BEFORE THE STATE OF WASHINGTON
ENERGY FACILITY SITE EVALUATION COUNCIL

IN RE APPLICATION NO. 99-1

SUMAS ENERGY 2 GENERATION FACILITY

EXHIBIT _____ (DM-T)

APPLICANT'S PREFILED TESTIMONY

WITNESS: W. DAVID MONTGOMERY

Q. Please state your name and business address.

A. My name is W. David Montgomery. My business address is Charles River Associates, Incorporated, 1201 F Street, NW, Suite 700, Washington, DC 20004.

Q. What is Charles River Associates?

A. Charles River Associates (CRA) was founded in 1965, and is a leading provider of sophisticated economic and financial consulting services, expert testimony, and business consulting. The firm's areas of expertise include auctions, antitrust, mergers and acquisitions, policy impact assessment, corporate finance, strategy and business operations and regulatory economics. CRA applies advanced analytic techniques and

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in-depth industry knowledge to complex engagements for a broad range of clients. The Company has advised legal and corporate clients, government agencies and other organizations in thousands of projects.

In addition to the Company's corporate headquarters in Boston, Massachusetts, CRA has U.S. offices in Berkeley/Oakland, College Station, Los Angeles, Palo Alto, Salt Lake City and Washington, DC, as well as international offices in London, Melbourne, Mexico City, Toronto, and Wellington.

Q. What is your position with Charles River Associates?

A. I am Vice President and head the Energy and Environment Practice in CRA's Litigation and Regulation Group.

Q. What is the subject of your prefiled testimony?

A. My testimony will focus on greenhouse gas issues. In particular, I will discuss the SE2 project's greenhouse gas emissions and offset proposal, and offer my opinions about the policy implications of this proposal and offset requirements.

Q. Please describe your background and experience as it relates to global warming and greenhouse gas and global warming issues?

A. Since receiving my Ph. D. in Economics from Harvard University in 1971, I have held a series of positions in teaching, research, government service and consulting, all of which have dealt with energy and environmental policy. Since 1988, much of my

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work, first as a government official and then as a consultant, has dealt with global warming issues.

From 1971 to 1978, I taught economics at the California Institute of Technology and worked at the Caltech Environmental Quality Laboratory. During that time, I taught environmental economics and published research that is frequently cited as the first rigorous analysis of how to design an emission trading system. From 1978 to 1981, I served in the U.S. Department of Energy during the Carter Administration, and became Deputy Assistant Secretary for Systems Analysis. Afterwards, I spent two years at Resources for the Future, where I wrote two books on energy policy. I returned to the Department of Energy in 1983, and headed energy forecasting and economic analysis activities in the Energy Information Administration until 1988. My responsibilities included management of our short and long term energy forecasts and of major statistical publications such as the Monthly Energy Review. I received the Department of Energy's Meritorious Service Award in 1988. I became Assistant Director of the Congressional Budget Office (CBO) in 1989. At that time, I began working on climate change issues, producing a major CBO study on the costs and benefits of using carbon taxes to control greenhouse gas emissions.

I left the government and joined Charles River Associates in 1991. I have also taught as a visiting lecturer in what is now the Department of Management Science and Engineering at Stanford. A large part of my consulting work has been in the area of climate change, and I believe that I have become recognized internationally as one of the leading experts on the economics of strategies to reduce greenhouse gas

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emissions. I was invited to be a Principal Lead Author of the Second Assessment Report of the Intergovernmental Panel on Climate Change, with responsibility for chapters on the costs of controlling greenhouse gas emissions. I have conducted a number of large scale studies on the design and economic impacts of climate change policies for clients in the public and private sector, including the U.S. Department of Energy, Natural Resources Canada, the government of Ontario, the United Kingdom Department of Environment, Trade and Regions, the Electric Power Research Institute, the American Petroleum Institute, the American Automobile Manufacturers Assocation and a number of other governments and clients in the private sector. On behalf of my clients, I attended many of the negotiating meetings leading up to the Kyoto Protocol and preparing for the Sixth Conference of the Parties (COP-6), which recently concluded in Bonn, Germany, and I made presentations to the delegates at sidebar sessions.

My work on the economics of climate change policy has been extensively peer reviewed and published in leading economics journals. These include studies of the impacts of climate change policy on international trade, impacts on the U.S. economy, regional and distributional impacts of climate change policy, and on the comparison of costs and benefits of reducing greenhouse gas emissions. I have been invited on several occasions to participate in expert workshops organized by the Intergovernmental Panel on Climate Change. I have been a regular participant in Stanford University's Energy Modeling Forum, which brings together the leading modelers working in the field of integrated assessment of climate change to compare and review each other's work. I have also been an invited participant in several of the

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annual Snowmass Workshops on integrated assessment of climate change, where I have become familiar with the issues involved in measuring the health and other benefits of reducing greenhouse gas emissions. I recently published a peer-reviewed paper on this subject in the journal *Human and Ecological Risk Assessment*, and I currently am completing a book on modeling international economic impacts of climate change policies to be published by Cambridge University Press.

A copy of my resume is provided as Exhibit ___(DM-1).

Q. Have you ever served as an expert witness regarding greenhouse gas emission issues?

A. Yes. I testified before the EFSEC in May, 2000 at the hearing on the proposed Chehalis Generating Facility, which also dealt with an advanced natural gas combined cycle power plant. My testimony at that time concerned the wisdom of an EFSEC requirement for offsets of greenhouse gas emissions from power plants under its jurisdiction. I testified as an expert on behalf of Tractebel at those hearings, and later helped prepare a mitigation report for the Chehalis Generation Facility. I have also been invited to testify on many occasions before Committees of the U.S. Senate and House of Representatives on climate change policy, as described in my resume.

Q. What has been your role concerning the Sumas Energy 2 (SE2) project?

A. Some time in early 2000, attorneys representing SE2 retained me to prepare a report regarding greenhouse gas emissions from combined cycle combustion turbine projects and emission offsets. We also discussed the possibility of me providing testimony

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during the Council's original hearings on the SE2 project, but the hearings were ultimately scheduled during a time in which I was traveling abroad. Therefore, I wasn't able to appear as a witness, but I understand that my report was introduced as an exhibit. Following SE2's submission of its Second Revised Application, SE2 retained me to serve as a witness for these hearings.

Project Emissions and Proposed Offsets

Q. What is your understanding about how the project modifications contained in the Second Revised Application have changed the greenhouse gas emissions anticipated to result from the operation of the SE2 facility?

A. The Second Revised Application contains information about emissions anticipated from Westinghouse 501F combustion turbines:

> According to Westinghouse's "Expected 501F Combustion Turbine Performance" specification (CTT-1905Rev3:08/30/99), each of the two turbines operating at base load with duct firing would emit approximately 138 tons of CO2 per hour. If both turbines were to operate at maximum capacity 365 days per year, the generating facility would emit 2.4 million tons of CO2. Emissions of nitrous oxide (N_20, another greenhouse gas) would increase the greenhouse gas emissions by another 1 percent on a CO2-equivalent basis.

Second Revised Application at 2.11-12. It is important to keep in mind that these numbers reflect theoretical maximums. In the real world, these types of facilities are not operated at maximum capacity 24 hours a day, 365 days per year. Due to planned and unplanned outages, these types of facilities generally are not capable of operating above a 90% capacity factor on a sustained basis. The actual capacity factor achieved

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depends on how the variable cost of a particular unit compares to other generators against which it competes, and will be significantly less than the practical maximum.

With that said, these emissions are generally consistent with those I've seen associated with other similar facilities. The final design and heat rate will determine the final emissions calculations. Since greenhouse gas emissions from diesel fuel are significantly greater than emissions from natural gas combustion, SE2's decision to eliminate back-up diesel firing will result in a reduction in greenhouse gas emissions compared to the emissions anticipated in the previous application.

Q. How has the Second Revised Application changed SE2's proposal to mitigate or offset the effects of those greenhouse gas emissions?

A. As I understand it, SE2's January 2000 application proposed to invest $1 million in greenhouse gas mitigation and offset projects. The proposal was unprecedented in Washington State, which has no statutory or regulatory requirement to mitigate greenhouse gas emissions similar to that in place in Oregon. In the Second Revised Application, SE2 proposes to go further to make a monetary payment to the Oregon Climate Trust in an amount equivalent to that required of similar facilities in Oregon. In particular, the Second Revised Application states:

> SE2 proposes to mitigate and offset greenhouse gas emissions from the S2GF according to the monetary path payment requirements established by the Oregon Energy Facility Siting Council, Oregon Administrative Rules chapter 345, except as otherwise provided herein Ninety days prior to commencing operation of the S2GF, SE2 will submit for EFSEC's approval a calculation of the payment that would be required if the S2GF were subject to the Oregon Energy Facility Siting Council's Standards for Energy Facilities that Emit Carbon

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> Dioxide. *See* Oregon Admin. Rules Chap. 345, Div. 24. Upon EFSEC's approval of SE2's calculation, SE2 will make the first of five equal payments totaling the amount due under this provision to the Oregon Climate Trust. SE2 will make each of the four subsequent payments on annual intervals.

Second Revised Application at 2.11-15.

Q. As a practical matter, what will this commitment by SE2 entail?

A. The Oregon regulations provide a very specific formula for calculating the amount owed under the monetary path. The exact amount of the payment will depend on the total greenhouse emissions predicted to be produced by the facility, a calculation that in turn will depend upon the final design and the heat rate of the facility. SE2 has reasonably proposed to submit final calculations to EFSEC for approval prior to beginning operations.

Implications of Offset Policies

Q. In your opinion, does it make sense for EFSEC to require natural gas-fired combined-cycle combustion turbine projects to offset their greenhouse gas emissions?

A. No. Global climate change is a serious issue and I am in favor of an effective global strategy to reduce the threat of global warming, which is then implemented consistently on both the national and local level. But any sensible strategy for reducing greenhouse gas emissions would take exactly the opposite course that some parties appear to be proposing to EFSEC. Building more highly efficient natural gas fired power plants is a key component of any sensible policy to reduce greenhouse gas

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emissions. This Council requiring full or even substantial offset of greenhouse gas emissions will have the effect of discouraging new, highly efficient power plants from being built, which in turn increases greenhouse gas emissions because it leaves older, less efficient power plants free to operate more intensively. It also makes room in the market for new power plants, with higher emissions, to be built outside EFSEC's jurisdiction.

Q. Given that, do you disagree with SE2's offer to comply with the Oregon monetary path?

A. If a private party is willing to go above and beyond regulatory requirements, I would respect their choice. However, I am concerned that this cost, together with other costs associated with the project, may prove to be counterproductive by making other less environmentally desirable projects more economic. Ultimately, continuing to add costs to this project, even voluntarily, may mean that when the final decision to commence construction has to be made, the project will no longer be economic. That would be a tragedy for the State of Washington, for electricity supply in the Western U.S., and for the global climate, because building more new natural gas combined cycle power plants is recognized in every serious study of how to manage climate change as a very important contribution to reducing greenhouse gas emissions.

In addition, I believe it is financially risky for a developer to agree to offsets or for a regulator to require them at this time, since any offsets created now are likely to have no claim to be recognized as credits against future national or international emission limits on greenhouse gases. For example, the Kyoto Protocol would only give credit

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for offsets that were created under its procedures, and neither the relevant governing bodies nor the procedures have as yet been established. The Jeffords and other so-called "4-pollutant" bills now under consideration in the U.S. Congress leave to future implementing regulations all decisions about whether and how offsets would be credited against their carbon dioxide limits or caps. For example, the Jeffords Bill [S. 556] only gives the general guidance that its implementation "shall achieve the objectives in a manner that the Administrator determines will allocate required emission reductions equitably, taking into account emission reductions achieved before the date of enactment of this section and other relevant factors." If and when these policies were implemented, eligibility, audit and certification requirements for offsets could be quite different from those currently in effect in the Oregon program, and they could make offsets generated now worthless, requiring additional future expenditures after the facility is in operation.

Q. Your testimony seems to assume that if the SE2 facility were built it would displace other less efficient and more polluting facilities. Is that the case?

A. Yes. Testimony at a recent Federal Energy Regulatory Commission investigation stated that last winter there were unusually high levels of natural gas demand for electricity generation in the West, and that one important reason was that old and extremely inefficient natural gas generating units had to be brought online to meet electric power demand. These units had heat rates considerably higher than those of the proposed SE2 facility, and therefore generated significantly greater greenhouse gas emissions. They also put even heavier demands on natural gas supplies and

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infrastructure, and contributed to the spike in natural gas prices in the West last winter.

If SE2 had been online last winter, natural gas consumption, natural gas prices and greenhouse gas emissions would all have been less, because it would not have been necessary to use these old and inefficient units so heavily. Last winter, a lot of "emergency" diesel generators were also put into service, which are even worse because they have higher heat rates and produce more carbon dioxide per btu of energy burned.

In the long run, bringing more natural gas CCCTs on line will lead to less efficient generating facilities going off-line, at least part of the time, which will be a big step in the right direction for greenhouse gas emissions. Electricity demand will be met from some source, and projections of electricity generation in the Northwest, show significant continued use of – and eventually growth in – coal-fired generating capacity. Even the best coal-fired units have greenhouse gas emissions twice those of natural gas CCCTs. Existing natural gas units also have considerably worse heat rates than the new CCCTs.

I have calculated that in the States of Washington and Oregon there was in 1999 approximately 1200 MW of gas-fired generating capacity with heat rates in excess of those proposed for SE2, and this calculation does not include all of the single-cycle natural gas turbines that have been put into service in recent months. All the units identified in Exhibit DM-2 have higher greenhouse gas emissions than SE2, and

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based on market prices for natural gas, would have higher operating costs than SE2. Under economic dispatch, the lowest cost generating units are dispatched first. On most days of the year, total generation is well below the maximum capacity of the system, so that not all units are needed to operate. On these days, SE2 would displace generation from power plants with higher heat rates and greenhouse gas emissions. All units, including SE2, would only be expected to operate simultaneously on the highest peak demand days. Even on those days, SE2 would likely displace less efficient gas turbines in other states providing electricity imports into Washington. This is particularly important for greenhouse gas emissions, because global climate is affected the same way by carbon dioxide emissions, no matter where they originate. The State of Washington does no good for the global climate if reducing carbon dioxide emissions from facilities within the State results in an equal or larger increase in carbon dioxide emissions outside the State.

Exhibit DM-2 compares heat rates of existing units in the States of Washington and Oregon with SE2. The average heat rate of other natural gas units that could be displaced by SE2 is 10,792 btu/kwh, which is 50% higher than SE2's projected heat rate of 7155 btu/kwh. As a result, those existing natural gas units on average produce 50% more greenhouse gas emissions than would SE2.

The fewer natural gas CCCTs are built, the more existing units will be used and the sooner it will be necessary to build new coal-fired units. Once built, we can expect a unit like SE2 to displace existing less efficient units because the Western power grid utilizes economic dispatch – the most efficient units are used first because they have

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the lowest fuel cost per kwh generated. On many days of the year, demand is well below total capacity. Therefore, building a new, more efficient facility displaces an older, less efficient facility. As a result, greenhouse gas emissions are reduced. The case is even stronger if the existence of sufficient capacity in CCCTs makes it unnecessary to maintain or expand coal-fired generation capacity.

Q. Some intervenors have argued that the Oregon Monetary Path is not adequate because it does not require 100% offset of emissions. Can you respond to that claim?

A. Yes. First, the Oregon standard was not intended to require full offset of greenhouse gas emissions. Rather, it was intended to encourage more efficient power plants by comparing the greenhouse gas emissions of a proposed project to the most efficient plant and requiring the proposed project to offset the difference. Given this design, there is certainly no guarantee that SE2's payment of funds calculated based upon the Oregon monetary path will offset the full amount of emissions from the SE2 facility. I do note that the calculation for the Oregon monetary path appears to assume that SE2 will operate at maximum capacity 100% of the year, and as I noted earlier this assumption grossly exaggerates its emissions. Indeed, facilities planned for baseload operation are considered exceptional if they reach capacity factors above 90%. Thus, whatever emission offsets the Oregon monetary path provides will in fact be a much larger fraction of SE2's actual emissions than of the emissions used to calculate the payment.

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More importantly, however, whether a 100% offset is provided should not be the issue. No strategy for responding to the challenge of global climate change requires or even suggests the desirability of a zero-emission standard in the near future. Exhibit DM-3 reproduces a chart prepared by the Energy Information Administration showing a least-cost path for the U.S. to follow in order to comply with the targets set for the U.S. in 2010 under the Kyoto Protocol. It shows generation of electricity using natural gas growing over the next decade, at the same time that total greenhouse gas emissions from electricity generation fall. This is possible because increasing use of natural gas makes it possible to replace less efficient, more polluting electric generation from existing plants with more efficient, cleaner natural gas generation. Discouraging new natural gas power plants from being constructed will frustrate this improvement in overall emissions.

One of the most important implications of the chart above is that there is no need for a zero-emissions standard for carbon dioxide. Carbon dioxide does not pose any immediate risks for health or well being; continued U.S. emissions of at least 1,250 million metric tons are perfectly consistent with at least one global strategy (that of the Kyoto Protocol) for managing climate change. Thus the policy question is not whether to eliminate emissions, but how best to manage the reduction in emissions from baseline levels to a level consistent with possible U.S. international obligations. A large majority of studies agree that for the next decade or more the single largest and most cost-effective option for reducing emissions would be the replacement of electricity generated from coal-fired power plants with electricity from new combined cycle power plants burning natural gas.

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Exhibit DM-4 illustrates the EIA conclusion that in a scenario requiring the U.S. to meet most of its obligations through domestic actions, switching from coal to natural gas for electricity generation (labeled "fuel switching") provides the majority of emission reductions from 2010 onward. Moreover, the contribution of "generation efficiency" comes largely from the technology to be installed at Sumas, combined cycle combustion turbines. Demand reductions play a relatively small role, because high levels of energy efficiency have already been achieved by U.S. consumers through energy conservation investments over the last quarter century, so that further reductions in emissions are likely to be increasingly costly.

Recognizing the need to manage, rather than eliminate greenhouse gas emissions, there are no proposals to impose a zero-net-emission standard at this time on any sector. New motor vehicles are sold without any requirement to offset any part of their emissions, and motor vehicles are responsible for about one-third of total U.S. greenhouse gas emissions. There is no federal, state or local statute or regulation that requires every source of greenhouse gases to fully offset its emissions by other reductions. Even the recently introduced Jeffords Bill, one of the most ambitious pieces of legislation dealing with utility greenhouse gas emissions, would cap utility emissions of CO2 at 1990 levels, and does not specify an offset requirement for each new source. Another current bill, the Clean Power Plant and Modernization Act of 2001 [S.1131.IS] would establish emission standards for carbon dioxide, but SE2 already does better than the applicable standard in the bill.

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A rational solution is to encourage efficient generation and discourage inefficient. Requiring 100% offset by certain facilities penalizes them and encourages others -- in this case, it penalizes the wrong ones – new facilities subject to EFSEC's jurisdiction – because these are in fact the most efficient, lowest greenhouse gas emitting units that need to be encouraged. It is necessary to look at the entire electricity market, and ask what effect an EFSEC 100% offset policy has on that market, not at each individual unit in isolation. In the context of the entire market, the 100% offset requirement on new facilities is counterproductive – it serves to increase total greenhouse gas emissions, not reduce them.

Moreover, a policy that limits carbon emissions from just one source can actually increase emissions if the source is chosen unwisely. This is exactly what requiring 100% offsets for new natural gas combined cycle power plants built in the States of Washington and Oregon would do. The policy of requiring offsets of new power plants is one that applies to just one, narrowly defined source of emissions: new units in a single state. It also turns out, perhaps unintentionally, to apply to just one fuel and technology, since the power plants of choice in the State of Washington electricity market are natural gas combined cycle units. The units at issue, unfortunately, are also the power plants with the lowest greenhouse gas emissions of any being built on a large scale across the country, and in particular have lower emissions than both existing power plants and new power plants being built in other states.

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There is at this time no national policy for reducing greenhouse gas emissions that could create a level playing field by applying comparable measures to existing units or to units built in other jurisdictions. There is no policy requiring offsets for the continued operation of existing coal-fired power plants or of older, less efficient natural gas units, even within the State of Washington. There is no consistent nationwide policy requiring offsets for new units in those jurisdictions.

Consequently, a policy of requiring offsets for new gas combined cycle power plants in Washington is most likely to cause higher emissions from generating electricity to meet the needs of the State of Washington than would be the case without the policy.

The reason for this conclusion begins with the observation that electricity demand will be met from some source. The Northwest Power Planning Commission has forecasted a need for significant growth in generating capacity to meet the region's needs without large increases in imports. This future demand will be met by calling on the least cost-mix of generating sources in existence at the time. A policy of requiring offsets for new combined cycle units raises the costs associated with those facilities, and acts to discourage their construction. At the same time, it does nothing to discourage use of existing facilities with higher emissions.

If the construction of new combined cycle units in the State of Washington is slowed or halted, the need for electricity will have to be served from some other source. This electricity could be generated by additional use of power plants outside the State of Washington. The next most cost-effective alternatives for meeting electricity needs is

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greater use of existing natural gas peaking units and coal base load units, which will fill in the needed electricity if new natural gas combined cycle units are not available. All of these have higher greenhouse gas emissions that SE2.

On average, approximately 34% of the power generated in the Western Systems Coordinating Council/Northwest Power Pool Area, composed of the states of Washington, Oregon, Idaho, Nevada, Utah, and western Montana and Wyoming which form an interconnected electricity market, is coal-fired, compared to 9% in the State of Washington.[1] Since only one of the states in this electricity market, Oregon, also has a policy addressing offsets, there is little hindrance to building new coal fired units in the region. Additional use of existing coal fired units, or even of existing natural gas fired units that are less efficient than the proposed power plants, would produce more emissions per kwh than the foregone generation from new natural gas-fired combined cycle combustion turbine facilities. It is also likely generation could increase from existing coal fired units within the State of Washington.

END OF TESTIMONY

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[1] U.S. Department of Energy, Energy Information Administration, *Annual Energy Outlook 2000,* Supplemental Table 74; U.S. Department of Energy, Energy Information Administration, *State Electricity Profiles (Washington),* Table 5.

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