

FINAL REPORT



CONSULTING ENGINEERS
& SCIENTISTS

Permitting Requirements for Rebuilding Burrard Thermal Generating Station

Project Number: #W07-1188C

June 9, 2008

SUBMITTED TO: **Craig Godsoe**
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June 9, 2008

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Attention: Craig Godsoe

**Subject: Permitting Requirements for Rebuilding Burrard Thermal
Generating Station**

Please find enclosed a draft report assessing permitting requirements for five alternative configurations for Burrard Thermal Generating Station: (A1a) winter peaking plant for 600 GWh/y with three heavy-frame SCGTs replacing existing units 1 to 3; (A1b) winter peaking plant for 600 GWh/y with three LMS100 SCGTs replacing existing units 1 and 2; (A1c) winter peaking plant for 600 GWh/y with four LMS100 SCGTs replacing existing units 1 to 3; (A2) seasonal base-load plant for about 3,000 GWh/y with one CCGT replacing existing units 1 to 3; and (A3) a year-around base-load plant for 6,000 GWh/y with two CCGTs replacing existing units 1 to 6.

If you have any questions or require further information, please contact the undersigned at (604) 730-5688 ext. 3223 or Jocelyn Fraser at 604-731-6164.

Sincerely,

RWDI AIR Inc.

A handwritten signature in blue ink that reads 'Kathy Preston'.

Kathy Preston, Ph.D., P. Eng.
Project Director

EXECUTIVE SUMMARY

Burrard Thermal Generating Station (Burrard) is a natural-gas fired generating station located on the northeastern shore of Burrard Inlet, west of Port Moody, in the Lower Fraser Valley (LFV). Burrard's current configuration consists of six nominally 150 MW conventional steam cycle (CSC) units. BC Hydro is currently reviewing several alternative configurations for rebuilding Burrard using combined-cycle gas turbine (CCGT) or simple-cycle gas turbine (SCGT) technology.

The following alternative configurations are under consideration:

- Scenario A1a: rebuild Burrard as a winter peaking unit that generates about 600 GWh/y by replacing existing Units 1 to 3 with three 170 to 180 MW heavy-frame SCGTs with dry-low nitrogen oxides (DLN) burners for a combined capacity of 960 to 990 MW;
- Scenario A1b: rebuild Burrard as a winter peaking unit that generates about 600 GWh/y by replacing existing Units 1 and 2 with three 90 to 100 MW LMS100 Aero derivative SCGTs with selective catalytic reduction (SCR) for a combined capacity of 870 to 900 MW;
- Scenario A1c: rebuild Burrard as a winter peaking unit that generates about 600 GWh/y by replacing existing Units 1 to 3 with four 90 to 100 MW LMS100 Aero derivative SCGTs with SCR for a combined capacity of 810 to 850 MW;
- Scenario A2: rebuild Burrard as a seasonal base-load plant for about 3,000 GWh/y with intermediate generation through fall, winter and spring and little or no summer generation by replacing existing Units 1 to 3 with a 510 to 540 MW CCGT with SCR for a combined capacity of 960 to 990 MW; and
- Scenario A3: rebuild Burrard as a year-round, 6,000 GWh/y base-load plant by replacing existing Units 1 to 6 with two 510 to 540 MW CCGTs with SCR for a combined capacity of 1020 to 1080 MW.

RWDI AIR Inc. (RWDI), in partnership with Communicate Public Affairs, was retained to give advice concerning certain permitting requirement issues as well as provide an assessment of the consent to operate risks associated with these five alternative configurations.

This report builds on a previous report by RWDI and Communicate Public Affairs entitled, "Burrard Thermal Generating Station Consent to Operate Risk Analysis", which assessed BC Hydro's social license to operate Burrard for the next twenty years as currently configured under four operating scenarios: Scenario 1 - its current peaking function; Scenario 2 - as a base-load

plant for 3,000 GWh/y; Scenario 3A - as a base-load plant for 6,100 GWh/y annually; and Scenario 3B - as a base-load plant for 6,100 GWh/y in low-water years only.”

Permitting Requirements

In the LFV there are three levels of government that could potentially regulate some aspect of a BC Hydro power project:

- the Government of British Columbia (BC) through the BC Environmental Assessment Act (BCEAA), the BC Utilities Commission Act (UCA), the BC Environmental Management Act and the Water Act,
- the Government of Canada through the Canadian Environmental Assessment Act (CEAA), and
- Metro Vancouver through Air Quality Management Bylaw No. 937.

BC Hydro advised that it did not require RWDI to assess the UCA or any potential municipal requirements.

New thermal electric power plants with a rated nameplate capacity of 50 MW or more and the modification of an existing facility that increases the rated nameplate capacity by 50 MW or more are considered reviewable under BCEAA and require an Environmental Assessment Certificate. Burrard's nameplate capacity as originally built is 972.5 MW; however, its current dependable capacity is 905 MW. If one compares to Burrard's original nameplate capacity, then only Scenario A3 would result in an increase of 50 MW and would be considered reviewable. However, if comparison were made to the current dependable capacity then more scenarios would result in increases of 50 MW or more. In addition, under Section 6 of BCEAA, the Minister of the Environment has the power to designate a project as reviewable. Notwithstanding this, if one of the rebuild scenarios were not considered reviewable by the Province, BC Hydro advised that as a crown corporation, it would apply under Section 7 of BCEAA to have the project designated as reviewable.

The SCGTs and CCGTs proposed for the rebuild scenarios are expected to require less cooling water than the existing CSC units. Therefore, it is unlikely that the Ministry of Environment would consider necessary for the protection of the environment either a new or an amendment to the existing Effluent Discharge Permit in accordance with Section 16 of the Environmental Management Act.

The conceptual designs for the rebuild scenarios do not require additional make-up water and therefore it is unlikely that Burrard's existing license under the BC Water Act to extract water from Buntzen Lake would need to be amended except perhaps for Scenario A3, which could be considered a new facility since all units are being replaced.

Since Burrard's cooling water is derived from the Burrard Inlet, Fisheries and Oceans Canada's mandate to protect fish habitat under the Fisheries Act would most likely trigger an assessment of the rebuild scenarios under CEAA. There are two main types of study required by CEAA: a "screening" or a comprehensive study. A screening is defined as an environmental assessment that is conducted where a project is not described in the comprehensive study list or the exclusion list and includes consideration for community and aboriginal knowledge. The Comprehensive Study List Regulations indicate that a comprehensive study is required for a fossil fuel-fired electrical generating project if it is a new facility with production capacity of 200 MW or more, or if it is an expansion that would result in an increase in production capacity of 50 per cent or more and 200 MW or more. Based on this information, the only rebuild scenario that has the potential to trigger a comprehensive study is Scenario A3, particularly if it is considered to be a new facility. All other scenarios would require only a screening.

BC Hydro has a Metro Vancouver Air Emission Permit (GVA0330) to operate the existing units. For scenarios A1a, A1b and A1c, it is most likely that only an amendment to the existing permit would be required. For Scenario A3, it is likely that a new permit would be required. For Scenario A2, either the existing permit would need to be amended or a new permit may be required. Since particulate matter (PM) emissions are expected to increase by more than 10% for all the rebuild scenarios, they would all be considered significant amendments and therefore public consultation would be required.

Social License Risk Assessment

When considering the social licensing risks of the five rebuild scenarios, several questions were considered:

- How do the emission profiles of the various rebuild scenarios compare to emission profiles for the existing Burrard units at the same generation level and to Burrard's emission levels in the past five years?
- Is there agreement on the need to rebuild Burrard?
- Can any new impacts be mitigated?
- How does the proposal to rebuild Burrard fit within the current social environment?

If it were possible to answer all four questions positively, and if there were no other socially, financially and environmentally feasible options, then the social licensing risk would be considered low. However, each of the various scenarios presents challenges.

Emissions of criteria air contaminants (CACs) and greenhouse gases (GHGs) for **Scenario A1a** are expected to increase relative to existing levels in part because the heavy-frame SCGTs proposed for this scenario cannot accommodate SCR units, which are considered best available control technology for gas turbines. Therefore, this scenario is not in keeping with the air quality regulators' philosophy of continuous improvement. Since Scenario A1a would extend the life of Burrard while negatively affecting its environmental performance it is felt that securing a social license for this scenario would be very challenging.

The LMS100 SCGTs proposed for **Scenario A1b** can be equipped with SCR units and they are more efficient than the existing CSC units and the heavy-frame SCGTs. Therefore this scenario is felt to have less risk than Scenario A1a as emissions of carbon dioxide (CO₂), nitrogen oxides (NO_x) and sulphur dioxide (SO₂) decrease relative to current operations at Burrard. However, the PM emission increase of 69% and ammonia (NH₃) emission increase of 11% are expected to be a concern for some due to the health risks associated with PM (NH₃ is a precursor to secondary formation of PM). Thus, it would likely be more difficult to maintain the social license to operate Burrard under this scenario than Scenario 1 (the current peaking operation) or Scenario A1c.

Scenario A1c is thought to have the lowest social license risk of the rebuild scenarios. When compared to the various scenarios for the existing configuration, Scenario A1c is expected to be lower risk than Scenarios 3A and 3B but higher risk than Scenarios 1 and 2. With the exception of PM emissions, Scenario A1c has by far the lowest emissions of the various winter peaking scenarios and is a distinct improvement on the existing situation from an air quality and GHG perspective. The power generated at the plant will remain comparable to its past generation and the plant will be retained as a peaking facility.

Scenario A2 proposes a change from Burrard's current role as a peaking facility to that of a seasonal base-load plant, which the public may feel represents something quite new as the production of 3,000 GWh/y would be a significant increase in generation compared to the past five years. When compared to current peaking operations of Burrard (Scenario 1), the annual emissions of Scenario A2 are from 1.4 to 6.7 times greater. Earning acceptance for Scenario A2 would be complicated by this large increase in emissions compared to current levels. Furthermore, GHG emissions for this scenario would place Burrard as the third largest GHG

emitter in the province at a time when the provincial government is focused on reducing GHGs. BC Hydro is unlikely to achieve a consensus on need for Scenario A2 as many stakeholders would prefer to see green energy or renewable electricity generation and believe that could be accomplished by building Site C or permitting more Independent Power Producer projects. For these reasons, it is believed that there would be significant social licensing risks associated with Scenario A2. These risks would be greater than for Scenario 2 (seasonal base-load of 3,000 GWh/y using existing units) but less than those for Scenario A3.

Under **Scenario A3**, the public would be asked to accept Burrard as a year-round base-load plant, producing ten times the electricity generated in the recent past. Emissions of CACs and GHGs for Scenario A3 are considerably less than if the existing units generated 6,000 GWh/y. But, compared to current levels, emissions of all CACs would increase dramatically. Also, under this scenario, Burrard would be the largest point source of GHGs in the province. Replacing all the existing units with two new CCGTs will be perceived by the public as a “new” project: as evidenced by the Sumas Energy 2 proposal, siting a new source of generation in the “sensitive” LFV airshed will attract considerable opposition. There is a group of citizens interested in energy issues who have successfully mobilized large constituencies in opposition to past projects. For these reasons, earning a social license to operate Burrard under Scenario A3 will be very difficult and it is thought that this scenario presents the highest risk option for both permitting and social license.

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1.0 INTRODUCTION

Burrard Thermal Generating Station (Burrard) is a natural-gas fired generating station located on the northeastern shore of Burrard Inlet, west of Port Moody, in the Lower Fraser Valley (LFV). Burrard's nameplate capacity as originally built is 972.5 megawatts (MW); however, its current dependable capacity is 905 MW. Burrard's current configuration consists of six nominally 150 MW conventional steam cycle (CSC) units. BC Hydro is currently developing a risk management strategy for Burrard in the event that it cannot reliably provide energy or capacity at some point in the future for technical, social, economic or environmental reasons. As part of this strategy, BC Hydro is reviewing the conceptual design, preliminary cost estimates, efficiency and environmental performance of several alternative configurations for rebuilding Burrard using combined-cycle gas turbine (CCGT) or simple-cycle gas turbine (SCGT) technology.

The following alternative configurations are under consideration:

- Scenario A1a: rebuild Burrard as a winter peaking unit that generates about 600 GWh/y by replacing existing Units 1 to 3 with three 170 to 180 MW heavy-frame SCGTs with dry-low nitrogen oxides (DLN) burners for a combined capacity of 960 to 990 MW;
- Scenario A1b: rebuild Burrard as a winter peaking unit that generates about 600 GWh/y by replacing existing Units 1 and 2 with three 90 to 100 MW LMS100 Aeroderivative SCGTs with selective catalytic reduction (SCR) for a combined capacity of 870 to 900 MW;
- Scenario A1c: rebuild Burrard as a winter peaking unit that generates about 600 GWh/y by replacing existing Units 1 to 3 with four 90 to 100 MW LMS100 Aeroderivative SCGTs with SCR for a combined capacity of 810 to 850 MW;
- Scenario A2: rebuild Burrard as a seasonal base-load plant for about 3,000 GWh/y with intermediate generation through fall, winter and spring and little or no summer generation by replacing existing Units 1 to 3 with a 510 to 540 MW CCGT with SCR for a combined capacity of 960 to 990 MW; and
- Scenario A3: rebuild Burrard as a year-round, 6,000 GWh/y base-load plant by replacing existing Units 1 to 6 with two 510 to 540 MW CCGTs with SCR for a combined capacity of 1020 to 1080 MW.

1.1 SCOPE OF THIS STUDY

RWDI AIR Inc. (RWDI), in partnership with Communicate Public Affairs, was retained to give advice concerning certain permitting requirement issues as well as provide an assessment of the

consent to operate risks associated with the five alternative configurations listed above (A1a, A1b, A1c, A2 and A3). The scope of work consisted of four main tasks:

1. Review current and previous studies on the topic of rebuilding Burrard to gain a better understanding of the potential environmental issues associated with the project.
2. Assess certain regional, provincial and federal permitting requirements for the different scenarios.
3. Assess the consent to operate risk of rebuilding Burrard.

This report builds on a previous report by RWDI and Communicate Public Affairs entitled, “Burrard Thermal Generating Station Consent to Operate Risk Analysis”, which assessed BC Hydro’s social license to operate Burrard for the next twenty years as currently configured under four operating scenarios: Scenario 1 - its current peaking function; Scenario 2 - as a base-load plant for 3,000 GWh/y; Scenario 3A - as a base-load plant for 6,100 GWh/y annually; and Scenario 3B - as a base-load plant for 6,100 GWh/y in low-water years only.

BC Hydro advised that it did not require RWDI to assess the UCA or any potential municipal requirements. In addition, two potential issues that were not included in this scope of work are requirements for asbestos removal or contaminated site remediation.

2.0 ENVIRONMENTAL PERFORMANCE OF ALTERNATIVE CONFIGURATIONS

The environmental performance of the alternative configurations was reviewed by AMEC^{1,2} in terms of air quality, water and noise. The following is a summary of their findings.

2.1 AIR QUALITY

The environmental performance in terms of air emissions varies considerably depending upon the alternative configuration. Potential emissions were estimated by AMEC for each type of equipment and emission scenario for the criteria air contaminants (CACs) currently in Burrard’s

¹ “Burrard Thermal Generating Station (TGS) Alternative Configuration Study – Task 3 Final Report”, AMEC April, 2008.

² “Burrard TGS Alternative Configuration Supplemental Report to Task 3 Alternative Configuration LMS 100 SCGT Options”, AMEC May, 2008.

air permit: nitrogen oxides (NO_x), ammonia (NH₃), sulphur oxides (SO_x) and particulate matter (PM). Emissions of carbon dioxide (CO₂), the greenhouse gas (GHG) emitted in the greatest quantity by Burrard, were also estimated by AMEC.

Emission concentrations of CACs at Metro Vancouver standard conditions (3% oxygen and 20°C) by equipment type are compared in Table 2-1. Based on this information, it appears that the three types of equipment evaluated (heavy frame SCGT, LMS100 SCGT and CCGT) will meet authorized maximum discharge criteria in the existing Metro Vancouver permit for NO_x and SO₂ but will not meet the permit concentration limit for PM of 10 mg/m³. Gas turbines burn the gas in a much smaller combustor volume than a CSC unit, are more sensitive to gas temperature and burner settings, and feature either DLN burners or water/steam injection for NO_x control. Therefore, gas turbines tend to have somewhat higher unburnt hydrocarbons and, hence, higher PM concentrations than CSC units. Table 2-1 also indicates that the units equipped with selective catalytic reduction (SCR) (LMS100 SCGT and CCGT) will not meet the NH₃ concentration limit of 7 mg/m³ as evaluated. However, the SCRs could be operated to stay within the existing limit for NH₃ by increasing the catalyst volume and shortening the catalyst life to limit ammonia slip at the end of catalyst life.

Table 2-1 Comparison of Emission Concentrations (mg/m³) for Various Types of Equipment Considered for the Rebuild Scenarios

	NO _x as NO ₂	NH ₃	SO _x as SO ₂	PM
Scenario A1a - Heavy Frame SCGT w/ DLN	52	0	4	12
Scenario A1b and A1c - LMS100 SCGT w/ SCR	29	11	4	12
Scenario A2 & A3 CCGT w/ SCR	16	11	4	12
Metro Vancouver Permit Emission Limit - 1 hour	52	7	10	10
Metro Vancouver Permit Emission Limit - 24 hour	35	-	-	-

For a given rebuild scenario, annual emissions can vary depending upon how the various old and new units are operated, the sulphur content of the natural gas and the age of the SCR catalyst. Therefore ranges of the possible emissions were estimated for each scenario. These are compared in Table 2-2. Emissions for each alternative scenario are discussed in the following subsections.

Table 2-2 Comparison of Annual Emissions of Permitted CACs and GHGs for Various Scenarios

Scenario	NOx		NH3		SO2		PM		CO2	
	Range	Assumed	Range	Assumed	Range	Assumed	Range	Assumed	Range	Assumed
	(Mg/y)	(Mg/y)	(Mg/y)	(Mg/y)	(Mg/y)	(Mg/y)	(Mg/y)	(Mg/y)	(Gg/y)	(Gg/y)
1	45 to 54.2	54.2	2 to 13.3	13.3	3.5 to 7.3	7.3	2 to 16.6	9.1	290 to 330	308
A1a	71 to 86	85.7	0.5 to 3.2	3.2	3.5 to 7.4	7.4	4.4 to 36	20	314 to 357	333
A1a vs. 1 (%)		58%		-76%		1%		120%		8%
A1b	41 to 50	50.0	2 to 14.8	14.8	2.6 to 5.5	5.5	3.4 to 28	15.4	280 to 319	298
A1b vs. 1 (%)		-8%		11%		-25%		69%		-3%
A1c	34 to 41	41.0	2 to 12.6	12.6	2.7 to 5.6	5.6	3 to 25	13.8	230 to 262	245
A1c vs. 1 (%)		-24%		-5%		-23%		52%		-20%
2	224 to 278	278	10 to 68	68	17 to 37	37	10 to 83	47	1450 to 1650	1580
A2	120 to 132	132	10 to 68	68	12 to 28	28	10 to 80	70	1150 to 1400	1254
A2 vs. 2 (%)		-53%		0%		-24%		49%		-21%
A2 vs. 1 (%)		144%		411%		284%		669%		307%
3	450 to 531	531	20 to 130	130	35 to 72	72	20 to 166	90	2900 to 3300	3020
A3	124 to 310	186	25 to 128	128	26 to 48	48	25 to 150	122	2100 to 2400	2200
A3 vs. 3 (%)		-65%		-2%		-33%		36%		-27%
A3 vs. 1 (%)		243%		862%		558%		1241%		614%
Permit Levels		715		168		240		240		n/a

2.1.1 Scenario A1a

Scenario A1a consists of rebuilding Burrard as a winter peaking unit generating on average 600 GWh/y (range of 200 to 1,500 GWh/y) by replacing Units 1 to 3 with three heavy-frame “F” class 170 to 180 MW SCGTs for a combined capacity of 960 to 990 MW. The “Heavy Frame” SCGT is widely used in the electric utility industry, especially since the early 2000s. It is typically larger in physical size and in MW capacity than the Aeroderivative SCGT. It is well established technology with a long, reliable operational life. It also has significant initial capital cost advantages for simple cycle peaking compared to the Aeroderivative SCGT.

A main disadvantage of the heavy-frame SCGT is that the flue gas is very hot, typically between 800 and 1000°F (427 and 538°C). This has two negative consequences:

1. Heavy-frame SCGTs are only between 32% and 35% efficient, requiring more fuel to produce the same amount of power and therefore having higher emission intensities of CO₂ and sulphur dioxide (SO₂) than Aeroderivative SCGTs and CCGTs.
2. SCR, the NO_x control technology currently in use at Burrard, cannot be applied to gases hotter than 427°C. The best available control technology (BACT) for minimizing NO_x emissions from a SCGT is DLN, which can achieve only 9 parts per million by volume (ppmv) NO_x at 15% oxygen (O₂) compared to 4 to 10 ppmv NO_x at 15% O₂ achieved by the current Burrard units and 2 to 3 ppmv NO_x at 15% O₂ for an SCR on a new CCGT.

Table 2-2 indicates that annual emissions of NO_x and PM for Scenario A1a are substantially (58% and 120%) greater than those for the current peaking function of Burrard (Scenario 1). Emissions of CO₂ are 8% higher for Scenario A1a while emissions of SO₂ are similar for the two scenarios. NH₃ emissions are substantially less for Scenario A1a compared to Scenario 1 because the heavy-frame SCGTs are not equipped with SCR and therefore don't require NH₃. Under this scenario, Burrard's GHG emissions would remain less than those of the top ten GHG emitters in BC.

2.1.2 Scenario A1b

Scenario A1b consists of rebuilding Burrard as a winter peaking unit generating on average 600 GWh/y (range of 200 to 1,500 GWh/y) by replacing Units 1 and 2 with three 90 to 100 MW LMS100 Aeroderivative SCGTs for a combined capacity of 870 to 900 MW. The LMS100 Aeroderivative SCGT uses aircraft engine technology (multiple shafts, higher speed, more exotic

materials) to achieve higher simple cycle efficiency at maximum loads (typically between 37 and 40%), simpler and quicker installation, and more rapid start times than the heavy-frame SCGT. Aeroderivative SCGTs also have lower flue gas temperatures that may be amenable to SCR NO_x control. The disadvantages of these units include higher initial capital and lower capacity, lower efficiency at low load, shorter maintenance cycles and higher untreated combustion NO_x emissions than the heavy-frame SCGT. They are also a less proven technology.

Since the LMS100 SCGTs are more efficient than the existing units, the annual emissions of CO₂ and particularly SO₂ are less for Scenario A1b than Scenario 1 (see Table 2-2). Under this scenario, Burrard's GHG emissions would remain less than those of the top ten GHG emitters in BC. The NO_x controls on the LMS100 SCGTs are also more efficient than the controls on the existing units and therefore NO_x emissions are 8% less for Scenario A1b than for Scenario 1. However, the ammonia slip for Scenario A1b is expected to be somewhat higher (11%) than for Scenario 1. The biggest difference in annual emissions for Scenario A1b compared to the existing situation (Scenario 1) is the potential increase in PM emissions of 69% due to the higher unburnt hydrocarbons associated with gas turbines. Overall, emissions for Scenario A1b are better than those for Scenario A1a and, depending on the contaminant, either somewhat better or somewhat worse than for the existing Scenario 1.

2.1.3 Scenario A1c

Scenario A1c is similar to Scenario A1b except that three rather than two existing units are replaced with four rather than three LMS100 SCGTs for a combined capacity of 810 to 850 MW. Scenario A1c is expected to have considerably lower (20 to 24%) emissions of CO₂, NO_x and SO₂ and slightly lower (5%) emissions of NH₃ (see Table 2-2). Under this scenario, Burrard's GHG emissions would remain less than those of the top ten GHG emitters in BC. However, this scenario does result in 52% higher PM emissions due to the replacement of CSC units with gas turbines. With the exception of PM emissions, Scenario A1c has by far the lowest emissions of the various winter peaking scenarios and is a distinct improvement on the existing situation from an air quality and GHG perspective.

2.1.4 Scenario A2

Scenario A2 consists of rebuilding Burrard as a seasonal base-load plant generating on average 3,000 GWh/y with intermediate generation through fall, winter and spring and little or no summer generation by replacing Units 1 to 3 with a 510 to 540 MW CCGT with SCR for a combined capacity of 960 to 990 MW. The CCGT consists of two (170 to 200 MW) SCGTs

paired with two heat-recovery steam generators (HRSG) that are connected to one (180 to 200 MW) steam-turbine generator. The hot flue gases from the turbine exhaust of the SCGTs at 427 to 538°C are passed through the HRSGs, which have water- and steam-filled tubes to capture the exhaust gas energy producing steam and reducing the flue gas temperature typically to about 82°C. The steam from the HRSG is then fed to a steam turbine generator.

The HRSG often has built into it an SCR section for reducing NO_x emissions to as low as 2 to 3 ppmv at 15% O₂, and in some cases also a carbon monoxide (CO) catalyst to reduce CO emissions to similar levels. This can be done since the SCR catalyst typically operates between the 316 and 427°C levels found inside the HRSG.

CCGTs tend to have efficiencies in the order of 45 to 55%, which is considerably higher than for either a heavy-frame or LMS100 SCGT and therefore the CO₂ and SO₂ emission intensities of a CCGT tends to be much lower than for either type of SCGT.

When compared to Scenario 2 (3,000 GWh/y production using the existing units), annual emissions of CO₂ and SO₂ are substantially reduced (21 and 24%) primarily due to the efficiency difference between a CCGT and a CSC unit (Table 2-2). Under Scenario A2, Burrard would be the third largest GHG emitter in BC compared to the second largest emitter under Scenario 2. Annual emissions of NO_x expected for Scenario A2 are also less than half those for Scenario 2 due to both the efficiency difference between a CCGT and a CSC and the lower outlet NO_x emission concentration. No change is expected in annual emissions of NH₃; however, the outlet concentration of the CCGT is expected to be higher than for the CSC. Due to the differences in design and operation of the CSC and CCGT, annual PM emissions are expected to be about 50% higher for Scenario A2 compared to Scenario 2.

In summary, when compared to annual emissions of the existing Burrard units for the same level of power generation (3,000 GWh/y), Scenario A2 provides some distinct environmental benefits with significant reductions in NO_x, SO₂ and CO₂. However, when compared to current peaking operations of Burrard for the past six years (Scenario 1), the annual emissions of Scenario A2 are from 1.4 to 6.7 times greater (Table 2-2).

2.1.5 Scenario A3

Scenario A3 consists of rebuilding Burrard as a year-round 6,000 GWh/y base-load plant by replacing existing units 1 to 6 with two 510 to 540 MW CCGTs for a combined capacity of 1020 to 1080 MW. Since all existing units are replaced in this scenario, this configuration is the most

efficient of all those considered and therefore has the lowest CO₂ and SO₂ emission intensities. Also, SCR controls on CCGTs can achieve lower NO_x concentrations than the SCR controls on the current units. When compared to the existing units at the same generation level (Scenario 3), the annual emissions of CO₂, SO₂ and NO_x for Scenario A3 are 27 to 65% less (Table 2-2). Nonetheless, under Scenario A3, Burrard would be the largest emitter of GHGs in BC, as would be the case for Scenario 3. Annual emissions of NH₃ are similar for Scenarios A3 and 3 because the ammonia slip levels of the SCR from CCGTs and CSC units are similar on a g/kWh basis. As was the case for all the other rebuild scenarios, annual PM emissions are higher (36%) for Scenario A3 than for Scenario 3.

Although the environmental performance in terms of air quality of Scenario A3 is better than if existing units were to generate the same amount of power (Scenario 3), it should be noted that the existing units have never operated at this level. The maximum power they have generated in any one year is 4,200 GWh in 1989 and 1995. The most recent year when Burrard operated near this level was in 2001. Since then, annual generation has been less than 700 GWh/y. Compared to current peaking operations (Scenario 1), annual emissions for Scenario A3 are 2.4 to 12.4 times higher (Table 2-2).

2.2 WATER

Due to differences in design and operation between CSC units and either SCGTs or CCGTs, for all rebuild scenarios, the water consumption and cooling water requirements are less than for the current configuration of Burrard. Therefore, the existing Ministry of Environment (MOE) Water License C113127 for make-up water from Buntzen Lake and the MOE Effluent Discharge Permit No. PE-07178 for cooling water discharge into Burrard Inlet should have sufficient capacity to meet requirements for the rebuild scenarios. In addition, use of cooling water can be managed to ensure Burrard operates within the chlorine content and outlet temperature limits of its MOE Effluent Discharge Permit.

2.3 NOISE

Noise was also flagged by AMEC as a potential environmental issue associated with the alternative configurations that would need to be mitigated. This is especially true given the recent announcement that Imperial Oil Company (IOCO) plans to sell property at their old refinery site, adjacent to Burrard, to property developers. According to AMEC, noise for all rebuild scenarios will be approximately 58 dBA at the plant boundary.

3.0 ENVIRONMENTAL ASSESSMENT AND PERMITTING REQUIREMENTS

New power projects and modifications to existing facilities can trigger a range of environmental regulatory requirements depending on the size of the project and potential change in emissions. In the LFV there are three levels of government that could potentially regulate some aspect of a BC Hydro power project:

- the Government of British Columbia through the BC Environmental Assessment Act [SBC 2002] Chapter 43 (BCEAA), the BC Utilities Commission Act (UCA), the BC Environmental Management Act and the Water Act,
- the Government of Canada through the Canadian Environmental Assessment Act, 1992, c. 37, C-15.2 (CEAA), and
- Metro Vancouver through Air Quality Management Bylaw No. 937.

As stated above, BC Hydro advised that it did not require RWDI to assess the UCA or any potential municipal requirements.

3.1 PROVINCIAL GOVERNMENT REQUIREMENTS

Three provincial acts that are relevant to permitting the rebuild scenarios are discussed in this section: BCEAA the Environmental Management Act, and the Water Act.

3.1.1 BC Environmental Assessment Act

The Government of BC issues Environmental Assessment Certificates (EACs) under BCEAA. In BCEAA, a “**reviewable project** means a project that is within a category of projects prescribed under section 5 or that is designated by the minister under section 6 or the executive director under section 7, and includes

- (a) the facilities at the main site of the project,
- (b) any off-site facilities related to the project that the executive director or the minister may designate, and
- (c) any activities related to the project that the executive director or the minister may designate.”

A project designated as a reviewable project is one for which an EAC is required.

Section 5 of BCEAA states that it is up to the discretion of the Lieutenant Governor in Council to make regulations prescribing what constitutes a reviewable project. The Lieutenant Governor

in Council may categorize projects according to size, production or storage capacity, timing, geographical location, potential for adverse effects, type of industry to which the projects are related, type of proponent or on any other basis that the Lieutenant Governor in Council considers appropriate.

Part 4 of the **BC Reviewable Projects Regulation** [B.C. Reg. 370/2002] provides guidance on whether a proposed or modified energy project is reviewable. New thermal electric power plants with a rated nameplate capacity of 50 MW or more are reviewable. Modification of an existing facility that results in the facility having a rated nameplate capacity that has increased by 50 MW or more is also reviewable. Burrard's nameplate capacity as originally built is 972.5 MW; however, its current dependable capacity is 905 MW. If one compares to Burrard's original nameplate capacity, then only Scenario A3 would result in an increase of 50 MW and would be considered reviewable. (Scenario A3 would also likely be considered a new facility and for this reason would be reviewable under BCEAA.) However, if comparison were made to the current dependable capacity of 905 MW then Scenarios A1a, A2 and A3 would also result in increases of 50 MW or more and would be considered reviewable.

Section 6 of BCEAA describes the Minister of the Environment's (the Minister) power to designate a project as reviewable. "Even though a project does not constitute a reviewable project under the regulations, the minister by order may designate the project as a reviewable project if

- (a) the minister is satisfied that the project may have a significant adverse environmental, economic, social, heritage or health effect, and that the designation is in the public interest, and
- (b) the minister believes on reasonable grounds that the project is not substantially started at the time of the designation."

Given the significant increase in air emissions for Scenario A2 compared to current peaking operations since 2001, this scenario is the most likely candidate for the Minister to designate as reviewable if it were not found to be reviewable under the BC Reviewable Projects Regulation. It is possible that Scenario A1a might also be designated reviewable by the Minister for two reasons: (1) it results in an increase in emissions compared to the current configuration for the same level of generation and (2) the LFV is considered to be a sensitive airshed.

Section 7 of BCEAA describes how an application can be made to the executive director to have a project designated as reviewable. "A person who proposes a project that is not a reviewable project under section 6 of this Act or under the regulations may apply to the executive director

for the project to be designated as a reviewable project.” Because it is a crown corporation, BC Hydro advised that it would apply for such designation for all of the rebuild scenarios.

3.1.2 The BC Environmental Management Act

Burrard currently has an **Effluent Discharge Permit** under the **Environmental Management Act** that governs the chlorine content, temperature and flow of water the plant is permitted to discharge. **Section 16** of the **Environmental Management Act** [SBC 2003] Chapter 53, titled **Amendment of permits and approvals in Part 2 — Prohibitions and Authorizations** addresses the process of amending and approving permits:

“A director may, subject to section 14 (3) [permits], this section and the regulations, for the protection of the environment,

(a) on the director's own initiative if he or she considers it necessary, or

(b) on application by a holder of a permit or an approval,

amend the requirements of the permit or approval.”

However, given that the SCGTs and CCGTs are expected to require less cooling water than the existing CSC units, it is unlikely that an amendment to the existing Effluent Discharge Permit will be required for the protection of the environment.

3.1.3 The BC Water Act

Burrard also has a license under the **BC Water Act** [RSBC 1996] Chapter 483 to extract make-up water from Buntzen Lake. Under **Section 18** (1) the comptroller or the regional water manager may amend a license to do a number of things including: authorize additional or other works than those previously authorized; authorize the use of water for some purpose other than that specified in the license; and increase or reduce the quantity of water authorized to be diverted or stored if it appears to have been erroneously estimated. AMEC concluded that no additional make-up water would be required for the rebuild scenarios and therefore it is unlikely that the license would need to be amended except perhaps for Scenario A3, which could be considered a new facility since all units are being replaced.

3.2 FEDERAL GOVERNMENT REQUIREMENTS

Since Burrard's cooling water is derived from the Burrard Inlet, Fisheries and Oceans Canada's mandate to protect fish habitat under the Fisheries Act would most likely trigger an assessment of the rebuild scenarios under CEAA.

There are two main types of study required by CEAA: a "screening" or a comprehensive study. A screening is defined as an environmental assessment that is conducted where a project is not described in the comprehensive study list or the exclusion list and includes consideration for community and aboriginal knowledge. Most projects are assessed relatively quickly under a screening type of environmental assessment. A screening systematically documents the anticipated environmental effects of a proposed project and determines the need to modify the project plan or recommend measures to mitigate the environmental effects. Comprehensive studies are conducted for large-scale, complex projects that are likely to have significant adverse environmental effects. Consequently, a comprehensive study is a more stringent type of environmental assessment than a screening. For example, public participation and implementation of a follow-up program are mandatory in a comprehensive study, whereas they are discretionary in a screening.

Part II of the Schedule of the **Comprehensive Study List Regulations, P.C. 1994-1687 October 7, 1994**, entitled **Electrical Generating Stations and Transmission Lines**, indicates that the proposed construction, decommissioning or abandonment of a fossil fuel-fired electrical generating station with a production capacity of 200 MW or more requires a comprehensive study. In addition, the proposed expansion of a fossil fuel-fired electrical generating station that would result in an increase in production capacity of 50 per cent or more and 200 MW or more requires a comprehensive study. Based on this information, the only rebuild scenario that has the potential to trigger a comprehensive study is Scenario A3, particularly if it is considered to be a new facility. All other scenarios would require only a screening.

3.3 REGIONAL GOVERNMENT REQUIREMENTS

Metro Vancouver has regulatory authority for air quality within its jurisdiction. This authority was delegated by the Province. Metro Vancouver has two bylaws for air quality: **Air Quality Management Bylaw No. 937** and **Air Pollution Control Bylaw 603**. Metro Vancouver is currently proposing to consolidate these two bylaws into one and at the same time make some revisions to the bylaw. These revisions will impact the annual emission fees that BC Hydro pays

Metro Vancouver and they may potentially affect permitted NO_x emissions from the auxiliary boiler.

BC Hydro has a Metro Vancouver Air Emission Permit (GVA0330) to operate the existing units. For scenarios A1a, A1b and A1c, it is most likely that only an amendment to the existing permit would be required. For Scenario A3, it is likely that a new permit would be required. For Scenario A2, either the existing permit would need to be amended or a new permit may be required.

Metro Vancouver has adopted the provincial public notification requirements, which are set out in **Public Notification Regulation 1994, B.C. Reg. 202/94** of the Environmental Management Act. According to this regulation, public consultation is required for new facilities and significant amendments to existing facilities. A significant amendment is defined as an amendment to a permit or approval that is not a minor amendment. The definition of a minor amendment has several parts to it, the most relevant of which is:

- a decrease in the authorized quantity of the discharge, emission or stored material;
- an increase in the authorized quantity of the discharge, emission or stored material that does not exceed 10% of the authorized quantity; and
- a change in the authorized quality of the discharge, emission or stored material such that, in the opinion of a director, the change has or will have less impact on the environment.

Since PM emissions are expected to increase by more than 10% for all the rebuild scenarios, they would all be considered significant amendments and therefore public consultation would be required. Since BC Hydro would likely apply for reviewable project status under Section 7 of BCEAA, the public notification requirements under the Environmental Management Act would include:

- post on site on a billboard as described and specified in Schedule B,
- give notice to municipalities, regional districts and chairpersons of waste management planning committees,
- give notice to residents and owners of property immediately adjacent to the property under application and within an area specified by a director,
- publish in British Columbia Gazette Part I at the applicant's expense, and
- publish in local newspaper(s) at the applicant's expense.

These steps are considered to be the bare minimum required to meet regulatory obligations.

4.0 SOCIAL LICENSE RISK ASSESSMENT

Crown corporations, business, industry and governments operating industrial facilities today are required to earn a social license to operate. According to Harvard professor Michael Porter, *“the notion of licence to operate derives from the fact that every company needs tacit or explicit permission from Governments, communities and other stakeholders to do business.”*³

4.1 BACKGROUND

As noted in a previous report prepared by RWDI for BC Hydro⁴, it is easier to retain public approval to continue to operate an existing facility, especially one such as Burrard, where the environmental performance of the facility is known and can be shown to be responsible, than it is to earn a social license for a new facility. The case study on Sumas Energy 2 (SE2), described in the previous report⁴, demonstrated that even projects proposed for areas of need, that would employ BACT and that would offset emissions can alarm a public concerned about air quality and emissions in an airshed described by Environment Canada as “sensitive.”

In the case of Burrard, BC Hydro’s efforts to consult and inform its stakeholders stretch back as least as far as 1993 with the formal establishment of a Community Liaison Committee to provide community input to the Burrard Upgrade Project (BUP). This committee, and the work of BC Hydro staff to work with local residents, have been effective ways to educate key stakeholders, such as the community of Port Moody, about the value the facility provides to the local community in terms of taxation, to the region in terms of acting as a “battery” for the Lower Mainland, and to the BC electricity grid in terms of energy security. Although the City of Port Moody was originally opposed to the BUP, in January 2008 Council passed a resolution indicating the municipality’s support for a proposal to rebuild Burrard and its opposition to a proposal to phase out Burrard. In her resolution Councillor Karen Rockwell noted that should Burrard close it would “have a significant impact to the financial bottom line of Port Moody.”⁵ While this is a positive sign, it is important to note that the resolution does not endorse an increase in CAC emissions and does call a full offset of GHG and other emissions:

³ Porter, Michael E. and Kramer, Mark R. “Strategy and Society: The Link Between Competitive Advantage and Corporate Social Responsibility” Harvard Business Review Volume 84, Number 12 pp78-92

⁴ “Burrard Thermal Generating Station Consent to Operate Risk Analysis”. Report prepared by RWDI. June, 2008

⁵ Mackenzie, Angela. “Moody wants Burrard Upgrades.” The Coquitlam Now. January 11, 2008.

“Therefore be it resolved that the City of Port Moody oppose all efforts to close this important and strategic asset and call for immediate upgrade and repowering of Burrard Thermal to *include the full offset of GHG or other emissions*, and that the City of Port Moody continue to oppose the actions of Bill 30 that preclude municipalities in having meaningful input into energy developments.”⁶ (Emphasis added)

It must also be noted that any proposal to rebuild Burrard may be met with concern or opposition in other parts of the LFV and that opposition would likely be focused on five main areas:

1. Air quality – While there have been significant improvements in the air quality of the LFV, residents and their elected officials continue to be concerned about the introduction of new point sources of CACs and about the performance of permitted facilities such as Burrard. Patricia Ross, a City of Abbotsford Councillor and Chair of the Fraser Valley Regional District’s air quality and environment committee recently summed up her responsibility: “We constantly have to remind people that we have a unique combination of geographic and meteorological features in the Valley that we can do nothing about – so we have no choice but to be extremely cautious about adding new air pollution sources.”⁷ With growing public concern about GHG and PM emissions, it can be expected that the emission profile for any proposal to rebuild Burrard will be scrutinized carefully, even if the proposal does not substantively change the way in which Burrard operates. Scenarios A2 and A3, which would see Burrard move from a peaking to base-load facility, are likely to provoke additional concern as some are likely to argue that moving from a peaking to a base-load plant is equivalent to adding a “new” source of air pollution.
2. The use of a non renewable fuel as a source of generation - Public opinion polling conducted in June 2005 for BC Hydro tells us that public support for gas-fired generation is below 50% province-wide, and given the LFV’s opposition to SE2, it could be anticipated that support for gas-fired generation would be lower in the LFV and may have declined from 2005 levels as a result of increased awareness of natural gas as a source of GHG emissions.

⁶ Approved resolution by Port Moody City Council regarding Burrard Thermal. Meetings Agendas and Minutes <http://www.cityofportmoody.com/NR/rdonlyres/1320c7A9-7EBE-49D7-B291>. Accessed January 21, 2008.

⁷ Lewis, Brian. “Metro Vancouver’s garbage scheme stinks; Regional councils unhappy about not being consulted”. The Province. 26 Feb 2008. Page A6

3. GHG - In the years since the BUP, concern about GHG emissions and climate change have come to dominant the public policy agenda in British Columbia. According to the BC Progress Board, an independent panel struck by the Premier to provide strategic advice on measures to improve provincial economic performance, climate change has emerged as a dominant issue and “is likely to persist as a critical provincial, national and global issue which (sic) will result in efforts to reduce greenhouse gas emissions over the short to medium term.”⁸

Within the 2007 BC Energy Plan, the provincial government committed that by 2016 Burrard Thermal would be required to achieve zero net GHG emissions.

Polling done by Ipsos Reid in March 2008 (see Table 4-1) reinforces the view of the BC Progress Board that global warming and GHG are key environmental issues in British Columbia.

Table 4-1 Results of Ipsos Reid Polling on Environmental Issues Facing British Columbia

Top environmental issue facing the province today	September 2006 (Sample 801)	April 2007 (Sample 600)	March 2008 (Sample 800)
Global warming	#6 concern cited by 9%	#1 concern cited by 22%	#1 concern cited by 16%
Specific GHG concern	#14 concern cited by 1%	#6 concern cited by 5%	#3 concern cited by 7%

Public understanding and acceptance of offsets is increasing; however, there remains a perception that for offsets to be effective they need to be located in the same airshed as the source of pollution. This was very clearly demonstrated during the SE2 hearings when elected officials and members of the public rejected the project proponent’s proposal to offset CAC and GHG emissions because it was felt there were no point sources of emissions of a comparable size located within the immediate vicinity of the proposed power plant.

⁸ BC Progress Board “Strategic Considerations for BC’s Future: Issues and Trends 2007 Report” July 10, 2007. p.iii

4. Should Imperial Oil follow through on its intention to redevelop a portion of its lands in Port Moody and Anmore for some type of housing, a new group of neighbours will be added to the stakeholder list for Burrard. Unlike many of the existing residents, who are accustomed to Burrard's operations and who have an awareness of BC Hydro's efforts to earn and maintain a social license for the plant, newcomers to the area may not be as accepting of Burrard. It can also be expected that realtors selling lots in a new housing development would be more likely to let prospective buyers know that the government has made a commitment to phase out Burrard than they will be to alert potential home buyers to rumours of a plan to repower Burrard and this expectation may fuel additional opposition to any plan to increase the frequency or capacity of operations.
5. Rebuilding versus phasing out – Based on comments made in the past by BC Hydro and endorsed by the Government of British Columbia, many stakeholders may retain the perception that Burrard is slated to be phased out, not rebuilt. Any suggestion that Burrard might play a larger role in generating electricity is likely to be met with surprise and, given the reaction to SE2, it is also likely that any proposal to change the way Burrard is operated from a peaking to a base-load plant, which would result in increased generation and emissions, will be met with resistance from Lower Mainland residents outside Port Moody concerned about air quality.

4.2 SOCIAL LICENSE RISK OF THE REBUILD SCENARIOS

When considering the social licensing risks of the five rebuild scenarios, several questions were considered:

- How do the emission profiles of the various rebuild scenarios compare to emission profiles for the existing Burrard units at the same generation level and to Burrard's emission levels in the past five years?
- Is there agreement on the need to rebuild Burrard?
- Can any new impacts be mitigated?
- How does the proposal to rebuild Burrard fit within the current social environment?

If it were possible to answer all four questions positively, and if there were no other socially, financially and environmentally feasible options, then the social licensing risk would be considered low. However, each of the various scenarios presents challenges.

4.2.1 Scenario A1a

Unlike the existing units, the heavy-frame SCGTs proposed to replace three units in this scenario cannot be equipped with SCRs, which are considered BACT for gas turbines. Under this scenario, Burrard's GHG emissions would still be lower than those of the province's top 10 emitters; however, as noted in Table 2-2, GHG emissions would increase by eight per cent compared to current operations. Also, the plant's emissions of NO_x and PM would increase by 58% and 120%, respectively. Thus, this scenario is not in keeping with Metro Vancouver's and the Federal Government's policies of continuous improvement. Since Scenario A1a would extend the life of Burrard while negatively affecting its environmental performance it is felt that securing a social license for this scenario would be very challenging.

Scenario Social License Challenges

- Little work has been done to build public awareness of the potential to rebuild Burrard and therefore extending the life of the Burrard facility may prove challenging.
- Does not employ BACT.
- GHG emissions will increase.
- Emissions of PM, which are becoming of greater concern to the public, will increase significantly (120%) and NO_x increases (58%) will not be acceptable given the significant role NO_x plays in poor air quality.

Scenario Attributes

- Use of Burrard does not change: the plant remains a peaking facility, generating 600 GWh/y, which is comparable to its recent past generation. This could be used to build support to extend the existing social license.
- Although GHG emissions increase, the percentage increase is not significant when compared to Scenarios A2 or A3.
- The City of Port Moody has expressed support for rebuilding Burrard and as this scenario will not significantly change the level or type of operation this key stakeholder group might be convinced to be an advocate if BC Hydro can demonstrate how emission increases can be offset.

4.2.2 Scenario A1b

The LMS100 SCGTs proposed for this scenario can be equipped with SCRs and they are more efficient than the existing units and the heavy-frame SCGTs. Therefore this scenario is felt to have less risk than Scenario A1a as emissions of CO₂, NO_x and SO₂ decrease relative to current operations at Burrard. However, the PM emission increase of 69% and NH₃ emission increase of 11% are expected to be a concern for some due to the health risks associated with PM (NH₃ is a precursor to secondary formation of PM). It would likely be more difficult to maintain the social license to operate Burrard under this scenario than Scenario 1 (the current peaking operation) or Scenario A1c.

Scenario Social License Challenges

- Little work has been done to build public awareness of the potential to rebuild Burrard and therefore extending the life of the Burrard facility may prove challenging.
- Emissions of PM, which are becoming of greater concern to the public, will increase significantly (69%) and NH₃ emission increases of 11% are likely to provoke public concern.

Scenario Attributes

- Use of Burrard does not change: the plant remains a peaking facility, generating 600 GWh/y, which is comparable to its recent past generation. This could be used to build support to extend the existing social license.
- Employs BACT.
- The small decrease in GHG production could be presented as a positive attribute.
- The City of Port Moody has expressed support for rebuilding Burrard and as this scenario will not significantly change the level or type of operation this key stakeholder group might be convinced to be an advocate if BC Hydro can demonstrate how emission increases can be offset.

4.2.3 Scenario A1c

This scenario is felt to have the lowest social license risk of the rebuild scenarios. With the exception of PM emissions, Scenario A1c has by far the lowest emissions of the various winter peaking scenarios and is a distinct improvement on the existing situation from an air quality and greenhouse gas perspective. The power generated at the plant will remain comparable to its past

generation and the plant will be retained as a peaking facility. In this case, future performance will be comparable to past performance, but emissions will be reduced, air quality improved, and therefore a case could be made that impacts can be mitigated. As there is currently agreement on the need to operate Burrard at these levels this option presents the “best” of the rebuild scenarios for retaining social license to operate Burrard. When compared to the existing configuration scenarios, it is thought that the social license risk of Scenario A1c is greater than that of Scenarios 1 and 2 but less than that of Scenarios 3A and 3B. As is the case for Scenarios 1 and 2, communication and community liaison will be required to maintain the social license to operate Burrard under Scenario A1c and to prevent concerns about safe operation of an ageing facility from growing and adversely impacting the social license.

Scenario Social License Challenges

- Little work has been done to build public awareness of the potential to rebuild Burrard and therefore extending the life of the Burrard facility may prove challenging.
- PM emissions increase 52%.

Scenario Attributes

- Use of Burrard does not change: the plant remains a peaking facility, generating 600 GWh/y, which is comparable to its recent past generation. This could be used to build support to extend the existing social license.
- Employs BACT.
- This scenario projects decreases in all emissions with the exception of PM.
- Assists with the provincial target to reduce BC’s GHG emissions by at least 33% below current levels by 2020.
- The City of Port Moody has expressed support for rebuilding Burrard and as this scenario will not significantly change the level or type of operation this key stakeholder group might be convinced to be an advocate if BC Hydro can demonstrate how emission increases can be offset.

4.2.4 Scenario A2

This scenario proposes a change from Burrard’s current role as a peaking facility to that of a base-load plant. Although Burrard would have seasonal operations in this scenario, running intermittently in the fall, winter and spring and seldom in the summer, the public may feel that

this represents something quite new. When compared to annual emissions of the existing Burrard units for the same level of power generation (3,000 GWh/y), Scenario A2 provides some distinct environmental benefits with significant reductions in NO_x, SO₂ and CO₂; however, when compared to current peaking operations of Burrard for the past six years (Scenario 1), the annual emissions of Scenario A2 are from 1.4 to 6.7 times greater. Earning acceptance for Scenario A2 would be complicated by this large increase in emissions compared to current levels. GHG emissions for this scenario would place Burrard as the third largest GHG emitter in the province at a time when the provincial government is focused on reducing GHGs.

BC Hydro is unlikely to achieve a consensus on need for Scenario A2 as many stakeholders would prefer to see green energy or renewable electricity generation and believe that could be accomplished by building Site C or permitting more Independent Power Producer (IPP) projects.⁹ Also the production of 3000 GWh/y would be a significant increase in generation when compared to Burrard's performance in the past five years. It is understood that Burrard has operated at the proposed levels in the past (3,100 GWh in 2000) but those opposed will remind the public that over the past five years the highest number of GWh/y was achieved in 2004 when Burrard generated 400 GWh – almost 90 per cent less than what is proposed under this scenario. For these reasons, it is believed that there would be significant social licensing risks associated with Scenario A2. These risks would be greater than for Scenario 2 (seasonal base-load of 3,000 GWh/y) but less than those for Scenario A3. Significant public consultation would be required to extend Burrard's social license to operate to include the changes proposed under Scenario A2.

Scenario Social License Challenges

- Little work has been done to build public awareness of the potential to rebuild Burrard and therefore extending the life of the Burrard facility may prove challenging.
- Use of Burrard changes from that of a peaking to a base-load facility. This will be perceived as a significant change and one that is likely to be met with resistance from the public, supporters of green/renewable energy, the Independent Power Producers Association of BC (IPPBC) and elected officials and staff within municipalities in the LFV.

⁹ It must be noted that recent IPP proposals – such as the run of river project proposed in Pitt Meadows, have met with stiff resistance by stakeholders concerned that there is not enough regulatory oversight on IPP projects and by those alarmed by proposals to site IPPs projects in areas where transmission will be required or park land accessed/impacted.

- Generation would increase significantly over levels in the past five years.
- There are very significant increases in CAC emissions compared to the past five years. This will raise concerns from the public and from regulators committed to seeing continuous improvement in regional air quality. Although the City of Port Moody has expressed support for rebuilding Burrard it is expected that this scenario will be a cause of concern for the municipality.
- GHG emissions will result in Burrard becoming the third largest GHG point source in the province – something that can be predicted to attract considerable opposition.

Scenario Attributes

- The plant will seldom run in the summer when public concerns about air quality are typically at the highest.
- No new land is required – the rebuilt plant can be sited within the existing boundaries of Burrard.

4.2.5 Scenario A3

In the past five years, Burrard's highest level of production as a peaking facility was just 674 GWh/y. Under Scenario A3, the public would be asked to accept Burrard as a year-round base-load plant, producing ten times the electricity generated in the recent past. Emissions of CACs and GHGs for Scenario A3 are considerably less than if the existing units generated 6,000 GWh/y. But, compared to current levels, emissions of all CACs would increase dramatically. Also, under this scenario, Burrard would be the largest point source of GHGs in the province.

Replacing all the existing units with two new CCGTs will be perceived by the public as a "new" project: as evidenced by the SE2 proposal, siting a new source of generation in the "sensitive" LFV airshed will attract considerable opposition. As will the fact that the capacity of Scenario A3 (1020 to 1080 MW) is almost twice as great as proposed for SE2 (660 MW). Questions will be raised about need, emissions, and the health impacts associated with dramatic increases in CACs; about the impact on climate change of increased GHG emissions; and doubts will be raised about how offsets will be achieved and where those offsets will be located. Past comments made by provincial, regional and municipal officials regarding SE2 will be resurrected to build a case that no new sources of generation should be located on the Canadian side of the LFV airshed.

There is a group of citizens interested in energy issues who have gained experience in the regulatory review process with projects such as SE2, Duke Point, the Georgia Strait Crossing, and the Inland Connector. They understand the concerns of the public and have successfully mobilized large constituencies in opposition to past projects.

For these reasons, earning social license to operate Burrard under Scenario A3 will be very difficult and it is predicted that this scenario presents the highest risk option for both permitting and social license.

Scenario Social License Challenges

- Little work has been done to build public awareness of the potential to rebuild Burrard and therefore extending the life of the Burrard facility may prove challenging.
- Use of Burrard changes from that of a peaking to a base-load facility. This will be perceived as a significant change and one that is likely to be met with resistance from the public, supporters of green/renewable energy, IPPBC and elected officials and staff within municipalities in the LFV.
- Burrard has never generated this much power. This increase and the fact that all existing CSC units will be replaced will create the perception that this version of Burrard is equivalent to siting a new plant.
- There are very significant increases in CAC emissions compared to the past five years. This will raise concerns from the public and from regulators committed to seeing continuous improvement in regional air quality. Although the City of Port Moody has expressed support for rebuilding Burrard it is expected that this scenario will be a cause of concern for the municipality.
- GHG emissions will result in Burrard becoming the largest GHG point source in the province – something that can be predicted to attract considerable opposition.

Scenario Attributes

- No new land acquisition will be required.

4.3 MAINTAINING AND EXTENDING BURRARD'S SOCIAL LICENSE TO OPERATE

Maintaining or extending Burrard's social license to operate to encompass any of the proposed rebuild scenarios will require a concerted public consultation effort. It can be anticipated that a proposal to rebuild Burrard and extend its operating life will be viewed sceptically by some

stakeholders. As authors Matthew McKinney and Will Harmon note in their 2007 article “Governing Nature, Governing Ourselves: Engaging Citizens in Natural Resource Decisions” published in *The International Journal of Public Participation*, there are three broad categories of natural resource issues:

1. Practical and technical problems – the “how to” questions that can be answered with reason and the application of existing knowledge. People are likely to agree on the nature of the problem and on a short list of potential solutions.
2. Value-laden problems – those in which people disagree on the basic nature of the problem but not on how to resolve it; and
3. Value-laden problems in which people disagree on both the nature of the problem and how to resolve it.

Based on our experience with other industrial operations with air quality emissions looking to site or upgrade facilities in the LFV, it is anticipated that any of the scenarios proposed for rebuilding Burrard would be likely to create a value-laden problem with values and interests pulling stakeholders in different directions. Public opinion polling⁴ indicates that BC Hydro is viewed as highly credible by many of its stakeholders and this attribute will be important to preserve as trust is key to solving value-laden problems.

As noted earlier in this report, several of the scenarios would trigger either a public notification or public consultation process. Even if a public engagement process was not technically required by one of the regulatory agencies, BC Hydro’s own commitment to consultation suggests that it would wish to continue to work with the public as options for Burrard are considered.

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