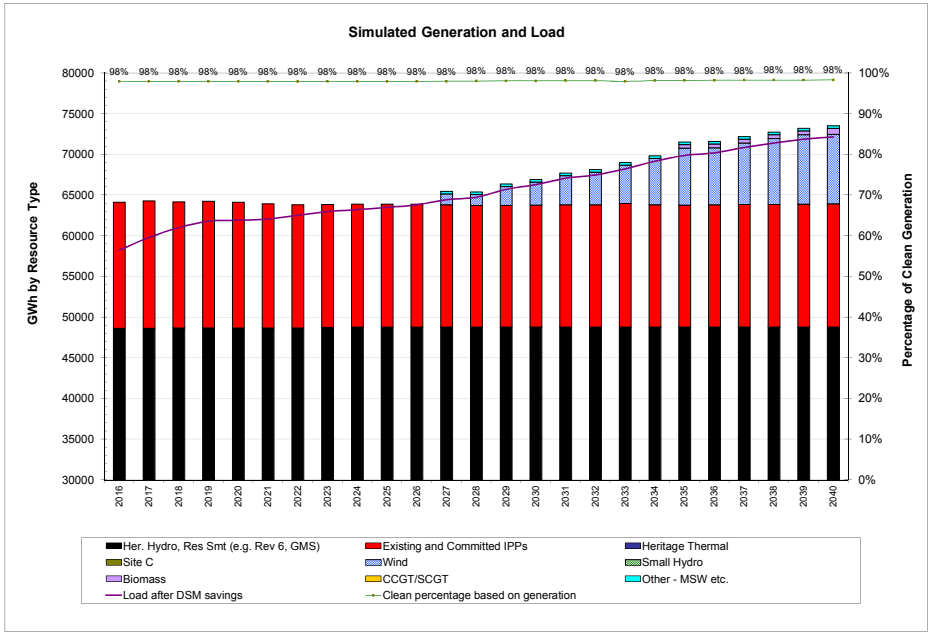

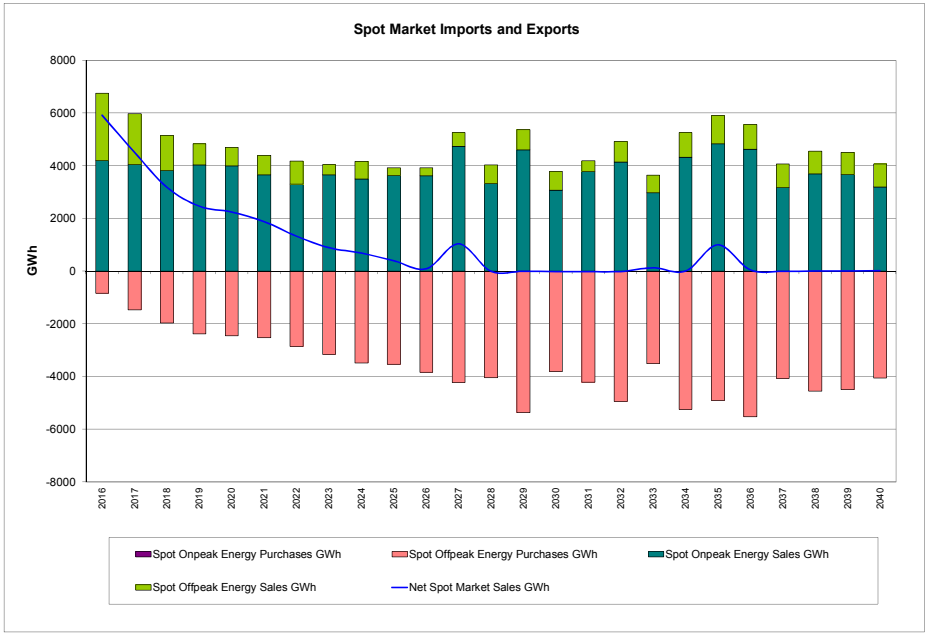

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	High Load & No LNG	Low DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Included	7% IPP CoC, $10 wind adder, Energy and Capacity bridging before Site C

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	17,790
PV of Trade Revenue - $ millions	(638)
PV of DSM Option cost - $ millions	2,804
PV of Total Portfolio Cost - $ millions	19,957

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	455	10	223	0	689
Firm Energy (GWh)	6,427	175	613	0	7,215

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	585	10	1,185	1,100	2,880
Firm Energy (GWh)	8,099	175	2,356	5,103	15,733

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	1,131	75	3,919	1,100	6,225
Firm Energy (GWh)	14,317	1,425	4,654	5,103	25,500

DSM Level in:

2020	5,588	GWh	1,011	MW
2030	7,938	GWh	1,556	MW
2040	10,393	GWh	2,034	MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	97%	94%
Lowest %	96%	93%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2019	Shunt compensation at WSN KLY	PR to KN	650
2019	Series compensation of 5L91 and 5L98	SE to KN	147
2023	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2023	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2024	Shunt compensation at NIC and MDN	KN to LM	570
2028	500kV circuit 5L8 between GMS and WSN	PR to CI	1470
2028	500kV circuit 5L14 between WSN and KLY	CI to KN	2120
2028	500 kV circuit 5L46 between KLY and Cheekye	KN to LM	1384

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2019	BCH_PR	Wind_PC09	207	54	713	713	122
2019	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2019	BCH_PR	Wind_PC11	126	33	473	473	122
2019	BCH_PR	Wind_PC13	135	35	541	541	113
2019	BCH_PR	Wind_PC14	144	37	527	527	117
2019	BCH_PR	Wind_PC15	108	28	382	382	119
2019	BCH_PR	Wind_PC16	99	26	377	377	116
2019	BCH_PR	Wind_PC19	117	30	441	441	113
2019	BCH_PR	Wind_PC20	159	41	610	610	119
2019	BCH_PR	Wind_PC21	99	26	371	371	112
2019	BCH_PR	Wind_PC28	153	40	591	591	111
2019	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2019	BCH_LM	MSW2_LM	25	24	208	208	92
2019	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2020	BCH_PR	Wind_PC41	45	12	155	155	122
2020	BCH_PR	Wind_PC42	63	16	219	219	122
2020	BCH_VI	MSW1_VI	12	12	100	100	127
2020	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2021	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2022	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2027	BCH_KN	100 MW SCGT KN	309	294	450	450	88
2027	BCH_VI	Wind_VI14	35	9	114	114	135
2028	BCH_PR	Wind_PC18	138	36	486	486	123
2028	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2029	BCH_PR	Wind_PC26	126	33	416	416	127
2029	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2029	BCH_VI	Wind_VI12	48	12	150	150	135
2029	BCH_LM	Biomass_LM	30	30	239	239	143
2030	BCH_PR	Wind_PC48	152	40	505	505	128
2030	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2031	BCH_PR	Biomass_PR	28	28	223	223	141
2031	BCH_CI	Biomass_CI	41	41	327	327	147
2031	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2031	BCH_VI	Biomass_VI	30	30	239	239	142
2032	BCH_NC	Biomass_NC	13	13	104	104	147
2032	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2032	BCH_KN	Biomass_KN	30	30	239	239	151
2033	BCH_PR	Wind_PC06	243	63	761	761	131
2033	BCH_NC	Wind_NC09	334	87	1,026	1,026	135
2033	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2033	BCH_VI	Wind_VI13	35	9	106	106	140
2034	BCH_KN	Run of River KN 90_100	72	2	172	221	108
2034	BCH_KN	Run of River KN 100_110	75	3	170	218	112
2034	BCH_VI	Run of River VI 100_110	119	29	352	451	120
2034	BCH_VI	Wind_VI15	41	11	124	124	143
2034	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2034	BCH_LM	Run of River LM 100_110	102	18	258	330	115
2035	BCH_PR	Wind_PC27	110	29	332	332	136
2035	BCH_VI	Run of River VI 110_120	94	13	300	385	125
2035	BCH_VI	Wind_VI08	41	11	112	112	151
2036	BCH_PR	Wind_PC40	117	30	349	349	137
2036	BCH_SE	Biomass_SE	33	33	263	263	141
2037	BCH_VI	Wind_VI07	166	43	503	503	154
2037	BCH_REV	Wind_SI12	186	48	544	544	141
2038	BCH_VI	Wind_VI05	255	66	702	702	157
2039	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2039	BCH_LM	Wind_SI27	90	23	250	250	161

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Year	Zone		Capacity - MW Installed	Capacity - MW Dependable	Energy - GWh Firm	Energy - GWh Total	UEC / UCC $/MWh or $/kW-year
2039	BCH_LM	Wind_SI28	90	23	262	262	165
2040	BCH_CI	Wind_PC25	159	41	451	451	146
2040	BCH_KN	Wind_SI20	41	11	121	121	146
2040	BCH_KN	Wind_SI23	193	50	569	569	144
2040	BCH_LM	Pumped_Storage_LM	1000	1,000			126

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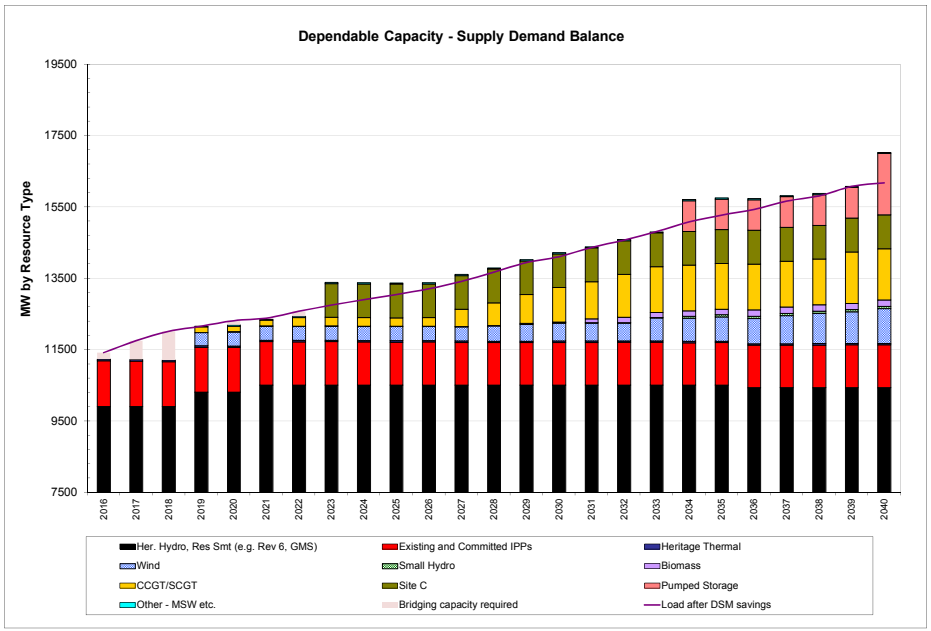

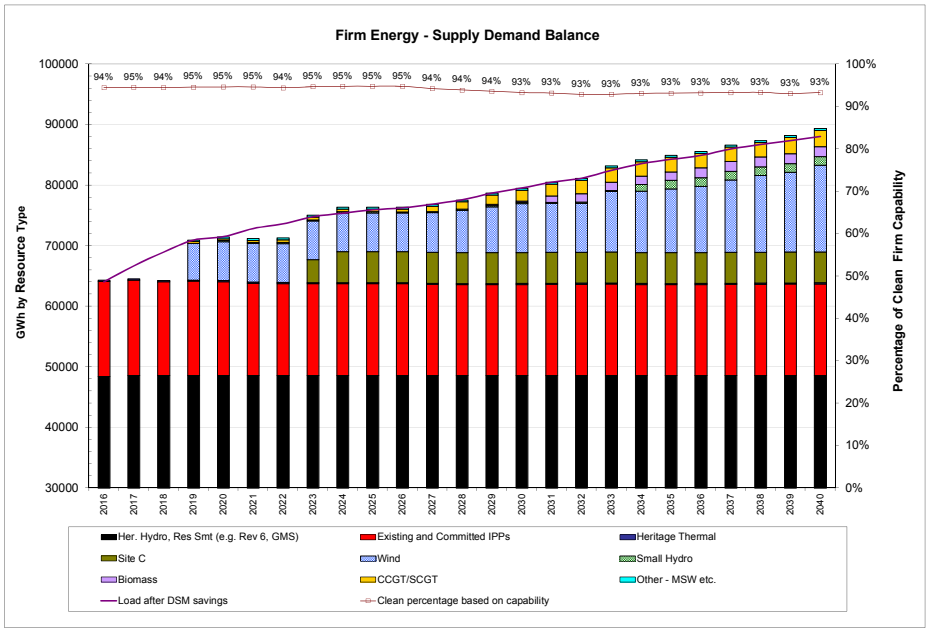

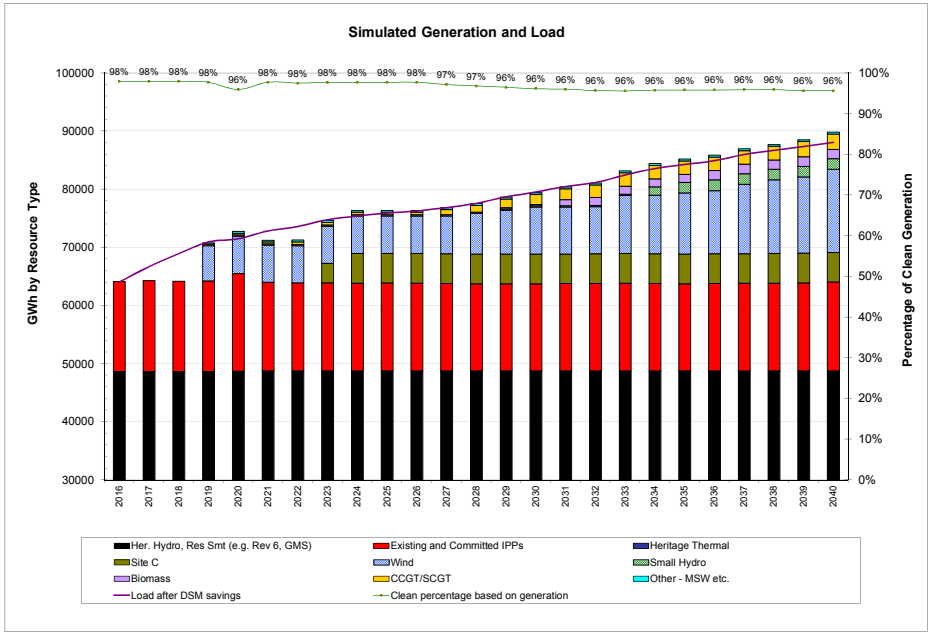

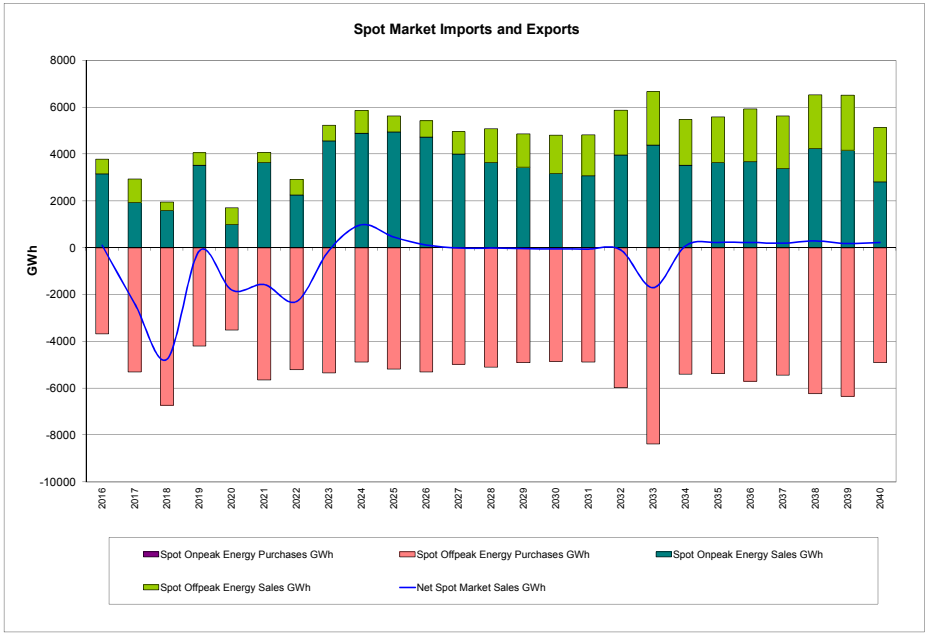

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	High Load & No LNG	Low DSM-Option2(extrapolated)	Scenario 1	Not included	Included	7% IPP CoC, $10 wind adder, Energy and Capacity bridging before Site C

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	20,001
PV of Trade Revenue - $ millions	(585)
PV of DSM Option cost - $ millions	2,804
PV of Total Portfolio Cost - $ millions	22,220

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	477	10	223	0	710
Firm Energy (GWh)	6,691	175	613	0	7,479

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	916	62	2,434	0	3,413
Firm Energy (GWh)	11,961	1,124	3,159	0	16,245

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	1,624	75	3,854	0	5,553
Firm Energy (GWh)	19,354	1,425	4,727	0	25,506

DSM Level in:

2020	5,588	GWh	1,011	MW
2030	7,938	GWh	1,556	MW
2040	10,393	GWh	2,034	MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	96%	94%
Lowest %	95%	93%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2019	Shunt compensation at WSN KLY	PR to KN	650
2019	Series compensation of 5L91 and 5L98	SE to KN	147
2024	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2024	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2024	Shunt compensation at NIC and MDN	KN to LM	570
2029	500kV circuit 5L14 between WSN and KLY	CI to KN	2120
2033	500 kV circuit 5L46 between KLY and Cheekye	KN to LM	1384
2039	500kV circuit 5L8 between GMS and WSN	PR to CI	1470

Resources Selected

Year	Zone	Resource	Capacity - MW Installed	Capacity - MW Dependable	Energy - GWh Firm	Energy - GWh Total	UEC / UCC $/MWh or $/kW-year
2019	BCH_PR	Wind_PC09	207	54	713	713	122
2019	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2019	BCH_PR	Wind_PC11	126	33	473	473	122
2019	BCH_PR	Wind_PC13	135	35	541	541	113
2019	BCH_PR	Wind_PC14	144	37	527	527	117
2019	BCH_PR	Wind_PC15	108	28	382	382	119
2019	BCH_PR	Wind_PC16	99	26	377	377	116
2019	BCH_PR	Wind_PC19	117	30	441	441	113
2019	BCH_PR	Wind_PC20	159	41	610	610	119
2019	BCH_PR	Wind_PC21	99	26	371	371	112
2019	BCH_PR	Wind_PC28	153	40	591	591	111
2019	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2019	BCH_LM	MSW2_LM	25	24	208	208	92
2019	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2020	BCH_PR	Wind_PC41	45	12	155	155	122
2020	BCH_PR	Wind_PC42	63	16	219	219	122
2020	BCH_VI	Wind_VI12	48	12	150	150	135
2020	BCH_VI	Wind_VI14	35	9	114	114	135
2020	BCH_VI	MSW1_VI	12	12	100	100	127
2020	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2021	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2022	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2023	BCH_PR	Wind_PC18	138	36	486	486	123
2023	BCH_VI	Biomass_VI	30	30	239	239	142
2024	BCH_PR	Wind_PC06	243	63	761	761	131
2024	BCH_PR	Wind_PC26	126	33	416	416	127
2024	BCH_PR	Wind_PC48	152	40	505	505	128
2024	BCH_KN	100 MW SCGT KN	824	784	1,200	1,200	88
2025	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2025	BCH_VI	Wind_VI13	35	9	106	106	140
2025	BCH_LM	Biomass_LM	30	30	239	239	143
2026	BCH_VI	Wind_VI15	41	11	124	124	143
2026	BCH_LM	Run of River LM 100_110	102	18	258	330	115
2027	BCH_VI	Run of River VI 100_110	119	29	352	451	120
2027	BCH_VI	Wind_VI07	166	43	503	503	154
2027	BCH_VI	Wind_VI08	41	11	112	112	151
2028	BCH_NC	Wind_NC09	334	87	1,026	1,026	135
2028	BCH_KN	Run of River KN 90_100	72	2	172	221	108
2028	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2029	BCH_PR	Wind_PC27	110	29	332	332	136
2029	BCH_PR	Wind_PC40	117	30	349	349	137
2029	BCH_KN	Run of River KN 100_110	75	3	170	218	112
2029	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2030	BCH_SE	Biomass_SE	33	33	263	263	141
2030	BCH_REV	Wind_SI12	186	48	544	544	141
2031	BCH_CI	Wind_NC10	97	25	281	281	145
2031	BCH_KN	Wind_SI20	41	11	121	121	146
2031	BCH_KN	Wind_SI23	193	50	569	569	144
2032	BCH_PR	Biomass_PR	28	28	223	223	141
2032	BCH_CI	Biomass_CI	41	41	327	327	147
2033	BCH_CI	Wind_PC25	159	41	451	451	146
2033	BCH_VI	Wind_VI05	255	66	702	702	157
2034	BCH_KN	Wind_SI15	304	79	815	815	148
2034	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2034	BCH_KN	Biomass_KN	30	30	239	239	151
2035	BCH_NC	Wind_BC22	260	68	697	697	149
2035	BCH_NC	Biomass_NC	13	13	104	104	147
2035	BCH_KN	100 MW SCGT KN	103	98	150	150	88

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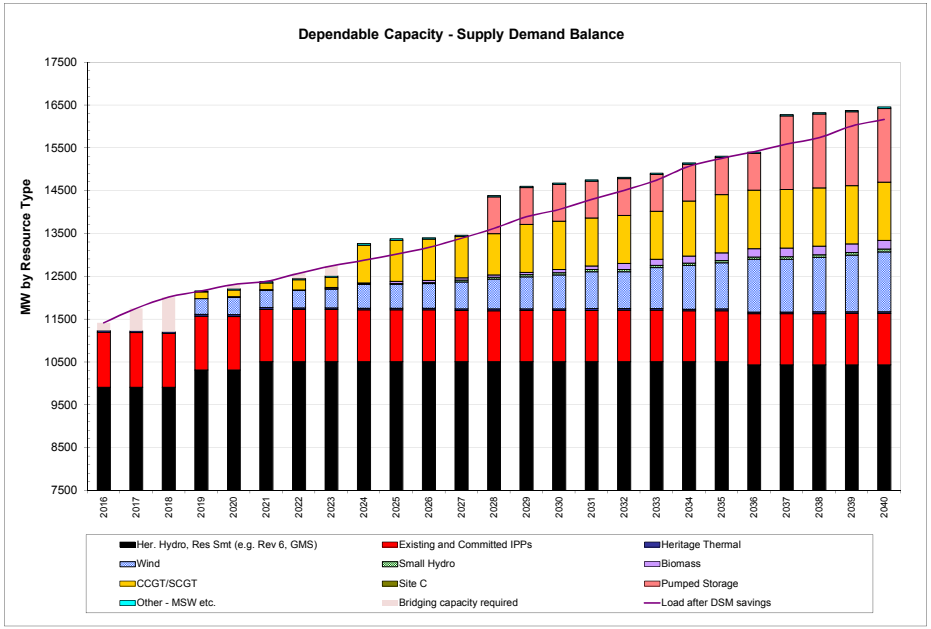
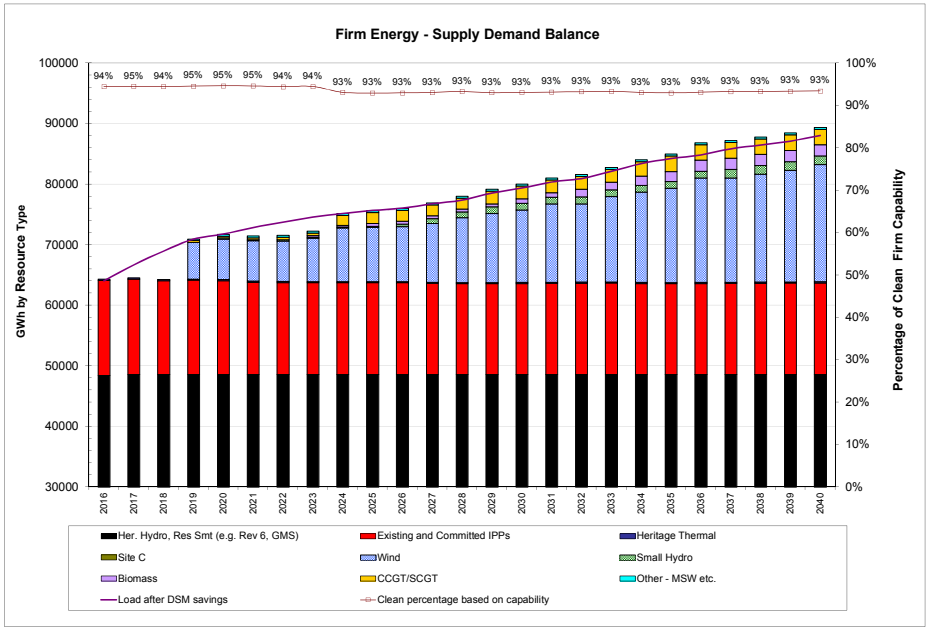
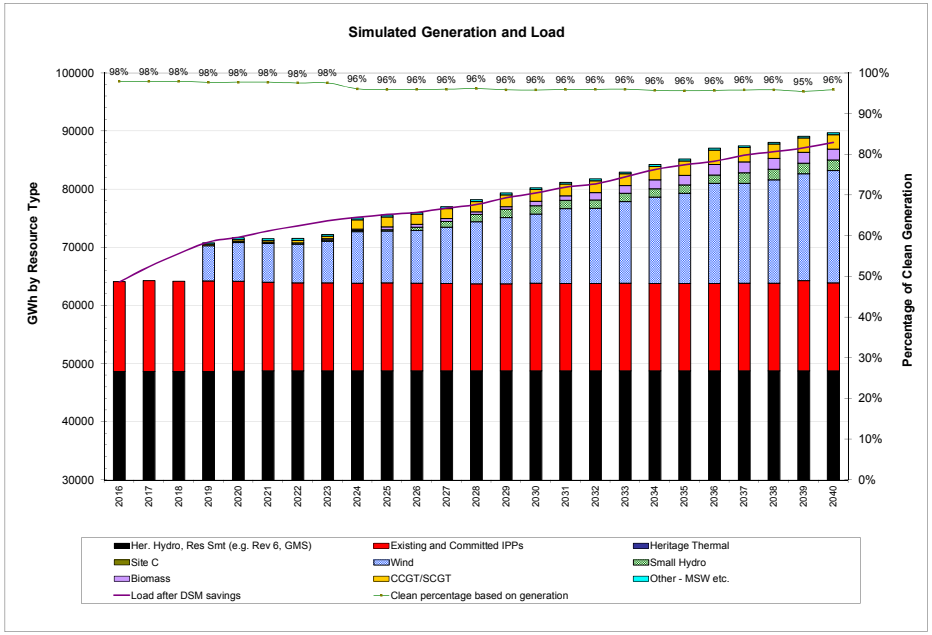
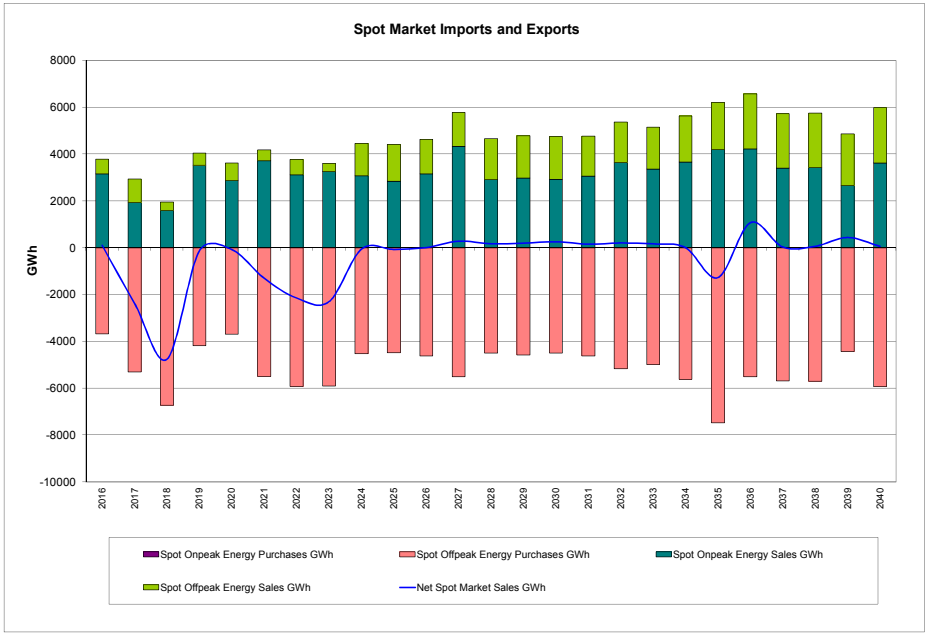
Year	Zone		Capacity - MW Installed	Capacity - MW Dependable	Energy - GWh Firm	Energy - GWh Total	UEC / UCC $/MWh or $/kW-year
2036	BCH_KN	Wind_SI16	662	172	1,631	1,631	156
2036	BCH_EK	Biomass_EK	28	28	223	223	149
2037	BCH_VI	Run of River VI 110_120	94	13	300	385	125
2037	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2038	BCH_PR	Wind_PC05	97	25	354	354	144
2038	BCH_PR	Wind_PC47	35	9	109	109	148
2038	BCH_KN	Wind_SI22	48	12	125	125	152
2038	BCH_VI	Biomass_VI	30	30	239	239	142
2039	BCH_PR	Wind_PC17	104	27	317	317	148
2039	BCH_KN	Wind_SI10	117	30	312	312	153
2040	BCH_PR	Wind_PC34	352	92	907	907	151
2040	BCH_LM	Biomass_LM	30	30	239	239	143









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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & Expected LNG	Mid DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Excluded (clean energy only)	7% IPP CoC, $10 wind adder, Energy and Capacity bridging before Site C

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	6,612
PV of Trade Revenue - $ millions	(1,224)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	8,642

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	40	0	37	1,100	1,176
Firm Energy (GWh)	591	0	312	5,103	6,007

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	477	12	2,097	1,100	3,686
Firm Energy (GWh)	6,683	347	791	5,103	12,924

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2019	Series compensation of WSN-GLN 500 kV line	CI to NC	500
2023	Shunt compensation at WSN KLY	PR to KN	650
2027	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2027	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2028	Series compensation of 5L91 and 5L98	SE to KN	147
2029	Shunt compensation at NIC and MDN	KN to LM	570
2039	500kV circuit 5L8 between GMS and WSN	PR to CI	1470
2039	500kV circuit 5L8 between WSN and KLY	CI to KN	2120

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2027	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2028	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2030	BCH_PR	Wind_PC28	153	40	591	591	111
2030	BCH_VI	MSW1_VI	12	12	100	100	127
2030	BCH_LM	MSW2_LM	25	24	208	208	92
2031	BCH_PR	Wind_PC13	135	35	541	541	113
2031	BCH_PR	Wind_PC14	144	37	527	527	117
2031	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2032	BCH_PR	Wind_PC19	117	30	441	441	113
2033	BCH_PR	Wind_PC16	99	26	377	377	116
2033	BCH_PR	Wind_PC21	99	26	371	371	112
2034	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2035	BCH_PR	Wind_PC20	159	41	610	610	119
2036	BCH_PR	Wind_PC15	108	28	382	382	119
2037	BCH_PR	Wind_PC09	207	54	713	713	122
2038	BCH_PR	Wind_PC41	45	12	155	155	122
2038	BCH_PR	Wind_PC42	63	16	219	219	122
2038	BCH_VI	Wind_VI12	48	12	150	150	135
2038	BCH_VI	Biomass_VI	30	30	239	239	142
2038	BCH_LM	Biomass_LM	30	30	239	239	143
2039	BCH_PR	Wind_PC11	126	33	473	473	122
2039	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2039	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2040	BCH_KN	Run of River KN 90_100	72	2	172	221	108
2040	BCH_VI	Wind_VI13	35	9	106	106	140

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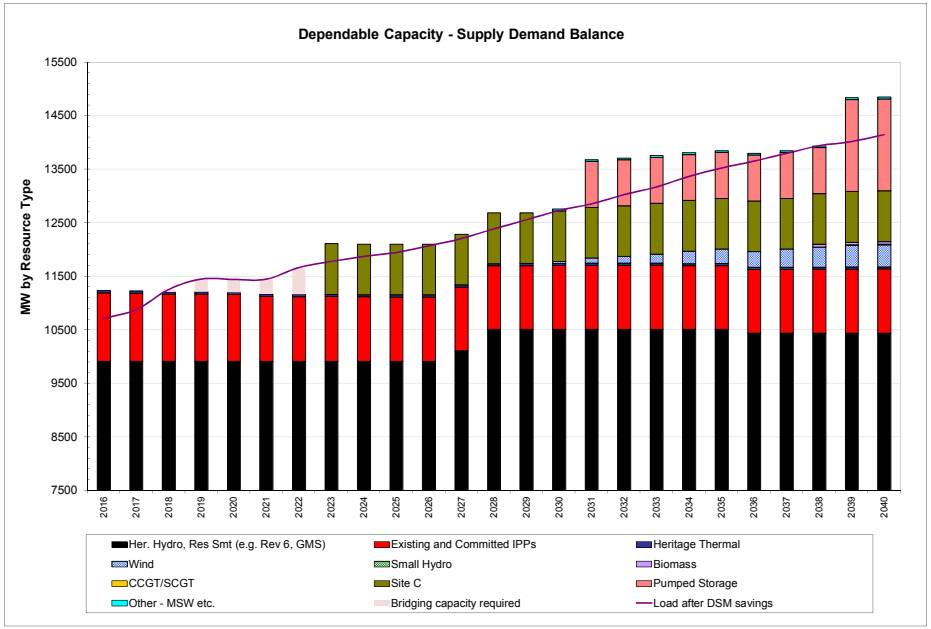

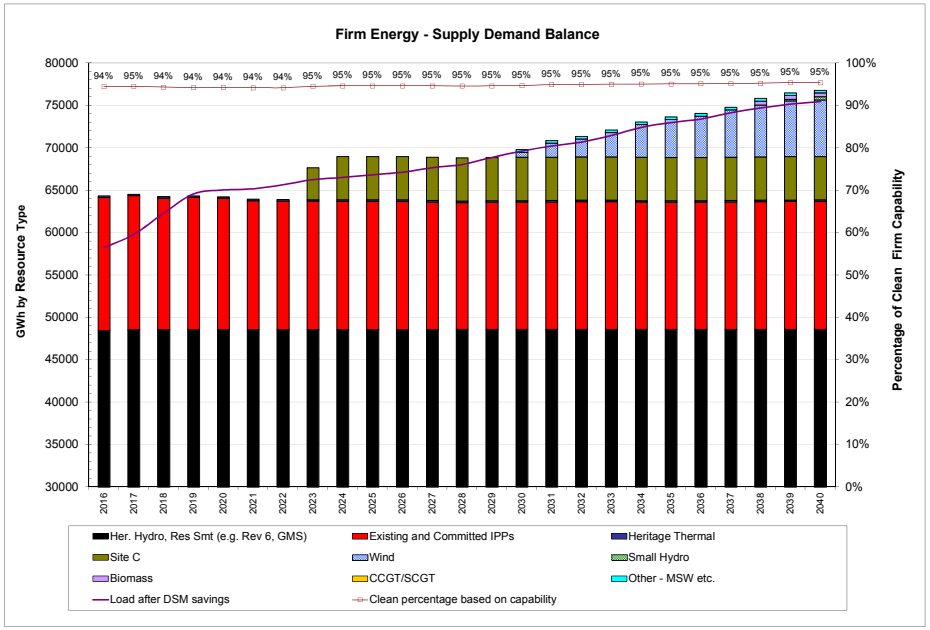

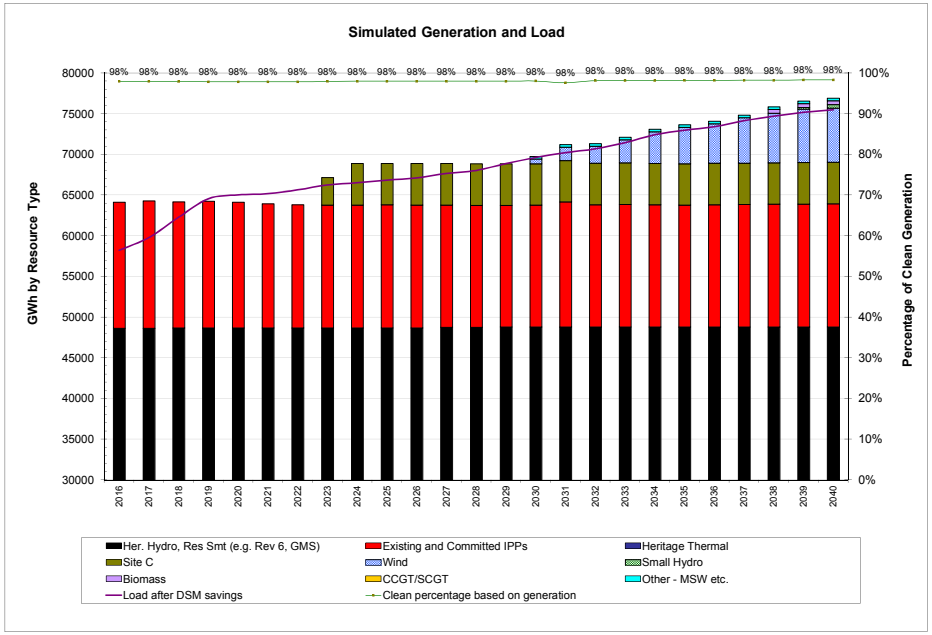

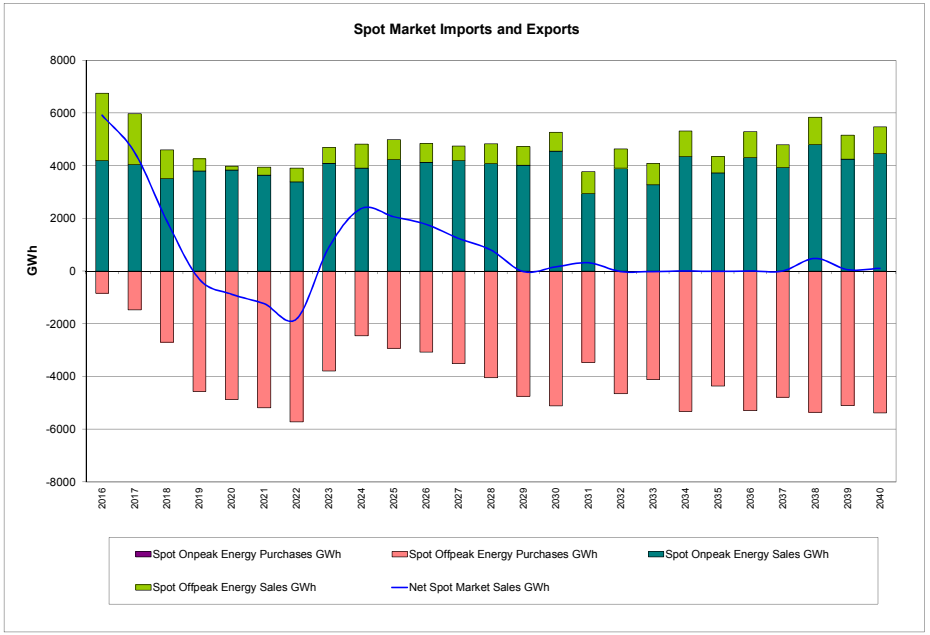

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & Expected LNG	Mid DSM-Option2(extrapolated)	Scenario 1	Not included	Excluded (clean energy only)	7% IPP CoC, $10 wind adder, Energy and Capacity bridging before Site C

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	8,267
PV of Trade Revenue - $ millions	(1,034)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	10,487

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	417	0	1,067	0	1,484
Firm Energy (GWh)	5,878	0	551	0	6,429

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	785	62	2,130	0	2,977
Firm Energy (GWh)	10,467	1,124	1,054	0	12,645

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2019	Series compensation of WSN-GLN 500 kV line	CI to NC	500
2023	Series compensation of 5L91 and 5L98	SE to KN	147
2028	Shunt compensation at WSN KLY	PR to KN	650
2033	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2033	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2039	500kV circuit 5L14 between WSN and KLY	CI to KN	2120

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2023	BCH_PR	Wind_PC13	135	35	541	541	113
2023	BCH_PR	Wind_PC19	117	30	441	441	113
2023	BCH_PR	Wind_PC21	99	26	371	371	112
2023	BCH_PR	Wind_PC28	153	40	591	591	111
2023	BCH_VI	MSW1_VI	12	12	100	100	127
2023	BCH_LM	MSW2_LM	25	24	208	208	92
2023	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2024	BCH_VI	Biomass_VI	30	30	239	239	142
2025	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2026	BCH_PR	Wind_PC42	63	16	219	219	122
2026	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2027	BCH_PR	Wind_PC14	144	37	527	527	117
2027	BCH_PR	Wind_PC41	45	12	155	155	122
2028	BCH_PR	Wind_PC15	108	28	382	382	119
2029	BCH_PR	Wind_PC16	99	26	377	377	116
2029	BCH_PR	Wind_PC20	159	41	610	610	119
2030	BCH_PR	Wind_PC18	138	36	486	486	123
2030	BCH_VI	Wind_VI12	48	12	150	150	135
2031	BCH_PR	Wind_PC09	207	54	713	713	122
2032	BCH_LM	Biomass_LM	30	30	239	239	143
2033	BCH_NC	Wind_NC09	334	87	1,026	1,026	135
2034	BCH_PR	Wind_PC11	126	33	473	473	122
2034	BCH_PR	Wind_PC48	152	40	505	505	128
2034	BCH_KN	Run of River KN 90_100	72	2	172	221	108
2034	BCH_VI	Wind_VI14	35	9	114	114	135
2034	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2034	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2035	BCH_PR	Wind_PC26	126	33	416	416	127
2035	BCH_LM	Run of River LM 100_110	102	18	258	330	115
2036	BCH_KN	Run of River KN 100_110	75	3	170	218	112
2036	BCH_VI	Wind_VI13	35	9	106	106	140
2037	BCH_PR	Wind_PC06	243	63	761	761	131
2038	BCH_VI	Run of River VI 100_110	119	29	352	451	120
2038	BCH_VI	Wind_VI15	41	11	124	124	143
2039	BCH_PR	Wind_PC40	117	30	349	349	137
2039	BCH_VI	Biomass_VI	30	30	239	239	142
2040	BCH_SE	Biomass_SE	33	33	263	263	141

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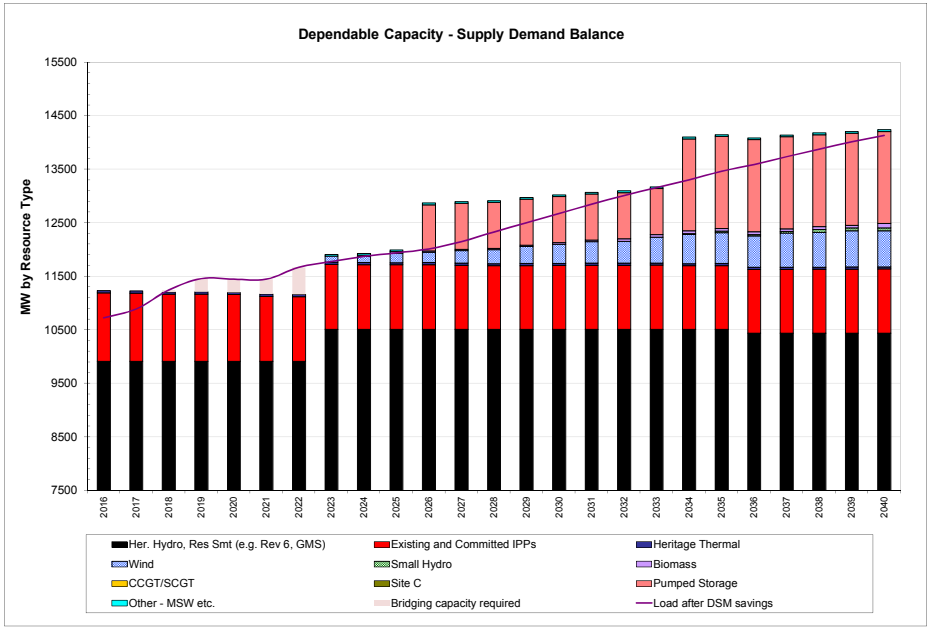

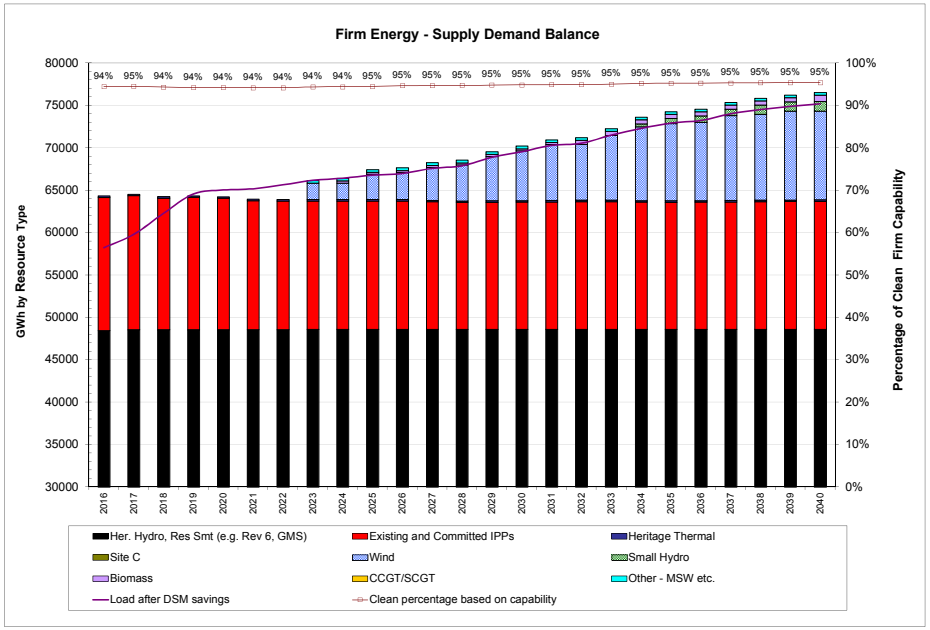

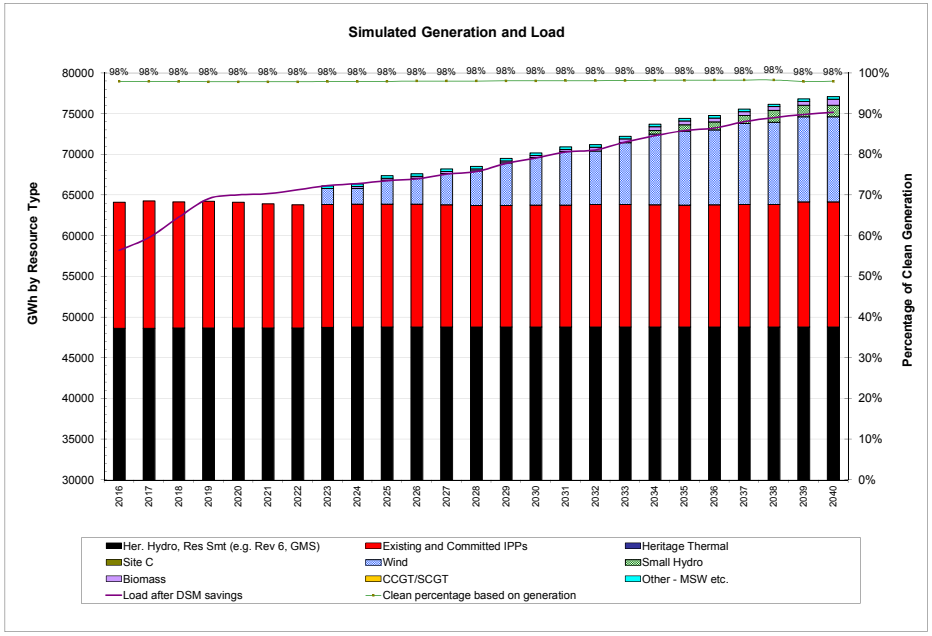

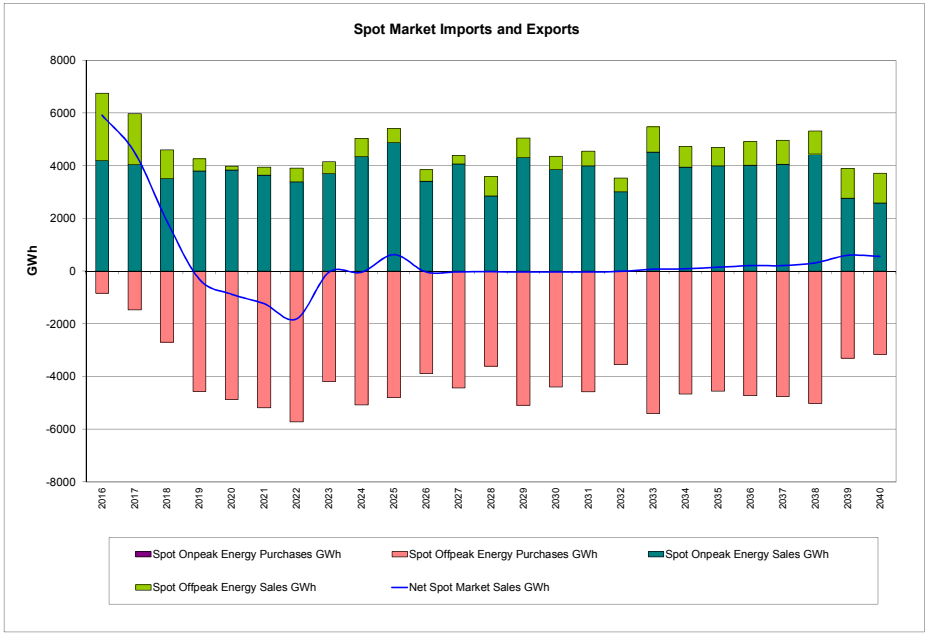

M&M_1NC_2N0_05U

Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & Expected LNG	Mid DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Included	7% IPP CoC, $10 wind adder, Energy and Capacity bridging before Site C

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	6,023
PV of Trade Revenue - $ millions	(1,242)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	8,035

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	559	1,100	1,659
Firm Energy (GWh)	0	0	902	5,103	6,006

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	271	0	1,597	1,100	2,968
Firm Energy (GWh)	3,874	0	3,860	5,103	12,837

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	97%	94%
Lowest %	95%	93%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2019	Series compensation of WSN-GLN 500 kV line	CI to NC	500
2023	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2023	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2027	Shunt compensation at WSN KLY	PR to KN	650
2029	Shunt compensation at NIC and MDN	KN to LM	570
2033	500 kV circuit 5L46 between KLY and Cheekye	KN to LM	1384
2034	Series compensation of 5L91 and 5L98	SE to KN	147
2040	500kV circuit 5L14 between WSN and KLY	CI to KN	2120

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2027	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2028	BCH_NC	100 MW SCGT NC	206	196	300	300	88
2029	BCH_NC	100 MW SCGT NC	206	196	300	300	88
2030	BCH_NC	100 MW SCGT NC	103	98	150	150	88
2030	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2031	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2031	BCH_LM	MSW2_LM	25	24	208	208	92
2032	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2033	BCH_PR	Wind_PC28	153	40	591	591	111
2033	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2034	BCH_PR	Wind_PC13	135	35	541	541	113
2034	BCH_PR	Wind_PC21	99	26	371	371	112
2034	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2035	BCH_PR	Wind_PC19	117	30	441	441	113
2035	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2035	BCH_VI	MSW1_VI	12	12	100	100	127
2036	BCH_PR	Wind_PC16	99	26	377	377	116
2037	BCH_PR	Wind_PC14	144	37	527	527	117
2037	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2038	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2038	BCH_LM	Biomass_LM	30	30	239	239	143
2039	BCH_PR	Biomass_PR	28	28	223	223	141
2039	BCH_CI	Biomass_CI	41	41	327	327	147
2039	BCH_SE	Biomass_SE	33	33	263	263	141
2039	BCH_VI	Biomass_VI	30	30	239	239	142
2040	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2040	BCH_NC	100 MW SCGT NC	103	98	150	150	88

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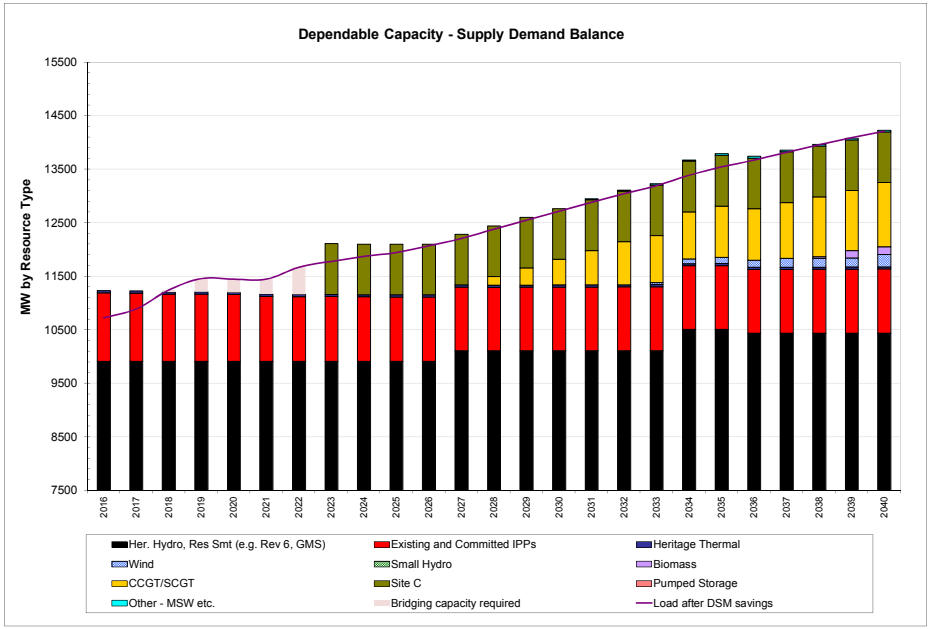

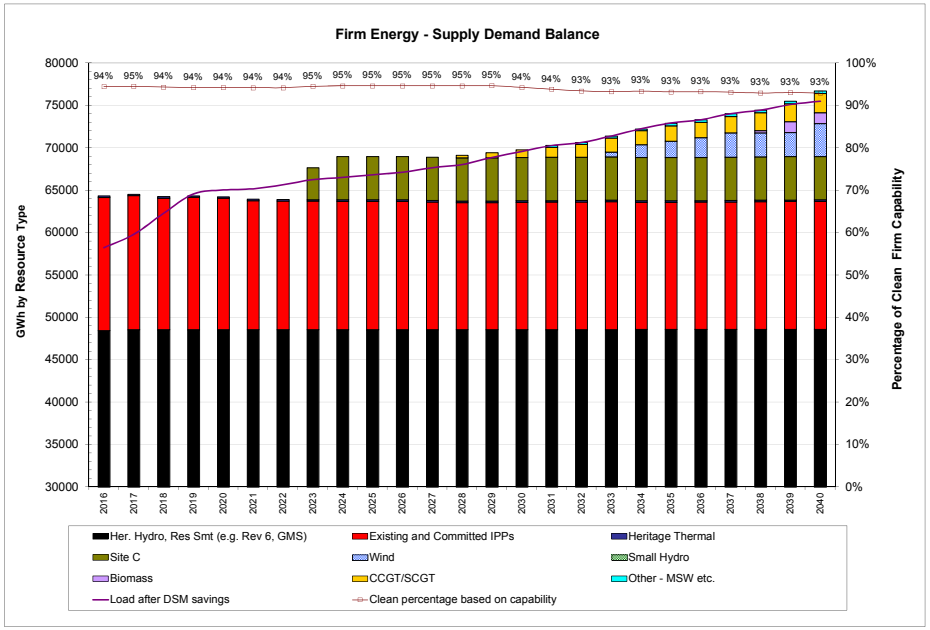

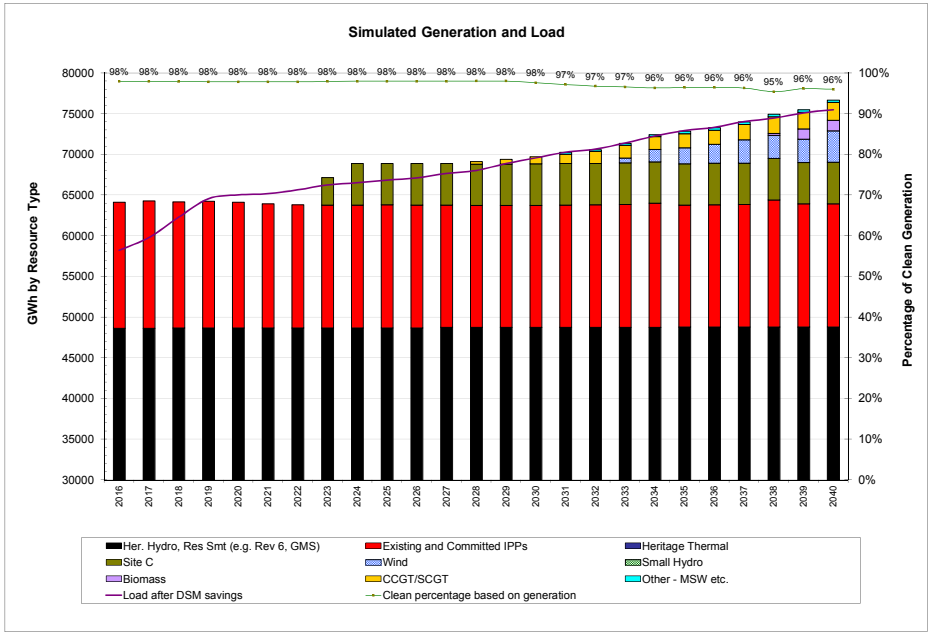

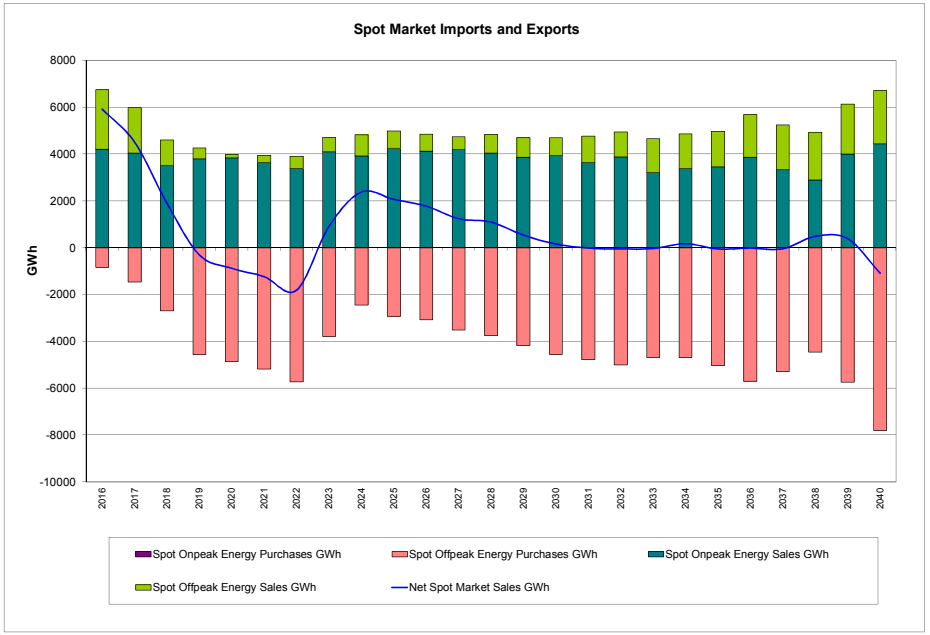

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & Expected LNG	Mid DSM-Option2(extrapolated)	Scenario 1	Not included	Included	7% IPP CoC, $10 wind adder, Energy and Capacity bridging before Site C

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	7,083
PV of Trade Revenue - $ millions	(1,045)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	9,293

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	271	0	1,050	0	1,321
Firm Energy (GWh)	3,874	0	1,864	0	5,738

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	583	57	2,434	0	3,075
Firm Energy (GWh)	8,087	783	3,159	0	12,029

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	94%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2019	Series compensation of WSN-GLN 500 kV line	CI to NC	500
2029	Shunt compensation at WSN KLY	PR to KN	650
2029	Series compensation of 5L91 and 5L98	SE to KN	147
2029	Shunt compensation at NIC and MDN	KN to LM	570
2033	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2033	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2040	500kV circuit 5L14 between WSN and KLY	CI to KN	2120

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2023	BCH_PR	Wind_PC19	117	30	441	441	113
2023	BCH_PR	Wind_PC21	99	26	371	371	112
2023	BCH_PR	Wind_PC28	153	40	591	591	111
2023	BCH_NC	100 MW SCGT NC	309	294	450	450	88
2023	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2023	BCH_LM	MSW2_LM	25	24	208	208	92
2024	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2025	BCH_NC	100 MW SCGT NC	103	98	150	150	88
2025	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2026	BCH_PR	Wind_PC13	135	35	541	541	113
2027	BCH_NC	100 MW SCGT NC	103	98	150	150	88
2027	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2028	BCH_PR	Wind_PC16	99	26	377	377	116
2028	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2029	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2029	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2030	BCH_PR	Wind_PC14	144	37	527	527	117
2031	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2031	BCH_VI	MSW1_VI	12	12	100	100	127
2031	BCH_VI	Biomass_VI	30	30	239	239	142
2031	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2032	BCH_VI	Wind_VI14	35	9	114	114	135
2032	BCH_LM	Biomass_LM	30	30	239	239	143
2033	BCH_PR	Wind_PC09	207	54	713	713	122
2033	BCH_PR	Wind_PC15	108	28	382	382	119
2033	BCH_PR	Wind_PC20	159	41	610	610	119
2033	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2034	BCH_PR	Wind_PC11	126	33	473	473	122
2034	BCH_PR	Wind_PC41	45	12	155	155	122
2035	BCH_PR	Wind_PC18	138	36	486	486	123
2035	BCH_PR	Wind_PC42	63	16	219	219	122
2036	BCH_PR	Wind_PC26	126	33	416	416	127
2037	BCH_VI	Run of River VI 100_110	119	29	352	451	120
2037	BCH_LM	Run of River LM 100_110	102	18	258	330	115
2038	BCH_PR	Wind_PC48	152	40	505	505	128
2039	BCH_PR	Wind_PC43	41	11	138	138	148
2039	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2040	BCH_SE	Biomass_SE	33	33	263	263	141

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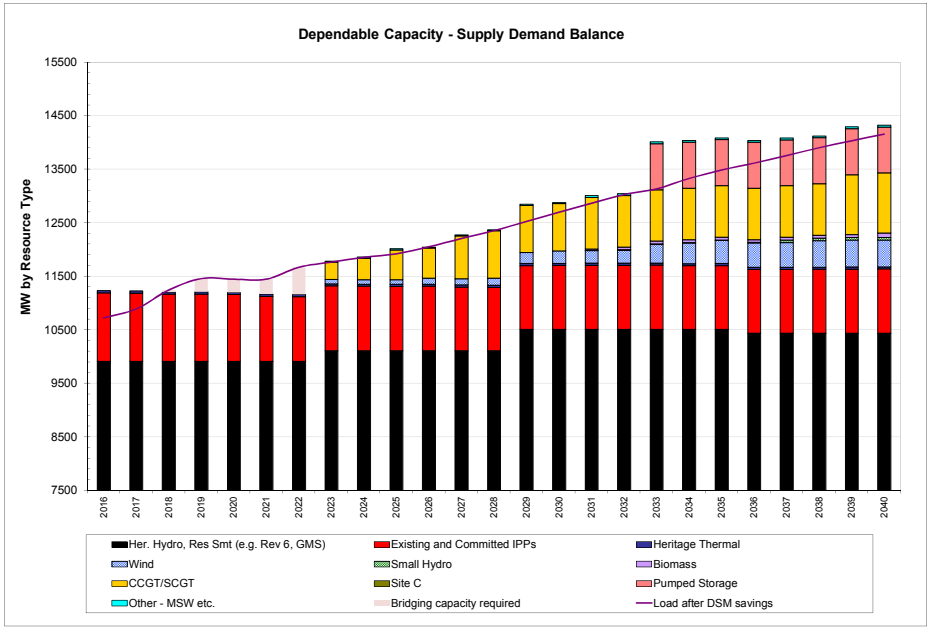

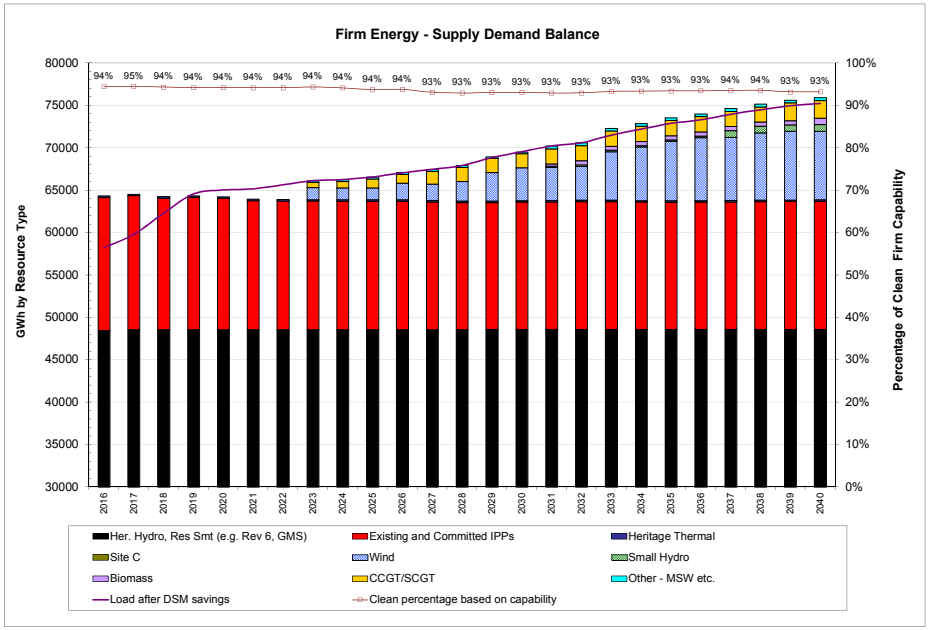

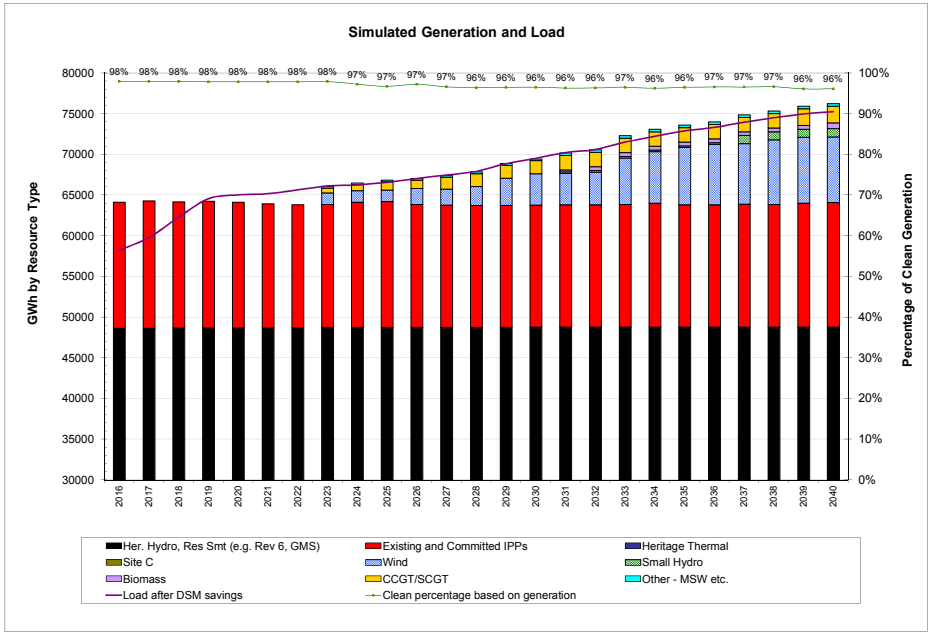

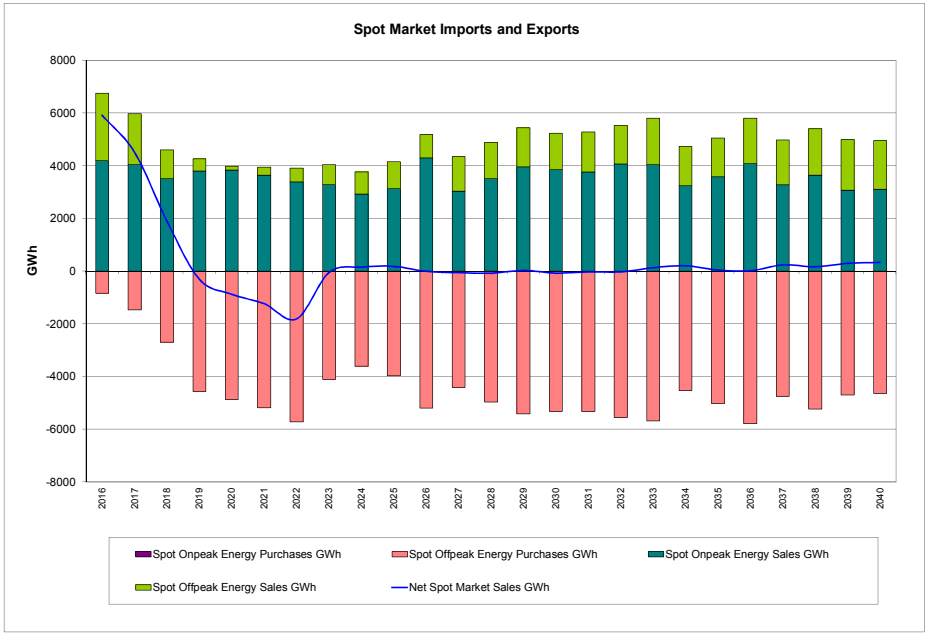

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Low Load & No LNG	Low DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Excluded (clean energy only)	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	4,225
PV of Trade Revenue - $ millions	(3,866)
PV of DSM Option cost - $ millions	2,804
PV of Total Portfolio Cost - $ millions	3,163

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2035	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2037	BCH_REV	Revelstoke Unit 6	500	488	26	26	50

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	1,100	1,100
Firm Energy (GWh)	0	0	0	5,103	5,103

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	1,100	1,100
Firm Energy (GWh)	0	0	0	5,103	5,103

DSM Level in:

2020	5,588 GWh	1,011 MW
2030	7,938 GWh	1,556 MW
2040	10,393 GWh	2,034 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2023	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2023	Shunt compensation at WSN KLY	PR to KN	650
2033	Shunt compensation at NIC and MDN	KN to LM	570
2037	Series compensation of 5L91 and 5L98	SE to KN	147
2038	500 kV circuit 5L46 between KLY and Cheekye	KN to LM	1384

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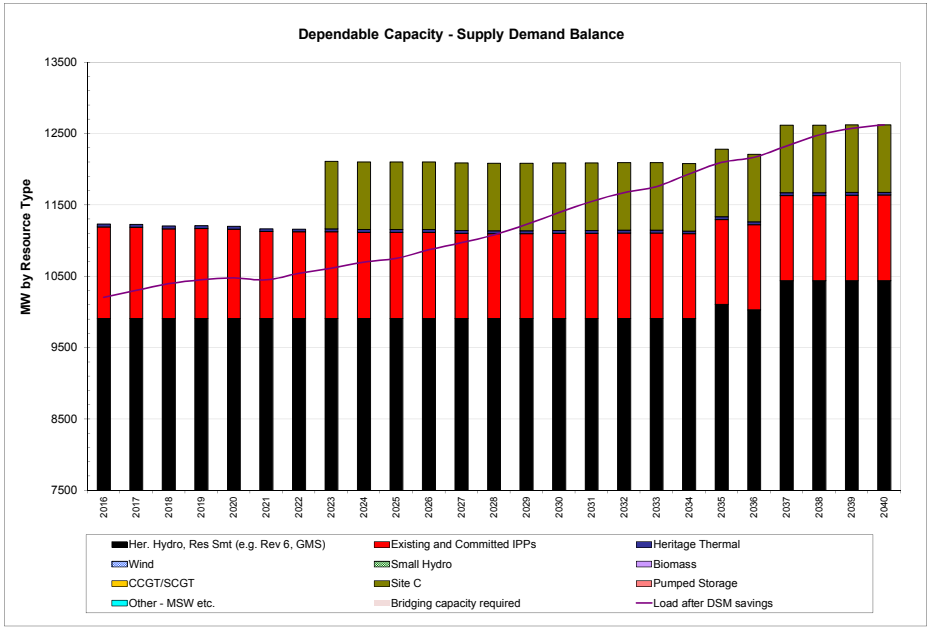

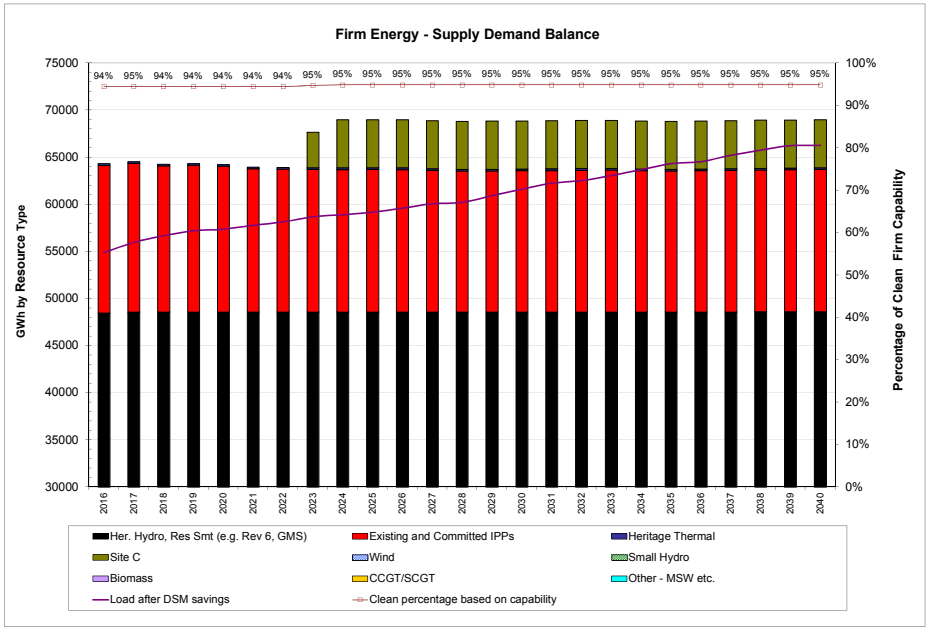

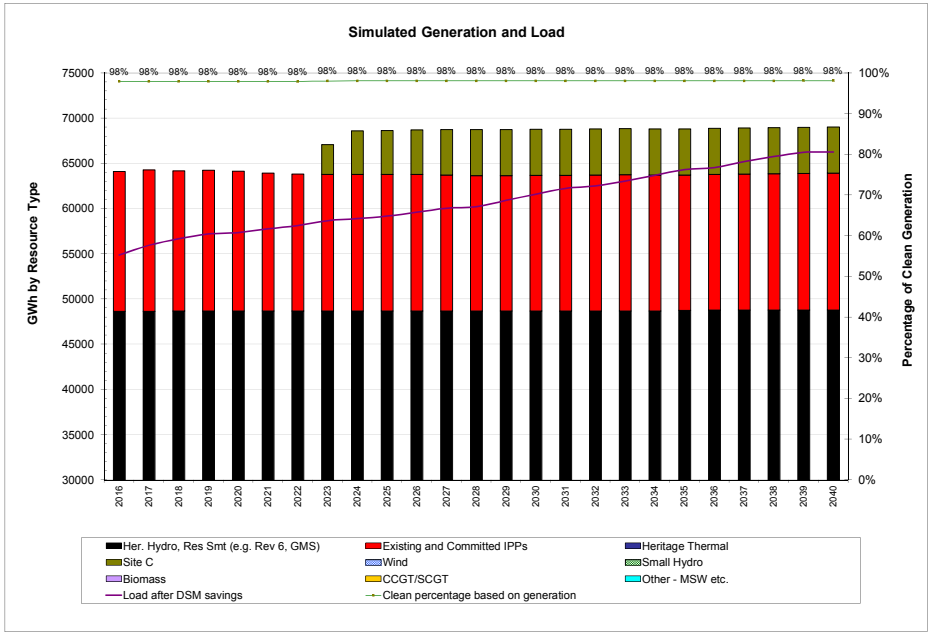

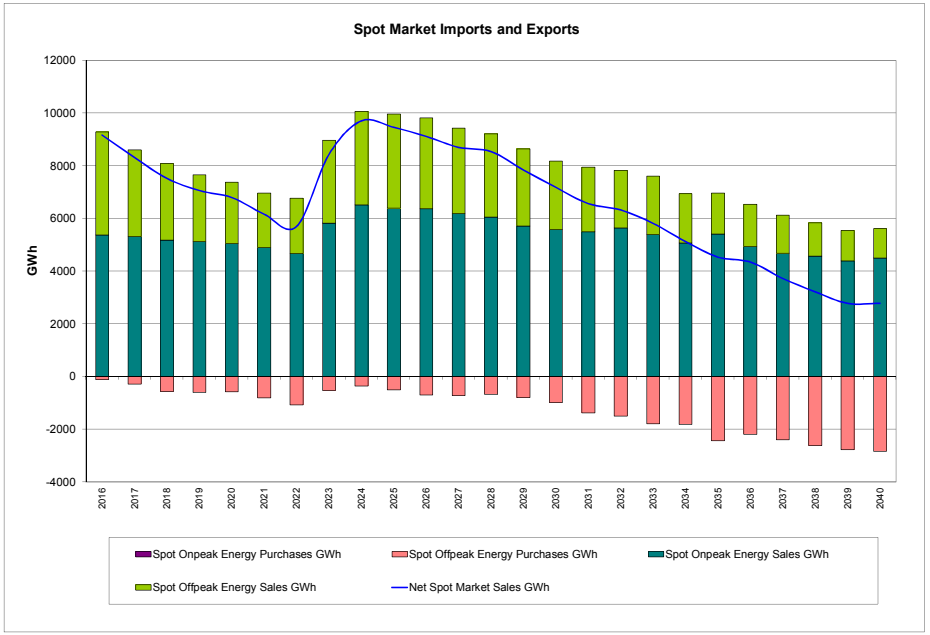

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Low Load & No LNG	Low DSM-Option2(extrapolated)	Scenario 1	Not included	Excluded (clean energy only)	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	1,903
PV of Trade Revenue - $ millions	(2,584)
PV of DSM Option cost - $ millions	2,804
PV of Total Portfolio Cost - $ millions	2,124

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	177	0	1,037	0	1,214
Firm Energy (GWh)	2,591	0	312	0	2,903

DSM Level in:

2020	5,588 GWh	1,011 MW
2030	7,938 GWh	1,556 MW
2040	10,393 GWh	2,034 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2030	Series compensation of 5L91 and 5L98	SE to KN	147
2038	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2029	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2033	BCH_PR	Wind_PC21	99	26	371	371	112
2033	BCH_VI	MSW1_VI	12	12	100	100	127
2033	BCH_LM	MSW2_LM	25	24	208	208	92
2034	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2035	BCH_PR	Wind_PC19	117	30	441	441	113
2037	BCH_PR	Wind_PC28	153	40	591	591	111
2037	BCH_PR	Wind_PC41	45	12	155	155	122
2038	BCH_PR	Wind_PC13	135	35	541	541	113
2039	BCH_PR	Wind_PC16	99	26	377	377	116
2039	BCH_VI	Wind_VI14	35	9	114	114	135

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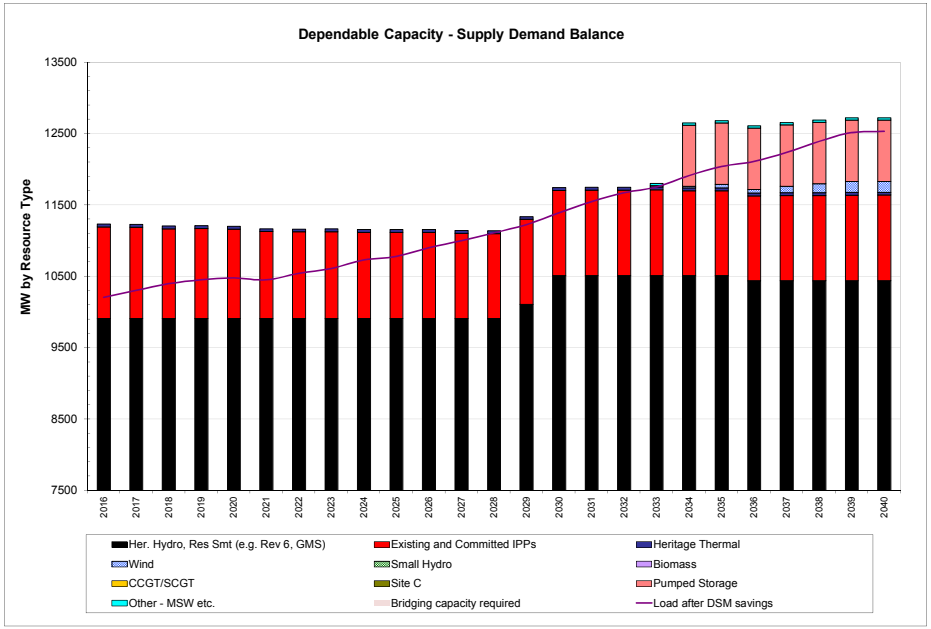

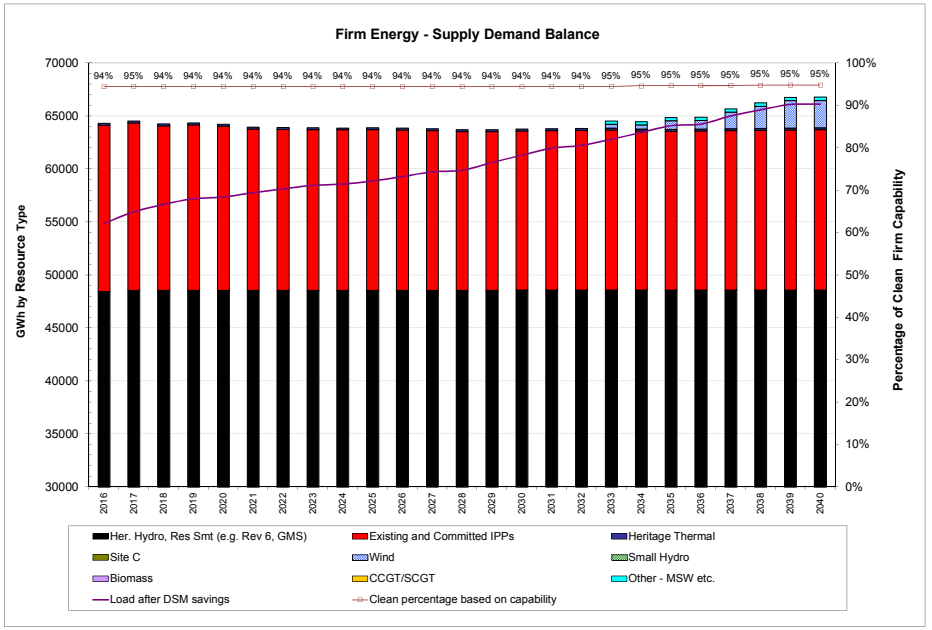

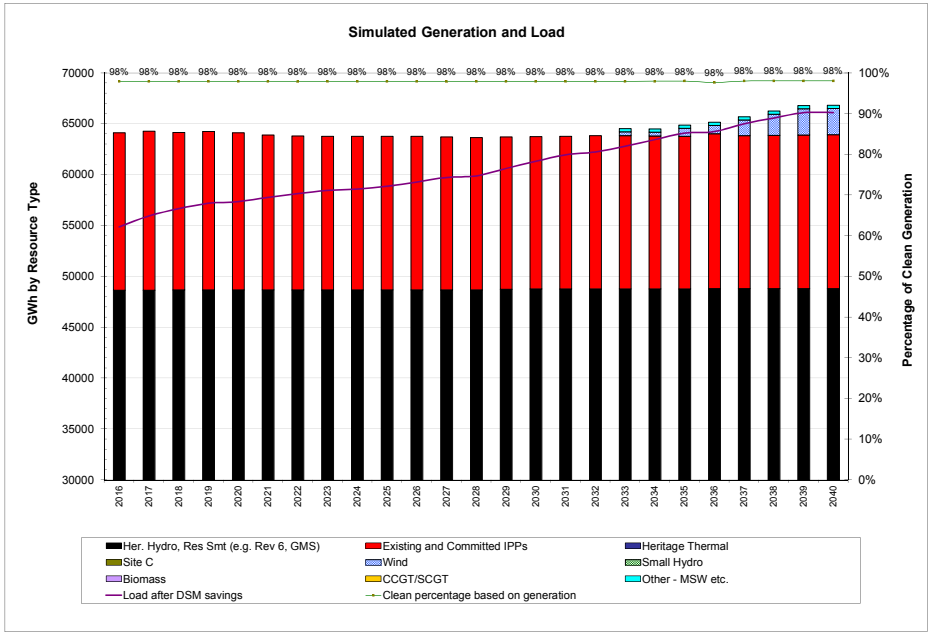

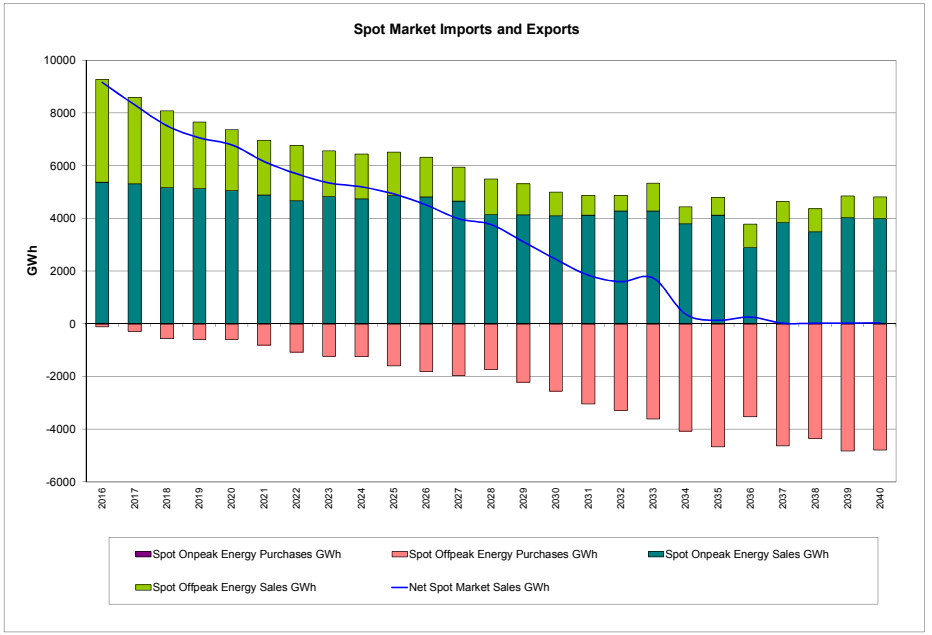

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Low Load & No LNG	Low DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Included	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	4,225
PV of Trade Revenue - $ millions	(3,866)
PV of DSM Option cost - $ millions	2,804
PV of Total Portfolio Cost - $ millions	3,163

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2035	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2037	BCH_REV	Revelstoke Unit 6	500	488	26	26	50

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	1,100	1,100
Firm Energy (GWh)	0	0	0	5,103	5,103

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	1,100	1,100
Firm Energy (GWh)	0	0	0	5,103	5,103

DSM Level in:

2020	5,588 GWh	1,011 MW
2030	7,938 GWh	1,556 MW
2040	10,393 GWh	2,034 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2023	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2023	Shunt compensation at WSN KLY	PR to KN	650
2033	Shunt compensation at NIC and MDN	KN to LM	570
2037	Series compensation of 5L91 and 5L98	SE to KN	147
2038	500 kV circuit 5L46 between KLY and Cheekye	KN to LM	1384

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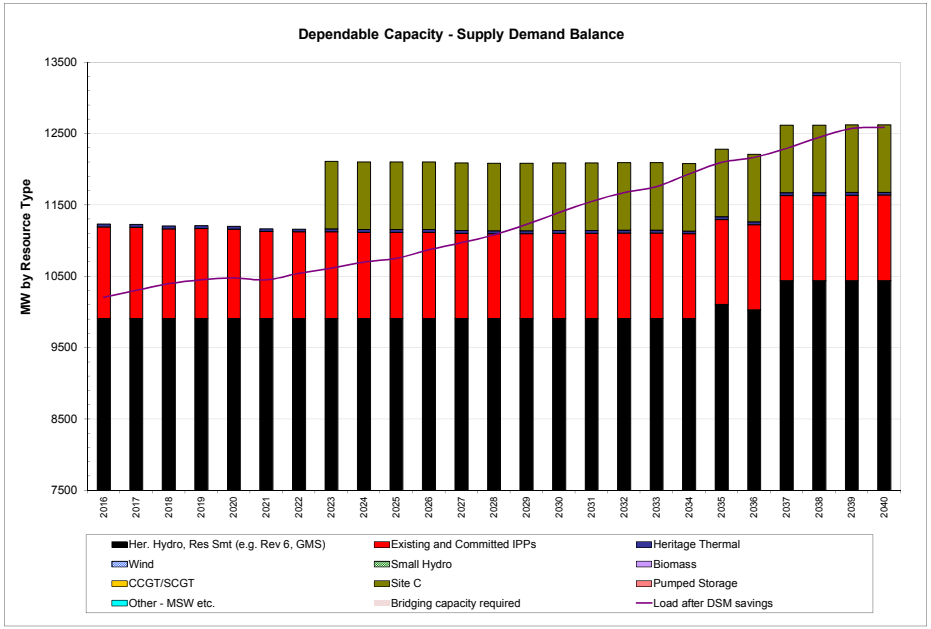

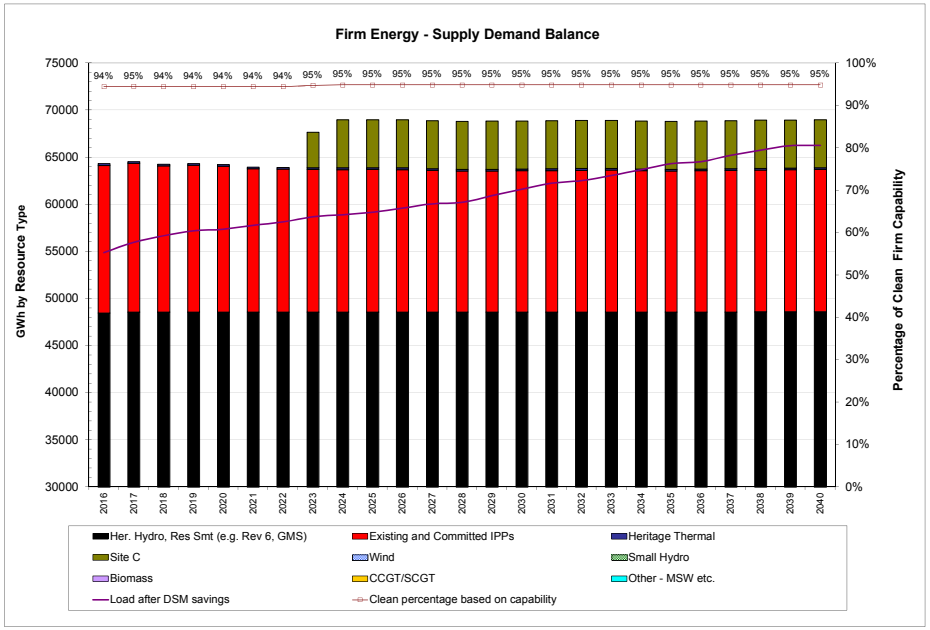

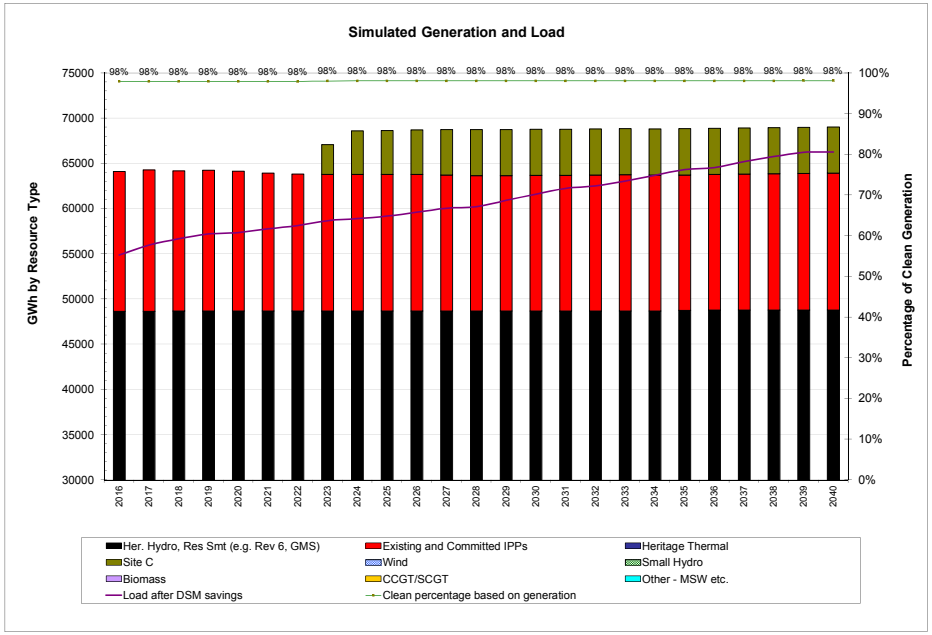

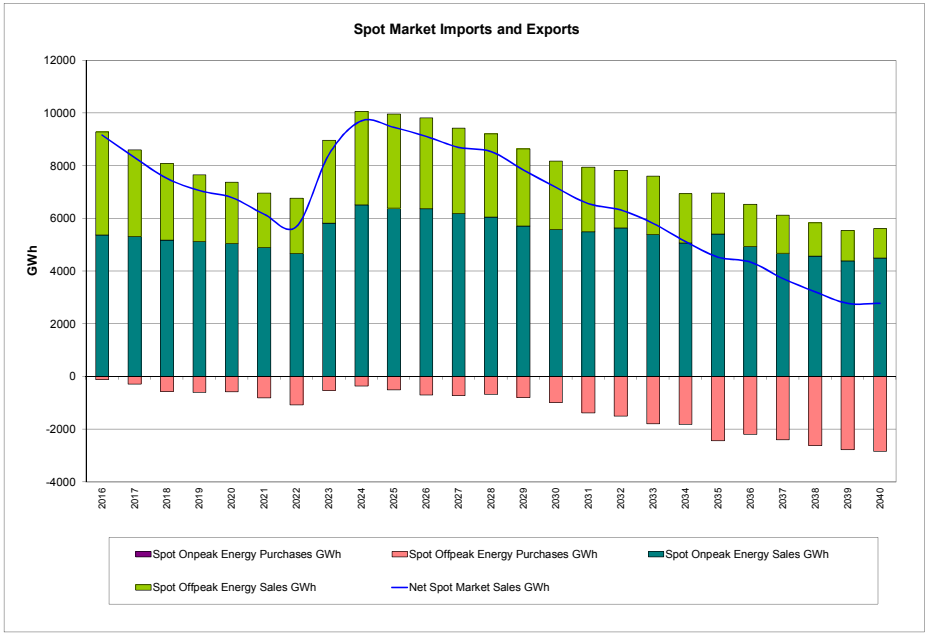

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Low Load & No LNG	Low DSM-Option2(extrapolated)	Scenario 1	Not included	Included	7% IPP CoC, $10 wind adder, Capacity bridging before F2024

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	1,707
PV of Trade Revenue - $ millions	(2,626)
PV of DSM Option cost - $ millions	2,804
PV of Total Portfolio Cost - $ millions	1,885

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	30	0	987	0	1,018
Firm Energy (GWh)	442	0	3,150	0	3,592

Resources Selected

Year	Zone	Resource	Capacity - MW Installed	Capacity - MW Dependable	Energy - GWh Firm	Energy - GWh Total	UEC / UCC $/MWh or $/kW-year
2029	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2033	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2034	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2035	BCH_KN	100 MW SCGT KN	206	196	300	300	88
2036	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2036	BCH_LM	MSW2_LM	25	24	208	208	92
2037	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2037	BCH_LM	Biomass_LM	30	30	239	239	143
2038	BCH_PR	Biomass_PR	28	28	223	223	141
2038	BCH_NC	Biomass_NC	13	13	104	104	147
2038	BCH_CI	Biomass_CI	41	41	327	327	147
2038	BCH_SE	Biomass_SE	33	33	263	263	141
2038	BCH_VI	MSW1_VI	12	12	100	100	127
2038	BCH_VI	Biomass_VI	30	30	239	239	142
2039	BCH_PR	Wind_PC19	117	30	441	441	113
2039	BCH_KN	100 MW SCGT KN	103	98	150	150	88
2039	BCH_KN	Biomass_KN	30	30	239	239	151

DSM Level in:

2020	5,588 GWh	1,011 MW
2030	7,938 GWh	1,556 MW
2040	10,393 GWh	2,034 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	94%
Lowest %	96%	93%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2030	Series compensation of 5L91 and 5L98	SE to KN	147
2033	Shunt compensation at NIC and MDN	KN to LM	570

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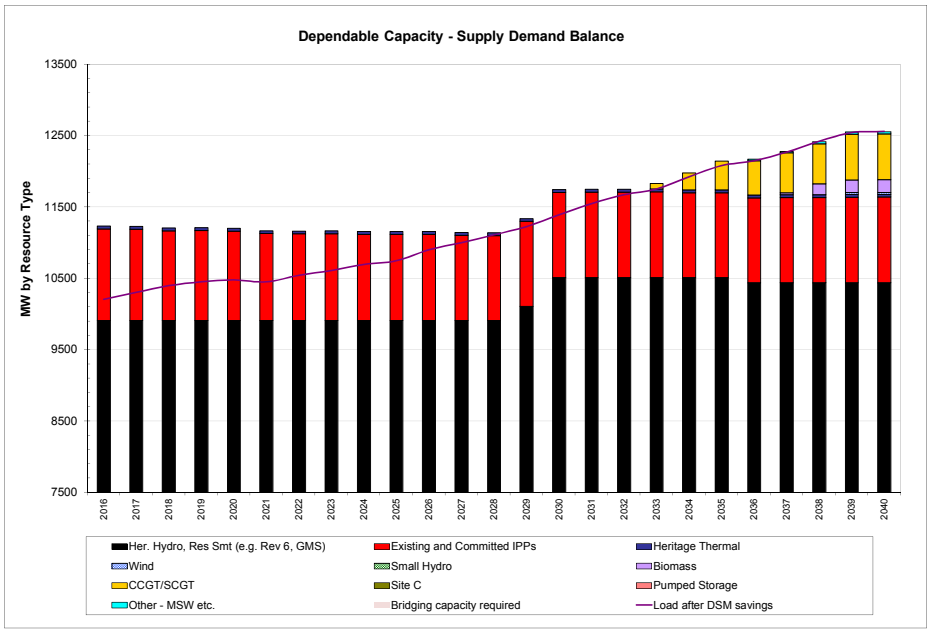

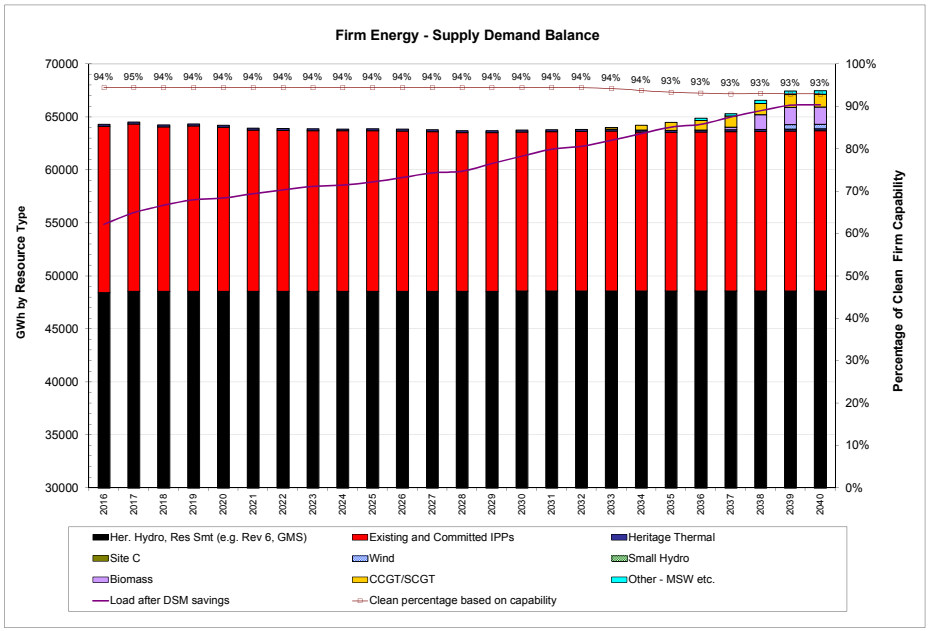

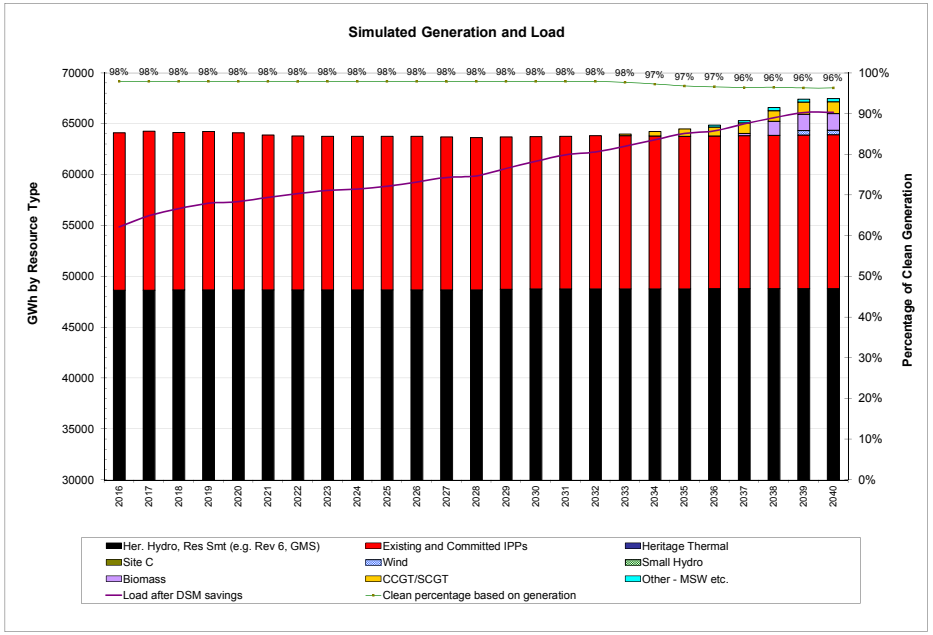

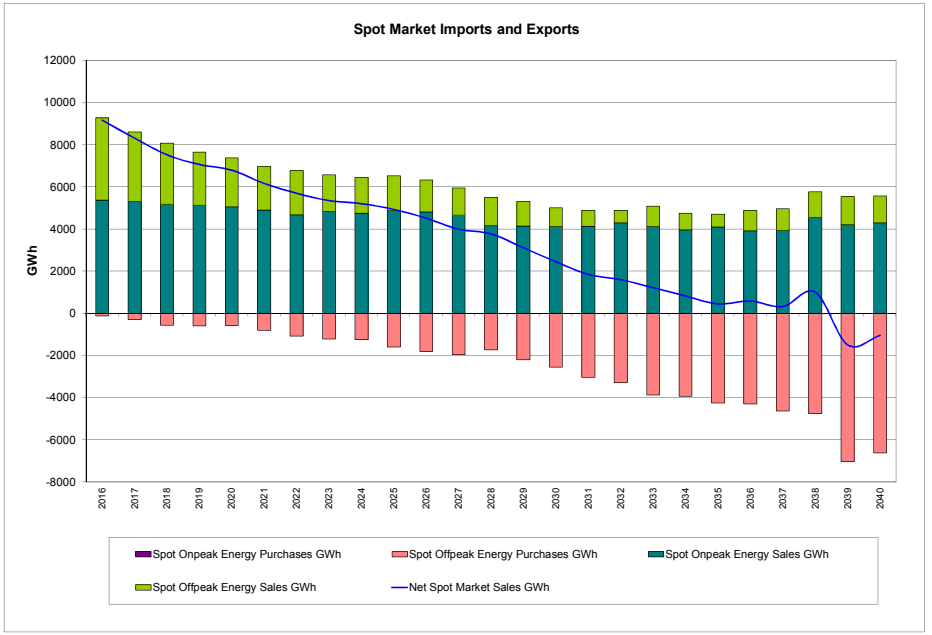

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4.4 Environmental Attributes

The environmental attributes for Site C and its alternative portfolios (equivalent blocks of resources) were compared in section 6.4.6 of the IRP. Site C alternative portfolios include one Clean Generation portfolio and two variations of the Clean + Thermal Generation portfolios as described in section 6.4.2 of the IRP.

In section 6.4.6 of the IRP, only the attributes that BC Hydro determined to provide meaningful comparison were represented. These are shaded in green in the table and were presented in section 6.4.6 of the IRP. The attributes with additional categorization are provided here (Table 9) for completeness.

The advanced level of project definition for Site C allows a high level of accuracy in determining its footprint. In contrast, Site C's alternative portfolios are populated with "typical" projects with estimated footprints. As a result, the environmental attributes presented in this section compare defined attributes for Site C to representative estimates for clean or renewable IPPs. The actual difference in attributes between portfolios cannot be known with certainty. For these reasons, only the overall footprint on land and freshwater is considered meaningful comparison because the additional categorization would rely on specific siting information of the projects in Site C's alternative portfolios when these projects are only meant to be representative.

In terms of atmospheric footprint, GHG emissions and NOx and CO attributes are shown in section 6.4.6 of the IRP. The atmospheric emissions shown were estimated for operating phase emissions associated with fuel combustion (that is, for natural gas-fired generation (**SCGTs**), and wood-based and municipal solid waste biomass resources). As a result, the GHG and air contaminant attributes associated with wind, run-of-river hydro and Site C are zero in this analysis. GHG emissions was shown in section 6.4.6 of the IRP due to the importance of GHG reductions as reflected in Subsection 2(g) of the *Clean Energy Act*. NO_x and CO attributes were shown because these are the two air contaminants with the highest levels of

emissions during operations. In addition, NOx and CO are ozone precursors, and ozone is known to have health effects when above certain concentrations.

Table 9 Environmental Attributes for Site C Vs Supply Side Alternatives

Category	Indicator	Units	Classification	Clean Portfolio	Clean + Thermal (6 SCGT)	Clean + Thermal (4 SCGT)	Site C Portfolio
Land	Footprint	hectares	n/a	2555	1768	2067	5661
	Net primary productivity	ha per class	Low (0 to < 69)	31	23	37	0
			Medium (69 to < 369)	2080	1587	1756	2284
			High (> 369)	444	159	274	3377
	Remoteness - linear disturbance density (km/km2)	ha per class	Wilderness (< 0.2)	1104	643	903	3072
			Remote (0.2 to < 0.66)	219	148	194	478
			Rural (0.66 to 2.2)	779	521	603	1359
			Urban (> 2.2)	453	456	367	752
	High priority species count (percentile)	ha per class	0 to < 20	217	193	250	0
			20 to < 40	997	850	910	0
			40 to < 60	479	368	424	0
			60 to 80	316	58	128	0
			> 80	544	299	355	5661
Freshwater	Affected Stream Length	kilometers	n/a	0	0	0	123
	Priority fish species (number per watershed)	ha per class	No priority species (0)	0	0	0	0
			Low species diversity (1 to 12)	28	3	28	0
			Moderate species diversity (13 to 23)	2526	1764	2038	5661
			High species diversity (24 to 38)	0	0	0	0
	Reservoir Aquatic Area	ha	n/a	0	0	0	9310
Marine	Valued ecological features	ha per class	None (0)	n/a	n/a	n/a	n/a
			Low (1 to 2)	0	0	0	0
			Medium (3 to 5)	0	0	0	0
			High (> 5)	0	0	0	0
	Key commercial bottom fishing areas	ha per class	No bottom fisheries	n/a	n/a	n/a	n/a
			1 bottom fishery	0	0	0	0
			2 to 3 bottom fisheries	0	0	0	0
			> 3 bottom fisheries	0	0	0	0
Atmosphere	GHG emissions	tonnes/year, thousands	Carbon dioxide equivalent	217	657	511	0
	Air contaminant emissions	tonnes/year, thousands	Sulphur dioxide	0.1	0.1	0.1	0
			Oxides of nitrogen	0.3	0.6	0.5	0.0
			Carbon monoxide	0.0	1.3	0.9	0.0
			Volatile organic compounds	0.0	0.0	0.0	0
			Fine particulates - PM2.5	0.0	0.0	0.0	0
			Fine particulates - PM10	0.0	0.0	0.0	0
			Fine particulates - PM total	0.0	0.0	0.0	0
			Mercury	0.0	0.0	0.0	0

Note: The values of the attributes shown include the impacts of associated transmission requirements to the point of interconnection.

Unlike other supply alternatives with average annual energy and capacity, DSM savings increase overtime. The comparison of Site C's environmental attributes against DSM as shown in Table 10 was not done using the "equivalent block" approach but was done based on portfolios created by SO and taking a snap shot for year F2041. The comparison was done for a portfolio with Site C and DSM Option 2, and another portfolio without Site C and DSM Option 3.

Table 10 Environmental Attributes for Site C with DSM Option 2 Vs no Site C with DSM Option 3

Category	Indicator	Units	Classification	DSM2 w/ SiteC (Clean)	DSM3 w/o SiteC (Clean)	DSM2 w/ SiteC (Clean and Thermal)	DSM3 w/o SiteC (Clean and Thermal)
Land	Footprint	hectares	n/a	12179	7577	10809	5114
	Net primary productivity	ha per class	Low (0 to < 69)	52	275	69	280
			Medium (69 to < 369)	6143	4466	5005	3443
			High (> 369)	5984	2837	5735	1390
	Remoteness - linear disturbance density (km/km2)	ha per class	Wilderness (< 0.2)	4390	2295	3912	1912
			Remote (0.2 to < 0.66)	801	478	696	372
			Rural (0.66 to 2.2)	2540	1766	2289	1362
			Urban (> 2.2)	4448	3037	3912	1468
	High priority species count (percentile)	ha per class	0 to < 20	327	436	211	413
			20 to < 40	1572	1665	990	1447
			40 to < 60	1019	1303	509	1046
			60 to 80	1640	1630	1539	548
			> 80	7616	2505	7555	1622
Freshwater	Affected Stream Length	kilometers	n/a	139	39	139	28
	Priority fish species (number per watershed)	ha per class	No priority species (0)	0	0	0	0
			Low species diversity (1 to 12)	962	566	371	209
			Moderate species diversity (13 to 23)	9988	5508	9323	4409
			High species diversity (24 to 38)	1224	1465	1111	459
	Reservoir Aquatic Area	ha	n/a	9310	0	9310	0
Marine	Valued ecological features	ha per class	None (0)	n/a	n/a	n/a	n/a
			Low (1 to 2)	0	22	0	22
			Medium (3 to 5)	0	8	0	8
			High (> 5)	0	0	0	0
	Key commercial bottom fishing areas	ha per class	No bottom fisheries	n/a	n/a	n/a	n/a
			1 bottom fishery	0	69	0	69
			2 to 3 bottom fisheries	0	0	0	0
			> 3 bottom fisheries	0	0	0	0
Atmosphere	GHG emissions	tonnes/year, thousands	Carbon dioxide equivalent	217	217	1025	1172
	Air contaminant emissions	tonnes/year, thousands	Sulphur dioxide	0.1	0.2	0.1	0
			Oxides of nitrogen	0.8	1.6	1.2	2.1
			Carbon monoxide	0.8	2.0	2.8	4.5
			Volatile organic compounds	0.0	0.1	0.0	0
			Fine particulates - PM2.5	0.0	0.0	0.0	0
			Fine particulates - PM10	0.3	0.6	0.1	1
			Fine particulates - PM total	0.5	1.3	0.3	1
			Mercury	0.0	0.0	0.0	0

4.5 Economic Development Attributes

The economic development attributes for Site C and its alternative portfolios (equivalent blocks of resources) were compared in section 6.4.7 of the IRP. The Site C alternative portfolios include one Clean Generation portfolio and two variations of the Clean + Thermal Generation portfolios as described in section 6.4.2 of the IRP.

Table 11 shows the complete list of economic development attributes and these attributes were provided for both the discrete construction period as well as the ongoing operations period. The effects of respending the money saved in the lower resource cost portfolio/block have not been captured in this calculation. Furthermore, the benefits shown have no account of time value.

The differences in economic development attributes are generally consistent across all indicators and classifications, although they vary between the construction and operations phases. As a result, to simplify the analysis BC Hydro selected three economic development attributes as indicative of the construction and operations attributes of the portfolios. These are shaded in green in the table and were presented in section 6.4.7 of the IRP. The other attributes were not material to the comparison of portfolios.

Table 11 Economic Development Attributes for Site C Vs Supply Side Alternatives

Category	Indicator	Units	Classification	Clean Portfolio	Clean + Thermal (6 SCGT)	Clean + Thermal (4 SCGT)	Site C Portfolio
Provincial GDP	Construction period GDP	dollars, millions	Direct	469	306	319	792
			Indirect	1,670	1,069	1,133	2,336
			Induced	374	241	254	548
			Total	2,513	1,616	1,706	3,676
	Operations period GDP	dollars, millions per year	Direct	43	30	30	10
			Indirect	40	68	58	3
			Induced	15	14	14	2
Employment	Construction period employment	jobs	Direct	5,777	3,767	3,927	9,754
			Indirect	20,578	13,253	14,025	27,997
			Induced	4,434	2,852	3,012	6,497
			Total	30,788	19,872	20,963	44,249
	Operations period employment	jobs per year	Direct	315	275	277	25
			Indirect	510	542	517	29
			Induced	173	168	164	20
			Total	998	985	958	74
Provincial Government Revenue	Construction period revenue	dollars, millions	Direct	71	47	49	125
			Indirect	235	152	161	320
			Induced	49	32	34	72
	Operations period revenue	dollars, millions per year	Direct	29	23	24	4
			Indirect	6	10	8	0
			Induced	2	2	2	0

Unlike other supply alternatives with distinct investments and average annual energy and capacity, DSM savings persist and increase overtime as more investments are made. As a result, the comparison of Site C's economic development attributes against DSM could not be done with an "equivalent block" approach. The results shown in Table 12 was done based on portfolios created by SO with the benefits discounted to F2013.

Table 12 Economic Development Attributes for Site C with DSM Option 2 Vs no Site C with DSM Option 3

Category	Indicator	Units	Classification	DSM2 w/ SiteC (Clean)	DSM3 w/o SiteC (Clean)	DSM2 w/ SiteC (Clean and Thermal)	DSM3 w/o SiteC (Clean and Thermal)
Provincial GDP	Construction period GDP	dollars, millions	Direct	3,106	3,301	3,025	3,160
			Indirect	3,257	2,519	3,016	2,170
			Induced	1,107	1,011	1,050	923
			Total	7,470	6,831	7,090	6,253
	Operations period GDP	dollars, millions per year	Direct	450	327	491	462
			Indirect	231	271	354	489
			Induced	99	107	107	129
Employment	Construction period employment	jobs	Direct	63,890	69,087	60,804	64,517
			Indirect	78,865	65,813	70,079	55,307
			Induced	22,061	20,331	20,018	17,684
			Total	164,816	155,231	150,901	137,508
	Operations period employment	jobs per year	Direct	7,424	8,775	7,314	9,664
			Indirect	7,543	11,049	7,149	11,567
			Induced	2,803	4,079	2,637	4,001
			Total	17,770	23,902	17,100	25,232
Provincial Government Revenue	Construction period revenue	dollars, millions	Direct	359	365	346	344
			Indirect	446	348	412	299
			Induced	146	134	139	122
	Operations period revenue	dollars, millions per year	Direct	148	184	162	170
			Indirect	35	43	51	73
			Induced	13	14	14	17

5 Portfolio Analysis – LNG and the North Coast

Section 6.5 of the IRP presents the analyses that test different options to meet incremental resource requirements to serve LNG, particularly in the North Coast.

5.1 Modelling Assumptions

Figure 3 illustrates the modelling assumptions used to create the portfolios discussed in section 6.5 of the IRP.

Figure 3 Modelling Map - LNG and the North Coast

Modelling Map				
Uncertainties/Scenarios				
Market Prices	Scenario 2 Low	Scenario 1 Mid	Scenario 3 High	
Load Forecast	Low	Mid	High	
DSM deliverability	Low	Mid	High	
LNG Load Scenarios	Prior to Expected LNG	800 GWh	3000 GWh	6600 GWh
Resource choices				
Usage of 7% non-clean for non LNG load	Yes	No		
DSM Options	DSM Option 1	DSM Target/ Option 2	DSM Option 3	
Site C (all units in) timing	F2024	F2026	No Site C	
LNG Supply Options, see individual portfolio description				
Modelling Assumptions and Parameters				
BCH/IPP Cost of Capital	5/7	5/6		
Pumped Storage as Option	Yes	No		
Site C Capital Cost		Base	Base plus 10%	
Wind Integration Cost	$5/MWh	$10/MWh	$15/MWh	
	shows the modeling assumptions			

5.2 Portfolio PV Differences

Table 13 provides details supporting the portfolio PV difference shown in section 6.5.5 of the IRP to meet electricity needs prior to Site C in-service.

Table 13 Portfolio PV for LNG Supply Options Prior to Site C

Section in the IRP	LNG Supply Options Prior to Site C	Portfolio name Portfolio PV (M$)	Portfolio PV Saving from Reference Portfolio (M$)
6.5.5 Comparison of Alternative Supply Options to meet needs prior to Site C	1. Integrated system supply with short term energy and capacity needs bridged until Site C in service	M&M_1LV_2N0_05W 8,406	490
	2. Integrated system supply with short term energy needs bridged until Site C in service and with Revelstoke Unit 6 built to meet capacity needs	M&M_1LC_2N0_05T 8,776	120
	3. Dependable capacity in the form of gas fired generation developed locally with short term energy needs bridged until Site C in service	M&M_1LT_2N0_05X 8,610	280
	4. Dependable capacity in the form of gas fired generation developed locally along with renewable energy resources built to meet energy deficit prior to Site C in service	M&M_1LT_2N0_05Y 8,893	Reference Portfolio

Table 14 provides details supporting the portfolio PV difference shown in section 6.5.5 of the IRP to meet long term electricity needs due to high LNG.

Table 14 Portfolio PV for LNG Long Term Supply Options

Section in the IRP	LNG Long Term Supply Options	Portfolio name Portfolio PV (M$)	Portfolio PV Saving from Reference Portfolio (M$)
6.5.5 Comparison of Alternative Options to meet long term System Needs due to High LNG	i. Integrated system supply facilitated by the addition of a second 500 kV line	M&M_1LT_8N0_05K 13,402	Reference Portfolio
	ii. Local gas-fired capacity with renewable energy resources sourced locally or from the integrated system	M&M_1LT_8N0_05I 12,697	710
	iii. Local gas-fired capacity with units being relied upon for firm energy and operated as base-loaded units	M&M_1LT_8N0_05H 11,303	2,100
	iv. Local gas-fired capacity with the units being relied upon for firm energy but mostly dispatched off in favour of lower cost surplus or non-firm energy from the integrated system or market imports	M&M_1LT_8N0_05J 10,502	2,900

5.3 Portfolio Output

The portfolio output sheets for these portfolios are included on the following pages.

Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & Expected LNG	Mid DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Included	7% IPP CoC, $10 wind adder, LNG Prior to Site C Supply Option 1

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	6,378
PV of Trade Revenue - $ millions	(1,227)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	8,406

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	10	130	1,100	1,240
Firm Energy (GWh)	0	175	463	5,103	5,741

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	386	10	1,469	1,100	2,965
Firm Energy (GWh)	5,414	175	1,392	5,103	12,084

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	97%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2019	Series compensation of WSN-GLN 500 kV line	CI to NC	500
2023	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2023	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2023	Shunt compensation at WSN KLY	PR to KN	650
2028	Series compensation of 5L91 and 5L98	SE to KN	147
2029	Shunt compensation at NIC and MDN	KN to LM	570
2038	500kV circuit 5L14 between WSN and KLY	CI to KN	2120

Resources Selected

Year	Zone	Resource	Capacity - MW Installed	Capacity - MW Dependable	Energy - GWh Firm	Energy - GWh Total	UEC / UCC $/MWh or $/kW-year
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2028	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2030	BCH_NC	100 MW SCGT NC	103	98	150	150	88
2030	BCH_VI	MSW1_VI	12	12	100	100	127
2030	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2030	BCH_LM	MSW2_LM	25	24	208	208	92
2031	BCH_NC	100 MW SCGT NC	206	196	300	300	88
2031	BCH_VI	Wind_VI14	35	9	114	114	135
2031	BCH_VI	Biomass_VI	30	30	239	239	142
2032	BCH_NC	100 MW SCGT NC	103	98	150	150	88
2032	BCH_LM	Biomass_LM	30	30	239	239	143
2033	BCH_PR	Wind_PC19	117	30	441	441	113
2033	BCH_PR	Wind_PC21	99	26	371	371	112
2033	BCH_PR	Wind_PC28	153	40	591	591	111
2033	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2034	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2035	BCH_PR	Wind_PC13	135	35	541	541	113
2036	BCH_PR	Wind_PC16	99	26	377	377	116
2037	BCH_PR	Wind_PC15	108	28	382	382	119
2037	BCH_PR	Wind_PC26	126	33	416	416	127
2038	BCH_PR	Wind_PC14	144	37	527	527	117
2039	BCH_PR	Wind_PC11	126	33	473	473	122
2040	BCH_PR	Wind_PC41	45	12	155	155	122

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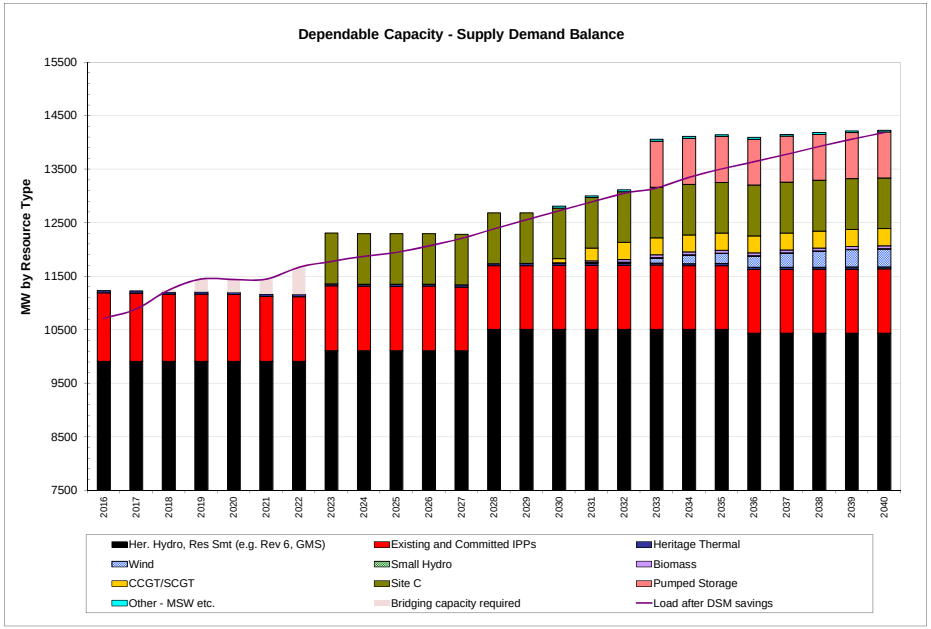

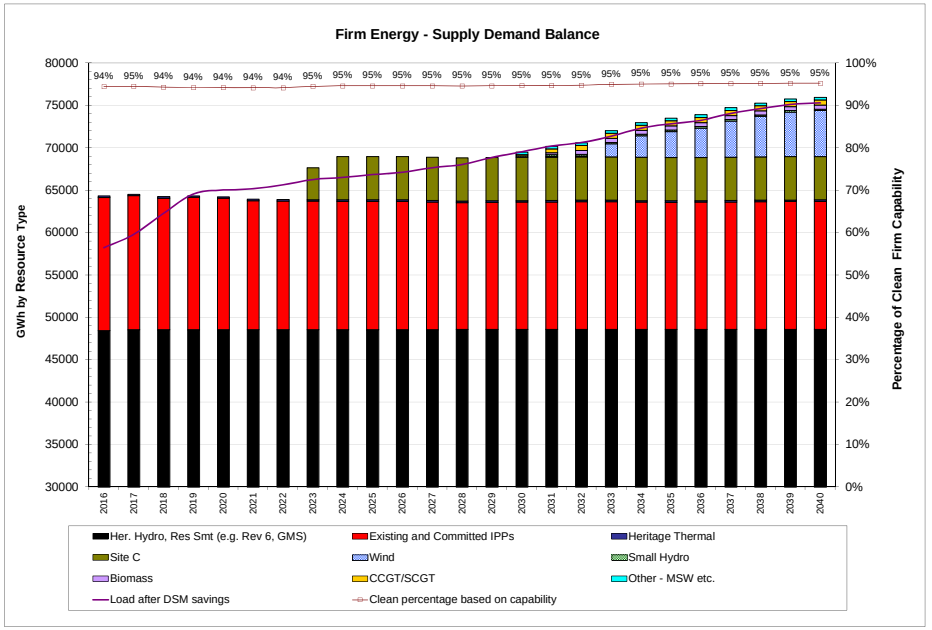

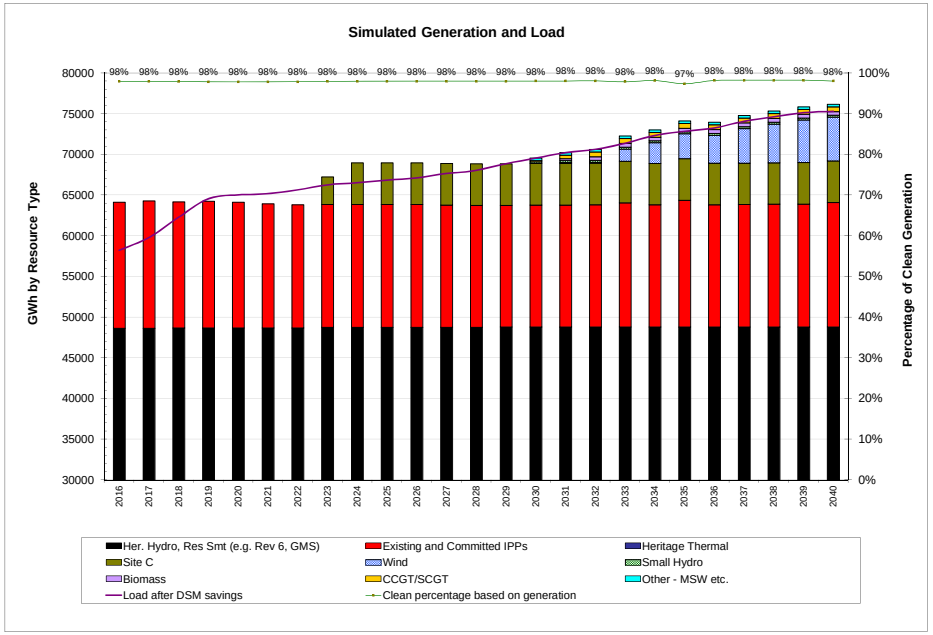

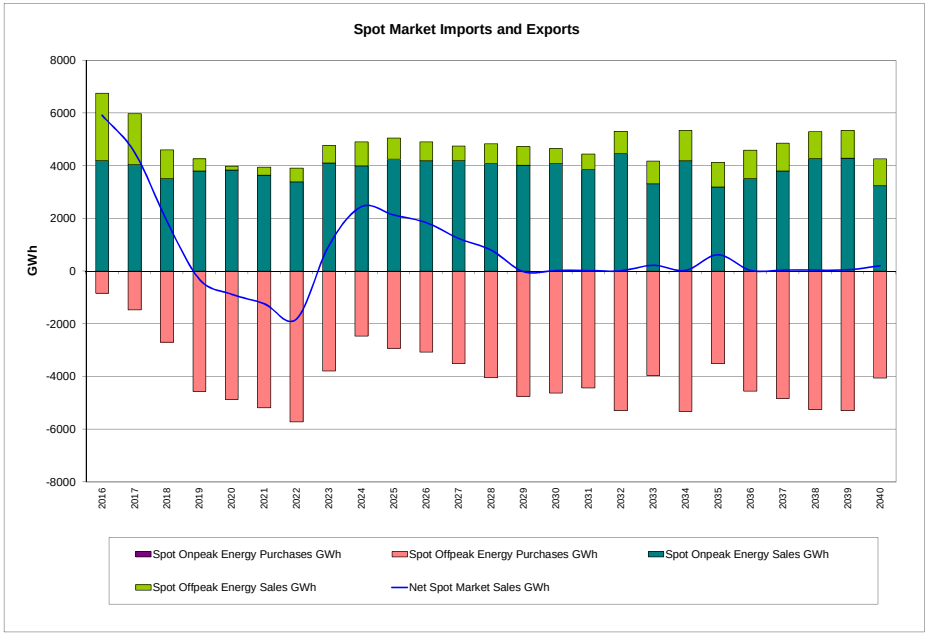

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & Expected LNG	Mid DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Excluded (clean energy only)	7% IPP CoC, $10 wind adder, LNG Prior to Site C Supply Option 2

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	6,729
PV of Trade Revenue - $ millions	(1,207)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	8,776

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	47	0	37	1,100	1,183
Firm Energy (GWh)	697	0	312	5,103	6,113

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	468	12	2,097	1,100	3,677
Firm Energy (GWh)	6,578	347	791	5,103	12,819

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2019	Series compensation of WSN-GLN 500 kV line	CI to NC	500
2019	Series compensation of 5L91 and 5L98	SE to KN	147
2023	Shunt compensation at WSN KLY	PR to KN	650
2028	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2028	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2029	Shunt compensation at NIC and MDN	KN to LM	570
2038	500kV circuit 5L8 between GMS and WSN	PR to CI	1470
2039	500kV circuit 5L14 between WSN and KLY	CI to KN	2120

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2019	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2028	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2030	BCH_PR	Wind_PC13	135	35	541	541	113
2030	BCH_PR	Wind_PC41	45	12	155	155	122
2030	BCH_VI	MSW1_VI	12	12	100	100	127
2030	BCH_LM	MSW2_LM	25	24	208	208	92
2031	BCH_PR	Wind_PC19	117	30	441	441	113
2031	BCH_PR	Wind_PC28	153	40	591	591	111
2031	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2032	BCH_PR	Wind_PC21	99	26	371	371	112
2033	BCH_PR	Wind_PC15	108	28	382	382	119
2033	BCH_PR	Wind_PC16	99	26	377	377	116
2034	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2035	BCH_PR	Wind_PC14	144	37	527	527	117
2035	BCH_VI	Wind_VI12	48	12	150	150	135
2036	BCH_PR	Wind_PC42	63	16	219	219	122
2037	BCH_PR	Wind_PC09	207	54	713	713	122
2038	BCH_PR	Wind_PC20	159	41	610	610	119
2038	BCH_VI	Biomass_VI	30	30	239	239	142
2038	BCH_LM	Biomass_LM	30	30	239	239	143
2039	BCH_PR	Wind_PC11	126	33	473	473	122
2039	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2039	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2040	BCH_KN	Run of River KN 90_100	72	2	172	221	108

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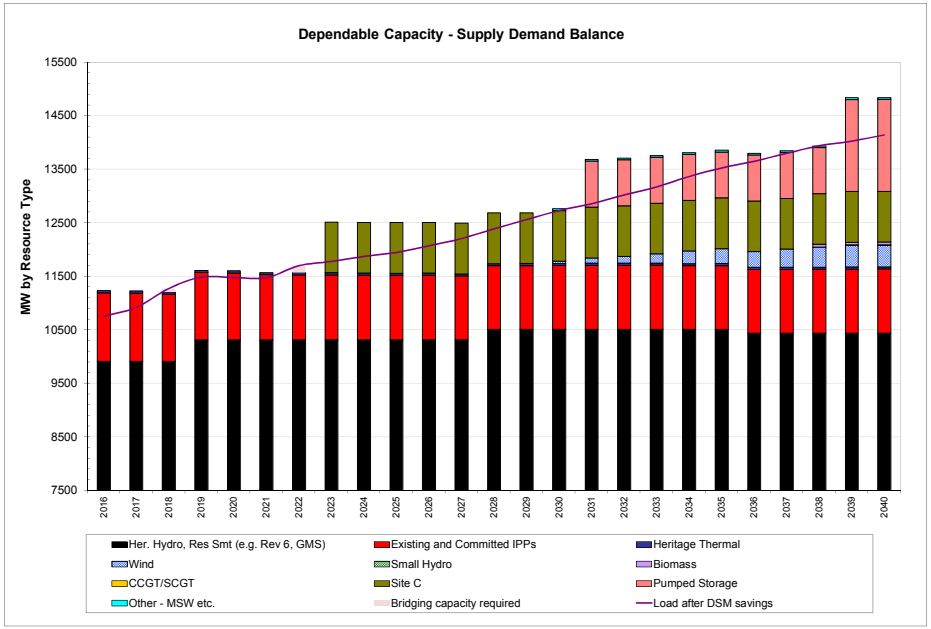

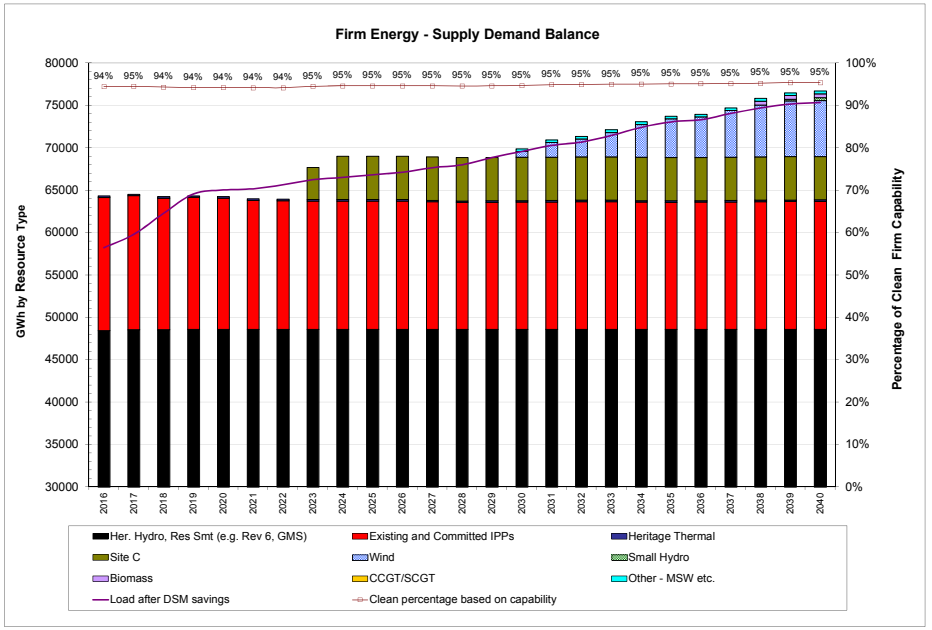

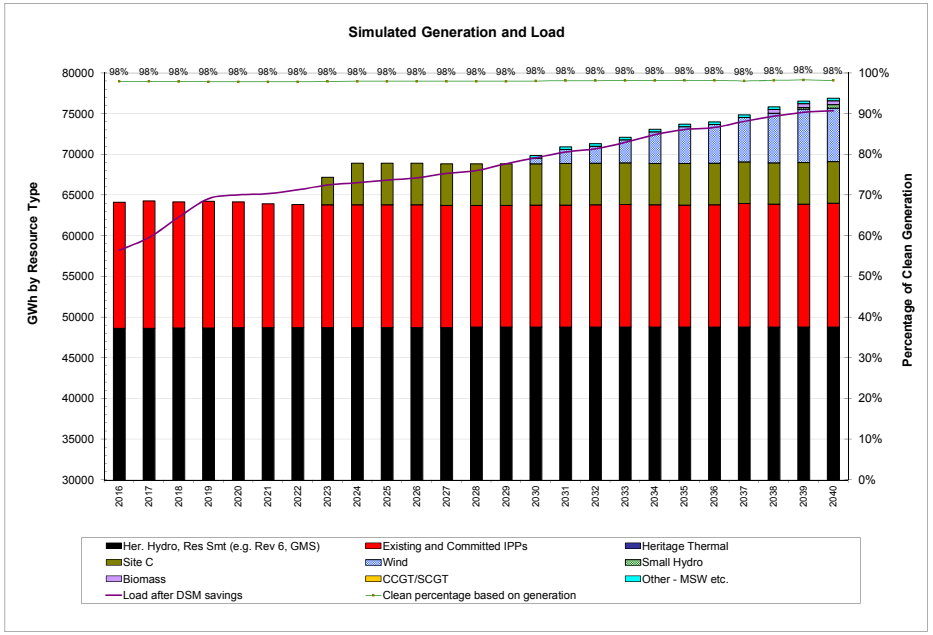

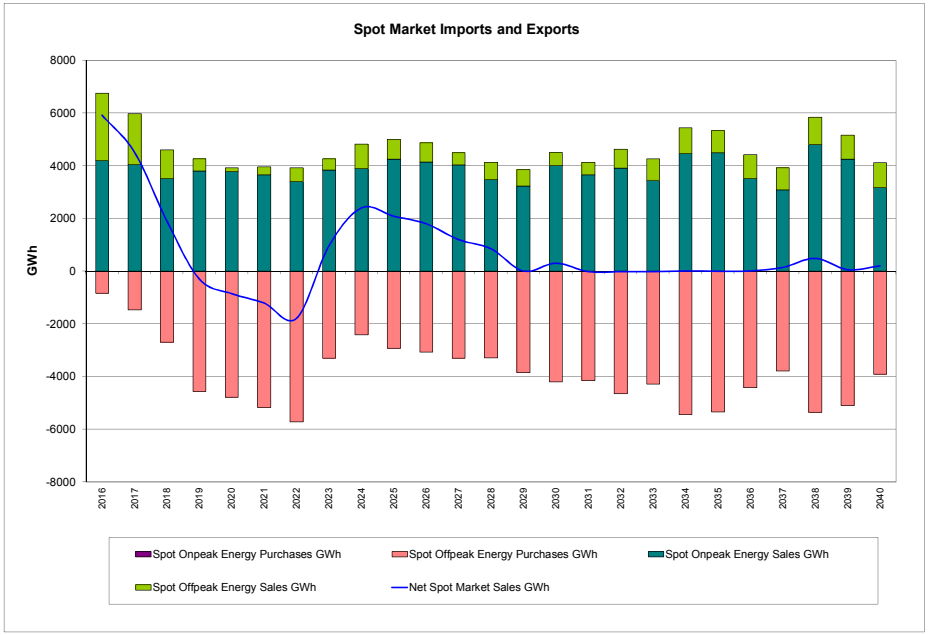

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & Expected LNG	Mid DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Included	7% IPP CoC, $10 wind adder, LNG Prior to Site C Supply Option 3

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	6,713
PV of Trade Revenue - $ millions	(1,357)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	8,610

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	373	0	373
Firm Energy (GWh)	0	0	601	0	601

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	373	1,100	1,473
Firm Energy (GWh)	0	0	601	5,103	5,705

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	387	10	1,469	1,100	2,967
Firm Energy (GWh)	5,516	175	1,392	5,103	12,187

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2023	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2023	Shunt compensation at WSN KLY	PR to KN	650
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147
2038	500kV circuit 5L8 between WSN and KLY	CI to KN	2120

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2018	BCH_NC	100 MW SCGT NC	206	196	300	300	88
2019	BCH_NC	100 MW SCGT NC	206	196	300	300	88
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2031	BCH_VI	Wind_VI14	35	9	114	114	135
2031	BCH_VI	MSW1_VI	12	12	100	100	127
2031	BCH_VI	Biomass_VI	30	30	239	239	142
2031	BCH_LM	MSW2_LM	25	24	208	208	92
2032	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2032	BCH_LM	Biomass_LM	30	30	239	239	143
2033	BCH_PR	Wind_PC19	117	30	441	441	113
2033	BCH_PR	Wind_PC21	99	26	371	371	112
2033	BCH_PR	Wind_PC28	153	40	591	591	111
2033	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2034	BCH_PR	Wind_PC13	135	35	541	541	113
2034	BCH_PR	Wind_PC14	144	37	527	527	117
2035	BCH_PR	Wind_PC20	159	41	610	610	119
2036	BCH_PR	Wind_PC16	99	26	377	377	116
2037	BCH_PR	Wind_PC09	207	54	713	713	122
2038	BCH_PR	Wind_PC15	108	28	382	382	119
2039	BCH_PR	Wind_PC11	126	33	473	473	122
2040	BCH_PR	Wind_PC41	45	12	155	155	122
2040	BCH_PR	Wind_PC42	63	16	219	219	122

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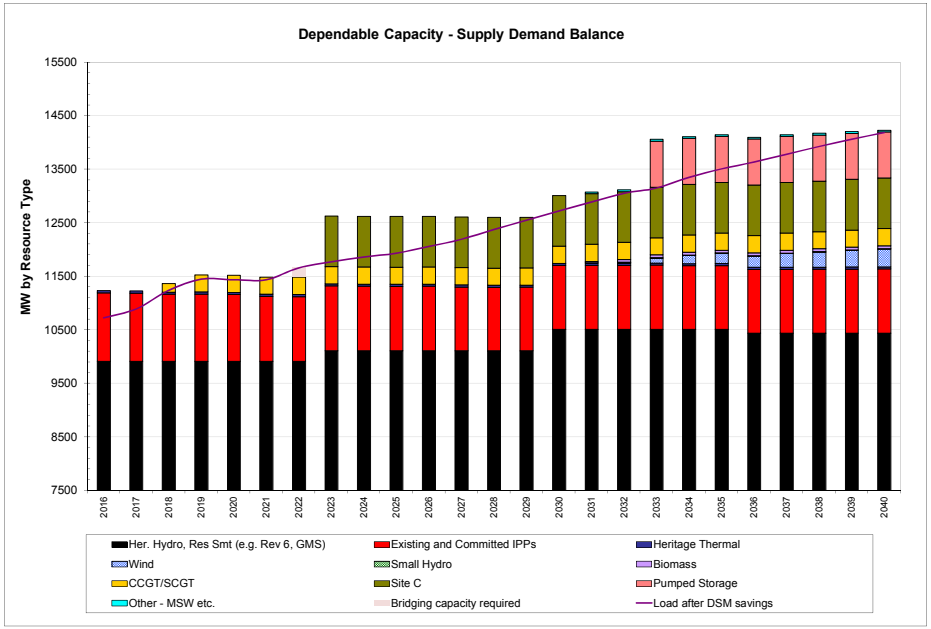

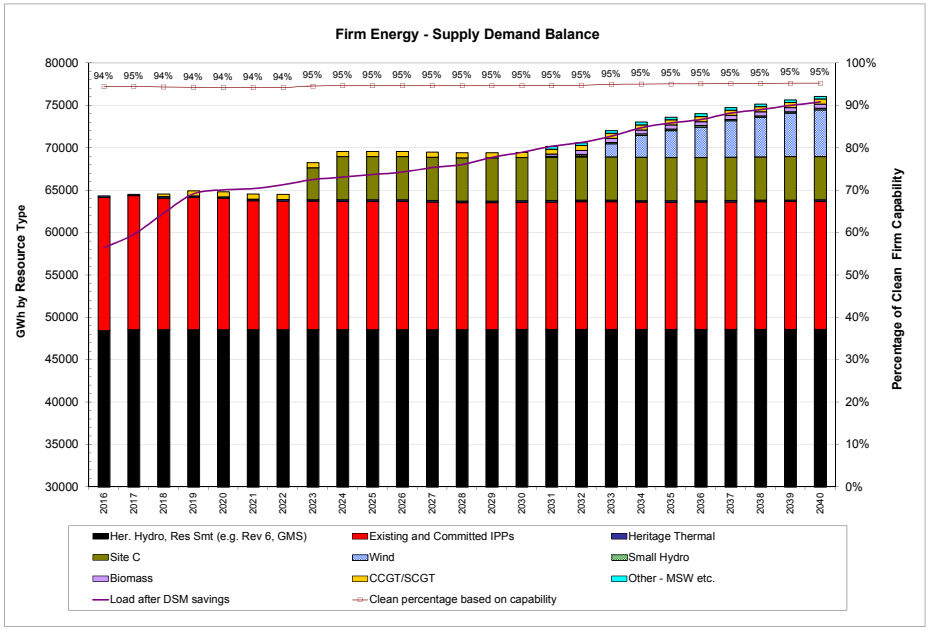

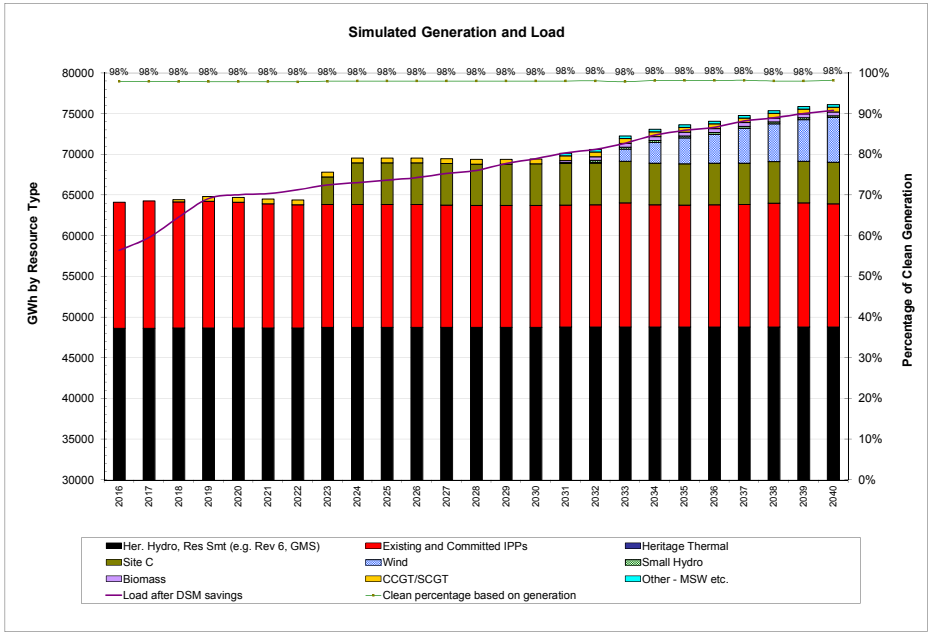

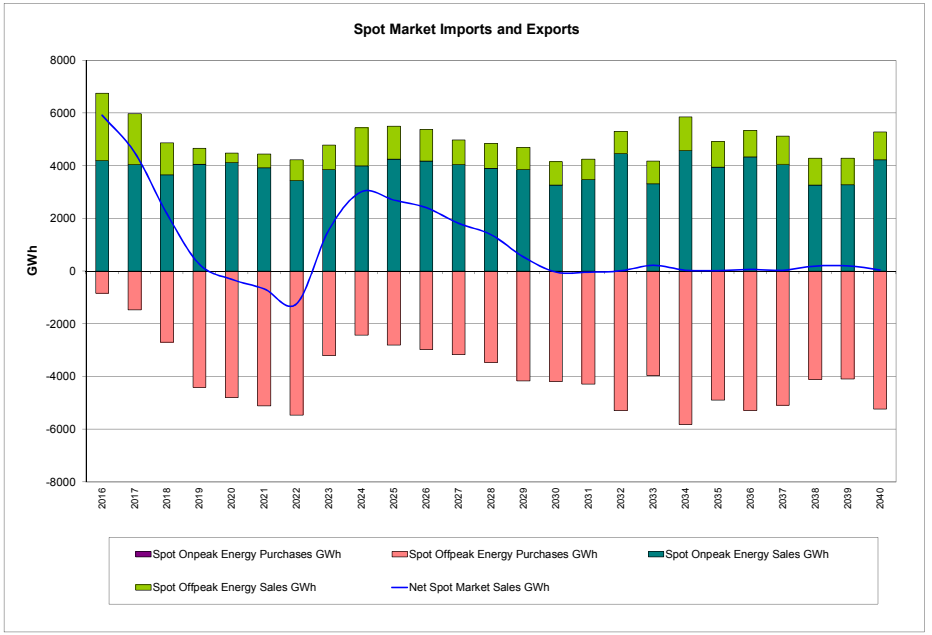

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & Expected LNG	Mid DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Included	7% IPP CoC, $10 wind adder, LNG Prior to Site C Supply Option 4

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	7,132
PV of Trade Revenue - $ millions	(1,494)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	8,893

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	398	0	398
Firm Energy (GWh)	0	0	812	0	812

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	40	0	398	1,100	1,537
Firm Energy (GWh)	591	0	812	5,103	6,507

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	402	10	1,439	1,100	2,951
Firm Energy (GWh)	5,713	175	1,153	5,103	12,145

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	96%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2023	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2023	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2023	Shunt compensation at WSN KLY	PR to KN	650
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147
2038	500kV circuit 5L14 between WSN and KLY	CI to KN	2120

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2018	BCH_NC	100 MW SCGT NC	206	196	300	300	88
2019	BCH_NC	100 MW SCGT NC	206	196	300	300	88
2020	BCH_LM	MSW2_LM	25	24	208	208	92
2021	BCH_PR	Wind_PC28	153	40	591	591	111
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2032	BCH_VI	Biomass_VI	30	30	239	239	142
2033	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2033	BCH_PR	Wind_PC19	117	30	441	441	113
2033	BCH_PR	Wind_PC21	99	26	371	371	112
2033	BCH_VI	MSW1_VI	12	12	100	100	127
2034	BCH_PR	Wind_PC13	135	35	541	541	113
2034	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2035	BCH_PR	Wind_PC15	108	28	382	382	119
2035	BCH_PR	Wind_PC16	99	26	377	377	116
2036	BCH_PR	Wind_PC41	45	12	155	155	122
2037	BCH_PR	Wind_PC20	159	41	610	610	119
2037	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2038	BCH_PR	Wind_PC11	126	33	473	473	122
2039	BCH_PR	Wind_PC14	144	37	527	527	117
2040	BCH_PR	Wind_PC42	63	16	219	219	122

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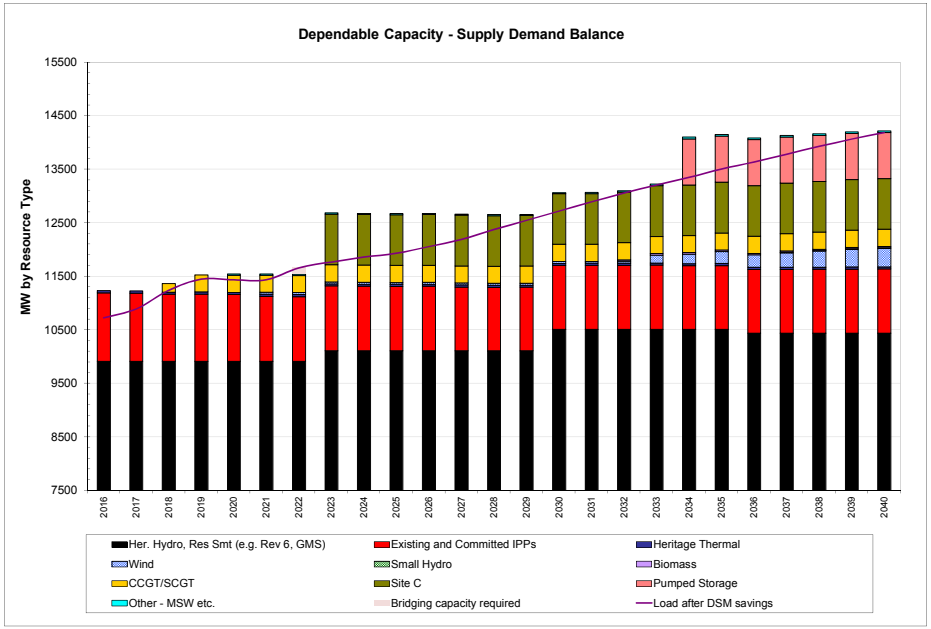

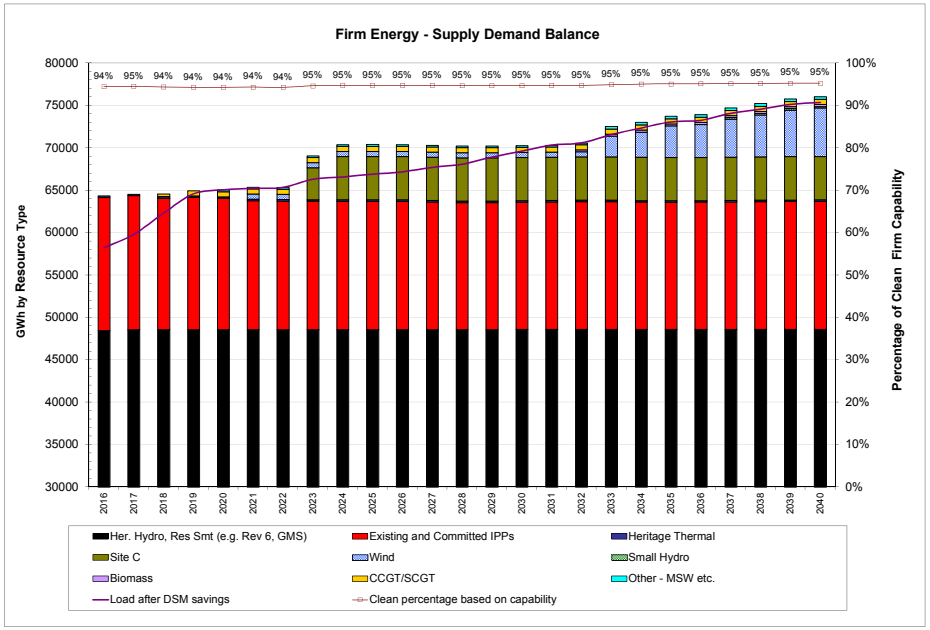

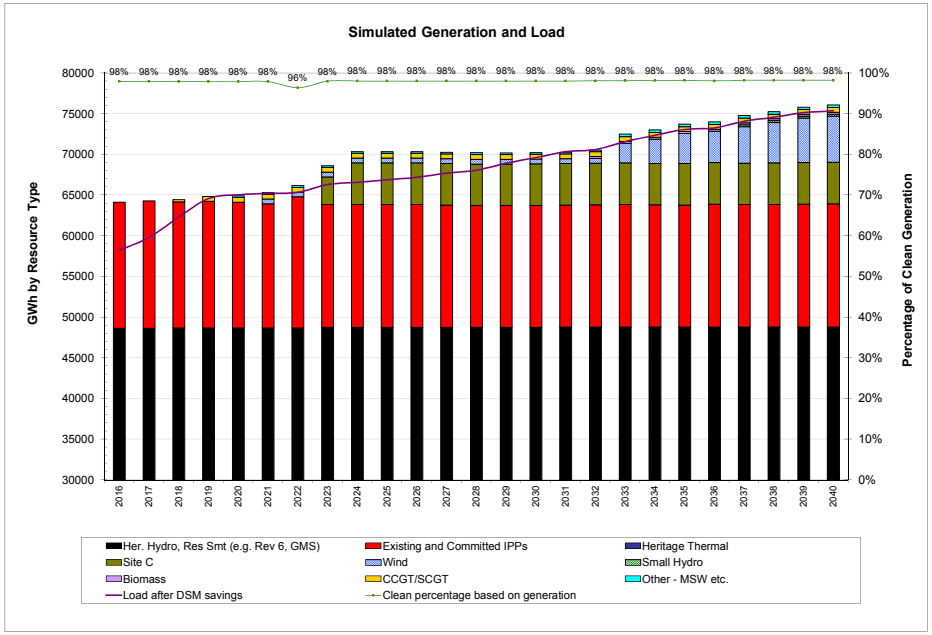

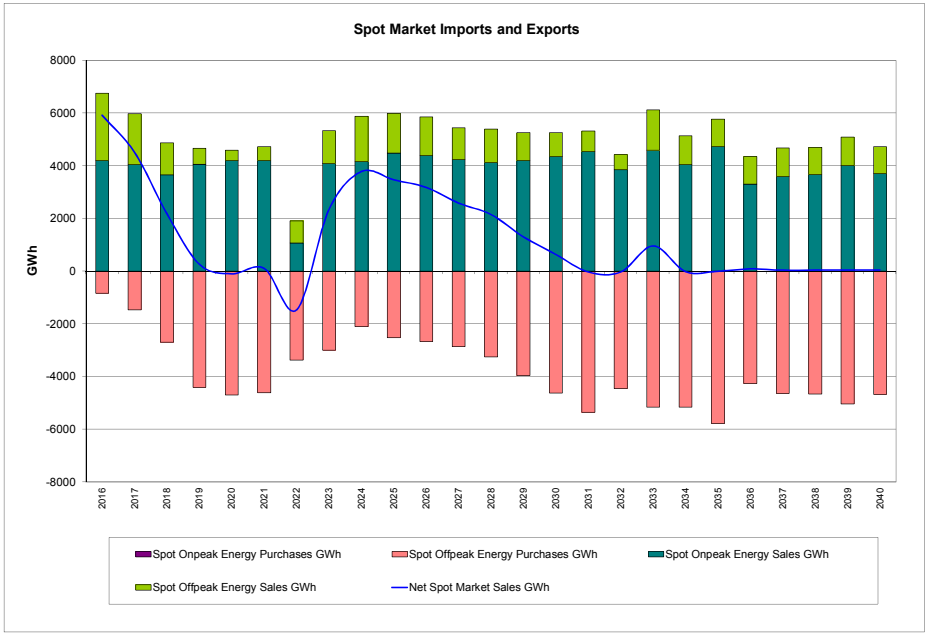

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & High LNG	Mid DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Included	7% IPP CoC, $10 wind adder, Energy and Capacity bridging before Site C, LNG LT Supply Option (i)

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	11,357
PV of Trade Revenue - $ millions	(1,210)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	13,402

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	101	0	864	0	964
Firm Energy (GWh)	1,504	0	1,564	0	3,068

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	207	0	864	1,100	2,170
Firm Energy (GWh)	3,001	0	1,564	5,103	9,668

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	585	39	1,963	1,100	3,688
Firm Energy (GWh)	8,099	526	2,367	5,103	16,096

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	96%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2019	500kV circuit CI to NC	CI to NC	1500
2019	Series compensation of WSN-GLN 500 kV line	CI to NC	500
2023	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2023	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2023	Shunt compensation at WSN KLY	PR to KN	650
2029	Shunt compensation at NIC and MDN	KN to LM	570
2031	Series compensation of 5L91 and 5L98	SE to KN	147
2034	500kV circuit 5L14 between WSN and KLY	CI to KN	2120
2035	500kV circuit 5L8 between GMS and WSN	PR to CI	1470

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2018	BCH_NC	100 MW SCGT NC	412	392	600	600	88
2019	BCH_PR	Wind_PC21	99	26	371	371	112
2019	BCH_NC	100 MW SCGT NC	515	490	750	750	88
2020	BCH_PR	Wind_PC13	135	35	541	541	113
2020	BCH_PR	Wind_PC28	153	40	591	591	111
2020	BCH_LM	MSW2_LM	25	24	208	208	92
2021	BCH_PR	Wind_PC19	117	30	441	441	113
2022	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2022	BCH_PR	Wind_PC16	99	26	377	377	116
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2030	BCH_PR	Wind_PC14	144	37	527	527	117
2030	BCH_VI	Wind_VI12	48	12	150	150	135
2031	BCH_PR	Wind_PC15	108	28	382	382	119
2031	BCH_VI	MSW1_VI	12	12	100	100	127
2031	BCH_LM	Biomass_LM	30	30	239	239	143
2031	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2032	BCH_VI	Biomass_VI	30	30	239	239	142
2033	BCH_PR	Wind_PC20	159	41	610	610	119
2033	BCH_PR	Wind_PC42	63	16	219	219	122
2034	BCH_PR	Wind_PC09	207	54	713	713	122
2034	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2034	BCH_PR	Wind_PC41	45	12	155	155	122
2035	BCH_PR	Wind_PC11	126	33	473	473	122
2035	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2036	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2037	BCH_PR	Wind_PC18	138	36	486	486	123
2037	BCH_PR	Wind_PC26	126	33	416	416	127
2038	BCH_VI	Run of River VI 100_110	119	29	352	451	120
2039	BCH_PR	Wind_PC48	152	40	505	505	128
2040	BCH_PR	Biomass_PR	28	28	223	223	141
2040	BCH_VI	Wind_VI14	35	9	114	114	135

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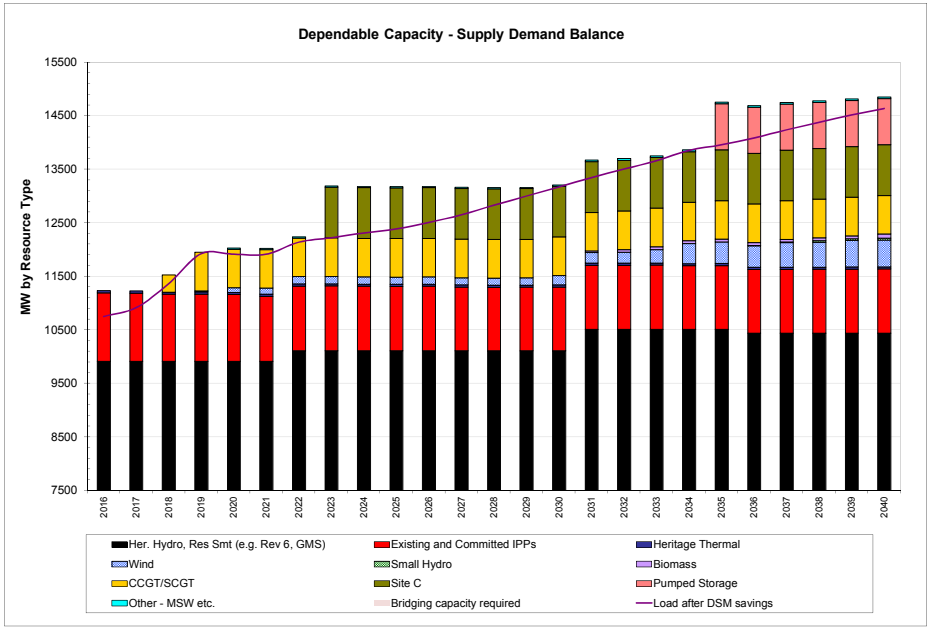

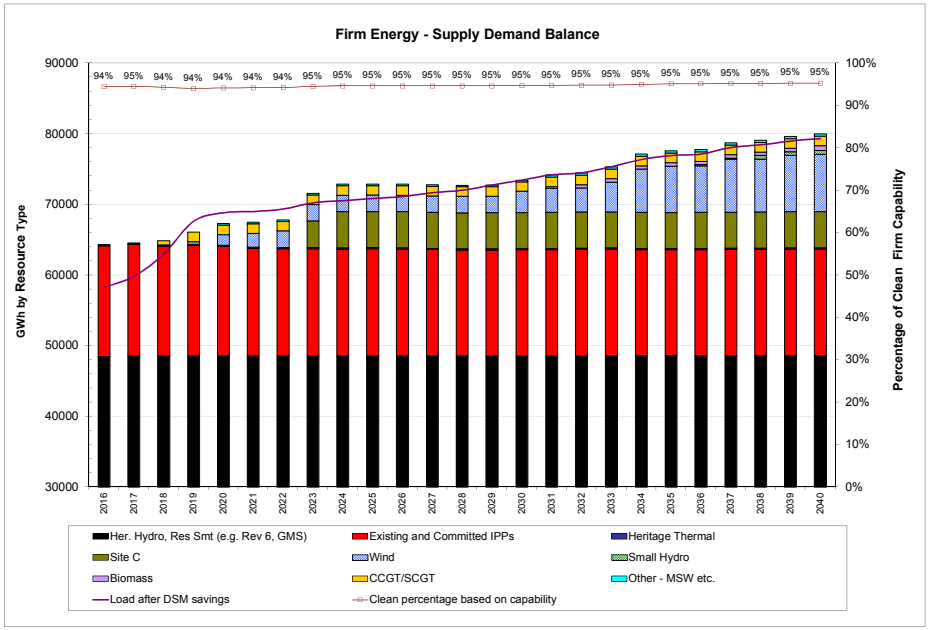

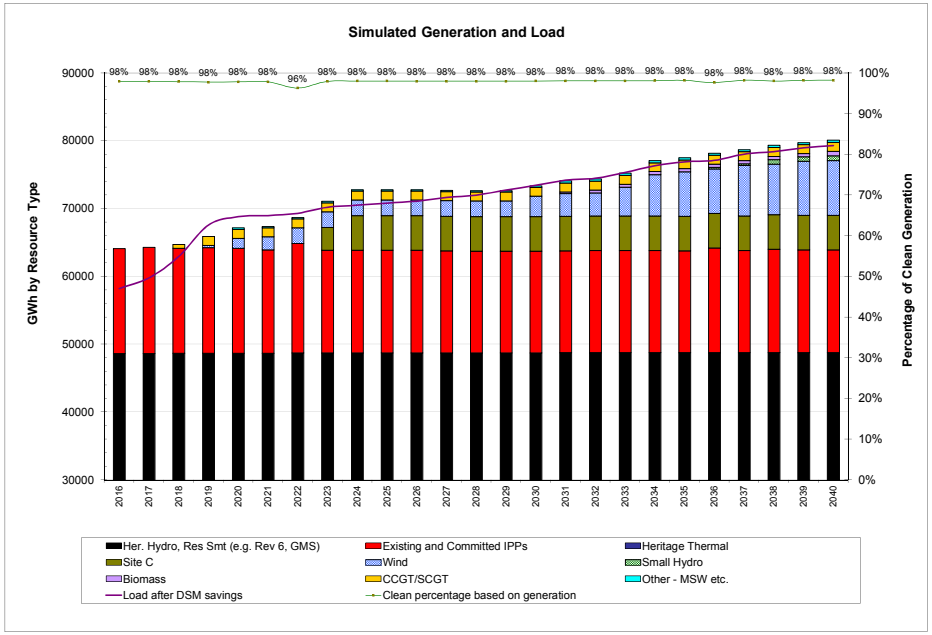

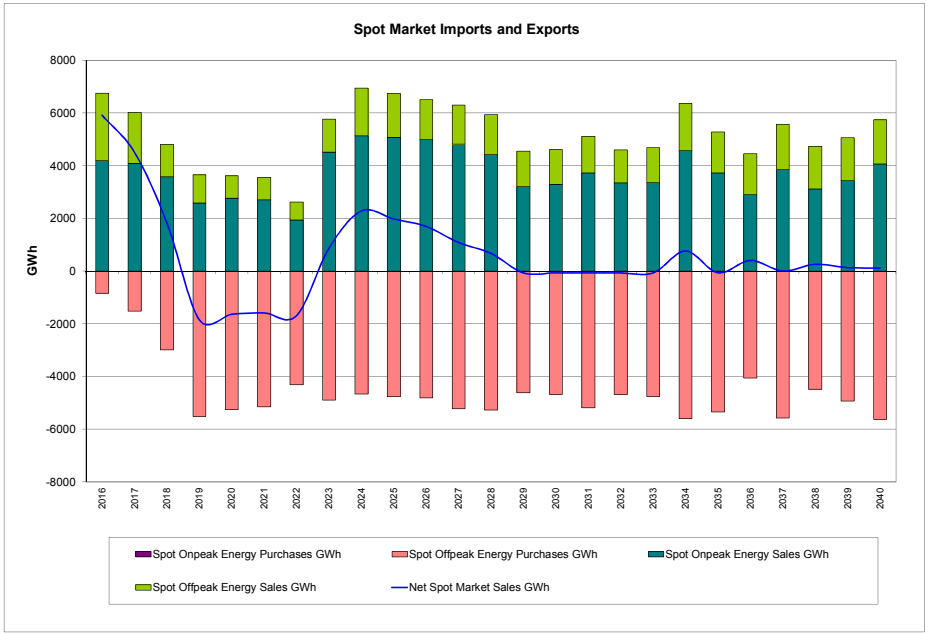

M&M_1LT_8N0_05K

Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & High LNG	Mid DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Included	7% IPP CoC, $10 wind adder, Energy and Capacity bridging before Site C, LNG LT Supply Option (ii)

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	10,665
PV of Trade Revenue - $ millions	(1,223)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	12,697

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	101	0	864	0	964
Firm Energy (GWh)	1,504	0	1,564	0	3,068

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	198	0	875	1,100	2,173
Firm Energy (GWh)	2,932	0	1,665	5,103	9,701

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	585	28	1,968	1,100	3,682
Firm Energy (GWh)	8,099	431	2,407	5,103	16,041

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	96%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2019	Series compensation of WSN-GLN 500 kV line	CI to NC	500
2023	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2023	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2023	Shunt compensation at WSN KLY	PR to KN	650
2029	Shunt compensation at NIC and MDN	KN to LM	570
2031	Series compensation of 5L91 and 5L98	SE to KN	147
2034	500kV circuit 5L14 between WSN and KLY	CI to KN	2120
2035	500kV circuit 5L8 between GMS and WSN	PR to CI	1470

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2018	BCH_NC	100 MW SCGT NC	412	392	600	600	88
2019	BCH_PR	Wind_PC21	99	26	371	371	112
2019	BCH_NC	100 MW SCGT NC	515	490	750	750	88
2020	BCH_PR	Wind_PC13	135	35	541	541	113
2020	BCH_PR	Wind_PC28	153	40	591	591	111
2020	BCH_LM	MSW2_LM	25	24	208	208	92
2021	BCH_PR	Wind_PC19	117	30	441	441	113
2022	BCH_PR	Wind_PC16	99	26	377	377	116
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2030	BCH_PR	Wind_PC20	159	41	610	610	119
2030	BCH_VI	MSW1_VI	12	12	100	100	127
2031	BCH_VI	Wind_VI12	48	12	150	150	135
2031	BCH_VI	Wind_VI14	35	9	114	114	135
2031	BCH_VI	Biomass_VI	30	30	239	239	142
2031	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2031	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2032	BCH_LM	Biomass_LM	30	30	239	239	143
2033	BCH_PR	Wind_PC14	144	37	527	527	117
2033	BCH_PR	Wind_PC15	108	28	382	382	119
2034	BCH_PR	Wind_PC09	207	54	713	713	122
2034	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2034	BCH_PR	Wind_PC41	45	12	155	155	122
2035	BCH_PR	Wind_PC11	126	33	473	473	122
2035	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2036	BCH_PR	Wind_PC42	63	16	219	219	122
2037	BCH_PR	Wind_PC18	138	36	486	486	123
2037	BCH_LM	Run of River LM 100_110	102	18	258	330	115
2038	BCH_PR	Wind_PC26	126	33	416	416	127
2039	BCH_PR	Wind_PC48	152	40	505	505	128
2040	BCH_SE	Biomass_SE	33	33	263	263	141

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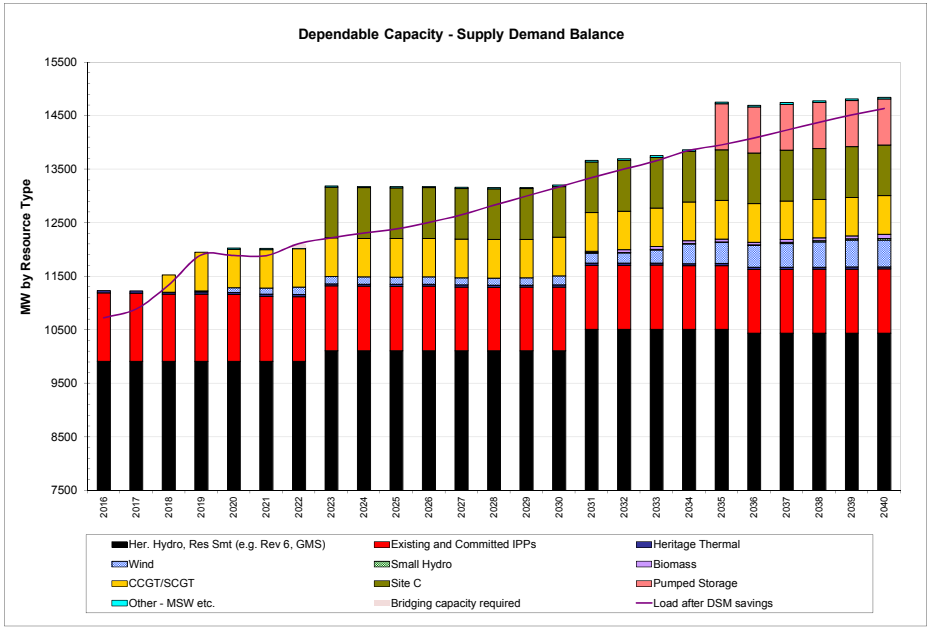

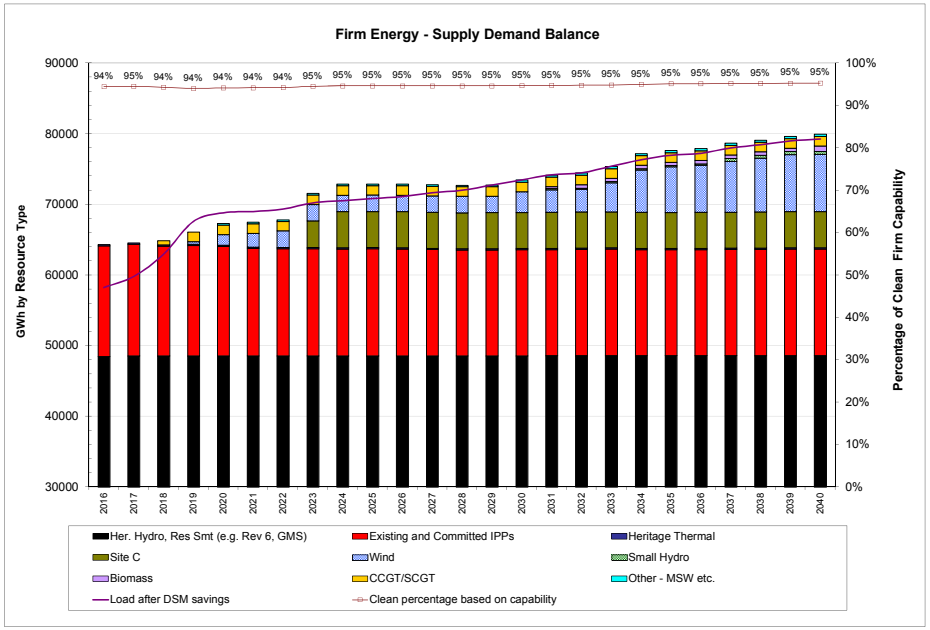

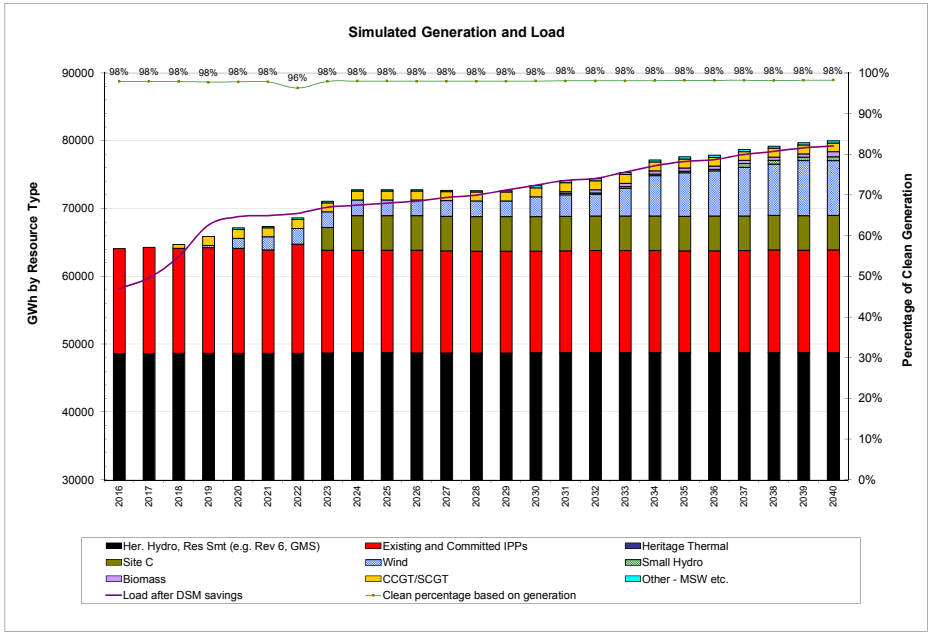

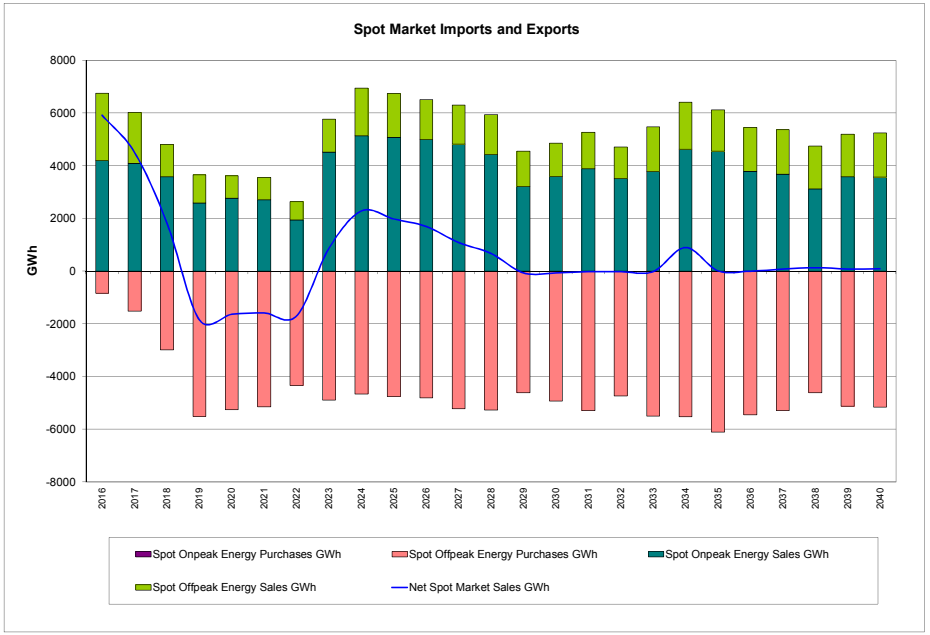

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & High LNG	Mid DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Included	7% IPP CoC, $10 wind adder, Energy and Capacity bridging before Site C, LNG LT Supply Option (iii)

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	9,221
PV of Trade Revenue - $ millions	(1,172)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	11,303

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	845	0	845
Firm Energy (GWh)	0	0	4,327	0	4,327

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	870	1,100	1,970
Firm Energy (GWh)	0	0	4,538	5,103	9,641

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	390	10	1,942	1,100	3,442
Firm Energy (GWh)	5,504	175	5,118	5,103	15,900

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	98%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2019	Series compensation of WSN-GLN 500 kV line	CI to NC	500
2023	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2023	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2023	Shunt compensation at WSN KLY	PR to KN	650
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147
2038	500kV circuit 5L14 between WSN and KLY	CI to KN	2120

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2018	BCH_NC	BCH_CCGT250NC	263	236	1,860	1,450	
2018	BCH_NC	100 MW SCGT NC	206	196	300	300	88
2019	BCH_NC	BCH_CCGT250NC	263	236	1,860	1,450	
2019	BCH_NC	100 MW SCGT NC	206	196	300	300	88
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2030	BCH_LM	MSW2_LM	25	24	208	208	92
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2031	BCH_VI	MSW1_VI	12	12	100	100	127
2031	BCH_VI	Biomass_VI	30	30	239	239	142
2031	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2032	BCH_VI	Wind_VI14	35	9	114	114	135
2032	BCH_LM	Biomass_LM	30	30	239	239	143
2033	BCH_PR	Wind_PC13	135	35	541	541	113
2033	BCH_PR	Wind_PC19	117	30	441	441	113
2033	BCH_PR	Wind_PC28	153	40	591	591	111
2033	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2034	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2035	BCH_PR	Wind_PC14	144	37	527	527	117
2036	BCH_PR	Wind_PC21	99	26	371	371	112
2037	BCH_PR	Wind_PC15	108	28	382	382	119
2037	BCH_PR	Wind_PC16	99	26	377	377	116
2038	BCH_PR	Wind_PC20	159	41	610	610	119
2039	BCH_PR	Wind_PC41	45	12	155	155	122
2039	BCH_PR	Wind_PC42	63	16	219	219	122
2040	BCH_VI	Wind_VI12	48	12	150	150	135

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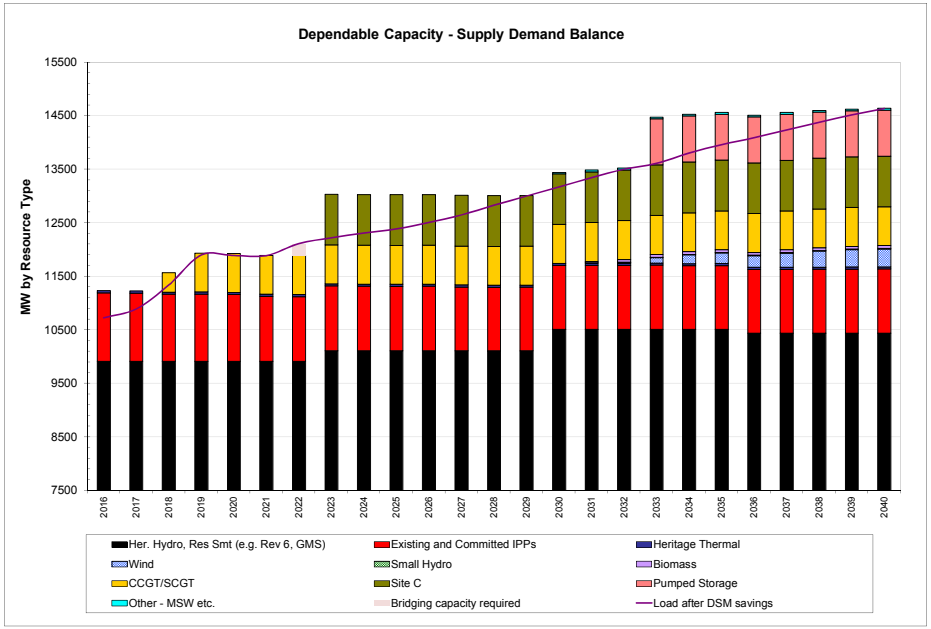

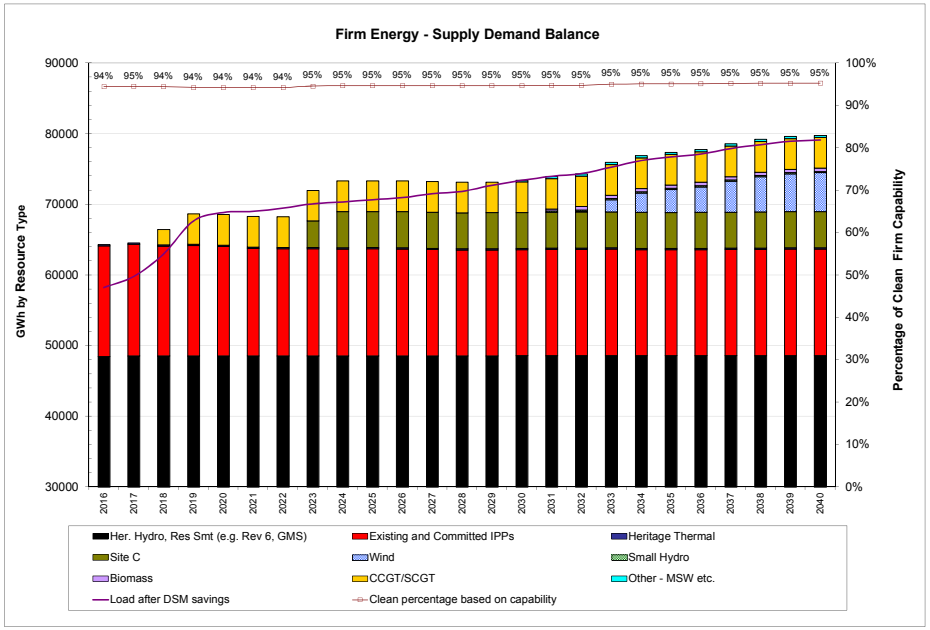

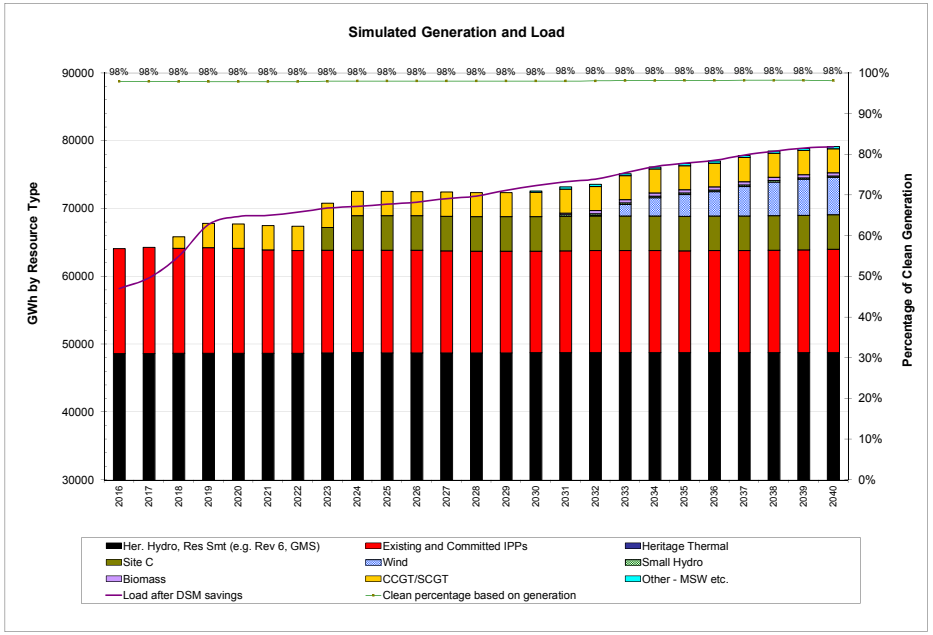

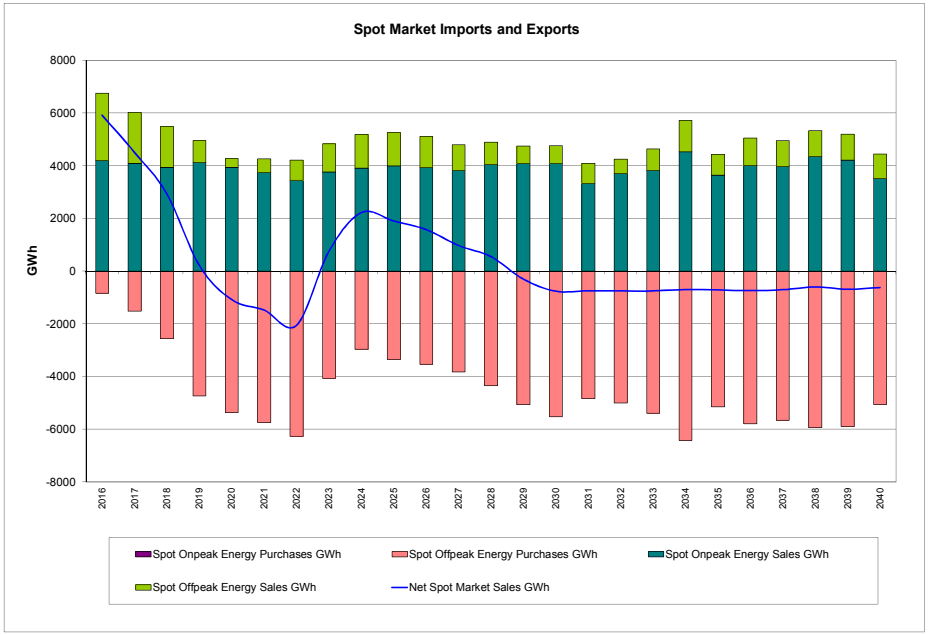

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Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & High LNG	Mid DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Included	7% IPP CoC, $10 wind adder, Energy and Capacity bridging before Site C, LNG LT Supply Option (iv)

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	7,170
PV of Trade Revenue - $ millions	78
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	10,502

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	839	0	839
Firm Energy (GWh)	0	0	6,958	0	6,958

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	0	0	839	1,100	1,939
Firm Energy (GWh)	0	0	6,958	5,103	12,062

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	256	10	2,905	1,100	4,271
Firm Energy (GWh)	3,652	175	7,510	5,103	16,440

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2016-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	97%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2019	Series compensation of WSN-GLN 500 kV line	CI to NC	500
2023	Series compensation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2023	Series compensation 5L11_12_13 from WSN to KLY	PR to KN	390
2023	Shunt compensation at WSN KLY	PR to KN	650
2029	Shunt compensation at NIC and MDN	KN to LM	570
2030	Series compensation of 5L91 and 5L98	SE to KN	147

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2018	BCH_NC	100 MW SCGT NC	412	392	3,080	600	88
2019	BCH_NC	100 MW SCGT NC	515	490	3,850	750	88
2023	BCH_PR	GMS Units 1-5 Cap Increase	220	220			35
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2030	BCH_REV	Revelstoke Unit 6	500	488	26	26	50
2032	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2034	BCH_PR	Wind_PC28	153	40	591	591	111
2034	BCH_LM	MSW2_LM	25	24	208	208	92
2035	BCH_PR	Wind_PC19	117	30	441	441	113
2035	BCH_PR	Wind_PC21	99	26	371	371	112
2036	BCH_VI	MSW1_VI	12	12	100	100	127
2037	BCH_PR	Wind_PC13	135	35	541	541	113
2037	BCH_VI	Wind_VI12	48	12	150	150	135
2037	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2038	BCH_VI	Wind_VI14	35	9	114	114	135
2038	BCH_VI	Biomass_VI	30	30	239	239	142
2039	BCH_PR	Wind_PC14	144	37	527	527	117
2039	BCH_PR	Wind_PC15	108	28	382	382	119
2039	BCH_PR	Wind_PC16	99	26	377	377	116
2039	BCH_LM	Pumped_Storage_LM	1000	1,000			126
2040	BCH_PR	Wind_PC41	45	12	155	155	122

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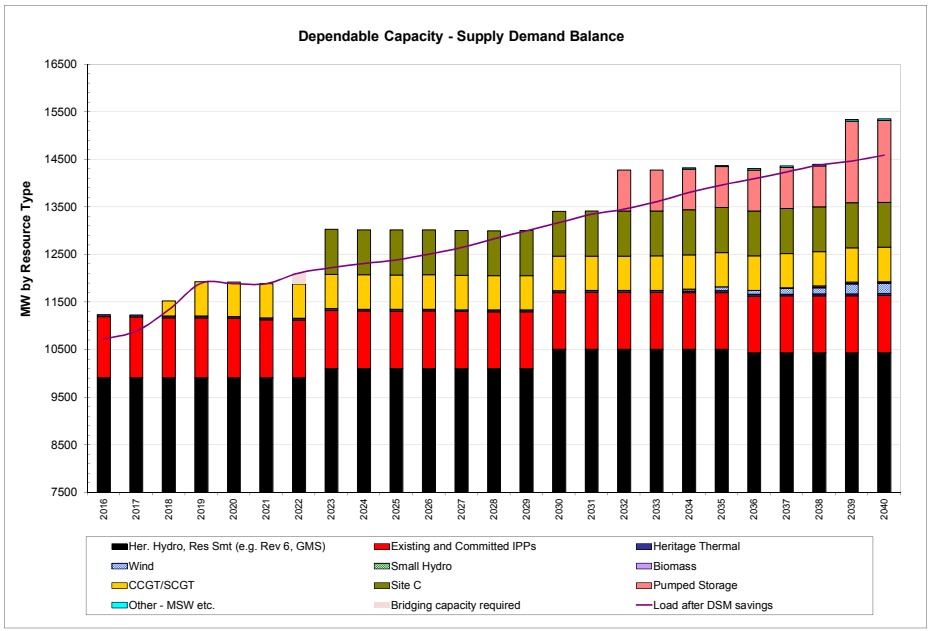

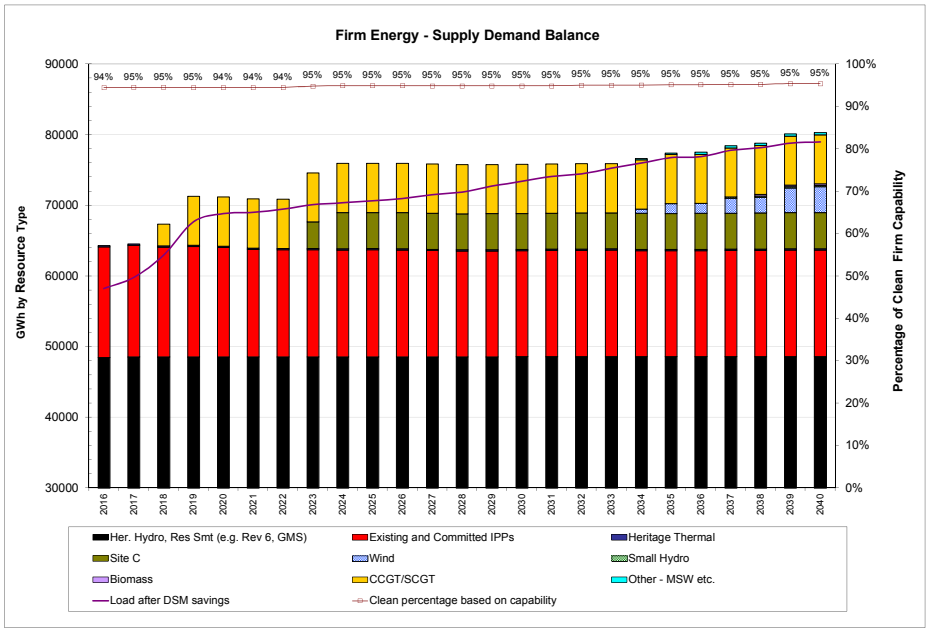

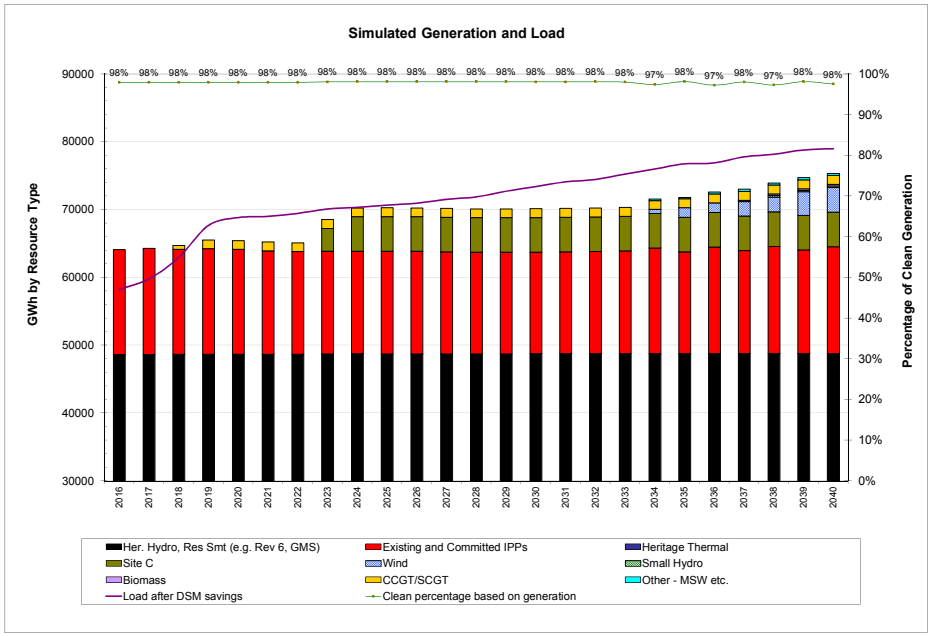

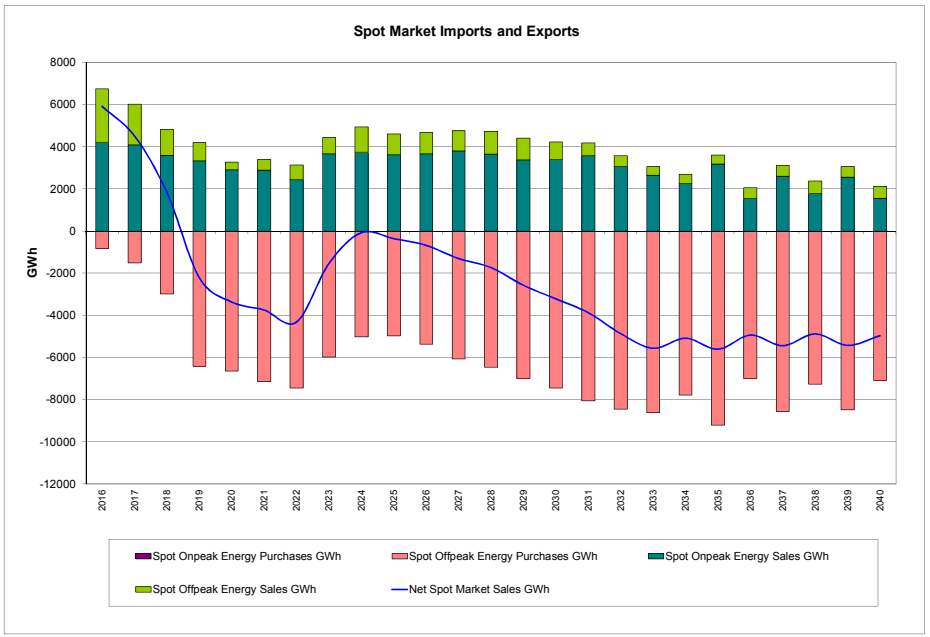

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5.4 Environmental Attributes

The environmental attributes for different supply options to meet long term electricity needs due to high LNG are shown in Table 15. The differences of the high level attributes shaded in green between the supply options and the reference portfolio are also shown in section 6.5.5 of the IRP. Note that the analysis was done using portfolios created by SO and taking a snapshot for year F2041.

Table 15 Environmental Attributes for LNG Long Term Supply Options

Category	Indicator	Units	Classification	i. Integrated system supply facilitated by the addition of a second 500 kV line	ii. Local gas-fired capacity with renewable energy resources sourced locally or from the integrated system	iii. Local gas-fired capacity with units being relied upon for firm energy and operated as base-loaded units	iv. Local gas-fired capacity with the units being relied upon for firm energy but mostly dispatched off in favour of lower cost surplus or non-firm energy from the integrated system or market imports
Land	Footprint	hectares	n/a	15503	12854	10013	8122
	Net primary productivity	ha per class	Low (0 to < 69)	301	110	75	49
			Medium (69 to < 369)	8245	6647	4822	4014
			High (> 369)	6957	6097	5116	4059
	Remoteness - linear disturbance density (km/km2)	ha per class	Wilderness (< 0.2)	4879	4625	4030	3800
			Remote (0.2 to < 0.66)	868	845	709	675
			Rural (0.66 to 2.2)	2939	2686	2175	2032
			Urban (> 2.2)	6818	4698	3099	1614
	High priority species count (percentile)	ha per class	0 to < 20	412	361	225	222
			20 to < 40	1752	1717	1038	813
			40 to < 60	2540	1145	534	288
			60 to 80	2718	1867	951	108
			> 80	8045	7759	7259	6686
Freshwater	Affected Stream Length	kilometers	n/a	150	150	139	139
	Priority fish species (number per watershed)	ha per class	No priority species (0)	0	0	0	0
			Low species diversity (1 to 12)	826	1022	174	275
			Moderate species diversity (13 to 23)	11205	10512	8840	7763
			High species diversity (24 to 38)	3435	1315	993	78
	Reservoir Aquatic Area	ha	n/a	9310	9310	9310	9310
Marine	Valued ecological features	ha per class	None (0)	n/a	n/a	n/a	n/a
			Low (1 to 2)	22	0	0	0
			Medium (3 to 5)	8	0	0	0
			High (> 5)	0	0	0	0
	Key commercial bottom fishing areas	ha per class	No bottom fisheries	n/a	n/a	n/a	n/a
			1 bottom fishery	69	0	0	0
			2 to 3 bottom fisheries	0	0	0	0
			> 3 bottom fisheries	0	0	0	0
Atmosphere	GHG emissions	tonnes/year, thousands	Carbon dioxide equivalent	858	858	1559	858
	Air contaminant emissions	tonnes/year, thousands	Sulphur dioxide	0	0.1	0.1	0.1
			Oxides of nitrogen	1.1	1.1	0.8	0.9
			Carbon monoxide	2.3	2.3	1.3	2.1
			Volatile organic compounds	0	0.0	0.0	0.0
			Fine particulates - PM2.5	0	0.0	0.0	0.0
			Fine particulates - PM10	0	0.1	0.1	0.0
			Fine particulates - PM total	0	0.3	0.3	0.1
			Mercury	0	0.0	0.0	0.0

5.5 Economic development attributes

The economic development attributes for different supply options to meet long term electricity needs due to high LNG are shown in Table 16. The results shown were done based on portfolios created by SO over the planning period with benefits discounted to fiscal 2013 with responding effects.

Table 16 Economic Development Attributes for LNG Long Term Supply Options

Category	Indicator	Units	Classification	i. Integrated system supply facilitatied by the addition of a second 500kV line	ii. Local gas-fired capacity with renewable energy resources sourced locally or from the integrated system	iii. Local gas-fired capacity with units being relied upon for firm energy and operated as base-loaded units	iv. Local gas-fired capacity with the units being relied upon for firm energy but mostly dispatched off in favour of lower cost surplus or non-firm energy from the integrated system or market imports
Provincial GDP	Construction period GDP	dollars, millions	Direct	3,430	3,261	3,114	3,019
			Indirect	3,888	3,662	3,225	3,105
			Induced	1,281	1,205	1,103	1,062
			Total	8,599	8,129	7,442	7,187
	Operations period GDP	dollars, millions per year	Direct	546	717	1,024	1,104
			Indirect	946	996	1,591	944
			Induced	206	228	276	229
Employment	Construction period employment	jobs	Direct	68,808	65,764	61,086	59,408
			Indirect	87,092	82,943	71,109	69,740
			Induced	24,379	23,056	20,226	19,674
			Total	180,279	171,763	152,421	148,823
	Operations period employment	jobs per year	Direct	12,190	14,043	16,598	15,007
			Indirect	18,063	18,276	20,623	12,034
			Induced	6,351	6,455	6,656	4,389
			Total	36,604	38,774	43,878	31,431
Provincial Government Revenue	Construction period revenue	dollars, millions	Direct	410	385	362	346
			Indirect	536	505	442	424
			Induced	169	159	146	140
	Operations period revenue	dollars, millions per year	Direct	481	355	304	262
			Indirect	138	146	227	135
			Induced	27	30	37	30

6 Portfolio Analysis – General Electrification

Section 6.7 of the IRP presents the analyses that test system requirements associated with meeting electrification loads, including general electrification.

6.1 Modelling Assumptions

As described in section 6.7.4 of the IRP, for the purposes of stress testing the potential impact of electrification on system requirements, BC Hydro considered a scenario that combines the requirements of electrified LNG load in the North Coast,

oil and gas production in the Northeast and general electrification. Table 17 summarizes the load and supply assumptions for this scenario.

Table 17 Electrification Load Scenario Summary

Load Assumptions	Supply Assumptions*
Mid load forecast	Clean resources from system
LNG/North Coast: Expected LNG load of 3,000 GWh/year all assumed in the North Coast	Clean energy backed by local gas peakers as required
Northeast: High gas production and electrification scenario for Fort Nelson/Horn River Basin	Clean resources from system with Northeast Transmission Line
General Electrification: Electrification 3	Clean resources from system

*supply assumed mostly clean as the intent of electrification is to reduce GHG emission

Figure 4 illustrates the other modelling assumptions used to create the portfolio.

Figure 4 Modelling Map – General Electrification

Modelling Map			
Uncertainties/Scenarios			
Market Prices	Scenario 2 Low	Scenario 1 Mid	Scenario 3 High
Load Forecast	Low	Mid	High
DSM deliverability	Low	Mid	High
Refer to other load scenario description in this section.			
Resource choices			
Usage of 7% non-clean for non LNG load	Yes	No	
DSM Options	DSM Option 1	DSM Target/ Option 2	DSM Option 3
Site C (all units in) timing	F2024	F2026	No Site C
Refer to other supply assumption description in this section.			
Modelling Assumptions and Parameters			
BCH/IPP Cost of Capital	5/7	5/6	
Pumped Storage as Option	Yes	No	
Site C Capital Cost		Base	Base plus 10%
Wind Integration Cost	$5/MWh	$10/MWh	$15/MWh
	shows the modeling assumptions		

6.2 Portfolio Output

The portfolio output sheets for this portfolio are included on the following pages.

Input Assumptions	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
	Mid Load & Expected LNG	Mid DSM-Option2(extrapolated)	Scenario 1	ISD fixed F2024	Included	7% IPP CoC, $10 wind adder, Electrification Load Scenario

	Discounted to January 2013 (F2013 $) - Jan DSM TRC
PV of G& T Resource cost - $ millions	27,618
PV of Trade Revenue - $ millions	(1,227)
PV of DSM Option cost - $ millions	3,255
PV of Total Portfolio Cost - $ millions	29,645

Supply Totals through 2020

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	131	0	398	0	529
Firm Energy (GWh)	1,946	0	812	0	2,758

Supply Totals through 2030

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	983	57	2,581	1,100	4,721
Firm Energy (GWh)	12,557	783	2,286	5,103	20,729

Supply Totals through 2040

	Wind	Small Hydro	Other	Site C	Total
Dep. Capacity (MW)	3,324	431	8,642	1,100	13,498
Firm Energy (GWh)	36,757	6,477	2,772	5,103	51,109

DSM Level in:

2020	7,606 GWh	1,421 MW
2030	11,190 GWh	2,036 MW
2040	14,572 GWh	2,652 MW

Clean Objective (%) - performance during the period 2014-2040

	Based on Generation	Based on Firm Capability
Average %	98%	95%
Lowest %	97%	94%

Transmission Expansion

Year	Project Description	Between	Capacity - MW
2022	Series compensation of 5L91 and 5L98	SE to KN	147
2023	Series Compenstation 5L1_2_3_7 from GMS to WSN	PR to KN	360
2023	Series Compenstation 5L11_12_13 from WSN to KLY	PR to KN	390
2023	Shunt Compenstation at WSN KLY	PR to KN	650
2023	Shunt Compenstation at NIC and MDN	KN to LM	570
2027	500kV circuit 5L8 between WSN and KLY	CI to KN	2120
2028	500kV circuit 5L14 between GMS and WSN	PR to CI	1470
2030	500 kV circuit 5L46 between KLY and Cheekye	KN to LM	1384
2032	Series compensation of WSN-GLN 500 kV line	CI to NC	500
2033	500kV circuit 5L8 between WSN and KLY	CI to KN	2120
2034	500kV circuit CI to NC	CI to NC	1500
2035	500 kV circuit between Selkir and Nicola	SE to KN	1500
2039	500 kV circuit 5L46 between KLY and Cheekye	KN to LM	1384

UECs and **UCCs** are shown for energy and capacity resource respectively. The UEC/UCC shown includes wind integration costs, soft costs and network upgrade costs where applicable. The UECs for gas-fired generation resources (CCGTs) are not shown as the UEC varies from year to year depending on the forecasted natural gas price.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC*
Year	Zone	Resource	Installed	Dependable	Firm	Total	$/MWh or $/kW-year
2018	BCH_NC	100 MW SCGT NC	206	196	300	300	88
2019	BCH_NC	100 MW SCGT NC	206	196	300	300	88
2020	BCH_PR	Wind_PC13	135	35	541	541	113
2020	BCH_PR	Wind_PC19	117	30	441	441	113
2020	BCH_PR	Wind_PC21	99	26	371	371	112
2020	BCH_PR	Wind_PC28	153	40	591	591	111
2020	BCH_LM	MSW2_LM	25	24	208	208	92
2021	BCH_PR	Wind_PC10	297	77	1,023	1,023	118
2021	BCH_PR	Wind_PC14	144	37	527	527	117
2021	BCH_PR	Wind_PC16	99	26	377	377	116
2021	BCH_PR	Wind_PC20	159	41	610	610	119
2022	BCH_PR	GMS Units 1-5 Cap Increase	3040	2,967			35
2022	BCH_PR	Wind_PC09	207	54	713	713	122
2022	BCH_PR	Wind_PC15	108	28	382	382	119
2022	BCH_VI	MSW1_VI	12	12	100	100	127
2022	BCH_REV	Revelstoke Unit 6	3005	3,005	355	355	50
2023	BCH_PR	Site C	1100	1,100	5,100	5,100	79
2025	BCH_LM	Pumped_Storage_LM	1000	1,000			109
2026	BCH_PR	Wind_PC11	126	33	473	473	122
2027	BCH_PR	Wind_PC18	138	36	486	486	123
2027	BCH_PR	Wind_PC26	126	33	416	416	127
2027	BCH_PR	Wind_PC41	45	12	155	155	122
2027	BCH_PR	Wind_PC42	63	16	219	219	122
2027	BCH_VI	Wind_VI12	48	12	150	150	135
2027	BCH_VI	Wind_VI14	35	9	114	114	135
2027	BCH_LM	Run of River LM 80_100	62	10	174	223	108
2028	BCH_PR	Wind_PC48	152	40	505	505	128
2028	BCH_NC	Wind_NC09	334	87	1,026	1,026	135
2028	BCH_VI	Wind_VI08	41	11	112	112	151
2028	BCH_VI	Wind_VI13	35	9	106	106	140
2028	BCH_VI	Biomass_VI	30	30	239	239	142
2028	BCH_LM	Pumped_Storage_LM	1000	1,000			109
2028	BCH_LM	Run of River LM 100_110	102	18	258	330	115
2029	BCH_PR	Wind_PC06	243	63	761	761	131
2029	BCH_PR	Wind_PC27	110	29	332	332	136
2029	BCH_PR	Wind_PC40	117	30	349	349	137
2029	BCH_VI	Run of River VI 100_110	119	29	352	451	120
2029	BCH_VI	Wind_VI15	41	11	124	124	143
2029	BCH_LM	Biomass_LM	30	30	239	239	143
2030	BCH_PR	Biomass_PR	28	28	223	223	141
2030	BCH_NC	Biomass_NC	13	13	104	104	147
2030	BCH_CI	Biomass_CI	41	41	327	327	147
2030	BCH_KN	Wind_SI15	304	79	815	815	148
2030	BCH_KN	Wind_SI22	48	12	125	125	152
2030	BCH_KN	Biomass_KN	30	30	239	239	151
2030	BCH_VI	Wind_VI05	255	66	702	702	157
2031	BCH_NC	Wind_BC20	104	27	296	296	149
2031	BCH_CI	Wind_NC10	97	25	281	281	145
2031	BCH_CI	Wind_PC25	159	41	451	451	146
2031	BCH_KN	Run of River KN 90_100	72	2	172	221	108
2031	BCH_KN	Run of River KN 100_110	75	3	170	218	112
2031	BCH_KN	Wind_SI20	41	11	121	121	146
2031	BCH_KN	Wind_SI23	193	50	569	569	144
2031	BCH_VI	Wind_VI07	166	43	503	503	154
2031	BCH_LM	Pumped_Storage_LM	1000	1,000			109
2032	BCH_NC	Wind_BC22	260	68	697	697	149
2032	BCH_KN	Wind_SI16	662	172	1,631	1,631	156
2033	BCH_PR	Wind_PC05	97	25	354	354	144

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Year	Zone		Capacity - MW Installed	Capacity - MW Dependable	Energy - GWh Firm	Energy - GWh Total	UEC / UCC $/MWh or $/kW-year
2033	BCH_PR	Wind_PC12	97	25	310	310	146
2033	BCH_PR	Wind_PC17	104	27	317	317	148
2033	BCH_PR	Wind_PC34	352	92	907	907	151
2033	BCH_NC	Wind_NC07	117	30	322	322	152
2033	BCH_KN	Wind_SI04	97	25	254	254	156
2033	BCH_KN	Wind_SI10	117	30	312	312	153
2033	BCH_KN	Wind_SI19	55	14	148	148	155
2033	BCH_VI	Run of River VI 110_120	94	13	300	385	125
2033	BCH_LM	Pumped_Storage_LM	1000	1,000			109
2033	BCH_LM	Wind_SI27	90	23	250	250	161
2034	BCH_PR	Wind_PC32	152	40	368	368	157
2034	BCH_PR	Wind_PC36	173	45	426	426	159
2034	BCH_PR	Wind_PC47	35	9	109	109	148
2034	BCH_NC	Wind_BC18	168	44	426	426	155
2034	BCH_CI	Wind_NC11	76	20	195	195	163
2034	BCH_KN	Wind_SI01	246	64	553	553	170
2034	BCH_KN	Wind_SI05	145	38	355	355	160
2034	BCH_KN	Wind_SI18	117	30	335	335	158
2034	BCH_VI	Wind_VI10	35	9	90	90	167
2034	BCH_VI	Wind_VI11	48	12	111	111	169
2034	BCH_LM	Wind_SI28	90	23	262	262	165
2035	BCH_PR	Wind_PC37	72	19	231	231	149
2035	BCH_PR	Wind_PC43	41	11	138	138	148
2035	BCH_NC	Wind_NC01	561	146	1,729	1,729	154
2035	BCH_SE	Biomass_SE	33	33	263	263	141
2035	BCH_EK	Biomass_EK	28	28	223	223	149
2035	BCH_VI	Run of River VI 120_130	26	6	90	115	138
2035	BCH_LM	Pumped_Storage_LM	1000	1,000			109
2035	BCH_REV	Wind_SI12	186	48	544	544	141
2035	BCH_REV	Wind_SI14	83	22	233	233	154
2036	BCH_PR	Wind_PC38	131	34	330	330	161
2036	BCH_NC	Wind_NC12	76	20	230	230	157
2036	BCH_NC	Wind_BC21	219	57	590	590	158
2036	BCH_KN	Run of River KN 110_130	54	4	135	174	135
2036	BCH_SE	Wind_SI32	35	9	90	90	158
2036	BCH_EK	Wind_SI37	35	9	89	89	161
2036	BCH_VI	Wind_VI02	173	45	468	468	172
2036	BCH_VI	Wind_VI06	117	30	332	332	171
2036	BCH_LM	Pumped_Storage_LM	1000	1,000			109
2036	BCH_LM	Run of River LM 120_130	168	29	506	649	138
2036	BCH_MCA	Run of River MCA 120_130	29	1	82	105	135
2036	BCH_REV	Wind_SI11	138	36	330	330	162
2037	BCH_PR	Wind_PC04	104	27	350	350	151
2037	BCH_PR	Wind_PC44	35	9	106	106	161
2037	BCH_NC	Run of River NC 110_120	38	5	106	136	127
2037	BCH_NC	Wind_NC02	235	61	667	667	159
2037	BCH_CI	Wind_BC25	159	41	426	426	163
2037	BCH_KN	Wind_SI03	152	40	356	356	169
2037	BCH_VI	Run of River VI 130_140	120	18	385	494	147
2037	BCH_LM	Wind_SI29	117	30	313	313	174
2037	BCH_LM	Wind_SI30	152	40	396	396	172
2038	BCH_PR	Wind_PC01	152	40	456	456	162
2038	BCH_PR	Wind_PC03	62	16	222	222	169
2038	BCH_PR	Wind_PC07	117	30	324	324	169
2038	BCH_PR	Wind_PC29	90	23	202	202	170
2038	BCH_NC	Wind_NC08	196	51	465	465	164
2038	BCH_NC	Wind_BC19	104	27	280	280	159
2038	BCH_KN	Wind_BC26	163	42	375	375	175
2038	BCH_SE	Run of River SE 120_130	28	0	68	88	138
2038	BCH_EK	Run of River EK 120_130	47	2	114	146	137
2038	BCH_EK	Wind_SI38	104	27	238	238	170
2038	BCH_LM	Pumped_Storage_LM	1000	1,000			109
2038	BCH_LM	Run of River LM 130_140	58	10	160	205	150
2038	BCH_REV	Wind_SI13	237	62	567	567	167
2039	BCH_PR	Wind_PC02	138	36	371	371	178
2039	BCH_NC	Run of River NC 120_140	24	4	69	89	138
2039	BCH_NC	Wind_BC23	104	27	279	279	168
2039	BCH_CI	Wind_PC23	55	14	149	149	178
2039	BCH_CI	Wind_PC24	117	30	284	284	177
2039	BCH_KN	Wind_SI06	131	34	294	294	175
2039	BCH_KN	Wind_SI08	117	30	255	255	179

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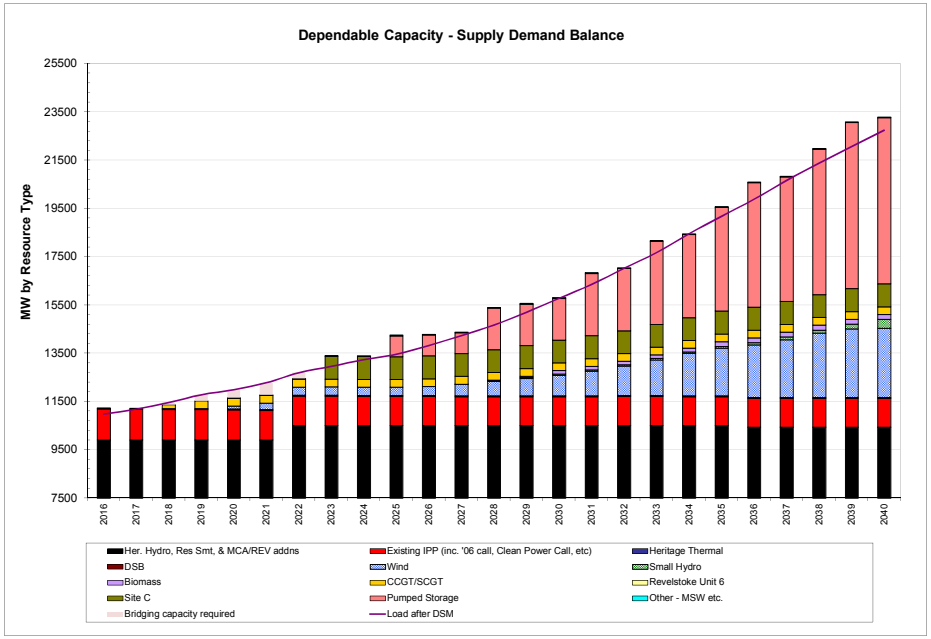
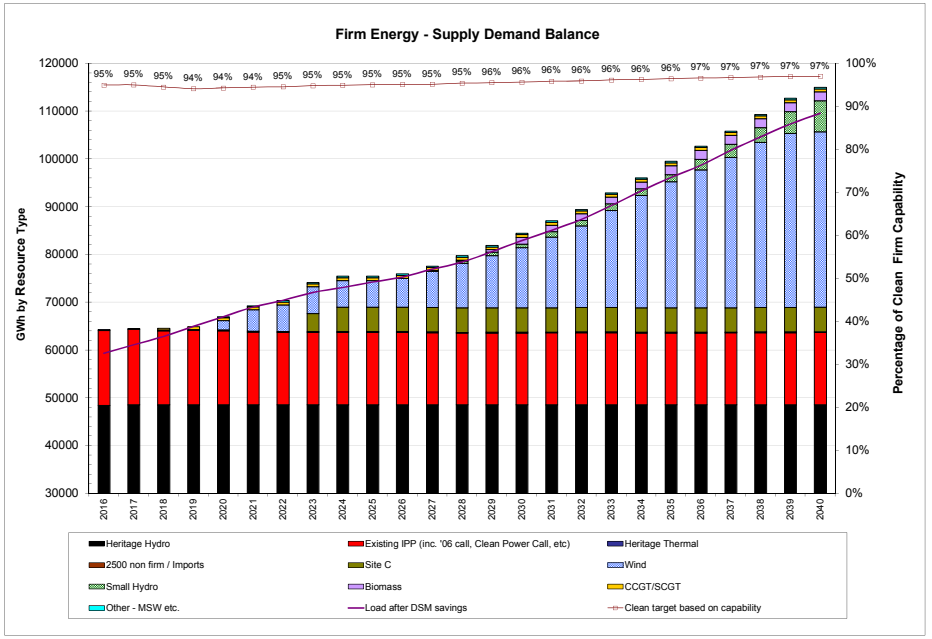
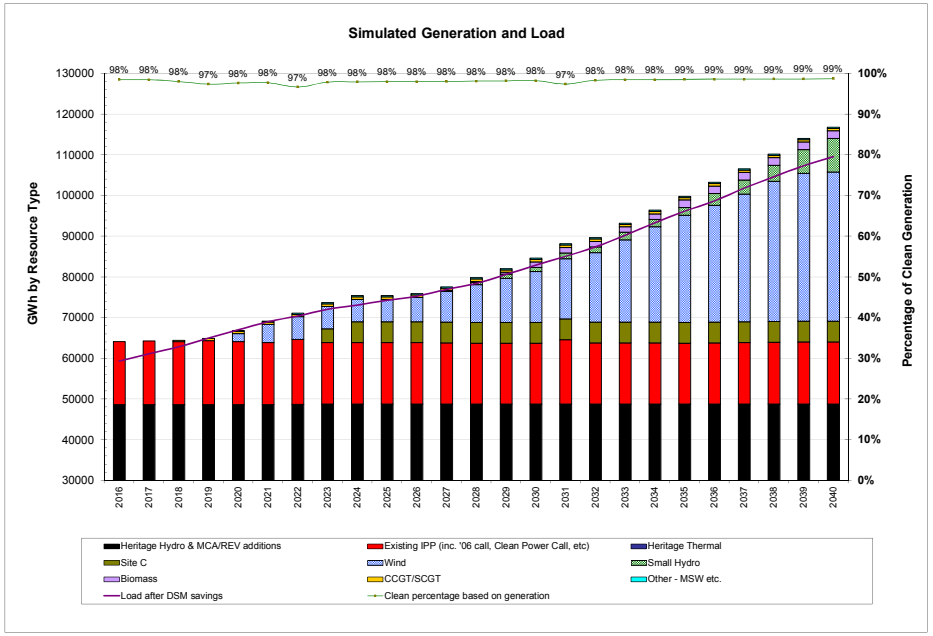
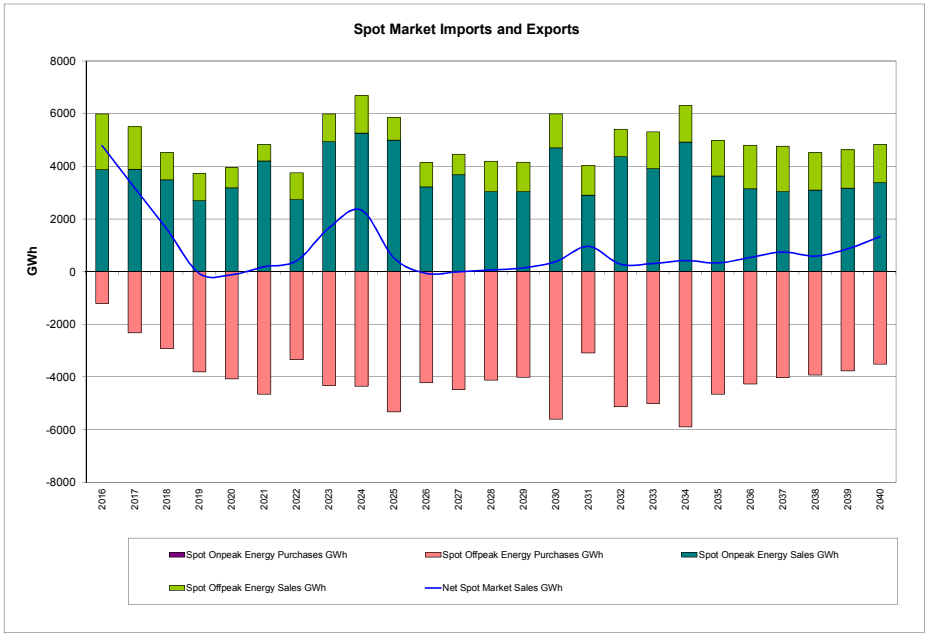
Year	Zone		Capacity - MW Installed	Capacity - MW Dependable	Energy - GWh Firm	Energy - GWh Total	UEC / UCC $/MWh or $/kW-year
2039	BCH_KN	Wind_SI09	97	25	213	213	175
2039	BCH_VI	Run of River VI 140_150	135	21	434	557	155
2039	BCH_LM	Pumped_Storage_LM	1000	1,000			109
2039	BCH_LM	Run of River LM 140_150	94	19	254	325	156
2039	BCH_LM	Run of River LM 150_160	129	27	360	462	170
2039	BCH_LM	Run of River LM 160_170	91	16	253	324	178
2039	BCH_BQN	Run of River BQL 110_120	45	0	124	159	127
2040	BCH_VI	Run of River VI 160_170	88	15	292	374	183
2040	BCH_VI	Run of River VI 170_180	56	13	181	232	193
2040	BCH_VI	Wind_VI09	55	14	153	153	228
2040	BCH_VI	Wind_VI04	62	16	177	177	204
2040	BCH_VI	Run of River VI 210_220	93	29	287	368	232
2040	BCH_VI	Run of River VI 260_280	37	14	80	103	268
2040	BCH_VI	Run of River VI 280_300	88	33	197	253	287
2040	BCH_LM	Run of River LM 170_180	81	16	229	294	188
2040	BCH_LM	Run of River LM 180_190	103	22	312	400	201
2040	BCH_LM	Run of River LM 210_220	77	19	188	241	232
2040	BCH_LM	Run of River LM 220_230	51	15	139	178	241









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7 Portfolio Analysis – Transmission

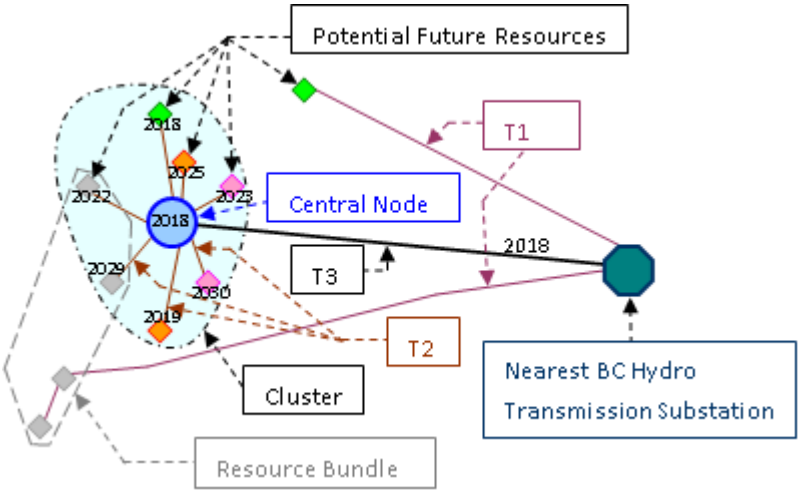
Section 6.8 of the IRP summarizes the transmission requirements for various planning conditions/scenarios already shown in the portfolios presented in the previous sections in this appendix.

In addition to a discussion on transmission requirements, Section 6.8 of the IRP also describes the Generation Cluster Analysis and presents the high level analytical results. This section of the appendix describes the elements and portfolio results of cluster analysis in details. Note that this analysis has not been updated with the latest information consistent with the rest of the IRP.

7.1 Elements of Cluster Modeling

Basic components of cluster modeling are illustrated in Figure 5 using a hypothetical example. The figure is followed by a description of the various components.

Figure 5 Elements of Cluster Modeling



7.1.1 Bundle approach

Bundle approach is the traditional evaluation framework used in resource planning. It reflects the current general approach of interconnecting individual generation projects with a separate transmission connection to the existing transmission grid.

In estimating the cost of resources in a bundle approach, the cost of transmission connecting a potential individual generating plant to its nearest existing BC Hydro substation or line is estimated. This transmission line is referred to as T1. In this IRP, T1 line voltages vary from 25 kV to 500 kV.

With an assumed voltage, the cost of transmission line was then estimated using the assumption shown in Table 18. The same assumption has been used for approximating the cost of T1, T2, and T3 circuits.

Table 18 Estimated Costs of Transmission Lines

New Power Line Voltage (kV)	Cost ($/km), 2011 Dollars			
	Avg. Overhead Line Slope (0-15%)	Avg. Overhead Line Slope (16-30%)	Avg. Overhead Line Slope (>30%)	Submarine Cable
25	84,800	169,600	254,400	500,000
69	106,000	212,000	318,000	1,000,000
138	159,000	318,000	477,000	3,600,000
230	265,000	530,000	795,000	5,300,000
500	530,000	1,060,000	1,590,000	7,100,000

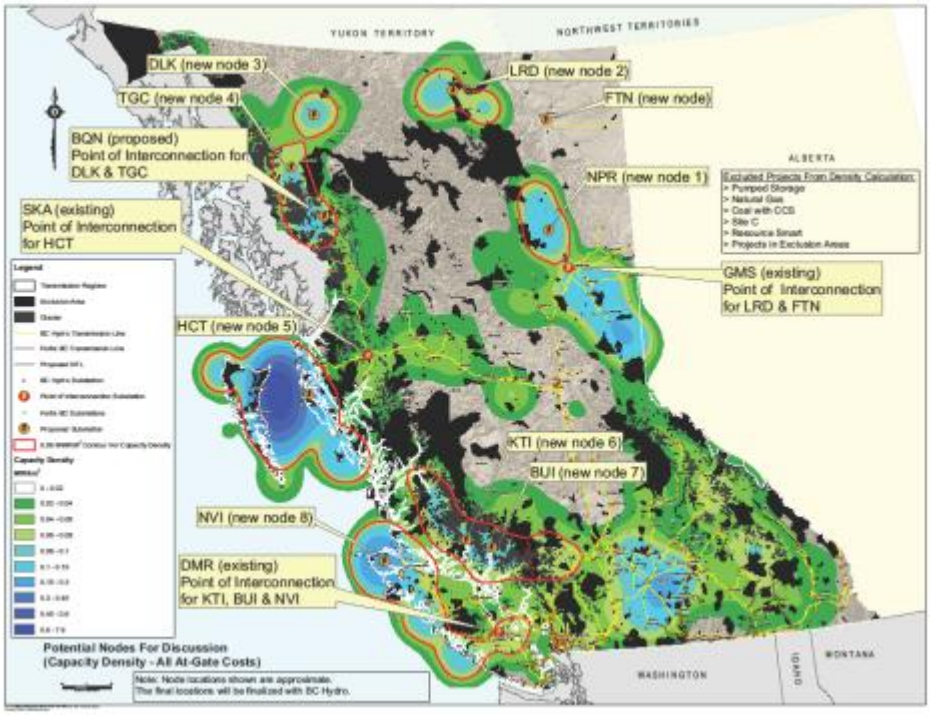
In analyzing the bundle approach, potential resources in each of the ten transmission regions (such as the North Coast or Peace Region) as described in Appendix 3A-1 (i.e., Figure 5-2 of the Resource Options Report) are grouped together according to their similar characteristics and costs into resource bundles. For modeling purposes, the ten transmission regions are further broken down into eleven transmission regions when represented as nodes in the SO model as the yellow shaded nodes shown in Figure 7. Generating resources including T1 costs are represented in these modeling nodes for the SO model to select in building portfolios. Transmission resource options, presented in Chapter 3, interconnecting the yellow nodes are also options for SO model to select to bring generated electricity to meet load.

7.1.2 Cluster approach

Cluster approach is the approach of pre building bulk transmission into a region of high generation resource potential. A cluster is a geographic area where there is high energy and/or capacity density.

To estimate the cost of resources in a cluster approach, resource clusters in B.C. were first identified. BC Hydro retained Kerr Wood Leidal Consulting Engineers (**KWL**) to review the data base of potential new generation resources, locate their GIS coordinates on a provincial map, and identify areas of high density generation resource potential (clusters) across the province. This analysis is described in Appendix 6D. The identified clusters and the location of their respective central nodes are shown in Figure 6. The location of central node is defined by reasonable proximity to all resources within the cluster and by professional judgement. It is assumed to be the location of a potential new substation, collector hub for the power transmitted from resources within the cluster.

Figure 6 Geographical Map of the IRP Clusters



With the identified clusters and central nodes, the cost of interconnecting the potential resources to the central node (T2) and the cost of interconnecting the central node to existing grid (T3) was then estimated.

T2 is defined as the transmission line which connects a potential individual generating plant to its cluster's central node. By definition, T2 are expected to be shorter than T1.To estimate the cost of T2 transmission interconnecting a potential generating plant and its associated potential cluster central node , an assumption of T2 voltage level was necessary and it is a function of both line capacity and circuit length as shown in Table 19. The 56 per cent[5] reduction factor in the far right column is to avoid overrating of the lines.

Table 19 Voltages of T2 Lines

T2 Voltage Level (kV)	Capacity Range (MW)		Distance from Cluster's Central Substation (km)		75% of Distance x 75% of Capacity (MW x km)	
	Min.	Max.	Min.	Max.	Min.	Max.
25	1	20	1	20	1	225
69	21	60	21	60	226	2,025
138	61	150	61	100	2,026	8,438
230	151	750	101	200	8,439	84,375
500	751	>751	201	>201	84,376	>84,376

T3 is defined as the high capacity transmission lines which connects a potential cluster from its central node to the nearest existing BC Hydro substation. The connection can be direct or via the central node of another cluster.

In this IRP, it is assumed that the T3 voltages are limited to 500 kV and 230 kV[6]. Table 20 shows how T3 transmission voltage and number of circuits are determined[7] and the estimatedT3 costs are shown in Table 21.

[5] 75 per cent x 75 per cent = 56.25 per cent.

[6] In this IRP transmission analysis, 287 kV and 230 kV circuits are assumed analogous and are represented by 230 kV. The only exception is the Fort Nelson to Peace region transmission (FTN-NPR-PR) where a double circuit 287 kV transmission is assessed.

[7] Transmission cost estimates for FTN to NPR and NPR to PR are based on the BCTC's 2009 Fort Nelson transmission study.

Table 20 Flow Levels on Transmission Lines

T3 Power Line Segment	Flow Level for Selection of One 230 kV (or 287 kV) Circuit	Flow Level for Selection of One 500 kV Circuit	Flow Level for Selection of Two 500 kV Circuits
LRD to FTN	Up to 235 MW	236 MW to 1200 MW	1200 MW to 2747 MW
FTN to NPR	See Note 1		1200 MW to 2729 MW
NPR to PR	See Note 1		1200 MW to 3703 MW
HCT to SKN	Up to 270 MW	271 MW to 1200 MW	1200 MW to 2984 MW
DLK to TGC	Up to 323 MW	324 MW to 1200 MW	1200 MW to 3329 MW
TGC to BQN	Up to 306 MW	307 MW to 1200 MW	1200 MW to 3220 MW
NVI to CBL	Up to 228 MW	229 MW to 1200 MW	1200 MW to 2702 MW
KTI to CBL	Up to 304 MW	305 MW to 1200 MW	1200 MW to 3202 MW
BUI to CBL	Up to 308 MW	309 MW to 1200 MW	1200 MW to 3229 MW
CBL to DMR	Up to 382 MW	383 MW to 1200 MW	1200 MW to 3721 MW

Note 1**:** Selection of a transmission voltage level from Fort Nelson to Peace region (FTN to NPR plus NPR to PR) is provided from the BCTC's 2009 Fort Nelson transmission study. This study assessed a range of transmission voltages including a double circuit 287 kV (rated 446 MW to 456 MW), one 230 kV circuit (rated 252 MW), and one 500 kV circuit (rated 633 MW to 656 MW).

Table 21 Estimated T3 Power Lines Costs and Losses[8]

T3 Power Line Segment	Voltage (kV)	Number of Single Circuit Power Lines	Power Line Length (km)	Total (Not Including IDC, Rounded to Nearest $1000)	Approximate T3 Losses
LRD to FTN	230	1	216	$ 102,789,000	2.90%
FTN to NPR	230	1	226	$ 114,063,000	3.03%
NPR to GMS	230	1	95	$ 47,743,000	1.27%
HCT to SKN	230	1	168	$ 140,460,000	2.25%
DLK to TGC	230	1	126	$ 59,478,000	1.69%
TGC to BQN	230	1	143	$ 76,350,000	1.92%
NVI to CBL	230	1	233	$ 115,186,000	3.13%
KTI to CBL	230	1	147	$ 116,276,000	1.97%
BUI to CBL	230	1	141	$ 99,718,000	1.89%
CBL to DMR	230	1	91	$ 40,613,000	1.22%
LRD to FTN	230	2	216	$ 205,578,000	1.45%
FTN to NPR	230	2	226	$ 228,126,000	1.52%
NPR to GMS	230	2	95	$ 95,486,000	0.63%
HCT to SKN	230	2	168	$ 280,919,000	1.13%
DLK to TGC	230	2	126	$ 118,957,000	0.85%
TGC to BQN	230	2	143	$ 152,700,000	0.96%
NVI to CBL	230	2	233	$ 230,371,000	1.57%
KTI to CBL	230	2	147	$ 232,553,000	0.99%
BUI to CBL	230	2	141	$ 199,436,000	0.95%
CBL to DMR	230	2	91	$ 81,225,000	0.61%
LRD to FTN	500	1	216	$ 195,963,000	1.73%
FTN to NPR	500	1	226	$ 150,270,000	1.81%
NPR to GMS	500	1	95	$ 62,898,000	0.76%
HCT to SKN	500	1	168	$ 217,703,000	1.35%
DLK to TGC	500	1	126	$ 115,399,000	1.01%
TGC to BQN	500	1	143	$ 142,449,000	1.15%
NVI to CBL	500	1	233	$ 216,250,000	1.87%
KTI to CBL	500	1	147	$ 203,523,000	1.18%
BUI to CBL	500	1	141	$ 184,653,000	1.13%
CBL to DMR	500	1	91	$ 80,608,000	0.73%
LRD to FTN	500	2	216	$ 391,926,000	0.87%
FTN to NPR	500	2	226	$ 300,540,000	0.91%
NPR to GMS	500	2	95	$ 125,796,000	0.38%
HCT to SKN	500	2	168	$ 435,407,000	0.67%
DLK to TGC	500	2	126	$ 230,798,000	0.51%
TGC to BQN	500	2	143	$ 284,898,000	0.57%
NVI to CBL	500	2	233	$ 432,500,000	0.94%
KTI to CBL	500	2	147	$ 407,045,000	0.59%
BUI to CBL	500	2	141	$ 369,307,000	0.57%
CBL to DMR	500	2	91	$ 161,217,000	0.36%
FTN to NPR	287	Double	226	$ 133,705,000	1.52%
NPR to GMS	287	Double	95	$ 55,964,000	0.63%

The cost of a transmission circuit is not limited to the cost of T3 circuits. Other T3 capital costs estimated based on high-level estimates of the expected expenditure based on the cost of similar upgrades in BC Hydro's network are approximated to be:

- Cost of a new cluster's central substation: $70.0 million

[8] In Table 3, the VI node is represented by two substations: Campbell River (**CBL**) in northern VI and Dunsmuir (**DMR**) in central VI.

- Cost of terminating each 500 kV T3 line into an existing substation: $7.8 million
- Cost of terminating each 230 kV T3 line into an existing substation: $3.8 million
- Cost of 230 kV to 500 kV transformation at an existing substation: $0.043 million per MW

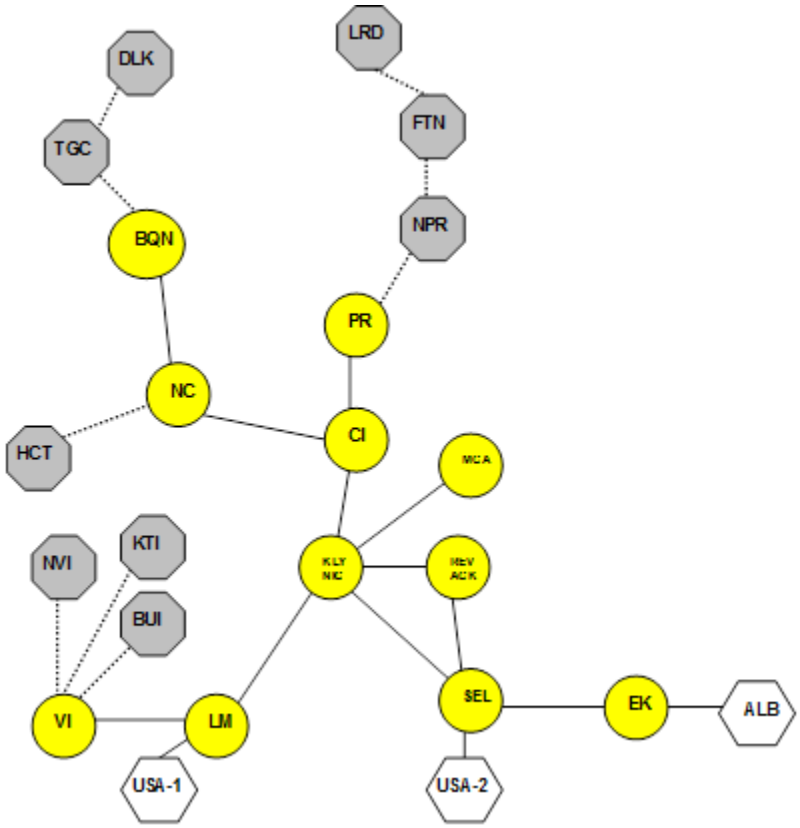
In analyzing the cluster approach, potential resources in each of the cluster regions are grouped together according to their similar characteristics and costs. For modeling purposes, generating resources including T2 costs are represented in modeling nodes for the SO model to select in building portfolios. T3 options between potential clusters and existing grid as well as transmission options between existing transmission regions are options for SO model to select to bring generated electricity to meet load.

7.1.3 Nodal Diagrams

A nodal diagram is a simplified representation of BC Hydro's both existing bulk transmission regions (zones) and new clusters. Figure 7 shows the "Nodal Diagram" of the IRP analysis. It is an input to BC Hydro's System Optimizer program and is used for determining transmission requirements between the nodes.

The nodes shaded in yellow represent existing transmission regions. The nodes shaded in grey represent potential clusters. The nodes in white represent the Alberta and US markets which are connected to BC Hydro's grid.

Figure 7 Nodal Diagram as modelled in System Optimizer



LEGEND	
Node	**Demand / Supply Zone**
ALB	Alberta Intertie
BQN	Bob Quinn Lake
BUI	Bute Inlet
CI	Central Interior
DLK	Dease Lake
EK	East Kootenay
FTN	Fort Nelson
HCT	Hecate
KLY/NIC	Kelly / Nicola
KTI	Knight Inlet
LM	Lower Mainland
LRD	Liard
MCA	Mica
NC	North Coast
NPR	North Peace River
NVI	North Vancouver Island
PR	Peace River
REV/ACK	Revelstoke/Ashton Creek
SEL	Selkirk
TGC	Telegraph Creek
USA-1	Western Intertie to US
USA-2	Eastern Intertie to US
VI	Vancouver Island
	Existing / Committed Node
	Future Node
———	Existing / Committed Transmission
---------	Future Transmission

In the above diagram, solid lines connecting the nodes symbolize flow of power between two regions. These lines represent existing and committed transmission paths including BC Hydro's interties to the U.S. and Alberta. The dashed lines represent interconnections between potential future cluster nodes or between potential cluster node and an existing BC Hydro transmission zone.

The abbreviations for the cluster regions are shown in Table 22.

Table 22 Abbreviations for Cluster Regions

Cluster Region
DLK – Dease Lake
TGC – Telegraph Creek
HCT - Hecate
NVI – North Vancouver Island
KTI – Knight Inlet
BUI – Bute Inlet
LRD - Liard
FTN – Fort Nelson
NPR – North Peace River

7.1.4 Results of Cluster Analysis

Portfolio were created, one using the Bundle approach and one using the Cluster approach, to estimate the costs difference between the two approaches. As noted, the Generation Cluster Analysis has not been repeated using the latest information used in the rest of the IRP. For example, the analysis presented uses a previous load resource gap as well as previous resource options data and financial assumptions. Nonetheless, the conclusions are indicative and the consequence table from the previous study is repeated here for reference (see Table 23). Key conclusions include:

- The total portfolio PV cost (in F2011 constant dollar for a 30-year study) between the bundle and cluster approach is small (less than 2 per cent difference)
- The cluster approach reduces the land footprint, as expected, because it decreases the amount of redundant lines being built. The affected stream length result highlights that these modelling outcomes can appear quite lumpy and counterintuitive when taken down at micro/project level.

- Both the bundle and cluster approach have similar economic development benefits

Table 23 Full Consequence Table for Cluster versus Bundle Approaches

	Measure	Results – Bundle	Results – Cluster
Land	total hectares	25,100	23,000
Affected Stream Length	km	390	450
Marine (valued ecological features)	total hectares	150	100
Total GDP	$ million PV	13,900	14,600
Employment	Total FTEs	350,500	363,200
Gov't Revenue	$ million PV	2,200	2,300
G& T Resource cost $ millions	$ million PV	12,250	11,941
Trade Revenue $ millions	$ million PV	-1,215	-1,190
DSM Option cost $ millions	$ million PV	3,996	3,996
Total Portfolio Cost	$ million PV	15,031	14,747

With the mid gap LRB used in this IRP, the difference in present value between the cluster and bundle approach would likely be reduced, or even swing in favour of the bundle approach as the much lower resource gap would lower the utilization of the T3 line in the cluster approach but still incur the entire cost of the T3 line.

It should be noted that the portfolio analysis is based on the resource selection being optimized given perfect foresight of future conditions within the portfolio construct. The costs and availability of resources analyzed represent planning level estimates that are sufficient for comparing resource options but this information is highly uncertain/unreliable for predicting which and where resources would be developed. In addition and in practice, the cluster approach also assumes the risk of stranded or under-utilized transmission assets that represent significant expenditures. The

cluster approach may also have potential negative impacts on bidding behaviour in a potential future acquisition process, which could erode any benefits.

Given all of the above considerations, the difference in portfolio PV results is not significant enough to support a cluster approach.

North Peace River Cluster Benefits

One of the clusters, the North Peace River (**NPR**), was further analyzed because it is situated along potential path of the Northeast Transmission Line (**NETL**) and may offer benefits that can offset the cost of this line. The analysis compared one portfolio developed using the bundle approach (interconnecting individual projects in NPR to existing GMS substation) and one using the cluster approach (building a bulk transmission line from GMS to a potential substation at NPR). The higher present value for the NPR cluster portfolio, as shown in Table 24, means that the benefit of building out the NPR cluster does not fully offset the cost of the GMS to NPR transmission line over the 30-year study period. However, the difference in portfolio cost without the cost of the T3 line from the Peace Region could be used to offset the cost of the NETL because the NETL enables access to the NPR cluster. By assuming the annual benefit at the end of the 30-year portfolio persists until the end of the project life of NETL, the benefit associated with the NPR cluster is about $150 million.

Table 24 Cost Comparison for Bundle and NPR Cluster (PV, $ million)

30 year PV	Bundle	NPR Cluster	Difference
Total Portfolio Cost	15,031	15,052	-21

This analysis was also not updated using the latest information used in the rest of this IRP. For example, the analysis presented uses a previous load resource gap (a larger gap) as well as previous resource options data and financial assumptions. Although the estimated benefits associated with the NPR cluster could be smaller, it is not expected to affect the conclusion or recommendations in this IRP.

7.2 Conclusions of the Cluster Analysis

The IRP analysis concludes that there could be marginal financial benefits in pre building transmission into clusters of generation resources over the 30-year planning horizon. It also has the potential to reduce environmental footprints somewhat as a result of optimal transmission configurations.

Meanwhile, there are also significant risks associated with pre building transmission for generation clusters that include:

- Stranded transmission investment if the expected generation projects do not materialize
- Potential negative impacts on acquisition process bidding behaviour, which could erode any financial benefit to pre building

To reap some potential pre building benefits while minimizing risk, BC Hydro could evaluate building adequate transmission to the identified high potential generation cluster regions during future acquisition processes if and when projects in these regions are proposed.

The NPR cluster could provide an estimated $150 million of benefit to offset the cost of NETL.

7.3 Portfolio Output

The portfolio output sheets for these portfolios are included on the following pages. Note that these output sheets have not been updated to reflect the latest format for output sheets, costs shown are F2011 constant dollars.

Scenario:	Load	DSM	Scenario	Site C	Thermal Resources	Other
	Reference (Mid)	DSM Option 2 Mid	C - Low GHG & Low Gas	Included as an Option	Thermal Resources excluded	Initial LNG, No HRB/FN Load, No Gas , 30 Years,10 Wind adder, Bundle

	Discounted to Beginning of 2011 (2011 dollars) - Net DSM	Discounted to Beginning of 2011 (2011 dollars) - Gross DSM
PV of G& T Resource cost (2014 - 2040) - $ millions	12,250	12,250
PV of Trade Revenue (2014 - 2040) - $ millions	(1,215)	(1,215)
PV of DSM Option cost (2014 - 2040) - $ millions	334	3,996
PV of Total Portfolio Cost (2014 - 2040) - $ millions	13,923	15,031

* UECs for gas resources shown are indicative and are for illustration only. The UECs shown reflect the levelized cost over 20 years based on gas and GHG costs for the market scenarios modeled. These simplifying assumptions were not used in the detailed NPV calculation yielding the overall portfolio costs shown. UCCs are shown for capacity rich projects.

Supply Totals through 2016

	Wind	Run of River	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2020

	Wind	Run of River	Other	Site C	Total
Dep. Capacity (MW)	103	104	598	0	805
Firm Energy (GWh)	1,493	2,004	1,066	0	4,562

Supply Totals through 2040

	Wind	Run of River	Other	Site C	Total	Avg. UEC
Dep. Capacity (MW)	844	259	3,707	1,100	5,909	
Firm Energy (GWh)	10,635	5,189	1,934	5,100	22,858	104

DSM Level in:

2020	7,532 GWh	1,161 MW
2030	10,230 GWh	1,578 MW

Clean Objective (%) - performance during the period 2014-2030

	Based on Generation	Based on Firm Capability
Average %	99%	96%
Lowest %	97%	95%

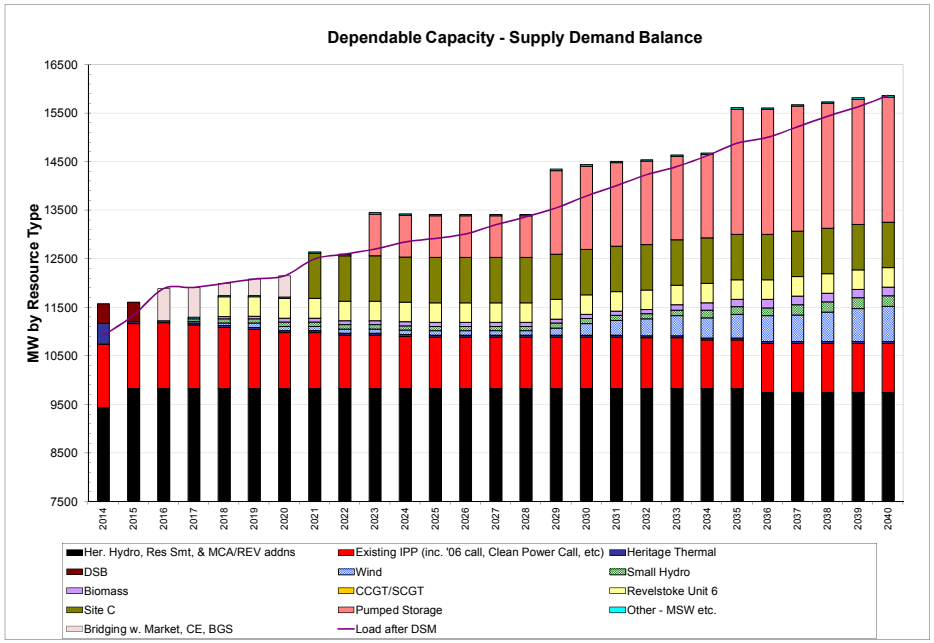
Transmission Expansion

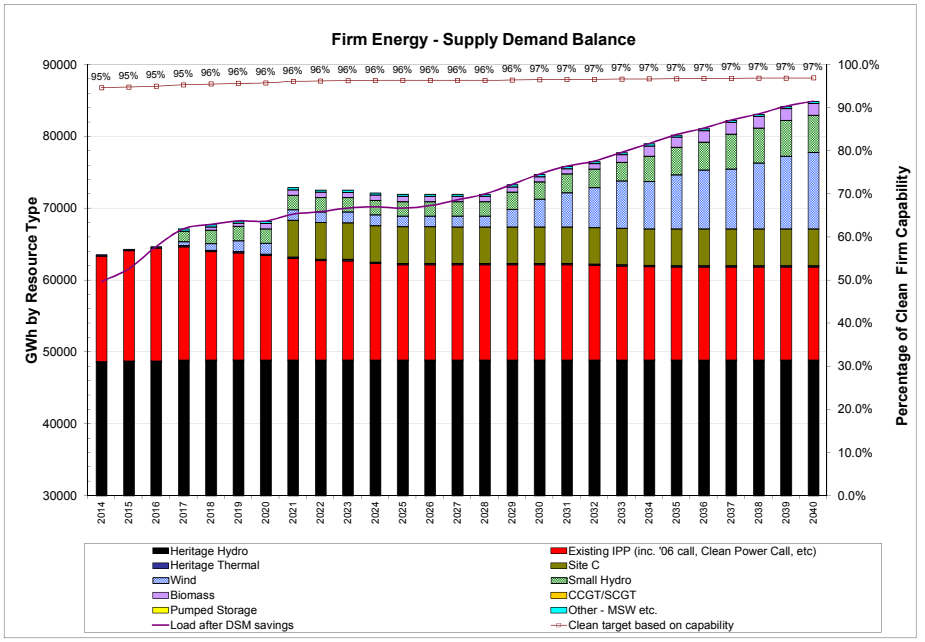
Year	Project Description	Between	Capacity (MW)
2016	Series compensation of WSN-SKA 500 kV line	CI to NC	580
2018	Series compensation of 5L91 and 5L98	SE to KN	147
2021	Series Compenstation 5L1_2_3_7 PR to CI	PR to KN	360
2021	Shunt Compenstation WSN KLY	PR to KN	650
2033	Series Compenstation 5L11_12_13 PR to CI	PR to KN	390
2035	5L8 PR to CI	PR to CI	1470
2038	5L14 CI to KN	CI to KN	2120

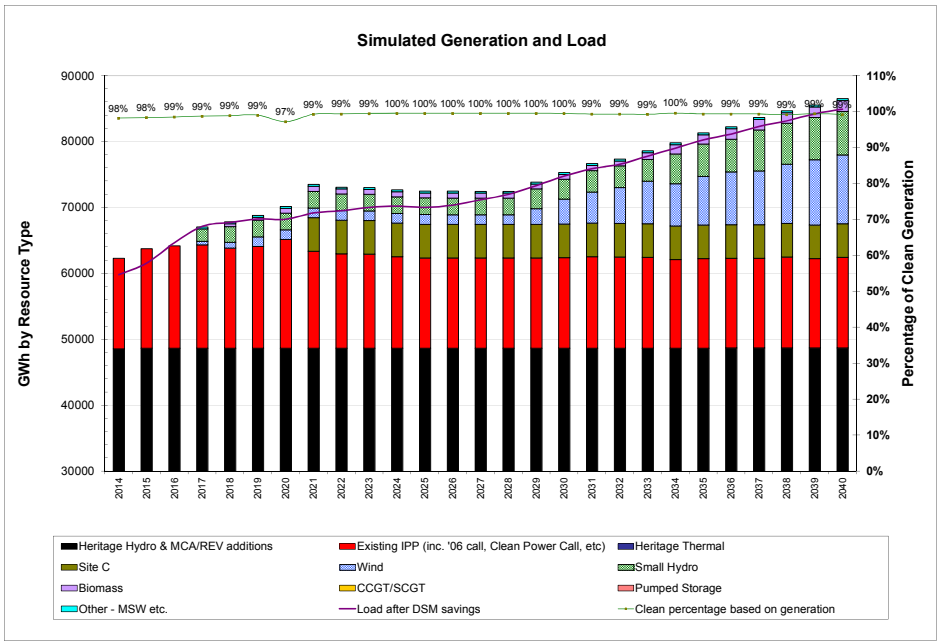
Resources Selected

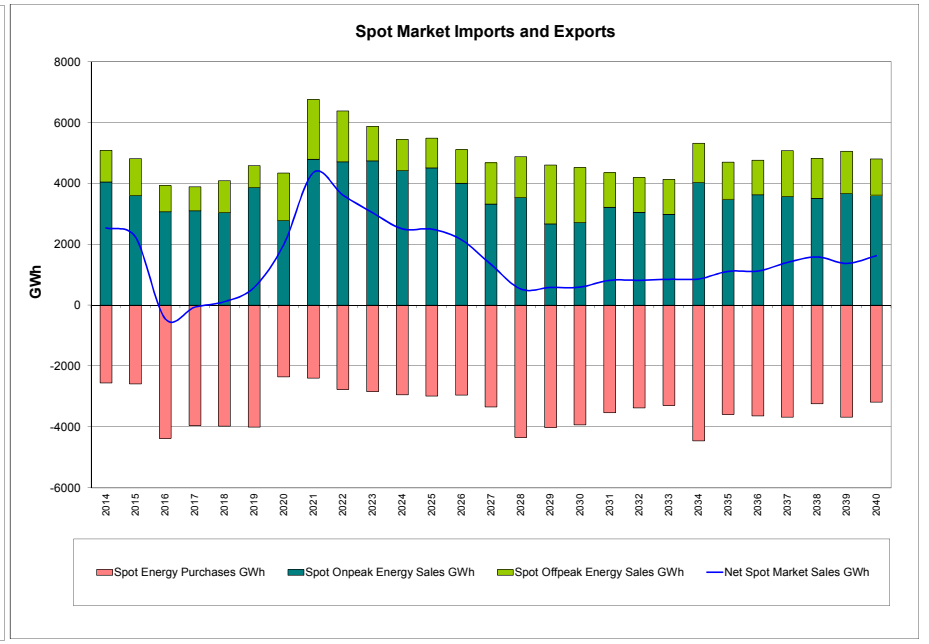
			Capacity - MW		Energy - GWh		UEC / UCC
Year	Zone	Resource	Installed	Dependable	Total	Firm	$/MWh or $/kW-year
2017	BCH_PR	Wind_PC28	153	37	536	536	95
2017	BCH_KN	ROR_T1R1_70-80_KN	155	13	597	447	78
2017	BCH_VI	ROR_T1R1_80-90_VI	98	22	440	348	83
2017	BCH_LM	MSW2_LM	34	33	283	283	81
2017	BCH_LM	ROR_T1R1_60-80_LM	73	10	311	241	71
2017	BCH_LM	ROR_T1R1_80-90_LM	135	17	550	436	84
2018	BCH_PR	Wind_PC19	117	28	381	381	100
2018	BCH_VI	WBBio_VI	55	55	438	438	112
2018	BCH_VI	ROR_T1R1_90-110_VI	124	38	498	412	95
2018	BCH_REV	Revelstoke Unit 6	500	470	26	26	55
2019	BCH_PR	Wind_PC20	159	38	575	575	99
2019	BCH_NC	ROR_T1R1_70-100_NC	40	4	163	119	89
2020	BCH_SE	WBBio_WK	39	39	311	311	123
2021	BCH_PR	Site C	1100	1,100	5,100	5,100	95
2023	BCH_LM	1000 MW PS_LM	1000	1,000			97
2029	BCH_PR	Wind_PC13	135	32	465	465	101
2029	BCH_PR	Wind_PC18	138	33	467	467	101
2029	BCH_LM	ROR_T1R1_90-100_LM	116	17	487	386	95
2029	BCH_LM	1000 MW PS_LM	1000	1,000			97
2030	BCH_PR	Wind_PC14	144	35	463	463	103
2030	BCH_PR	Wind_PC15	108	26	329	329	107
2030	BCH_PR	Wind_PC16	99	24	323	323	104
2030	BCH_PR	Wind_PC21	99	24	311	311	102
2031	BCH_PR	Wind_PC10	297	71	901	901	104
2031	BCH_KN	ROR_T1R1_80-100_KN	74	7	295	215	92
2032	BCH_PR	Wind_PC42	63	15	194	194	108
2032	BCH_PR	Wind_PC48	152	36	482	482	107
2032	BCH_VI	Wind_VI14	35	8	105	105	117
2033	BCH_PR	Wind_PC09	207	50	619	619	109
2033	BCH_PR	Wind_PC11	126	30	409	409	109
2033	BCH_EK	WBBio_EK	37	37	295	295	127
2034	BCH_NC	WBBio_PG	45	45	359	359	129
2034	BCH_LM	ROR_T1R1_100-110_LM	282	51	1,220	954	104
2035	BCH_PR	Wind_PC26	126	30	372	372	112
2035	BCH_PR	Wind_PC40	117	28	333	333	116
2035	BCH_PR	Wind_PC41	45	11	131	131	112
2035	BCH_KN	ROR_T1R1_100-110_KN	39	4	155	113	102
2035	BCH_EK	ROR_T1R1_80-100_EK	76	1	265	184	94
2035	BCH_VI	Wind_VI12	48	12	126	126	126
2035	BCH_LM	1000 MW PS_LM	1000	1,000			97
2036	BCH_PR	Wind_PC06	243	58	674	674	117
2036	BCH_KN	WBBio_KM	26	26	207	207	130
2037	BCH_VI	Wind_VI15	41	10	105	105	134
2037	BCH_VI	ROR_T1R1_110-120_VI	294	66	1,319	1,031	115
2038	BCH_PR	Wind_PC05	97	23	334	334	122
2038	BCH_KN	Wind_SI23	193	46	521	521	127
2039	BCH_PR	Wind_PC43	41	10	133	133	123
2039	BCH_NC	Wind_NC09	334	80	808	808	134
2039	BCH_NC	ROR_T1R1_110-120_NC	42	4	164	123	112
2040	BCH_VI	Wind_VI07	166	40	448	448	139
2040	BCH_VI	Wind_VI13	35	8	87	87	135
2040	BCH_REV	ROR_T1R1_90-110_REV	65	4	253	178	102

M2M_CYC_KN0_050









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	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
Input Assumptions	Reference (Mid)	DSM Option 2 Mid	C - Low GHG & Low Gas	Included as an Option	Thermal Resources excluded	Initial LNG, No HRB/FN Load, No Gas , 30 Years,10 Wind adder, Cluster

	Discounted to Beginning of 2011 (2011 dollars) - Net DSM	Discounted to Beginning of 2011 (2011 dollars) - Gross DSM
PV of G& T Resource cost (2014 - 2040) - $ millions	11,941	11,941
PV of Trade Revenue (2014 - 2040) - $ millions	(1,190)	(1,190)
PV of DSM Option cost (2014 - 2040) - $ millions	334	3,996
PV of Total Portfolio Cost (2014 - 2040) - $ millions	13,982	14,747

* UECs for gas resources shown are indicative and are for illustration only. The UECs shown reflect the levelized cost over 20 years based on gas and GHG costs for the market scenarios modeled. These simplifying assumptions were not used in the detailed NPV calculation yielding the overall portfolio costs shown. UCCs are shown for capacity rich projects.

Supply Totals through 2016

	Wind	Run of River	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2020

	Wind	Run of River	Other	Site C	Total
Dep. Capacity (MW)	75	128	503	0	706
Firm Energy (GWh)	1,111	3,001	313	0	4,426

Supply Totals through 2040

	Wind	Run of River	Other	Site C	Total	Avg. UEC
Dep. Capacity (MW)	827	276	3,718	1,100	5,921	
Firm Energy (GWh)	10,471	5,799	2,035	5,100	23,405	103

DSM Level in:

2020	7,532 GWh	1,161 MW
2030	10,230 GWh	1,578 MW

Clean Objective (%) - performance during the period 2014-2030

	Based on Generation	Based on Firm Capability
Average %	99%	96%
Lowest %	96%	95%

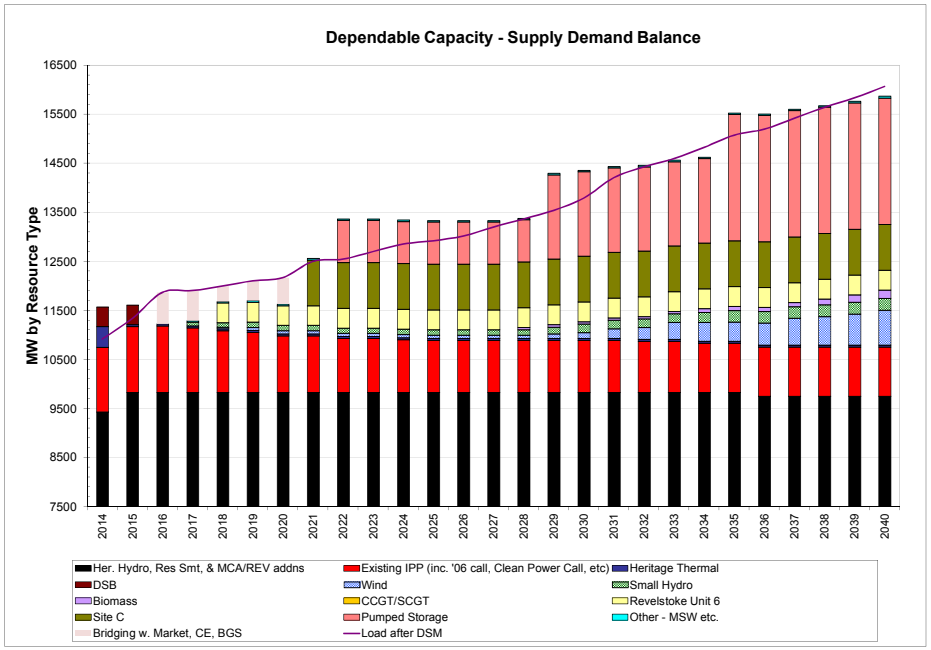
Transmission Expansion

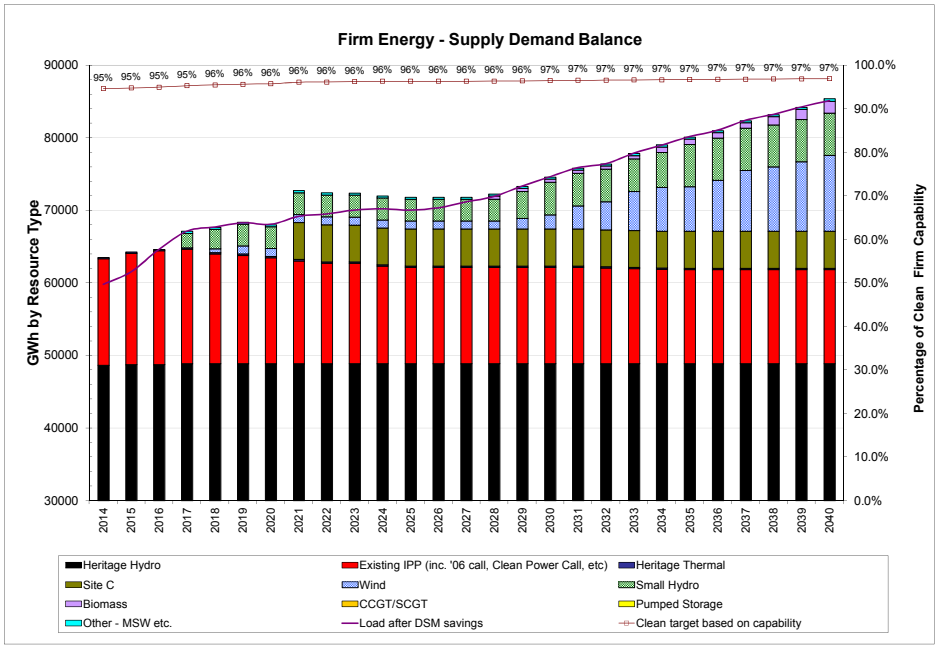
Year	Project Description	Between	Capacity (MW)
2016	Series compensation of WSN-SKA 500 kV line	CI to NC	580
2017	Cluster BUI to CBL 230 1 cct	BUI to CBL	308
2017	Cluster CBL to DMR 230 1 cct	CBL to DMR	382
2017	Cluster KTI to CBL 230 1 cct	KTI to CBL	304
2018	Series compensation of 5L91 and 5L98	SE to KN	147
2019	Cluster CBL to DMR 230 2 cct	CBL to DMR	765
2021	Series Compenstation 5L1_2_3_7 PR to CI	PR to KN	360
2021	Shunt Compenstation WSN KLY	PR to KN	650
2029	Cluster KTI to CBL 230 1 cct	KTI to CBL	304
2030	Cluster BUI to CBL 230 1 cct	BUI to CBL	308
2033	Cluster NPR to PR 500 1 cct	NPR to PR	1200
2033	Series Compenstation 5L11_12_13 PR to CI	PR to KN	390
2037	5L8 PR to CI	PR to CI	1470
2037	5L14 CI to KN	CI to KN	2120

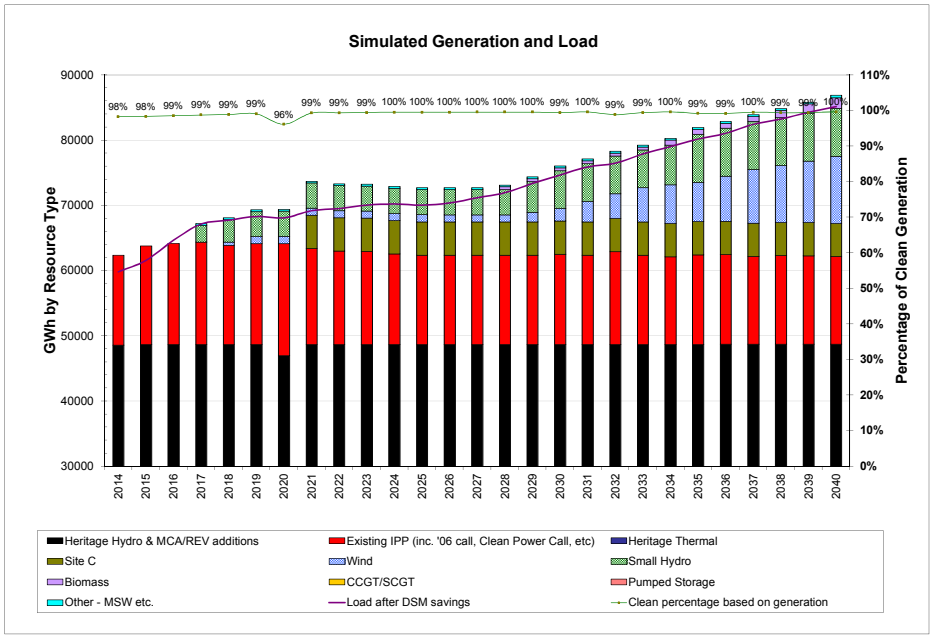
Resources Selected

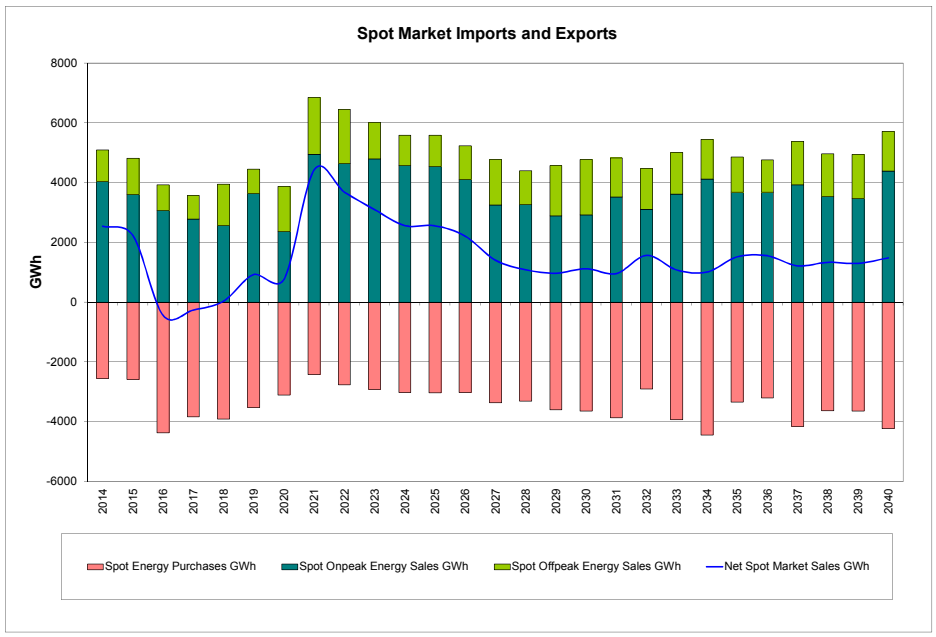
			Capacity - MW		Energy - GWh		UEC / UCC *
Year	Zone	Resource	Installed	Dependable	Total	Firm	$/MWh or $/kW-year
2017	BCH_LM	ROR_Clsr_60-80_LM	73	9	307	242	71
2017	BCH_LM	ROR_Clsr_80-90_LM	135	15	552	437	84
2017	BCH_LM	MSW2_LM	34	33	283	283	81
2017	BCH_KTI	ROR_Clsr_50-60_KTI	77	15	349	275	53
2017	BCH_BUI	ROR_Clsr_50-60_BUI	186	36	834	657	58
2017	BCH_BUI	ROR_Clsr_60-70_BUI	131	18	551	408	67
2018	BCH_PR	Wind_PC28	153	37	536	536	105
2018	BCH_KN	ROR_Clsr_70-100_KN	228	17	878	659	83
2018	BCH_REV	Revelstoke Unit 6	500	470	26	26	55
2019	BCH_PR	Wind_PC20	159	38	575	575	109
2019	BCH_KTI	ROR_Clsr_60-80_KTI	98	19	443	324	64
2021	BCH_PR	Site C	1100	1,100	5,100	5,100	95
2022	BCH_LM	1000 MW PS_LM	1000	1,000			97
2028	BCH_VI	WBBio_VI	55	55	438	438	112
2029	BCH_PR	Wind_PC19	117	28	381	381	110
2029	BCH_LM	1000 MW PS_LM	1000	1,000			97
2029	BCH_KTI	ROR_Clsr_80-90_KTI	200	37	896	673	87
2030	BCH_PR	Wind_PC13	135	32	465	465	111
2030	BCH_LM	ROR_Clsr_90-100_LM	116	15	488	386	95
2030	BCH_BUI	ROR_Clsr_70-80_BUI	130	25	585	431	75
2031	BCH_PR	Wind_PC14	144	35	463	463	113
2031	BCH_PR	Wind_PC18	138	33	467	467	111
2031	BCH_PR	Wind_PC21	99	24	311	311	112
2032	BCH_PR	Wind_PC15	108	26	329	329	117
2032	BCH_PR	Wind_PC16	99	24	323	323	114
2033	BCH_NPR	Wind_PC09	207	50	619	619	113
2033	BCH_NPR	Wind_PC10	297	71	901	901	112
2034	BCH_PR	Wind_PC42	63	15	194	194	118
2034	BCH_PR	Wind_PC48	152	36	482	482	117
2034	BCH_SE	WBBio_WK	39	39	311	311	123
2034	BCH_VI	ROR_Clsr_100-140_VI	91	32	328	305	119
2035	BCH_NC	ROR_Clsr_70-120_NC	81	7	316	241	100
2035	BCH_VI	Wind_VI14	35	8	105	105	127
2035	BCH_LM	ROR_Clsr_100-110_LM	226	33	971	758	105
2035	BCH_LM	1000 MW PS_LM	1000	1,000			97
2036	BCH_PR	Wind_PC11	126	30	409	409	119
2036	BCH_PR	Wind_PC41	45	11	131	131	122
2036	BCH_NPR	Wind_PC05	97	23	334	334	114
2037	BCH_PR	Wind_PC26	126	30	372	372	122
2037	BCH_NPR	Wind_PC04	104	25	327	327	121
2037	BCH_NPR	Wind_PC06	243	58	674	674	120
2038	BCH_PR	Wind_PC40	117	28	333	333	126
2038	BCH_NC	WBBio_PG	45	45	359	359	129
2038	BCH_VI	Wind_VI12	48	12	126	126	136
2039	BCH_KN	Wind_SI23	193	46	521	521	137
2039	BCH_EK	WBBio_EK	37	37	295	295	127
2039	BCH_NPR	Wind_PC37	72	17	199	199	126
2040	BCH_NC	Wind_NC09	334	80	808	808	144
2040	BCH_KN	WBBio_KM	26	26	207	207	130
2040	BCH_VI	Wind_VI13	35	8	87	87	145
2040	BCH_VI	MSW1_VI	12	12	100	100	148

M2M_CYC_KN0_054









M2M_CYC_KN0_054

	Load	DSM	Market Scenario	Site C	Thermal Resources	Other
Input Assumptions	Reference (Mid)	DSM Option 2 Mid	C - Low GHG & Low Gas	Included as an Option	Thermal Resources excluded	Initial LNG, No HRB/FN Load, No Gas , 30 Years,10 Wind adder, NPR Cluster

	Discounted to Beginning of 2011 (2011 dollars) - Net DSM	Discounted to Beginning of 2011 (2011 dollars) - Gross DSM
PV of G& T Resource cost (2014 - 2040) - $ millions	12,269	12,269
PV of Trade Revenue (2014 - 2040) - $ millions	(1,213)	(1,213)
PV of DSM Option cost (2014 - 2040) - $ millions	334	3,996
PV of Total Portfolio Cost (2014 - 2040) - $ millions	14,019	15,052

Supply Totals through 2016

	Wind	Run of River	Other	Site C	Total
Dep. Capacity (MW)	0	0	0	0	0
Firm Energy (GWh)	0	0	0	0	0

Supply Totals through 2020

	Wind	Run of River	Other	Site C	Total
Dep. Capacity (MW)	149	100	559	0	808
Firm Energy (GWh)	1,901	1,885	755	0	4,541

Supply Totals through 2040

	Wind	Run of River	Other	Site C	Total	Avg. UEC
Dep. Capacity (MW)	843	254	3,718	1,100	5,915	
Firm Energy (GWh)	10,836	5,012	2,035	5,100	22,983	103

DSM Level in:

2020	7,532 GWh	1,161 MW
2030	10,230 GWh	1,578 MW

Clean Objective (%) - performance during the period 2014-2030

	Based on Generation	Based on Firm Capability
Average %	99%	96%
Lowest %	97%	95%

Transmission Expansion

Year	Project Description	Between	Capacity (MW)
2016	Series compensation of WSN-SKA 500 kV line	CI to NC	580
2018	Cluster NPR to PR 500 1 cct	NPR to PR	1200
2018	Series compensation of 5L91 and 5L98	SE to KN	147
2021	Series Compenstation 5L1_2_3_7 PR to CI	PR to KN	360
2021	Shunt Compenstation WSN KLY	PR to KN	650
2031	Series Compenstation 5L11_12_13 PR to CI	PR to KN	390
2035	5L8 PR to CI	PR to CI	1470
2036	5L14 CI to KN	CI to KN	2120
2038	Cluster NPR to PR 230 1 cct	NPR to PR	380

* UECs for gas resources shown are indicative and are for illustration only. The UECs shown reflect the levelized cost over 20 years based on gas and GHG costs for the market scenarios modeled. These simplifying assumptions were not used in the detailed NPV calculation yielding the overall portfolio costs shown. UCCs are shown for capacity rich projects.

Resources Selected

			Capacity - MW		Energy - GWh		UEC / UCC *
Year	Zone	Resource	Installed	Dependable	Total	Firm	$/MWh or $/kW-year
2017	BCH_KN	ROR_T1R1_70-80_KN	155	13	597	447	78
2017	BCH_VI	ROR_T1R1_80-90_VI	98	22	440	348	83
2017	BCH_VI	WBBio_VI	55	55	438	438	112
2017	BCH_LM	ROR_T1R1_60-80_LM	73	10	311	241	71
2017	BCH_LM	ROR_T1R1_80-90_LM	135	17	550	436	84
2017	BCH_LM	MSW2_LM	34	33	283	283	81
2018	BCH_VI	ROR_T1R1_90-110_VI	124	38	498	412	95
2018	BCH_NPR	Wind_PC10	297	71	901	901	102
2018	BCH_REV	Revelstoke Unit 6	500	470	26	26	55
2019	BCH_NPR	Wind_PC09	207	50	619	619	103
2020	BCH_PR	Wind_PC19	117	28	381	381	100
2021	BCH_PR	Site C	1100	1,100	5,100	5,100	95
2023	BCH_LM	1000 MW PS_LM	1000	1,000			97
2029	BCH_PR	Wind_PC28	153	37	536	536	95
2029	BCH_NC	ROR_T1R1_70-100_NC	40	4	163	119	89
2029	BCH_LM	1000 MW PS_LM	1000	1,000			97
2029	BCH_LM	ROR_T1R1_90-100_LM	116	17	487	386	95
2029	BCH_NPR	Wind_PC05	97	23	334	334	104
2030	BCH_PR	Wind_PC20	159	38	575	575	99
2030	BCH_PR	Wind_PC21	99	24	311	311	102
2030	BCH_PR	Wind_PC13	135	32	465	465	101
2031	BCH_PR	Wind_PC16	99	24	323	323	104
2031	BCH_PR	Wind_PC14	144	35	463	463	103
2031	BCH_PR	Wind_PC18	138	33	467	467	101
2032	BCH_NPR	Wind_PC06	243	58	674	674	110
2033	BCH_PR	Wind_PC42	63	15	194	194	108
2033	BCH_KN	ROR_T1R1_80-100_KN	74	7	295	215	92
2033	BCH_LM	ROR_T1R1_100-110_LM	282	51	1,220	954	104
2034	BCH_NC	WBBio_PG	45	45	359	359	129
2034	BCH_SE	WBBio_WK	39	39	311	311	123
2034	BCH_EK	WBBio_EK	37	37	295	295	127
2034	BCH_VI	Wind_VI14	35	8	105	105	117
2034	BCH_NPR	Wind_PC08	41	10	123	123	114
2035	BCH_PR	Wind_PC48	152	36	482	482	107
2035	BCH_PR	Wind_PC15	108	26	329	329	107
2035	BCH_LM	1000 MW PS_LM	1000	1,000			97
2035	BCH_NPR	Wind_PC03	62	15	209	209	113
2035	BCH_NPR	Wind_PC04	104	25	327	327	111
2036	BCH_PR	Wind_PC11	126	30	409	409	109
2036	BCH_PR	Wind_PC41	45	11	131	131	112
2036	BCH_EK	ROR_T1R1_80-100_EK	76	1	265	184	94
2036	BCH_NPR	Wind_PC37	72	17	199	199	116
2037	BCH_PR	Wind_PC40	117	28	333	333	116
2037	BCH_PR	Wind_PC26	126	30	372	372	112
2037	BCH_KN	ROR_T1R1_100-110_KN	39	4	155	113	102
2037	BCH_KN	WBBio_KM	26	26	207	207	130
2037	BCH_VI	Wind_VI12	48	12	126	126	126
2038	BCH_PR	Wind_PC43	41	10	133	133	123
2038	BCH_KN	Wind_SI23	193	46	521	521	127
2038	BCH_NPR	Wind_PC07	117	28	312	312	125
2039	BCH_VI	ROR_T1R1_110-120_VI	294	66	1,319	1,031	115
2040	BCH_PR	Wind_PC12	97	23	286	286	126
2040	BCH_NC	ROR_T1R1_110-120_NC	42	4	164	123	112
2040	BCH_VI	MSW1_VI	12	12	100	100	148

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Resources Selected

Year	Zone	Resource	Capacity - MW Installed	Capacity - MW Dependable	Energy - GWh Total	Energy - GWh Firm	UEC / UCC $/MWh or $/kW-year
2040	BCH_VI	Wind_VI15	41	10	105	105	134
2040	BCH_VI	Wind_VI13	35	8	87	87	135

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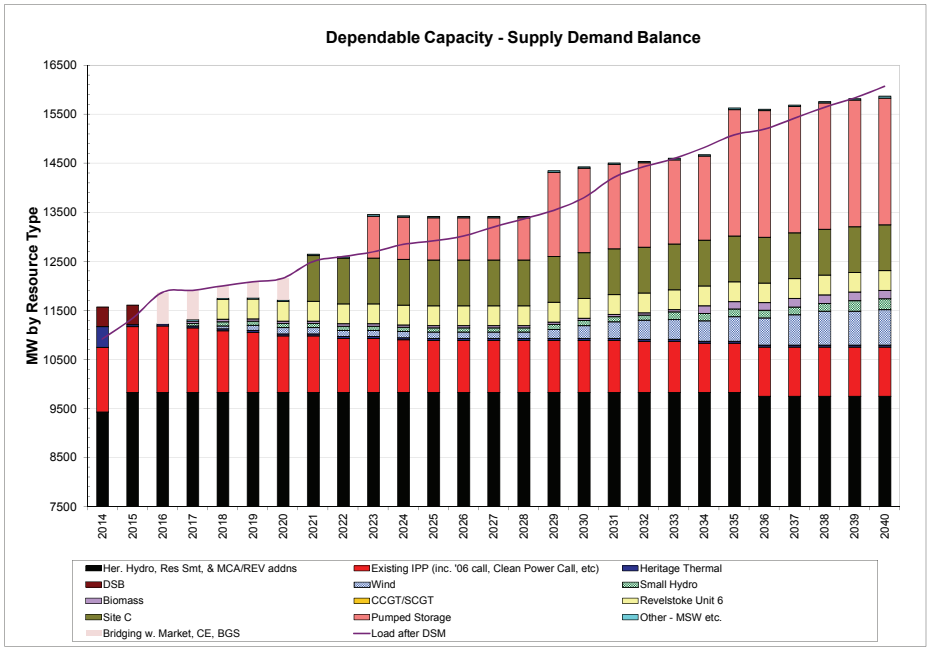

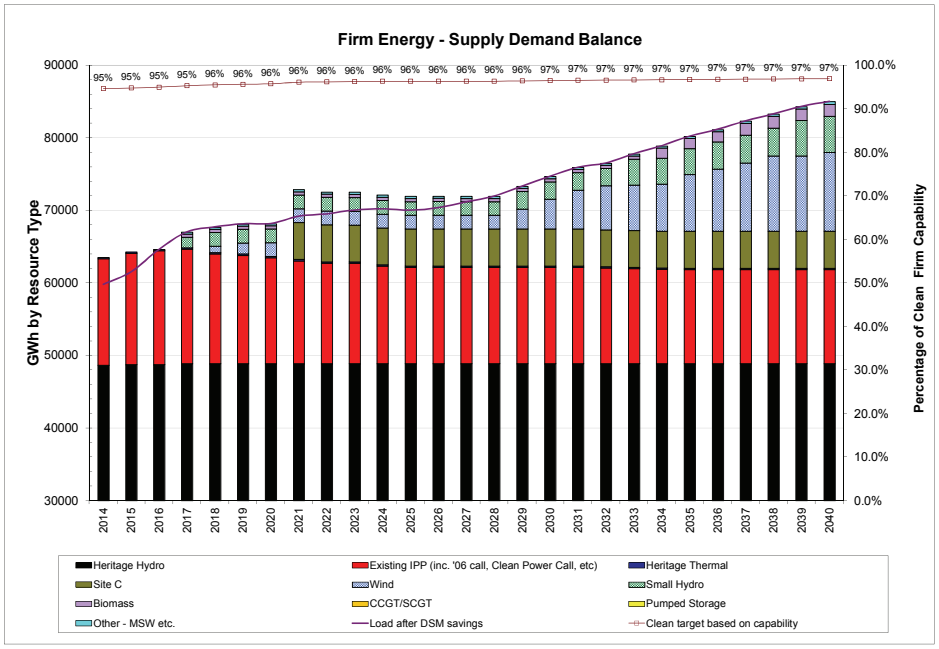

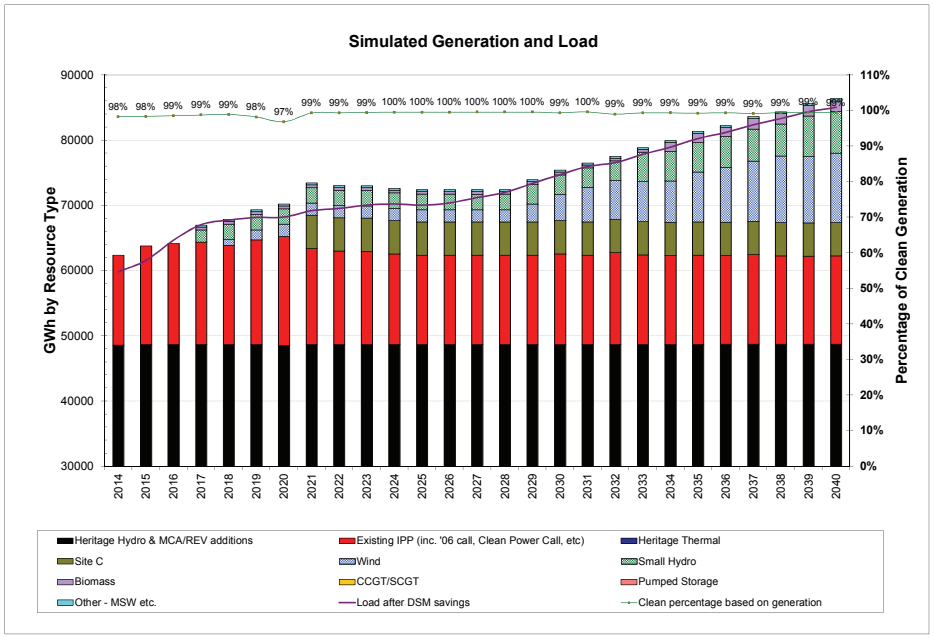

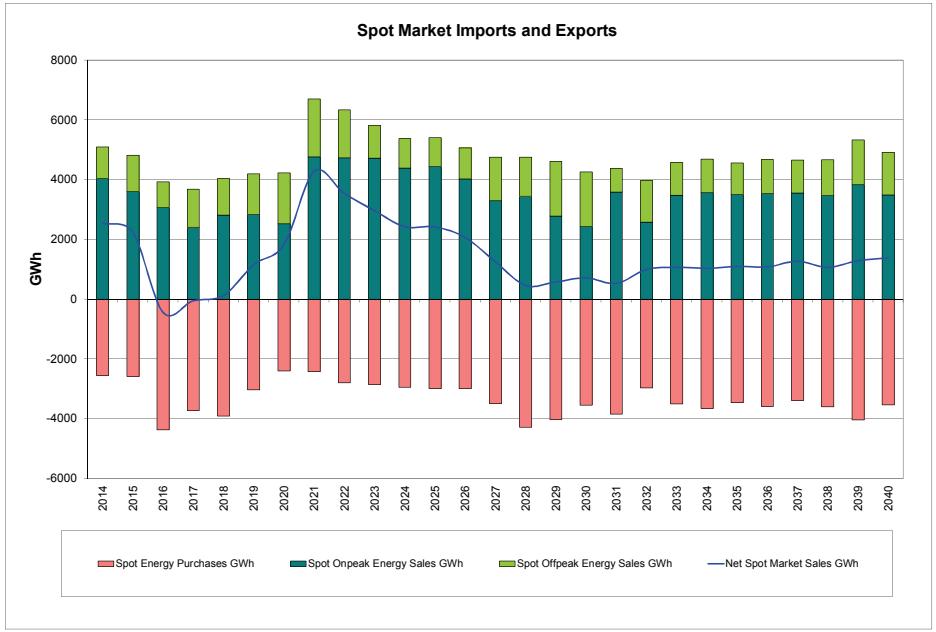

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