Section 12

DOW SYNGAS PROJECT STATUS

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Dow Chemical Co.

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Dow Energy Program

Dow is one of the five largest industrial energy consumers in the United States, so the economics of energy have always been a high priority concern for Dow management. We generate most of the electric power used in our process plants including our chlorine and magnesium electrolytic processes; plus large amounts of steam for process use. Dow produces in excess of 2000 MW of power at manufacturing sites around the world, including over 1000 MW at Freeport, TX alone. On the Gulf Coast natural gas has been the primary source of our energy needs, but we have concerns that sometime in the future natural gas will demand a significant premium price and/or be unavailable for large industrial energy use.

Dow has approached this potential problem from two directions. First, to use less fuel to produce the same amount of power. Energy conservation has been a way of life at Dow for a long time. While some companies have just recently discovered cogeneration, Dow has been practicing cogeneration since the early 1900's, and has been operating combined cycle - cogeneration gas turbines since the late 1960's. In 1978 Dow initiated a half billion dollar electric power modernization program which we have now completed. This program has converted all of Dow's gulf coast power generation facilities to high efficiency, combined cycle gas turbines. No company--electric utility or industrial--has more operating experience, or a stronger continuing commitment to combined cycle gas turbine operations.

The second phase of our energy program is to use solid fuels rather than natural gas as our energy base. In 1974 Dow chose coal as the lowest cost, most readily available energy source for our future needs. In 1975 gasification was selected as the best technology for utilizing coal, which led us to greatly expand our gasification studies.

While energy prices have stabilized recently, we view this as temporary and have continued an aggressive program to develop alternative sources.

Gasification was a logical selection for us. The solid fuel, such as coal or lignite, is converted to carbon monoxide and hydrogen (syngas) plus by-product CO_2. The sulfur in the coal reacts to form H_2S, which is converted to commercial sulfur and then sold. Like natural gas, syngas can be burned as fuel in a gas turbine and substituted for natural gas in

our process furnaces and boilers. In addition, the heat generated in the gasification reaction can be recovered as high pressure steam.

During this same early 70's period Dow recognized that the most available source of solid fuels for its Gulf Coast operations was the large deposits of lignite in east Texas and north-west Louisiana. Consequently, we undertook an extensive exploration, leasing and acquisition program in these areas.

By 1978 we had acquired sufficient lignite reserves to decide that lignite was our fuel of choice and that gasification with combined cycle gas turbines was the ideal way to utilize solid fuels. Dow therefore needed a gasification process that would be reliable, have minimal environmental problems and be energy efficient when operating on lignite. Dow has conducted an extensive research and development program to develope a process with a focus on the efficient conversion of low rank coals to medium BTU syngas.

Dow Gasification Process

The Dow Gasification Process utilizes a pressurized, entrained flow, slagging, slurry fed gasifier with a continuous slag removal system. The process includes a unique heat recovery system which provides high efficiency on low rank coals. The process reliably produces medium BTU syngas suitable for fueling combined cycle power units. The oxygen and slurry are carefully controlled, utilizing special temperature sensing devices, to maintain the temperature at the desired point. The gasifier system operates in such a manner that essentially no tars are produced and the sulfur in the coal is almost totally converted to hydrogen sulfide. In addition to the unique heat recovery system additional heat is recovered by a conventional heat recovery boiler in the form of high pressure steam.

Because our initial use for gasification is to fuel power generating gas turbines, reliability has been given a very high priority. Reliability is essential in power generation. The process includes a continuous slag removal system, a unique technique that eliminates high maintenance, problem prone lockhoppers. We also have a novel slurry feed technology, special temperature monitoring devices, and other operating reliability features. Of special significance, a computer-controlled instrumentation system allows on-stream switching of the fuel to the gas turbines. We have demonstrated the ability to interchange the gas turbine feed between medium BTU syngas and natural gas without shutting down the gas turbine.

Dow Syngas Project

The Dow Syngas Project will be a commercial coal gasification plant that uses Dow-developed coal gasification technology to convert coal into medium BTU syngas for use in combined cycle gas turbines generating electricity and steam. The project, which

will require a total commitment in excess of $300 million, will feed about 2,400 tons per day of low-rank coal and produce 30 billion BTU per day of synthetic gas. The synthetic gas output is equivalent to 155 megawatts of electric power after supplying the total project power requirements.

The project is located within Dow's existing petrochemical manufacturing site near Plaquemine, Louisiana and will be fully integrated with existing power generating units.

The Dow Chemical Company is the single sponsor of the project. Dow will design, build, own, and operate the entire facility and will consume the syngas product. The project has a price guarantee commitment from the Synthetic Fuels Corporation of up to $620 million over a ten-year period which commences with plant startup in early 1987.

The Dow project fits the Synthetic Fuels Corporation's charter very well. Dow submitted a proposal in January, 1983, under the SFC's third general solicitation. Several months were spent evaluating the technology with the SFC technical staff. Financial negotiations began in August, 1983, and a contract was signed April, 1984. This unprecedented rapid approval by the SFC is confirmation of the excellent depth of our technology and Dow's firm commitment to commercialization of the Dow Gasification Process.

The commercial project schedule is geared to a plant startup in early 1987. Process design is complete and detail engineering is currently in progress and will be completed late this year. Some site construction work has begun, and we anticipate that major construction will be underway by late 1985 and be completed for the planned early 1987 startup.

Commitments for major equipment items have been made. It is anticipated that all equipment commitments will be made by mid-1985.

Dow is unique in having all the technology necessary to produce synthetic gas from a wide range of solid fuels for its own internal needs; plus generate electric power and steam from combined cycle, high efficiency gas turbines. Our experience encompasses all phases of gas turbines, gasification, and solid fuels. Because of Dow's commitment to use gasification and gas turbines for our own significant energy needs the Dow technology is assured of continuing operating know-how and technology improvements.

The Dow syngas project is well underway, Dow and the SFC have made firm project commitments, and we look forward to a very succesful plant startup in early 1987.