BEFORE THE STATE OF WASHINGTON
ENERGY FACILITY SITE EVALUATION COUNCIL

In the Matter of Application No. 99-1: SUMAS ENERGY 2 GENERATION FACILITY	EXHIBIT ____ (RBC-T) PRE-FILED TESTIMONY OF ROBERT B. CATON

Q: Please introduce yourself.

A: My name is Robert Caton.

Q: What subjects do you intend to address?

A: I will address issues related to the project's air pollution emissions and impacts.

Q: What is your background to address such issues?

A: I hold a Ph.D. in physical chemistry and for the past 21 years have been involved directly in consulting for public and private sector clients on emissions and air quality matters. I hold the designation Qualified Environmental Professional (QEP) from the Institute of Professional Environmental Practice. In recent years, my practice has been primarily in the areas of air quality management analysis and strategic planning and in corporate environmental management systems development.

I have been employed with consulting companies that have carried out analysis

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of emissions and air quality in the Lower Fraser Valley since the early 1980s, and my personal involvement in analysis and assessment of emissions and air quality in the region dates from 1988-9 when I chaired the scientific advisory panel for the first stage of development of the current Air Quality Management Plan for the Greater Vancouver Regional District (GVRD). Subsequently, I have directed a number of studies in support of the development of the final AQMP (1994) and its implementation since then. I have directed or participated in a variety of technical analyses and policy and strategy development studies in the region for GVRD, the Province of British Columbia, Environment Canada and a variety of private sector clients in the energy and manufacturing sectors. This body of work includes air quality analysis, cost-benefit analysis of emission reduction measures, impact assessments of specific pollutants (e.g., PM10, diesel particulate matter, hazardous air pollutants) and strategic planning.

Nationally in Canada, I served as a member of the Atmospheric Science Expert Panel for the Joint Industry/Government-sponsored Study of Sulfur in Gasoline and Diesel Fuels (1997). Recently, I assisted the Analysis and Modelling Group in the Canadian National Climate Change Process to carry out analysis of the air quality and other environmental co-benefits of measures to mitigate climate change (2000-2001). Since 1980, I have appeared as an expert witness on emissions and air quality issues in various quasi-judicial processes in the provinces of Ontario, Alberta and British Columbia, and federally.

For more than 25 years I have directed or participated in multi-disciplinary research and project work in which I have coordinated teams and integrated information on emissions, air quality modelling and analysis, health effects and other environmental impacts, risk analysis and economic valuation of effects.

Q: Could you please summarize your conclusions?

A: Yes, but let me preface that by saying that all of my remarks are intended to refer to the changes between (1) the project documentation and hearing record of the original EFSEC hearing that led to its decision as recorded in Order #754 and (2) the June 29, 2001 Second Revised Application and its supporting documents that are before us now. In that context, I intend to comment on the following issues:

1. There is no new information in the amended application or otherwise that would suggest that there is need for any change in the Council=s conclusions about the impaired air quality in the Lower Fraser Valley airshed. The Council=s conclusions in

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that regard should not change.

2. The project modifications in the Second Revised Application cause little reduction in projected emissions from the facility and little reduction in the resulting air quality impacts. There are several sub-points here:

$ The annual emissions of the pollutants of greatest concern in this case, particulates (soot) and NO_x (an ozone precursor) would drop by only six percent and seven percent, respectively B and perhaps even less if start ups and shut downs are taken into account. That small of a drop should have very little effect on the Council=s air quality conclusions.

$ The applicant is wrong in claiming that the current proposal to emit NO_x at a rate of two parts per million represents a 33 percent reduction from the project considered by the Council in Order No. 754. The emission rate for NO_x now and the emission rate considered by the Council in its prior recommendation are precisely the same B two ppm. There has been no reduction in that emission rate.

$ Looking at the combination of all emissions of all pollutants on an annual basis, the revised proposal will probably emit slightly less than the prior proposal. How much less is a function of the frequency of start ups and shut downs. Ignoring that factor for the moment, the annual emissions from the revised project will be about 16 percent less than the one described in Council Order No. 754.

$ The applicant makes claims of much larger percentage reductions by looking at short-term emission peaks (instead of annual emissions). The applicant=s analysis of short-term peaks is flawed in several respects. One, the applicant presents a false comparison. Ostensibly, the applicant is comparing worst case, short-term emissions under the former proposal with worse case, short-term emissions under the current proposal. But in fact, the applicant has ignored worst case, short-term emissions under the current proposal by ignoring emissions during start-up and shut-down. Start-up and shut-down operations could occur more often under the current proposal than diesel would have been burned under the old proposal. Peaks associated with start up and shut down cannot be ignored. No valid claim of a reduction in short-term peaks can be made without that information.

$ The Applicant is wrong to suggest that, from a public health perspective, the focus should be on short-term air quality impacts. Long-term

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exposures to air pollution at levels below peaks is a significant health concern. That's part of the reason air quality standards are written for both long and short-term exposures. In fact, the health assessment done by the three Canadian agencies last year for this facility (the "Joint Technical Report," Exhibit 162.12) focused on the long-term exposures as being the most problematic from a health risk perspective.

$ The applicant=s focus on short-term emissions ignores that annual emissions are reduced only slightly and, in fact, in some instances actually increase. For instance, annual emissions of sulfur dioxide are estimated to increase by 50 percent to 69 tons per year and sulfuric acid mist emissions by the same percentage to 14.3 tons per year.

3. The modifications in the project will have little impact on the prior health effects analysis.

$ A health effects analysis has to consider impacts from both long-term (annual) exposures and short-term (peak) exposures.

$ Because there is little change in the annual air pollution emissions from the facility, there is little change in the health impacts associated with those annual emissions.

$ Because the applicant has not presented a valid comparison of the change in short-term emissions, it is impossible to reach any meaningful conclusions about how a potential change to short-term emission would impact the health effects conclusions.

$ Most of the health effects testimony presented by the applicant re-hashes the earlier debate about whether adverse health effects occur even when minimum regulatory standards are met. That testimony does not seem to respect the limited scope of this hearing.

$ Health studies published since the close of the first round of hearings support the Council=s conclusion that significant health effects do occur at levels below the minimum regulatory standards.

$ The increases in air pollution caused by SE2=s omissions will result in adverse health effects.

4. SE2=s offset proposal is flawed in several respects:

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$ The Province has made substantial strides towards improving air quality in this region but more improvement is needed; the air is still unhealthy. Efforts to reduce or eliminate air pollution emissions from existing sources should not be traded for new emissions which are not necessary to occur in this air shed. Simply trading old emissions for new ones will not advance the Province=s goal of improving air quality in this highly populated region.

$ The offset proposal is technically flawed, too. There do not appear to be large emission sources close to the SE2 site that could serve as appropriate offsets.

The 1.5 million mitigation fee offered to be paid in lieu of an offset program is not adequate. It will not create benefits for those who would be breathing SE2=s pollution and the dollar amount is insubstantial considering the expense incurred by the Province in pursuing other air pollution abatement efforts.

5. I will also respond to a number of collateral points raised in the testimony of Mr. Martin and Mr. Hansen.

Q: Let=s start with existing air quality in the Lower Fraser Valley. Are you familiar with the Council=s finding on that issue in Order No. 754?

A: Yes.

Q: Have you assessed whether there is new information in the Second Revised Application which would cause a change in the Council=s findings regarding that matter?

A: Yes, I have made that assessment. In so doing, I want to emphasize that I focused on new information and developments that would supplement EFSEC=s understanding of the evidence on air quality and its impacts, rather than revisit old ground. I believe that this is consistent with the limited scope of these resumed hearings, as established by EFSEC.

Q: What conclusions did you reach as a result of that review?

A: Let me start with the airshed and then move to the project. The Second Revised Application presents new monitoring data from 1999 for the Lower Fraser Valley airshed that was not presented at the last hearing. Given the limited scope of this hearing, the issue here is whether that data suggests any

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changes are needed in the Council=s prior findings about the airshed. The Council=s prior findings were, and I quote EFSEC=s decision: A[c]onsistent evidence from highly qualified expert witnesses indicates that the Lower Fraser Valley is already an environmentally sensitive area with acknowledged atmospheric visibility problems and is already considered to be an impaired airshed.@ Council Order No. 754 at 23. Further, the Council cited and quoted other evidence that Athe Fraser Valley airshed is very sensitive and already suffers from significant air quality and visibility issues;@ that the airshed is Aunder active air quality management by British Columbia agencies . . . because it is already prone to periods of poor air quality, including elevated levels of ground-level ozone, inhalable particulate and visibility reductions;@ that the Lower Fraser Valley Aalready exceeds current ambient air quality objectives for ozone;@ that Aair quality in the Lower Fraser Valley . . . and many other parts of British Columbia is frequently in the range where its effects upon health have been demonstrated;@ and that Avarious short- and medium-term air quality objectives and standards for the area from Hope to West Vancouver are already exceeded up to ten percent of the time.@ Council Order No. 754 at 24. Finding of Fact No. 38 also includes additional details about air quality in the Lower Fraser Valley. Nothing has changed since the issuance of Order No. 754 to change the basis for any of those conclusions.

In particular, I am very familiar with the air quality monitoring database for the Lower Fraser Valley and conclude that the new data for 1999 presented in the Second Revised Application do not change the picture presented in the previous Application. For example, Table 6.1-8 in the SRA shows that the monitoring data for 1999 do not show any improvement for the critical pollutants NO_x, ozone and PM (both PM10 and PM2.5). That is, the average maximum values over the period shown in the table for these pollutants are not materially different from the comparable values shown in the previous Application. Moreover, based on my observations of GVRD=s ongoing air quality reporting, I expect that air quality data for the region for 2000 would show little change from the period analyzed by the Applicant=s consultants. The Council=s conclusion that the airshed is suffering from too much pollution is still sound.

Q: Eric Hansen testifies in this second round of hearings that air quality in the Fraser Valley is Avery good@ at least by United States standards. Ex. 182 at 17:17 (Hansen). Is his testimony in that regard based on any new evidence that was not available at last year=s hearing?

A: No. Hansen gave essentially the same testimony last year. His optimistic

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characterization of air quality in the region was rejected by EFSEC: AAlthough the Applicant argues that the Lower Fraser Valley airshed is not a particularly threatened, impaired, or sensitive airshed, the Council finds the evidence to the contrary is not only convincing, it is overwhelming.@ Order No. 754 at 23. Hansen does not cite any new monitoring data or other evidence to support changing EFSEC=s previous conclusions. Just because air quality in Abbotsford (and the Canadian Lower Fraser Valley, generally) has neither improved nor deteriorated in recent years does not mean that it can be classified Avery good.@

Q: Then let=s shift from characterization of the airshed to the project. How do the proposed project changes affect air pollution emissions?

A: Very little. As explained in more detail in Michael Lepage=s testimony comparing the current proposal to the former proposal, the annual emissions of particulates (soot) and NO_x (an ozone precursor) would drop by six percent and seven percent, respectively (and perhaps even increase if start-ups and shut-downs are considered). That small of a drop should have very little effect on the Council=s conclusions. Last time, the Council concluded that the facility=s emissions would be Aindisputably a large amount of pollution to add to an airshed.@ Order No. 754 at 20. A six or seven percent reduction in the two pollutants of greatest concern should not change that fundamental conclusion.

Q: The Second Revised Application and the Applicant=s Pre-Filed Testimony refers to much larger percentage reductions in emissions. Are those statements in error?

A: In a sense, yes. As one example, the claimed reduction in NO_x of 33% was already part of the record on which EFSEC based its original decision not to approve the project. The lowering of the operating NO_x level from 3 ppm to 2 ppm was in the draft PSD permit (Ex. 170.1 at 6:134); it was used as the basis for the Joint Technical Report (Exhibit 162.12 at i and 8);.and it was used as a part of the project description by EFSEC in its original recommendation. Order No. 754 made express reference to the 2 ppm emission rate for NO_X. Council Order No. 754 at 49 (Finding No. 31). The inclusion of a 2 ppm emission rate in the Second Revised Application is not a real change in the project description.

Q: Are there other problems with the Applicant=s focus on the claimed reduction in peak emissions?

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A: Yes. One additional problem is that the Applicant focuses on peak emissions without acknowledging that even though peaks are reduced, total emissions can still go up. For instance, even though SO_2 and sulfuric acid mist peaks have been reduced, the annual emissions of those pollutants has increased significantly. Annual emissions of SO_2 are estimated to increase from 45 tpy to 69 tpy, and sulfuric acid mist from 7.9 to 14.3 tpy.

Q: What is the cause of the increase in SO_2 and sulfuric acid emissions?

A: The discrepancy is due to an erroneous value for the sulfur content of pipeline gas in the earlier (first) Revised Application. Because of that error, the emissions of sulfur dioxide and sulfuric acid mist under normal conditions actually increase by about a factor of five. This increase exceeds the reductions of sulfur oxides associated with removing oil firing, leading to a substantial net increase. Both of these pollutants will also add materially to the ambient PM10 or PM2.5 loadings through formation of secondary particulate matter. The original error in estimating sulfur oxide emissions is not even acknowledged in Hansen=s testimony. One has to read the Second Revised Application in detail to find it in the PSD analysis. Exhibit 181.3 at 6.1-1 & 6.1-2.

Q: Is the increase in SO_2 and sulfuric acid mist a concern? We have not heard much about these pollutants in the earlier proceedings.

A: The increase in SO_2 and sulfuric acid mist would lead to the production of additional fine particulates and thus would negate most of the apparent reduction in particulate emissions stated in the Second Revised Application. The sulfuric acid mist in particular would react rapidly with the ammonia already in the plume from SE2 (even at the lower estimated emission rate in the SRA) and with the ample ambient ammonia in the Fraser Valley air from agricultural sources to form ammonium sulphate. The ammonium sulphate would add directly to the fine particle loading. These fine particles would all be in the PM2.5 size range that is of greatest concern respecting both public health and visibility impairment. Mr Lepage addresses this technical issue in his pre-filed testimony.

Q: Are there more problems with the Applicant=s focus on the peak emissions?

A: Yes. The Applicant claims that there are huge reductions in peak emissions as a result of eliminating the use of diesel. But the applicant presents a false comparison. The comparison ought to be between the peak emissions for the

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prior proposal and the peak emissions for the current proposal. To make that comparison, one obviously needs to identify the peak emissions for the current proposal. But the applicant has not done this. As Mr. Lepage describes in greater detail, the peak emissions for the current proposal would occur during start-up and shut-down. The amount of time starting up and shutting down can be two or three times more than was proposed to be spent burning diesel fuel under the prior proposal. Yet the Applicant never submits information about the emission levels during these potentially extensive periods of starting up and shutting down. Without that information, it is impossible for the Applicant to make any claim about how much peak emissions have been reduced as a result of the project changes. EFSEC noted this deficiency in Order No. 754 [at page 21, footnote 29], but the Applicant has not responded to it in the SRA. Michael Lepage provides some estimates of start-up and shut-down emissions in his testimony.

Q: If it is impossible to make that comparison based on the data presented by the Applicant, how did the Applicant develop those large percentages?

A: The Applicant takes the worst case peaks from the old proposal and compares them to the best case operating conditions for the new proposal. Little wonder that in comparing worst case to best case they are able to develop percentages that, at first blush, appear very impressive.

Q: Are there any other concerns you have about the Applicant=s focus on short-term, peak emissions?

A: Yes. The Applicant suggests that it is appropriate to focus on peak emissions because those are the ones that create the primary health and visibility concerns. But there are several things to consider here.

First, on close examination, I notice that Mr. Hansen does not himself testify that he believes that annual emissions or annual average impacts are worthy of less attention than peak emissions and peak impacts. Rather, he states that peak emissions were the focus of the first round of hearings. Exhibit 182 at 4:19-35. There is a reason that air regulations and studies on air quality health effects look not just at peak conditions but also long-term ambient conditions. Both perspectives play an important role in any discussion of air quality impacts.

Second, while I did not participate in the first round of hearings, I have reviewed the portions of the record dealing with air quality. While certainly

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the use of diesel for a maximum of ten days per year (on average) made the situation that much worse, it is clear that the parties and the Council were not focused exclusively on that component of the project. For example, Environment Canada=s ozone modeling estimates do not use the oil-firing peak emissions.

Similarly, in the PM Health Impact Assessment (Section 4.4.4 of the Joint Technical Report, 2000), Exhibit 162.12, the health effects estimates and valuation are essentially unaffected by the newly-estimated emissions, since they are dominated by the longer-term elevation of ambient concentrations of PM, not by the peaks associated with oil-firing. In fact, the oil-firing emission peaks did not contribute materially in the health impacts assessment in the Canadian Joint Technical Report (Exhibit 162.12 at 24, Tables 10 & 11), since the typical emissions from the other 350 days of normal operations dominate the health effects assessment. Since the total contribution of the SE2 emissions to ambient PM loadings will not be changed materially by the revisions shown in the Second Revised Application, there would be no material change to the estimates of the health impacts and their valuation.

Q: What are the health effects implications of the changes in the project?

A: The changes in the project should have very little impact on this Council=s conclusions regarding the health risks associated with this project. There are five principal points to make in this regard.

First, health risks are directly correlated to the project=s emissions and, as I have discussed and as Mr. Lepage details, the project changes will result in very little change in overall emission rates. The project modifications represent virtually no change in long-term emission rates and therefore virtually no change in health effects associated with long-term exposure. Short-term exposure health effects may be different but it is impossible to evaluate that because the Applicant has failed to produce information about short-term emission peaks.

Second, the majority of the health effects information provided by the Applicant in this round of the proceedings is contained in the Pre-Filed Testimony of Sanya Petrovic. However, it does not appear that Ms. Petrovic has confined her comments to correspond to the limited scope of these proceedings. In Council Order No. 754, the Council rejected the Applicant=s claim that compliance with regulatory standards could be equated with an absence of health effects. Rather, the Council quoted with approval the portion

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of the Canadian "Joint Technical Report" (Exhibit 162.12) which states that "recent studies on air quality and health indicate that effects on human health begin to occur at levels well below any of those [government] objectives and standards." Council Order No. 754 at 24.

Much of Ms. Petrovic's testimony is an effort to re-argue that issue which EFSEC has already decided. Ms. Petrovic does not cite anything different about the project nor any recent health studies to support re-opening that discussion. Rather, she makes the same arguments that the Applicant made last time -- arguments the Council did not accept.

Q: Could you elaborate on that point, please?

A: Yes. My understanding is that the Council has limited the scope of these hearings to a discussion of the "implications of the modifications" in the proposal. As a result, I have focused my study on the changes in the project as they relate to air quality emissions and the health effects associated with those emissions. Dr. Bates has cited new health studies that have been published since Council Order 754 that are relevant to the health effects issue. But we have not gone back and re-assessed the entire health effects issue as if the first round of hearings had never happened and as if Council Order No. 754 had not been entered.

In contrast, Ms. Petrovic does not seem to have been made aware of that limitation in scope. Her testimony repeatedly re-argues issues that were debated and resolved in the initial round of hearings.

Q: Can you give me some particulars?

A: Yes. As I said, much of Ms. Petrovic's testimony involves an effort to justify assessing the project's health effects by comparison only to United States and Canadian regulatory standards and objectives. This testimony is an effort to avoid consideration of adverse health effects that occur even when regulatory standards are being met.

But this issue was extensively debated in the prior proceeding and the Council has already ruled on it. In Council Order 754 (at 22), the Council stated:

> Although the Council concludes that the project meets federal and state air quality standards, this is the beginning, not the end, of our inquiry. Compliance with promulgated numerical air quality standards is a

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> minimum requirement for allowing a power generating facility to be constructed in this state. The Council has a much broader mandate than simply deciding whether minimum standards are met; rather, the Council is charged with protecting the people's health and welfare and with siting power plants only where minimal adverse effects on the environment can be achieved . . . A power plant may satisfy the numerical standards for the amount of air pollutants that it emits without the requested site being an appropriate location.

Given that prior finding of the Council and the Council's Order limiting the scope of this hearing, much of Ms. Petrovic's testimony seems beyond the limited scope of this hearing. At page 6, line 23, she identifies as one of her two major points that SE2 emissions will not exceed Canada-Wide Standards or the British Columbia Objective for PM10. Later on that page, she describes the Canadian air quality objective/standards as ?the most relevant? and then spends nine pages discussing that topic (pages 7 through 15) and spends five more pages (16 through 20) arguing that no heed should be paid to the more protective health reference levels. She brings no new scientific information to bear on any of this discussion. She does not cite a single article or health study published subsequent to Council Order 754. Rather, she primarily makes reference to exhibits and reports that were before the Council at the previous hearings.

Q: What is your third point regarding health effects?

A: Ms. Petrovic's discussion of the applicability of the Canada-Wide Standards and Reference Levels ignores the Akeeping clean areas clean@ requirement expressed in Annex A to the Canada-Wide Standards for PM and Ozone (AGuidance for Continuous Improvement and Keeping Clean Areas Clean Programs for PM and Ozone@) Exhibit 159.4. The drafters of the CWS and all of the signatories intended that areas that are now in compliance with the CWS should take steps to ensure future compliance, in fact to ensure continuous improvement in air quality. The ability of the Province to make continuous improvement is threatened by the SE2 project which, I understand, need not be sited in this airshed.

Q: What is your fourth point?

A: The fourth item, as Dr. Bates testifies, is that now there is even more evidence supporting the health effects conclusions addressed by the Council in Order

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No. 754. Subsequent to the earlier EFSEC hearings, there have been additional studies confirming the adverse effects of several air pollutants at levels below current standards or guidelines. Effects of PM and ozone especially on the elderly, children and asthmatics of all ages have been confirmed by unassailable analysis as described in the testimony of David Bates. The real issue is one of acceptable risk, not whether certain bright lines have been crossed or would be crossed if SE2 proceeds. Any amount of additional pollution increases the risk of occurrence of many respiratory and cardiac diseases. There has been no showing of thresholds below which impacts do not occur.

Q: What is your fifth point related to the health impacts?

A: The last point regards Ms. Petrovic"s statement that because the increases in particulate matter and ozone from the SE2 facility will be a small fraction of current background concentrations that there will be no adverse health impacts from those emissions. (Exhibit 183 at 6:20-29). She elaborates on this briefly near the end of her testimony at pages 21-22. But then she contradicts herself when she claims that any reduction in air pollution (because of offsets) will have a positive effect on human health. If any reduction in pollution equates to a human health benefit (and she is right about that), then any increase in air pollution must equate to a human health risk. She can't have it both ways.

Q: Let's turn to the offset issue. SE2=s witnesses have referred to an offset proposal as a way to mitigate air pollution impacts on the Lower Fraser Valley. Have you reviewed that offset plan?

A: I have read the material in the Second Revised Application and in Mr. Martin=s and Mr. Hansen=s pre-filed testimony, but I find no explicit plan that could be evaluated at this time. As I understand the situation, SE2 has offered to submit a plan at a later date. Without seeing the plan, it is impossible to assess fully its effectiveness or acceptability.

Q: Do you think it is likely that an offset plan could be developed that would address the Province=s air quality concerns in this airshed?

A: I think it unlikely, but the reason for that involves several issues and some background about how air quality concerns are being addressed in British Columbia.

First, the context for this discussion includes an understanding of regional air

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quality trends. I will detail this in a moment but, in general terms, as the result of aggressive government action, we have been successful in reducing air pollution on our side of the border. However, air pollution is still at an unacceptable level. Moreover, the relatively >easy= (most cost effective) methods for reducing emissions pretty much have been exhausted. As inevitable growth occurs in the future, it will be more and more difficult to obtain further reductions in the airshed=s pollution levels or even to maintain the status quo. Despite the aggressive efforts that have brought us some success to date, the long-term trends are not good. I will explain how this relates to the offset issue in a moment, but first let me provide some more detail about these trends.

Environment Canada and GVRD have been monitoring PM10 levels in the Lower Fraser Valley since 1984. GVRD now has thirteen PM10 monitoring sites across the LFV, with continuous monitoring starting in 1994. The air quality data since 1985 show, for example, that the annual mean fine particle (PM10) concentration has declined by almost a factor of 3 between 1985 and 2000---from about 30 micrograms per cubic meter to about 12 micrograms per cubic meter. Monitored PM10 levels are essentially the same all across the airshed - both in terms of average concentration and statistical distributions at the 13 sites.

Similarly, monitored levels of carbon monoxide, sulfur dioxide and nitrogen dioxide have declined over the past 15 years. Ozone peak levels have declined since the 1980s, but mean levels have been increasing slowly since the mid-1990s. Nonetheless, as I mentioned above and as the Council recognized in its prior order, despite these improvements, air quality still stands at undesirable levels.

Q: What are the forecasts for air pollution trends in the coming years?

A: I have recently co-authored a report for GVRD and the Province of British Columbia that sets the stage for future additional emission reductions of common air contaminants and coordinated measures to manage greenhouse gas emissions and common air contaminants. Forecasts of future air quality *based on* the anticipated changes to the Canadian Lower Fraser Valley emission inventory attributable to anticipated changes in existing sources indicate that current air quality will persist for the next 5 or 10 years as continuing emission reductions in some sectors are just about balanced by increasing emissions associated with regional population and economic growth. Between the 2005-2010 time period and 2020, emissions of some pollutants in the Canadian Lower Fraser Valley are predicted to increase

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slowly, even with no new industrial sources accounted for. Projections of the concentrations of CO, SO_2, NO_2 and PM10 based on the best currently available emission inventories (that take into account all of the anticipated future improvements in on-road vehicle emissions) show that although CO, SO_2 and NO_2 concentrations are expected to decrease, PM100 levels will rise slowly between 2005-2010 and 2020. The forecast trends take into account all of the emission reduction measures in the 1994 GVRD Air Quality Management Plan, as well as anticipated changes in response to other committed regulations. By 2020, I estimate that the average PM10 level in the Lower Fraser Valley will have increased by about 15% from current levels (including contributions from both primary emissions and secondary pollutant formation). Again, this projection assumes that there are no new industrial sources added to the inventory.

An important point is that the trend toward reduced emissions and improved air quality over the period 1985-1999, which has plateaued over the past five years or so, has been the result of considerable effort and commitment by regulators and stakeholders and has cost a significant amount of capital investment. Even with all of the effort and investment, air quality improvement in the region has slowed or stopped - leaving current air quality at undesirable levels.

Q: Now that you've described these trends, please explain how they influence the development of an offset program?

A: The measures that have been implemented in the Canadian Lower Fraser Valley since the 1980s have focused on the most cost-effective measures first. These measures have achieved marked reductions in emissions of most pollutants between 1985 and 1995 (PM being the principal exception). Additional emission reductions will be necessary to maintain and improve air quality in the future but the necessary measures have been assessed to be relatively more expensive and will be harder to achieve. Remaining opportunities for emissions reductions will have to be carefully managed to compensate for unavoidable increases in emissions that accompany regional growth. It would not be wise to use those potential emission reductions to offset new pollution sources that do not need to be sited in this vulnerable airshed. This factor alone suggests offsets should not be used to justify a major new emission source which is not necessary to be sited in this particular airshed.

Q: Do you have any information regarding the air quality impacts of this plant when considered in conjunction with other proposed

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power plants in this region?

A: Yes. I was reviewing a recent air quality report sponsored by the Bonneville Power Administration (BPA) which sheds some light on this issue. Interestingly, the report [APhase I Results, Regional Air Quality Modeling Study@, Bonneville Power Administration, August 1, 2001] was carried out by SE2=s air quality consultants, MFG. The report states that there are about 45 proposed power plants lined up for potential approval in Oregon and Washington and that, if all were built, they would create a significant cumulative impact on regional air quality in the Northwest United States and British Columbia. Of note is that the report states that of the 45 planned plants (representing more than 24,000 MW), "it is highly unlikely that more than 6,000 to 8,000 MW will be built." That is, only one-quarter to one-third will be viable. It would appear that an EFSEC decision to respect the Province's concerns about siting this plant at this particular location doesn't represent a constraint on future energy, given the number of proposals available.

Q: In addition to these fundamental policy concerns about an offset program, are there any practical obstacles to using offsets in this particular setting?

A: Yes, there are practical problems, too. The practical problems relate to both location and timing. Because of the complex nature of pollutant movement and chemical transformation in the Lower Fraser Valley airshed, the specific location of the offsetting emission reductions is critical in determining how they affect air quality in another part of the airshed. The seasonal or daily time profiles of the proposed offsets are also very important in assessing their potential to improve air quality in the vicinity of the SE2 site. For example, an offset that reduces NO_X emissions mainly in the winter will have no effect on summer ozone or secondary fine particle formation. A NO_X or SO_X offset in the southwestern corner of Whatcom County, for example, would be unlikely to have a proportionate positive effect on air quality in Abbotsford or Chilliwack.

Perusal of the 1999 emission inventory for all types of emission sources in the Fraser Valley Regional District in which Abbotsford lies indicates that there are few significant sources of NO_x or PM emissions in the vicinity of Abbotsford. If the proponent has been unable to come to terms with the owners of major point sources on potential offsets, it is unlikely that there exist enough other sources of sufficient strength to achieve the 1:1 offset of NO_X and PM_X that the proponent alludes to, especially considering the requirements for location and timing already mentioned.

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Q: Have you considered the possibility of finding offsets on the United States side?

A: Yes. My statement is true for both sides. The Whatcom County 1999 Emission Inventory indicates that there are very few industrial sources with appreciable emissions of NO_x or PM in the Sumas area that could conceivably provide sufficient emission reductions to offset SE2=s emissions. Presumably SE2 has approached the operators of these facilities (including the SE1 plant) and has been unable to negotiate offsets with these nearby sources. There are only 14 major emission sources listed in the inventory throughout all of the county and most of the significant sources that might be able to provide offsetting emission reductions are in the Bellingham and Cherry Point areas. Emissions from these sources do not contribute significantly to pollution in the Abbotsford, according to my understanding of the available regional modeling results.

Q: Can you comment on the Applicant=s proposed alternative of simply contributing $1.5 million in lieu of developing an offset program?

A: Yes, there are two problems with this. First, if the idea is that the $1.5 million would be used to bring about emission reduction programs at unspecified locations in British Columbia and Whatcom County, then obviously there would be no commitment to spend that money in a way that would offset the impacts to those people who are going to be breathing SE2's pollution.

Second, contrary to Martin=s testimony that the amount is Agenerous and appropriate,@ the amount seems very insubstantial when compared to the costs of programs designed to reduce air pollution that have already been initiated in the Canadian part of the airshed.

I have been involved in surveys of potential offsets for NO_X in the Lower Fraser Valley in several studies for private and public sector clients and have determined that typical cost-effectiveness values appear to be in the range of at least $1,500-$3,000 CAD (present value) per ton of NO_x removed over the project=s lifetime. Thus, a fund of $1.5 million USD (about $2.2 million CAD) might be sufficient to remove about 750 to 1,500 lifetime tons of NO_x. This range corresponds to not more than 5 to 10 years worth of SE2=s NO_x emissions (at 145 tpy). The proposed $1.5 million (USD) appears to be inadequate to offset fully even SE2=s NO_X emissions over a project life of 25-50 years, let alone offset other emissions like particulates and SO_X.

Q: Mr. Martin testifies that SE2's proposed $1.5 million contribution

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should be considered significant in the context of funding air pollution programs. What have been the costs associated with the emission reduction measures you have been describing?

While the emission reduction measures that have been pursued have been the most cost effective ones, that does not mean that they have been inexpensive. Two studies of the costs and benefits of the emission reduction measures in the 1994 GVRD Air Quality Management Plan were carried out in 1994 and 1995. I co-authored both of those reports and was responsible for a major portion of the technical analysis. Those studies concluded that the direct cost to the public and private sectors of implementing the approximately 54 measures in the 1994 GVRD Plan would be $2.9 billion 1993$CDN (4% discount rate) over the period 1994-2020. This estimate included only direct control costs and not administrative costs. The preliminary cost estimates included, for example, about $100 million to reduce NO_x emissions and upgrade combustion efficiency at BC Hydro=s Burrard Thermal Plant (about $200 million was eventually spent) and about $1 billion over the period to carry out the AirCare7 light-duty vehicle inspection and maintenance program.

Q: Let's turn to some other portions of the Applicant's pre-filed testimony. Mr. Martin suggests that Canadian authorities have not been aggressive in tackling air pollution. Is that an accurate characterization?

A: The Province has been a partner with the Greater Vancouver Regional District (GVRD) and the Federal Government in developing all of the air quality management measures in the Lower Fraser Valley over the past 20 years. A few examples of specific initiatives that the Province continues to implement are:

- $ The AirCare7 car inspection and maintenance program (1992, renewed 2000)
- $ Low sulfur diesel fuel regulation (1994)
- $ Gasoline vapour control regulation (1995)
- $ Motor vehicle emissions reduction regulation - requiring low emission vehicles to be sold in B.C (1995)
- $ Scrap-It older vehicle early retirement scrap program (1996)
- $ Diesel truck and bus on-road inspection program (1999)
- $ Sponsor of natural gas and fuel cell buses demonstrations
- $ Sponsor of alternative public transportation programs (e.g., Go Green, HOV lanes, various transportation demand management-TDM-programs).

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It should be pointed out that the AirCare7 inspection and maintenance program has recently (2000) been revised to incorporate an advanced IM240 testing protocol. It is also relevant that such programs are only required in the United States in non-attainment areas. AirCare7 came about as a result of strong local public and political will to address air quality.

In addition, I might add that the 1994 GVRD Air Quality Management Plan was the first urban regional AQMP in Canada. The Greater Vancouver Area and the Montreal Urban Community are the only urban regions in Canada to have local authority over air emissions and air quality management. GVRD has been delegated air pollution control authority in its jurisdiction by the Province. The rest of Canada has looked to Vancouver as the leader in air quality management initiatives for 20 years.

The 1994 GVRD AQMP was an aggressive approach to reducing emissions by 38% overall from 1985 levels by 2000. According to the most recent accounting, this target was essentially achieved by 1999.

The Fraser Valley Regional District (FVRD), which has jurisdiction over the municipalities in the eastern portion of the Canadian Lower Fraser Valley, also has established an Air Quality Management Plan as of February 2000. FVRD has applied for air pollution control authority similar to GVRD=s but at present, the Province is the air pollution regulator for the FVRD.
Both regional districts are actively considering measures to continue the emission reduction trend in the face of diminishing returns in terms of cost-effectiveness with respect to traditional emission sources. The recent renewal of AirCare7 with a more stringent testing protocol is evidence of the continuing programs in the region.

Q: The Applicant has been very critical of Canadian commitments to regulating emission sources in the airshed. What are your comments on past experience with environmental assessment and permitting of existing and proposed emission sources in the Lower Fraser Valley?

A: First of all, the Applicant=s statements would come as a great surprise to the many industrial and public sources of emissions that have been involved in the extensive emission reduction programs over the past 15 years that I have already described. I have acted as consultant to a number of private sector proponents of projects in the Canadian Lower Fraser Valley over the past 12 years. Two of these projects have been large combined-cycle gas turbine power plants of the order of SE2 in size. The clients in these cases are confidential,

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and there is no formal documentation of the statements that I am about to make, because, in both cases, after preliminary assessment of, among other factors, the likelihood of being able to obtain permits to operate in the airshed, the projects were abandoned. No assessment process applications were prepared. I advised the proponents in those situations that, given the prospect of the GVRD=s Air Quality Management Plan, which was in development at the time (early 1990s), it would be very difficult to conclude the required permitting processes successfully. These proposals preceded the B.C. Environmental Assessment Act, which was promulgated in 1995, and established stricter scrutiny of projects with adverse environmental effects.

Q: Mr. Martin testified about the laxity of emission regulations by Canadian regulators. Do you agree with Mr. Martin=s characterizations?

A: Statements in Mr. Martin=s pre-filed testimony about the laxity of emission regulations by Canadian regulators are not borne out by the record of achievement that I have already outlined. Mr. Martin would have us believe (a) that air quality is so good in the Lower Fraser Valley that his project ought to be allowed to proceed, but (b) that Canadian regulators are so lax and Canadian emitters so apathetic that they had nothing to do with the current state of air quality (it must have happened by magic). Based on the information presented above, it is future air quality that all of us need be concerned about, and a concerted effort and expenditure by all stakeholders on the Canadian side of the airshed have produced the observed improvements, which cannot be sustained without further emission reduction measures.

Q: Mr. Martin and Mr. Hansen compare emissions from other power plants in Canada with those of SE2. Are those fair and accurate comparisons?

A: Those comparisons are not fair and accurate. The Burrard Thermal Generating Plant was built decades ago--in the 1960s. It's silly to suggest that British Columbia is not committed to clean air simply because a plant built 40 years ago does not have all the technological advances that a new plant would have today. BC Hydro is, understandably, reluctant to walk away from a huge capital investment. So instead, BC Hydro and the BC government have addressed the situation through other means. One, the plant simply is not used that much. It is only used when peak demand requires its operation. Thus, while SE2 focuses on Burrard's emission rate (per hour), the plant is run at less than half its permitted output, and most years even less than that, so its total emission output is far less than SE2's is projected to be.

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Second, Burrard isn't allowed to operate--peak demand or not--when air quality in the region is particularly poor. Martin is wrong when he claims that this limitation was ignored this summer. While there was an inversion, the deteriorating air quality did not quite trigger the automatic shut-down requirement. We were probably within a day of that trigger when a front moved through and the inversion broke up.

Third, the Applicant ignores the tremendous investment made to upgrade the plant. In 1993, the owners of that plant were required to reduce NO_x emissions by 80% by installing selective catalytic reduction technology as a retrofit in response to re-permitting requirements from the GVRD and the Province. Currently, Burrard is believed to be among the cleanest large simple-steam-cycle, natural gas-fired plants on the continent.

Q What are your comments about the Applicant's comparisons to other proposed power plants in British Columbia?

A: Mr. Hansen in his testimony refers to the current version of the Port Alberni Generation Project, which is going through the B.C. Environmental Assessment Process. He comments that the Port Alberni project if approved would emit A74% more NO_X than S2GF for each megawatt of electricity produced.@ Ex. 183 at 9:24. It is unclear whether this difference would be true in practice, since the proponents in both cases are proposing essentially the same generation and emission control equipment. The Port Alberni proposal happens to be a much smaller plant than SE2 (265 MWe compared with 660 MWe) and would therefore emit far less peak or total NO_X. In any event, this project has not received any governmental approvals. At this time, conclusions can be drawn only from what that applicant has sought, not from what the government has approved.

The other Canadian example cited (the Island Cogeneration Project) is less than one-half the size of SE2 (245 MWe compared with 660 MWe) and is a true cogeneration project, with the adjacent pulp mill as steam host. The emission values in Hansen=s testimony appear to be for electricity generation only, not taking into account the co-generated steam that displaces emissions at the mill host.

Q: The Applicant suggests that before imposing more stringent requirements on new proposed air pollution sources that Canadian authorities should more stringently regulate existing sources. Is that typical on either side of the border?

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A: No. Mr. Martin=s arguments about the laxity of regulating existing (>grandfathered=) sources in the Canadian Lower Fraser Valley are difficult to understand. The U.S. Clean Air Act differentiates between existing and new sources. New Source Performance Standards, BACT or LAER requirements, etc. do not apply retrospectively to existing sources, unless they undergo significant modifications, or are otherwise required to participate in programs in non-compliance areas. In situations that I am aware of, new sources are always required to meet more stringent standards than existing sources. BACT for new sources is not the same as BARCT (best available retrofit technology) for existing sources. Effectively, all major industrial sources in the Canadian Lower Fraser Valley airshed have been engaged in emission reduction programs since the implementation of the GVRD Air Quality Management Plan in 1994As pointed out earlier, the most cost-effective measures have already been implemented. Further, the criticism of the Canadian approach presumably applies equally to treatment of emission sources in Whatcom County that Mr. Martin might expect to submit to regulatory programs to reduce emissions to offset SE2=s emissions.

Q: The Council stated in Order No. 757 that "at first blush, it appears " that the proposed changes address many, if not all, of the Council's concerns. Could you comment on that?

A: I can see how Aat first blush@ the modifications may have seemed to address EFSEC=s air quality concerns. But on closer scrutiny, that initial perception has not been borne out. The proposed modifications will have little or no effect on the air quality and health risk concerns that led the Council to recommend denial in Order No. 754.

END OF TESTIMONY

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