3.9 Energy

S2GF would consume energy and natural resources directly and indirectly during construction and operation. Direct consumption involves the use of natural gas as fuel for generating electricity during project operation. Indirect consumption refers to energy expended in the construction and maintenance of the facility by items such as vehicles and tools.

The S2GF would produce many times the energy consumed in manufacturing its construction materials or in building the facility. Thus, the focus of this section is on the operational aspects of the S2GF rather than the construction activities.

3.9.1 Sources of Information

The Application for Site Certification presented information from the Energy Information Administration of the U.S. Department of Energy that was used to identify existing Canadian reserves.

Testimony from the adjudicative hearings held with respect to the review of this project was used to identify cumulative impacts to oil and natural gas supply and reserves (Prefiled testimony of J. Lazar, Exhibit 72).

3.9.2 Existing Conditions

Energy sources in Sumas and Whatcom County include natural gas, used for heating, cooking, and for the operation of the existing SCCLP facility, and electricity provided by SCCLP, PSE, and BPA.

The S2GF site is located at Sumas, Washington, one of several major import points for natural gas from Canada. At this location, the major pipeline in western Canada, Westcoast Energy, interconnects with the Williams Company pipeline, one of two major natural gas pipelines in the Northwest. The Williams Company pipeline transports natural gas into and through Washington State.

Natural gas, the project's primary combustion source, would come from Canada's Western Canadian Sedimentary Basin (WCSB), Canada's largest and single most important natural gas source. The WCSB includes most of the provinces of Alberta, British Columbia, Saskatchewan, and the Yukon and Northwest Territories.

Canada is estimated to have approximately 65 trillion cubic feet (Tcf) of proven gas reserves, an additional 50 Tcf of probable gas reserves, and as much as 574 Tcf of possible gas reserves. In 1997, Canada produced over 5.8 Tcf of natural gas and exported 2.9 Tcf to the United States. Canadian gas pipeline companies are currently expanding

their export capacity to the U.S. significantly. Between 1998 and 2000, Canada's export capacity to the U.S. was expected to increase by at least 1.1 Tcf.

3.9.3 Environmental Impacts of Proposed Action

3.9.3.1 Construction

Construction bulk materials such as soil, aggregate gravel and sand would be supplied locally from existing quarries. Other building materials, equipment, diesel fuel for the emergency generator and other operational commodities, would be purchased from equipment and material suppliers.

The S2GF would be constructed using materials, such as steel, that require energy for fabrication. Energy would also be required to transport these materials to the project site. Additional energy would be consumed by cranes, trucks, mobile equipment, tools, and other equipment operated during construction of the facility. Data for energy use during this activity are unavailable. Therefore, the short-term consumption of energy for these construction-related activities is difficult to measure and likely insignificant in quantity. However, such consumption is predominately in the form of electricity, gasoline, and diesel fuel.

Maximum expected electricity demand during construction is 500 kW at the planned 480 distribution voltage during the expected 40 hours per week of construction activity. Electricity use during non-working hours would primarily consist of lighting for security purposes. Excess capacity of the existing transmission and distribution systems is adequate for electrical needs during construction. Should the local distribution capacity be unavailable, the loss of electric service could be replaced through the use of self-contained construction equipment such as engine-driven welders and portable gas/diesel electric generators.

Diesel and gasoline would be used for the transport of fill to the site, for workforce transportation and parking, for the installation of the natural gas pipeline and the water and sewer lines, and for the installation of new transmission poles. The amounts used would be typical for a construction project, and would not have a significant impact on the energy resources in Whatcom County.

3.9.3.2 Operation

Onsite Facilities

The S2GF is a natural gas-fired combined-cycle facility. Its design includes two natural gas combustion turbine generators, two heat recovery steam generators (HRSG), and one common steam turbine generator. Each combustion turbine discharges hot exhaust gases to the HRSG for the production of steam for use in the steam turbine. Light distillate oil

is the backup fuel oil in case the gas supply is interrupted. The nominal generating capacity of the S2GF facility would be 660 MW.

S2GF would be a merchant plant. It would be interconnected to the electric grid 5.6 miles to the north at the BC Hydro Clayburn Station in Abbotsford, British Columbia. Clayburn is the closest direct connection to the main electric grid that services British Columbia, Alberta, and the 11 western states. Purchasers can obtain transmission rights and buy SE2's power at Clayburn, or, SE2 can obtain transmission rights to move the power to customers anywhere throughout the West. SE2 would sell its power to various purchasers under differing arrangements likely to vary in length from a few hours up to several years. SE2 has had discussions with several potential customers, but as of this time, no electricity sales contracts have been signed.

At a 97 percent capacity factor, the S2GF would generate approximately 5.6 million megawatt hours of electricity annually and approximately 168 million megawatt hours of electricity over a 30-year operational life. To achieve this generation, the S2GF would consume approximately 36 million million British thermal units (MMBtu) of natural gas annually and approximately 1,086 million MMBtu over a 30-year operational life.

The combined system would operate at a nominal 53 percent efficiency, at least 20 percent higher than a well-designed conventional power plant using a boiler with solid fuel (coal, for example) and steam turbine on an equivalent basis, but at a lower efficiency than prototype models such as General Electric's (GE) H System. Table 3.9-1 presents the estimated annual energy consumption for the S2GF. It shows the partial offset from the export offsite of 19,141,000 MMBtu/year of electrical energy.

Table 3.9-1: Estimated Plant Energy Consumption (Based On Average Ambient Conditions)

Energy Type	Estimated Energy Consumption (MM KWh)	Estimated Energy Consumption (MMBtu/year)
Natural Gas Fuel Consumed	10,612	36,218,000
Electrical Energy Produced (Net)	5,608	19,141,000
Total Energy Consumption	**5,004**	**17,077,000**

The S2GF would use natural gas as its primary energy source. The maximum total estimated gas reserves required for the S2GF over a 30-year operational life equals approximately 1.8 percent of the most recent estimate of existing proven WCSB gas reserves published by the Energy Information Administration, U.S. Department of Energy (1997).

SE2 would contract for delivery of natural gas to the U.S./Canadian border at a point approximately 4 miles from the site (the delivery point). SE2 would design, permit, construct and operate border crossing facilities and a private natural gas supply pipeline from the site to the delivery point where it would interconnect with the Westcoast

Energy, Inc. (Westcoast) pipeline system. Westcoast operates the main gas pipeline system in British Columbia. Westcoast is willing and able to expand its existing facilities to service the interconnection with SE2. SE2 would secure the majority of its pipeline and border crossing facilities easements from an affiliated company.

Transmission Line ROW Maintenance

Minor amounts of fossil fuels, used for trucks and construction equipment, would be used for transmission line ROW maintenance.

Backup Generator Fueling

Low Sulfur No. 2 Fuel Oil would be used as backup fuel for up to 15 days per year per turbine, with a rolling average over any 10 years not to exceed 10 days per year per turbine, in the event of natural gas curtailment. SE2 expects to operate on oil for approximately five days during each of the months of December, January, and February. The fuel consumption for the 15-day period is estimated to be as shown in Table 3.9-2.

Table 3.9-2: Estimated Low Sulfur No. 2 Fuel Oil Usage

Gallons per minute	428
Barrels per minute	10
Gallons per hour	25,694
Barrels per hour	612
Gallons per day	616,656
Barrels per day	1,468

The energy usage would be 141,000 Btu/gallon. If No. 2 fuel is used for the entire 15-day period each year, the total usage would be 9,249,840 gallons/year, or 22,020 barrels/year.

The anticipated source of supply would be the Shell Oil facility in Abbotsford, British Columbia. (See Section 3.10 for a discussion of traffic impacts from the supply trucks.) The site would have a 2,500,000-gallon oil storage facility[1] that would be initially filled during the nine months of the year that oil is not being consumed.

1 In its final briefing to the Energy Facility Site Evaluation Council (September 5, 2000) the applicant proposed to reduce the diesel storage tank size to 1.5 million gallons. The environmental impact of this proposed design modification has not been analyzed in this FEIS.

Electricity

S2GF would fully supply its own power when operating. Start-up and backup power would be supplied by a backfeed through the interconnection with the BC Hydro system, or a local utility should the power be connected locally. The backfeed would be reduced to an estimated 2 MW of standby power for times when the plant is out of service for maintenance or other reasons. The ultimate source of standby electric power for station service is the emergency diesel generator.

3.9.3.3 Conservation and Renewable Resources

Generation from the S2GF would be sold under long-term contracts and on the short-term market. Because it is easily dispatched (that is, it can start and stop fairly easily), the generation from the S2GF can be sold as a back-up to renewable resources such as hydro and wind-generated power that can be affected by weather and climatic conditions. SE2 anticipates that the S2GF may not generate power during periods of extremely low market prices such as during periods of high water run-off when hydro-based generation is typically plentiful and inexpensive. Accordingly, availability of power from the S2GF would help optimize the use of renewable resources of other power producers as well as the conservation of natural resources.

By providing additional flexibility to hydro generators, for example, the S2GF may promote conservation of fish resources by allowing a hydro facility to store water that could be used to augment fish flows. A recent study by the Bonneville Power Administration suggests that the Northwest region could experience serious electricity shortages if water flows in the Columbia Basin are near historic lows. The neighboring province of Alberta is also short on winter electrical generating capacity.

The S2GF uses natural gas, a nonrenewable resource, in an efficient manner due to its state-of-the-art combustion turbine combined-cycle generating units. The S2GF's primary advantage when compared to other fossil fuel-fired generating resources is that it generates electricity more efficiently. It takes less energy (British thermal units) to generate a kilowatt-hour of electricity in a combined-cycle facility (6,000 to 6,700 Btu/net kwh) than in existing thermal generating facilities (9,000 to 11,000 Btu/kwh for coal plants; 10,500 Btu/kwh for nuclear plants; and 11,500 Btu/kwh for simple cycle combustion turbines). Fossil fuels, particularly natural gas, would be conserved because combined-cycle plants are the most efficient fossil-fueled power generation systems currently available. Existing combined-cycle plants operate at thermal efficiencies greater than 44 percent. The S2GF would operate nominally at 53 percent efficiency at average ambient temperatures.

3.9.4 Environmental Impacts of No Action

If the S2GF project is not built, the facility would not be available to generate energy. No energy would be consumed or generated by the project. Other sources of energy would be considered to provide electrical energy to the Northwest grid.

3.9.5 Mitigation Measures

No mitigation measures are required.

3.9.6 Cumulative Impacts

The operation of this project would cumulatively add to the availability of energy and capacity of energy sources in the Pacific Northwest, and would supplement alternatives to hydropower and coal-fired power projects.

The operation of this plant would cause an increase of approximately 14 percent of the existing total consumption of natural gas in Washington State. While fired with oil over extended periods of time, the facility would use about 25 percent of the daily statewide diesel consumption of home heating oil, trucking fuel, and ferry and railroad transportation uses.

3.9.7 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts to energy would occur from the construction or operation of this project. Diesel supply to other users could be impacted if the facility is fueled with oil over extended periods.