The Gregory County Pumped Storage Facility

FINAL REPORT

Feasibility Study Reevaluation

Performed for the South Dakota Department of Environment and Natural Resources

June 24, 2004

BLACK & VEATCH

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1.0 Executive Summary

The purpose of the Gregory County Pumped Storage Facility (Facility) Feasibility Study Reevaluation is to consider a number of factors affecting project feasibility that may have changed since the last study was completed in 1991. Key issues include the definition of the market study area, and an evaluation of changes in market conditions that could affect the Facility economics such as deregulation, regional power demand, transmission policy, fuel costs, and the cost of alternative peaking generation. These issues are discussed and developed in this Final Report.

Changes in the regulatory environment include a move toward deregulation of vertically integrated utilities, accompanied by a dramatic change in the control and operation of the nation's bulk transmission network. These changes are on-going, but the clear intent is the creation of a competitive power generation market and the removal of barriers in the transmission area that could prevent end-users from benefiting from increased competition. Due to these developments, the selected market study area has been increased from the 11 utilities in the 1991 study area to encompass the entire U.S.-Mid-Continent Area Power Pool (MAPP-U.S.) region. The factors leading to this decision are discussed in Section 3.0.

An important assumption of the study is an estimate of the off peak cost of energy that would be available to the Facility to refill the storage area. This cost is derived in Section 6.0 based on an inventory of power plants in the market study area (Section 4.0) and the development of a load duration curve (Section 5.0). The conclusion resulting from the analysis is that the Facility would have access to ample excess energy from available coal based capacity during off peak periods when the market price would reflect the marginal cost of production, estimated to average $12.85/MWh in 2010 in the study area.

Section 7.0 develops bus-bar costs for the Facility with two different options, sized at 1,200 MW and 600 MW, and compares these costs to those of three other peaking options, all of which are natural gas fired combustion turbine (CT) units. A summary of the results is presented in Table ES-1. Based on many assumptions including a natural gas price forecast from the U.S. Energy Information Administration's *Annual Energy Outlook* and a Facility capital cost that was updated as part of the Phase 2 study scope, the base case bus-bar curves indicate that a 1,200 MW and 600 MW Facility would not be the least cost option under 10 percent, 15 percent, or 20 percent capacity factor scenarios. At the most likely 15 percent capacity factor, the 1,200 MW Facility has a levelized bus-bar cost of 16.52 cents/kWh or about 3.5 cents/kWh more costly than

Table ES-1. Economic Comparison at Selected Capacity Factors (cents/kWh)			
	Base Case		
Unit	10% CF	15% CF	20% CF
LM6000 SC	19.96	16.10	14.17
7EA SC	17.19	14.61	13.32
7FA SC	15.08	12.98	11.92
Pumped Storage Facility, 1,200 MW	23.49	16.52	13.04
Pumped Storage Facility, 600 MW	29.60	21.10	16.10
	High Natural Gas Case		
Unit	10% CF	15% CF	20% CF
LM6000 SC	23.63	19.78	17.85
7EA SC	21.92	18.63	18.05
7FA SC	19.35	17.25	16.20
Pumped Storage Facility, 1,200 MW	23.48	16.52	13.04
Pumped Storage Facility, 600 MW	29.60	21.10	16.10
	Low Fuel Price Case		
Unit	10% CF	15% CF	20% CF
LM6000 SC	17.48	13.62	11.69
7EA SC	14.01	11.43	10.14
7FA SC	19.35	17.25	16.20
Pumped Storage Facility, 1,200 MW	22.97	16.00	12.52
Pumped Storage Facility, 600 MW	29.07	20.58	15.57
	Facility Low Capital Cost Case		
Unit	10% CF	15% CF	20% CF
LM6000 SC	19.96	16.10	14.17
7EA SC	17.19	14.61	13.32
7FA SC	15.08	12.98	11.92
Pumped Storage Facility, 1,200 MW	20.15	14.30	11.37
Pumped Storage Facility, 600 MW	25.29	18.23	13.94
	Low Facility Capital Cost Plus High Natural Gas Case		
Unit	10% CF	15% CF	20% CF
LM6000 SC	23.63	19.78	17.85
7EA SC	21.92	18.63	18.05
7FA SC	19.35	17.25	16.20
Pumped Storage Facility, 1,200 MW	20.15	14.30	11.37
Pumped Storage Facility, 600 MW	25.29	18.23	13.94

the least cost CT option. The 600 MW Facility has a 21.10 cents/kWh levelized bus-bar cost at a 15 percent capacity factor.

A number of sensitivity evaluations have been performed to provide an understanding of the ability of the Facility to compete under alternative natural gas and Facility capital cost scenarios. A scenario consisting of a high natural gas price (a 2.0 percent higher annual rate of growth over the base case) plus a low Facility capital cost scenario (a 20 percent reduction from the Facility base case capital cost) is the most competitive scenario for the Facility, as a 1,200 MW plant would be the least cost option under the 15 percent and 20 percent capacity factor scenarios. A 600 MW Facility only beats the CT options at a 20 percent capacity factor in this sensitivity.

In the high gas price scenario, a 1,200 MW Facility is cost effective at a 15 percent capacity factor but the Facility is not cost effective in the low fuel cost (ranking third) or low capacity cost (ranking second) sensitivity at a 15 percent capacity factor. The 600 MW Facility is not cost-effective relative to the CT options at any of these three sensitivity evaluations at a 15 percent capacity factor.

At a 10 percent capacity factor, neither the 1,200 MW nor the 600 MW is the least cost option in any scenario. At a 20 percent capacity factor, the 1,200 MW Facility is cost effective in three of the four sensitivities, while the 600 MW Facility is lower in cost than the CT options in two sensitivities.

The bus-bar cost results make a recommendation difficult because, while the economics are not generally favorable for a 1,200 MW Facility (and less so for a 600 MW Facility), neither are they entirely unfavorable. This is especially an issue given that the most important variable appears to be the cost of natural gas for the CT options, and the historical volatility of this input.

In addition to bus-bar economics, other factors should influence the evaluation of project feasibility. Table ES-2 lists a number of other factors to be considered. Among the most significant factors favoring the Facility are electric system benefits related to the use of off-peak excess coal capacity and the socioeconomic benefits resulting from construction and operation. Factors favoring the CT options are the lower risks resulting from a smaller initial investment, and transmission policy considerations. These later two are not small issues, as a utility or other body considering an investment of its limited capital would want to be certain that a long-term investment in peaking facility is going to be cost effective before opting for a capital intensive option, such as the Facility, versus a CT option having a much lower capital cost. Further given the substantial uncertainty that remains regarding transmission policy at the national and regional level, any plan relying on projections of the cost of firm transmission service and the that may or may not be able to achieve cost recovery of transmission investments combine to

ES-2. Qualitative Analysis of Pumped Storage Facility Versus CT	
Parameter	Indicator
Uncertainty of transmission policy and pricing.	Favors CTs
Initial capital commitment	Favors CTs
Contribution to fuel diversity of existing peaking fleet	Favors Facility
Off-peak load factor benefits.	Favors Facility
Reduced wear on coal plants due to ramping.	Favors Facility
Level of effort for project development.	Favors CTs
Financial community risk perception.	Favors CTs slightly
Risk of cost overruns.	Favors CTs
Fuel uncertainty risks.	Favors Facility
Construction and capital cost overrun risks.	Favors CTs
Long-term peaking power hedging vehicle	Favors Facility
Socioeconomic impacts in South Dakota	Favors Facility
Non-socioeconomic environmental impacts	May favor CTs slightly

mean, along with the other non-economic factors, that a utility would likely opt for the Facility only if it had a clear economic advantage over other peaking options. The results of the analysis indicate that the 600 MW Facility clearly does not meet that hurdle, and the 1,200 MW size is marginal in a number of scenarios.

While certain factors, especially long term gas price and transmission network development, could change to justify a renewed consideration of the Facility, this study concludes that the Facility is not likely to be viewed by potential participants as a cost-effective investment option having a risk profile comparable to other peaking options. Barring an expression of interest from a utility or developer to spearhead project development, it may be prudent to minimize further development efforts.

2.0 Background

The Facility is a proposed peaking generation plant to be located in Gregory County, South Dakota. Water would be pumped into the elevated storage area during off peak periods using low cost energy from base load generation, and the stored water would be released to produce energy during peak and near peak periods when the energy has the greatest market value. The basic task of this feasibility study reevaluation is to determine whether the concept is cost-effective when compared to peaking unit alternatives such as combustion turbines burning natural gas.

The Facility concept has a history dating back to 1977, when the Corps of Engineers completed a study investigating a number of water resource opportunities along the Missouri River. The study identified an approximate 1,200 MW pumped storage facility adjacent to Lake Francis Case in Gregory County as the best location on the Missouri River for a pumped storage project. Since that time, a number of technical and economic studies have been performed, investigating various Facility sizes ranging from 600 MW to 2,400 MW.

In January, 1991, EBASCO Incorporated, working with Black & Veatch, completed a Project Feasibility and Power Marketing Analysis. The analysis concluded that the Facility was an economical option for meeting regional peaking power needs. However the project never proceeded further.

The 2002 South Dakota State Legislature appropriated $100,000 to the Department of Environment and Natural Resources (DENR) for a reevaluation. The DENR subsequently issued an RFP on February 25, 2003, and the reevaluation study was awarded to Black & Veatch. The scope of work was divided into two phases.

Phase 1 consisted of: 1) an evaluation of the regional power needs based on the existing and planned generation facilities, and 2) an analysis of the power demand. At a minimum, the analysis was to include the 11 utility firms studied in the initial study. Phase 1 tasks also included: 3) a determination of the availability and cost of off-peak pumping energy, and 4) a determination of the break-even cost that pumped storage must meet if it is to compete with alternative peaking options, primarily natural gas fired combustion turbine units. Black & Veatch submitted its final Phase 1 report to DENR on March 11, 2004. The Phase 1 study concluded that, while the Facility did not appear competitive under the base case assumptions, there was much uncertainty about capital costs. Because the Phase 1 capital costs were based on assumed escalation rates made in the previous 1991 study, it was recommended that DENR undertake the optional Phase 2 of the study to specifically address the capital cost issue.

Based on the Phase 1 study, DENR decided to proceed with the Phase 2 scope of work that consisted of: 1) an update of the capital and operating and maintenance (O&M) cost estimates for the Facility, sized at 600 MW and 1,200 MW; and 2) the identification of Facility transmission needs (the 1991 study determined that new transmission lines were needed. A 1,200 MW (600 MW) project was estimated to require transmission-related expenditures in 1990 direct costs of $114 million ($63 million) and would include ties into WAPA's 230 kV and 345 kV system).

The remainder of this report incorporates several background sections of the Phase 1 report, updated as appropriate, and presents the results of the Phase 2 economic analysis of the Facility. Section 3.0 identifies the appropriate regional market study area, based on considerations that include the transmission network, ongoing regulatory reforms, and market reorganization. In Section 4.0, an inventory of existing and planned generation units is developed for the market study area. In Section 5.0, a demand profile in the form of a load duration curve for the market study area is developed. Section 6.0 develops an estimate of the cost of off peak pumping energy available to the Facility, and Section 7.0 calculates bus-bar cost comparisons between the Facility and alternative peaking options, based on the Phase 2 capital and O&M cost updates. Section 8.0 contains the study conclusions and recommendations.

3.0 Identification of the Appropriate Regional Market Study Area

The first major task in the study is to select an appropriate regional market area in which the Facility should be studied. This is important because the size of the Facility will require multiple off-takers, some of whom could be located a considerable distance from Gregory County. The 1991 study selected a regional market that consisted of the following utilities:

- Interstate Power
- Iowa Electric Light & Power
- Iowa Power & Light
- Iowa Southern Utilities
- Kansas City Power & Light
- Nebraska Public Power District
- Northern States Power
- Northwestern Public Service
- Omaha Public Power District
- St. Joseph Power & Light

The selection of these utilities was based on their projected capacity requirements, and indications of interest in the Facility. Since the initial study, however, several developments have occurred suggesting that it is appropriate to reconsider the market study area. The most important of these developments include state deregulation activities, mergers, and bulk transmission policy developments in particular. Because selection of the market study area is central to the analyses, these issues will be discussed at length to explain the selection of the updated market study area, which is expanded in this study to include the entire U.S. portion of the Mid-Continent Area Power Pool (MAPP-U.S.) region.

3.1 Transmission Policy Development

Power produced from the Facility must be deliverable to a purchasing utility or other entity at a cost and level of reliability comparable with other peaking options. Therefore, a key assumption of the study is to select a realistic market study area that considers these cost and reliability issues.

To achieve a comparable level of reliability as the installation of a peaking unit on a utility system, power from the Facility must secure firm transmission, meaning that the contracted path of power delivery from the Facility to the purchasing utility is not subject to interruption except in extreme cases such as a system emergency. The market study area must also be selected with due consideration of the economic impact arising from transmission costs. In general, the price of transmission increases as the number of transmission systems utilized in a power delivery transaction increases. Also, line losses tend to increase with distance, and this further discourages long distance power delivery transactions.

Since the completion of the first feasibility study, monumental changes have occurred and continue to develop in the bulk transmission markets, making it a challenge to accurately project available transmission capacity and transmission-related costs into the future. The approach taken in this study is to discuss the historical development of these fundamental changes, to explain the targeted end state of the policy driven changes, and to select a market study area assuming progress toward certain stated policy objectives by the commercial operation date of the Facility that would not likely occur prior to 2009.

The remainder of Section 3.1 discusses the transmission network near the Facility site. Section 3.2 addresses issues related to the historical and future regulation of the bulk transmission network, including the many uncertainties associated with the FERC 2002 Standard Market Design proposed rule making. Section 3.2 ends by designating the market study area.

3.1.1 The Existing Transmission Network Near the Facility Site.

Existing Transmission. A high voltage transmission network map for the MAPP-U.S. region is shown as the shaded area in Figure 3-1. Though Gregory County is a rural, sparsely populated area, there are a number of major transmission lines in the vicinity at 230 kV or higher. This is primarily the due to the nearby Ft. Randall hydroelectric facility on the Missouri River, near the extreme southeast portion of Gregory County. The Ft. Randall facility consists of eight hydro units, each having a nameplate capacity rating of 40 MW.

Three 230 kV lines interconnect with the Ft. Randall substation. The first is a 230 kV line owned by the Western Area Power Administration (WAPA) running east of the Missouri River in a northwest to southeast direction. The second 230 kV line is owned by the Nebraska Public Power District and extends into east central Nebraska. WAPA also owns a 230 kV transmission line that extends from the Ft. Randall substation to the east.

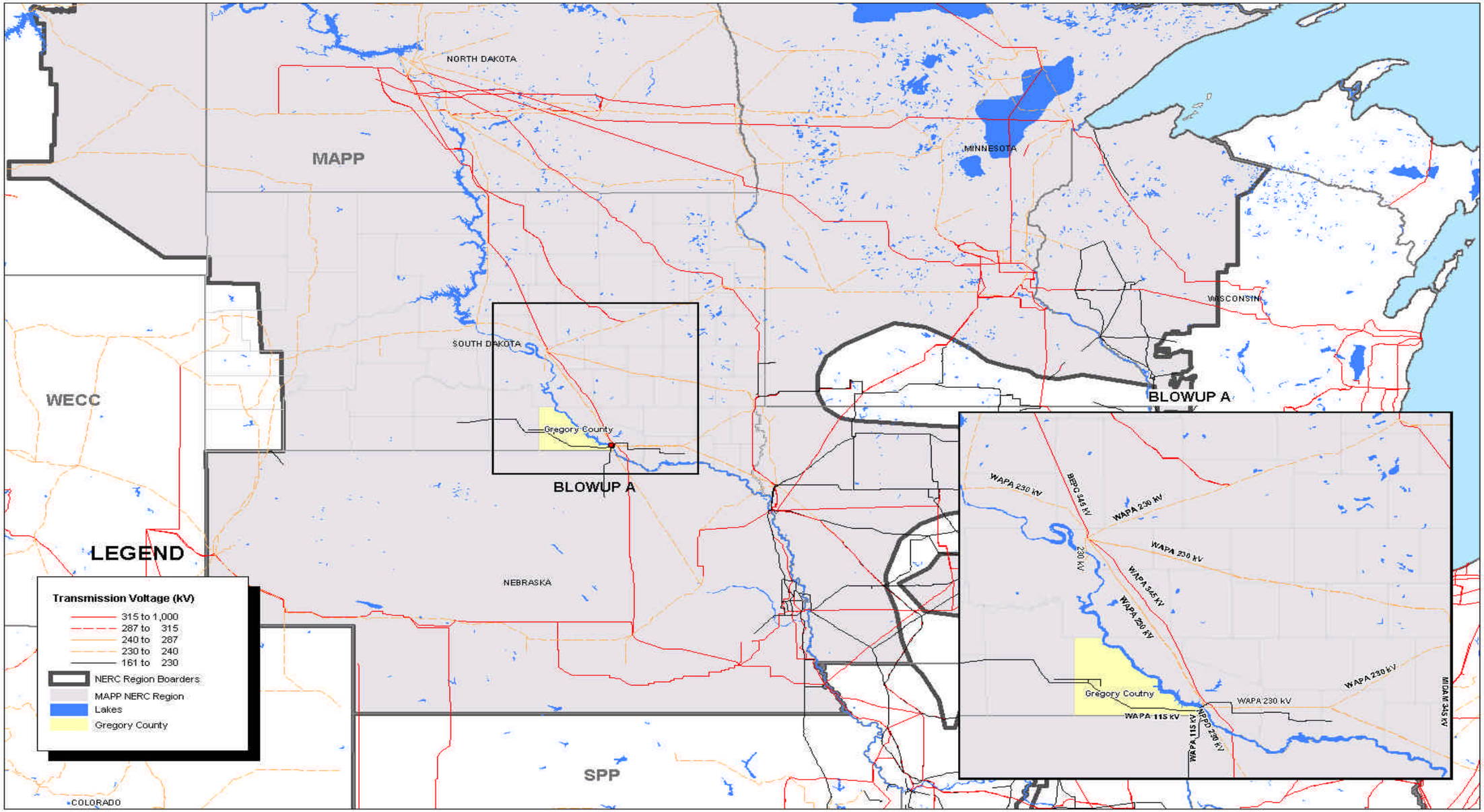

Figure 3-1. MAPP High Voltage Transmission Lines

A WAPA-owned the 345 kV line generally parallels its 230 kV line and the Missouri River as it extends northwest of Ft. Randall. Finally, there is a 115 kV network in Gregory County including a line that runs east to west in the southern portion of the county and includes the Bonesteel substation. The existing high voltage transmission network in the vicinity of Gregory County is part of the MAPP transmission system and the eastern U.S. grid. The Facility could conceivably export power to parties in other reliability areas, though this ability could be constrained by the physical transfer capability out of the MAPP region, and the utilization of the transmission capacity.

Figure 3-2 indicates the estimated incremental transfer capability from MAPP to adjacent reliability areas, the transfer capability into MAPP, and the typical electricity transfer normally occurring in 2003. These estimates are made by the North American Electric Reliability Council (NERC). As seen in the figure, the transfer capability from MAPP-U.S. to other regions is fairly high, and includes a capability of 2,000 MW into SPP, 2,000 MW into MAIN, 700 MW into MAPP-Canada, 90 MW into NPCC-Canada, and 710 MW into WECC-U.S. According to NERC's *2003/2004 Winter Assessment*, there is a projected net import of firm capacity into the MAPP region. This net import balance consists of 2,916 MW of firm purchases planned between MAPP members and parties outside the region, and 1,345 MW of firm sales planned from MAPP members to entities outside the region. NERC also reports that the normal base electricity transfers (resulting from firm, non-firm, and other types of transactions) is an outflow of 172 MW to SPP and WECC, and a 320 MW inflow from MAIN.

Load Flow and Power Curtailment Considerations. The installed transfer capability between regions is not necessarily a good indicator of the ability to transfer incremental capability, because the measure does not account for the utilization of transmission facilities within and between regions. NERC has recognized for a number of years that there are severe power flow constraints between the MAPP and MAIN regions. NERC's *2003 Summer Assessment* listed MAPP to MAIN transfer capability as one of six primary areas of concern, noting that "constrained interfaces such as MAPP-MAIN continue to require special operating attention and procedures to maintain reliable operation." The *MAPP 2001 Update* to its *2000 Regional Plan* also acknowledges that transfer capability increases are needed between MAPP and MAIN, and identifies a need for incremental transfer capability between MAPP and SPP as well. These needs for increased transmission tie capacity are bi-directional, meaning that additional tie capacity is needed for additional imports into, and exports out of MAPP. The selection of a long-term marketing area for the Gregory County Facility should consider such constraints, as well

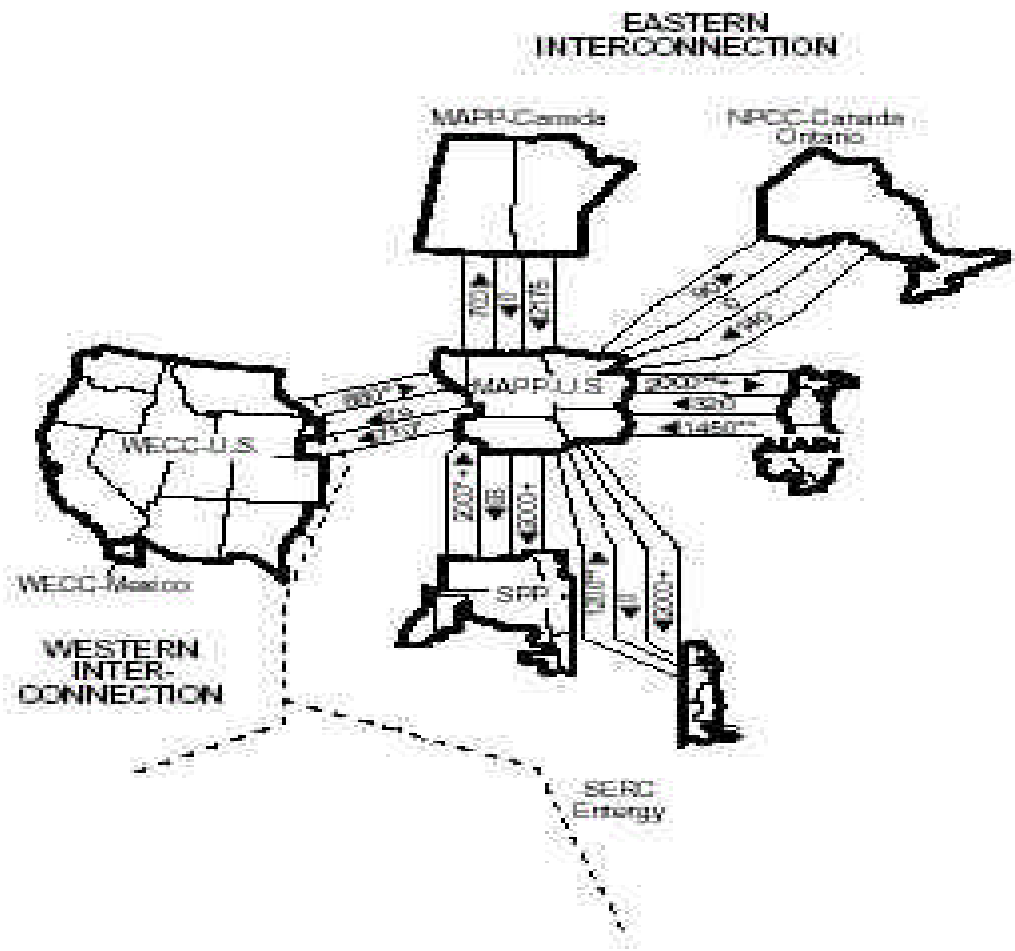

Figure 3-2. Estimated NERC Incremental Transfer Capability

as the timing of new investments in transmission that may reduce or eliminate constrained power flows. For example, the Arrowhead-Weston 345 kV line now in permitting in Wisconsin and targeted for operation in 2007 should help reduce the MAPP to MAIN limitations, but will not eliminate constrained flows between the two areas altogether.

Practical issues related to constructing new transmission lines and incentives to do so should also be considered, and a major line needing a new right of way or involving more than one state could face strong opposition in the permitting stage. Additionally, given the continued development of national and regional transmission policy, discussed below, it is clear that the uncertainty related to cost recovery continues to discourage investment in major new transmission lines. On the other hand, and related specifically to North Dakota and South Dakota, there is considerable interest in increasing the transmission export capability as these states contain some of the most favorable conditions for the addition of large scale wind generation. Were transmission not a significant constraint,

North Dakota and South Dakota would likely realize large scale wind power development, with the power exported to other states.

Should the Facility undergo development, detailed load flow and stability studies will be required to confirm that the impact on the regional transmission system will be acceptable and what, if any, mitigation techniques may be required to maintain acceptable load flow and stability on the regional transmission system. A detailed interconnection study will also be required.

Short of such project specific studies, one view of the adequacy of the network in the region can be obtained by reviewing MAPP's record of transmission reservation refusals and curtailments, which indicates the frequency and location of instances in which the desire to use the MAPP transmission system has exceeded the Available Transfer Capability. If a significant level of reservation refusals or curtailments has occurred within MAPP, it may indicate that a subregion of MAPP may be a conservatively appropriate market study area. If the number of refusals and curtailments are minor, or if curtailments are largely limited to MAPP transfers with other regions, it would suggest the selection of the MAPP region as the market study area may be appropriate.

Based on MAPP's *2001 Update* of its *2000 Regional Plan*, the transmission network has a low incidence of reservation refusals and curtailments of transmission service. During 1999 through mid-2001, curtailed non-firm energy equaled about 0.55 percent of all scheduled energy, and the amount of curtailed firm energy was only 0.015 percent of all scheduled energy. Also, an analysis of data from 1999 through March, 2001 indicates that an average of only 0.56 percent of all Point-to-Point schedules were curtailed, and this compares to a 2.0 percent level in MAPP's *2000 Regional Plan* that was based on data only through 1999.

When measuring the adequacy of a transmission system, another approach is to determine when an operating limit established for the system is violated. Operating security limits can include voltage stability, unacceptable voltage levels, or thermal limits. The ability to transfer power between two points depends on the ability to stay within these security limits, especially at known system bottlenecks that tend to limit power transfer. In the MAPP *2001 Update*, 18 such locations are identified within the region. These "flowgates" are listed in Table 3-1 and shown in Figure 3-3. Key flowgates include those linking MAPP to SPP (COOPER_S and FTCAL_S), and those linking MAPP to MAIN (MNEX, ECL_ARP, and PRI-BYN).

Three important statistics that track curtailments and refusals are: 1) the firm and non-firm energy curtailments, 2) instances of refusals for firm transmission requests, and 3) instances of refusals for non-firm transmission requests. These statistics, which are tracked by flowgates, are summarized below.

MAPP's records of firm and non-firm energy curtailments from April 1998 through April 2001 indicate that approximately 39 percent of the MAPP curtailments were due to COOPER_S and FTCAL_S, and about 40 percent are due to MAPP to MAIN related facilities. Combined, then, about 79 percent of the curtailments involve energy transfers between MAPP and other regions.

Perhaps more important than total firm and non-firm energy curtailments are the instances of refusals for firm requests. MAPP records indicate that as a group, the two major MAPP to SPP flowgates (COOPER_S and FTCAL_S) account for 31 percent of the FIRM MW days refused. Also, two MAPP to MAIN related flowgates (MNEX and ECL-ARP) accounted for 41 percent of the firm refusals. Thus, at least 72 percent of the refusals for firm transmission service involve transfers between MAPP and other regions.

Finally, regarding refusals for non-firm transmission requests, the two major MAPP to SPP flowgates (COOPER_X and FTCAL_S) account for about 40 percent of the total refused, and the MAPP to MAIN group accounts for about 40 percent. Combined, about 80 percent of the refusals for non-firm transmission requests involve transfers between MAPP and other regions.

Table 3-1 MAPP Flowgates

Abbreviation	Line/Device	Description
COOPER_S	Cooper South Transmission Interface	Located in south east Nebraska
ECL_ARP	Eau Claire to Arpin	Between city of Eau Claire WI and the Aprin substation to the east
FTCAL_S	Fort Calhoun South	Power flow south out of Fort Calhoun plant
GGS	Gerald Gentleman Station	Power flow east and south from GGS
GRIS_LNC	Grand Island to Lincoln	
LACYGNE_N	Lacygne North	Power flow North form the Lacygne plant in Missouri
MH_SPC_W	Manitoba Hydro to Saskatchewan	Tie lines between the two providers
MHEX N	Manitoba Hydro Export North	Stability interface. Power flow form the south into Manitoba
MHEX_S	Manitoba Hydro Export South	Stability interface. Power flow out of Manitoba to the south
MNEX	Minnesota Export	
MNTZUMA_W	Montezuma West	Power flow from Montezuma to Bondurant 161 kV line in Iowa
NDDC	North Dakota Direct Current	Power flow into N. Dakota AC system from plants (Coal Creed and Young 2) that are normally scheduled over DC lines
NDEX	North Dakota Export	Stability interface located in the Dakotas
NI_WUMS	Northern Illinois to Wisconsin upper Michigan Systems	
PRI_BYN	Prairie Island to Byron	345 kV line
QUADCITY_W	Quad City West	Power flowing West out of the Quad City Substation at Illinois/Iowa border
WNE_WKS	Western Nebraska-Western Kansas Transmission Interface	
Y2DC	Young 2 Direct Current	Power flow into the N. Dakota AC system from the Young 2 Unit only

Source: *MAPP 2001 Updated to the 2000 Regional Plan*, p. 21

Figure 3-3. MAPP Flowgates

To sum up the historical MAPP data, a majority of the curtailments and refusals for transmission service in the MAPP region has involved transmission or transmission requests between MAPP and other regions (primarily MAIN and SPP). While interregional transfers will continue into the future, and while efforts to strengthen interregional tie capacity will continue, it would appear that from a technical standpoint, designation of the MAPP-U.S. region as the Facility market study area is conservatively appropriate.

3.2 Regulatory Considerations and the Selection of a Market Study Area

Selection of the market study area should also consider the possible impacts of the future regulatory environment, operating control of the transmission system, and how these factors could impact the economics of out-of-MAPP transactions. For this reason, a discussion of regulatory policy and industry responses during the past several years is provided below. Of interest is whether consideration of these factors supports the conclusion, from a technical perspective, that MAPP-U.S. is a conservatively appropriate market study area. Also, developing an expectation of the organizational structure controlling the future bulk transmission network will influence the transmission-related costs assumed in the economic analysis.

3.2.1 Historical Perspective of the Bulk Transmission Network.

The nation's utility network was historically developed around franchised electric utilities which were vertically integrated and, initially, not extensively interconnected with neighboring utilities. Due to their monopoly power, these franchised utilities were most commonly under rate of return regulation by state commissions which established rates sufficient to offer the utility the opportunity, but not the guarantee, to earn revenue sufficient to offset all operating costs and to provide a reasonable return on investment. Utilities not under regulation from state commissions consisted primarily of non-profit municipal and cooperative utilities whose rates were cost-based and whose management was directly accountable to a governing board and, ultimately, to ratepayers.

As the nation's demand for power grew during the 20th century, utilities became increasingly interconnected for reasons related to improving reliability, better utilization of power generation assets, and economy of scale benefits. Over time, these trends greatly transformed the industry, and the bulk transmission network was increasingly relied upon by utilities and their customers. For example, the Federal Energy Regulatory Commission (FERC) reports that between 1989 and 2000, wholesale power purchases for investor owned utilities increased from 18 percent of total utility energy to over 37 percent, and the corresponding figure for large public power utilities (municipals and federal power authorities) was 40.5 percent in 2000.

The increasing utilization of the nation's bulk transmission network did not arise without problems. Primary among these were issues related to 1) the lack of transmission access by those not owning the transmission facilities, 2) transmission charges and practices which were unduly discriminatory and which discouraged otherwise efficient transactions, 3) parallel path flows (the flow of energy over non-contracted transmission

routes which use up available transmission capacity) and 4) the "pancaking" of transmission rates. [1]

During the 1980s and into the 1990s, the problems with the bulk transmission network increased in severity and it became apparent that several fundamental defects in the market would need to be corrected if the transmission network was to operate efficiently and fairly. As discussed below, these issues would be addressed by FERC through a dramatic restructuring of the utility industry.

3.2.2 FERC Order 888.

FERC has jurisdiction over the nation's interstate high voltage transmission network, although it has limited control in Texas. This authority flows from the Federal Power Act which authorizes FERC to investigate and remedy unduly discriminatory or preferential rules, regulations, practices, or contracts affecting public utility rates for transmission interstate commerce and for sales for resale of electric energy in interstate commerce. The Federal Power Act also allows FERC to investigate and remedy unjust and unreasonable rates, charges, rules, regulations, practices, and contracts affecting such rates and charges. A broad interpretation of FERC's jurisdiction over transmission policy has been confirmed by a number of court decisions.

In light of this authority, FERC has issued a number of significant orders and proposed rule makings in an attempt to resolve problems with the bulk transmission network. FERC's first major rulemaking was its Order 888, issued in 1996. The genesis for Order 888 was the FERC finding that "unduly discriminatory and anticompetitive practices existed in the electric industry" and that entities owning or controlling interstate transmission facilities "had discriminated against others seeking transmission access." FERC determined that "non-discriminatory open access transmission services, including access to information, and stranded cost recovery were the most critical components of a successful transition to competitive wholesale power markets." Its overriding objective, then, was to ensure that customers have the benefits of competitively priced generation.

Order 888 required all public entities owning or controlling transmission facilities used in interstate commerce to:

[1] "Pancaking" describes a situation in which an entity wheels power over multiple transmission systems, incurring separate transmission charges along the way, such that the delivery price consists of multiple transmission charges stacked on one another. Although transmission rates have historically been cost-based, such rates typically include sub-transmission facility costs which primarily serve native load and do not directly support inter-utility or inter-regional transactions. Thus, the more transmission systems in a contract path, the more the pancaked rate has historically tended to overestimate the true cost of providing inter-utility and inter-regional transmission service.

1. file open access non-discriminatory transmission tariffs containing certain minimum, non-price terms and conditions; and
2. functionally unbundle wholesale power services from transmission services.

Unbundling required public utilities to:

1. take wholesale transmission services under the same tariff offered to their customers;
2. state separate rates for wholesale generation, transmission, and ancillary services; and
3. rely on the same electronic information network that their transmission customers rely on to obtain information about the utilities' transmission systems.

FERC's open access transmission tariff provided for two distinct types of wholesale transmission services – Network Integration Transmission Service and Point-to-Point Transmission Service. The first was designed primarily to meet the needs of the transmission customer that wants to integrate many generators and many loads at diverse locations on the public utility's grid; it was intended to be comparable to the service that the public utility provided to its own bundled retail customers. Point-to-Point service was designed primarily for the customer that wants to move power from one discrete location to another.

Order 889, issued concurrent with Order 888, also imposed standards of conduct governing communications between the utility's transmission and wholesale power functions, to prevent the utility from giving its power marketing arm preferential access to information. All public utilities that owned or controlled transmission facilities used in interstate commerce were required to create or participate in an Open Access Same-Time Information System that provides existing and potential transmission users the same access to transmission information that would enable them to obtain open access non-discriminatory transmission service.

Order 888 did not mandate corporate unbundling of vertically integrated utilities (generation, transmission, and distribution), but followed a less intrusive approach as FERC merely encouraged the creation of transmission Independent System Operators, and did not mandate regional organizations. It did, however, state that "if it becomes apparent that functional unbundling is inadequate or unworkable in assuring non-discriminatory open access transmission, we will reevaluate our position and decide whether other mechanisms, such as Independent System Operators, should be required." Even without a mandate, Order 888 resulted in the formation of Independent System Operators in New England, New York, PJM, the Midwest, California, and in Texas.

3.2.3 FERC Order 2000.

Order 888 was followed in December, 1999, by FERC Order 2000 which called for the formation of Regional Transmission Organizations as a means to further increase transmission access and efficiency. This order set the objective for "all transmission owning entities in the Nation, including non-public utility entities, to place their transmission facilities under the control of appropriate regional transmission institutions in a timely manner." It identified two broad categories of impediments to competitive power markets: 1) the engineering and economic inefficiency inherent in the current operation and expansion of the transmission grid, and 2) continuing opportunities for transmission owners to unduly discriminate in the operation of their transmission systems to favor their own marketing efforts. It also found that local management of the grid by vertically integrated utilities was inadequate to support the efficient, reliable region-wide operation needed for continued development of competitive markets.

FERC concluded that independent Regional Transmission Organizations would eliminate discrimination, enhance benefits of competitive markets, and could 1) improve efficiency in grid management, 2) improve grid reliability, 3) remove remaining opportunities for discriminatory practices, 4) improve market performance, and 5) facilitate lighter-handed regulation. FERC expected regional grids would result in cost savings to the industry and customers.

Order 2000 encouraged all transmission owners to voluntarily place their transmission facilities in the hands of a Regional Transmission Organization including Independent System Operators and independent for-profit transmission companies. All Regional Transmission Organizations must meet four characteristics (independence, regional configuration, operational authority, and short-term reliability) and perform eight minimum functions (tariff administration and design, congestion management, parallel path flow, ancillary services, provide information on available transfer capability on the Open Access Same-Time Information System, market monitoring, planning and expansion, and interregional coordination).

3.2.4 Current Transmission Pricing Methods. Tariff design is one of eight important functions of regional transmission providers, and a number of methodologies have been developed. Currently, the terms which describe these methodologies include "license plate" pricing, and "postage stamp" pricing. FERC has endorsed both approaches although it appears to view the license plate approach as only a temporary methodology.

The license plate methodology describes a process in which the transmission rate assessed to a transaction is based on the embedded transmission rate of the utility system into which the power "sinks" or is delivered. The term reflects that just as a car owner

pays a licensing fee based on the fee in one's home state and independent of where the car is driven, so is the license plate rate linked to the delivery point for the power. This approach eliminates pancaking but has drawbacks, the most significant of which may be that it does not ensure that other systems through which the power travels will recoup their transmission investment.

The postage stamp methodology is an alternative approach which applies a transmission rate derived by averaging the embedded costs of all participating transmission owners. The distribution of revenues is then based on a predetermined allocation formula. This method partially overcomes the main shortfall of license plate rates in that affected transmission owners receive some compensation for use of their facilities, however, the embedded cost averaging still leads to a certain degree of cross-subsidization among the participants. Moreover, to the degree that sub-transmission facilities not directly supporting inter-utility or inter-regional transfers are included in the rate calculation, price distortions still exist.

Given the drawbacks of the postage stamp and license plate methodologies, Regional Transmission Organizations are continuing to evaluate whether fundamental pricing changes are warranted. One pricing alternative is the "Highway-Zone" approach which is intended to overcome the weaknesses of the postage stamp and license plate methods. The approach is to divide the region's transmission assets into regional (highway) and local (or zonal) categories, based on voltage level. Separate rates for these categories are then established. The highway rate is a postage stamp rate which is applied to transactions utilizing the region's high voltage network, and would be the only charge for 'through' transactions in which the source and load (sink) are outside the region. The zonal rate applies for users of the lower voltage system and would therefore apply to transactions which originate or end in the region. It is common to see such transactions described as 'drive-in' (the source of the power is from outside the region, the sink is in the region), 'drive-out' (the source is in the region, and the sink is outside the region), and 'within' (the source and sink are within the region) transactions.

In FERC's 2002 Standard Market Design proposed rule making (discussed below), the regulator endorsed the approach of separating zonal and regional facilities, with the suggested division occurring at 138 kV.

3.2.5 MISO and MAPP. Should the Facility be constructed, it is possible that transmission lines under the control of various Regional Transmission Organizations could be utilized to transmit power to a purchasing utility. The most likely transmission options would be over lines controlled by the Midwest Independent System Operator (MISO) and possibly over a new MAPP Regional Transmission Organization which is currently under consideration. These options are discussed below.

MISO was formed in 1996 and became the nation's first Regional Transmission Organization to receive full FERC approval on December 20, 2001. Headquartered in central Indiana, MISO serves as an independent agent for its transmission-owning members and controls an interconnected transmission grid encompassing more than 122,000 MW of generation capacity and more than 111,000 miles of high voltage transmission lines in all or parts of 15 states and parts of Canada. In the MAPP region, approximately 47 percent of the regional transmission is under the MISO umbrella. MISO is currently in discussions with PJM and TVA, among other transmission providers, to develop seamless service between the organizations.

The services offered by MISO and the processes through which service is secured are described in MISO's FERC Electric Tariff. In general and reflective of Order 888, MISO offers two broad types of transmission service, Point-to-Point and Network Integration Transmission Service. The MISO Tariff can be found on the MISO website which is www.midwestiso.org.

Late in 2003, the MAPP Executive Committee authorized the study of alternatives for participation in Regional Transmission Organizations by MAPP members. This was prompted during an October, 2003, regional conference where a number of utilities expressed strong interest in maintaining a contiguous North Central Region which would ensure continued reliable operation of the regional grid, maintain a unified transmission system, and ensure cost control mechanisms. Currently, the MAPP transmission region is split with participation in MISO and MAPP, resulting in a number of pricing seams.

There are two alternatives being studied. The first is a proposal to develop a Regional Transmission Organization for the North Central Region (previously, a vote of MAPP members to form an Independent System Operator failed (1999), as did a vote to form a MAPP Regional Transmission Organization (2000)). The second would involve the North Central Region's participation as a sub-region under the umbrella of MISO, utilizing its own tariff and having substantial autonomy. In January, 2004, the study team decided to focus initially on participation under a MISO umbrella as a means to meet the needs of non-MISO members and to maintain a contiguous region, rather than developing a new seam between MISO and a newly created Regional Transmission Organization. This approach would be similar to the operating relationship between TRANSLink and MISO. The study team emphasized, however, that if the details of the relationship cannot

be developed, a stand-alone transmission organization remains an option. "Must haves" listed by the study team include significant autonomy for the St. Paul Security Center, alternatives to the license plant pricing approach used by MISO, control of crucial functions within the North Central footprint, cost control, and bottoms-up planning for the region.

3.2.6 FERC's 2002 Standard Market Design Proposed Rule Making.

Even though regional transmission providers have only recently begun to form and function, additional significant changes to the nation's transmission network appear certain. These changes may arise out of the policy framed in FERC's July 31, 2002, Standard Market Design proposed rule making. In this proposed rule making, FERC observed that, despite the initial steps achieved through Orders 888 and 2000, significant impediments to a competitive market remained. These impediments included:

- Undue discrimination and impediments to competition
- Ongoing denial of comparable access
- Unfair administration of policies and tariffs
- Non-standardized tariffs which raise the cost of evaluating and entering into a transaction (the "seams" problem resulting from different rules and pricing systems)
- Limited and sporadic offerings of new services
- Delays in responding to requests for service
- Inaccurate information on the OSASIS which misrepresents the ATC
- The over sale of transmission services which outpace the ATC, coupled with increased interruption of transmission service.

Moreover, FERC concluded in the proposed rule making that:

> "through Order Nos. 888 and 2000, the Commission required open access to public utility transmission systems, encouraged the formation of Independent System Operators and, later, Regional Transmission Organizations to achieve control of the transmission grid by entities that are independent from generation marketing or sales. However, only limited portions of the country have moved beyond the basic requirements of open access (e.g., through the voluntary divestiture of generation or establishment of Regional Transmission Organizations, Independent System Operators, or Independent Transmission Companies). In the rest of the country, the remaining corporate ties between generation and transmission within public utilities have proven problematic for

> transmission access. Thus, across most of the nation, barriers to entry remain for new generators and new load serving entities. A large portion of this problem is directly attributable to the continued ability of vertically integrated transmission providers to exercise some degree of transmission market power…"

Through the 2002 proposed rule making, FERC's objective is to remedy remaining undue discrimination and establish a standardized transmission service and wholesale electric market design that will produce a fair and consistent market for all who wish to participate in wholesale electric markets. The primary means are through a flexible transmission service and an open and transparent spot market design that provides the right pricing signals for investment in transmission and generation facilities.

FERC's 2002 proposed rule making is more than 600 pages long. In its original form, FERC's Standard Market Design would:

1. Require all public utilities that own, control, or operate interstate transmission facilities to become an Independent Transmission Provider, turn over their transmission facilities to an Independent Transmission Provider, or contract with such a provider to operate their facilities. "Independent" means independent of any direct or indirect links to market participants, as determined primarily by the arrangements for the governance of the Regional Transmission Organization, which FERC must approve. "Grid" refers to the facilities that the Regional Transmission Organization would control in managing generation scheduling, dispatch, and transmission operations within its footprint.
2. Establish a single non-discriminatory open access transmission tariff with a single transmission service (Network Access Service) that is applicable to all users of the interstate transmission grid: wholesale and unbundled retail transmission customers, and bundled retail customers. In effect, FERC proposes to eliminate the distinction between Point-to-Point and Network Integration Transmission Services by having one service, Network Access Service, which contains the flexibility of Network Integration Transmission Service and the tradability of Point-to-Point Transmission. The revised tariff would standardize wholesale electric market design, resulting in "seamless" wholesale power markets that allow sellers to transact easily across transmission grid boundaries and to create benefits of lower-cost and more reliable electric supply. Thus, it will attempt to overcome the pancaking problem and other inefficiencies in the market.

Network Access Service is based on an open spot market for imbalance energy and a uniform congestion management methodology, i.e., Locational Marginal Pricing to more efficiently manage the transmission grid. The spot energy market and Locational Marginal Pricing rely on management of the transmission system and bidding by supply and demand resources attached to the transmission grid under market rules and protocols.

Locational Marginal Pricing is the purchase price of an incremental MWh in the real-time or day-ahead market at a specific time and location on the grid. The price includes generation costs based on competitive bids and the costs caused by transmission congestion, if any. If demand is low or moderate and the grid is not congested, Locational Marginal Pricing will be the same at all locations on the grid and will reflect the cost of the cheapest unused generation capacity then available. As trade on the grid increases, the Regional Transmission Organization will begin rescheduling transactions that could overload specific lines. Accordingly, some buyers seeking incremental MWh from the Regional Transmission Organization spot market will not be able to obtain access to the least-cost generator, and will have to turn to a higher cost alternative. This causes Locational Marginal Pricing to begin to vary from location to location. If the congestion becomes more widespread, the price differential will increase. To provide the price signals needed to manage congestion, the transmission provider will be required to operate a day-ahead and real-time market for energy.

To provide customers with a mechanism for achieving price certainty under the new congestion management system, customers will be given Congestion Revenue Rights, also called “financial transmission rights”, “firm transmission rights”, and “fixed transmission rights”. Congestion Revenue Rights are financial rights (not physical reservations of transmission capacity) that provide the holder with protection against increases in congestion costs. Congestion Revenue Rights would be allocated initially to transmission owners or to parties who have entered contracts with such owners for the use of transmission capacity. Congestion Revenue Rights would be for specific MW levels, for a specific entry and delivery point, and for a specific term. The holder of a Congestion Revenue Right is entitled to any congestion revenues associated with transmission at the specified MW level between the specified points during the specific term, which would offset increases due to congestion costs. Assuming the holder moved the exact amount of power specified in the Congestion Revenue Right, the right would reimburse the holder for congestion costs. Payments to the holder would be made through

the Regional Transmission Organization or Independent System Operator managing the regional network.

After the initial allocation of Congestion Revenue Rights, market participants could trade Congestion Revenue Rights among themselves bilaterally. Investors in additional transmission capacity would acquire a number of Congestion Revenue Rights commensurate with the amount of transfer capacity added. In a secondary market, the value of the Congestion Revenue Rights would be closely linked to persistent differentials in Locational Marginal Pricing.

Tradable transmission rights are essential to Standard Market Design because they provide a means by which a market participant, especially wholesale buyers, can insulate themselves against the risks of fluctuations in wholesale electricity prices under Locational Marginal Pricing due to transmission congestion. FERC believes that together, Locational Marginal Pricing and Congestion Revenue Rights will provide price signals to indicate where new investment is needed.

3. Require Regional Transmission Organizations to establish and operate day-ahead markets to coordinate unit commitment decisions over a wider market area. To address energy imbalances, the proposal would require Regional Transmission Organizations to operate real-time spot markets based on competitive bids. The proposal also requires Regional Transmission Organizations to establish markets for certain ancillary services, and to publish promptly the prices for all regulated transactions. Participation in such markets by buyers and sellers would be voluntary.
4. Continue to rely on long-term contracts to be the wholesale sector's primary mode of doing business.
5. Establish an access charge to recover embedded transmission costs based on a customer's load ratio share of the Independent Transmission Provider's costs, to be paid by any customer taking power off the grid.
6. Establish procedures to mitigate market power in the day-ahead and real-time markets required by Standard Market Design and mechanisms for market monitoring. In FERC's view, generator bids should reflect production costs under normal conditions, as well as scarcity under peak or unusual conditions, but should not reflect market power. Accordingly, bids from generators in confined load pockets would be limited to marginal production costs plus 10 percent, and bids under scarcity conditions would be capped at a proposed $1,000 per MWh.

In addition, each Regional Transmission Organization would be required to establish a market monitoring unit that would scrutinize market operations for indications of abuses and bring any such indications promptly to the attention of FERC and of the Regional Transmission Organization's governing body. The market monitor would also review the overall design and administration of the Regional Transmission Organization's markets for flaws and inefficiencies.

7. Provide for state participation.
8. Give the Regional Transmission Organization primary responsibility for coordination of transmission planning within its footprint. To avert capacity shortages, FERC suggested a 12 percent reserve requirement as a floor and recognized that states may specify higher requirements. FERC proposed that a load-serving entity would be required to enter contractual agreements with resource providers for resources exceeding by 12 percent or more their projected needs for the next three years.

   Regional transmission planning also could entail guidelines for siting new generation and economically efficient use of alternatives to new transmission lines, such as distributed generation, energy efficiency, demand response programs, and improved real-time grid management.

3.2.7 Current Status of the Standard Market Design Proposal.

FERC originally set forth a schedule to allow for substantial input and comment by interested parties. Assuming comments would be relatively minor, the original schedule established that by July 31, 2003, all public utilities that own, operate, or control interstate transmission facilities would file revised open access transmission tariffs (Interim Tariffs) to become effective September 30, 2004, that include bundled retail customers as eligible customers. By December 1, 2003, utilities were to have filed revised open access transmission tariffs (Standard Market Design Tariffs), which would become effective no later than September 30, 2004.

Following the issuance of the proposed rule making, FERC received more than 1,000 sets of formal comments on its Standard Market Design proposal. Reaction varied widely. While most Regional Transmission Organizations and Independent Transmission Companies agreed with the intent of the proposed rule making, some, such as MISO, were largely in agreement with the proposed concepts while other organizations were only cautiously supportive, voicing specific concerns about the ability of the Standard Market Design to achieve itsstated objectives.

As a whole, the formal comments received by FERC were apparently more critical than it anticipated and this, in part, caused the original schedule for

implementation to be delayed. In response to the comments, FERC issued its "White Paper" on April 28, 2003, that restated its case for the rule making, but it also showed signs of certain concessions and less dramatic restructuring than was present in the original proposed rule making.

On August 14, 2003, a power blackout struck much of the northeastern U.S. and part of Canada. Testimony by FERC Chairman Pat Wood, III, before the U.S. Senate concluded that current reliability standards were violated by First Energy and MISO, and that the entire event may have been avoided if a more aggressive tree trimming procedure had been in place. While not directly associated with FERC's Standard Market Design initiative, and despite Commissioner Wood's testimony that electric competition is not to blame, it appears that one result of the blackout is a slowing of the Standard Market Design process, and some believe that the initiative may be derailed for sometime. What is clear is that reliability concerns magnified by the August blackout have created much additional uncertainty regarding the future organization, regulation, and pricing of high voltage transmission services into the future.

3.2.8 FERC Order 2003 and 2003-A.

Another transmission-related regulatory issue involves FERC's Order 2003, issued in the summer of 2003. The order is intended to address what has been considered to be a major deterrent to additional transmission investment in the U.S. This deterrent is that, while there is a great need for investment in new transmission facilities, there is no guarantee under the current transmission tariff structures that the cost of new facilities will be fully recovered, particularly from the third parties benefiting from transmission network upgrades.

FERC Order 2003 established a policy that transmission network upgrade costs would be recoverable over a five year period, and this would include the time value of money associated with the investment. Essentially, the approach is to socialize the costs of transmission network upgrades, and all benefactors would help defray costs that were not recovered through normal transmission tariff payments after a five year period. This policy is a factor in the Facility economic analysis because the interconnection costs were assumed to be part of the project cost in the 1991 study. If this cost was assured of being offset, then it may be appropriate to reflect this in the project economics.

In March, 2004, FERC issued Order 2003-A that clarified a number of issues in its original order. Related to cost recovery, the order stated:

> "We reaffirm the Order No. 2003 requirement that, unless the Transmission Provider and the Interconnection Customer agree otherwise, the Interconnection Customer must initially fund the cost of any Network Upgrades associated with the interconnection of its Generating Facility to a non-independent Transmission

> Provider's transmission system and that the Transmission Provider must reimburse the funded amount on a dollar-for-dollar basis with interest. This reimbursement is in the form of credits against the rates the Interconnection Customer pays for the delivery component of transmission service. However, we are granting rehearing on two aspects of the Order No. 2003 crediting policy. First, we are requiring the Transmission Provider to provide credits to the Interconnection Customer only against transmission delivery service taken with respect to the interconnecting Generating Facility. The Transmission Provider need not provide credits against other Transmission Services. Second, we are giving the Transmission Provider two options regarding the payments of credits. At the end of five years from the Commercial Operation Date of the Generating Facility, the Transmission Provider may either: (1) reimburse the Interconnection Customer for the remaining balance of the upfront payment, plus accrued interest, or (2) continue to provide credits to the Interconnection Customer until the total of all credits equals the Interconnection Customer's upfront payment, plus accrued interest."

As with FERC's Standard Market Design policy, there remains some uncertainty regarding the applicability of FERC Order 2003-A. It is not, at this point, completely clear as to whether, and under what conditions, transmission investments involving the interconnect of the Facility would qualify as a Network Upgrade and, therefore, be subject to guaranteed cost recovery. The difficulty lies with the fact that detailed studies would be required to build the case that an investment should qualify as a Network Upgrade which benefits all Regional Transmission Organization members. Clearly, the incentive to other parties in the region would be to contend that new transmission associated with a particular facility has limited network benefits and the costs should not be socialized. Given that the Facility would, in any case, be required to fund the transmission investment under Order 2003 and 2003-A, the analysis assumes that the Facility must carry the full burden of its interconnection costs, although a capital cost sensitivity is also performed.

3.2.9 Selection of the Regional Market.

The Gregory County Facility will rely heavily on the high voltage transmission network to deliver peaking power to off-takers. This suggests that the market study area selected for the feasibility study must be such that there is a high probability of power delivery to customers, recognizing that much of the Facility output will be at peak periods. From a technical perspective, it was concluded that the MAPP-U.S. region

appears to be a reasonable market study area based on the existing transmission network and on historical patterns of power curtailments and transmission request refusals.

The market study area selected must also account for recent and expected future regulatory and organizational considerations. While there is much uncertainty regarding the continued development of the federal transmission policy, and organizational structure in the region impacting transmission system operation, a reasonable and conservative conclusion is that the market study area selected for this study should be no larger than the MAPP-U.S. footprint. This is based on the stated objective of MAPP members to reduce pricing seams in the region, and to maintain a high degree of control over the regional operation of the grid in the North Central region. Therefore, the economic analysis which follows assumes that the Facility will compete as a peaking resource to serve load in the MAPP-U.S. region.

For the economic analysis, it will also be assumed that, within the MAPP-U.S. region, the number of transmission pricing seams will be reduced so that by the time the Facility is assumed to be in-service (2009), a single transmission rate would apply to power sold within the market study area. Based on current rates in the MAPP region, the average firm transmission rate assumed to apply to the Facility in the economic analysis is $1/kW-month. These assumptions reflect the intent of FERC policy and MAPP stated objectives, and will allow the economic analysis to be performed without a projection of where the Facility output will be sold within MAPP-U.S., and what the transmission tariffs may be on an individual utility basis.

4.0 Review Existing Facilities and Planned Facility Additions

Sections 4.0, 5.0, and 6.0 comprise an integrated approach that will generate a projection of the Facility's pumping energy cost during off peak hours. In Section 4.0, an inventory of power facilities in the study area is compiled. Information collected for the inventoried units includes size, fuel type, heat rate, O&M costs, fuel cost, and expected availability. This information is compiled from a number of sources including MAPP, Platts' POWERdat and COALdat data bases, the Energy Information Administration, and Black & Veatch estimates.

Section 5.0 analyzes the regional demand pattern and develops a load duration curve for the study area, which indicates the level of demand in the region for the 8,760 hours in a year, arranged in order of the peak hourly demand down to the minimum hourly demand. Section 6.0 combines information from the unit inventory (Section 4.0) and the load duration curve (Section 5.0) to estimate the cost of off peak energy available for pumping water into the Facility storage area. This cost is an important component of the Facility's overall cost and is utilized in the bus-bar comparison between peaking alternatives in Section 7.0.

4.1 Existing and Planned Market Study Area Units

The Facility will operate through the release of water during peak and non-peak hours, when the energy generated has the most value, with the water being pumped into the elevated storage area during off-peak hours. The 1991 study estimated that 1.4 kWh of energy will be required during off-peak periods to store enough water to produce 1 kWh of Facility output during peak periods. These large energy requirements make it important to project the cost of off-peak energy in the market study area. This requires multiple categories of inputs, including an inventory of the existing units in the market study area, and a projection of future unit additions.

Having defined the market study area as the MAPP-U.S. region, two primary sources of information were accessed and crossed checked to develop the inventory of existing units. The starting point was to develop an inventory list for units in the MAPP region from Platts' POWERdat data base. POWERdat is the most widely used strategic intelligence tool for the North American electric power industry. The data base includes

unit level information for the fleets of public and private utilities in the nation, including in-service data, output, net plant heat rate, fuel costs, and variable O&M costs.

The POWERdat list was cross-checked with MAPP's own inventory of power plant units contained in the *MAPP Regional Reliability Council Coordinated Bulk Power Supply Program*. This dual approach resulted in a comprehensive list of approximately 1,100 existing units, having a combined capacity of more than 35,100 MW. A listing of these units is provided in Appendix A. In addition, a projection of unit additions to the region by 2010 was made, based on MAPP's projection of unit additions, plus units in the planning stage considered by Black & Veatch as likely to be constructed. By 2010, the total MAPP capacity is estimated to be nearly 41,600 MW. Once derived, the 2010 inventory was sorted by type, resulting in the following MW blocks of capacity:

Wind: 1,018 MW
Methane/Landfill Gas: 75 MW
Hydro: 3,090 MW
Nuclear: 3,420 MW
Coal: 21,403 MW
Combined cycle: 4,696 MW
Simple cycle, gas fired: 5,859 MW
Simple cycle, internal combustion engines and other peaking units: 2,015 MW

In theory, the total amount of energy which could be produced from each capacity block is equal to the total amount of capacity times the 8,760 hours in a year. In practice, this potential output is never achieved due, in part, to scheduled and unscheduled outages that occur for all units. Thus, at any given time, not all the capacity in any single block will be available. To account for these outages it is therefore appropriate to derate the capacity based on assumptions about forced and scheduled outage limits. The result is a projection of availability for each capacity block. The deratings for each block were based on Black & Veatch experience, and historical availability information from NERC's Generator Availability Data System (GADS) data base. Hydro deratings were based on plant availability, but also on the historical availability of water, as reflected in the capacity factors of these units in POWERdat. The analysis resulted in an availability rating of the study area capacity blocks as follows:

Hydro availability factor:	72 percent
Biomass/landfill gas	90 percent
Nuclear availability factor:	85 percent

Coal availability factor: 87 percent
Combined cycle availability factor: 86 percent
Simple cycle availability factor: 90 percent
Simple cycle, internal combustion engines and other peaking units: 90 percent

Using the coal unit bock as an example, the availability adjustment is interpreted as meaning that over the course of a year, only about 87 percent of the theoretical amount of coal thermal capacity is available for dispatch because of forced and scheduled outages. Thus, the area associated with each capacity block is reflective of the total amount of energy that could be produced once availability (and water flow issues for the hydro capacity) are taken into account.

5.0 Analysis of Annual Power Demand Patterns

The second major step in deriving a projection of the cost of off-peak energy available to the Facility is to develop a market study load duration curve based on the area demand pattern. This involved collecting information about the market study area peak demand and energy requirements, available on a monthly basis in the document *MAPP Regional Reliability Council Coordinated Bulk Power Supply Program* (July, 2001). This data is summarized in Table 5-1. Next, an estimation of the energy requirements for each hour of the year was needed. In other words, it was necessary to spread the monthly energy requirements across the 730 hours in a typical month. To perform this task, Black & Veatch utilized actual hourly load data for a MAPP utility having a load pattern representative of the MAPP-U.S. region. This hourly load profile was adjusted slightly during the off-peak hours to equate the total energy requirements with the MAPP-U.S. forecast.

This process was repeated for all months, resulting in hourly energy requirements for the market study area each of 8,760 hours, with the total energy requirements and the monthly peak demand equaling the MAPP data. These hourly energy requirements were adjusted by 2.0 percent through 2004 and 2.3 percent thereafter to arrive at a 2010 energy requirements projection. Finally, the hourly loads for the study area were arranged in descending order, providing the load duration curve for the study area. The resulting load duration curve is plotted in Figure 5-1.

The load duration curve indicates a market study area peak demand projection of 35,312 MW in 2010. The lowest hourly demand of the year is shown as 10,981 MW. The energy requirements for all other hours are also plotted, giving the load duration curve its characteristic shape. It is the interaction of this load duration curve and the study area unit inventory list that will result in an estimate of the cost of off peak energy available to the Facility.

Table 5-1. Calendar Year 2000 Monthly Energy and Hourly Peak Demands

Month	Peak Hour Demand (MW)	Net Energy (GWh)
January	22,995	13,065
February	21,843	11,635
March	20,301	11,453
April	19,323	10,569
May	21,751	11,153
June	26,677	11,956
July	28,372	13,820
August	28,462	14,119
September	25,264	11,740
October	20,301	11,245
November	22,006	11,886
December	23,993	13,340

Source: "Item 1 Net Energy and Non-Coincident Peak Demand", of MAPP Coordinated Bulk Power Supply Program, July 1, 2001.

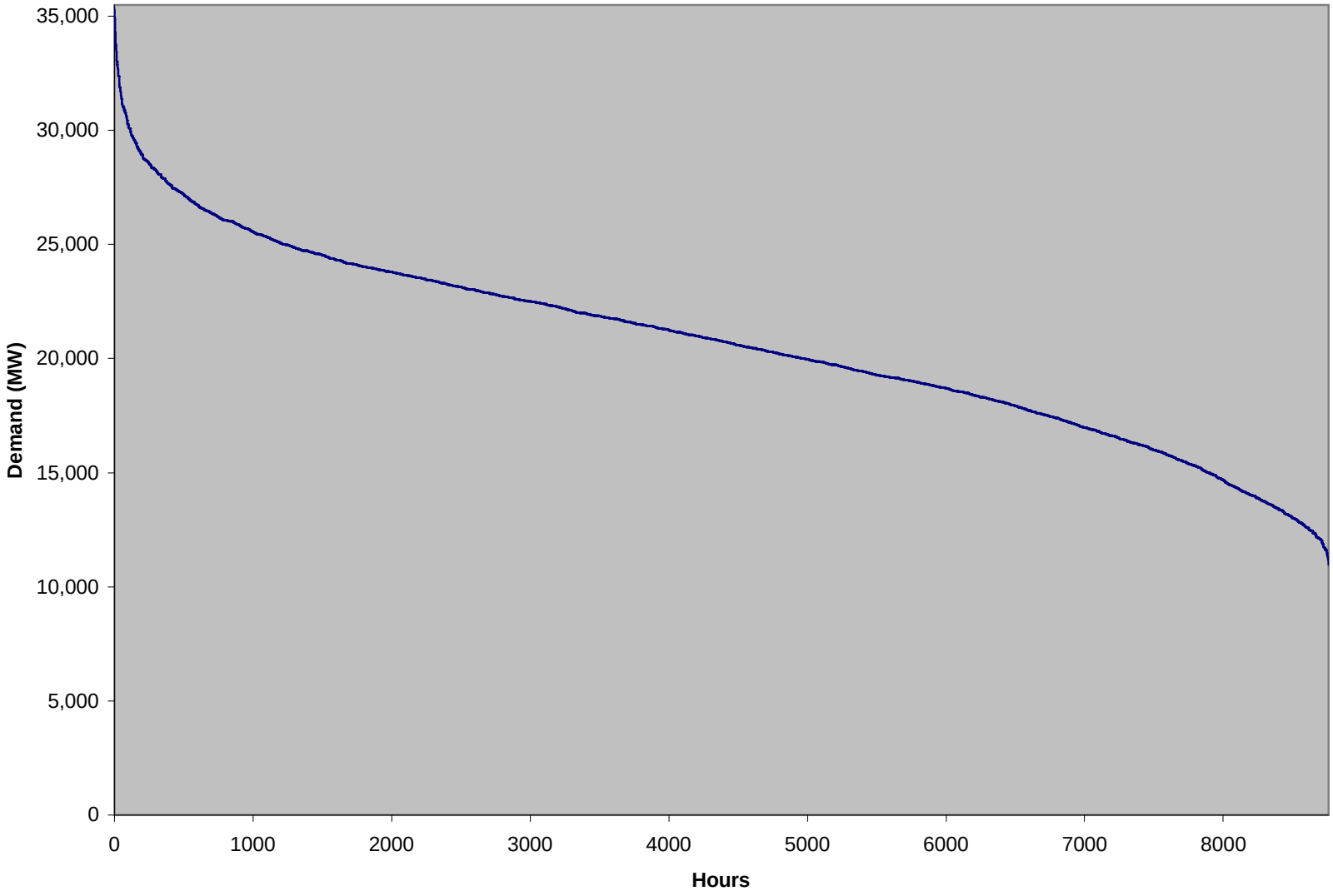

Figure 5-1. Market Study Area Projected 2010 Load Duration Curve

6.0 Cost and Availability of Off-Peak Pumping Energy

The Facility will require a considerable amount of off peak energy to pump water into the storage area. Based on data from the 1991 study, a 1,200 MW Facility size, operating at a 15 percent capacity factor, would have annual pumping energy requirements of 2,208 GWh per year. Given energy purchases of this magnitude, the cost of off peak pumping energy becomes an important assumption impacting the overall project economics.

To estimate the cost of purchasing pumping energy, several assumptions must be made regarding the regulatory structure in place and the degree of market efficiency. For many market price forecasts performed by the energy consulting industry, it has become increasingly common since the advent of deregulation to assume that the future markets will be competitive and efficient. In other words, it is assumed that vertically integrated utilities, consisting of generation, transmission, and distribution assets serving a franchised service area, will be separated into separate entities. The distribution assets will continue to be subject to rate regulation because of their recognized status as a natural monopoly, and transmission assets will gradually be transferred to an independent system operator in line with the federal initiatives previously discussed. It is also assumed that transmission limitations, at least in the long-run and within the region of study, will gradually be eliminated such that regional generation assets will be available for dispatch to serve regional load.

Concerning the generation market, units are assumed to be part of a separate, competitive market in which many owners compete through a bidding process to supply the regional power needs. Unless their capacity is sold under a power purchase agreement, the owners of generation are assumed to bid for the right to provide energy on the open market. The short-term market clearing price for a market with adequate capacity levels will tend to reflect the variable costs of production of the last unit being dispatched because a generator would be willing to operate a unit whenever marginal costs can be covered.[2] These aforementioned assumptions related to a long-term competitive and efficient market are adopted for the economic analysis.

Given the above assumptions, the load duration curve developed in Section 5.0, was combined with the regional unit inventory developed in Section 4.0 to determine the

[2] In most competitive power markets all generators being dispatched are paid the price of the last unit being dispatched. Thus, if a coal unit is on the margin, meaning that a coal unit will serve the incremental MWh of demand on the system, the market clearing price paid to all generators will reflect the marginal cost of the coal unit. Similarly, when a peaking unit is on the margin during periods of high demand, the market clearing price paid to all generators will reflect the marginal cost of the peaking unit being dispatched.

cost of off-peak energy that would be available to the Facility, were it in operation in 2010. The process involved "stacking" the blocks of capacity on a merit order basis, meaning that blocks having the lowest production costs are at the base, and the capacity blocks having the highest production costs are at the top of the stack. The result is shown in Figure 6-1, which indicates the study area capacity blocks dispatched, and the unit type on the margin for differing load levels during the year. For example, the load duration curve indicates a minimum load (hour 8,760) of 10,981 MW. To meet this load level, assuming merit order dispatch, all the hydroelectric, nuclear, wind, and landfill gas units- adjusted for availability- are dispatched, and part of the coal capacity block must be dispatched. Thus, coal-based capacity is on the margin. At higher load levels, the increased energy requirements mean that it is necessary to slowly work through the available coal capacity. Nevertheless, due to the high level of coal capacity in the study area, the coal block is on the margin for all but the highest 1,546 hours of the year, or about 18 percent of the time. During these peak periods, combined cycle units are dispatched first, followed by combustion turbine units and other peaking capacity.

The key output from the stacking of capacity blocks in the study area load duration curve is to determine the capacity block on the margin during off-peak hours when the Facility will purchase energy. Given that coal is projected to be on the margin for all but 18 percent of the hours, it is appropriate to conclude that off-peak energy purchases will be linked to the price of coal. When the Facility's energy requirements are added to the study area demand profile, coal would remain on the margin when the Facility purchased off-peak energy, as the coal block has more than 36,000 GWh of unused energy available based on a comparison of the load duration curve with the block of coal capacity.

The marginal energy cost of the block of coal capacity is estimated by considering the fuel price for coal, the net plant heat rate for the coal capacity block, and the variable O&M cost. To derive a delivered cents/MBtu fuel price, Black & Veatch utilized the Platts' COALdat data base for the market study area coal units, weighted by delivered tons. These costs were escalated to 2010 at an assumed 2.5 percent coal escalation rate. Similarly, an average net plant heat rate, measured in terms of the Btu required to produce a net kWh of electrical output was derived, weighted by MW of coal capacity in the study area. The results are a delivered coal price of $0.997/MBtu, and a net plant heat rate of 10,862 Btu/kWh. This results in a fuel cost of $10.83 per MWh of output. To this figure was added a 2010 variable O&M cost of $2.02/MWh, based on an escalation of the Platts' O&M costs contained in the database. The result is an estimated marginal energy cost of $12.85/MWh for the coal capacity providing the off peak energy requirements for the Facility. This off-peak energy cost assumption will be carried forward to Section 7.0.

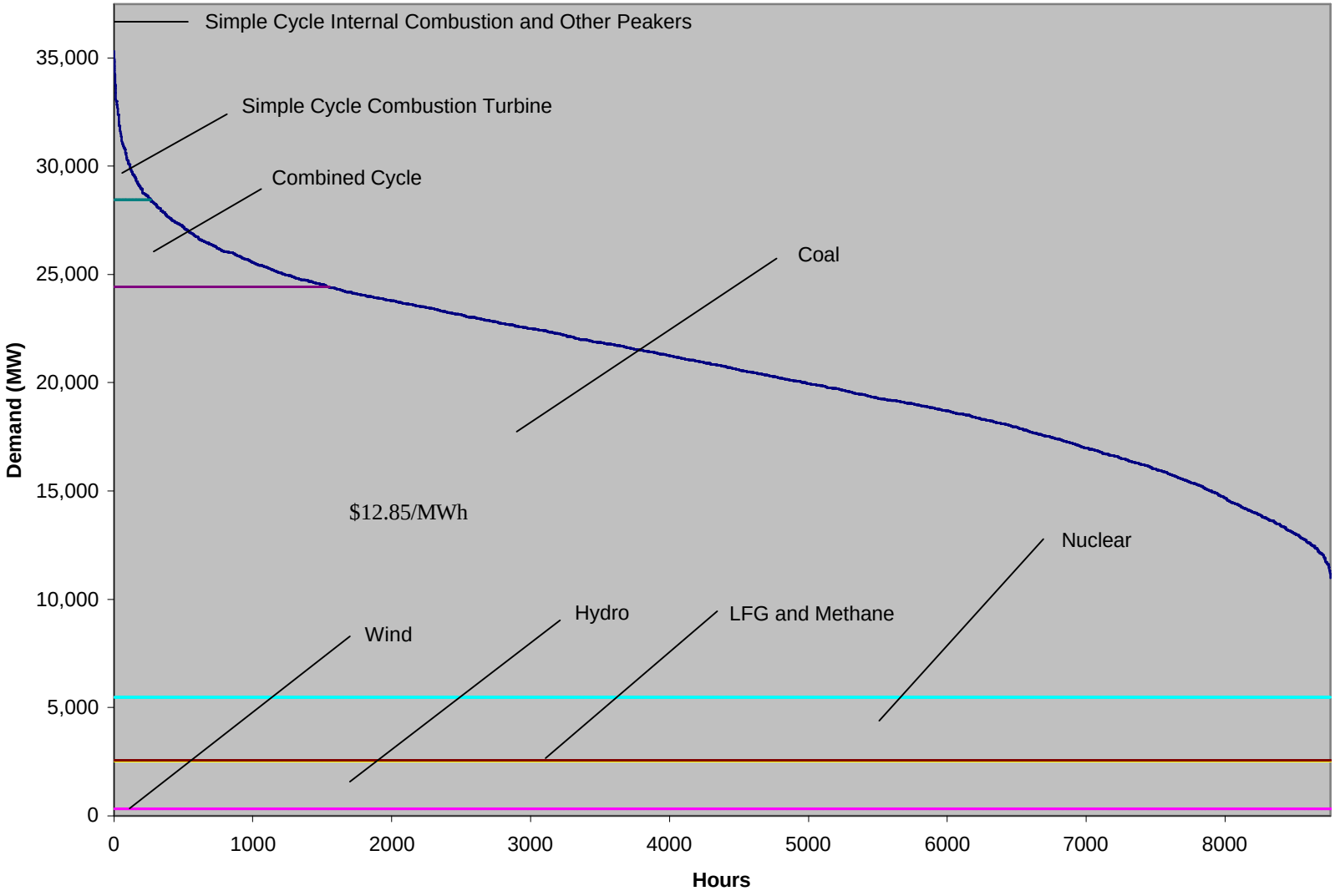

Figure 6-1. MAPP 2010 Capacity Stacking Profile

7.0 Pumped Energy Break-Even Cost Determination

Based on the information presented and derived in the previous sections, bus-bar cost comparisons are developed between the Facility and traditional peaking options, represented by natural gas fired combustion turbines. A Facility bus-bar cost below or comparable to traditional peaking options would be an indication that the Facility may be a financially viable option; a Facility bus-bar cost higher than that for other peaking options may be an indication that the Facility is not likely to be a competitive peaking option. Any conclusions, however, should also consider the sensitivity evaluations performed for fuel costs, capacity factor, and Facility capital costs, as well as non-economic factors and risks.

7.1 Combustion Turbine Bus-Bar Cost Development

Simple cycle combustion turbine (CT) units burning natural gas or fuel oil have been the technology of choice for utilities installing peaking capacity. Operation of CTs is based on the Brayton thermodynamic power cycle. A CT generates power by compressing ambient air to approximately 12 to 16 atmospheres, heats the pressurized air to 2,000 °F or more by burning oil or natural gas, and then expands those hot gases through a turbine. The turbine drives both the air compressor and an electric generator. A typical combustion turbine would convert 30 to 35 percent of the fuel energy to electric power. A substantial portion of the fuel energy is wasted in the form of hot (900 °F to 1,100 °F) gases exiting the turbine exhaust. When the combustion turbine is used to generate power and no energy is captured from the hot exhaust gasses, the power cycle is referred to as a “simple cycle” power plant.

A CT unit has the advantages of a relatively low capital cost, a short construction time, a small foot print compared to baseload options, the ability to come on-line very quickly, the ability to ramp up and down quickly, and many units have a very good performance record. The primary drawback is that CTs are relatively inefficient, having a net plant heat rate that may range from about 9,000 Btu/kWh to more than 11,500 Btu/kWh. This compares to a combined cycle NPHR that, for new units, can be below 7,000 Btu/kWh. Another potential disadvantage of CTs is that they are mass flow devices, and their performance changes with ambient conditions. Generally speaking, as temperatures rise, combustion turbine efficiency and output decrease due to the lower density of the air. To lessen the impact of this negative characteristic, most conventional power plants now include inlet air cooling systems to boost plant performance at higher ambient temperatures.

CTs are available in a wide range of sizes. For the purposes of this study, it has been assumed that the alternative to securing power from the Facility would be one of three CT models: a General Electric (GE) LM6000, a GE 7EA, or a GE 7FA, which range in size from approximately 44 MW to nearly 177 MW (ISO conditions), and have typical cost and performance parameters as listed in Table 7-1. Each machine is described more fully below.

Table 7-1. Assumed Combustion Turbine Cost and Performance Parameters (2004 Dollars)

Description	Output (MW))	Net Plant Heat Rate (Btu/kWh)	Fixed O&M ($/kW-year)	Variable O&M ($/MWh)	Capital Cost ($1,000)
LM 6000 SC	43.7	8,990	8.94	8.51	27,409
7EA SC	85.4	11,560	2.81	3.29	39,246
7FA SC	171.7	10,450	1.76	4.30	65,403

7.1.1 GE LM6000PC Combustion Turbine.

The General Electric LM6000 is a 2-shaft gas turbine engine derived from the core of the CF6-80C2, GE's high thrust, high efficiency aircraft engine. The CF6-80C2 has logged more than 30,000,000 flight hours in the Boeing 747 and other wide-body aircraft.

The LM6000 consists of a 5-stage low-pressure compressor, a 14-stage variable geometry high-pressure compressor, an annular combustor, a 2-stage air-cooled high pressure turbine and a 5-stage low pressure turbine, and an accessory drive gear box. It has two concentric rotor shafts. The low-pressure compressor and low pressure turbine are assembled on one shaft, forming the low-pressure rotor. The high pressure combustor and high pressure turbine are assembled on the other shaft, forming the high-pressure rotor. The CT's use of flight-proven parts, produced in high volume, contributes to the relatively low initial cost and high operating efficiency of the LM6000.

The LM6000 uses the low pressure turbine to power the output shaft. By eliminating the separate power turbine found in many other gas turbines, the LM6000 design simplifies the engine, improves fuel efficiency and permits direct-coupling to 3,600 RPM generators for 60 Hz power generation. The gas turbine drives its generator through a flexible dry type coupling connected to the front, or "cold," end of the low pressure combustor shaft. The LM6000 gas turbine generator set has the following characteristics:

- Full power in 10 minutes
- Baseload, cycling, or peaking
- Synchronous condensor capability

- Compact, modular design
- 3 million operating hours
- More than 300 turbines sold
- 97.8 percent documented availability
- LM6000PC — water or steam injection
- LM6000PD — dry-low emission combustion
- LM6000 SPRINT™ spray inter-cooling for power boost

7.1.2 GE 7EA Combustion Turbine.

The GE PG7121EA (7EA) model is a highly reliable, mid-size modular combustion turbine. With design emphasis placed on energy efficiency, availability, performance and maintainability, the GE 7EA is a proven technology with about 800 units installed or on order worldwide. The simple, medium-sized design of the GE 7EA lends to flexibility in plant layout and easy, low-cost addition of increments of power when phased capacity expansion is necessary. The GE 7EA is ideal for plants that require high efficiency along with the back-up power only multiple units can provide. Rated at 85.4 MW, the unit has a 3,600 rpm shaft speed and is direct coupled to the generator. The GE 7EA is fuel-flexible, and can operate on natural gas, liquefied natural gas, distillate, and treated residual oil. The GE 7EA can be used for simple cycle and combined cycle, base load and peaking power generation, and industrial and cogeneration applications.

7.1.3 GE 7FA Combustion Turbine.

GE 7FA combustion turbine, introduced in 1986, is the result of a multi-year development program using technology advanced by GE Aircraft Engines and GE's Corporate Research & Development Center. This program facilitated the application of technologies such as advanced bucket cooling techniques, compressor aerodynamic design and new alloys to F-class gas turbines, enabling them to attain higher firing temperatures (2,400 °F, or 1,315 °C) than previous generation machines.

The GE 7FA gas turbine has an 18-stage compressor and a 3-stage turbine. They feature cold-end drive and axial exhaust, which is beneficial for combined cycle arrangements. Net efficiencies over 56 percent can be achieved. With reduced cycle time for installation and start-up, the GE 7FA gas turbines can be installed relatively quickly. The packaging concept of GE 7FA features consolidated skid-mounted components, controls, and accessories. This standardized arrangement reduces piping, wiring, and other on-site interconnection work.

The GE 7FA also has displayed outstanding environmental characteristics. Because of the higher specific output of these machines, less NOx and CO are emitted

per unit of power produced for the same exhaust concentrations. GE 7FA machines have accumulated over 900,000 operating hours on Dry Low NOx burners.

7.2 Combustion Turbine Bus-Bar Cost Calculations

In this section, the CT cost and performance characteristics are used to estimate the cost of producing a kWh of energy. This is done through the development of a bus-bar cost spreadsheet and a bus-bar cost curve for each CT option.

A bus-bar spreadsheet calculates the all-in cent/kWh cost of a generation option based on the unit's fixed and variable costs, and performance characteristics. When this is calculated across a reasonable range of operating capacity factors, a bus-bar curve that plots the cent/kWh cost at various capacity factors can be developed and compared to other generating alternatives.

Several inputs are required to calculate bus-bar costs, including capital costs, fixed and variable O&M costs, fuel costs, capacity factor, and financing costs. Financing costs consider the debt to equity ratio, the cost of debt and equity, the capital recovery period, and tax life, all of which is expressed in terms of a levelized fixed charge rate. The levelized fixed charge rate is the percent of total capital cost needed to be recovered each year during the capital recovery period to offset capital-related costs. Inputs related to these categories are shown in Table 7-2. The levelized fixed charge rate for the present study is based on an assumed 60/40 debt to equity ratio, an 8.5 percent cost of debt, a 14 percent equity return, and a 20-year capital recovery period for the CTs (a 30-year capital recovery period is assumed for the Facility, which lowers the fixed charge rate versus the CT options). The operational life of the CT is assumed to be 25 years, half the assumed life of the Facility. To make the peaking options comparable, the bus-bar costs for all options are evaluated on a 50-year basis, with a second CT replacing the original beginning in year 26. Table 7-3 shows the natural gas price forecast used in the base case, as well as in the sensitivities discussed in Section 7.3. These fuel costs were derived from the 2004 *Annual Energy Outlook.*

Table 7-2. Bus-bar Calculation Parameters

Parameter	Combustion Turbines	Pumped Storage Facility
Present Worth Discount Rate	8.60%	8.60%
Capital Recovery Period	20 Years	30 Years
Levelized Fixed Charge Rate	11.93%	10.17%
Operational Life	25 Years	50 Years

Table 7-3. Natural Gas Price Forecast (Nominal $/MBtu)

Year	Base Projections	High Projections	Low Projections
2010	$4.25	$4.70	$3.74
2011	$4.54	$5.00	$3.82
2012	$4.85	$5.32	$3.91
2013	$5.18	$5.65	$4.00
2014	$5.54	$6.01	$4.09
2015	$5.91	$6.39	$4.19
2016	$6.08	$6.79	$4.29
2017	$6.25	$7.22	$4.39
2018	$6.42	$7.68	$4.49
2019	$6.60	$8.16	$4.59
2020	$6.78	$8.67	$4.70
2021	$6.99	$9.22	$4.81
2022	$7.21	$9.80	$4.92
2023	$7.43	$10.42	$5.03
2024	$7.65	$11.08	$5.15
2025	$7.89	$11.78	$5.27
2026	$8.23	$12.53	$5.39
2027	$8.58	$13.32	$5.51
2028	$8.96	$14.16	$5.64
2029	$9.34	$15.05	$5.77
2030	$9.75	$16.00	$5.90
2031	$10.17	$17.01	$6.04
2032	$10.61	$18.09	$6.18
2033	$11.07	$19.23	$6.32
2034	$11.54	$20.44	$6.47
2035	$12.04	$21.73	$6.62
2036	$12.56	$23.11	$6.77
2037	$13.11	$24.56	$6.93
2038	$13.67	$26.11	$7.09
2039	$14.27	$27.76	$7.25
2040	$14.88	$29.52	$7.42
2041	$15.53	$31.38	$7.59
2042	$16.20	$33.36	$7.77
2043	$16.90	$35.47	$7.95
2044	$17.63	$37.71	$8.13
2045	$18.39	$40.09	$8.32
2046	$19.18	$42.62	$8.51
2047	$20.01	$45.31	$8.71
2048	$20.88	$48.17	$8.91
2049	$21.78	$51.21	$9.12
2050	$22.72	$54.45	$9.33
2051	$23.70	$57.88	$9.54
2052	$24.73	$61.54	$9.77
2053	$25.80	$65.42	$9.99
2054	$26.91	$69.56	$10.22
2055	$28.08	$73.95	$10.46
2056	$29.29	$78.62	$10.70
2057	$30.56	$83.58	$10.95
2058	$31.88	$88.86	$11.20
2059	$33.26	$94.47	$11.46

Note: *2004 Annual Energy Outlook* provided in 2002, 2010, 2015, 2020, and 2025 in real 2002 dollars. These projections were then escalated to nominal dollars at an assumed rate of 3.0% annually, with intermediate values calculated by applying the average annual escalation rate between years. Beyond 2025 the average annual escalation from 2002-20025 was applied to the previous years' forecast.

The bus-bar sheet for the LM6000 is found Table 7-4 and discussed below. The remainder of the CT bus-bar sheets can be found in Appendix B. The top portion of Table 7-4 lists the inputs used for the cost columns. To match the life of the pumped storage facility, the cost calculations cover a 50-year period beginning in 2010. The capital cost column is based on the levelized fixed charge rate multiplied by the 2010 capital cost (capital costs were increased by 3 percent from the 2004 estimates). Because the CTs are only assumed to have a 25-year operating life and a 20-year capital recovery period, no capital costs are incurred in years 21 through 25 (2030-2034). In year 26 (2035), the second LM6000 is assumed to come on-line and begins a second 20-year recovery period in order to produce a bus-bar calculation comparable to the Facility, assumed to have a 50-year life. The capital cost associated with the second LM6000 in the plan is significantly higher than the first unit, due to inflationary impacts (2.5 percent) on the unit capital cost.

Fixed O&M costs are based on the initial value and inflationary adjustments each year. Similarly, variable O&M costs are based on the initial rate, a unit capacity factor of 15 percent, and escalation. The fuel cost is based on the base case natural gas price in Table 7-3 and the unit NPHR. The total cost column is the sum of the fuel, variable O&M, fixed O&M, and capital costs each year. The total costs are stated on a present value basis in the following column. The final two columns in Table 7-4 present the bus-bar cost and present worth bus-bar costs. The bus-bar costs are calculated by dividing the corresponding total costs by plant output.

Finally, the levelized bus-bar cost is shown at the bottom of Table 7-4. This is calculated as 16.10 cents/kWh for the LM6000, based on the input assumptions and a 15 percent capacity factor. The levelized bus-bar cost of 16.10 cents/kWh has the same present value as the sum of the present values of the year-by-year bus-bar costs. As a result, economically correct decisions can be made by comparing the single levelized bus-bar costs between options, and this is much simpler than comparing a stream of 50 year-by-year present value costs between technologies.

A key input into the bus-bar cost calculation model is the assumed capacity factor of a Facility. This input is especially important in the present analysis due to the capital intensity of the Facility relative to the CT options. The higher the capacity factor, the better the Facility should compare to the less capital intensive CT options, as the Facility's relatively high capital costs are spread over more operating hours. While the historical operating profile of most pumped storage facilities has averaged around 15 percent, a 10 percent and 20 percent capacity factor bus-bar cost was also prepared for all options. For the LM6000, a decrease in capacity factor to 10 percent produced a

Table 7-4. GE LM6000 CT Bus-Bar Calculation - 15% Capacity Factor

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	31,010	First Year Fixed O&M ($ 1,000)	466.5	3.0%
Total Net Capacity (kW)	43,700	First Year Variable O&M ($/MWh)	10.16	3.0%
Capacity Factor	15.0%	First Year NG Cost ($/MBtu)	4.25	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	8,990	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	3,700	466	583	4.25	2,195	6,945	6,945		12.09	12.09
2011	3,700	480	601	4.54	2,345	7,126	6,562		12.41	11.43
2012	3,700	495	619	4.85	2,505	7,318	6,205		12.74	10.81
2013	3,700	510	637	5.18	2,675	7,523	5,873		13.10	10.23
2014	3,700	525	657	5.54	2,858	7,739	5,564		13.48	9.69
2015	3,700	541	676	5.91	3,053	7,970	5,276		13.88	9.19
2016	3,700	557	697	6.08	3,138	8,091	4,932		14.09	8.59
2017	3,700	574	717	6.25	3,225	8,216	4,612		14.31	8.03
2018	3,700	591	739	6.42	3,315	8,345	4,313		14.53	7.51
2019	3,700	609	761	6.60	3,407	8,477	4,034		14.76	7.03
2020	3,700	627	784	6.78	3,502	8,613	3,774		15.00	6.57
2021	3,700	646	807	6.99	3,609	8,763	3,536		15.26	6.16
2022	3,700	665	832	7.21	3,720	8,917	3,313		15.53	5.77
2023	3,700	685	857	7.43	3,834	9,075	3,105		15.80	5.41
2024	3,700	706	882	7.65	3,951	9,239	2,911		16.09	5.07
2025	3,700	727	909	7.89	4,072	9,407	2,729		16.38	4.75
2026	3,700	749	936	8.23	4,248	9,632	2,573		16.77	4.48
2027	3,700	771	964	8.58	4,432	9,867	2,427		17.18	4.23
2028	3,700	794	993	8.96	4,623	10,110	2,290		17.61	3.99
2029	3,700	818	1,023	9.34	4,823	10,364	2,161		18.05	3.76
2030	0	843	1,054	9.75	5,031	6,928	1,330		12.06	2.32
2031	0	868	1,085	10.17	5,249	7,202	1,274		12.54	2.22
2032	0	894	1,118	10.61	5,476	7,487	1,219		13.04	2.12
2033	0	921	1,151	11.07	5,713	7,785	1,167		13.56	2.03
2034	0	948	1,186	11.54	5,960	8,094	1,117		14.10	1.95
2035	6,859	977	1,221	12.04	6,217	15,275	1,942		26.60	3.38
2036	6,859	1,006	1,258	12.56	6,486	15,609	1,827		27.18	3.18
2037	6,859	1,036	1,296	13.11	6,766	15,958	1,720		27.79	3.00
2038	6,859	1,067	1,335	13.67	7,059	16,320	1,620		28.42	2.82
2039	6,859	1,099	1,375	14.27	7,364	16,697	1,526		29.08	2.66
2040	6,859	1,132	1,416	14.88	7,682	17,090	1,438		29.76	2.50
2041	6,859	1,166	1,458	15.53	8,014	17,498	1,356		30.47	2.36
2042	6,859	1,201	1,502	16.20	8,361	17,924	1,279		31.21	2.23
2043	6,859	1,237	1,547	16.90	8,722	18,366	1,207		31.98	2.10
2044	6,859	1,274	1,594	17.63	9,099	18,827	1,139		32.79	1.98
2045	6,859	1,313	1,641	18.39	9,493	19,306	1,076		33.62	1.87
2046	6,859	1,352	1,691	19.18	9,903	19,805	1,016		34.49	1.77
2047	6,859	1,393	1,741	20.01	10,331	20,325	960		35.40	1.67
2048	6,859	1,434	1,794	20.88	10,778	20,865	908		36.34	1.58
2049	6,859	1,477	1,847	21.78	11,244	21,428	858		37.32	1.49
2050	6,859	1,522	1,903	22.72	11,730	22,014	812		38.34	1.41
2051	6,859	1,567	1,960	23.70	12,237	22,624	768		39.40	1.34
2052	6,859	1,614	2,019	24.73	12,766	23,258	727		40.50	1.27
2053	6,859	1,663	2,079	25.80	13,318	23,919	689		41.66	1.20
2054	6,859	1,713	2,142	26.91	13,894	24,607	652		42.85	1.14
2055	0	1,764	2,206	28.08	14,494	18,464	451		32.16	0.79
2056	0	1,817	2,272	29.29	15,121	19,210	432		33.45	0.75
2057	0	1,872	2,340	30.56	15,774	19,986	414		34.81	0.72
2058	0	1,928	2,411	31.88	16,456	20,795	396		36.21	0.69
2059	0	1,985	2,483	33.26	17,168	21,636	380		37.68	0.66
							Net Levelized Cost (c/kWh)			**16.10**
							Net Levelized Cost ($000s)			**9,243**

levelized bus-bar cost of 19.96 cents/kWh. A 20 percent capacity factor reduced the levelized bus-bar cost to 14.17 cents/kWh, as shown in Table 7-5.

Table 7-5 presents the bus-bar cost summaries for the three CT options at three capacity factors. At all capacity factors, the 7FA has the lowest bus-bar cost, ranging from a low of 11.92 cents/kWh at a 20 percent capacity factor, to 15.08 cents/kWh at a 10 percent capacity factor. The 7EA option has a bus-bar cost falling in between the other two CTs, and ranges from 13.32 cents/kWh to 17.19 cents/kWh. These levelized bus-bar costs are plotted in Figure 7-1.

Table 7-5. Bus-bar Cost Comparison

Unit	Bus-bar Cost (cents/kWh)		
	10% CF	15% CF	20% CF
LM6000 SC	19.96	16.10	14.17
7EA SC	17.19	14.61	13.32
7FA SC	15.08	12.98	11.92

7.3 Phase 2 Pumped Storage Facility Cost and Bus-Bar Updates

For the Facility to be viable as a peaking option, it must be competitive with other options such as the CTs identified in Section 7.1. In this section, the bus-bar costs of the Facility, sized at 1,200 MW and 600 MW, are estimated and compared to the CT options. In the Phase 1 reevaluation, the capital cost estimate from the 1991 study for an in-service date of 2002 was used, after being adjusted two years for inflationary impacts. The resulting cost per kW was $1,572 (based on the $1,495.8/kW cost in the initial study, adjusted by a 2.5 percent inflation rate for two years). For the Phase 2 reevaluation, a more detailed update was undertaken and is described below.

The Phase 2 capital cost update involved adjusting the itemized cost categories from the 1991 study by applying a cost escalation index for the 1990 to 2004 period. This was done for the 1,200 MW sized Facility and the 600 MW sized Facility, and is shown in Table 7-6. As seen in the table, the total direct capital cost increased using this method from $789.2 million for the 1,200 MW sized Facility, to $1,145.6 million. Added to this Facility cost is the capital cost for the transmission line infrastructure assumed to be required. In the 1991 study, this transmission investment was estimated to be $114 million. To derive a 2004 cost estimate, the Accessory Electric

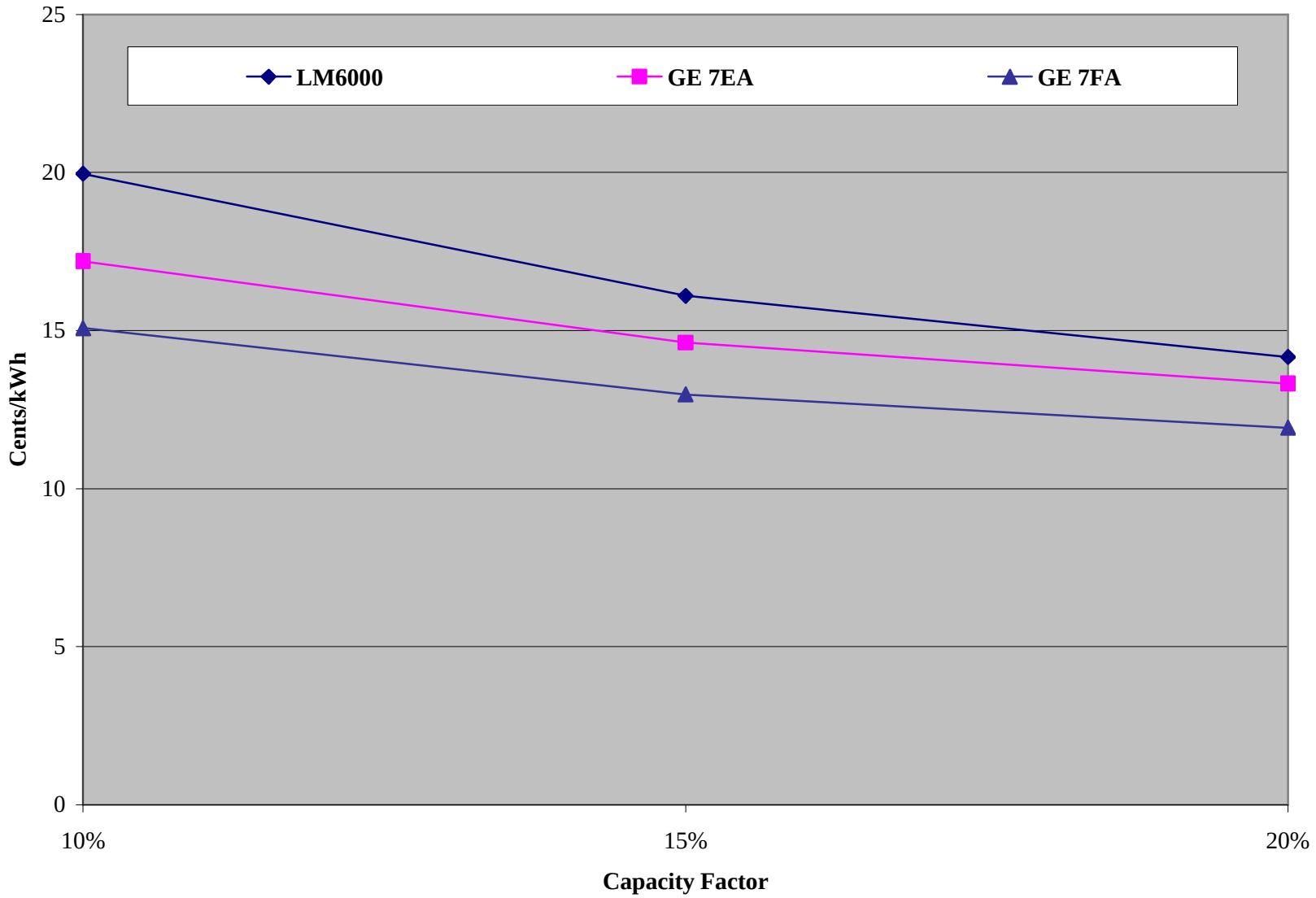

Figure 7-1. CT Bus-bar Cost Comparison

Table 7-6 Phase 2 Capital Cost Estimate for the 1,200 MW and 600 MW Facility, (2004 Dollars)

		1,200 MW				600 MW
	Item Description	**Amount (Jan 1990)**	**Index (Jan 1990)**	**Index (Jan 2004)**	**Amount (Jan 2004)**	**Amount (Jan 2004)**
1	Lands and Damages	1,500,000	100	136	2,040,000	2,040,000
2	Relocations	100,000	100	136	136,000	136,000
4	Dams					
	4.2 Forebay	42,789,000	154	233	64,739,201	48,554,401
	4.4 Power Structure					
	Intake Structure	5,279,000	166	249	7,918,500	5,938,875
	Upper, Low Pressure Pipe	11,801,000	168	252	17,701,500	10,620,900
	Shafts	12,192,000	186	275	18,025,806	10,815,484
	Penstocks Tunnels	209,063,000	186	275	309,098,522	185,459,113
	Bifurcations & Transitions	5,117,000	186	275	7,565,457	4,539,274
	Access Tunnels	6,373,000	186	275	9,422,446	9,422,446
	Surge Chambers	27,151,000	186	275	40,142,608	24,085,565
	Subtotal for Power Structures	276,976,000			409,874,839	250,881,657
	Total Dams	319,765,000			474,614,040	299,436,058
6	Fish Screen	7,894,000	166	249	11,841,000	8,880,750
7	Powerplant					
	7.1 Powerhouse	50,050,000	166	249	75,075,000	49,549,500
	Cofferdam	3,120,000	154	233	4,720,519	3,540,390
	7.2 Equipment					
	Pump Turbines	67,045,000	195	267	91,800,077	55,080,046
	Motor Generators	66,700,000	195	267	91,327,692	54,796,615
	Inlet Valves	9,062,000	195	267	12,407,969	7,444,782
	Governors	2,300,000	195	267	3,149,231	1,889,538
	Pressure Regulators	2,359,000	195	267	3,230,015	1,938,009
	Total Equipment	147,466,000			201,914,985	121,148,991
	7.3 Accessory Electrical Equipment	32,307,000	181	252	44,979,912	29,686,742
	7.4 Miscellaneous Powerplant Mechanical	10,181,000	181	252	14,174,652	9,355,270
	7.5 Tailrace and Deflector Dike	29,576,000	154	233	44,748,104	33,561,078
	7.6 Switchyard Civil	1,774,000	181	244	2,391,470	1,578,370
	Total Powerplant	274,474,000			388,004,641	248,420,340
8	Roads	1,541,000	206	269	2,012,277	2,012,277
19	Buildings, Grounds & Utilities	432,000	179	245	591,285	591,285
20	Permenant Operating Equipment	325,000	181	252	452,486	452,486
	SUBTOTAL, DIRECT CONSTRUCTION COST	605,599,000			879,100,444	561,377,911
	CONTINGENCY (20%)	121,119,800			175,820,089	112,275,582
30	Engineering & Design (4.3%)	31,248,908			45,361,583	40,825,425
31	Supervision & Inspection (4.3%)	31,248,908			45,361,583	40,825,425
	TOTAL	**789,216,617**			**1,145,643,699**	**755,304,342**

Equipment index from Table 7-6 was used applied with a 50 percent premium to account for the significant increase seen in right-of-way cost acquisition during the past 15 years. The resulting transmission cost in 2004 dollars was estimated to be $182 million for the 1,200 MW Facility.

To arrive at a 2010 total in-service capital cost estimate for the Facility, the middle of construction, overnight method was used in which the 2004 capital cost for the Facility and transmission infrastructure was escalated to the mid-point of construction at a 2.5 percent escalation rate, and an 8.6 percent interest during construction rate was applied for the later half of the construction period. The resulting total in-service capital cost is estimated to be $1,762.3 million, or $1,469/kW. This cost is approximately $100/kW below the cost estimated in the Phase 1 study.

The total 2010 in-service capital cost for the 600 MW Facility is calculated to be $1,136 million, or $1,894/kW. This cost is derived from a 2004 capital cost estimate for the Facility of $755.3 million and a transmission cost of $100.8 million.

The Phase 2 study also included an update of the operating and maintenance costs of the 1,200 MW and 600 MW Facility. In total, these costs are significantly higher than assumed in the Phase 1 Study. The annual O&M costs for the 1,200 MW Facility were estimated to be $9.5 million in 2004, and $6.4 million for the 600 MW Facility. These costs include the annual payment of FERC fees assumed to be $1.4 million in 2004 dollars. Added were the staffing level costs that, for the 1,200 MW and 600 MW Facility were assumed to include a staff level of 42 and 35 persons, respectively. This was based on the assumption that operators would be required to man and operate the facility, and produced an operating staff level higher than the staffing level of five of eight similar pumped storage projects for which data was available. The resulting total annual cost of staffing in 2004 dollars was estimated to be $4.2 million for the 1,200 MW and $3.5 million for the 600 MW Facility, both in 2004 dollars.

The final O&M cost category estimated in Phase 2 was the cost of the annual and periodic routine maintenance work. These costs, estimated in 2004 dollars, are presented in Table 7-7. These costs are on a per 300 MW unit basis and would be multiplied by four for the 1,200 MW Facility, and by two for the 600 MW Facility. To escalate all O&M costs to the assumed 2010 in-service date of the Facility, an escalation rate of three percent was assumed.

To derive a Facility bus-bar cost estimate, other inputs were required and made comparable with those assumed for the CT options where possible. One difference is that the capital recovery period for the Facility is assumed to be 30 years, or 10 years longer than the CT recovery period, due to an assumed longer finance period. Two differences related to transmission costs include a $1/kW-mo transmission charge, added as a

reasonable estimate of the cost of firm transmission on the region's transmission system, and a 5 percent energy loss assumption. These adjustments are not assumed to apply to the CT options as it is likely that CT peaking units would be installed near load centers and are assumed to be directly interconnected to the owning utility system. Finally, a separate cost category is required for the Facility's off-peak purchases of coal-based energy for pumping purposes. As discussed in Section 6.0, the 2010 cost of off-peak energy is based on a fuel cost of $0.997/MBtu, a net plant heat rate of 10,862 Btu/kWh, 1.4 kWh energy input per kWh of production, and a variable O&M cost of $2.02/MWh.

Table 7-7 Estimated Major Maintenance Costs for the Facility
(per 300 MW Unit, 2004 dollars)

	Frequency	**Cost**
Tunnel/Penstock	30 years	700,000
Pump/Turbine overhaul	25 years	5,500,000
Runner Replacement	25 years	5,500,000
Motor/Generator re-wedge	5 years	700,000
Motor/Generator rewind	15 years	3,400,000
Static Converter	30 years	500,000
Excitation System	30 years	7,200,000
Auxiliary electrical	25 years	6,000,000
Valve overhaul	25 years	1,400,000
Auxiliary mechanical	25 years	6,800,000
Gate/Trashrack rehab	30 years	400,000
Cranes, hoists overhaul	25 years	500,000
Road resurfacing	15 years	250,000

The resulting base case annual and levelized bus-bar costs for the 1,200 MW and 600 MW Facility at a 15 percent capacity factor are shown in Table 7-8 and Table 7-9, respectively. As seen in Table 7-8, the levelized bus-bar cost for the 1,200 MW Facility is estimated to be 16.52 cents/kWh. The 15 percent levelized bus-bar cost for the 600 MW Facility is estimated to be 21.10 cents/kWh. The individual bus-bar sheets at a 10 and 20 percent capacity factor are included in Appendix B.

Table 7-10 compares the base case bus-bar costs among all five peaking options at three different capacity factors. These are plotted in Figure 7-2 where it is evident that, at a 15 percent capacity factor, the 1,200 MW and 600 MW sized Facility rank third (16.52 cents/kWh) and fifth (21.10 cents/kWh), respectively, among the peaking options,

Table 7-8. Pumped Storage Bus-Bar Calculation - 15% Capacity Factor

Plant Input Data				Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)			1,762,342	First Year Staffing ($ 1,000)	5,015.0	3.0%
Total Net Capacity (kW)			1,200,000	Annual O&M Costs ($ 1,000)	10,627	3.0%
Capacity Factor			15.0%	First Year Coal Cost ($/MBtu)	0.997	2.5%
Transmission Tariff ($/kW-mo) ; % Losses	$	1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost			10,862	Levelized Fixed Charge Rate	10.17%	
				Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	179,301	5,015	10,627	14,400	0.997	23,914	4,459	237,716	237,716	15.87	15.87
2011	179,301	5,165	10,946	14,400	1.022	24,512	4,593	238,917	219,997	15.95	14.69
2012	179,301	5,320	11,274	14,400	1.048	25,125	4,731	240,151	203,622	16.03	13.59
2013	179,301	5,480	11,612	14,400	1.074	25,753	4,873	241,419	188,487	16.12	12.58
2014	179,301	5,644	11,961	18,276	1.101	26,397	5,019	246,597	177,284	16.46	11.84
2015	179,301	5,814	12,320	14,400	1.128	27,057	5,169	244,060	161,565	16.29	10.79
2016	179,301	5,988	12,689	14,400	1.157	27,733	5,325	245,436	149,609	16.38	9.99
2017	179,301	6,168	13,070	14,400	1.186	28,426	5,484	246,849	138,555	16.48	9.25
2018	179,301	6,353	13,462	14,400	1.215	29,137	5,649	248,301	128,334	16.58	8.57
2019	179,301	6,543	13,866	14,400	1.246	29,866	5,818	249,794	118,881	16.68	7.94
2020	179,301	6,740	14,282	14,400	1.277	30,612	5,993	251,327	110,139	16.78	7.35
2021	179,301	6,942	14,710	14,400	1.309	31,378	6,173	252,903	102,053	16.88	6.81
2022	179,301	7,150	15,152	14,400	1.341	32,162	6,358	254,522	94,573	16.99	6.31
2023	179,301	7,365	15,606	14,400	1.375	32,966	6,548	256,186	87,653	17.10	5.85
2024	179,301	7,586	16,074	41,560	1.409	33,790	6,745	285,056	89,808	19.03	6.00
2025	179,301	7,813	16,557	14,400	1.444	34,635	6,947	259,653	75,326	17.33	5.03
2026	179,301	8,048	17,053	14,400	1.481	35,501	7,156	261,458	69,843	17.45	4.66
2027	179,301	8,289	17,565	14,400	1.518	36,388	7,370	263,313	64,769	17.58	4.32
2028	179,301	8,538	18,092	14,400	1.556	37,298	7,591	265,220	60,072	17.71	4.01
2029	179,301	8,794	18,635	14,400	1.594	38,230	7,819	267,179	55,723	17.84	3.72
2030	179,301	9,058	19,194	14,400	1.634	39,186	8,054	269,192	51,697	17.97	3.45
2031	179,301	9,329	19,769	14,400	1.675	40,166	8,295	271,261	47,969	18.11	3.20
2032	179,301	9,609	20,363	14,400	1.717	41,170	8,544	273,387	44,517	18.25	2.97
2033	179,301	9,898	20,973	14,400	1.760	42,199	8,801	275,572	41,319	18.40	2.76
2034	179,301	10,195	21,603	271,408	1.804	43,254	9,065	534,825	73,841	35.70	4.93
2035	179,301	10,500	22,251	14,400	1.849	44,336	9,337	280,124	35,613	18.70	2.38
2036	179,301	10,815	22,918	14,400	1.895	45,444	9,617	282,495	33,070	18.86	2.21
2037	179,301	11,140	23,606	14,400	1.943	46,580	9,905	284,931	30,714	19.02	2.05
2038	179,301	11,474	24,314	14,400	1.991	47,745	10,202	287,436	28,530	19.19	1.90
2039	179,301	11,818	25,043	116,419	2.041	48,938	10,508	392,028	35,830	26.17	2.39
2040	0	12,173	25,795	14,400	2.092	50,162	10,824	113,353	9,540	7.57	0.64
2041	0	12,538	26,569	14,400	2.144	51,416	11,148	116,071	8,995	7.75	0.60
2042	0	12,914	27,366	14,400	2.198	52,701	11,483	118,864	8,482	7.94	0.57
2043	0	13,302	28,187	14,400	2.253	54,019	11,827	121,734	7,999	8.13	0.53
2044	0	13,701	29,032	23,808	2.309	55,369	12,182	134,092	8,113	8.95	0.54
2045	0	14,112	29,903	14,400	2.367	56,753	12,548	127,716	7,115	8.53	0.48
2046	0	14,535	30,800	14,400	2.426	58,172	12,924	130,831	6,712	8.73	0.45
2047	0	14,971	31,724	14,400	2.487	59,626	13,312	134,033	6,332	8.95	0.42
2048	0	15,420	32,676	14,400	2.549	61,117	13,711	137,324	5,973	9.17	0.40
2049	0	15,883	33,656	14,400	2.613	62,645	14,122	140,706	5,636	9.39	0.38
2050	0	16,359	34,666	14,400	2.678	64,211	14,546	144,182	5,318	9.63	0.35
2051	0	16,850	35,706	14,400	2.745	65,816	14,982	147,755	5,018	9.86	0.33
2052	0	17,355	36,777	14,400	2.813	67,462	15,432	151,426	4,735	10.11	0.32
2053	0	17,876	37,880	14,400	2.884	69,148	15,895	155,200	4,469	10.36	0.30
2054	0	18,412	39,017	80,325	2.956	70,877	16,372	225,003	5,966	15.02	0.40
2055	0	18,965	40,187	14,400	3.030	72,649	16,863	163,064	3,981	10.89	0.27
2056	0	19,534	41,393	14,400	3.106	74,465	17,369	167,161	3,758	11.16	0.25
2057	0	20,120	42,635	14,400	3.183	76,327	17,890	171,371	3,548	11.44	0.24
2058	0	20,723	43,914	14,400	3.263	78,235	18,426	175,699	3,349	11.73	0.22
2059	0	21,345	45,231	14,400	3.344	80,191	18,979	180,146	3,162	12.03	0.21
									Net Levelized Cost (c/kWh)		**16.52**
									Net Levelized Cost ($000s)		**247,534**

Table 7-9. Pumped Storage Bus-Bar Calculation - 15% Capacity Factor

Plant Input Data		Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)	1,136,411	First Year Staffing ($ 1,000)	4,179.2	3.0%
Total Net Capacity (kW)	600,000	Annual O&M Costs ($ 1,000)	10,627	3.0%
Capacity Factor	15.0%	First Year Coal Cost ($/MBtu)	0.997	2.5%
Transmission Tariff ($/kW-mo) ; % Losses $ 1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost	10,862	Levelized Fixed Charge Rate	10.17%	
		Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	rans. Tariff Major Main ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	115,618	4,179	10,627	7,200	0.997	11,957	2,230	151,811	151,811	20.27	20.27
2011	115,618	4,305	10,946	7,200	1.022	12,256	2,296	152,621	140,535	20.38	18.76
2012	115,618	4,434	11,274	7,200	1.048	12,562	2,365	153,454	130,113	20.49	17.37
2013	115,618	4,567	11,612	7,200	1.074	12,876	2,436	154,310	120,477	20.60	16.09
2014	115,618	4,704	11,961	9,138	1.101	13,198	2,509	157,129	112,963	20.98	15.08
2015	115,618	4,845	12,320	7,200	1.128	13,528	2,585	156,096	103,334	20.84	13.80
2016	115,618	4,990	12,689	7,200	1.157	13,867	2,662	157,027	95,718	20.97	12.78
2017	115,618	5,140	13,070	7,200	1.186	14,213	2,742	157,984	88,675	21.09	11.84
2018	115,618	5,294	13,462	7,200	1.215	14,569	2,824	158,967	82,162	21.22	10.97
2019	115,618	5,453	13,866	7,200	1.246	14,933	2,909	159,979	76,137	21.36	10.17
2020	115,618	5,616	14,282	7,200	1.277	15,306	2,996	161,019	70,563	21.50	9.42
2021	115,618	5,785	14,710	7,200	1.309	15,689	3,086	162,089	65,407	21.64	8.73
2022	115,618	5,959	15,152	7,200	1.341	16,081	3,179	163,188	60,636	21.79	8.10
2023	115,618	6,137	15,606	7,200	1.375	16,483	3,274	164,319	56,221	21.94	7.51
2024	115,618	6,321	16,074	20,780	1.409	16,895	3,372	179,062	56,414	23.91	7.53
2025	115,618	6,511	16,557	7,200	1.444	17,317	3,474	166,677	48,354	22.25	6.46
2026	115,618	6,706	17,053	7,200	1.481	17,750	3,578	167,906	44,853	22.42	5.99
2027	115,618	6,908	17,565	7,200	1.518	18,194	3,685	169,170	41,612	22.59	5.56
2028	115,618	7,115	18,092	7,200	1.556	18,649	3,796	170,470	38,611	22.76	5.16
2029	115,618	7,328	18,635	7,200	1.594	19,115	3,910	171,806	35,832	22.94	4.78
2030	115,618	7,548	19,194	7,200	1.634	19,593	4,027	173,180	33,258	23.12	4.44
2031	115,618	7,775	19,769	7,200	1.675	20,083	4,148	174,593	30,875	23.31	4.12
2032	115,618	8,008	20,363	7,200	1.717	20,585	4,272	176,046	28,666	23.50	3.83
2033	115,618	8,248	20,973	7,200	1.760	21,100	4,400	177,540	26,620	23.70	3.55
2034	115,618	8,495	21,603	135,704	1.804	21,627	4,532	307,580	42,466	41.07	5.67
2035	115,618	8,750	22,251	7,200	1.849	22,168	4,668	180,655	22,967	24.12	3.07
2036	115,618	9,013	22,918	7,200	1.895	22,722	4,808	182,280	21,338	24.34	2.85
2037	115,618	9,283	23,606	7,200	1.943	23,290	4,953	183,950	19,829	24.56	2.65
2038	115,618	9,562	24,314	7,200	1.991	23,872	5,101	185,667	18,429	24.79	2.46
2039	115,618	9,849	25,043	58,210	2.041	24,469	5,254	238,443	21,793	31.84	2.91
2040	0	10,144	25,795	7,200	2.092	25,081	5,412	73,631	6,197	9.83	0.83
2041	0	10,448	26,569	7,200	2.144	25,708	5,574	75,499	5,851	10.08	0.78
2042	0	10,762	27,366	7,200	2.198	26,351	5,741	77,419	5,525	10.34	0.74
2043	0	11,085	28,187	7,200	2.253	27,009	5,914	79,394	5,217	10.60	0.70
2044	0	11,417	29,032	11,904	2.309	27,685	6,091	86,129	5,211	11.50	0.70
2045	0	11,760	29,903	7,200	2.367	28,377	6,274	83,513	4,653	11.15	0.62
2046	0	12,112	30,800	7,200	2.426	29,086	6,462	85,661	4,394	11.44	0.59
2047	0	12,476	31,724	7,200	2.487	29,813	6,656	87,869	4,151	11.73	0.55
2048	0	12,850	32,676	7,200	2.549	30,559	6,856	90,140	3,921	12.04	0.52
2049	0	13,236	33,656	7,200	2.613	31,323	7,061	92,476	3,704	12.35	0.49
2050	0	13,633	34,666	7,200	2.678	32,106	7,273	94,877	3,499	12.67	0.47
2051	0	14,042	35,706	7,200	2.745	32,908	7,491	97,347	3,306	13.00	0.44
2052	0	14,463	36,777	7,200	2.813	33,731	7,716	99,887	3,124	13.34	0.42
2053	0	14,897	37,880	7,200	2.884	34,574	7,947	102,499	2,951	13.69	0.39
2054	0	15,344	39,017	40,163	2.956	35,439	8,186	138,147	3,663	18.44	0.49
2055	0	15,804	40,187	7,200	3.030	36,325	8,431	107,947	2,636	14.41	0.35
2056	0	16,278	41,393	7,200	3.106	37,233	8,684	110,788	2,491	14.79	0.33
2057	0	16,766	42,635	7,200	3.183	38,163	8,945	113,709	2,354	15.18	0.31
2058	0	17,269	43,914	7,200	3.263	39,118	9,213	116,714	2,225	15.58	0.30
2059	0	17,788	45,231	7,200	3.344	40,095	9,490	119,804	2,103	16.00	0.28
									Net Levelized Cost (c/kWh)		**21.10**
									Net Levelized Cost ($000s)		**158,071**

and are considerably higher than the 12.98 cents/kWh cost of the most economical option, the 7FA CT. At a 10 percent capacity factor, the two Facility sizes become significantly more costly than the conventional CT options, and only at a 20 percent capacity factor does the 1,200 MW Facility size result in a lower bus-bar cost than any of the CT options, ranking second (13.04 cents/kWh) behind the 7FA CT (11.92 cents/kWh).

Table 7-10. Bus-bar Cost Comparison at Selected Capacity Factors

Unit	Bus-bar Cost (cents/kWh)		
	10% CF	15% CF	20% CF
LM6000 CT	19.96	16.10	14.17
7EA CT	17.19	14.61	13.32
7FA CT	15.08	12.98	11.92
Pumped Storage Facility, 1,200 MW	23.49	16.52	13.04
Pumped Storage Facility, 600 MW	29.60	21.10	16.10

7.4 Sensitivity Case Evaluations

Neither Facility size appears to be cost-effective compared to other peaking options under the base case assumptions and at the most likely 15 percent capacity factor. However, several input assumptions in the analysis are subject to uncertainty, with fuel prices and the Facility capital cost particularly subject to fluctuation. In this section, sensitivity evaluations are performed to determine if either Facility size becomes more competitive under alternative but realistic future scenarios.

7.4.1 Natural Gas Price Sensitivities.

Natural gas prices have been very volatile during recent years, as is shown in Figure 7-3, which also indicates the recent coal price history in the U.S. The volatility in natural gas prices has been particularly burdensome to utilities and electric customers as the price extremes have tended to materialize during the peak winter and summer demand periods when natural gas supplies in storage grow short and prices adjust to reflect supply imbalances caused by transportation and, increasingly, supply constraints. Should these fundamentals continue, it is quite possible that the *Annual Energy Outlook* forecast used in the base case will be exceeded.

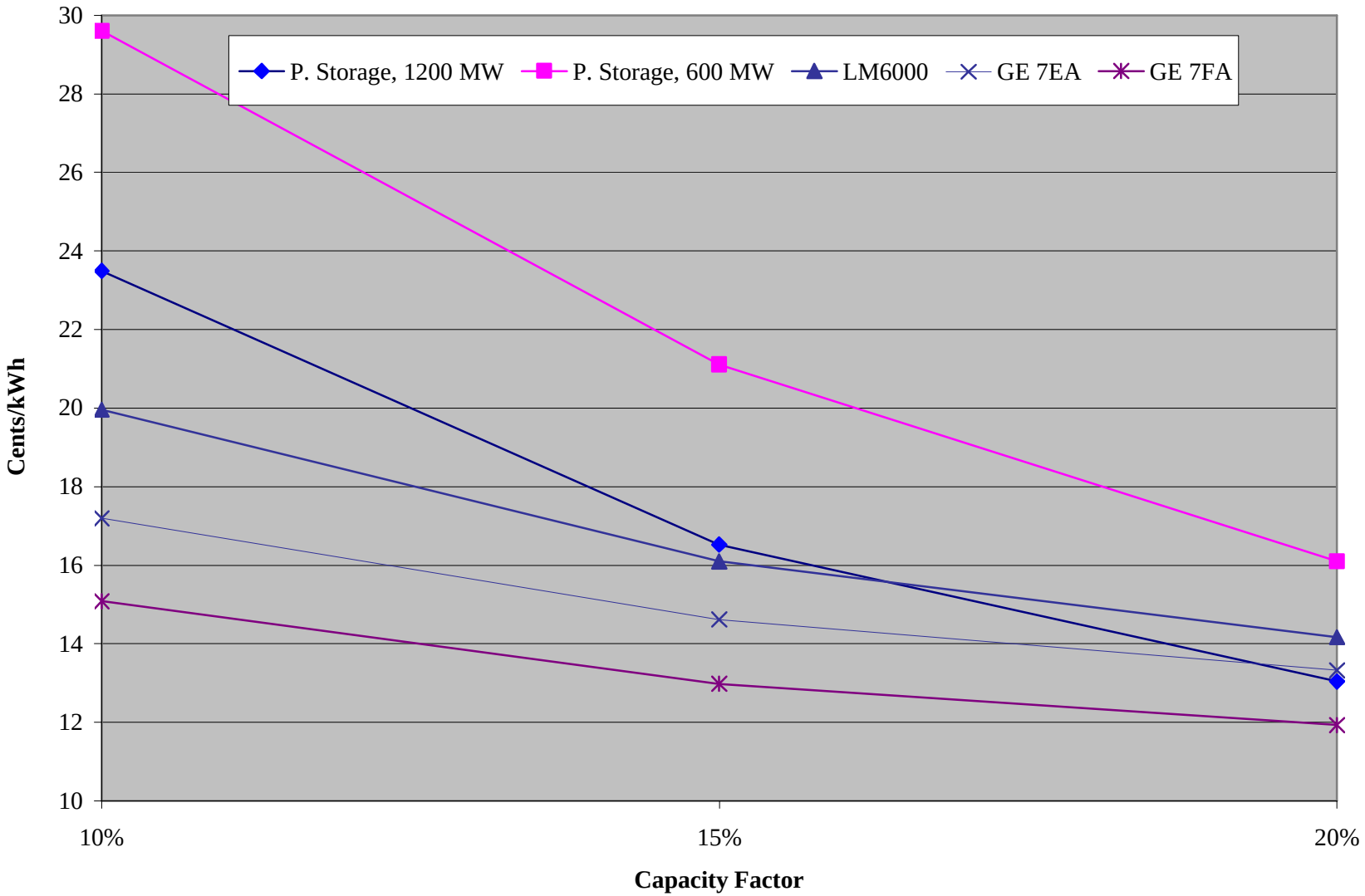

Figure 7-2. CT and Pumped Storage Bus-bar Comparison

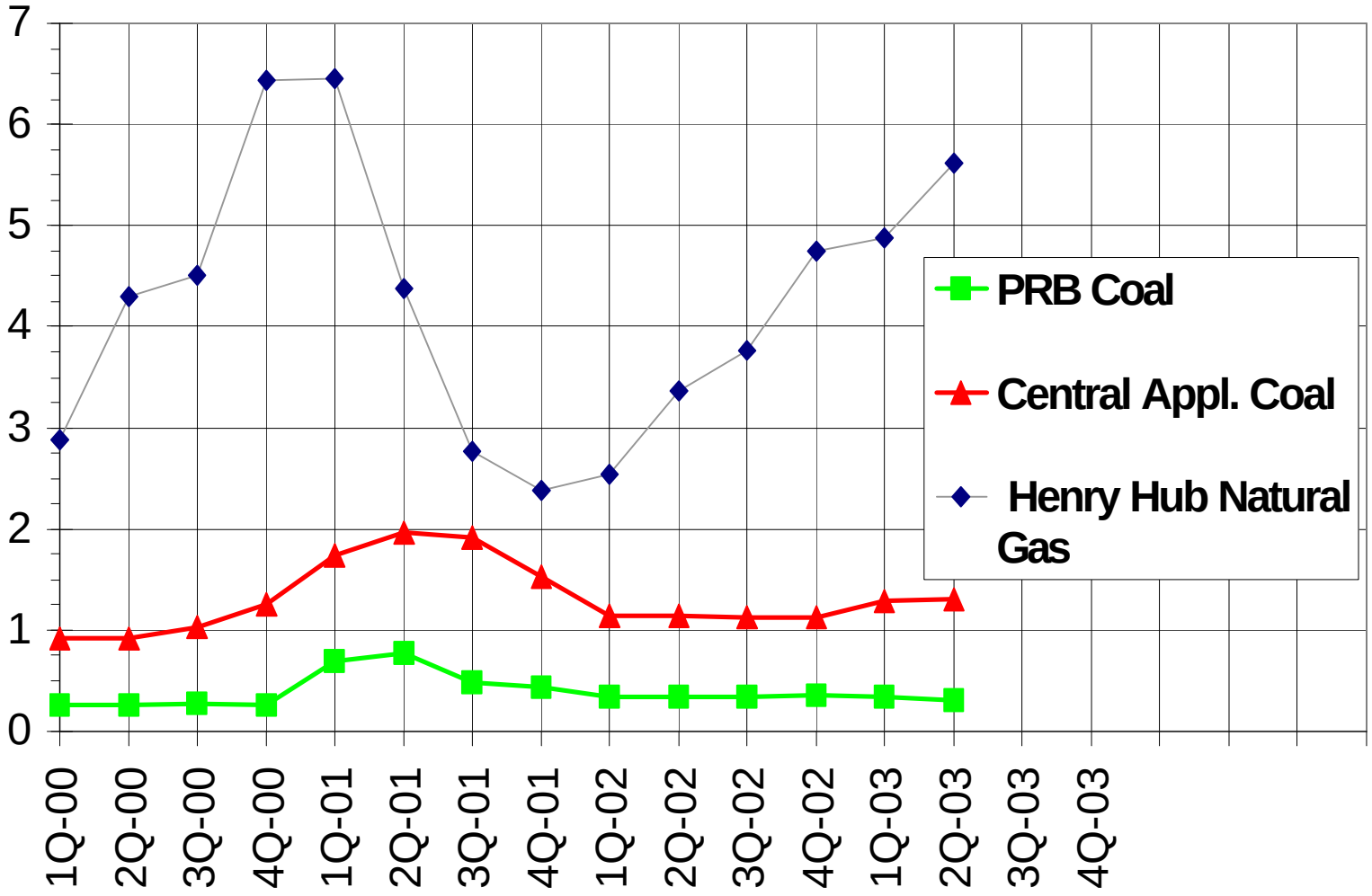

Figure 7-3. Recent Price Trends – Natural Gas and Coal

As a high fuel price scenario, the average annual escalation rate for 2004-2053 from the base case natural gas forecast was increased by 2.0 percentage points and the base case coal cost was left unchanged, even though there has been consolidation in the coal industry in the past two years and coal producers may be able to exercise some market power. The bus-bar results summarized in Table 7-11 indicate that under this high natural gas price scenario, the 1,200 MW Facility ranks lowest in bus-bar costs among the five peaking options considered at a 15 percent and 20 percent capacity factor, and third at a 10 percent capacity factor. The 600 MW unit ranks second lowest (16.10 cents/kWh) at a 20 percent capacity factor but ranks last at the 10 percent and 15 percent capacity factor.

These results indicate that those expecting a continuation of the high natural gas prices may view the Facility as a hedge against uncertain future gas prices. On the other hand, it can be argued that what matters is the relative cost of peaking power in the market and that utilities choosing to install a new efficient CT may be comfortable with the natural gas price exposure if they receive a market clearing price for peaking power that is set by more inefficient gas fired CT units during peaking hours. Large users of natural gas also have the option to hedge against natural gas prices, though this does come at a cost.

A low fuel price scenario was also run in which the average annual escalation rate for 2004-2053 from the base case natural gas forecast was decreased by 2.0 percentage points and coal prices were escalated at 1.0 percent annually. The results in Table 7-12 indicate that under this low fuel price scenario, neither Facility size consistently is the lowest cost option under any capacity factor scenario.

Table 7-11. Bus-bar Cost Comparison for High Natural Gas Scenario

Unit	Bus-bar Cost (cents/kWh)		
	10% CF	15% CF	20% CF
LM6000 SC	23.63	19.78	17.85
7EA SC	21.92	18.63	18.05
7FA SC	19.35	17.25	16.20
Pumped Storage Facility, 1,200 MW	23.48	16.52	13.04
Pumped Storage Facility, 600 MW	29.60	21.10	16.10

Table 7-12. Bus-bar Cost Comparison for Low Fuel Price Scenario

Unit	Bus-bar Cost (cents/kWh)		
	10% CF	15% CF	20% CF
LM6000 SC	17.48	13.62	11.69
7EA SC	14.01	11.43	10.14
7FA SC	19.35	17.25	16.20
Pumped Storage Facility, 1,200 MW	22.92	16.00	12.52
Pumped Storage Facility, 600 MW	29.07	20.58	15.57

7.4.2 Facility Capital Cost Sensitivities.

Additional sensitivities were performed to measure the competitiveness of the Facility if the capital cost is lower than that projected in the initial study. One situation that could reduce project costs in the 10 or 15 percent range would occur if the project did not have to carry the burden of the additional transmission infrastructure. As discussed in Section 3.2.8, it is possible that these transmission costs could potentially be designated as a Network Upgrade under FERC Order 2003-A, though several studies would need to be performed before it could be concluded that part or all of the investment would qualify as a necessary upgrade for the network. Further, in the MISO *2003 Transmission Expansion Plan*, two expansion cases evaluated would install a 500 kV line that would transverse South Dakota from the north central to the southeastern part of the state. These line additions are at the early study phase and are considered as a means to allow out of state delivery of up to 10,000 MW of potential wind energy and low cost power from coal. Even if such a plan were approved and the lines were built, however, there would be an expenditure of funds to interconnect with the grid. At any rate, this and other capital cost uncertainty justifies a capital cost sensitivity.

A sensitivity analysis was performed assuming a 20 percent reduction in the Facility's base case capital cost, holding the CT capital cost unchanged, and the results are shown in Table 7-13. A 20 percent decrease in the Facility capital cost would significantly improve the bus-bar cost of the two Facility sizes, although neither would be the least-cost option at a 10 percent or 15 percent capacity factor. At a 20 percent capacity factor, the 1,200 MW Facility would be the least cost option (11.37 cents/kWh) and the 600 MW Facility would be the third lowest cost option (13.94 cents/kWh).

A final sensitivity was performed assuming a combination of the capital cost reduction and high gas prices. This scenario would benefit the Facility on the two fronts most subject to uncertainty. Results, shown in Table 7-14, indicate that the 1,200 MW

Facility would be the least cost option at the 20 percent capacity factor as well as the 15 percent capacity factor scenario, but would rank second in a 10 percent capacity factor scenario. The 600 MW Facility would be lower in cost than the CT options at a 20 percent capacity factor, but would not be as cost-effective as the best CT option at a 10 percent or 15 percent capacity factor.

Table 7-13. Bus-bar Cost Comparison for Facility Low Capital Cost Scenario

Unit	Bus-bar Cost (cents/kWh)		
	10% CF	15% CF	20% CF
LM6000 SC	19.96	16.10	14.17
7EA SC	17.19	14.61	13.32
7FA SC	15.08	12.98	11.92
Pumped Storage Facility, 1,200 MW	20.15	14.30	11.37
Pumped Storage Facility, 600 MW	25.29	18.23	13.94

Table 7-14. Bus-bar Cost Comparison for Facility Low Capital Cost and High Natural Gas Scenario

Unit	Bus-bar Cost (cents/kWh)		
	10% CF	15% CF	20% CF
LM6000 SC	23.63	19.78	17.85
7EA SC	21.92	18.63	18.05
7FA SC	19.35	17.25	16.20
Pumped Storage Facility, 1,200 MW	20.15	14.30	11.37
Pumped Storage Facility, 600 MW	25.29	18.23	13.94

8.0 Conclusions and Phase 2 Recommendations

The Gregory County Feasibility Study Reevaluation has determined the economics of a 1,200 MW and 600 MW sized Facility under a range of possible scenarios. Under the base assumptions, neither Facility size was able to compete with CT alternatives at a 15 percent capacity factor, which is considered the most likely output level. The reason for the relatively high Facility bus-bar cost is due to the high capital cost relative to CT options, combined with the relatively low capacity factor that does not allow the higher fixed costs to be recovered over a large quantity of output. In the end, the Facility has a cost profile that very much resembles a coal plant (high capital and O&M costs, and costs linked to coal) which would not be expected to be a cost-effective option at a low capacity factor. A number of sensitivity evaluations were performed to determine whether the Facility could compete under alternative future scenarios. The 1,200 MW Facility was least cost in the high natural gas and in the high gas and lower capital cost sensitivities at a 15 percent capacity factor, but was not least cost in the low capital cost or low fuel cost scenarios. Due to economy of scale considerations, the 600 MW Facility was not competitive in any sensitivity at a 15 percent capacity factor level.

Other factors in addition to economic costs, some mentioned previously, would also influence a decision to develop the Facility; these are listed in Table 8-1. An indication is also provided regarding whether the factor would tend to be favorable or unfavorable from the Facility's perspective, relative to CT development.

Among the most significant factors favoring the Facility are related to the use of off peak excess coal capacity and the socioeconomic benefits resulting from construction and operation. Factors favoring the CT options are the lower risks resulting from a smaller initial investment, and transmission policy considerations. Given that the weight of these factors favor the CT investment, it is probable that a utility may only be willing to pursue development or participation in the Facility if the economics were clearly favorable. Neither the 600 MW or 1,200 MW Facility are so favored in the economic analysis.

Considering all factors, it is concluded that the Facility is not likely to be seen as a low risk, economical candidate for providing peaking power under reasonably expected conditions. While factors, especially long term gas price and transmission network development, could change to justify a renewed consideration of the Facility, it is probably prudent to minimize any significant development expenditures at the present time, with the understanding that should a utility or developer approach the State with enough interest to assume their own development costs or should future conditions dramatically change to favor the project, the concept could be revived.

Table 8-1. Qualitative Analysis of Pumped Storage Facility Versus CT	
Parameter	Indicator
Uncertainty of transmission policy and pricing.	Favors CTs
Initial capital commitment	Favors CTs
Contribution to fuel diversity of existing peaking fleet	Favors Facility
Off-peak load factor benefits.	Favors Facility
Reduced wear on coal plants due to ramping.	Favors Facility
Level of effort for project development.	Favors CTs
Financial community risk perception.	Favors CTs slightly
Risk of cost overruns.	Favors CTs
Fuel uncertainty risks.	Favors Facility
Construction and capital cost overrun risks.	Favors CTs
Long-term peaking power hedging vehicle	Favors Facility
Socioeconomic impacts in South Dakota	Favors Facility
Non-socioeconomic environmental impacts	May favor CTs slightly

Appendix A

Generating Units in MAPP-U.S. Study Region

Plant Name	Unit Number
Aberdeen	GT1
ACS - Drayton (AMCR)	1
ACS - East Grand Forks	1
ACS - East Grand Forks	2
AG Processing Inc.	1
Agassiz Beach	1
Agassiz Beach	2
Agassiz Beach	3
Algona	8
Algona	9
Algona	5
Algona	3
Algona	7
Algona	6
Algona	4
Alliant	1
Alma	3
Alma	2
Alma	5
Alma	4
Alma	1
Alta (ALTA)	3
Alta (ALTA)	1
Ames	8
Ames	7
Ames-Gt	GT1
Angus Anson	CT 2
Angus Anson	CT 1
Angus Anson	CT 3
Anita	1
Anita	2
Anita	3
Anita	4
Anita	5
Antelope Valley (BEPC)	2
Antelope Valley (BEPC)	1
Apple River	2
Apple River	3
Apple River	1
Arcadia (AREU)	6
Arcadia (AREU)	2
Arcadia (AREU)	4
Arcadia (AREU)	5
Arcadia (AREU)	1
Arcadia (AREU)	3
Argyle - AMEWD	4
Argyle - AMEWD	2A
Argyle - AMEWD	3
Argyle - AMEWD	HYD
Arpin Dam	3
Arpin Dam	1
Arpin Dam	2
Atlantic (ATLAN)	6
Atlantic (ATLAN)	1
Auburn (AUBU)	4A
Auburn (AUBU)	2
Auburn (AUBU)	5
Auburn (AUBU)	1
Auburn (AUBU)	7
Auburn (AUBU)	6
Autumn Hills	1-3
Barron	H2
Bay Front	6
Bay Front	5
Bay Front	4
Bellevue	7
Bellevue	4
Bellevue	1
Bellevue	6
Bellevue	5
Bemidji	H1
Bemidji	H2
Benkelman	2
Benkelman	1
Big Bend Project	6
Big Bend Project	3
Big Bend Project	7
Big Bend Project	5
Big Bend Project	4
Big Bend Project	2
Big Bend Project	1
Big Bend Project	8
Big Falls (NSP)	3
Big Falls (NSP)	2
Big Falls (NSP)	1
Big Stone	1
Big Stone	D1
Black Brook Dam	2
Black Brook Dam	1
Black Dog	CC
Black Dog	3
Black Dog	1
Black Dog	4
Black River Falls	HY2
Black River Falls	HY1
Blanchard	3
Blanchard	2
Blanchard	1
Blandin Paper Co. (Blapap)	ST1
Blandin Paper Co. (Blapap)	ST2

Plant Name	Unit Number
Blue Earth	IC6
Blue Lake	5
Blue Lake	2
Blue Lake	3
Blue Lake	1
Boise Cascade/International Fa	ST1
Boise Cascade/International Fa	ST2
Boise Cascade/International Fa	ST3
Boise Cascade/International Fa	ST4
Boise Cascade/International Fa	ST5
Boswell Energy Center	D4
Boswell Energy Center	4
Boswell Energy Center	3
Boswell Energy Center	1
Boswell Energy Center	2
Broadway Generation Plant	IC1
Broadway Generation Plant	IC2
Broadway Generation Plant	IC3
Broadway Generation Plant	IC4
Broadway Generation Plant	IC5
Broadway Generation Plant	IC6
Broken Bow	3
Broken Bow	5
Broken Bow	4
Broken Bow	6
Broken Bow	2
Broken Bow	1
Buffalo Ridge Wind Plant	ALL
Byllesby	ALL
C.W. Burdick	GT1
C.W. Burdick	GT2
C.W. Burdick	GT3
C.W. Burdick	3
C.W. Burdick	1
C.W. Burdick	2
Cambridge (GRERIV)	GT1
Canaday	1
Cascade (CASC)	3A
Cascade Creek	GT1
Cascade Creek	GT2
Cass County	1
Cass County	2
Cedar Falls (NSP)	2
Cedar Falls (NSP)	1
Cedar Falls (NSP)	3
Cedar Falls GT	1
Cedar Falls GT	2
Central (Wright)	1
Central Heating Plant (IOSTUN)	2
Central Heating Plant (IOSTUN)	4
Cerro Gordo Wind Project	1-55
Chanarambie Wind Plant	1-57
Chandler Wind Turbine	1-3
Chandler Wind Turbine	4-9
Chippewa Falls	6
Chippewa Falls	1
Chippewa Falls	3
Chippewa Falls	5
Chippewa Falls	4
Chippewa Falls	2
City Light & Water	2
City Light & Water	1
City of Hastings Hydroelectric	1
City of Hastings Hydroelectric	2
City of Wakefield	2456
Clam River Dam	1
Clam River Dam	2
Clark (NWPS)	1
Coal Creek	IC1
Coal Creek	2
Coal Creek	1
Columbus (LRPPD)	1
Columbus (LRPPD)	2
Columbus (LRPPD)	3
Cooper Station	1
Coralville	4
Coralville	2
Coralville	3
Coralville	1
Cordova Energy	CC
Cornell	3
Cornell	2
Cornell	4
Cornell	1
Cottage Grove Cogeneration Facility	CC
Council Bluffs	3
Council Bluffs	1
Council Bluffs	2
Coyote	1
Crete Mun Power	1
Crete Mun Power	4
Crete Mun Power	6
Crete Mun Power	5
Crete Mun Power	2
Crete Mun Power	3
Crete Mun Power	7
Cumberland (CUMB)	1
Cumberland (CUMB)	2
Cumberland (CUMB)	3
Cumberland (CUMB)	6

Plant Name	Unit Number
Cumberland (CUMB)	4
Cumberland (CUMB)	5
Danbury Dam	GT1
Danbury Dam	IC2
Danbury Dam	IC1
Danbury Dam	1
Danbury Dam	2
Danbury Dam	HY3
Davenport Water Pollution Control Plant	GEB2
Davenport Water Pollution Control Plant	GEN1
Davenport Water Pollution Control Plant	GEN2
David City Plant	5
David City Plant	6
David City Plant	7
David City Plant	4
David City Plant	1
David City Plant	2
David City Plant	3
Dayton (DLPD)	5
Dayton Hollow	2
Dayton Hollow	1
Delano	7
Delano	6
Delano	5
Delano	1
Delano	2
Delano	3
Dells	2
Dells	7
Dells	6
Dells	5
Dells	4
Dells	3
Dells	1
Des Moines - ADM	1
Des Moines Metro WWTP	1
Des Moines Metro WWTP	2
Des Moines Metro WWTP	3
Deshler	5
Deshler	2
Deshler	4
Detroit Lakes	1
Dodge Center	1-10
Dodge Center	11-26
Dodge Center	27-34
Don Henry	1
Duane Arnold	1
Duluth Paper Mill	1
Durant	4
Durant	5
Durant	7
Earl F. Wisdom	ST
East Fork	2
East Fork	1
East Hydro	1
East Hydro	3
East Hydro	2
East Plant (WVY)	3
East Plant (WVY)	4
East Plant (WVY)	2
Edgeley (North Dakota Wind Energy Center)	1-27
Edward Kramer and Sons landfill	1
Edward Kramer and Sons landfill	2
Edward Kramer and Sons landfill	3
Electrifarm	1
Electrifarm	3
Electrifarm	2
Elk City Station	GT1
Elk City Station	GT2
Elk City Station	GT3
Elk City Station	GT4
Elk Mound Station	GT1
Elk Mound Station	GT2
Elk River - UPA	3
Elk River - UPA	1
Elk River - UPA	2
Elroy	5
Emerson	3
Emerson	4
Emerson	2
Enderlin	1
Enderlin	2
Fair Station	1
Fair Station	2
Fairmont	6
Fairmont	7
Fairmont (SMMP)	1
Fairmont (SMMP)	2
Faulkton	1
Fennimore	6
Fennimore	7
Fennimore	8
Fergus Control Center	1
Flambeau	1
Flambeau (DPC)	3
Flambeau (DPC)	2
Flambeau (DPC)	1
Flambeau Mill	1
Flambeau Mill	2
Flambeau Mill	3

Plant Name	Unit Number
Flambeau Mill	4
Flambeau Mill	5
Flambeau Mill	6
Flambeau Mill	7
Flambeau Mill	8
Flambeau Mill	9
Flambeau Mill	10
Florence Hills	1-3
Flying Cloud	1 - 29
Fond Du Lac	1
Forest City	3
Forest City	2
Forest City	5
Forest City	1
Forest City	IC4
Fort Calhoun	1
Fort Peck	5
Fort Peck	1
Fort Peck	4
Fort Peck	3
Fort Peck	2
Fort Randall	4
Fort Randall	3
Fort Randall	7
Fort Randall	6
Fort Randall	5
Fort Randall	2
Fort Randall	1
Fort Randall	8
Franklin (FL&WD)	3
Franklin (FL&WD)	1
Franklin (FL&WD)	2
Franklin (FL&WD)	4
Franklin Heating Station	GEN1
Franklin Heating Station	GEN2
Franklin Heating Station	GEN3
Frederic Diesel	7
Frederic Diesel	4
Frederic Diesel	3
Frederic Diesel	2
Frederic Diesel	6
Frederic Diesel	5
Fremont 1	GT
French Island	4
French Island	3
French Island	1
French Island	2
Garrison	5
Garrison	1
Garrison	3
Garrison	4
Garrison	2
Gavins Point	2
Gavins Point	3
Gavins Point	1
Genoa	ST3
Gentleman	2
Gentleman	1
George Neal North	3
George Neal North	1
George Neal North	2
George Neal South	4
Glencoe	10
Glencoe	6
Glencoe	5
Glencoe	9
Glencoe	8
Glencoe	7
Glendive	GT1
Glendive	GT2
Gordon (DLP)	1
Gordon (DLP)	2
Gowrie	2
Gowrie	1
Graber Family Wind Farm	1-3
Grand Junction	2
Grand Junction	6
Grand Junction	1
Grand Rapids (BLAPOW)	ALL
Granite City	3
Granite City	1
Granite City	4
Granite City	2
Granite Falls	2
Granite Falls	HC3
Granite Falls	1
Grantsburg Diesel	1A
Grantsburg Diesel	4
Grantsburg Diesel	2
Grantsburg Diesel	3
Greater Des Moines Energy Center	GT1
Greater Des Moines Energy Center	GT2
Grimh	IC1
Grimh	3
Grimh	1
Hadley Ridge	1-3
Hallam	1
Hancock County	1-148
Hayward	1
Hebron	1

Plant Name	Unit Number
Hennepin Energy Resource Co.	ST
Hennepin Island	2
Hennepin Island	4
Hennepin Island	5
Hennepin Island	1
Hennepin Island	3
Heskett	2
Heskett	1
Hibbing	3
Hibbing	5
Hibbing	6
High Bridge	4
High Bridge	3
High Bridge	5
High Bridge	6
Highmore	1
Highmore	3
Highmore	2
Highmore (FPLENE)	1-27
Hillsboro (AMCR)	1
Holcombe	2
Holcombe	3
Holcombe	1
Holdrege	1
Holdrege	3
Holdrege	2
Hoot Lake	D1
Hoot Lake	D2
Hoot Lake	3
Hoot Lake	1
Hoot Lake	2
Hoot Lake	H1
Hope Creek	1-3
Hopkinton	IC2
Hopkinton	IC3
Hopkinton	1
Huron	2A
Huron	1
Hutchinson Plant 1	6
Hutchinson Plant 1	5
Hutchinson Plant 1	8
Hutchinson Plant 1	7
Hutchinson Plant 1	4
Hutchinson Plant 1	3
Hutchinson Plant 1	2
Hutchinson Plant 2	9
Hutchinson Plant 2	1
Independence IA	1B
Independence IA	4A
Independence IA	4B
Independence IA	8
Independence IA	9
Independence IA	4
Independence IA	1
Independence IA	7
Independence IA	6
Independence IA	5
Indianola	7
Indianola	2
Indianola	5
Indianola	4
Indianola	3
Indianola	6
Indianola	1
International Falls Power Comp	ALL
Inver Hills	2
Inver Hills	3
Inver Hills	5
Inver Hills	1
Inver Hills	4
Inver Hills	6
Inver Hills	7
Inver Hills	8
Iowa Distributed Wind Generation Project	1
Iowa Distributed Wind Generation Project	2
Iowa Distributed Wind Generation Project	3
Iowa Methodist Medical Center	1
Iowa Methodist Medical Center	2
Iowa Methodist Medical Center	3
J.P. Madgett	1
Jack River	1-3
Jamestown	1
Jamestown	2
Janesville	4
Janesville	1
Janesville	2
Janesville	3
Jeffrey	1
Jeffrey	2
Jessica Mills	1-3
Jim Falls	HC2
Jim Falls	HC1
Jim Falls	MSF
John Deere Harvester Works	1
John Deere Harvester Works	2
John Deere Harvester Works	3
John Deere Harvester Works	4
Johnson 1	2
Johnson 1	1
Johnson 2	1

Plant Name	Unit Number
Jones Street	2
Jones Street	1
Julia Hills	1-3
Kearney	1
Kenyon Municipal	7
Kenyon Municipal	6
Kenyon Municipal	5
Key City	4
Key City	3
Key City	2
Key City	1
Kimball Wind	WT
King	1
Kingsley	1
Knife Falls	1
Knife Falls	2
Knife Falls	3
Knoxville Industrial (Midam)	1
Knoxville Industrial (Midam)	2
Knoxville Industrial (Midam)	3
Knoxville Industrial (Midam)	4
Knoxville Industrial (Midam)	5
Knoxville Industrial (Midam)	6
Knoxville Industrial (Midam)	7
Knoxville Industrial (Midam)	8
Kulm Wind Farm	1-14
La Farge	4
La Porte	3A
La Porte	4A
LAC Courte Oreilles Hydroelect	1
LAC Courte Oreilles Hydroelect	2
LAC Courte Oreilles Hydroelect	3
Ladysmith	2
Ladysmith	1
Ladysmith	3
Lake Benton I Wind Power Facility	1-143
Lake Benton II Wind Power Facility	1-138
Lake Crystal	5
Lake Crystal	4
Lake Crystal	1
Lake Crystal	3
Lake Park	2
Lake Preston	GT1
Lake Road (AQUILA)	6
Lake Road (AQUILA)	7
Lake Road (AQUILA)	5
Lake Road (AQUILA)	3
Lake Road (AQUILA)	2
Lake Road (AQUILA)	1
Lake Road (AQUILA)	4
Lake Zumbro-RPU	1
Lakefield Junction Generation Facility	GT1
Lakefield Junction Generation Facility	GT2
Lakefield Junction Generation Facility	GT3
Lakefield Junction Generation Facility	GT4
Lakefield Junction Generation Facility	GT5
Lakefield Junction Generation Facility	GT6
Lakefield Utilities	1
Lakefield Utilities	2
Lakefield Utilities	3
Lakefield Utilities	4
Lakefield Utilities	5
Lakota Ridge Wind Plant	1-15
Lamoni	6
Lamoni	1
Lamoni	3
Lamoni	4
Lamoni	5
Lamoni	2
Laskin Energy Center	1
Laskin Energy Center	2
Leland Olds	2
Leland Olds	1
Lenox WT	1
Lewis & Clark	1
Lincoln (ADM)	1
Lincoln J Street	1
Little Falls (MPL)	6
Little Falls (MPL)	1
Little Falls (MPL)	5
Little Falls (MPL)	2
Little Falls (MPL)	3
Little Falls (MPL)	4
Lodgepole	2
Lodgepole	1
Louisa (MID)	1
Lundquist	1
Lundquist	2
Lundquist	3
Lundquist	4
Lundquist	5
Lundquist	6
Lundquist	7
Lundquist	8
Lundquist	9
Lundquist	10
Lyons Plant	1
Lyons Plant	3
Lyons Plant	2
M.L. Hibbard	4

Plant Name	Unit Number
M.L. Hibbard	3
Madelia	3
Madelia	4
Madelia	5
Madelia	2
Madison Plant (NPPD)	4
Madison Plant (NPPD)	3
Madison Plant (NPPD)	1
Madison Plant (NPPD)	2
Madison Utilities	FM1
Madison Utilities	FM2
Madison Utilities	FM3
Madison Utilities	FM4
Mandan Refinery	1
Mandan Refinery	2
Mandan Refinery	3
Mankato	GT
Mankato (ADM)	1
Mankato (ADM)	2
Manning	1
Manning	4
Manning	2
Maple Lake	GT1
Maquoketa - MMP	4A
Maquoketa - MMP	9
Maquoketa - MMP	2
Maquoketa - MMP	8
Maquoketa - MMP	7
Maquoketa - MMP	5
Maquoketa - MMP	1
Maquoketa - MMP	3
Maquoketa - MMP	6
Market Street Energy Company	ST
Marshall Wind Farm	1-5
McCook	1
McGregor	1
McGregor	3
McGregor	2
Melrose Wastewater	EG
Menomonie	2
Menomonie	1
Merrillan	2
Merrillan	1
Metro Park East Landfill Gas R	1
Metro Park East Landfill Gas R	2
Metro Park East Landfill Gas R	3
Metro Park East Landfill Gas R	4
Metro Park East Landfill Gas R	5
Metro Park East Landfill Gas R	6
Metro Park East Landfill Gas R	7
Metro Park East Landfill Gas R	8
Miles City - CT	1
Milford (MILFO)	5
Milford (MILFO)	6
Milford (MILFO)	7
Minnesota River Station	GT
Minnesota Valley	3
Minot	1
Minot	2
Minwind I	1
Minwind I	2
Minwind II	1
Minwind II	2
Missouri River Wastewater Treatment Plant	ALL
Mobile (NWPS)	2
Mobile (NWPS)	1
Moline (MIDAM)	GT1
Moline (MIDAM)	GT3
Moline (MIDAM)	GT2
Moline (MIDAM)	GT4
Moline (MIDAM)	HY1
Moline (MIDAM)	HY2
Moline (MIDAM)	HY3
Moline (MIDAM)	HY4
Monroe (LRPPD)	2
Monroe (LRPPD)	1
Monroe (LRPPD)	3
Montezuma (MONT)	9
Montezuma (MONT)	8
Monticello (NMC)	1
Moorhead - MHPSD	6
Moorhead Wind Turbines	1
Moorhead Wind Turbines	2
Moraine Wind Power Project	1-34
Mosinee Paper Corporation Pul	HYD1
Mosinee Paper Corporation Pul	HYD2
Mosinee Paper Corporation Pul	HYD3
Mosinee Paper Corporation Pul	GEN1
Mosinee Paper Corporation Pul	WEST
Mount Pleasant	4
Mount Pleasant	D
Mountain Lake	6
Mountain Lake	7
Muscatine (MPW)	8
Muscatine (MPW)	7
Muscatine (MPW)	9
Muscatine (MPW)	8A
Nancy	1
Nancy	2
Nebraska City - NEB	13

Plant Name	Unit Number
Nebraska City - NEB	8
Nebraska City - NEB	9
Nebraska City - NEB	10
Nebraska City - NEB	3
Nebraska City - NEB	5
Nebraska City - NEB	4
Nebraska City - NEB	2
Nebraska City - NEB	11
Nebraska City - NEB	12
Nebraska City - OPPD	1
New Hampton	7
New Hampton	8
New Hampton	3
New Hampton	5
New Hampton	4
New Lisbon (Nlmun)	1
New Lisbon (Nlmun)	4
New Lisbon (Nlmun)	3
New Lisbon (Nlmun)	5
New Lisbon (Nlmun)	2
New Prague	1
New Prague	5
New Ulm	5
New Ulm	3
New Ulm	4
New Ulm	6
Nimeca Diesels	ALL
North Denver	4
North Denver	5
North Omaha	4
North Omaha	3
North Omaha	1
North Omaha	5
North Omaha	2
North Plant	10
North Plant	7
North Plant	8
North Plant	6
North Plant	9
North Plant	5
North Platte	2
North Platte	1
Northeast (Downtown)	5
Northeast (Downtown)	4
Northeast (Downtown)	3
Northeast (Downtown)	2
Northeast Station	1
Northome Wood Plant	1
Northwest Wind	GEN1
Northwest Wind	GEN2
Oahe	3
Oahe	4
Oahe	5
Oahe	7
Oahe	1
Oahe	2
Oahe	6
Olmsted Waste-Energy Facility	TG2
Olmsted Waste-Energy Facility	TG1
Ord Plant	3
Ord Plant	2
Ord Plant	1
Osage (OSAG)	7
Osage (OSAG)	6
Osage (OSAG)	5
Osage (OSAG)	8
Oxford (OXFOR)	3
Oxford (OXFOR)	4
Oxford (OXFOR)	2
Oxford (OXFOR)	5
Papillion Creek Wastewater Treatment Plant	1
Pathfinder	1
Pella	5
Pella	6
Pender	3
Pender	5
Pender	4
Pender	2
Pender	1
Perham Resource Recovery Facility	1
Pillager	2
Pillager	1
Pine Bend	1
Pisgah	1
Platte	1
Pleasant Hill (MIDAM)	3
Pleasant Hill (MIDAM)	1
Pleasant Hill (MIDAM)	2
Pleasant Valley Station	GT1
Pleasant Valley Station	GT2
Pleasant Valley Station	GT3
Potlatch Cloquet Cogen	ST
Potlatch Corp Minnesota Pulp & Paper Div.	VPLS
Potlatch Corp Minnesota Pulp & Paper Div.	1
Potlatch Corp Minnesota Pulp & Paper Div.	2
Potlatch Corp Minnesota Pulp & Paper Div.	3
Potlatch Corp Minnesota Pulp & Paper Div.	4
Potlatch Corp Minnesota Pulp & Paper Div.	5
Potlatch Corp Minnesota Pulp-Paper Div	HGN5
Potlatch Corp Minnesota Pulp-Paper Div	HGN6

Plant Name	Unit Number
Potlatch Corp Minnesota Pulp-Paper Div	HGN7
Potlatch Corp Minnesota Pulp-Paper Div	GEN3
Potlatch Corp Minnesota Pulp-Paper Div	GEN4
Potlatch Corp Minnesota Wood Products Div.	1
Powell Falls	1
Prairie Island	1
Prairie Island	2
Prairie River	2
Prairie River	1
Prairiewinds	WT1
Prairiewinds	WT2
Rapidan Hydroelectric Facility	ALL
Red Wing	2
Red Wing	1
Redfield	3
Redfield	2
Redfield	1
Redwood Falls	1
Renville	0001
River Falls (Junction)	8
River Falls (Junction)	6
River Falls (Junction)	5
River Falls (Junction)	7
River Falls (Junction)	9
River Falls (Junction)	10
River Falls (Junction)	1
River Falls (Junction)	2U
River Hills	3
River Hills	1
River Hills	8
River Hills	5
River Hills	7
River Hills	4
River Hills	6
River Hills	2
Riverdale (NSP)	2
Riverdale (NSP)	1
Riverside (MIDAM)	3HS
Riverside (MIDAM)	5
Riverside (NSP)	8
Riverside (NSP)	ST7
Rochester Hydro	1
Rochester Hydro	2
Rock Lake	1
Rockford (RMLP)	6
Rokeby	2
Rokeby	D1
Rokeby	1
Rosebud WT	1
Ruthton Ridge	1-3
Saint Marys Hospital Power Pl	1
Saint Marys Hospital Power Pl	3
Salt Valley Generating Station	3
Salt Valley Generating Station	2
Salt Valley Generating Station	1
Salt Valley Wind	1
Salt Valley Wind	2
Sarpy	BSD
Sarpy	1
Sarpy	2
Sarpy	3
Sarpy	GT1
Sarpy	GT2
Sarpy	GT3
Sarpy	GT4
Sartell Mill	ABB2
Sartell Mill	2
Sartell Mill	3
Sartell Mill	4
Sartell Mill	5
Sartell Mill	6
Sartell Mill	7
Sartell Mill	8
Sartell Mill	9
Sartell Mill	10
Sartell Mill	11
Sartell Mill	12
Saxon Falls	2
Saxon Falls	1
Scanlon	4
Scanlon	2
Scanlon	1
Scanlon	3
Shaokatan Hills Wind Plant	1-18
Shaokatan Power Partners	1-2
Sheldon (NPPD)	2
Sheldon (NPPD)	1
Shenandoah	1
Shenandoah	2
Shenandoah	3
Shenandoah	4
Shenandoah	5
Shenandoah	6
Shenandoah	7
Shenandoah	8
Shenandoah	9
Shenandoah	10
Sherburne	2
Sherburne	3
Sherburne	1

Plant Name	Unit Number
Sibley No One	2
Sibley No One	3
Sibley No One	4
Sibley Wind Farm	1
Sibley Wind Farm	2
Silver Bay Power Co.	GEN1
Silver Bay Power Co.	GEN2
Silver Lake (RPU)	4
Silver Lake (RPU)	1
Silver Lake (RPU)	2
Silver Lake (RPU)	3
Skeets 1	11
Sleepy Eye	5
Sleepy Eye	3
Soliloquoy Ridge	1-3
Solon Diesel	6
Solon Diesel	7
Solon Diesel	8
Solway Power Plant	1
South Plant	1
South Plant	2
South Plant	3
South Plant	4
South Plant	5
Spalding (SPALD)	5
Spalding (SPALD)	6
Spalding (SPALD)	4
Spalding (SPALD)	2
Spalding (SPALD)	1
Spartan Hills	1-3
Spencer (NPPD)	2
Spencer (NPPD)	1
Spencer (SPENCE)	GT1
Spirit Mound	2
Spirit Mound	1
Spring Valley	1
Spring Valley	2
Spring Valley	3
Springview Wind Project	1
Springview Wind Project	2
St Cloud Hydroelectric Generating Facility	ALL
St Croix Waste-To-Energy Fcty	1
St. Bonifacius	1
St. Croix Falls	8
St. Croix Falls	6
St. Croix Falls	3
St. Croix Falls	7
St. Croix Falls	5
St. Croix Falls	4
St. Croix Falls	2
St. Croix Falls	1
Stanton (GRERIV)	2
Stanton (GRERIV)	10
Stanton (GRERIV)	1
State Center	4
State Center	1
State Center	2
State Center	3
State Center	6
Storm Lake I Wind Power	1-107
Storm Lake II Wind Power	1-150
Strawberry Point	6
Strawberry Point	4
Strawberry Point	3
Streeter Station	7
Streeter Station	6
Stuart (STU)	5
Summit Lake	CC1
Summit Lake	IC2
Summit Lake	IC1
Summit Lake	IC5
Summit Lake	IC4
Sun River	1-3
Superior Falls	2
Superior Falls	1
Sutherland Plant	3
Sutherland Plant	4
Sutherland Plant	1
Sutherland Plant	2
Sycamore (MIDAM)	1
Sycamore (MIDAM)	2
Sylvan	2
Sylvan	3
Sylvan	1
Syracuse (NEB)	6
Syracuse (NEB)	7
Taconite Harbor Power Plant	1
Taconite Harbor Power Plant	2
Taconite Harbor Power Plant	3
Taplin Gorge	1
Tecumseh	6
Tecumseh	4
Tecumseh	3
Tecumseh	2
Tecumseh	1
Thief River Falls	HY1
Thief River Falls	HY2
Thomson	6
Thomson	4
Thomson	5
Thomson	3
Thomson	2
Thomson	1
Thornapple	1
Thornapple	2

Plant Name	Unit Number
Top Deck Holstein	GT
Trego	1
Trego	2
Truman	3
Truman	4
Truman	5
Truman	2
Truman	1
Truman	6
Tsar Nicholas	1-3
Twin Cities Assembly Plant	ALL
Twin Lake Hills	1-3
United Health Care	1
United Health Care	2
United Hospital 1	1
United Hospital 1	2
United Hospital 1	3
University of Iowa - Main Powe	ST1
University of Iowa - Main Powe	ST2
University of Iowa - Main Powe	ST3
University of Northern Iowa	1
Viking Project	1-8
Virginia	1A
Virginia	5
Virginia	6
Wakefield Plant	5
Wakefield Plant	IC4
Wakefield Plant	6
Wakefield Plant	2
Wall Lake WT	WT
Waterloo (MIDAM)	1
Waterloo (MIDAM)	2
Waterloo (MIDAM)	3
Waterloo (MIDAM)	4
Waterloo (MIDAM)	5
Waterloo (MIDAM)	6
Waterloo (MIDAM)	7
Waterloo (MIDAM)	8
Waterloo (MIDAM)	9
Waterloo (MIDAM)	10
Watertown	1
Wayne (WAYN)	3
Wayne (WAYN)	5
Wayne (WAYN)	6
Wayne (WAYN)	4
Wayne (WAYN)	2
Wayne (WAYN)	1
Webster (NWPS)	1
Webster (NWPS)	2
West Bend (WBMPP)	4
West Bend (WBMPP)	1
West Bend (WBMPP)	3
West Faribault	2
West Faribault	3
West Liberty	2
West Liberty	3
West Liberty	1
Western Sugar Company - Bayard	1
Westroads Shopping Center	1
Westroads Shopping Center	2
Westroads Shopping Center	3
Wheaton	5
Wheaton	3
Wheaton	2
Wheaton	4
Wheaton	1
Wheaton	6
Whelan Energy Center	1
White River (NSP)	1
White River (NSP)	2
White River (RVLP)	1
White River (RVLP)	2
Wilber - WILB	6
Williston	2
Williston	3
Willmar	3
Willmar	ST2
Willmar	ST1
Willmarth	2
Willmarth	1
Wilmont Hills	1
Winter Spawn	1-3
Winton	3
Winton	2
Wissota	6
Wissota	5
Wissota	2
Wissota	4
Wissota	3
Wissota	1
Woodlake Sanitary Services, Inc.	1
Woodlake Sanitary Services, Inc.	2
Woodlake Sanitary Services, Inc.	3
Woodstock Wind Plant	1-17
Worthington	1-4
Wright (FRE)	6
Wright (FRE)	8
Wright (FRE)	7
Yankton New	4
Yankton New	2
Yankton New	3
Yankton New	1
Young	1
Young	2

Appendix B
Bus-Bar Sheets for CTs and Pumped Storage Facility

Pumped Storage Bus-Bar Calculation - 20% Capacity Factor

Plant Input Data			Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)		1,762,342	First Year Staffing ($ 1,000)	5,015.0	3.0%
Total Net Capacity (kW)		1,200,000	Annual O&M Costs ($ 1,000)	10,627	3.0%
Capacity Factor		20.0%	First Year Coal Cost ($/MBtu)	0.997	2.5%
Transmission Tariff ($/kW-mo) ; % Losse	$ 1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost		10,862	Levelized Fixed Charge Rate	10.17%	
			Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	179,301	5,015	10,627	14,400	0.997	31,886	5,946	247,174	247,174	12.38	12.38
2011	179,301	5,165	10,946	14,400	1.022	32,683	6,124	248,619	228,931	12.45	11.46
2012	179,301	5,320	11,274	14,400	1.048	33,500	6,308	250,103	212,060	12.52	10.62
2013	179,301	5,480	11,612	14,400	1.074	34,337	6,497	251,627	196,457	12.60	9.84
2014	179,301	5,644	11,961	18,276	1.101	35,196	6,692	257,069	184,812	12.87	9.25
2015	179,301	5,814	12,320	14,400	1.128	36,076	6,893	254,802	168,676	12.76	8.45
2016	179,301	5,988	12,689	14,400	1.157	36,978	7,099	256,455	156,326	12.84	7.83
2017	179,301	6,168	13,070	14,400	1.186	37,902	7,312	258,153	144,900	12.93	7.25
2018	179,301	6,353	13,462	14,400	1.215	38,850	7,532	259,897	134,327	13.01	6.73
2019	179,301	6,543	13,866	14,400	1.246	39,821	7,758	261,688	124,542	13.10	6.24
2020	179,301	6,740	14,282	14,400	1.277	40,816	7,990	263,529	115,486	13.19	5.78
2021	179,301	6,942	14,710	14,400	1.309	41,837	8,230	265,420	107,104	13.29	5.36
2022	179,301	7,150	15,152	14,400	1.341	42,883	8,477	267,362	99,344	13.39	4.97
2023	179,301	7,365	15,606	14,400	1.375	43,955	8,731	269,358	92,160	13.49	4.61
2024	179,301	7,586	16,074	41,560	1.409	45,054	8,993	298,568	94,064	14.95	4.71
2025	179,301	7,813	16,557	14,400	1.444	46,180	9,263	273,513	79,347	13.69	3.97
2026	179,301	8,048	17,053	14,400	1.481	47,334	9,541	275,677	73,642	13.80	3.69
2027	179,301	8,289	17,565	14,400	1.518	48,518	9,827	277,900	68,357	13.91	3.42
2028	179,301	8,538	18,092	14,400	1.556	49,731	10,122	280,183	63,461	14.03	3.18
2029	179,301	8,794	18,635	14,400	1.594	50,974	10,426	282,529	58,924	14.15	2.95
2030	179,301	9,058	19,194	14,400	1.634	52,248	10,738	284,939	54,721	14.27	2.74
2031	179,301	9,329	19,769	14,400	1.675	53,555	11,061	287,415	50,826	14.39	2.54
2032	179,301	9,609	20,363	14,400	1.717	54,893	11,392	289,958	47,215	14.52	2.36
2033	179,301	9,898	20,973	14,400	1.760	56,266	11,734	292,571	43,868	14.65	2.20
2034	179,301	10,195	21,603	271,408	1.804	57,672	12,086	552,265	76,249	27.65	3.82
2035	179,301	10,500	22,251	14,400	1.849	59,114	12,449	298,015	37,887	14.92	1.90
2036	179,301	10,815	22,918	14,400	1.895	60,592	12,822	300,848	35,219	15.06	1.76
2037	179,301	11,140	23,606	14,400	1.943	62,107	13,207	303,760	32,744	15.21	1.64
2038	179,301	11,474	24,314	14,400	1.991	63,659	13,603	306,751	30,447	15.36	1.52
2039	179,301	11,818	25,043	116,419	2.041	65,251	14,011	411,844	37,642	20.62	1.88
2040	0	12,173	25,795	14,400	2.092	66,882	14,432	133,681	11,251	6.69	0.56
2041	0	12,538	26,569	14,400	2.144	68,554	14,864	136,925	10,611	6.86	0.53
2042	0	12,914	27,366	14,400	2.198	70,268	15,310	140,258	10,009	7.02	0.50
2043	0	13,302	28,187	14,400	2.253	72,025	15,770	143,683	9,441	7.19	0.47
2044	0	13,701	29,032	23,808	2.309	73,825	16,243	156,609	9,475	7.84	0.47
2045	0	14,112	29,903	14,400	2.367	75,671	16,730	150,816	8,402	7.55	0.42
2046	0	14,535	30,800	14,400	2.426	77,563	17,232	154,530	7,928	7.74	0.40
2047	0	14,971	31,724	14,400	2.487	79,502	17,749	158,346	7,480	7.93	0.37
2048	0	15,420	32,676	14,400	2.549	81,490	18,281	162,267	7,058	8.12	0.35
2049	0	15,883	33,656	14,400	2.613	83,527	18,830	166,295	6,661	8.33	0.33
2050	0	16,359	34,666	14,400	2.678	85,615	19,395	170,435	6,286	8.53	0.31
2051	0	16,850	35,706	14,400	2.745	87,755	19,977	174,688	5,933	8.75	0.30
2052	0	17,355	36,777	14,400	2.813	89,949	20,576	179,058	5,599	8.97	0.28
2053	0	17,876	37,880	14,400	2.884	92,198	21,193	183,548	5,285	9.19	0.26
2054	0	18,412	39,017	80,325	2.956	94,503	21,829	254,086	6,737	12.72	0.34
2055	0	18,965	40,187	14,400	3.030	96,865	22,484	192,901	4,710	9.66	0.24
2056	0	19,534	41,393	14,400	3.106	99,287	23,158	197,772	4,446	9.90	0.22
2057	0	20,120	42,635	14,400	3.183	101,769	23,853	202,777	4,198	10.15	0.21
2058	0	20,723	43,914	14,400	3.263	104,313	24,569	207,919	3,963	10.41	0.20
2059	0	21,345	45,231	14,400	3.344	106,921	25,306	213,203	3,742	10.67	0.19
									Net Levelized Cost (c/kWh		**13.04**
									Net Levelized Cost ($000s)		**260,478**

Pumped Storage Bus-Bar Calculation - 20% Capacity Factor

Plant Input Data			Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)		1,136,411	First Year Staffing ($ 1,000)	4,179.2	3.0%
Total Net Capacity (kW)		600,000	Annual O&M Costs ($ 1,000)	8,000	3.0%
Capacity Factor		20.0%	First Year Coal Cost ($/MBtu)	0.997	2.5%
Transmission Tariff ($/kW-mo) ; % Losses	$ 1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost		10,862	Levelized Fixed Charge Rate	10.17%	
			Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	115,618	4,179	8,000	7,200	0.997	15,943	2,973	153,913	153,913	15.41	15.41
2011	115,618	4,305	8,240	7,200	1.022	16,341	3,062	154,766	142,511	15.50	14.27
2012	115,618	4,434	8,487	7,200	1.048	16,750	3,154	155,643	131,969	15.59	13.21
2013	115,618	4,567	8,742	7,200	1.074	17,169	3,248	156,544	122,221	15.68	12.24
2014	115,618	4,704	9,004	9,138	1.101	17,598	3,346	159,408	114,602	15.96	11.48
2015	115,618	4,845	9,274	7,200	1.128	18,038	3,446	158,422	104,873	15.86	10.50
2016	115,618	4,990	9,553	7,200	1.157	18,489	3,550	159,400	97,165	15.96	9.73
2017	115,618	5,140	9,839	7,200	1.186	18,951	3,656	160,405	90,034	16.06	9.02
2018	115,618	5,294	10,134	7,200	1.215	19,425	3,766	161,437	83,438	16.17	8.36
2019	115,618	5,453	10,438	7,200	1.246	19,910	3,879	162,499	77,336	16.27	7.74
2020	115,618	5,616	10,752	7,200	1.277	20,408	3,995	163,590	71,690	16.38	7.18
2021	115,618	5,785	11,074	7,200	1.309	20,918	4,115	164,711	66,465	16.49	6.66
2022	115,618	5,959	11,406	7,200	1.341	21,441	4,238	165,863	61,630	16.61	6.17
2023	115,618	6,137	11,748	7,200	1.375	21,977	4,366	167,047	57,155	16.73	5.72
2024	115,618	6,321	12,101	20,780	1.409	22,527	4,497	181,844	57,290	18.21	5.74
2025	115,618	6,511	12,464	7,200	1.444	23,090	4,632	169,515	49,177	16.97	4.92
2026	115,618	6,706	12,838	7,200	1.481	23,667	4,770	170,800	45,626	17.10	4.57
2027	115,618	6,908	13,223	7,200	1.518	24,259	4,914	172,121	42,338	17.24	4.24
2028	115,618	7,115	13,620	7,200	1.556	24,865	5,061	173,479	39,293	17.37	3.93
2029	115,618	7,328	14,028	7,200	1.594	25,487	5,213	174,875	36,472	17.51	3.65
2030	115,618	7,548	14,449	7,200	1.634	26,124	5,369	176,309	33,859	17.65	3.39
2031	115,618	7,775	14,883	7,200	1.675	26,777	5,530	177,783	31,439	17.80	3.15
2032	115,618	8,008	15,329	7,200	1.717	27,447	5,696	179,298	29,196	17.95	2.92
2033	115,618	8,248	15,789	7,200	1.760	28,133	5,867	180,855	27,117	18.11	2.72
2034	115,618	8,495	16,263	135,704	1.804	28,836	6,043	310,960	42,933	31.14	4.30
2035	115,618	8,750	16,751	7,200	1.849	29,557	6,224	184,101	23,405	18.44	2.34
2036	115,618	9,013	17,253	7,200	1.895	30,296	6,411	185,791	21,750	18.60	2.18
2037	115,618	9,283	17,771	7,200	1.943	31,053	6,603	187,529	20,215	18.78	2.02
2038	115,618	9,562	18,304	7,200	1.991	31,830	6,802	189,315	18,791	18.96	1.88
2039	115,618	9,849	18,853	58,210	2.041	32,625	7,006	242,161	22,133	24.25	2.22
2040	0	10,144	19,418	7,200	2.092	33,441	7,216	77,419	6,516	7.75	0.65
2041	0	10,448	20,001	7,200	2.144	34,277	7,432	79,359	6,150	7.95	0.62
2042	0	10,762	20,601	7,200	2.198	35,134	7,655	81,352	5,805	8.15	0.58
2043	0	11,085	21,219	7,200	2.253	36,012	7,885	83,401	5,480	8.35	0.55
2044	0	11,417	21,856	11,904	2.309	36,913	8,121	90,211	5,458	9.03	0.55
2045	0	11,760	22,511	7,200	2.367	37,836	8,365	87,672	4,884	8.78	0.49
2046	0	12,112	23,187	7,200	2.426	38,781	8,616	89,897	4,612	9.00	0.46
2047	0	12,476	23,882	7,200	2.487	39,751	8,874	92,184	4,355	9.23	0.44
2048	0	12,850	24,599	7,200	2.549	40,745	9,141	94,534	4,112	9.47	0.41
2049	0	13,236	25,337	7,200	2.613	41,763	9,415	96,951	3,883	9.71	0.39
2050	0	13,633	26,097	7,200	2.678	42,807	9,697	99,434	3,667	9.96	0.37
2051	0	14,042	26,880	7,200	2.745	43,878	9,988	101,987	3,464	10.21	0.35
2052	0	14,463	27,686	7,200	2.813	44,975	10,288	104,611	3,271	10.48	0.33
2053	0	14,897	28,517	7,200	2.884	46,099	10,597	107,309	3,090	10.75	0.31
2054	0	15,344	29,372	40,163	2.956	47,251	10,914	143,044	3,793	14.32	0.38
2055	0	15,804	30,253	7,200	3.030	48,433	11,242	112,932	2,757	11.31	0.28
2056	0	16,278	31,161	7,200	3.106	49,644	11,579	115,862	2,605	11.60	0.26
2057	0	16,766	32,096	7,200	3.183	50,885	11,927	118,873	2,461	11.90	0.25
2058	0	17,269	33,059	7,200	3.263	52,157	12,284	121,969	2,325	12.21	0.23
2059	0	17,788	34,050	7,200	3.344	53,461	12,653	125,151	2,197	12.53	0.22
									Net Levelized Cost (c/kWh)		**16.10**
									Net Levelized Cost ($000s)		**160,733**

GE LM6000 CT Bus-Bar Calculation - 20% Capacity Factor

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	31,010	First Year Fixed O&M ($ 1,000)	466.5	3.0%
Total Net Capacity (kW)	43,700	First Year Variable O&M ($/MWh)	10.16	3.0%
Capacity Factor	20.0%	First Year NG Cost ($/MBtu)	4.25	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	8,990	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	3,700	466	778	4.25	2,927	7,871	7,871		10.28	10.28
2011	3,700	480	801	4.54	3,126	8,108	7,466		10.59	9.75
2012	3,700	495	825	4.85	3,340	8,359	7,088		10.92	9.26
2013	3,700	510	850	5.18	3,567	8,627	6,735		11.27	8.80
2014	3,700	525	875	5.54	3,811	8,911	6,406		11.64	8.37
2015	3,700	541	902	5.91	4,070	9,213	6,099		12.03	7.97
2016	3,700	557	929	6.08	4,184	9,369	5,711		12.24	7.46
2017	3,700	574	957	6.25	4,300	9,530	5,349		12.45	6.99
2018	3,700	591	985	6.42	4,420	9,696	5,011		12.66	6.55
2019	3,700	609	1,015	6.60	4,543	9,867	4,696		12.89	6.13
2020	3,700	627	1,045	6.78	4,670	10,042	4,401		13.12	5.75
2021	3,700	646	1,077	6.99	4,813	10,235	4,130		13.37	5.39
2022	3,700	665	1,109	7.21	4,960	10,434	3,877		13.63	5.06
2023	3,700	685	1,142	7.43	5,112	10,639	3,640		13.90	4.75
2024	3,700	706	1,176	7.65	5,268	10,850	3,418		14.17	4.46
2025	3,700	727	1,212	7.89	5,429	11,068	3,211		14.46	4.19
2026	3,700	749	1,248	8.23	5,664	11,360	3,035		14.84	3.96
2027	3,700	771	1,286	8.58	5,909	11,665	2,869		15.24	3.75
2028	3,700	794	1,324	8.96	6,164	11,982	2,714		15.65	3.54
2029	3,700	818	1,364	9.34	6,431	12,312	2,568		16.08	3.35
2030	0	843	1,405	9.75	6,709	8,956	1,720		11.70	2.25
2031	0	868	1,447	10.17	6,999	9,313	1,647		12.16	2.15
2032	0	894	1,490	10.61	7,301	9,685	1,577		12.65	2.06
2033	0	921	1,535	11.07	7,617	10,072	1,510		13.16	1.97
2034	0	948	1,581	11.54	7,946	10,475	1,446		13.68	1.89
2035	6,859	977	1,629	12.04	8,290	17,754	2,257		23.19	2.95
2036	6,859	1,006	1,677	12.56	8,648	18,191	2,129		23.76	2.78
2037	6,859	1,036	1,728	13.11	9,022	18,645	2,010		24.35	2.63
2038	6,859	1,067	1,780	13.67	9,412	19,118	1,898		24.97	2.48
2039	6,859	1,099	1,833	14.27	9,819	19,610	1,792		25.61	2.34
2040	6,859	1,132	1,888	14.88	10,243	20,123	1,694		26.28	2.21
2041	6,859	1,166	1,945	15.53	10,686	20,656	1,601		26.98	2.09
2042	6,859	1,201	2,003	16.20	11,148	21,211	1,514		27.70	1.98
2043	6,859	1,237	2,063	16.90	11,630	21,789	1,432		28.46	1.87
2044	6,859	1,274	2,125	17.63	12,133	22,391	1,355		29.25	1.77
2045	6,859	1,313	2,189	18.39	12,657	23,018	1,282		30.06	1.67
2046	6,859	1,352	2,254	19.18	13,204	23,670	1,214		30.92	1.59
2047	6,859	1,393	2,322	20.01	13,775	24,349	1,150		31.80	1.50
2048	6,859	1,434	2,392	20.88	14,370	25,056	1,090		32.73	1.42
2049	6,859	1,477	2,463	21.78	14,992	25,792	1,033		33.69	1.35
2050	6,859	1,522	2,537	22.72	15,640	26,558	979		34.69	1.28
2051	6,859	1,567	2,613	23.70	16,316	27,356	929		35.73	1.21
2052	6,859	1,614	2,692	24.73	17,021	28,187	881		36.82	1.15
2053	6,859	1,663	2,772	25.80	17,757	29,052	837		37.95	1.09
2054	6,859	1,713	2,856	26.91	18,525	29,952	794		39.12	1.04
2055	0	1,764	2,941	28.08	19,326	24,031	587		31.39	0.77
2056	0	1,817	3,030	29.29	20,161	25,008	562		32.66	0.73
2057	0	1,872	3,120	30.56	21,033	26,024	539		33.99	0.70
2058	0	1,928	3,214	31.88	21,942	27,083	516		35.37	0.67
2059	0	1,985	3,310	33.26	22,890	28,186	495		36.81	0.65
							Net Levelized Cost (c/kWh)			**14.17**
							Net Levelized Cost ($000s)			**10,847**

GE 7EA CT Bus-Bar Calculation - 20% Capacity Factor

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	44,403	First Year Fixed O&M ($ 1,000)	286.5	3.0%
Total Net Capacity (kW)	85,400	First Year Variable O&M ($/MWh)	3.93	3.0%
Capacity Factor	20.0%	First Year NG Cost ($/MBtu)	4.25	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	11,560	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	5,298	287	588	4.25	7,355	13,528	13,528		9.04	9.04
2011	5,298	295	606	4.54	7,856	14,055	12,942		9.39	8.65
2012	5,298	304	624	4.85	8,392	14,618	12,395		9.77	8.28
2013	5,298	313	643	5.18	8,964	15,218	11,882		10.17	7.94
2014	5,298	323	662	5.54	9,576	15,858	11,401		10.60	7.62
2015	5,298	332	682	5.91	10,229	16,541	10,950		11.06	7.32
2016	5,298	342	703	6.08	10,514	16,856	10,275		11.27	6.87
2017	5,298	352	724	6.25	10,806	17,180	9,643		11.48	6.45
2018	5,298	363	745	6.42	11,107	17,514	9,052		11.71	6.05
2019	5,298	374	768	6.60	11,417	17,856	8,498		11.93	5.68
2020	5,298	385	791	6.78	11,735	18,208	7,979		12.17	5.33
2021	5,298	397	815	6.99	12,094	18,603	7,507		12.43	5.02
2022	5,298	409	839	7.21	12,464	19,009	7,063		12.70	4.72
2023	5,298	421	864	7.43	12,845	19,428	6,647		12.98	4.44
2024	5,298	433	890	7.65	13,238	19,859	6,257		13.27	4.18
2025	5,298	446	917	7.89	13,643	20,304	5,890		13.57	3.94
2026	5,298	460	944	8.23	14,233	20,935	5,592		13.99	3.74
2027	5,298	474	973	8.58	14,848	21,592	5,311		14.43	3.55
2028	5,298	488	1,002	8.96	15,490	22,277	5,046		14.89	3.37
2029	5,298	502	1,032	9.34	16,159	22,992	4,795		15.37	3.20
2030	0	518	1,063	9.75	16,858	18,438	3,541		12.32	2.37
2031	0	533	1,095	10.17	17,587	19,215	3,398		12.84	2.27
2032	0	549	1,128	10.61	18,347	20,024	3,261		13.38	2.18
2033	0	566	1,161	11.07	19,140	20,867	3,129		13.95	2.09
2034	0	582	1,196	11.54	19,968	21,746	3,002		14.53	2.01
2035	9,822	600	1,232	12.04	20,831	32,485	4,130		21.71	2.76
2036	9,822	618	1,269	12.56	21,731	33,440	3,915		22.35	2.62
2037	9,822	636	1,307	13.11	22,671	34,436	3,712		23.02	2.48
2038	9,822	656	1,346	13.67	23,651	35,475	3,521		23.71	2.35
2039	9,822	675	1,387	14.27	24,673	36,557	3,341		24.43	2.23
2040	9,822	696	1,428	14.88	25,740	37,686	3,172		25.19	2.12
2041	9,822	716	1,471	15.53	26,853	38,862	3,012		25.97	2.01
2042	9,822	738	1,515	16.20	28,013	40,088	2,861		26.79	1.91
2043	9,822	760	1,561	16.90	29,224	41,367	2,718		27.65	1.82
2044	9,822	783	1,608	17.63	30,488	42,700	2,584		28.54	1.73
2045	9,822	806	1,656	18.39	31,806	44,090	2,456		29.47	1.64
2046	9,822	830	1,706	19.18	33,181	45,539	2,336		30.44	1.56
2047	9,822	855	1,757	20.01	34,615	47,049	2,223		31.45	1.49
2048	9,822	881	1,809	20.88	36,112	48,624	2,115		32.50	1.41
2049	9,822	907	1,864	21.78	37,673	50,266	2,013		33.60	1.35
2050	9,822	935	1,920	22.72	39,301	51,977	1,917		34.74	1.28
2051	9,822	963	1,977	23.70	41,000	53,762	1,826		35.93	1.22
2052	9,822	992	2,037	24.73	42,773	55,623	1,739		37.18	1.16
2053	9,822	1,021	2,098	25.80	44,622	57,563	1,658		38.47	1.11
2054	9,822	1,052	2,161	26.91	46,551	59,585	1,580		39.82	1.06
2055	0	1,084	2,225	28.08	48,563	51,872	1,266		34.67	0.85
2056	0	1,116	2,292	29.29	50,662	54,071	1,216		36.14	0.81
2057	0	1,150	2,361	30.56	52,853	56,363	1,167		37.67	0.78
2058	0	1,184	2,432	31.88	55,137	58,753	1,120		39.27	0.75
2059	0	1,220	2,505	33.26	57,521	61,245	1,075		40.93	0.72
							Net Levelized Cost (c/kWh)			**13.32**
							Net Levelized Cost ($000s)			**19,934**

GE 7FA CT Bus-Bar Calculation - 20% Capacity Factor

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	73,998	First Year Fixed O&M ($ 1,000)	360.8	3.0%
Total Net Capacity (kW)	171,700	First Year Variable O&M ($/MWh)	5.13	3.0%
Capacity Factor	20.0%	First Year NG Cost ($/MBtu)	4.25	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	10,450	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	8,829	361	1,543	4.25	13,367	24,100	24,100		8.01	8.01
2011	8,829	372	1,589	4.54	14,279	25,068	23,083		8.33	7.67
2012	8,829	383	1,637	4.85	15,252	26,101	22,131		8.68	7.36
2013	8,829	394	1,686	5.18	16,293	27,202	21,238		9.04	7.06
2014	8,829	406	1,737	5.54	17,404	28,375	20,399		9.43	6.78
2015	8,829	418	1,789	5.91	18,590	29,626	19,612		9.85	6.52
2016	8,829	431	1,843	6.08	19,108	30,210	18,415		10.04	6.12
2017	8,829	444	1,898	6.25	19,640	30,811	17,294		10.24	5.75
2018	8,829	457	1,955	6.42	20,187	31,428	16,243		10.45	5.40
2019	8,829	471	2,013	6.60	20,750	32,062	15,259		10.66	5.07
2020	8,829	485	2,074	6.78	21,327	32,715	14,337		10.88	4.77
2021	8,829	499	2,136	6.99	21,980	33,444	13,496		11.12	4.49
2022	8,829	514	2,200	7.21	22,652	34,196	12,706		11.37	4.22
2023	8,829	530	2,266	7.43	23,345	34,970	11,965		11.62	3.98
2024	8,829	546	2,334	7.65	24,060	35,768	11,269		11.89	3.75
2025	8,829	562	2,404	7.89	24,796	36,591	10,615		12.16	3.53
2026	8,829	579	2,476	8.23	25,868	37,752	10,085		12.55	3.35
2027	8,829	596	2,550	8.58	26,986	38,961	9,584		12.95	3.19
2028	8,829	614	2,627	8.96	28,153	40,222	9,110		13.37	3.03
2029	8,829	633	2,706	9.34	29,370	41,537	8,663		13.81	2.88
2030	0	652	2,787	9.75	30,639	34,078	6,544		11.33	2.18
2031	0	671	2,871	10.17	31,964	35,506	6,279		11.80	2.09
2032	0	691	2,957	10.61	33,345	36,994	6,024		12.30	2.00
2033	0	712	3,045	11.07	34,787	38,545	5,779		12.81	1.92
2034	0	733	3,137	11.54	36,291	40,161	5,545		13.35	1.84
2035	16,368	756	3,231	12.04	37,860	58,214	7,401		19.35	2.46
2036	16,368	778	3,328	12.56	39,496	59,970	7,020		19.94	2.33
2037	16,368	802	3,428	13.11	41,204	61,801	6,662		20.54	2.21
2038	16,368	826	3,530	13.67	42,985	63,709	6,324		21.18	2.10
2039	16,368	850	3,636	14.27	44,843	65,698	6,005		21.84	2.00
2040	16,368	876	3,745	14.88	46,782	67,771	5,704		22.53	1.90
2041	16,368	902	3,858	15.53	48,804	69,932	5,419		23.25	1.80
2042	16,368	929	3,974	16.20	50,914	72,185	5,151		24.00	1.71
2043	16,368	957	4,093	16.90	53,115	74,533	4,897		24.78	1.63
2044	16,368	986	4,216	17.63	55,411	76,980	4,658		25.59	1.55
2045	16,368	1,015	4,342	18.39	57,807	79,532	4,431		26.44	1.47
2046	16,368	1,046	4,472	19.18	60,306	82,191	4,217		27.32	1.40
2047	16,368	1,077	4,606	20.01	62,913	84,964	4,014		28.24	1.33
2048	16,368	1,109	4,745	20.88	65,632	87,854	3,821		29.21	1.27
2049	16,368	1,143	4,887	21.78	68,470	90,867	3,640		30.21	1.21
2050	16,368	1,177	5,034	22.72	71,429	94,008	3,467		31.25	1.15
2051	16,368	1,212	5,185	23.70	74,517	97,282	3,304		32.34	1.10
2052	16,368	1,249	5,340	24.73	77,739	100,695	3,149		33.47	1.05
2053	16,368	1,286	5,500	25.80	81,099	104,254	3,002		34.66	1.00
2054	16,368	1,325	5,665	26.91	84,605	107,963	2,863		35.89	0.95
2055	0	1,365	5,835	28.08	88,263	95,463	2,331		31.73	0.77
2056	0	1,405	6,010	29.29	92,078	99,494	2,237		33.07	0.74
2057	0	1,448	6,191	30.56	96,059	103,697	2,147		34.47	0.71
2058	0	1,491	6,376	31.88	100,211	108,079	2,060		35.93	0.68
2059	0	1,536	6,568	33.26	104,544	112,647	1,977		37.45	0.66
							Net Levelized Cost (c/kWh)			**11.92**
							Net Levelized Cost ($000s)			**35,872**

GE 7FA CT Bus-Bar Calculation - 20% Capacity Factor

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	73,998	First Year Fixed O&M ($ 1,000)	360.8	3.0%
Total Net Capacity (kW)	171,700	First Year Variable O&M ($/MWh)	5.13	3.0%
Capacity Factor	15.0%	First Year NG Cost ($/MBtu)	4.25	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	10,450	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	8,829	361	1,157	4.25	10,025	20,372	20,372		9.03	9.03
2011	8,829	372	1,192	4.54	10,709	21,101	19,430		9.35	8.61
2012	8,829	383	1,228	4.85	11,439	21,879	18,551		9.70	8.22
2013	8,829	394	1,265	5.18	12,219	22,707	17,728		10.06	7.86
2014	8,829	406	1,303	5.54	13,053	23,590	16,959		10.46	7.52
2015	8,829	418	1,342	5.91	13,943	24,531	16,240		10.87	7.20
2016	8,829	431	1,382	6.08	14,331	24,973	15,222		11.07	6.75
2017	8,829	444	1,423	6.25	14,730	25,426	14,272		11.27	6.33
2018	8,829	457	1,466	6.42	15,141	25,892	13,382		11.48	5.93
2019	8,829	471	1,510	6.60	15,562	26,372	12,551		11.69	5.56
2020	8,829	485	1,555	6.78	15,996	26,865	11,773		11.91	5.22
2021	8,829	499	1,602	6.99	16,485	27,415	11,063		12.15	4.90
2022	8,829	514	1,650	7.21	16,989	27,982	10,397		12.40	4.61
2023	8,829	530	1,700	7.43	17,509	28,567	9,774		12.66	4.33
2024	8,829	546	1,751	7.65	18,045	29,170	9,190		12.93	4.07
2025	8,829	562	1,803	7.89	18,597	29,791	8,642		13.20	3.83
2026	8,829	579	1,857	8.23	19,401	30,666	8,192		13.59	3.63
2027	8,829	596	1,913	8.58	20,239	31,577	7,767		14.00	3.44
2028	8,829	614	1,970	8.96	21,114	32,528	7,367		14.42	3.27
2029	8,829	633	2,029	9.34	22,027	33,518	6,991		14.86	3.10
2030	0	652	2,090	9.75	22,979	25,721	4,940		11.40	2.19
2031	0	671	2,153	10.17	23,973	26,797	4,739		11.88	2.10
2032	0	691	2,218	10.61	25,009	27,918	4,546		12.37	2.01
2033	0	712	2,284	11.07	26,090	29,086	4,361		12.89	1.93
2034	0	733	2,353	11.54	27,218	30,304	4,184		13.43	1.85
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							Net Levelized Cost (c/kWh)			**11.20**
							Net Levelized Cost ($000s)			**25,279**

Pumped Storage Bus-Bar Calculation - 10% Capacity Factor

Plant Input Data				Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)			1,762,342	First Year Staffing ($ 1,000)	5,015.0	3.0%
Total Net Capacity (kW)			1,200,000	Annual O&M Costs ($ 1,000)	10,627	3.0%
Capacity Factor			10.0%	First Year Coal Cost ($/MBtu)	0.997	2.5%
Transmission Tariff ($/kW-mo) ; % Losses	$	1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost			10,862	Levelized Fixed Charge Rate	10.17%	
				Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	179,301	5,015	10,627	14,400	0.997	15,943	2,973	228,258	228,258	22.86	22.86
2011	179,301	5,165	10,946	14,400	1.022	16,341	3,062	229,215	211,064	22.95	21.14
2012	179,301	5,320	11,274	14,400	1.048	16,750	3,154	230,199	195,184	23.05	19.54
2013	179,301	5,480	11,612	14,400	1.074	17,169	3,248	231,210	180,517	23.15	18.08
2014	179,301	5,644	11,961	18,276	1.101	17,598	3,346	236,126	169,755	23.64	17.00
2015	179,301	5,814	12,320	14,400	1.128	18,038	3,446	233,318	154,454	23.36	15.47
2016	179,301	5,988	12,689	14,400	1.157	18,489	3,550	234,417	142,892	23.47	14.31
2017	179,301	6,168	13,070	14,400	1.186	18,951	3,656	235,546	132,211	23.59	13.24
2018	179,301	6,353	13,462	14,400	1.215	19,425	3,766	236,706	122,341	23.70	12.25
2019	179,301	6,543	13,866	14,400	1.246	19,910	3,879	237,899	113,220	23.82	11.34
2020	179,301	6,740	14,282	14,400	1.277	20,408	3,995	239,126	104,792	23.95	10.49
2021	179,301	6,942	14,710	14,400	1.309	20,918	4,115	240,386	97,002	24.07	9.71
2022	179,301	7,150	15,152	14,400	1.341	21,441	4,238	241,682	89,802	24.20	8.99
2023	179,301	7,365	15,606	14,400	1.375	21,977	4,366	243,015	83,147	24.33	8.33
2024	179,301	7,586	16,074	41,560	1.409	22,527	4,497	271,544	85,551	27.19	8.57
2025	179,301	7,813	16,557	14,400	1.444	23,090	4,632	245,792	71,305	24.61	7.14
2026	179,301	8,048	17,053	14,400	1.481	23,667	4,770	247,239	66,045	24.76	6.61
2027	179,301	8,289	17,565	14,400	1.518	24,259	4,914	248,727	61,181	24.91	6.13
2028	179,301	8,538	18,092	14,400	1.556	24,865	5,061	250,257	56,682	25.06	5.68
2029	179,301	8,794	18,635	14,400	1.594	25,487	5,213	251,829	52,522	25.22	5.26
2030	179,301	9,058	19,194	14,400	1.634	26,124	5,369	253,445	48,673	25.38	4.87
2031	179,301	9,329	19,769	14,400	1.675	26,777	5,530	255,107	45,112	25.55	4.52
2032	179,301	9,609	20,363	14,400	1.717	27,447	5,696	256,815	41,818	25.72	4.19
2033	179,301	9,898	20,973	14,400	1.760	28,133	5,867	258,572	38,770	25.89	3.88
2034	179,301	10,195	21,603	271,408	1.804	28,836	6,043	517,385	71,433	51.81	7.15
2035	179,301	10,500	22,251	14,400	1.849	29,557	6,224	262,233	33,338	26.26	3.34
2036	179,301	10,815	22,918	14,400	1.895	30,296	6,411	264,141	30,922	26.45	3.10
2037	179,301	11,140	23,606	14,400	1.943	31,053	6,603	266,103	28,684	26.65	2.87
2038	179,301	11,474	24,314	14,400	1.991	31,830	6,802	268,120	26,613	26.85	2.66
2039	179,301	11,818	25,043	116,419	2.041	32,625	7,006	372,213	34,019	37.27	3.41
2040	0	12,173	25,795	14,400	2.092	33,441	7,216	93,024	7,829	9.32	0.78
2041	0	12,538	26,569	14,400	2.144	34,277	7,432	95,216	7,379	9.53	0.74
2042	0	12,914	27,366	14,400	2.198	35,134	7,655	97,469	6,955	9.76	0.70
2043	0	13,302	28,187	14,400	2.253	36,012	7,885	99,785	6,557	9.99	0.66
2044	0	13,701	29,032	23,808	2.309	36,913	8,121	111,575	6,751	11.17	0.68
2045	0	14,112	29,903	14,400	2.367	37,836	8,365	104,615	5,828	10.48	0.58
2046	0	14,535	30,800	14,400	2.426	38,781	8,616	107,133	5,496	10.73	0.55
2047	0	14,971	31,724	14,400	2.487	39,751	8,874	109,721	5,183	10.99	0.52
2048	0	15,420	32,676	14,400	2.549	40,745	9,141	112,381	4,888	11.25	0.49
2049	0	15,883	33,656	14,400	2.613	41,763	9,415	115,117	4,611	11.53	0.46
2050	0	16,359	34,666	14,400	2.678	42,807	9,697	117,930	4,349	11.81	0.44
2051	0	16,850	35,706	14,400	2.745	43,878	9,988	120,822	4,103	12.10	0.41
2052	0	17,355	36,777	14,400	2.813	44,975	10,288	123,795	3,871	12.40	0.39
2053	0	17,876	37,880	14,400	2.884	46,099	10,597	126,852	3,653	12.70	0.37
2054	0	18,412	39,017	80,325	2.956	47,251	10,914	195,920	5,195	19.62	0.52
2055	0	18,965	40,187	14,400	3.030	48,433	11,242	133,227	3,253	13.34	0.33
2056	0	19,534	41,393	14,400	3.106	49,644	11,579	136,549	3,070	13.67	0.31
2057	0	20,120	42,635	14,400	3.183	50,885	11,927	139,966	2,897	14.02	0.29
2058	0	20,723	43,914	14,400	3.263	52,157	12,284	143,478	2,735	14.37	0.27
2059	0	21,345	45,231	14,400	3.344	53,461	12,653	147,090	2,582	14.73	0.26
									Net Levelized Cost (c/kWh)		**23.49**
									Net Levelized Cost ($000s)		**234,589**

Pumped Storage Bus-Bar Calculation - 10% Capacity Factor

Plant Input Data			Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)		1,136,411	First Year Staffing ($ 1,000)	4,179.2	3.0%
Total Net Capacity (kW)		600,000	Annual O&M Costs ($ 1,000)	8,000	3.0%
Capacity Factor		10.0%	First Year Coal Cost ($/MBtu)	0.997	2.5%
Transmission Tariff ($/kW-mo) ; % Losses	$ 1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost		10,862	Levelized Fixed Charge Rate	10.17%	
			Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	115,618	4,179	8,000	7,200	0.997	7,971	1,486	144,456	144,456	28.93	28.93
2011	115,618	4,305	8,240	7,200	1.022	8,171	1,531	145,065	133,577	29.05	26.75
2012	115,618	4,434	8,487	7,200	1.048	8,375	1,577	145,691	123,530	29.18	24.74
2013	115,618	4,567	8,742	7,200	1.074	8,584	1,624	146,336	114,251	29.31	22.88
2014	115,618	4,704	9,004	9,138	1.101	8,799	1,673	148,936	107,073	29.83	21.44
2015	115,618	4,845	9,274	7,200	1.128	9,019	1,723	147,680	97,762	29.58	19.58
2016	115,618	4,990	9,553	7,200	1.157	9,244	1,775	148,380	90,448	29.72	18.11
2017	115,618	5,140	9,839	7,200	1.186	9,475	1,828	149,101	83,690	29.86	16.76
2018	115,618	5,294	10,134	7,200	1.215	9,712	1,883	149,842	77,445	30.01	15.51
2019	115,618	5,453	10,438	7,200	1.246	9,955	1,939	150,604	71,675	30.16	14.35
2020	115,618	5,616	10,752	7,200	1.277	10,204	1,998	151,388	66,343	30.32	13.29
2021	115,618	5,785	11,074	7,200	1.309	10,459	2,058	152,194	61,414	30.48	12.30
2022	115,618	5,959	11,406	7,200	1.341	10,721	2,119	153,023	56,859	30.65	11.39
2023	115,618	6,137	11,748	7,200	1.375	10,989	2,183	153,876	52,648	30.82	10.54
2024	115,618	6,321	12,101	20,780	1.409	11,263	2,248	168,333	53,034	33.71	10.62
2025	115,618	6,511	12,464	7,200	1.444	11,545	2,316	155,654	45,156	31.17	9.04
2026	115,618	6,706	12,838	7,200	1.481	11,834	2,385	156,581	41,828	31.36	8.38
2027	115,618	6,908	13,223	7,200	1.518	12,129	2,457	157,535	38,750	31.55	7.76
2028	115,618	7,115	13,620	7,200	1.556	12,433	2,530	158,516	35,903	31.75	7.19
2029	115,618	7,328	14,028	7,200	1.594	12,743	2,606	159,525	33,271	31.95	6.66
2030	115,618	7,548	14,449	7,200	1.634	13,062	2,685	160,562	30,835	32.16	6.18
2031	115,618	7,775	14,883	7,200	1.675	13,389	2,765	161,629	28,582	32.37	5.72
2032	115,618	8,008	15,329	7,200	1.717	13,723	2,848	162,727	26,497	32.59	5.31
2033	115,618	8,248	15,789	7,200	1.760	14,066	2,934	163,855	24,568	32.82	4.92
2034	115,618	8,495	16,263	135,704	1.804	14,418	3,022	293,520	40,525	58.78	8.12
2035	115,618	8,750	16,751	7,200	1.849	14,779	3,112	166,210	21,131	33.29	4.23
2036	115,618	9,013	17,253	7,200	1.895	15,148	3,206	167,438	19,601	33.53	3.93
2037	115,618	9,283	17,771	7,200	1.943	15,527	3,302	168,701	18,185	33.79	3.64
2038	115,618	9,562	18,304	7,200	1.991	15,915	3,401	169,999	16,874	34.05	3.38
2039	115,618	9,849	18,853	58,210	2.041	16,313	3,503	222,345	20,322	44.53	4.07
2040	0	10,144	19,418	7,200	2.092	16,721	3,608	57,091	4,805	11.43	0.96
2041	0	10,448	20,001	7,200	2.144	17,139	3,716	58,504	4,534	11.72	0.91
2042	0	10,762	20,601	7,200	2.198	17,567	3,828	59,957	4,278	12.01	0.86
2043	0	11,085	21,219	7,200	2.253	18,006	3,942	61,452	4,038	12.31	0.81
2044	0	11,417	21,856	11,904	2.309	18,456	4,061	67,694	4,096	13.56	0.82
2045	0	11,760	22,511	7,200	2.367	18,918	4,183	64,571	3,597	12.93	0.72
2046	0	12,112	23,187	7,200	2.426	19,391	4,308	66,198	3,396	13.26	0.68
2047	0	12,476	23,882	7,200	2.487	19,875	4,437	67,871	3,206	13.59	0.64
2048	0	12,850	24,599	7,200	2.549	20,372	4,570	69,592	3,027	13.94	0.61
2049	0	13,236	25,337	7,200	2.613	20,882	4,707	71,361	2,858	14.29	0.57
2050	0	13,633	26,097	7,200	2.678	21,404	4,849	73,182	2,699	14.66	0.54
2051	0	14,042	26,880	7,200	2.745	21,939	4,994	75,054	2,549	15.03	0.51
2052	0	14,463	27,686	7,200	2.813	22,487	5,144	76,980	2,407	15.42	0.48
2053	0	14,897	28,517	7,200	2.884	23,049	5,298	78,961	2,274	15.81	0.46
2054	0	15,344	29,372	40,163	2.956	23,626	5,457	113,961	3,022	22.82	0.61
2055	0	15,804	30,253	7,200	3.030	24,216	5,621	83,095	2,029	16.64	0.41
2056	0	16,278	31,161	7,200	3.106	24,822	5,790	85,250	1,917	17.07	0.38
2057	0	16,766	32,096	7,200	3.183	25,442	5,963	87,468	1,811	17.52	0.36
2058	0	17,269	33,059	7,200	3.263	26,078	6,142	89,749	1,711	17.97	0.34
2059	0	17,788	34,050	7,200	3.344	26,730	6,326	92,095	1,616	18.44	0.32
									Net Levelized Cost (c/kWh)		**29.60**
									Net Levelized Cost ($000s)		**147,789**

GE LM6000 CT Bus-Bar Calculation - 10% Capacity Factor

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	31,010	First Year Fixed O&M ($ 1,000)	466.5	3.0%
Total Net Capacity (kW)	43,700	First Year Variable O&M ($/MWh)	10.16	3.0%
Capacity Factor	10.0%	First Year NG Cost ($/MBtu)	4.25	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	8,990	Levelized Fixed Charge Rate	11.93%	

Year	Capital	Fixed O&M	Variable O&M	Fuel (NG) Rate	Fuel (NG) Cost	Total Cost	PW Total Cost	Other	Busbar Cost	Net PW Cost
	($ 1,000)	($ 1,000)	($ 1,000)	($/MBtu)	($ 1,000)	($ 1,000)	($ 1,000)	($ 1,000)	(c/kWh)	(c/kWh)
2010	3,700	466	389	4.25	1,463	6,019	6,019		15.72	15.72
2011	3,700	480	401	4.54	1,563	6,144	5,658		16.05	14.78
2012	3,700	495	413	4.85	1,670	6,277	5,322		16.40	13.90
2013	3,700	510	425	5.18	1,784	6,418	5,011		16.77	13.09
2014	3,700	525	438	5.54	1,905	6,568	4,722		17.16	12.33
2015	3,700	541	451	5.91	2,035	6,727	4,453		17.57	11.63
2016	3,700	557	464	6.08	2,092	6,813	4,153		17.80	10.85
2017	3,700	574	478	6.25	2,150	6,902	3,874		18.03	10.12
2018	3,700	591	493	6.42	2,210	6,993	3,615		18.27	9.44
2019	3,700	609	507	6.60	2,272	7,088	3,373		18.51	8.81
2020	3,700	627	523	6.78	2,335	7,184	3,148		18.77	8.22
2021	3,700	646	538	6.99	2,406	7,290	2,942		19.04	7.68
2022	3,700	665	554	7.21	2,480	7,399	2,749		19.33	7.18
2023	3,700	685	571	7.43	2,556	7,512	2,570		19.62	6.71
2024	3,700	706	588	7.65	2,634	7,628	2,403		19.93	6.28
2025	3,700	727	606	7.89	2,715	7,747	2,247		20.24	5.87
2026	3,700	749	624	8.23	2,832	7,904	2,112		20.65	5.52
2027	3,700	771	643	8.58	2,954	8,068	1,985		21.08	5.18
2028	3,700	794	662	8.96	3,082	8,238	1,866		21.52	4.87
2029	3,700	818	682	9.34	3,215	8,415	1,755		21.98	4.58
2030	0	843	702	9.75	3,354	4,899	941		12.80	2.46
2031	0	868	723	10.17	3,499	5,091	900		13.30	2.35
2032	0	894	745	10.61	3,651	5,290	861		13.82	2.25
2033	0	921	768	11.07	3,808	5,497	824		14.36	2.15
2034	0	948	791	11.54	3,973	5,712	789		14.92	2.06
2035	6,859	977	814	12.04	4,145	12,795	1,627		33.42	4.25
2036	6,859	1,006	839	12.56	4,324	13,028	1,525		34.03	3.98
2037	6,859	1,036	864	13.11	4,511	13,270	1,430		34.67	3.74
2038	6,859	1,067	890	13.67	4,706	13,522	1,342		35.32	3.51
2039	6,859	1,099	916	14.27	4,909	13,784	1,260		36.01	3.29
2040	6,859	1,132	944	14.88	5,122	14,057	1,183		36.72	3.09
2041	6,859	1,166	972	15.53	5,343	14,341	1,111		37.46	2.90
2042	6,859	1,201	1,001	16.20	5,574	14,636	1,044		38.23	2.73
2043	6,859	1,237	1,031	16.90	5,815	14,943	982		39.03	2.56
2044	6,859	1,274	1,062	17.63	6,066	15,262	923		39.87	2.41
2045	6,859	1,313	1,094	18.39	6,329	15,595	869		40.74	2.27
2046	6,859	1,352	1,127	19.18	6,602	15,941	818		41.64	2.14
2047	6,859	1,393	1,161	20.01	6,888	16,300	770		42.58	2.01
2048	6,859	1,434	1,196	20.88	7,185	16,675	725		43.56	1.89
2049	6,859	1,477	1,232	21.78	7,496	17,064	683		44.58	1.79
2050	6,859	1,522	1,269	22.72	7,820	17,469	644		45.63	1.68
2051	6,859	1,567	1,307	23.70	8,158	17,891	608		46.74	1.59
2052	6,859	1,614	1,346	24.73	8,511	18,330	573		47.88	1.50
2053	6,859	1,663	1,386	25.80	8,879	18,787	541		49.08	1.41
2054	6,859	1,713	1,428	26.91	9,262	19,262	511		50.32	1.33
2055	0	1,764	1,471	28.08	9,663	12,898	315		33.69	0.82
2056	0	1,817	1,515	29.29	10,080	13,412	302		35.04	0.79
2057	0	1,872	1,560	30.56	10,516	13,948	289		36.44	0.75
2058	0	1,928	1,607	31.88	10,971	14,506	277		37.89	0.72
2059	0	1,985	1,655	33.26	11,445	15,086	265		39.41	0.69
							Net Levelized Cost (c/kWh)			**19.96**
							Net Levelized Cost ($000s)			**7,639**

GE 7EA CT Bus-Bar Calculation - 10% Capacity Factor

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	44,403	First Year Fixed O&M ($ 1,000)	286.5	3.0%
Total Net Capacity (kW)	85,400	First Year Variable O&M ($/MWh)	3.93	3.0%
Capacity Factor	10.0%	First Year NG Cost ($/MBtu)	4.25	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	11,560	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	5,298	287	294	4.25	3,677	9,556	9,556		12.77	12.77
2011	5,298	295	303	4.54	3,928	9,824	9,046		13.13	12.09
2012	5,298	304	312	4.85	4,196	10,110	8,572		13.51	11.46
2013	5,298	313	322	5.18	4,482	10,415	8,131		13.92	10.87
2014	5,298	323	331	5.54	4,788	10,739	7,721		14.36	10.32
2015	5,298	332	341	5.91	5,114	11,085	7,338		14.82	9.81
2016	5,298	342	351	6.08	5,257	11,248	6,856		15.04	9.17
2017	5,298	352	362	6.25	5,403	11,415	6,407		15.26	8.56
2018	5,298	363	373	6.42	5,554	11,587	5,989		15.49	8.01
2019	5,298	374	384	6.60	5,708	11,764	5,599		15.72	7.48
2020	5,298	385	395	6.78	5,867	11,946	5,235		15.97	7.00
2021	5,298	397	407	6.99	6,047	12,149	4,902		16.24	6.55
2022	5,298	409	420	7.21	6,232	12,358	4,592		16.52	6.14
2023	5,298	421	432	7.43	6,422	12,573	4,302		16.81	5.75
2024	5,298	433	445	7.65	6,619	12,795	4,031		17.10	5.39
2025	5,298	446	458	7.89	6,821	13,024	3,778		17.41	5.05
2026	5,298	460	472	8.23	7,116	13,346	3,565		17.84	4.77
2027	5,298	474	486	8.58	7,424	13,682	3,365		18.29	4.50
2028	5,298	488	501	8.96	7,745	14,031	3,178		18.76	4.25
2029	5,298	502	516	9.34	8,080	14,396	3,002		19.24	4.01
2030	0	518	531	9.75	8,429	9,478	1,820		12.67	2.43
2031	0	533	547	10.17	8,793	9,874	1,746		13.20	2.33
2032	0	549	564	10.61	9,174	10,286	1,675		13.75	2.24
2033	0	566	581	11.07	9,570	10,716	1,607		14.32	2.15
2034	0	582	598	11.54	9,984	11,164	1,541		14.92	2.06
2035	9,822	600	616	12.04	10,415	21,453	2,727		28.68	3.65
2036	9,822	618	635	12.56	10,866	21,940	2,568		29.33	3.43
2037	9,822	636	654	13.11	11,335	22,447	2,420		30.01	3.23
2038	9,822	656	673	13.67	11,825	22,976	2,281		30.71	3.05
2039	9,822	675	693	14.27	12,337	23,527	2,150		31.45	2.87
2040	9,822	696	714	14.88	12,870	24,101	2,028		32.22	2.71
2041	9,822	716	736	15.53	13,426	24,700	1,914		33.02	2.56
2042	9,822	738	758	16.20	14,007	25,324	1,807		33.85	2.42
2043	9,822	760	780	16.90	14,612	25,974	1,707		34.72	2.28
2044	9,822	783	804	17.63	15,244	26,652	1,613		35.63	2.16
2045	9,822	806	828	18.39	15,903	27,359	1,524		36.57	2.04
2046	9,822	830	853	19.18	16,590	28,095	1,441		37.56	1.93
2047	9,822	855	878	20.01	17,308	28,863	1,363		38.58	1.82
2048	9,822	881	905	20.88	18,056	29,663	1,290		39.65	1.72
2049	9,822	907	932	21.78	18,836	30,497	1,222		40.77	1.63
2050	9,822	935	960	22.72	19,651	31,367	1,157		41.93	1.55
2051	9,822	963	989	23.70	20,500	32,273	1,096		43.14	1.47
2052	9,822	992	1,018	24.73	21,386	33,218	1,039		44.40	1.39
2053	9,822	1,021	1,049	25.80	22,311	34,203	985		45.72	1.32
2054	9,822	1,052	1,080	26.91	23,275	35,229	934		47.09	1.25
2055	0	1,084	1,113	28.08	24,282	26,478	646		35.39	0.86
2056	0	1,116	1,146	29.29	25,331	27,593	620		36.88	0.83
2057	0	1,150	1,180	30.56	26,426	28,756	595		38.44	0.80
2058	0	1,184	1,216	31.88	27,569	29,969	571		40.06	0.76
2059	0	1,220	1,252	33.26	28,761	31,232	548		41.75	0.73
							Net Levelized Cost (c/kWh)			**17.19**
							Net Levelized Cost ($000s)			**12,863**

GE 7FA CT Bus-Bar Calculation - 10% Capacity Factor

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	73,998	First Year Fixed O&M ($ 1,000)	360.8	3.0%
Total Net Capacity (kW)	171,700	First Year Variable O&M ($/MWh)	5.13	3.0%
Capacity Factor	10.0%	First Year NG Cost ($/MBtu)	4.25	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	10,450	Levelized Fixed Charge Rate	11.93%	

Year	Capital	Fixed O&M	Variable O&M	Fuel (NG) Rate	Fuel (NG) Cost	Total Cost	PW Total Cost	Other	Busbar Cost	Net PW Cost
	($ 1,000)	($ 1,000)	($ 1,000)	($/MBtu)	($ 1,000)	($ 1,000)	($ 1,000)	($ 1,000)	(c/kWh)	(c/kWh)
2010	8,829	361	772	4.25	6,684	16,645	16,645		11.07	11.07
2011	8,829	372	795	4.54	7,139	17,134	15,777		11.39	10.49
2012	8,829	383	819	4.85	7,626	17,656	14,971		11.74	9.95
2013	8,829	394	843	5.18	8,146	18,212	14,219		12.11	9.45
2014	8,829	406	868	5.54	8,702	18,805	13,519		12.50	8.99
2015	8,829	418	894	5.91	9,295	19,437	12,867		12.92	8.55
2016	8,829	431	921	6.08	9,554	19,735	12,030		13.12	8.00
2017	8,829	444	949	6.25	9,820	20,042	11,249		13.32	7.48
2018	8,829	457	977	6.42	10,094	20,357	10,521		13.53	7.00
2019	8,829	471	1,007	6.60	10,375	20,681	9,842		13.75	6.54
2020	8,829	485	1,037	6.78	10,664	21,014	9,209		13.97	6.12
2021	8,829	499	1,068	6.99	10,990	21,386	8,630		14.22	5.74
2022	8,829	514	1,100	7.21	11,326	21,769	8,089		14.47	5.38
2023	8,829	530	1,133	7.43	11,673	22,164	7,583		14.74	5.04
2024	8,829	546	1,167	7.65	12,030	22,571	7,111		15.01	4.73
2025	8,829	562	1,202	7.89	12,398	22,991	6,670		15.29	4.43
2026	8,829	579	1,238	8.23	12,934	23,580	6,299		15.68	4.19
2027	8,829	596	1,275	8.58	13,493	24,193	5,951		16.08	3.96
2028	8,829	614	1,314	8.96	14,076	24,833	5,625		16.51	3.74
2029	8,829	633	1,353	9.34	14,685	25,499	5,318		16.95	3.54
2030	0	652	1,393	9.75	15,320	17,365	3,335		11.55	2.22
2031	0	671	1,435	10.17	15,982	18,088	3,199		12.03	2.13
2032	0	691	1,478	10.61	16,673	18,843	3,068		12.53	2.04
2033	0	712	1,523	11.07	17,394	19,628	2,943		13.05	1.96
2034	0	733	1,568	11.54	18,145	20,447	2,823		13.59	1.88
2035	16,368	756	1,615	12.04	18,930	37,669	4,789		25.04	3.18
2036	16,368	778	1,664	12.56	19,748	38,558	4,514		25.64	3.00
2037	16,368	802	1,714	13.11	20,602	39,485	4,256		26.25	2.83
2038	16,368	826	1,765	13.67	21,493	40,451	4,015		26.89	2.67
2039	16,368	850	1,818	14.27	22,422	41,458	3,789		27.56	2.52
2040	16,368	876	1,873	14.88	23,391	42,507	3,577		28.26	2.38
2041	16,368	902	1,929	15.53	24,402	43,601	3,379		28.99	2.25
2042	16,368	929	1,987	16.20	25,457	44,741	3,193		29.75	2.12
2043	16,368	957	2,046	16.90	26,558	45,929	3,018		30.54	2.01
2044	16,368	986	2,108	17.63	27,706	47,167	2,854		31.36	1.90
2045	16,368	1,015	2,171	18.39	28,903	48,457	2,700		32.22	1.79
2046	16,368	1,046	2,236	19.18	30,153	49,803	2,555		33.11	1.70
2047	16,368	1,077	2,303	20.01	31,456	51,205	2,419		34.04	1.61
2048	16,368	1,109	2,372	20.88	32,816	52,666	2,291		35.02	1.52
2049	16,368	1,143	2,444	21.78	34,235	54,189	2,170		36.03	1.44
2050	16,368	1,177	2,517	22.72	35,715	55,776	2,057		37.08	1.37
2051	16,368	1,212	2,592	23.70	37,259	57,431	1,950		38.18	1.30
2052	16,368	1,249	2,670	24.73	38,869	59,156	1,850		39.33	1.23
2053	16,368	1,286	2,750	25.80	40,550	60,954	1,755		40.53	1.17
2054	16,368	1,325	2,833	26.91	42,303	62,828	1,666		41.77	1.11
2055	0	1,365	2,918	28.08	44,131	48,414	1,182		32.19	0.79
2056	0	1,405	3,005	29.29	46,039	50,450	1,134		33.54	0.75
2057	0	1,448	3,095	30.56	48,029	52,572	1,088		34.95	0.72
2058	0	1,491	3,188	31.88	50,106	54,785	1,044		36.42	0.69
2059	0	1,536	3,284	33.26	52,272	57,091	1,002		37.96	0.67

Net Levelized Cost (c/kWh)	**15.08**
Net Levelized Cost ($000s)	**22,677**

Table 7-8. Pumped Storage Bus-Bar Calculation - 15% Capacity Factor

Plant Input Data				Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)			1,762,342	First Year Staffing ($ 1,000)	5,015.0	3.0%
Total Net Capacity (kW)			1,200,000	Annual O&M Costs ($ 1,000)	10,627	3.0%
Capacity Factor			15.0%	First Year Coal Cost ($/MBtu)	0.997	2.5%
Transmission Tariff ($/kW-mo) ; % Losses	$	1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost			10,862	Levelized Fixed Charge Rate	10.17%	
				Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	179,301	5,015	10,627	14,400	0.997	23,914	4,459	237,716	237,716	15.87	15.87
2011	179,301	5,165	10,946	14,400	1.022	24,512	4,593	238,917	219,997	15.95	14.69
2012	179,301	5,320	11,274	14,400	1.048	25,125	4,731	240,151	203,622	16.03	13.59
2013	179,301	5,480	11,612	14,400	1.074	25,753	4,873	241,419	188,487	16.12	12.58
2014	179,301	5,644	11,961	18,276	1.101	26,397	5,019	246,597	177,284	16.46	11.84
2015	179,301	5,814	12,320	14,400	1.128	27,057	5,169	244,060	161,565	16.29	10.79
2016	179,301	5,988	12,689	14,400	1.157	27,733	5,325	245,436	149,609	16.38	9.99
2017	179,301	6,168	13,070	14,400	1.186	28,426	5,484	246,849	138,555	16.48	9.25
2018	179,301	6,353	13,462	14,400	1.215	29,137	5,649	248,301	128,334	16.58	8.57
2019	179,301	6,543	13,866	14,400	1.246	29,866	5,818	249,794	118,881	16.68	7.94
2020	179,301	6,740	14,282	14,400	1.277	30,612	5,993	251,327	110,139	16.78	7.35
2021	179,301	6,942	14,710	14,400	1.309	31,378	6,173	252,903	102,053	16.88	6.81
2022	179,301	7,150	15,152	14,400	1.341	32,162	6,358	254,522	94,573	16.99	6.31
2023	179,301	7,365	15,606	14,400	1.375	32,966	6,548	256,186	87,653	17.10	5.85
2024	179,301	7,586	16,074	41,560	1.409	33,790	6,745	285,056	89,808	19.03	6.00
2025	179,301	7,813	16,557	14,400	1.444	34,635	6,947	259,653	75,326	17.33	5.03
2026	179,301	8,048	17,053	14,400	1.481	35,501	7,156	261,458	69,843	17.45	4.66
2027	179,301	8,289	17,565	14,400	1.518	36,388	7,370	263,313	64,769	17.58	4.32
2028	179,301	8,538	18,092	14,400	1.556	37,298	7,591	265,220	60,072	17.71	4.01
2029	179,301	8,794	18,635	14,400	1.594	38,230	7,819	267,179	55,723	17.84	3.72
2030	179,301	9,058	19,194	14,400	1.634	39,186	8,054	269,192	51,697	17.97	3.45
2031	179,301	9,329	19,769	14,400	1.675	40,166	8,295	271,261	47,969	18.11	3.20
2032	179,301	9,609	20,363	14,400	1.717	41,170	8,544	273,387	44,517	18.25	2.97
2033	179,301	9,898	20,973	14,400	1.760	42,199	8,801	275,572	41,319	18.40	2.76
2034	179,301	10,195	21,603	271,408	1.804	43,254	9,065	534,825	73,841	35.70	4.93
2035	179,301	10,500	22,251	14,400	1.849	44,336	9,337	280,124	35,613	18.70	2.38
2036	179,301	10,815	22,918	14,400	1.895	45,444	9,617	282,495	33,070	18.86	2.21
2037	179,301	11,140	23,606	14,400	1.943	46,580	9,905	284,931	30,714	19.02	2.05
2038	179,301	11,474	24,314	14,400	1.991	47,745	10,202	287,436	28,530	19.19	1.90
2039	179,301	11,818	25,043	116,419	2.041	48,938	10,508	392,028	35,830	26.17	2.39
2040	0	12,173	25,795	14,400	2.092	50,162	10,824	113,353	9,540	7.57	0.64
2041	0	12,538	26,569	14,400	2.144	51,416	11,148	116,071	8,995	7.75	0.60
2042	0	12,914	27,366	14,400	2.198	52,701	11,483	118,864	8,482	7.94	0.57
2043	0	13,302	28,187	14,400	2.253	54,019	11,827	121,734	7,999	8.13	0.53
2044	0	13,701	29,032	23,808	2.309	55,369	12,182	134,092	8,113	8.95	0.54
2045	0	14,112	29,903	14,400	2.367	56,753	12,548	127,716	7,115	8.53	0.48
2046	0	14,535	30,800	14,400	2.426	58,172	12,924	130,831	6,712	8.73	0.45
2047	0	14,971	31,724	14,400	2.487	59,626	13,312	134,033	6,332	8.95	0.42
2048	0	15,420	32,676	14,400	2.549	61,117	13,711	137,324	5,973	9.17	0.40
2049	0	15,883	33,656	14,400	2.613	62,645	14,122	140,706	5,636	9.39	0.38
2050	0	16,359	34,666	14,400	2.678	64,211	14,546	144,182	5,318	9.63	0.35
2051	0	16,850	35,706	14,400	2.745	65,816	14,982	147,755	5,018	9.86	0.33
2052	0	17,355	36,777	14,400	2.813	67,462	15,432	151,426	4,735	10.11	0.32
2053	0	17,876	37,880	14,400	2.884	69,148	15,895	155,200	4,469	10.36	0.30
2054	0	18,412	39,017	80,325	2.956	70,877	16,372	225,003	5,966	15.02	0.40
2055	0	18,965	40,187	14,400	3.030	72,649	16,863	163,064	3,981	10.89	0.27
2056	0	19,534	41,393	14,400	3.106	74,465	17,369	167,161	3,758	11.16	0.25
2057	0	20,120	42,635	14,400	3.183	76,327	17,890	171,371	3,548	11.44	0.24
2058	0	20,723	43,914	14,400	3.263	78,235	18,426	175,699	3,349	11.73	0.22
2059	0	21,345	45,231	14,400	3.344	80,191	18,979	180,146	3,162	12.03	0.21
									Net Levelized Cost (c/kWh)		**16.52**
									Net Levelized Cost ($000s)		**247,534**

Table 7-9. Pumped Storage Bus-Bar Calculation - 15% Capacity Factor

Plant Input Data			Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)		1,136,411	First Year Staffing ($ 1,000)	4,179.2	3.0%
Total Net Capacity (kW)		600,000	Annual O&M Costs ($ 1,000)	10,627	3.0%
Capacity Factor		15.0%	First Year Coal Cost ($/MBtu)	0.997	2.5%
Transmission Tariff ($/kW-mo) ; % Losses	$ 1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost		10,862	Levelized Fixed Charge Rate	10.17%	
			Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	115,618	4,179	10,627	7,200	0.997	11,957	2,230	151,811	151,811	20.27	20.27
2011	115,618	4,305	10,946	7,200	1.022	12,256	2,296	152,621	140,535	20.38	18.76
2012	115,618	4,434	11,274	7,200	1.048	12,562	2,365	153,454	130,113	20.49	17.37
2013	115,618	4,567	11,612	7,200	1.074	12,876	2,436	154,310	120,477	20.60	16.09
2014	115,618	4,704	11,961	9,138	1.101	13,198	2,509	157,129	112,963	20.98	15.08
2015	115,618	4,845	12,320	7,200	1.128	13,528	2,585	156,096	103,334	20.84	13.80
2016	115,618	4,990	12,689	7,200	1.157	13,867	2,662	157,027	95,718	20.97	12.78
2017	115,618	5,140	13,070	7,200	1.186	14,213	2,742	157,984	88,675	21.09	11.84
2018	115,618	5,294	13,462	7,200	1.215	14,569	2,824	158,967	82,162	21.22	10.97
2019	115,618	5,453	13,866	7,200	1.246	14,933	2,909	159,979	76,137	21.36	10.17
2020	115,618	5,616	14,282	7,200	1.277	15,306	2,996	161,019	70,563	21.50	9.42
2021	115,618	5,785	14,710	7,200	1.309	15,689	3,086	162,089	65,407	21.64	8.73
2022	115,618	5,959	15,152	7,200	1.341	16,081	3,179	163,188	60,636	21.79	8.10
2023	115,618	6,137	15,606	7,200	1.375	16,483	3,274	164,319	56,221	21.94	7.51
2024	115,618	6,321	16,074	20,780	1.409	16,895	3,372	179,062	56,414	23.91	7.53
2025	115,618	6,511	16,557	7,200	1.444	17,317	3,474	166,677	48,354	22.25	6.46
2026	115,618	6,706	17,053	7,200	1.481	17,750	3,578	167,906	44,853	22.42	5.99
2027	115,618	6,908	17,565	7,200	1.518	18,194	3,685	169,170	41,612	22.59	5.56
2028	115,618	7,115	18,092	7,200	1.556	18,649	3,796	170,470	38,611	22.76	5.16
2029	115,618	7,328	18,635	7,200	1.594	19,115	3,910	171,806	35,832	22.94	4.78
2030	115,618	7,548	19,194	7,200	1.634	19,593	4,027	173,180	33,258	23.12	4.44
2031	115,618	7,775	19,769	7,200	1.675	20,083	4,148	174,593	30,875	23.31	4.12
2032	115,618	8,008	20,363	7,200	1.717	20,585	4,272	176,046	28,666	23.50	3.83
2033	115,618	8,248	20,973	7,200	1.760	21,100	4,400	177,540	26,620	23.70	3.55
2034	115,618	8,495	21,603	135,704	1.804	21,627	4,532	307,580	42,466	41.07	5.67
2035	115,618	8,750	22,251	7,200	1.849	22,168	4,668	180,655	22,967	24.12	3.07
2036	115,618	9,013	22,918	7,200	1.895	22,722	4,808	182,280	21,338	24.34	2.85
2037	115,618	9,283	23,606	7,200	1.943	23,290	4,953	183,950	19,829	24.56	2.65
2038	115,618	9,562	24,314	7,200	1.991	23,872	5,101	185,667	18,429	24.79	2.46
2039	115,618	9,849	25,043	58,210	2.041	24,469	5,254	238,443	21,793	31.84	2.91
2040	0	10,144	25,795	7,200	2.092	25,081	5,412	73,631	6,197	9.83	0.83
2041	0	10,448	26,569	7,200	2.144	25,708	5,574	75,499	5,851	10.08	0.78
2042	0	10,762	27,366	7,200	2.198	26,351	5,741	77,419	5,525	10.34	0.74
2043	0	11,085	28,187	7,200	2.253	27,009	5,914	79,394	5,217	10.60	0.70
2044	0	11,417	29,032	11,904	2.309	27,685	6,091	86,129	5,211	11.50	0.70
2045	0	11,760	29,903	7,200	2.367	28,377	6,274	83,513	4,653	11.15	0.62
2046	0	12,112	30,800	7,200	2.426	29,086	6,462	85,661	4,394	11.44	0.59
2047	0	12,476	31,724	7,200	2.487	29,813	6,656	87,869	4,151	11.73	0.55
2048	0	12,850	32,676	7,200	2.549	30,559	6,856	90,140	3,921	12.04	0.52
2049	0	13,236	33,656	7,200	2.613	31,323	7,061	92,476	3,704	12.35	0.49
2050	0	13,633	34,666	7,200	2.678	32,106	7,273	94,877	3,499	12.67	0.47
2051	0	14,042	35,706	7,200	2.745	32,908	7,491	97,347	3,306	13.00	0.44
2052	0	14,463	36,777	7,200	2.813	33,731	7,716	99,887	3,124	13.34	0.42
2053	0	14,897	37,880	7,200	2.884	34,574	7,947	102,499	2,951	13.69	0.39
2054	0	15,344	39,017	40,163	2.956	35,439	8,186	138,147	3,663	18.44	0.49
2055	0	15,804	40,187	7,200	3.030	36,325	8,431	107,947	2,636	14.41	0.35
2056	0	16,278	41,393	7,200	3.106	37,233	8,684	110,788	2,491	14.79	0.33
2057	0	16,766	42,635	7,200	3.183	38,163	8,945	113,709	2,354	15.18	0.31
2058	0	17,269	43,914	7,200	3.263	39,118	9,213	116,714	2,225	15.58	0.30
2059	0	17,788	45,231	7,200	3.344	40,095	9,490	119,804	2,103	16.00	0.28
									Net Levelized Cost (c/kWh)		**21.10**
									Net Levelized Cost ($000s)		**158,071**

GE LM6000 CT Bus-Bar Calculation - 15% Capacity Factor

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	31,010	First Year Fixed O&M ($ 1,000)	466.5	3.0%
Total Net Capacity (kW)	43,700	First Year Variable O&M ($/MWh)	10.16	3.0%
Capacity Factor	15.0%	First Year NG Cost ($/MBtu)	4.25	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	8,990	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	3,700	466	583	4.25	2,195	6,945	6,945		12.09	12.09
2011	3,700	480	601	4.54	2,345	7,126	6,562		12.41	11.43
2012	3,700	495	619	4.85	2,505	7,318	6,205		12.74	10.81
2013	3,700	510	637	5.18	2,675	7,523	5,873		13.10	10.23
2014	3,700	525	657	5.54	2,858	7,739	5,564		13.48	9.69
2015	3,700	541	676	5.91	3,053	7,970	5,276		13.88	9.19
2016	3,700	557	697	6.08	3,138	8,091	4,932		14.09	8.59
2017	3,700	574	717	6.25	3,225	8,216	4,612		14.31	8.03
2018	3,700	591	739	6.42	3,315	8,345	4,313		14.53	7.51
2019	3,700	609	761	6.60	3,407	8,477	4,034		14.76	7.03
2020	3,700	627	784	6.78	3,502	8,613	3,774		15.00	6.57
2021	3,700	646	807	6.99	3,609	8,763	3,536		15.26	6.16
2022	3,700	665	832	7.21	3,720	8,917	3,313		15.53	5.77
2023	3,700	685	857	7.43	3,834	9,075	3,105		15.80	5.41
2024	3,700	706	882	7.65	3,951	9,239	2,911		16.09	5.07
2025	3,700	727	909	7.89	4,072	9,407	2,729		16.38	4.75
2026	3,700	749	936	8.23	4,248	9,632	2,573		16.77	4.48
2027	3,700	771	964	8.58	4,432	9,867	2,427		17.18	4.23
2028	3,700	794	993	8.96	4,623	10,110	2,290		17.61	3.99
2029	3,700	818	1,023	9.34	4,823	10,364	2,161		18.05	3.76
2030	0	843	1,054	9.75	5,031	6,928	1,330		12.06	2.32
2031	0	868	1,085	10.17	5,249	7,202	1,274		12.54	2.22
2032	0	894	1,118	10.61	5,476	7,487	1,219		13.04	2.12
2033	0	921	1,151	11.07	5,713	7,785	1,167		13.56	2.03
2034	0	948	1,186	11.54	5,960	8,094	1,117		14.10	1.95
2035	6,859	977	1,221	12.04	6,217	15,275	1,942		26.60	3.38
2036	6,859	1,006	1,258	12.56	6,486	15,609	1,827		27.18	3.18
2037	6,859	1,036	1,296	13.11	6,766	15,958	1,720		27.79	3.00
2038	6,859	1,067	1,335	13.67	7,059	16,320	1,620		28.42	2.82
2039	6,859	1,099	1,375	14.27	7,364	16,697	1,526		29.08	2.66
2040	6,859	1,132	1,416	14.88	7,682	17,090	1,438		29.76	2.50
2041	6,859	1,166	1,458	15.53	8,014	17,498	1,356		30.47	2.36
2042	6,859	1,201	1,502	16.20	8,361	17,924	1,279		31.21	2.23
2043	6,859	1,237	1,547	16.90	8,722	18,366	1,207		31.98	2.10
2044	6,859	1,274	1,594	17.63	9,099	18,827	1,139		32.79	1.98
2045	6,859	1,313	1,641	18.39	9,493	19,306	1,076		33.62	1.87
2046	6,859	1,352	1,691	19.18	9,903	19,805	1,016		34.49	1.77
2047	6,859	1,393	1,741	20.01	10,331	20,325	960		35.40	1.67
2048	6,859	1,434	1,794	20.88	10,778	20,865	908		36.34	1.58
2049	6,859	1,477	1,847	21.78	11,244	21,428	858		37.32	1.49
2050	6,859	1,522	1,903	22.72	11,730	22,014	812		38.34	1.41
2051	6,859	1,567	1,960	23.70	12,237	22,624	768		39.40	1.34
2052	6,859	1,614	2,019	24.73	12,766	23,258	727		40.50	1.27
2053	6,859	1,663	2,079	25.80	13,318	23,919	689		41.66	1.20
2054	6,859	1,713	2,142	26.91	13,894	24,607	652		42.85	1.14
2055	0	1,764	2,206	28.08	14,494	18,464	451		32.16	0.79
2056	0	1,817	2,272	29.29	15,121	19,210	432		33.45	0.75
2057	0	1,872	2,340	30.56	15,774	19,986	414		34.81	0.72
2058	0	1,928	2,411	31.88	16,456	20,795	396		36.21	0.69
2059	0	1,985	2,483	33.26	17,168	21,636	380		37.68	0.66
							Net Levelized Cost (c/kWh)			**16.10**
							Net Levelized Cost ($000s)			**9,243**

GE 7EA CT Bus-Bar Calculation - 15% Capacity Factor

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	44,403	First Year Fixed O&M ($ 1,000)	286.5	3.0%
Total Net Capacity (kW)	85,400	First Year Variable O&M ($/MWh)	3.93	3.0%
Capacity Factor	15.0%	First Year NG Cost ($/MBtu)	4.25	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	11,560	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	5,298	287	441	4.25	5,516	11,542	11,542		10.29	10.29
2011	5,298	295	455	4.54	5,892	11,940	10,994		10.64	9.80
2012	5,298	304	468	4.85	6,294	12,364	10,483		11.02	9.34
2013	5,298	313	482	5.18	6,723	12,816	10,006		11.42	8.92
2014	5,298	323	497	5.54	7,182	13,299	9,561		11.85	8.52
2015	5,298	332	512	5.91	7,671	13,813	9,144		12.31	8.15
2016	5,298	342	527	6.08	7,885	14,052	8,566		12.52	7.63
2017	5,298	352	543	6.25	8,105	14,298	8,025		12.74	7.15
2018	5,298	363	559	6.42	8,330	14,550	7,520		12.97	6.70
2019	5,298	374	576	6.60	8,562	14,810	7,048		13.20	6.28
2020	5,298	385	593	6.78	8,801	15,077	6,607		13.44	5.89
2021	5,298	397	611	6.99	9,070	15,376	6,204		13.70	5.53
2022	5,298	409	629	7.21	9,348	15,683	5,827		13.98	5.19
2023	5,298	421	648	7.43	9,634	16,000	5,474		14.26	4.88
2024	5,298	433	668	7.65	9,928	16,327	5,144		14.55	4.58
2025	5,298	446	688	7.89	10,232	16,664	4,834		14.85	4.31
2026	5,298	460	708	8.23	10,674	17,140	4,579		15.27	4.08
2027	5,298	474	730	8.58	11,136	17,637	4,338		15.72	3.87
2028	5,298	488	751	8.96	11,617	18,154	4,112		16.18	3.66
2029	5,298	502	774	9.34	12,120	18,694	3,899		16.66	3.47
2030	0	518	797	9.75	12,644	13,958	2,681		12.44	2.39
2031	0	533	821	10.17	13,190	14,544	2,572		12.96	2.29
2032	0	549	846	10.61	13,760	15,155	2,468		13.51	2.20
2033	0	566	871	11.07	14,355	15,792	2,368		14.07	2.11
2034	0	582	897	11.54	14,976	16,455	2,272		14.66	2.02
2035	9,822	600	924	12.04	15,623	26,969	3,429		24.03	3.06
2036	9,822	618	952	12.56	16,298	27,690	3,242		24.68	2.89
2037	9,822	636	980	13.11	17,003	28,442	3,066		25.35	2.73
2038	9,822	656	1,010	13.67	17,738	29,225	2,901		26.04	2.59
2039	9,822	675	1,040	14.27	18,505	30,042	2,746		26.77	2.45
2040	9,822	696	1,071	14.88	19,305	30,894	2,600		27.53	2.32
2041	9,822	716	1,103	15.53	20,139	31,781	2,463		28.32	2.19
2042	9,822	738	1,137	16.20	21,010	32,706	2,334		29.15	2.08
2043	9,822	760	1,171	16.90	21,918	33,671	2,212		30.01	1.97
2044	9,822	783	1,206	17.63	22,866	34,676	2,098		30.90	1.87
2045	9,822	806	1,242	18.39	23,854	35,724	1,990		31.84	1.77
2046	9,822	830	1,279	19.18	24,886	36,817	1,889		32.81	1.68
2047	9,822	855	1,318	20.01	25,961	37,956	1,793		33.82	1.60
2048	9,822	881	1,357	20.88	27,084	39,144	1,703		34.88	1.52
2049	9,822	907	1,398	21.78	28,255	40,382	1,617		35.99	1.44
2050	9,822	935	1,440	22.72	29,476	41,672	1,537		37.14	1.37
2051	9,822	963	1,483	23.70	30,750	43,018	1,461		38.33	1.30
2052	9,822	992	1,527	24.73	32,080	44,420	1,389		39.58	1.24
2053	9,822	1,021	1,573	25.80	33,466	45,883	1,321		40.89	1.18
2054	9,822	1,052	1,620	26.91	34,913	47,407	1,257		42.25	1.12
2055	0	1,084	1,669	28.08	36,422	39,175	956		34.91	0.85
2056	0	1,116	1,719	29.29	37,997	40,832	918		36.39	0.82
2057	0	1,150	1,771	30.56	39,639	42,560	881		37.93	0.79
2058	0	1,184	1,824	31.88	41,353	44,361	846		39.53	0.75
2059	0	1,220	1,879	33.26	43,141	46,239	812		41.21	0.72
							Net Levelized Cost (c/kWh)			**14.61**
							Net Levelized Cost ($000s)			**16,398**

GE 7FA CT Bus-Bar Calculation - 15% Capacity Factor

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	73,998	First Year Fixed O&M ($ 1,000)	360.8	3.0%
Total Net Capacity (kW)	171,700	First Year Variable O&M ($/MWh)	5.13	3.0%
Capacity Factor	15.0%	First Year NG Cost ($/MBtu)	4.25	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	10,450	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	8,829	361	1,157	4.25	10,025	20,372	20,372		9.03	9.03
2011	8,829	372	1,192	4.54	10,709	21,101	19,430		9.35	8.61
2012	8,829	383	1,228	4.85	11,439	21,879	18,551		9.70	8.22
2013	8,829	394	1,265	5.18	12,219	22,707	17,728		10.06	7.86
2014	8,829	406	1,303	5.54	13,053	23,590	16,959		10.46	7.52
2015	8,829	418	1,342	5.91	13,943	24,531	16,240		10.87	7.20
2016	8,829	431	1,382	6.08	14,331	24,973	15,222		11.07	6.75
2017	8,829	444	1,423	6.25	14,730	25,426	14,272		11.27	6.33
2018	8,829	457	1,466	6.42	15,141	25,892	13,382		11.48	5.93
2019	8,829	471	1,510	6.60	15,562	26,372	12,551		11.69	5.56
2020	8,829	485	1,555	6.78	15,996	26,865	11,773		11.91	5.22
2021	8,829	499	1,602	6.99	16,485	27,415	11,063		12.15	4.90
2022	8,829	514	1,650	7.21	16,989	27,982	10,397		12.40	4.61
2023	8,829	530	1,700	7.43	17,509	28,567	9,774		12.66	4.33
2024	8,829	546	1,751	7.65	18,045	29,170	9,190		12.93	4.07
2025	8,829	562	1,803	7.89	18,597	29,791	8,642		13.20	3.83
2026	8,829	579	1,857	8.23	19,401	30,666	8,192		13.59	3.63
2027	8,829	596	1,913	8.58	20,239	31,577	7,767		14.00	3.44
2028	8,829	614	1,970	8.96	21,114	32,528	7,367		14.42	3.27
2029	8,829	633	2,029	9.34	22,027	33,518	6,991		14.86	3.10
2030	0	652	2,090	9.75	22,979	25,721	4,940		11.40	2.19
2031	0	671	2,153	10.17	23,973	26,797	4,739		11.88	2.10
2032	0	691	2,218	10.61	25,009	27,918	4,546		12.37	2.01
2033	0	712	2,284	11.07	26,090	29,086	4,361		12.89	1.93
2034	0	733	2,353	11.54	27,218	30,304	4,184		13.43	1.85
2035	16,368	756	2,423	12.04	28,395	47,941	6,095		21.25	2.70
2036	16,368	778	2,496	12.56	29,622	49,264	5,767		21.84	2.56
2037	16,368	802	2,571	13.11	30,903	50,643	5,459		22.45	2.42
2038	16,368	826	2,648	13.67	32,239	52,080	5,169		23.08	2.29
2039	16,368	850	2,727	14.27	33,632	53,578	4,897		23.75	2.17
2040	16,368	876	2,809	14.88	35,086	55,139	4,641		24.44	2.06
2041	16,368	902	2,893	15.53	36,603	56,766	4,399		25.16	1.95
2042	16,368	929	2,980	16.20	38,186	58,463	4,172		25.91	1.85
2043	16,368	957	3,070	16.90	39,836	60,231	3,958		26.70	1.75
2044	16,368	986	3,162	17.63	41,558	62,074	3,756		27.51	1.66
2045	16,368	1,015	3,257	18.39	43,355	63,995	3,565		28.36	1.58
2046	16,368	1,046	3,354	19.18	45,229	65,997	3,386		29.25	1.50
2047	16,368	1,077	3,455	20.01	47,184	68,084	3,216		30.18	1.43
2048	16,368	1,109	3,559	20.88	49,224	70,260	3,056		31.14	1.35
2049	16,368	1,143	3,665	21.78	51,352	72,528	2,905		32.15	1.29
2050	16,368	1,177	3,775	22.72	53,572	74,892	2,762		33.19	1.22
2051	16,368	1,212	3,888	23.70	55,888	77,357	2,627		34.29	1.16
2052	16,368	1,249	4,005	24.73	58,304	79,926	2,499		35.43	1.11
2053	16,368	1,286	4,125	25.80	60,825	82,604	2,379		36.61	1.05
2054	16,368	1,325	4,249	26.91	63,454	85,396	2,264		37.85	1.00
2055	0	1,365	4,377	28.08	66,197	71,938	1,756		31.89	0.78
2056	0	1,405	4,508	29.29	69,059	74,972	1,685		33.23	0.75
2057	0	1,448	4,643	30.56	72,044	78,135	1,617		34.63	0.72
2058	0	1,491	4,782	31.88	75,159	81,432	1,552		36.09	0.69
2059	0	1,536	4,926	33.26	78,408	84,869	1,490		37.62	0.66
							Net Levelized Cost (c/kWh)			**12.98**
							Net Levelized Cost ($000s)			**29,275**

GE LM6000 CT Bus-Bar Calculation - 20% Capacity Factor - High Gas Case

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	31,010	First Year Fixed O&M ($ 1,000)	466.5	3.0%
Total Net Capacity (kW)	43,700	First Year Variable O&M ($/MWh)	10.16	3.0%
Capacity Factor	20.0%	First Year NG Cost ($/MBtu)	4.70	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	8,990	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	3,700	466	778	4.70	3,237	8,181	8,181		10.69	10.69
2011	3,700	480	801	5.00	3,441	8,423	7,756		11.00	10.13
2012	3,700	495	825	5.32	3,659	8,678	7,358		11.34	9.61
2013	3,700	510	850	5.65	3,890	8,949	6,987		11.69	9.13
2014	3,700	525	875	6.01	4,135	9,235	6,640		12.06	8.67
2015	3,700	541	902	6.39	4,396	9,539	6,314		12.46	8.25
2016	3,700	557	929	6.79	4,674	9,859	6,010		12.88	7.85
2017	3,700	574	957	7.22	4,969	10,199	5,725		13.32	7.48
2018	3,700	591	985	7.68	5,283	10,559	5,457		13.79	7.13
2019	3,700	609	1,015	8.16	5,616	10,940	5,206		14.29	6.80
2020	3,700	627	1,045	8.67	5,971	11,343	4,971		14.82	6.49
2021	3,700	646	1,077	9.22	6,348	11,770	4,750		15.37	6.20
2022	3,700	665	1,109	9.80	6,749	12,223	4,542		15.96	5.93
2023	3,700	685	1,142	10.42	7,175	12,702	4,346		16.59	5.68
2024	3,700	706	1,176	11.08	7,628	13,210	4,162		17.25	5.44
2025	3,700	727	1,212	11.78	8,109	13,748	3,988		17.96	5.21
2026	3,700	749	1,248	12.53	8,621	14,318	3,825		18.70	5.00
2027	3,700	771	1,286	13.32	9,166	14,922	3,671		19.49	4.79
2028	3,700	794	1,324	14.16	9,744	15,563	3,525		20.33	4.60
2029	3,700	818	1,364	15.05	10,360	16,241	3,387		21.21	4.42
2030	0	843	1,405	16.00	11,014	13,261	2,547		17.32	3.33
2031	0	868	1,447	17.01	11,709	14,024	2,480		18.32	3.24
2032	0	894	1,490	18.09	12,449	14,833	2,415		19.37	3.15
2033	0	921	1,535	19.23	13,235	15,690	2,353		20.49	3.07
2034	0	948	1,581	20.44	14,070	16,600	2,292		21.68	2.99
2035	6,859	977	1,629	21.73	14,959	24,423	3,105		31.90	4.06
2036	6,859	1,006	1,677	23.11	15,903	25,446	2,979		33.24	3.89
2037	6,859	1,036	1,728	24.56	16,907	26,530	2,860		34.65	3.74
2038	6,859	1,067	1,780	26.11	17,975	27,681	2,748		36.15	3.59
2039	6,859	1,099	1,833	27.76	19,110	28,901	2,641		37.75	3.45
2040	6,859	1,132	1,888	29.52	20,316	30,196	2,541		39.44	3.32
2041	6,859	1,166	1,945	31.38	21,599	31,569	2,446		41.23	3.20
2042	6,859	1,201	2,003	33.36	22,963	33,026	2,357		43.14	3.08
2043	6,859	1,237	2,063	35.47	24,413	34,572	2,272		45.16	2.97
2044	6,859	1,274	2,125	37.71	25,954	36,213	2,191		47.30	2.86
2045	6,859	1,313	2,189	40.09	27,593	37,953	2,114		49.57	2.76
2046	6,859	1,352	2,254	42.62	29,335	39,800	2,042		51.98	2.67
2047	6,859	1,393	2,322	45.31	31,187	41,761	1,973		54.54	2.58
2048	6,859	1,434	2,392	48.17	33,156	43,841	1,907		57.26	2.49
2049	6,859	1,477	2,463	51.21	35,250	46,050	1,844		60.15	2.41
2050	6,859	1,522	2,537	54.45	37,475	48,394	1,785		63.21	2.33
2051	6,859	1,567	2,613	57.88	39,842	50,882	1,728		66.46	2.26
2052	6,859	1,614	2,692	61.54	42,357	53,523	1,674		69.91	2.19
2053	6,859	1,663	2,772	65.42	45,032	56,326	1,622		73.57	2.12
2054	6,859	1,713	2,856	69.56	47,875	59,302	1,572		77.46	2.05
2055	0	1,764	2,941	73.95	50,898	55,603	1,358		72.62	1.77
2056	0	1,817	3,030	78.62	54,111	58,958	1,325		77.01	1.73
2057	0	1,872	3,120	83.58	57,528	62,520	1,294		81.66	1.69
2058	0	1,928	3,214	88.86	61,160	66,302	1,264		86.60	1.65
2059	0	1,985	3,310	94.47	65,022	70,318	1,234		91.84	1.61

Net Levelized Cost (c/kWh)	**17.85**
Net Levelized Cost ($000s)	**13,664**

GE 7EA CT Bus-Bar Calculation - 20% Capacity Factor - High Gas Case

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	44,403	First Year Fixed O&M ($ 1,000)	286.5	3.0%
Total Net Capacity (kW)	85,400	First Year Variable O&M ($/MWh)	3.93	3.0%
Capacity Factor	20.0%	First Year NG Cost ($/MBtu)	4.70	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	11,560	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	5,298	287	588	4.70	8,134	14,307	14,307		9.56	9.56
2011	5,298	295	606	5.00	8,648	14,847	13,671		9.92	9.14
2012	5,298	304	624	5.32	9,194	15,420	13,074		10.31	8.74
2013	5,298	313	643	5.65	9,774	16,028	12,514		10.71	8.36
2014	5,298	323	662	6.01	10,391	16,674	11,987		11.14	8.01
2015	5,298	332	682	6.39	11,047	17,360	11,492		11.60	7.68
2016	5,298	342	703	6.79	11,745	18,088	11,026		12.09	7.37
2017	5,298	352	724	7.22	12,486	18,860	10,586		12.61	7.08
2018	5,298	363	745	7.68	13,275	19,681	10,172		13.15	6.80
2019	5,298	374	768	8.16	14,113	20,553	9,781		13.74	6.54
2020	5,298	385	791	8.67	15,004	21,478	9,412		14.35	6.29
2021	5,298	397	815	9.22	15,951	22,461	9,063		15.01	6.06
2022	5,298	409	839	9.80	16,959	23,504	8,733		15.71	5.84
2023	5,298	421	864	10.42	18,029	24,612	8,421		16.45	5.63
2024	5,298	433	890	11.08	19,168	25,789	8,125		17.24	5.43
2025	5,298	446	917	11.78	20,378	27,039	7,844		18.07	5.24
2026	5,298	460	944	12.53	21,665	28,367	7,578		18.96	5.06
2027	5,298	474	973	13.32	23,033	29,777	7,324		19.90	4.90
2028	5,298	488	1,002	14.16	24,487	31,274	7,084		20.90	4.73
2029	5,298	502	1,032	15.05	26,033	32,865	6,854		21.97	4.58
2030	0	518	1,063	16.00	27,677	29,257	5,619		19.55	3.76
2031	0	533	1,095	17.01	29,424	31,052	5,491		20.75	3.67
2032	0	549	1,128	18.09	31,282	32,959	5,367		22.03	3.59
2033	0	566	1,161	19.23	33,257	34,984	5,245		23.38	3.51
2034	0	582	1,196	20.44	35,357	37,136	5,127		24.82	3.43
2035	9,822	600	1,232	21.73	37,589	49,243	6,260		32.91	4.18
2036	9,822	618	1,269	23.11	39,963	51,672	6,049		34.54	4.04
2037	9,822	636	1,307	24.56	42,486	54,252	5,848		36.26	3.91
2038	9,822	656	1,346	26.11	45,169	56,992	5,657		38.09	3.78
2039	9,822	675	1,387	27.76	48,021	59,904	5,475		40.04	3.66
2040	9,822	696	1,428	29.52	51,053	62,998	5,302		42.11	3.54
2041	9,822	716	1,471	31.38	54,276	66,285	5,137		44.30	3.43
2042	9,822	738	1,515	33.36	57,703	69,778	4,979		46.64	3.33
2043	9,822	760	1,561	35.47	61,346	73,489	4,829		49.12	3.23
2044	9,822	783	1,608	37.71	65,220	77,432	4,685		51.75	3.13
2045	9,822	806	1,656	40.09	69,338	81,622	4,547		54.55	3.04
2046	9,822	830	1,706	42.62	73,716	86,073	4,416		57.53	2.95
2047	9,822	855	1,757	45.31	78,370	90,804	4,289		60.69	2.87
2048	9,822	881	1,809	48.17	83,318	95,831	4,168		64.05	2.79
2049	9,822	907	1,864	51.21	88,579	101,172	4,052		67.62	2.71
2050	9,822	935	1,920	54.45	94,172	106,848	3,941		71.41	2.63
2051	9,822	963	1,977	57.88	100,118	112,880	3,833		75.44	2.56
2052	9,822	992	2,037	61.54	106,439	119,289	3,730		79.73	2.49
2053	9,822	1,021	2,098	65.42	113,160	126,101	3,631		84.28	2.43
2054	9,822	1,052	2,161	69.56	120,305	133,339	3,535		89.12	2.36
2055	0	1,084	2,225	73.95	127,901	131,210	3,203		87.69	2.14
2056	0	1,116	2,292	78.62	135,976	139,384	3,134		93.16	2.09
2057	0	1,150	2,361	83.58	144,562	148,072	3,065		98.96	2.05
2058	0	1,184	2,432	88.86	153,689	157,305	2,999		105.14	2.00
2059	0	1,220	2,505	94.47	163,393	167,117	2,933		111.69	1.96
							Net Levelized Cost (c/kWh)			**18.05**
							Net Levelized Cost ($000s)			**27,013**

GE 7FA CT Bus-Bar Calculation - 20% Capacity Factor - High Gas Case

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	73,998	First Year Fixed O&M ($ 1,000)	360.8	3.0%
Total Net Capacity (kW)	171,700	First Year Variable O&M ($/MWh)	5.13	3.0%
Capacity Factor	20.0%	First Year NG Cost ($/MBtu)	4.70	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	10,450	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	8,829	361	1,543	4.70	14,784	25,516	25,516		8.48	8.48
2011	8,829	372	1,589	5.00	15,717	26,507	24,408		8.81	8.11
2012	8,829	383	1,637	5.32	16,709	27,558	23,366		9.16	7.77
2013	8,829	394	1,686	5.65	17,764	28,674	22,387		9.53	7.44
2014	8,829	406	1,737	6.01	18,886	29,858	21,465		9.93	7.14
2015	8,829	418	1,789	6.39	20,078	31,114	20,597		10.34	6.85
2016	8,829	431	1,843	6.79	21,346	32,448	19,779		10.79	6.58
2017	8,829	444	1,898	7.22	22,694	33,864	19,008		11.26	6.32
2018	8,829	457	1,955	7.68	24,127	35,367	18,280		11.76	6.08
2019	8,829	471	2,013	8.16	25,650	36,963	17,591		12.29	5.85
2020	8,829	485	2,074	8.67	27,270	38,657	16,941		12.85	5.63
2021	8,829	499	2,136	9.22	28,992	40,456	16,325		13.45	5.43
2022	8,829	514	2,200	9.80	30,822	42,365	15,742		14.08	5.23
2023	8,829	530	2,266	10.42	32,768	44,393	15,189		14.76	5.05
2024	8,829	546	2,334	11.08	34,837	46,546	14,664		15.47	4.87
2025	8,829	562	2,404	11.78	37,037	48,832	14,166		16.23	4.71
2026	8,829	579	2,476	12.53	39,375	51,259	13,693		17.04	4.55
2027	8,829	596	2,550	13.32	41,861	53,837	13,243		17.90	4.40
2028	8,829	614	2,627	14.16	44,505	56,575	12,814		18.81	4.26
2029	8,829	633	2,706	15.05	47,315	59,482	12,406		19.77	4.12
2030	0	652	2,787	16.00	50,302	53,741	10,321		17.86	3.43
2031	0	671	2,871	17.01	53,478	57,020	10,083		18.95	3.35
2032	0	691	2,957	18.09	56,855	60,503	9,852		20.11	3.28
2033	0	712	3,045	19.23	60,444	64,202	9,626		21.34	3.20
2034	0	733	3,137	20.44	64,261	68,131	9,407		22.65	3.13
2035	16,368	756	3,231	21.73	68,318	88,673	11,273		29.48	3.75
2036	16,368	778	3,328	23.11	72,632	93,106	10,899		30.95	3.62
2037	16,368	802	3,428	24.56	77,218	97,815	10,544		32.52	3.51
2038	16,368	826	3,530	26.11	82,093	102,817	10,205		34.18	3.39
2039	16,368	850	3,636	27.76	87,277	108,131	9,883		35.95	3.29
2040	16,368	876	3,745	29.52	92,787	113,776	9,575		37.82	3.18
2041	16,368	902	3,858	31.38	98,646	119,774	9,282		39.82	3.09
2042	16,368	929	3,974	33.36	104,874	126,145	9,002		41.93	2.99
2043	16,368	957	4,093	35.47	111,496	132,914	8,733		44.18	2.90
2044	16,368	986	4,216	37.71	118,536	140,105	8,477		46.57	2.82
2045	16,368	1,015	4,342	40.09	126,020	147,745	8,231		49.11	2.74
2046	16,368	1,046	4,472	42.62	133,977	155,863	7,996		51.81	2.66
2047	16,368	1,077	4,606	45.31	142,436	164,488	7,770		54.68	2.58
2048	16,368	1,109	4,745	48.17	151,430	173,652	7,553		57.73	2.51
2049	16,368	1,143	4,887	51.21	160,991	183,389	7,345		60.96	2.44
2050	16,368	1,177	5,034	54.45	171,156	193,734	7,145		64.40	2.38
2051	16,368	1,212	5,185	57.88	181,963	204,727	6,953		68.06	2.31
2052	16,368	1,249	5,340	61.54	193,452	216,408	6,767		71.94	2.25
2053	16,368	1,286	5,500	65.42	205,666	228,820	6,589		76.07	2.19
2054	16,368	1,325	5,665	69.56	218,652	242,010	6,417		80.45	2.13
2055	0	1,365	5,835	73.95	232,457	239,657	5,851		79.67	1.95
2056	0	1,405	6,010	78.62	247,135	254,550	5,723		84.62	1.90
2057	0	1,448	6,191	83.58	262,739	270,377	5,597		89.88	1.86
2058	0	1,491	6,376	88.86	279,328	287,195	5,475		95.47	1.82
2059	0	1,536	6,568	94.47	296,964	305,068	5,355		101.41	1.78
							Net Levelized Cost (c/kWh)			**16.20**
							Net Levelized Cost ($000s)			**48,738**

GE LM6000 CT Bus-Bar Calculation - 10% Capacity Factor - High Gas Case

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	31,010	First Year Fixed O&M ($ 1,000)	466.5	3.0%
Total Net Capacity (kW)	43,700	First Year Variable O&M ($/MWh)	10.16	3.0%
Capacity Factor	10.0%	First Year NG Cost ($/MBtu)	4.70	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	8,990	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	3,700	466	389	4.70	1,618	6,174	6,174		16.13	16.13
2011	3,700	480	401	5.00	1,721	6,302	5,803		16.46	15.16
2012	3,700	495	413	5.32	1,829	6,437	5,458		16.81	14.26
2013	3,700	510	425	5.65	1,945	6,579	5,137		17.19	13.42
2014	3,700	525	438	6.01	2,068	6,730	4,838		17.58	12.64
2015	3,700	541	451	6.39	2,198	6,890	4,561		18.00	11.91
2016	3,700	557	464	6.79	2,337	7,058	4,302		18.44	11.24
2017	3,700	574	478	7.22	2,484	7,236	4,062		18.90	10.61
2018	3,700	591	493	7.68	2,641	7,425	3,837		19.40	10.02
2019	3,700	609	507	8.16	2,808	7,624	3,628		19.92	9.48
2020	3,700	627	523	8.67	2,985	7,835	3,433		20.47	8.97
2021	3,700	646	538	9.22	3,174	8,058	3,252		21.05	8.49
2022	3,700	665	554	9.80	3,374	8,294	3,082		21.67	8.05
2023	3,700	685	571	10.42	3,587	8,543	2,923		22.32	7.64
2024	3,700	706	588	11.08	3,814	8,808	2,775		23.01	7.25
2025	3,700	727	606	11.78	4,055	9,087	2,636		23.74	6.89
2026	3,700	749	624	12.53	4,311	9,383	2,507		24.51	6.55
2027	3,700	771	643	13.32	4,583	9,697	2,385		25.33	6.23
2028	3,700	794	662	14.16	4,872	10,028	2,271		26.20	5.93
2029	3,700	818	682	15.05	5,180	10,380	2,165		27.11	5.65
2030	0	843	702	16.00	5,507	7,052	1,354		18.42	3.54
2031	0	868	723	17.01	5,855	7,446	1,317		19.45	3.44
2032	0	894	745	18.09	6,224	7,863	1,280		20.54	3.34
2033	0	921	768	19.23	6,617	8,305	1,245		21.70	3.25
2034	0	948	791	20.44	7,035	8,774	1,211		22.92	3.16
2035	6,859	977	814	21.73	7,479	16,130	2,051		42.13	5.36
2036	6,859	1,006	839	23.11	7,952	16,656	1,950		43.51	5.09
2037	6,859	1,036	864	24.56	8,454	17,213	1,855		44.96	4.85
2038	6,859	1,067	890	26.11	8,987	17,804	1,767		46.51	4.62
2039	6,859	1,099	916	27.76	9,555	18,430	1,684		48.14	4.40
2040	6,859	1,132	944	29.52	10,158	19,094	1,607		49.88	4.20
2041	6,859	1,166	972	31.38	10,799	19,797	1,534		51.72	4.01
2042	6,859	1,201	1,001	33.36	11,481	20,543	1,466		53.66	3.83
2043	6,859	1,237	1,031	35.47	12,206	21,334	1,402		55.73	3.66
2044	6,859	1,274	1,062	37.71	12,977	22,173	1,342		57.92	3.50
2045	6,859	1,313	1,094	40.09	13,796	23,063	1,285		60.25	3.36
2046	6,859	1,352	1,127	42.62	14,667	24,006	1,232		62.71	3.22
2047	6,859	1,393	1,161	45.31	15,594	25,006	1,181		65.32	3.09
2048	6,859	1,434	1,196	48.17	16,578	26,068	1,134		68.09	2.96
2049	6,859	1,477	1,232	51.21	17,625	27,193	1,089		71.04	2.85
2050	6,859	1,522	1,269	54.45	18,738	28,387	1,047		74.15	2.73
2051	6,859	1,567	1,307	57.88	19,921	29,654	1,007		77.46	2.63
2052	6,859	1,614	1,346	61.54	21,179	30,998	969		80.97	2.53
2053	6,859	1,663	1,386	65.42	22,516	32,424	934		84.70	2.44
2054	6,859	1,713	1,428	69.56	23,937	33,937	900		88.65	2.35
2055	0	1,764	1,471	73.95	25,449	28,684	700		74.93	1.83
2056	0	1,817	1,515	78.62	27,056	30,387	683		79.38	1.78
2057	0	1,872	1,560	83.58	28,764	32,196	666		84.10	1.74
2058	0	1,928	1,607	88.86	30,580	34,115	650		89.12	1.70
2059	0	1,985	1,655	94.47	32,511	36,152	635		94.44	1.66
							Net Levelized Cost (c/kWh)			**23.63**
							Net Levelized Cost ($000s)			**9,048**

GE 7EA CT Bus-Bar Calculation - 10% Capacity Factor - High Gas Case

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	44,403	First Year Fixed O&M ($ 1,000)	286.5	3.0%
Total Net Capacity (kW)	85,400	First Year Variable O&M ($/MWh)	3.93	3.0%
Capacity Factor	10.0%	First Year NG Cost ($/MBtu)	4.70	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	11,560	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	5,298	287	294	4.70	4,067	9,946	9,946		13.29	13.29
2011	5,298	295	303	5.00	4,324	10,220	9,411		13.66	12.58
2012	5,298	304	312	5.32	4,597	10,511	8,912		14.05	11.91
2013	5,298	313	322	5.65	4,887	10,819	8,447		14.46	11.29
2014	5,298	323	331	6.01	5,196	11,147	8,014		14.90	10.71
2015	5,298	332	341	6.39	5,524	11,495	7,609		15.37	10.17
2016	5,298	342	351	6.79	5,872	11,864	7,232		15.86	9.67
2017	5,298	352	362	7.22	6,243	12,255	6,879		16.38	9.20
2018	5,298	363	373	7.68	6,637	12,671	6,549		16.94	8.75
2019	5,298	374	384	8.16	7,057	13,112	6,240		17.53	8.34
2020	5,298	385	395	8.67	7,502	13,580	5,951		18.15	7.96
2021	5,298	397	407	9.22	7,976	14,077	5,681		18.82	7.59
2022	5,298	409	420	9.80	8,479	14,605	5,427		19.52	7.25
2023	5,298	421	432	10.42	9,015	15,165	5,189		20.27	6.94
2024	5,298	433	445	11.08	9,584	15,760	4,965		21.07	6.64
2025	5,298	446	458	11.78	10,189	16,392	4,755		21.91	6.36
2026	5,298	460	472	12.53	10,832	17,062	4,558		22.81	6.09
2027	5,298	474	486	13.32	11,516	17,774	4,372		23.76	5.84
2028	5,298	488	501	14.16	12,243	18,530	4,197		24.77	5.61
2029	5,298	502	516	15.05	13,016	19,333	4,032		25.84	5.39
2030	0	518	531	16.00	13,838	14,887	2,859		19.90	3.82
2031	0	533	547	17.01	14,712	15,793	2,793		21.11	3.73
2032	0	549	564	18.09	15,641	16,754	2,728		22.40	3.65
2033	0	566	581	19.23	16,629	17,775	2,665		23.76	3.56
2034	0	582	598	20.44	17,679	18,859	2,604		25.21	3.48
2035	9,822	600	616	21.73	18,795	29,833	3,793		39.88	5.07
2036	9,822	618	635	23.11	19,981	31,056	3,636		41.51	4.86
2037	9,822	636	654	24.56	21,243	32,355	3,488		43.25	4.66
2038	9,822	656	673	26.11	22,584	33,735	3,348		45.09	4.48
2039	9,822	675	693	27.76	24,010	35,201	3,217		47.05	4.30
2040	9,822	696	714	29.52	25,526	36,758	3,094		49.13	4.14
2041	9,822	716	736	31.38	27,138	38,412	2,977		51.35	3.98
2042	9,822	738	758	33.36	28,851	40,169	2,866		53.69	3.83
2043	9,822	760	780	35.47	30,673	42,035	2,762		56.19	3.69
2044	9,822	783	804	37.71	32,610	44,018	2,663		58.84	3.56
2045	9,822	806	828	40.09	34,669	46,125	2,570		61.66	3.44
2046	9,822	830	853	42.62	36,858	48,363	2,481		64.65	3.32
2047	9,822	855	878	45.31	39,185	50,741	2,397		67.83	3.20
2048	9,822	881	905	48.17	41,659	53,267	2,317		71.20	3.10
2049	9,822	907	932	51.21	44,289	55,951	2,241		74.79	3.00
2050	9,822	935	960	54.45	47,086	58,802	2,169		78.60	2.90
2051	9,822	963	989	57.88	50,059	61,832	2,100		82.65	2.81
2052	9,822	992	1,018	61.54	53,220	65,051	2,034		86.95	2.72
2053	9,822	1,021	1,049	65.42	56,580	68,472	1,972		91.53	2.64
2054	9,822	1,052	1,080	69.56	60,152	72,106	1,912		96.39	2.56
2055	0	1,084	1,113	73.95	63,950	66,147	1,615		88.42	2.16
2056	0	1,116	1,146	78.62	67,988	70,250	1,579		93.90	2.11
2057	0	1,150	1,180	83.58	72,281	74,611	1,545		99.73	2.06
2058	0	1,184	1,216	88.86	76,845	79,245	1,511		105.93	2.02
2059	0	1,220	1,252	94.47	81,697	84,168	1,477		112.51	1.97
							Net Levelized Cost (c/kWh)			**21.92**
							Net Levelized Cost ($000s)			**16,402**

GE 7FA CT Bus-Bar Calculation - 10% Capacity Factor - High Gas Case

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	73,998	First Year Fixed O&M ($ 1,000)	360.8	3.0%
Total Net Capacity (kW)	171,700	First Year Variable O&M ($/MWh)	5.13	3.0%
Capacity Factor	10.0%	First Year NG Cost ($/MBtu)	4.70	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	10,450	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	8,829	361	772	4.70	7,392	17,353	17,353		11.54	11.54
2011	8,829	372	795	5.00	7,858	17,854	16,440		11.87	10.93
2012	8,829	383	819	5.32	8,355	18,385	15,588		12.22	10.36
2013	8,829	394	843	5.65	8,882	18,948	14,794		12.60	9.84
2014	8,829	406	868	6.01	9,443	19,546	14,052		13.00	9.34
2015	8,829	418	894	6.39	10,039	20,181	13,359		13.42	8.88
2016	8,829	431	921	6.79	10,673	20,854	12,712		13.86	8.45
2017	8,829	444	949	7.22	11,347	21,568	12,106		14.34	8.05
2018	8,829	457	977	7.68	12,063	22,327	11,539		14.84	7.67
2019	8,829	471	1,007	8.16	12,825	23,131	11,009		15.38	7.32
2020	8,829	485	1,037	8.67	13,635	23,985	10,511		15.95	6.99
2021	8,829	499	1,068	9.22	14,496	24,892	10,045		16.55	6.68
2022	8,829	514	1,100	9.80	15,411	25,854	9,607		17.19	6.39
2023	8,829	530	1,133	10.42	16,384	26,876	9,195		17.87	6.11
2024	8,829	546	1,167	11.08	17,419	27,960	8,809		18.59	5.86
2025	8,829	562	1,202	11.78	18,518	29,111	8,445		19.35	5.61
2026	8,829	579	1,238	12.53	19,688	30,333	8,103		20.17	5.39
2027	8,829	596	1,275	13.32	20,931	31,631	7,780		21.03	5.17
2028	8,829	614	1,314	14.16	22,252	33,009	7,476		21.95	4.97
2029	8,829	633	1,353	15.05	23,657	34,472	7,189		22.92	4.78
2030	0	652	1,393	16.00	25,151	27,196	5,223		18.08	3.47
2031	0	671	1,435	17.01	26,739	28,846	5,101		19.18	3.39
2032	0	691	1,478	18.09	28,427	30,597	4,982		20.34	3.31
2033	0	712	1,523	19.23	30,222	32,457	4,867		21.58	3.24
2034	0	733	1,568	20.44	32,130	34,432	4,754		22.89	3.16
2035	16,368	756	1,615	21.73	34,159	52,898	6,725		35.17	4.47
2036	16,368	778	1,664	23.11	36,316	55,126	6,453		36.65	4.29
2037	16,368	802	1,714	24.56	38,609	57,492	6,197		38.22	4.12
2038	16,368	826	1,765	26.11	41,047	60,005	5,956		39.89	3.96
2039	16,368	850	1,818	27.76	43,638	62,675	5,728		41.67	3.81
2040	16,368	876	1,873	29.52	46,394	65,510	5,513		43.55	3.67
2041	16,368	902	1,929	31.38	49,323	68,522	5,310		45.56	3.53
2042	16,368	929	1,987	33.36	52,437	71,721	5,118		47.68	3.40
2043	16,368	957	2,046	35.47	55,748	75,119	4,936		49.94	3.28
2044	16,368	986	2,108	37.71	59,268	78,729	4,763		52.34	3.17
2045	16,368	1,015	2,171	40.09	63,010	82,564	4,600		54.89	3.06
2046	16,368	1,046	2,236	42.62	66,989	86,638	4,445		57.60	2.96
2047	16,368	1,077	2,303	45.31	71,218	90,966	4,297		60.48	2.86
2048	16,368	1,109	2,372	48.17	75,715	95,564	4,157		63.54	2.76
2049	16,368	1,143	2,444	51.21	80,495	100,450	4,023		66.78	2.67
2050	16,368	1,177	2,517	54.45	85,578	105,640	3,896		70.23	2.59
2051	16,368	1,212	2,592	57.88	90,981	111,154	3,775		73.90	2.51
2052	16,368	1,249	2,670	61.54	96,726	117,012	3,659		77.80	2.43
2053	16,368	1,286	2,750	65.42	102,833	123,237	3,549		81.93	2.36
2054	16,368	1,325	2,833	69.56	109,326	129,851	3,443		86.33	2.29
2055	0	1,365	2,918	73.95	116,229	120,511	2,942		80.12	1.96
2056	0	1,405	3,005	78.62	123,567	127,978	2,877		85.09	1.91
2057	0	1,448	3,095	83.58	131,369	135,912	2,814		90.36	1.87
2058	0	1,491	3,188	88.86	139,664	144,343	2,751		95.97	1.83
2059	0	1,536	3,284	94.47	148,482	153,302	2,691		101.92	1.79
							Net Levelized Cost (c/kWh)			**19.35**
							Net Levelized Cost ($000s)			**29,110**

GE LM6000 CT Bus-Bar Calculation - 15% Capacity Factor - High Gas Case

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	31,010	First Year Fixed O&M ($ 1,000)	466.5	3.0%
Total Net Capacity (kW)	43,700	First Year Variable O&M ($/MWh)	10.16	3.0%
Capacity Factor	15.0%	First Year NG Cost ($/MBtu)	4.70	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	8,990	Levelized Fixed Charge Rate	11.93%	

Year	Capital	Fixed O&M	Variable O&M	Fuel (NG) Rate	Fuel (NG) Cost	Total Cost	PW Total Cost	Other	Busbar Cost	Net PW Cost
	($ 1,000)	($ 1,000)	($ 1,000)	($/MBtu)	($ 1,000)	($ 1,000)	($ 1,000)	($ 1,000)	(c/kWh)	(c/kWh)
2010	3,700	466	583	4.70	2,428	7,177	7,177		12.50	12.50
2011	3,700	480	601	5.00	2,581	7,362	6,779		12.82	11.81
2012	3,700	495	619	5.32	2,744	7,558	6,408		13.16	11.16
2013	3,700	510	637	5.65	2,917	7,764	6,062		13.52	10.56
2014	3,700	525	657	6.01	3,101	7,983	5,739		13.90	9.99
2015	3,700	541	676	6.39	3,297	8,214	5,438		14.30	9.47
2016	3,700	557	697	6.79	3,505	8,459	5,156		14.73	8.98
2017	3,700	574	717	7.22	3,727	8,718	4,893		15.18	8.52
2018	3,700	591	739	7.68	3,962	8,992	4,647		15.66	8.09
2019	3,700	609	761	8.16	4,212	9,282	4,417		16.16	7.69
2020	3,700	627	784	8.67	4,478	9,589	4,202		16.70	7.32
2021	3,700	646	807	9.22	4,761	9,914	4,001		17.27	6.97
2022	3,700	665	832	9.80	5,061	10,258	3,812		17.86	6.64
2023	3,700	685	857	10.42	5,381	10,623	3,634		18.50	6.33
2024	3,700	706	882	11.08	5,721	11,009	3,468		19.17	6.04
2025	3,700	727	909	11.78	6,082	11,417	3,312		19.88	5.77
2026	3,700	749	936	12.53	6,466	11,851	3,166		20.64	5.51
2027	3,700	771	964	13.32	6,874	12,309	3,028		21.44	5.27
2028	3,700	794	993	14.16	7,308	12,795	2,898		22.28	5.05
2029	3,700	818	1,023	15.05	7,770	13,311	2,776		23.18	4.83
2030	0	843	1,054	16.00	8,260	10,157	1,951		17.69	3.40
2031	0	868	1,085	17.01	8,782	10,735	1,898		18.69	3.31
2032	0	894	1,118	18.09	9,336	11,348	1,848		19.76	3.22
2033	0	921	1,151	19.23	9,926	11,998	1,799		20.89	3.13
2034	0	948	1,186	20.44	10,553	12,687	1,752		22.09	3.05
2035	6,859	977	1,221	21.73	11,219	20,276	2,578		35.31	4.49
2036	6,859	1,006	1,258	23.11	11,927	21,051	2,464		36.66	4.29
2037	6,859	1,036	1,296	24.56	12,680	21,872	2,358		38.09	4.11
2038	6,859	1,067	1,335	26.11	13,481	22,742	2,257		39.61	3.93
2039	6,859	1,099	1,375	27.76	14,332	23,666	2,163		41.21	3.77
2040	6,859	1,132	1,416	29.52	15,237	24,645	2,074		42.92	3.61
2041	6,859	1,166	1,458	31.38	16,199	25,683	1,990		44.73	3.47
2042	6,859	1,201	1,502	33.36	17,222	26,785	1,911		46.65	3.33
2043	6,859	1,237	1,547	35.47	18,309	27,953	1,837		48.68	3.20
2044	6,859	1,274	1,594	37.71	19,465	29,193	1,766		50.84	3.08
2045	6,859	1,313	1,641	40.09	20,695	30,508	1,700		53.13	2.96
2046	6,859	1,352	1,691	42.62	22,001	31,903	1,637		55.56	2.85
2047	6,859	1,393	1,741	45.31	23,390	33,384	1,577		58.14	2.75
2048	6,859	1,434	1,794	48.17	24,867	34,954	1,520		60.87	2.65
2049	6,859	1,477	1,847	51.21	26,437	36,621	1,467		63.78	2.55
2050	6,859	1,522	1,903	54.45	28,107	38,390	1,416		66.86	2.47
2051	6,859	1,567	1,960	57.88	29,881	40,268	1,368		70.13	2.38
2052	6,859	1,614	2,019	61.54	31,768	42,260	1,322		73.60	2.30
2053	6,859	1,663	2,079	65.42	33,774	44,375	1,278		77.28	2.23
2054	6,859	1,713	2,142	69.56	35,906	46,620	1,236		81.19	2.15
2055	0	1,764	2,206	73.95	38,173	42,143	1,029		73.39	1.79
2056	0	1,817	2,272	78.62	40,583	44,673	1,004		77.80	1.75
2057	0	1,872	2,340	83.58	43,146	47,358	980		82.47	1.71
2058	0	1,928	2,411	88.86	45,870	50,208	957		87.44	1.67
2059	0	1,985	2,483	94.47	48,766	53,235	934		92.71	1.63
							Net Levelized Cost (c/kWh)			**19.78**
							Net Levelized Cost ($000s)			**11,356**

GE 7EA CT Bus-Bar Calculation - 15% Capacity Factor, High Natural Gas

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	39,246	First Year Fixed O&M ($ 1,000)	240.0	3.0%
Total Net Capacity (kW)	85,400	First Year Variable O&M ($/MWh)	3.29	3.0%
Capacity Factor	15.0%	First Year NG Cost ($/MBtu)	4.70	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	11,560	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	4,682	240	370	4.70	6,101	11,393	11,393		10.15	10.15
2011	4,682	247	381	5.00	6,486	11,796	10,862		10.51	9.68
2012	4,682	255	392	5.32	6,895	12,224	10,365		10.89	9.24
2013	4,682	262	404	5.65	7,331	12,679	9,899		11.30	8.82
2014	4,682	270	416	6.01	7,793	13,162	9,462		11.73	8.43
2015	4,682	278	429	6.39	8,286	13,675	9,053		12.19	8.07
2016	4,682	287	441	6.79	8,809	14,219	8,667		12.67	7.72
2017	4,682	295	455	7.22	9,365	14,797	8,306		13.19	7.40
2018	4,682	304	468	7.68	9,956	15,411	7,965		13.73	7.10
2019	4,682	313	482	8.16	10,585	16,063	7,644		14.31	6.81
2020	4,682	323	497	8.67	11,253	16,755	7,342		14.93	6.54
2021	4,682	332	512	9.22	11,964	17,490	7,058		15.59	6.29
2022	4,682	342	527	9.80	12,719	18,271	6,789		16.28	6.05
2023	4,682	352	543	10.42	13,522	19,100	6,535		17.02	5.82
2024	4,682	363	559	11.08	14,376	19,980	6,295		17.81	5.61
2025	4,682	374	576	11.78	15,284	20,916	6,068		18.64	5.41
2026	4,682	385	593	12.53	16,249	21,909	5,853		19.52	5.22
2027	4,682	397	611	13.32	17,274	22,965	5,649		20.46	5.03
2028	4,682	409	629	14.16	18,365	24,085	5,455		21.46	4.86
2029	4,682	421	648	15.05	19,525	25,276	5,272		22.52	4.70
2030	0	433	668	16.00	20,758	21,859	4,198		19.48	3.74
2031	0	446	688	17.01	22,068	23,202	4,103		20.68	3.66
2032	0	460	708	18.09	23,462	24,630	4,011		21.95	3.57
2033	0	474	730	19.23	24,943	26,146	3,920		23.30	3.49
2034	0	488	751	20.44	26,518	27,757	3,832		24.74	3.42
2035	8,681	502	774	21.73	28,192	38,150	4,850		34.00	4.32
2036	8,681	518	797	23.11	29,972	39,968	4,679		35.62	4.17
2037	8,681	533	821	24.56	31,865	41,900	4,517		37.34	4.02
2038	8,681	549	846	26.11	33,876	43,952	4,363		39.17	3.89
2039	8,681	566	871	27.76	36,015	46,133	4,216		41.11	3.76
2040	8,681	582	897	29.52	38,289	48,450	4,078		43.18	3.63
2041	8,681	600	924	31.38	40,707	50,912	3,945		45.37	3.52
2042	8,681	618	952	33.36	43,277	53,528	3,820		47.70	3.40
2043	8,681	636	980	35.47	46,010	56,308	3,700		50.18	3.30
2044	8,681	656	1,010	37.71	48,915	59,261	3,586		52.81	3.20
2045	8,681	675	1,040	40.09	52,003	62,400	3,476		55.61	3.10
2046	8,681	696	1,071	42.62	55,287	65,735	3,372		58.58	3.01
2047	8,681	716	1,103	45.31	58,777	69,278	3,273		61.74	2.92
2048	8,681	738	1,137	48.17	62,489	73,044	3,177		65.09	2.83
2049	8,681	760	1,171	51.21	66,434	77,046	3,086		68.66	2.75
2050	8,681	783	1,206	54.45	70,629	81,298	2,998		72.45	2.67
2051	8,681	806	1,242	57.88	75,088	85,818	2,914		76.48	2.60
2052	8,681	830	1,279	61.54	79,829	90,620	2,834		80.76	2.53
2053	8,681	855	1,318	65.42	84,870	95,724	2,756		85.30	2.46
2054	8,681	881	1,357	69.56	90,228	101,148	2,682		90.14	2.39
2055	0	907	1,398	73.95	95,925	98,231	2,398		87.54	2.14
2056	0	935	1,440	78.62	101,982	104,357	2,346		93.00	2.09
2057	0	963	1,483	83.58	108,421	110,867	2,295		98.80	2.05
2058	0	992	1,527	88.86	115,267	117,786	2,245		104.96	2.00
2059	0	1,021	1,573	94.47	122,545	125,139	2,197		111.52	1.96

Net Levelized Cost (c/kWh)	**18.63**
Net Levelized Cost ($000s)	**20,911**

GE 7FA CT Bus-Bar Calculation - 15% Capacity Factor - High Gas Case

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	73,998	First Year Fixed O&M ($ 1,000)	360.8	3.0%
Total Net Capacity (kW)	171,700	First Year Variable O&M ($/MWh)	5.13	3.0%
Capacity Factor	15.0%	First Year NG Cost ($/MBtu)	4.70	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	10,450	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	8,829	361	1,157	4.70	11,088	21,434	21,434		9.50	9.50
2011	8,829	372	1,192	5.00	11,788	22,180	20,424		9.83	9.05
2012	8,829	383	1,228	5.32	12,532	22,971	19,477		10.18	8.63
2013	8,829	394	1,265	5.65	13,323	23,811	18,590		10.55	8.24
2014	8,829	406	1,303	6.01	14,165	24,702	17,759		10.95	7.87
2015	8,829	418	1,342	6.39	15,059	25,647	16,978		11.37	7.53
2016	8,829	431	1,382	6.79	16,010	26,651	16,246		11.81	7.20
2017	8,829	444	1,423	7.22	17,021	27,716	15,557		12.28	6.90
2018	8,829	457	1,466	7.68	18,095	28,847	14,909		12.79	6.61
2019	8,829	471	1,510	8.16	19,238	30,047	14,300		13.32	6.34
2020	8,829	485	1,555	8.67	20,452	31,321	13,726		13.88	6.08
2021	8,829	499	1,602	9.22	21,744	32,674	13,185		14.48	5.84
2022	8,829	514	1,650	9.80	23,117	34,110	12,674		15.12	5.62
2023	8,829	530	1,700	10.42	24,576	35,634	12,192		15.79	5.40
2024	8,829	546	1,751	11.08	26,128	37,253	11,737		16.51	5.20
2025	8,829	562	1,803	11.78	27,778	38,972	11,306		17.27	5.01
2026	8,829	579	1,857	12.53	29,531	40,796	10,898		18.08	4.83
2027	8,829	596	1,913	13.32	31,396	42,734	10,512		18.94	4.66
2028	8,829	614	1,970	14.16	33,378	44,792	10,145		19.85	4.50
2029	8,829	633	2,029	15.05	35,486	46,977	9,798		20.82	4.34
2030	0	652	2,090	16.00	37,726	40,468	7,772		17.94	3.44
2031	0	671	2,153	17.01	40,109	42,933	7,592		19.03	3.37
2032	0	691	2,218	18.09	42,641	45,550	7,417		20.19	3.29
2033	0	712	2,284	19.23	45,333	48,330	7,246		21.42	3.21
2034	0	733	2,353	20.44	48,196	51,282	7,080		22.73	3.14
2035	16,368	756	2,423	21.73	51,239	70,785	8,999		31.37	3.99
2036	16,368	778	2,496	23.11	54,474	74,116	8,676		32.85	3.85
2037	16,368	802	2,571	24.56	57,913	77,653	8,371		34.42	3.71
2038	16,368	826	2,648	26.11	61,570	81,411	8,081		36.08	3.58
2039	16,368	850	2,727	27.76	65,457	85,403	7,806		37.85	3.46
2040	16,368	876	2,809	29.52	69,590	89,643	7,544		39.73	3.34
2041	16,368	902	2,893	31.38	73,984	94,148	7,296		41.73	3.23
2042	16,368	929	2,980	33.36	78,656	98,933	7,060		43.85	3.13
2043	16,368	957	3,070	35.47	83,622	104,017	6,835		46.10	3.03
2044	16,368	986	3,162	37.71	88,902	109,417	6,620		48.50	2.93
2045	16,368	1,015	3,257	40.09	94,515	115,155	6,416		51.04	2.84
2046	16,368	1,046	3,354	42.62	100,483	121,251	6,220		53.74	2.76
2047	16,368	1,077	3,455	45.31	106,827	127,727	6,034		56.61	2.67
2048	16,368	1,109	3,559	48.17	113,572	134,608	5,855		59.66	2.60
2049	16,368	1,143	3,665	51.21	120,743	141,919	5,684		62.90	2.52
2050	16,368	1,177	3,775	54.45	128,367	149,687	5,521		66.35	2.45
2051	16,368	1,212	3,888	57.88	136,472	157,941	5,364		70.00	2.38
2052	16,368	1,249	4,005	61.54	145,089	166,710	5,213		73.89	2.31
2053	16,368	1,286	4,125	65.42	154,250	176,029	5,069		78.02	2.25
2054	16,368	1,325	4,249	69.56	163,989	185,930	4,930		82.41	2.19
2055	0	1,365	4,377	73.95	174,343	180,084	4,397		79.82	1.95
2056	0	1,405	4,508	78.62	185,351	191,264	4,300		84.78	1.91
2057	0	1,448	4,643	83.58	197,054	203,145	4,205		90.04	1.86
2058	0	1,491	4,782	88.86	209,496	215,769	4,113		95.64	1.82
2059	0	1,536	4,926	94.47	222,723	229,185	4,023		101.58	1.78
							Net Levelized Cost (c/kWh)			**17.25**
							Net Levelized Cost ($000s)			**38,924**

GE LM6000 CT Bus-Bar Calculation - 20% Capacity Factor - Low Gas Case

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	31,010	First Year Fixed O&M ($ 1,000)	466.5	3.0%
Total Net Capacity (kW)	43,700	First Year Variable O&M ($/MWh)	10.16	3.0%
Capacity Factor	20.0%	First Year NG Cost ($/MBtu)	3.74	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	8,990	Levelized Fixed Charge Rate	11.93%	

Year	Capital	Fixed O&M	Variable O&M	Fuel (NG) Rate	Fuel (NG) Cost	Total Cost	PW Total Cost	Other	Busbar Cost	Net PW Cost
	($ 1,000)	($ 1,000)	($ 1,000)	($/MBtu)	($ 1,000)	($ 1,000)	($ 1,000)	($ 1,000)	(c/kWh)	(c/kWh)
2010	3,700	466	778	3.74	2,572	7,516	7,516		9.82	9.82
2011	3,700	480	801	3.82	2,631	7,613	7,010		9.94	9.16
2012	3,700	495	825	3.91	2,692	7,712	6,539		10.07	8.54
2013	3,700	510	850	4.00	2,754	7,814	6,101		10.21	7.97
2014	3,700	525	875	4.09	2,818	7,918	5,693		10.34	7.44
2015	3,700	541	902	4.19	2,883	8,026	5,313		10.48	6.94
2016	3,700	557	929	4.29	2,950	8,135	4,959		10.63	6.48
2017	3,700	574	957	4.39	3,018	8,248	4,630		10.77	6.05
2018	3,700	591	985	4.49	3,088	8,364	4,323		10.92	5.65
2019	3,700	609	1,015	4.59	3,159	8,483	4,037		11.08	5.27
2020	3,700	627	1,045	4.70	3,233	8,605	3,771		11.24	4.93
2021	3,700	646	1,077	4.81	3,307	8,730	3,523		11.40	4.60
2022	3,700	665	1,109	4.92	3,384	8,858	3,291		11.57	4.30
2023	3,700	685	1,142	5.03	3,462	8,989	3,076		11.74	4.02
2024	3,700	706	1,176	5.15	3,542	9,124	2,875		11.92	3.75
2025	3,700	727	1,212	5.27	3,624	9,263	2,687		12.10	3.51
2026	3,700	749	1,248	5.39	3,708	9,405	2,512		12.28	3.28
2027	3,700	771	1,286	5.51	3,794	9,550	2,349		12.47	3.07
2028	3,700	794	1,324	5.64	3,882	9,700	2,197		12.67	2.87
2029	3,700	818	1,364	5.77	3,972	9,853	2,055		12.87	2.68
2030	0	843	1,405	5.90	4,063	6,311	1,212		8.24	1.58
2031	0	868	1,447	6.04	4,158	6,472	1,145		8.45	1.49
2032	0	894	1,490	6.18	4,254	6,638	1,081		8.67	1.41
2033	0	921	1,535	6.32	4,352	6,808	1,021		8.89	1.33
2034	0	948	1,581	6.47	4,453	6,982	964		9.12	1.26
2035	6,859	977	1,629	6.62	4,556	14,020	1,782		18.31	2.33
2036	6,859	1,006	1,677	6.77	4,661	14,204	1,663		18.55	2.17
2037	6,859	1,036	1,728	6.93	4,769	14,392	1,551		18.80	2.03
2038	6,859	1,067	1,780	7.09	4,880	14,586	1,448		19.05	1.89
2039	6,859	1,099	1,833	7.25	4,992	14,784	1,351		19.31	1.76
2040	6,859	1,132	1,888	7.42	5,108	14,987	1,261		19.58	1.65
2041	6,859	1,166	1,945	7.59	5,226	15,196	1,178		19.85	1.54
2042	6,859	1,201	2,003	7.77	5,347	15,411	1,100		20.13	1.44
2043	6,859	1,237	2,063	7.95	5,471	15,630	1,027		20.42	1.34
2044	6,859	1,274	2,125	8.13	5,597	15,856	959		20.71	1.25
2045	6,859	1,313	2,189	8.32	5,727	16,087	896		21.01	1.17
2046	6,859	1,352	2,254	8.51	5,859	16,325	837		21.32	1.09
2047	6,859	1,393	2,322	8.71	5,995	16,569	783		21.64	1.02
2048	6,859	1,434	2,392	8.91	6,134	16,819	732		21.97	0.96
2049	6,859	1,477	2,463	9.12	6,276	17,076	684		22.30	0.89
2050	6,859	1,522	2,537	9.33	6,421	17,339	639		22.65	0.84
2051	6,859	1,567	2,613	9.54	6,570	17,609	598		23.00	0.78
2052	6,859	1,614	2,692	9.77	6,722	17,887	559		23.36	0.73
2053	6,859	1,663	2,772	9.99	6,877	18,172	523		23.73	0.68
2054	6,859	1,713	2,856	10.22	7,036	18,464	490		24.12	0.64
2055	0	1,764	2,941	10.46	7,199	11,904	291		15.55	0.38
2056	0	1,817	3,030	10.70	7,366	12,212	275		15.95	0.36
2057	0	1,872	3,120	10.95	7,536	12,528	259		16.36	0.34
2058	0	1,928	3,214	11.20	7,710	12,852	245		16.79	0.32
2059	0	1,985	3,310	11.46	7,889	13,185	231		17.22	0.30
							Net Levelized Cost (c/kWh)			**11.69**
							Net Levelized Cost ($000s)			**8,954**

GE 7EA CT Bus-Bar Calculation - 20% Capacity Factor - Low Gas Case

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	44,403	First Year Fixed O&M ($ 1,000)	286.5	3.0%
Total Net Capacity (kW)	85,400	First Year Variable O&M ($/MWh)	3.93	3.0%
Capacity Factor	20.0%	First Year NG Cost ($/MBtu)	3.74	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	11,560	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	5,298	287	588	3.74	6,462	12,635	12,635		8.44	8.44
2011	5,298	295	606	3.82	6,612	12,811	11,796		8.56	7.88
2012	5,298	304	624	3.91	6,765	12,991	11,015		8.68	7.36
2013	5,298	313	643	4.00	6,921	13,175	10,286		8.81	6.88
2014	5,298	323	662	4.09	7,081	13,364	9,608		8.93	6.42
2015	5,298	332	682	4.19	7,245	13,557	8,975		9.06	6.00
2016	5,298	342	703	4.29	7,413	13,755	8,385		9.19	5.60
2017	5,298	352	724	4.39	7,584	13,958	7,835		9.33	5.24
2018	5,298	363	745	4.49	7,760	14,166	7,322		9.47	4.89
2019	5,298	374	768	4.59	7,939	14,379	6,843		9.61	4.57
2020	5,298	385	791	4.70	8,123	14,597	6,397		9.76	4.28
2021	5,298	397	815	4.81	8,311	14,820	5,980		9.91	4.00
2022	5,298	409	839	4.92	8,503	15,049	5,592		10.06	3.74
2023	5,298	421	864	5.03	8,700	15,283	5,229		10.21	3.49
2024	5,298	433	890	5.15	8,902	15,523	4,891		10.37	3.27
2025	5,298	446	917	5.27	9,108	15,769	4,575		10.54	3.06
2026	5,298	460	944	5.39	9,318	16,020	4,279		10.71	2.86
2027	5,298	474	973	5.51	9,534	16,278	4,004		10.88	2.68
2028	5,298	488	1,002	5.64	9,754	16,542	3,747		11.06	2.50
2029	5,298	502	1,032	5.77	9,980	16,812	3,506		11.24	2.34
2030	0	518	1,063	5.90	10,211	11,792	2,265		7.88	1.51
2031	0	533	1,095	6.04	10,447	12,075	2,135		8.07	1.43
2032	0	549	1,128	6.18	10,689	12,366	2,014		8.26	1.35
2033	0	566	1,161	6.32	10,937	12,663	1,899		8.46	1.27
2034	0	582	1,196	6.47	11,190	12,968	1,790		8.67	1.20
2035	9,822	600	1,232	6.62	11,448	23,102	2,937		15.44	1.96
2036	9,822	618	1,269	6.77	11,713	23,422	2,742		15.65	1.83
2037	9,822	636	1,307	6.93	11,984	23,750	2,560		15.87	1.71
2038	9,822	656	1,346	7.09	12,262	24,086	2,391		16.10	1.60
2039	9,822	675	1,387	7.25	12,546	24,429	2,233		16.33	1.49
2040	9,822	696	1,428	7.42	12,836	24,782	2,086		16.56	1.39
2041	9,822	716	1,471	7.59	13,133	25,142	1,948		16.80	1.30
2042	9,822	738	1,515	7.77	13,437	25,512	1,820		17.05	1.22
2043	9,822	760	1,561	7.95	13,748	25,890	1,701		17.30	1.14
2044	9,822	783	1,608	8.13	14,066	26,278	1,590		17.56	1.06
2045	9,822	806	1,656	8.32	14,391	26,675	1,486		17.83	0.99
2046	9,822	830	1,706	8.51	14,724	27,082	1,389		18.10	0.93
2047	9,822	855	1,757	8.71	15,065	27,499	1,299		18.38	0.87
2048	9,822	881	1,809	8.91	15,414	27,926	1,215		18.66	0.81
2049	9,822	907	1,864	9.12	15,770	28,363	1,136		18.96	0.76
2050	9,822	935	1,920	9.33	16,135	28,811	1,063		19.26	0.71
2051	9,822	963	1,977	9.54	16,508	29,270	994		19.56	0.66
2052	9,822	992	2,037	9.77	16,890	29,740	930		19.88	0.62
2053	9,822	1,021	2,098	9.99	17,281	30,222	870		20.20	0.58
2054	9,822	1,052	2,161	10.22	17,681	30,716	814		20.53	0.54
2055	0	1,084	2,225	10.46	18,090	21,399	522		14.30	0.35
2056	0	1,116	2,292	10.70	18,509	21,917	493		14.65	0.33
2057	0	1,150	2,361	10.95	18,937	22,448	465		15.00	0.31
2058	0	1,184	2,432	11.20	19,375	22,991	438		15.37	0.29
2059	0	1,220	2,505	11.46	19,824	23,548	413		15.74	0.28
							Net Levelized Cost (c/kWh)			**10.14**
							Net Levelized Cost ($000s)			**15,176**

GE 7FA CT Bus-Bar Calculation - 20% Capacity Factor - Low Gas Case

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	73,998	First Year Fixed O&M ($ 1,000)	360.8	3.0%
Total Net Capacity (kW)	171,700	First Year Variable O&M ($/MWh)	5.13	3.0%
Capacity Factor	20.0%	First Year NG Cost ($/MBtu)	4.70	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	10,450	Levelized Fixed Charge Rate	11.93%	

Year	Capital	Fixed O&M	Variable O&M	Fuel (NG) Rate	Fuel (NG) Cost	Total Cost	PW Total Cost	Other	Busbar Cost	Net PW Cost
	($ 1,000)	($ 1,000)	($ 1,000)	($/MBtu)	($ 1,000)	($ 1,000)	($ 1,000)	($ 1,000)	(c/kWh)	(c/kWh)
2010	8,829	361	1,543	4.70	14,784	25,516	25,516		8.48	8.48
2011	8,829	372	1,589	5.00	15,717	26,507	24,408		8.81	8.11
2012	8,829	383	1,637	5.32	16,709	27,558	23,366		9.16	7.77
2013	8,829	394	1,686	5.65	17,764	28,674	22,387		9.53	7.44
2014	8,829	406	1,737	6.01	18,886	29,858	21,465		9.93	7.14
2015	8,829	418	1,789	6.39	20,078	31,114	20,597		10.34	6.85
2016	8,829	431	1,843	6.79	21,346	32,448	19,779		10.79	6.58
2017	8,829	444	1,898	7.22	22,694	33,864	19,008		11.26	6.32
2018	8,829	457	1,955	7.68	24,127	35,367	18,280		11.76	6.08
2019	8,829	471	2,013	8.16	25,650	36,963	17,591		12.29	5.85
2020	8,829	485	2,074	8.67	27,270	38,657	16,941		12.85	5.63
2021	8,829	499	2,136	9.22	28,992	40,456	16,325		13.45	5.43
2022	8,829	514	2,200	9.80	30,822	42,365	15,742		14.08	5.23
2023	8,829	530	2,266	10.42	32,768	44,393	15,189		14.76	5.05
2024	8,829	546	2,334	11.08	34,837	46,546	14,664		15.47	4.87
2025	8,829	562	2,404	11.78	37,037	48,832	14,166		16.23	4.71
2026	8,829	579	2,476	12.53	39,375	51,259	13,693		17.04	4.55
2027	8,829	596	2,550	13.32	41,861	53,837	13,243		17.90	4.40
2028	8,829	614	2,627	14.16	44,505	56,575	12,814		18.81	4.26
2029	8,829	633	2,706	15.05	47,315	59,482	12,406		19.77	4.12
2030	0	652	2,787	16.00	50,302	53,741	10,321		17.86	3.43
2031	0	671	2,871	17.01	53,478	57,020	10,083		18.95	3.35
2032	0	691	2,957	18.09	56,855	60,503	9,852		20.11	3.28
2033	0	712	3,045	19.23	60,444	64,202	9,626		21.34	3.20
2034	0	733	3,137	20.44	64,261	68,131	9,407		22.65	3.13
2035	16,368	756	3,231	21.73	68,318	88,673	11,273		29.48	3.75
2036	16,368	778	3,328	23.11	72,632	93,106	10,899		30.95	3.62
2037	16,368	802	3,428	24.56	77,218	97,815	10,544		32.52	3.51
2038	16,368	826	3,530	26.11	82,093	102,817	10,205		34.18	3.39
2039	16,368	850	3,636	27.76	87,277	108,131	9,883		35.95	3.29
2040	16,368	876	3,745	29.52	92,787	113,776	9,575		37.82	3.18
2041	16,368	902	3,858	31.38	98,646	119,774	9,282		39.82	3.09
2042	16,368	929	3,974	33.36	104,874	126,145	9,002		41.93	2.99
2043	16,368	957	4,093	35.47	111,496	132,914	8,733		44.18	2.90
2044	16,368	986	4,216	37.71	118,536	140,105	8,477		46.57	2.82
2045	16,368	1,015	4,342	40.09	126,020	147,745	8,231		49.11	2.74
2046	16,368	1,046	4,472	42.62	133,977	155,863	7,996		51.81	2.66
2047	16,368	1,077	4,606	45.31	142,436	164,488	7,770		54.68	2.58
2048	16,368	1,109	4,745	48.17	151,430	173,652	7,553		57.73	2.51
2049	16,368	1,143	4,887	51.21	160,991	183,389	7,345		60.96	2.44
2050	16,368	1,177	5,034	54.45	171,156	193,734	7,145		64.40	2.38
2051	16,368	1,212	5,185	57.88	181,963	204,727	6,953		68.06	2.31
2052	16,368	1,249	5,340	61.54	193,452	216,408	6,767		71.94	2.25
2053	16,368	1,286	5,500	65.42	205,666	228,820	6,589		76.07	2.19
2054	16,368	1,325	5,665	69.56	218,652	242,010	6,417		80.45	2.13
2055	0	1,365	5,835	73.95	232,457	239,657	5,851		79.67	1.95
2056	0	1,405	6,010	78.62	247,135	254,550	5,723		84.62	1.90
2057	0	1,448	6,191	83.58	262,739	270,377	5,597		89.88	1.86
2058	0	1,491	6,376	88.86	279,328	287,195	5,475		95.47	1.82
2059	0	1,536	6,568	94.47	296,964	305,068	5,355		101.41	1.78
							Net Levelized Cost (c/kWh)			**16.20**
							Net Levelized Cost ($000s)			**48,738**

GE LM6000 CT Bus-Bar Calculation - 10% Capacity Factor - Low Gas Case

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	31,010	First Year Fixed O&M ($ 1,000)	466.5	3.0%
Total Net Capacity (kW)	43,700	First Year Variable O&M ($/MWh)	10.16	3.0%
Capacity Factor	10.0%	First Year NG Cost ($/MBtu)	3.74	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	8,990	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	3,700	466	389	3.74	1,286	5,841	5,841		15.26	15.26
2011	3,700	480	401	3.82	1,316	5,896	5,429		15.40	14.18
2012	3,700	495	413	3.91	1,346	5,953	5,048		15.55	13.19
2013	3,700	510	425	4.00	1,377	6,012	4,694		15.70	12.26
2014	3,700	525	438	4.09	1,409	6,072	4,365		15.86	11.40
2015	3,700	541	451	4.19	1,442	6,133	4,060		16.02	10.61
2016	3,700	557	464	4.29	1,475	6,196	3,777		16.19	9.87
2017	3,700	574	478	4.39	1,509	6,261	3,514		16.36	9.18
2018	3,700	591	493	4.49	1,544	6,327	3,270		16.53	8.54
2019	3,700	609	507	4.59	1,580	6,396	3,044		16.71	7.95
2020	3,700	627	523	4.70	1,616	6,466	2,833		16.89	7.40
2021	3,700	646	538	4.81	1,654	6,538	2,638		17.08	6.89
2022	3,700	665	554	4.92	1,692	6,611	2,457		17.27	6.42
2023	3,700	685	571	5.03	1,731	6,687	2,288		17.47	5.98
2024	3,700	706	588	5.15	1,771	6,765	2,131		17.67	5.57
2025	3,700	727	606	5.27	1,812	6,845	1,986		17.88	5.19
2026	3,700	749	624	5.39	1,854	6,927	1,850		18.09	4.83
2027	3,700	771	643	5.51	1,897	7,011	1,724		18.31	4.50
2028	3,700	794	662	5.64	1,941	7,097	1,607		18.54	4.20
2029	3,700	818	682	5.77	1,986	7,186	1,499		18.77	3.91
2030	0	843	702	5.90	2,032	3,577	687		9.34	1.79
2031	0	868	723	6.04	2,079	3,670	649		9.59	1.70
2032	0	894	745	6.18	2,127	3,766	613		9.84	1.60
2033	0	921	768	6.32	2,176	3,864	579		10.09	1.51
2034	0	948	791	6.47	2,226	3,965	547		10.36	1.43
2035	6,859	977	814	6.62	2,278	10,928	1,389		28.55	3.63
2036	6,859	1,006	839	6.77	2,331	11,035	1,292		28.83	3.37
2037	6,859	1,036	864	6.93	2,385	11,144	1,201		29.11	3.14
2038	6,859	1,067	890	7.09	2,440	11,256	1,117		29.40	2.92
2039	6,859	1,099	916	7.25	2,496	11,371	1,039		29.70	2.71
2040	6,859	1,132	944	7.42	2,554	11,490	967		30.01	2.53
2041	6,859	1,166	972	7.59	2,613	11,611	900		30.33	2.35
2042	6,859	1,201	1,001	7.77	2,674	11,736	837		30.66	2.19
2043	6,859	1,237	1,031	7.95	2,735	11,863	780		30.99	2.04
2044	6,859	1,274	1,062	8.13	2,799	11,995	726		31.33	1.90
2045	6,859	1,313	1,094	8.32	2,863	12,130	676		31.69	1.77
2046	6,859	1,352	1,127	8.51	2,930	12,268	629		32.05	1.64
2047	6,859	1,393	1,161	8.71	2,998	12,410	586		32.42	1.53
2048	6,859	1,434	1,196	8.91	3,067	12,556	546		32.80	1.43
2049	6,859	1,477	1,232	9.12	3,138	12,706	509		33.19	1.33
2050	6,859	1,522	1,269	9.33	3,210	12,860	474		33.59	1.24
2051	6,859	1,567	1,307	9.54	3,285	13,018	442		34.01	1.15
2052	6,859	1,614	1,346	9.77	3,361	13,180	412		34.43	1.08
2053	6,859	1,663	1,386	9.99	3,439	13,347	384		34.87	1.00
2054	6,859	1,713	1,428	10.22	3,518	13,518	358		35.31	0.94
2055	0	1,764	1,471	10.46	3,600	6,834	167		17.85	0.44
2056	0	1,817	1,515	10.70	3,683	7,015	158		18.32	0.41
2057	0	1,872	1,560	10.95	3,768	7,200	149		18.81	0.39
2058	0	1,928	1,607	11.20	3,855	7,390	141		19.30	0.37
2059	0	1,985	1,655	11.46	3,944	7,585	133		19.81	0.35
							Net Levelized Cost (c/kWh)			**17.48**
							Net Levelized Cost ($000s)			**6,692**

GE 7EA CT Bus-Bar Calculation - 10% Capacity Factor - Low Gas Case

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	44,403	First Year Fixed O&M ($ 1,000)	286.5	3.0%
Total Net Capacity (kW)	85,400	First Year Variable O&M ($/MWh)	3.93	3.0%
Capacity Factor	10.0%	First Year NG Cost ($/MBtu)	3.74	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	11,560	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	5,298	287	294	3.74	3,231	9,110	9,110		12.18	12.18
2011	5,298	295	303	3.82	3,306	9,202	8,473		12.30	11.33
2012	5,298	304	312	3.91	3,382	9,296	7,882		12.43	10.54
2013	5,298	313	322	4.00	3,461	9,393	7,334		12.56	9.80
2014	5,298	323	331	4.09	3,541	9,492	6,824		12.69	9.12
2015	5,298	332	341	4.19	3,623	9,594	6,351		12.82	8.49
2016	5,298	342	351	4.29	3,706	9,698	5,911		12.96	7.90
2017	5,298	352	362	4.39	3,792	9,804	5,503		13.11	7.36
2018	5,298	363	373	4.49	3,880	9,913	5,124		13.25	6.85
2019	5,298	374	384	4.59	3,970	10,025	4,771		13.40	6.38
2020	5,298	385	395	4.70	4,062	10,140	4,444		13.55	5.94
2021	5,298	397	407	4.81	4,156	10,257	4,139		13.71	5.53
2022	5,298	409	420	4.92	4,252	10,378	3,856		13.87	5.15
2023	5,298	421	432	5.03	4,350	10,501	3,593		14.04	4.80
2024	5,298	433	445	5.15	4,451	10,627	3,348		14.21	4.48
2025	5,298	446	458	5.27	4,554	10,756	3,120		14.38	4.17
2026	5,298	460	472	5.39	4,659	10,889	2,909		14.56	3.89
2027	5,298	474	486	5.51	4,767	11,025	2,712		14.74	3.62
2028	5,298	488	501	5.64	4,877	11,164	2,529		14.92	3.38
2029	5,298	502	516	5.77	4,990	11,306	2,358		15.11	3.15
2030	0	518	531	5.90	5,106	6,155	1,182		8.23	1.58
2031	0	533	547	6.04	5,224	6,304	1,115		8.43	1.49
2032	0	549	564	6.18	5,345	6,457	1,051		8.63	1.41
2033	0	566	581	6.32	5,468	6,614	992		8.84	1.33
2034	0	582	598	6.47	5,595	6,775	935		9.06	1.25
2035	9,822	600	616	6.62	5,724	16,762	2,131		22.41	2.85
2036	9,822	618	635	6.77	5,857	16,931	1,982		22.63	2.65
2037	9,822	636	654	6.93	5,992	17,104	1,844		22.86	2.46
2038	9,822	656	673	7.09	6,131	17,281	1,715		23.10	2.29
2039	9,822	675	693	7.25	6,273	17,463	1,596		23.34	2.13
2040	9,822	696	714	7.42	6,418	17,649	1,485		23.59	1.99
2041	9,822	716	736	7.59	6,566	17,840	1,383		23.85	1.85
2042	9,822	738	758	7.77	6,718	18,036	1,287		24.11	1.72
2043	9,822	760	780	7.95	6,874	18,236	1,198		24.38	1.60
2044	9,822	783	804	8.13	7,033	18,441	1,116		24.65	1.49
2045	9,822	806	828	8.32	7,196	18,652	1,039		24.93	1.39
2046	9,822	830	853	8.51	7,362	18,867	968		25.22	1.29
2047	9,822	855	878	8.71	7,532	19,088	902		25.52	1.21
2048	9,822	881	905	8.91	7,707	19,314	840		25.82	1.12
2049	9,822	907	932	9.12	7,885	19,546	783		26.13	1.05
2050	9,822	935	960	9.33	8,068	19,784	730		26.45	0.98
2051	9,822	963	989	9.54	8,254	20,027	680		26.77	0.91
2052	9,822	992	1,018	9.77	8,445	20,277	634		27.10	0.85
2053	9,822	1,021	1,049	9.99	8,641	20,533	591		27.45	0.79
2054	9,822	1,052	1,080	10.22	8,841	20,795	551		27.80	0.74
2055	0	1,084	1,113	10.46	9,045	11,241	274		15.03	0.37
2056	0	1,116	1,146	10.70	9,254	11,517	259		15.39	0.35
2057	0	1,150	1,180	10.95	9,469	11,799	244		15.77	0.33
2058	0	1,184	1,216	11.20	9,688	12,088	230		16.16	0.31
2059	0	1,220	1,252	11.46	9,912	12,384	217		16.55	0.29
							Net Levelized Cost (c/kWh)			**14.01**
							Net Levelized Cost ($000s)			**10,484**

GE 7FA CT Bus-Bar Calculation - 10% Capacity Factor - Low Gas Case

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	73,998	First Year Fixed O&M ($ 1,000)	360.8	3.0%
Total Net Capacity (kW)	171,700	First Year Variable O&M ($/MWh)	5.13	3.0%
Capacity Factor	10.0%	First Year NG Cost ($/MBtu)	4.70	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	10,450	Levelized Fixed Charge Rate	11.93%	

Year	Capital	Fixed O&M	Variable O&M	Fuel (NG) Rate	Fuel (NG) Cost	Total Cost	PW Total Cost	Other	Busbar Cost	Net PW Cost
	($ 1,000)	($ 1,000)	($ 1,000)	($/MBtu)	($ 1,000)	($ 1,000)	($ 1,000)	($ 1,000)	(c/kWh)	(c/kWh)
2010	8,829	361	772	4.70	7,392	17,353	17,353		11.54	11.54
2011	8,829	372	795	5.00	7,858	17,854	16,440		11.87	10.93
2012	8,829	383	819	5.32	8,355	18,385	15,588		12.22	10.36
2013	8,829	394	843	5.65	8,882	18,948	14,794		12.60	9.84
2014	8,829	406	868	6.01	9,443	19,546	14,052		13.00	9.34
2015	8,829	418	894	6.39	10,039	20,181	13,359		13.42	8.88
2016	8,829	431	921	6.79	10,673	20,854	12,712		13.86	8.45
2017	8,829	444	949	7.22	11,347	21,568	12,106		14.34	8.05
2018	8,829	457	977	7.68	12,063	22,327	11,539		14.84	7.67
2019	8,829	471	1,007	8.16	12,825	23,131	11,009		15.38	7.32
2020	8,829	485	1,037	8.67	13,635	23,985	10,511		15.95	6.99
2021	8,829	499	1,068	9.22	14,496	24,892	10,045		16.55	6.68
2022	8,829	514	1,100	9.80	15,411	25,854	9,607		17.19	6.39
2023	8,829	530	1,133	10.42	16,384	26,876	9,195		17.87	6.11
2024	8,829	546	1,167	11.08	17,419	27,960	8,809		18.59	5.86
2025	8,829	562	1,202	11.78	18,518	29,111	8,445		19.35	5.61
2026	8,829	579	1,238	12.53	19,688	30,333	8,103		20.17	5.39
2027	8,829	596	1,275	13.32	20,931	31,631	7,780		21.03	5.17
2028	8,829	614	1,314	14.16	22,252	33,009	7,476		21.95	4.97
2029	8,829	633	1,353	15.05	23,657	34,472	7,189		22.92	4.78
2030	0	652	1,393	16.00	25,151	27,196	5,223		18.08	3.47
2031	0	671	1,435	17.01	26,739	28,846	5,101		19.18	3.39
2032	0	691	1,478	18.09	28,427	30,597	4,982		20.34	3.31
2033	0	712	1,523	19.23	30,222	32,457	4,867		21.58	3.24
2034	0	733	1,568	20.44	32,130	34,432	4,754		22.89	3.16
2035	16,368	756	1,615	21.73	34,159	52,898	6,725		35.17	4.47
2036	16,368	778	1,664	23.11	36,316	55,126	6,453		36.65	4.29
2037	16,368	802	1,714	24.56	38,609	57,492	6,197		38.22	4.12
2038	16,368	826	1,765	26.11	41,047	60,005	5,956		39.89	3.96
2039	16,368	850	1,818	27.76	43,638	62,675	5,728		41.67	3.81
2040	16,368	876	1,873	29.52	46,394	65,510	5,513		43.55	3.67
2041	16,368	902	1,929	31.38	49,323	68,522	5,310		45.56	3.53
2042	16,368	929	1,987	33.36	52,437	71,721	5,118		47.68	3.40
2043	16,368	957	2,046	35.47	55,748	75,119	4,936		49.94	3.28
2044	16,368	986	2,108	37.71	59,268	78,729	4,763		52.34	3.17
2045	16,368	1,015	2,171	40.09	63,010	82,564	4,600		54.89	3.06
2046	16,368	1,046	2,236	42.62	66,989	86,638	4,445		57.60	2.96
2047	16,368	1,077	2,303	45.31	71,218	90,966	4,297		60.48	2.86
2048	16,368	1,109	2,372	48.17	75,715	95,564	4,157		63.54	2.76
2049	16,368	1,143	2,444	51.21	80,495	100,450	4,023		66.78	2.67
2050	16,368	1,177	2,517	54.45	85,578	105,640	3,896		70.23	2.59
2051	16,368	1,212	2,592	57.88	90,981	111,154	3,775		73.90	2.51
2052	16,368	1,249	2,670	61.54	96,726	117,012	3,659		77.80	2.43
2053	16,368	1,286	2,750	65.42	102,833	123,237	3,549		81.93	2.36
2054	16,368	1,325	2,833	69.56	109,326	129,851	3,443		86.33	2.29
2055	0	1,365	2,918	73.95	116,229	120,511	2,942		80.12	1.96
2056	0	1,405	3,005	78.62	123,567	127,978	2,877		85.09	1.91
2057	0	1,448	3,095	83.58	131,369	135,912	2,814		90.36	1.87
2058	0	1,491	3,188	88.86	139,664	144,343	2,751		95.97	1.83
2059	0	1,536	3,284	94.47	148,482	153,302	2,691		101.92	1.79
							Net Levelized Cost (c/kWh)			**19.35**
							Net Levelized Cost ($000s)			**29,110**

GE LM6000 CT Bus-Bar Calculation - 15% Capacity Factor - Low Gas Case

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	31,010	First Year Fixed O&M ($ 1,000)	466.5	3.0%
Total Net Capacity (kW)	43,700	First Year Variable O&M ($/MWh)	10.16	3.0%
Capacity Factor	15.0%	First Year NG Cost ($/MBtu)	3.74	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	8,990	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	3,700	466	583	3.74	1,929	6,678	6,678		11.63	11.63
2011	3,700	480	601	3.82	1,973	6,754	6,220		11.76	10.83
2012	3,700	495	619	3.91	2,019	6,833	5,793		11.90	10.09
2013	3,700	510	637	4.00	2,066	6,913	5,397		12.04	9.40
2014	3,700	525	657	4.09	2,113	6,995	5,029		12.18	8.76
2015	3,700	541	676	4.19	2,162	7,079	4,686		12.33	8.16
2016	3,700	557	697	4.29	2,212	7,166	4,368		12.48	7.61
2017	3,700	574	717	4.39	2,264	7,255	4,072		12.63	7.09
2018	3,700	591	739	4.49	2,316	7,346	3,797		12.79	6.61
2019	3,700	609	761	4.59	2,370	7,439	3,540		12.96	6.17
2020	3,700	627	784	4.70	2,424	7,535	3,302		13.12	5.75
2021	3,700	646	807	4.81	2,481	7,634	3,080		13.29	5.36
2022	3,700	665	832	4.92	2,538	7,735	2,874		13.47	5.00
2023	3,700	685	857	5.03	2,597	7,838	2,682		13.65	4.67
2024	3,700	706	882	5.15	2,657	7,945	2,503		13.84	4.36
2025	3,700	727	909	5.27	2,718	8,054	2,336		14.03	4.07
2026	3,700	749	936	5.39	2,781	8,166	2,181		14.22	3.80
2027	3,700	771	964	5.51	2,845	8,281	2,037		14.42	3.55
2028	3,700	794	993	5.64	2,911	8,398	1,902		14.63	3.31
2029	3,700	818	1,023	5.77	2,979	8,519	1,777		14.84	3.09
2030	0	843	1,054	5.90	3,048	4,944	949		8.61	1.65
2031	0	868	1,085	6.04	3,118	5,071	897		8.83	1.56
2032	0	894	1,118	6.18	3,190	5,202	847		9.06	1.48
2033	0	921	1,151	6.32	3,264	5,336	800		9.29	1.39
2034	0	948	1,186	6.47	3,340	5,474	756		9.53	1.32
2035	6,859	977	1,221	6.62	3,417	12,474	1,586		21.72	2.76
2036	6,859	1,006	1,258	6.77	3,496	12,619	1,477		21.98	2.57
2037	6,859	1,036	1,296	6.93	3,577	12,768	1,376		22.24	2.40
2038	6,859	1,067	1,335	7.09	3,660	12,921	1,282		22.50	2.23
2039	6,859	1,099	1,375	7.25	3,744	13,078	1,195		22.77	2.08
2040	6,859	1,132	1,416	7.42	3,831	13,238	1,114		23.05	1.94
2041	6,859	1,166	1,458	7.59	3,920	13,404	1,039		23.34	1.81
2042	6,859	1,201	1,502	7.77	4,010	13,573	969		23.64	1.69
2043	6,859	1,237	1,547	7.95	4,103	13,747	903		23.94	1.57
2044	6,859	1,274	1,594	8.13	4,198	13,925	843		24.25	1.47
2045	6,859	1,313	1,641	8.32	4,295	14,109	786		24.57	1.37
2046	6,859	1,352	1,691	8.51	4,395	14,297	733		24.90	1.28
2047	6,859	1,393	1,741	8.71	4,496	14,490	684		25.23	1.19
2048	6,859	1,434	1,794	8.91	4,600	14,688	639		25.58	1.11
2049	6,859	1,477	1,847	9.12	4,707	14,891	596		25.93	1.04
2050	6,859	1,522	1,903	9.33	4,816	15,100	557		26.30	0.97
2051	6,859	1,567	1,960	9.54	4,927	15,314	520		26.67	0.91
2052	6,859	1,614	2,019	9.77	5,041	15,534	486		27.05	0.85
2053	6,859	1,663	2,079	9.99	5,158	15,759	454		27.44	0.79
2054	6,859	1,713	2,142	10.22	5,277	15,991	424		27.85	0.74
2055	0	1,764	2,206	10.46	5,399	9,369	229		16.32	0.40
2056	0	1,817	2,272	10.70	5,524	9,613	216		16.74	0.38
2057	0	1,872	2,340	10.95	5,652	9,864	204		17.18	0.36
2058	0	1,928	2,411	11.20	5,783	10,121	193		17.63	0.34
2059	0	1,985	2,483	11.46	5,917	10,385	182		18.09	0.32
							Net Levelized Cost (c/kWh)			**13.62**
							Net Levelized Cost ($000s)			**7,823**

GE 7EA CT Bus-Bar Calculation - 15% Capacity Factor - Low Gas Case

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	44,403	First Year Fixed O&M ($ 1,000)	286.5	3.0%
Total Net Capacity (kW)	85,400	First Year Variable O&M ($/MWh)	3.93	3.0%
Capacity Factor	15.0%	First Year NG Cost ($/MBtu)	3.74	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	11,560	Levelized Fixed Charge Rate	11.93%	

Year	Capital	Fixed O&M	Variable O&M	Fuel (NG) Rate	Fuel (NG) Cost	Total Cost	PW Total Cost	Other	Busbar Cost	Net PW Cost
	($ 1,000)	($ 1,000)	($ 1,000)	($/MBtu)	($ 1,000)	($ 1,000)	($ 1,000)	($ 1,000)	(c/kWh)	(c/kWh)
2010	5,298	287	441	3.74	4,847	10,872	10,872		9.69	9.69
2011	5,298	295	455	3.82	4,959	11,006	10,135		9.81	9.03
2012	5,298	304	468	3.91	5,073	11,144	9,448		9.93	8.42
2013	5,298	313	482	4.00	5,191	11,284	8,810		10.06	7.85
2014	5,298	323	497	4.09	5,311	11,428	8,216		10.18	7.32
2015	5,298	332	512	4.19	5,434	11,576	7,663		10.32	6.83
2016	5,298	342	527	4.29	5,560	11,727	7,148		10.45	6.37
2017	5,298	352	543	4.39	5,688	11,881	6,669		10.59	5.94
2018	5,298	363	559	4.49	5,820	12,040	6,223		10.73	5.55
2019	5,298	374	576	4.59	5,955	12,202	5,807		10.87	5.18
2020	5,298	385	593	4.70	6,092	12,368	5,420		11.02	4.83
2021	5,298	397	611	4.81	6,233	12,539	5,060		11.17	4.51
2022	5,298	409	629	4.92	6,378	12,713	4,724		11.33	4.21
2023	5,298	421	648	5.03	6,525	12,892	4,411		11.49	3.93
2024	5,298	433	668	5.15	6,676	13,075	4,119		11.65	3.67
2025	5,298	446	688	5.27	6,831	13,262	3,847		11.82	3.43
2026	5,298	460	708	5.39	6,989	13,455	3,594		11.99	3.20
2027	5,298	474	730	5.51	7,150	13,651	3,358		12.17	2.99
2028	5,298	488	751	5.64	7,316	13,853	3,138		12.34	2.80
2029	5,298	502	774	5.77	7,485	14,059	2,932		12.53	2.61
2030	0	518	797	5.90	7,658	8,973	1,723		8.00	1.54
2031	0	533	821	6.04	7,836	9,190	1,625		8.19	1.45
2032	0	549	846	6.18	8,017	9,412	1,533		8.39	1.37
2033	0	566	871	6.32	8,202	9,639	1,445		8.59	1.29
2034	0	582	897	6.47	8,392	9,872	1,363		8.80	1.21
2035	9,822	600	924	6.62	8,586	19,932	2,534		17.76	2.26
2036	9,822	618	952	6.77	8,785	20,177	2,362		17.98	2.10
2037	9,822	636	980	6.93	8,988	20,427	2,202		18.20	1.96
2038	9,822	656	1,010	7.09	9,196	20,684	2,053		18.43	1.83
2039	9,822	675	1,040	7.25	9,409	20,946	1,914		18.67	1.71
2040	9,822	696	1,071	7.42	9,627	21,215	1,785		18.91	1.59
2041	9,822	716	1,103	7.59	9,850	21,491	1,665		19.15	1.48
2042	9,822	738	1,137	7.77	10,078	21,774	1,554		19.40	1.38
2043	9,822	760	1,171	7.95	10,311	22,063	1,450		19.66	1.29
2044	9,822	783	1,206	8.13	10,549	22,360	1,353		19.93	1.21
2045	9,822	806	1,242	8.32	10,793	22,663	1,263		20.20	1.13
2046	9,822	830	1,279	8.51	11,043	22,975	1,179		20.47	1.05
2047	9,822	855	1,318	8.71	11,299	23,293	1,100		20.76	0.98
2048	9,822	881	1,357	8.91	11,560	23,620	1,027		21.05	0.92
2049	9,822	907	1,398	9.12	11,828	23,955	959		21.35	0.86
2050	9,822	935	1,440	9.33	12,101	24,298	896		21.65	0.80
2051	9,822	963	1,483	9.54	12,381	24,649	837		21.97	0.75
2052	9,822	992	1,527	9.77	12,668	25,009	782		22.29	0.70
2053	9,822	1,021	1,573	9.99	12,961	25,377	731		22.61	0.65
2054	9,822	1,052	1,620	10.22	13,261	25,755	683		22.95	0.61
2055	0	1,084	1,669	10.46	13,568	16,320	398		14.54	0.36
2056	0	1,116	1,719	10.70	13,882	16,717	376		14.90	0.33
2057	0	1,150	1,771	10.95	14,203	17,123	354		15.26	0.32
2058	0	1,184	1,824	11.20	14,532	17,539	334		15.63	0.30
2059	0	1,220	1,879	11.46	14,868	17,966	315		16.01	0.28

Net Levelized Cost (c/kWh)	**11.43**
Net Levelized Cost ($000s)	**12,830**

GE 7FA CT Bus-Bar Calculation - 15% Capacity Factor - Low Gas Case

Plant Input Data		Economic Input Data	Rate	Escalation
Capital Cost ($ 1,000)	73,998	First Year Fixed O&M ($ 1,000)	360.8	3.0%
Total Net Capacity (kW)	171,700	First Year Variable O&M ($/MWh)	5.13	3.0%
Capacity Factor	15.0%	First Year NG Cost ($/MBtu)	4.70	(Input)
		Present Worth Discount Rate	8.60%	
Full Load Heat Rate with Degradation	10,450	Levelized Fixed Charge Rate	11.93%	

Year	Capital ($ 1,000)	Fixed O&M ($ 1,000)	Variable O&M ($ 1,000)	Fuel (NG) Rate ($/MBtu)	Fuel (NG) Cost ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Other ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	8,829	361	1,157	4.70	11,088	21,434	21,434		9.50	9.50
2011	8,829	372	1,192	5.00	11,788	22,180	20,424		9.83	9.05
2012	8,829	383	1,228	5.32	12,532	22,971	19,477		10.18	8.63
2013	8,829	394	1,265	5.65	13,323	23,811	18,590		10.55	8.24
2014	8,829	406	1,303	6.01	14,165	24,702	17,759		10.95	7.87
2015	8,829	418	1,342	6.39	15,059	25,647	16,978		11.37	7.53
2016	8,829	431	1,382	6.79	16,010	26,651	16,246		11.81	7.20
2017	8,829	444	1,423	7.22	17,021	27,716	15,557		12.28	6.90
2018	8,829	457	1,466	7.68	18,095	28,847	14,909		12.79	6.61
2019	8,829	471	1,510	8.16	19,238	30,047	14,300		13.32	6.34
2020	8,829	485	1,555	8.67	20,452	31,321	13,726		13.88	6.08
2021	8,829	499	1,602	9.22	21,744	32,674	13,185		14.48	5.84
2022	8,829	514	1,650	9.80	23,117	34,110	12,674		15.12	5.62
2023	8,829	530	1,700	10.42	24,576	35,634	12,192		15.79	5.40
2024	8,829	546	1,751	11.08	26,128	37,253	11,737		16.51	5.20
2025	8,829	562	1,803	11.78	27,778	38,972	11,306		17.27	5.01
2026	8,829	579	1,857	12.53	29,531	40,796	10,898		18.08	4.83
2027	8,829	596	1,913	13.32	31,396	42,734	10,512		18.94	4.66
2028	8,829	614	1,970	14.16	33,378	44,792	10,145		19.85	4.50
2029	8,829	633	2,029	15.05	35,486	46,977	9,798		20.82	4.34
2030	0	652	2,090	16.00	37,726	40,468	7,772		17.94	3.44
2031	0	671	2,153	17.01	40,109	42,933	7,592		19.03	3.37
2032	0	691	2,218	18.09	42,641	45,550	7,417		20.19	3.29
2033	0	712	2,284	19.23	45,333	48,330	7,246		21.42	3.21
2034	0	733	2,353	20.44	48,196	51,282	7,080		22.73	3.14
2035	16,368	756	2,423	21.73	51,239	70,785	8,999		31.37	3.99
2036	16,368	778	2,496	23.11	54,474	74,116	8,676		32.85	3.85
2037	16,368	802	2,571	24.56	57,913	77,653	8,371		34.42	3.71
2038	16,368	826	2,648	26.11	61,570	81,411	8,081		36.08	3.58
2039	16,368	850	2,727	27.76	65,457	85,403	7,806		37.85	3.46
2040	16,368	876	2,809	29.52	69,590	89,643	7,544		39.73	3.34
2041	16,368	902	2,893	31.38	73,984	94,148	7,296		41.73	3.23
2042	16,368	929	2,980	33.36	78,656	98,933	7,060		43.85	3.13
2043	16,368	957	3,070	35.47	83,622	104,017	6,835		46.10	3.03
2044	16,368	986	3,162	37.71	88,902	109,417	6,620		48.50	2.93
2045	16,368	1,015	3,257	40.09	94,515	115,155	6,416		51.04	2.84
2046	16,368	1,046	3,354	42.62	100,483	121,251	6,220		53.74	2.76
2047	16,368	1,077	3,455	45.31	106,827	127,727	6,034		56.61	2.67
2048	16,368	1,109	3,559	48.17	113,572	134,608	5,855		59.66	2.60
2049	16,368	1,143	3,665	51.21	120,743	141,919	5,684		62.90	2.52
2050	16,368	1,177	3,775	54.45	128,367	149,687	5,521		66.35	2.45
2051	16,368	1,212	3,888	57.88	136,472	157,941	5,364		70.00	2.38
2052	16,368	1,249	4,005	61.54	145,089	166,710	5,213		73.89	2.31
2053	16,368	1,286	4,125	65.42	154,250	176,029	5,069		78.02	2.25
2054	16,368	1,325	4,249	69.56	163,989	185,930	4,930		82.41	2.19
2055	0	1,365	4,377	73.95	174,343	180,084	4,397		79.82	1.95
2056	0	1,405	4,508	78.62	185,351	191,264	4,300		84.78	1.91
2057	0	1,448	4,643	83.58	197,054	203,145	4,205		90.04	1.86
2058	0	1,491	4,782	88.86	209,496	215,769	4,113		95.64	1.82
2059	0	1,536	4,926	94.47	222,723	229,185	4,023		101.58	1.78

Net Levelized Cost (c/kWh)	**17.25**
Net Levelized Cost ($000s)	**38,924**

Pumped Storage Bus-Bar Calculation - 20% Capacity Factor - Low Coal

Plant Input Data				Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)			1,762,342	First Year Staffing ($ 1,000)	5,015.0	3.0%
Total Net Capacity (kW)			1,200,000	Annual O&M Costs ($ 1,000)	10,627	3.0%
Capacity Factor			20.0%	First Year Coal Cost ($/MBtu)	0.913	1.0%
Transmission Tariff ($/kW-mo) ; % Losses	$	1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost			10,862	Levelized Fixed Charge Rate	10.17%	
				Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	179,301	5,015	10,627	14,400	0.913	29,186	5,946	244,475	244,475	12.24	12.24
2011	179,301	5,165	10,946	14,400	0.922	29,478	6,124	245,414	225,980	12.29	11.31
2012	179,301	5,320	11,274	14,400	0.931	29,773	6,308	246,376	208,900	12.34	10.46
2013	179,301	5,480	11,612	14,400	0.941	30,071	6,497	247,361	193,126	12.38	9.67
2014	179,301	5,644	11,961	18,276	0.950	30,371	6,692	252,245	181,344	12.63	9.08
2015	179,301	5,814	12,320	14,400	0.959	30,675	6,893	249,402	165,101	12.49	8.27
2016	179,301	5,988	12,689	14,400	0.969	30,982	7,099	250,459	152,672	12.54	7.64
2017	179,301	6,168	13,070	14,400	0.979	31,292	7,312	251,542	141,190	12.59	7.07
2018	179,301	6,353	13,462	14,400	0.989	31,605	7,532	252,652	130,582	12.65	6.54
2019	179,301	6,543	13,866	14,400	0.998	31,921	7,758	253,788	120,782	12.71	6.05
2020	179,301	6,740	14,282	14,400	1.008	32,240	7,990	254,953	111,728	12.76	5.59
2021	179,301	6,942	14,710	14,400	1.019	32,562	8,230	256,145	103,361	12.82	5.18
2022	179,301	7,150	15,152	14,400	1.029	32,888	8,477	257,367	95,630	12.89	4.79
2023	179,301	7,365	15,606	14,400	1.039	33,217	8,731	258,620	88,486	12.95	4.43
2024	179,301	7,586	16,074	41,560	1.049	33,549	8,993	287,063	90,440	14.37	4.53
2025	179,301	7,813	16,557	14,400	1.060	33,884	9,263	261,218	75,780	13.08	3.79
2026	179,301	8,048	17,053	14,400	1.070	34,223	9,541	262,566	70,139	13.15	3.51
2027	179,301	8,289	17,565	14,400	1.081	34,566	9,827	263,947	64,925	13.22	3.25
2028	179,301	8,538	18,092	14,400	1.092	34,911	10,122	265,363	60,104	13.29	3.01
2029	179,301	8,794	18,635	14,400	1.103	35,260	10,426	266,815	55,647	13.36	2.79
2030	179,301	9,058	19,194	14,400	1.114	35,613	10,738	268,303	51,526	13.43	2.58
2031	179,301	9,329	19,769	14,400	1.125	35,969	11,061	269,829	47,716	13.51	2.39
2032	179,301	9,609	20,363	14,400	1.136	36,329	11,392	271,394	44,192	13.59	2.21
2033	179,301	9,898	20,973	14,400	1.148	36,692	11,734	272,998	40,933	13.67	2.05
2034	179,301	10,195	21,603	271,408	1.159	37,059	12,086	531,651	73,403	26.62	3.68
2035	179,301	10,500	22,251	14,400	1.171	37,430	12,449	276,330	35,130	13.84	1.76
2036	179,301	10,815	22,918	14,400	1.182	37,804	12,822	278,060	32,551	13.92	1.63
2037	179,301	11,140	23,606	14,400	1.194	38,182	13,207	279,835	30,165	14.01	1.51
2038	179,301	11,474	24,314	14,400	1.206	38,564	13,603	281,655	27,957	14.10	1.40
2039	179,301	11,818	25,043	116,419	1.218	38,949	14,011	385,542	35,238	19.30	1.76
2040	0	12,173	25,795	14,400	1.230	39,339	14,432	106,138	8,933	5.31	0.45
2041	0	12,538	26,569	14,400	1.243	39,732	14,864	108,103	8,377	5.41	0.42
2042	0	12,914	27,366	14,400	1.255	40,130	15,310	110,120	7,858	5.51	0.39
2043	0	13,302	28,187	14,400	1.268	40,531	15,770	112,189	7,372	5.62	0.37
2044	0	13,701	29,032	23,808	1.280	40,936	16,243	123,719	7,486	6.19	0.37
2045	0	14,112	29,903	14,400	1.293	41,345	16,730	116,490	6,490	5.83	0.32
2046	0	14,535	30,800	14,400	1.306	41,759	17,232	118,726	6,091	5.94	0.30
2047	0	14,971	31,724	14,400	1.319	42,177	17,749	121,021	5,717	6.06	0.29
2048	0	15,420	32,676	14,400	1.332	42,598	18,281	123,376	5,367	6.18	0.27
2049	0	15,883	33,656	14,400	1.346	43,024	18,830	125,793	5,038	6.30	0.25
2050	0	16,359	34,666	14,400	1.359	43,455	19,395	128,274	4,731	6.42	0.24
2051	0	16,850	35,706	14,400	1.373	43,889	19,977	130,821	4,443	6.55	0.22
2052	0	17,355	36,777	14,400	1.387	44,328	20,576	133,436	4,173	6.68	0.21
2053	0	17,876	37,880	14,400	1.400	44,771	21,193	136,121	3,920	6.82	0.20
2054	0	18,412	39,017	80,325	1.414	45,219	21,829	204,802	5,430	10.25	0.27
2055	0	18,965	40,187	14,400	1.429	45,671	22,484	141,707	3,460	7.09	0.17
2056	0	19,534	41,393	14,400	1.443	46,128	23,158	144,613	3,251	7.24	0.16
2057	0	20,120	42,635	14,400	1.457	46,589	23,853	147,597	3,055	7.39	0.15
2058	0	20,723	43,914	14,400	1.472	47,055	24,569	150,661	2,872	7.54	0.14
2059	0	21,345	45,231	14,400	1.487	47,526	25,306	153,807	2,700	7.70	0.14
									Net Levelized Cost (c/kWh)		**12.52**
									Net Levelized Cost ($000s)		**250,001**

Pumped Storage Bus-Bar Calculation - 20% Capacity Factor - Low Coal

Plant Input Data				Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)			1,136,411	First Year Staffing ($ 1,000)	4,179.2	3.0%
Total Net Capacity (kW)			600,000	Annual O&M Costs ($ 1,000)	8,000	3.0%
Capacity Factor			20.0%	First Year Coal Cost ($/MBtu)	0.913	1.0%
Transmission Tariff ($/kW-mo) ; % Losses	$	1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost			10,862	Levelized Fixed Charge Rate	10.17%	
				Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	115,618	4,179	8,000	7,200	0.913	14,593	2,973	152,564	152,564	15.28	15.28
2011	115,618	4,305	8,240	7,200	0.922	14,739	3,062	153,164	141,035	15.34	14.12
2012	115,618	4,434	8,487	7,200	0.931	14,887	3,154	153,780	130,389	15.40	13.06
2013	115,618	4,567	8,742	7,200	0.941	15,035	3,248	154,411	120,556	15.46	12.07
2014	115,618	4,704	9,004	9,138	0.950	15,186	3,346	156,996	112,868	15.72	11.30
2015	115,618	4,845	9,274	7,200	0.959	15,338	3,446	155,721	103,086	15.59	10.32
2016	115,618	4,990	9,553	7,200	0.969	15,491	3,550	156,402	95,337	15.66	9.55
2017	115,618	5,140	9,839	7,200	0.979	15,646	3,656	157,099	88,179	15.73	8.83
2018	115,618	5,294	10,134	7,200	0.989	15,802	3,766	157,815	81,566	15.80	8.17
2019	115,618	5,453	10,438	7,200	0.998	15,960	3,879	158,549	75,456	15.88	7.56
2020	115,618	5,616	10,752	7,200	1.008	16,120	3,995	159,302	69,811	15.95	6.99
2021	115,618	5,785	11,074	7,200	1.019	16,281	4,115	160,074	64,594	16.03	6.47
2022	115,618	5,959	11,406	7,200	1.029	16,444	4,238	160,866	59,773	16.11	5.99
2023	115,618	6,137	11,748	7,200	1.039	16,608	4,366	161,678	55,318	16.19	5.54
2024	115,618	6,321	12,101	20,780	1.049	16,774	4,497	176,092	55,478	17.63	5.56
2025	115,618	6,511	12,464	7,200	1.060	16,942	4,632	163,367	47,393	16.36	4.75
2026	115,618	6,706	12,838	7,200	1.070	17,112	4,770	164,245	43,875	16.45	4.39
2027	115,618	6,908	13,223	7,200	1.081	17,283	4,914	165,145	40,622	16.54	4.07
2028	115,618	7,115	13,620	7,200	1.092	17,456	5,061	166,069	37,614	16.63	3.77
2029	115,618	7,328	14,028	7,200	1.103	17,630	5,213	167,018	34,833	16.72	3.49
2030	115,618	7,548	14,449	7,200	1.114	17,806	5,369	167,991	32,262	16.82	3.23
2031	115,618	7,775	14,883	7,200	1.125	17,985	5,530	168,990	29,884	16.92	2.99
2032	115,618	8,008	15,329	7,200	1.136	18,164	5,696	170,016	27,684	17.02	2.77
2033	115,618	8,248	15,789	7,200	1.148	18,346	5,867	171,068	25,650	17.13	2.57
2034	115,618	8,495	16,263	135,704	1.159	18,529	6,043	300,653	41,510	30.11	4.16
2035	115,618	8,750	16,751	7,200	1.171	18,715	6,224	173,258	22,027	17.35	2.21
2036	115,618	9,013	17,253	7,200	1.182	18,902	6,411	174,397	20,416	17.46	2.04
2037	115,618	9,283	17,771	7,200	1.194	19,091	6,603	175,567	18,925	17.58	1.90
2038	115,618	9,562	18,304	7,200	1.206	19,282	6,802	176,767	17,546	17.70	1.76
2039	115,618	9,849	18,853	58,210	1.218	19,475	7,006	229,010	20,931	22.93	2.10
2040	0	10,144	19,418	7,200	1.230	19,669	7,216	63,648	5,357	6.37	0.54
2041	0	10,448	20,001	7,200	1.243	19,866	7,432	64,948	5,033	6.50	0.50
2042	0	10,762	20,601	7,200	1.255	20,065	7,655	66,283	4,730	6.64	0.47
2043	0	11,085	21,219	7,200	1.268	20,265	7,885	67,654	4,445	6.77	0.45
2044	0	11,417	21,856	11,904	1.280	20,468	8,121	73,766	4,463	7.39	0.45
2045	0	11,760	22,511	7,200	1.293	20,673	8,365	70,509	3,928	7.06	0.39
2046	0	12,112	23,187	7,200	1.306	20,879	8,616	71,995	3,693	7.21	0.37
2047	0	12,476	23,882	7,200	1.319	21,088	8,874	73,521	3,473	7.36	0.35
2048	0	12,850	24,599	7,200	1.332	21,299	9,141	75,089	3,266	7.52	0.33
2049	0	13,236	25,337	7,200	1.346	21,512	9,415	76,699	3,072	7.68	0.31
2050	0	13,633	26,097	7,200	1.359	21,727	9,697	78,354	2,890	7.85	0.29
2051	0	14,042	26,880	7,200	1.373	21,945	9,988	80,054	2,719	8.02	0.27
2052	0	14,463	27,686	7,200	1.387	22,164	10,288	81,801	2,558	8.19	0.26
2053	0	14,897	28,517	7,200	1.400	22,386	10,597	83,596	2,407	8.37	0.24
2054	0	15,344	29,372	40,163	1.414	22,609	10,914	118,402	3,139	11.86	0.31
2055	0	15,804	30,253	7,200	1.429	22,836	11,242	87,335	2,132	8.75	0.21
2056	0	16,278	31,161	7,200	1.443	23,064	11,579	89,282	2,007	8.94	0.20
2057	0	16,766	32,096	7,200	1.457	23,295	11,927	91,283	1,890	9.14	0.19
2058	0	17,269	33,059	7,200	1.472	23,528	12,284	93,340	1,779	9.35	0.18
2059	0	17,788	34,050	7,200	1.487	23,763	12,653	95,454	1,675	9.56	0.17
									Net Levelized Cost (c/kWh)		**15.57**
									Net Levelized Cost ($000s)		**155,495**

Pumped Storage Bus-Bar Calculation - 10% Capacity Factor - Low Coal

Plant Input Data				Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)			1,762,342	First Year Staffing ($ 1,000)	5,015.0	3.0%
Total Net Capacity (kW)			1,200,000	Annual O&M Costs ($ 1,000)	10,627	3.0%
Capacity Factor			10.0%	First Year Coal Cost ($/MBtu)	0.913	1.0%
Transmission Tariff ($/kW-mo) ; % Losses	$	1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost			10,862	Levelized Fixed Charge Rate	10.17%	
				Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	179,301	5,015	10,627	14,400	0.913	14,593	2,973	226,909	226,909	22.72	22.72
2011	179,301	5,165	10,946	14,400	0.922	14,739	3,062	227,613	209,588	22.79	20.99
2012	179,301	5,320	11,274	14,400	0.931	14,887	3,154	228,336	193,604	22.86	19.39
2013	179,301	5,480	11,612	14,400	0.941	15,035	3,248	229,077	178,851	22.94	17.91
2014	179,301	5,644	11,961	18,276	0.950	15,186	3,346	233,713	168,021	23.40	16.83
2015	179,301	5,814	12,320	14,400	0.959	15,338	3,446	230,618	152,667	23.09	15.29
2016	179,301	5,988	12,689	14,400	0.969	15,491	3,550	231,419	141,065	23.17	14.13
2017	179,301	6,168	13,070	14,400	0.979	15,646	3,656	232,240	130,355	23.26	13.05
2018	179,301	6,353	13,462	14,400	0.989	15,802	3,766	233,084	120,468	23.34	12.06
2019	179,301	6,543	13,866	14,400	0.998	15,960	3,879	233,949	111,340	23.43	11.15
2020	179,301	6,740	14,282	14,400	1.008	16,120	3,995	234,837	102,913	23.52	10.31
2021	179,301	6,942	14,710	14,400	1.019	16,281	4,115	235,749	95,131	23.61	9.53
2022	179,301	7,150	15,152	14,400	1.029	16,444	4,238	236,685	87,945	23.70	8.81
2023	179,301	7,365	15,606	14,400	1.039	16,608	4,366	237,646	81,310	23.80	8.14
2024	179,301	7,586	16,074	41,560	1.049	16,774	4,497	265,792	83,738	26.62	8.39
2025	179,301	7,813	16,557	14,400	1.060	16,942	4,632	239,644	69,522	24.00	6.96
2026	179,301	8,048	17,053	14,400	1.070	17,112	4,770	240,684	64,294	24.10	6.44
2027	179,301	8,289	17,565	14,400	1.081	17,283	4,914	241,751	59,465	24.21	5.95
2028	179,301	8,538	18,092	14,400	1.092	17,456	5,061	242,847	55,004	24.32	5.51
2029	179,301	8,794	18,635	14,400	1.103	17,630	5,213	243,972	50,883	24.43	5.10
2030	179,301	9,058	19,194	14,400	1.114	17,806	5,369	245,128	47,076	24.55	4.71
2031	179,301	9,329	19,769	14,400	1.125	17,985	5,530	246,314	43,558	24.66	4.36
2032	179,301	9,609	20,363	14,400	1.136	18,164	5,696	247,533	40,307	24.79	4.04
2033	179,301	9,898	20,973	14,400	1.148	18,346	5,867	248,785	37,302	24.91	3.74
2034	179,301	10,195	21,603	271,408	1.159	18,529	6,043	507,079	70,010	50.78	7.01
2035	179,301	10,500	22,251	14,400	1.171	18,715	6,224	251,391	31,960	25.17	3.20
2036	179,301	10,815	22,918	14,400	1.182	18,902	6,411	252,747	29,588	25.31	2.96
2037	179,301	11,140	23,606	14,400	1.194	19,091	6,603	254,141	27,395	25.45	2.74
2038	179,301	11,474	24,314	14,400	1.206	19,282	6,802	255,572	25,368	25.59	2.54
2039	179,301	11,818	25,043	116,419	1.218	19,475	7,006	359,062	32,817	35.96	3.29
2040	0	12,173	25,795	14,400	1.230	19,669	7,216	79,253	6,670	7.94	0.67
2041	0	12,538	26,569	14,400	1.243	19,866	7,432	80,805	6,262	8.09	0.63
2042	0	12,914	27,366	14,400	1.255	20,065	7,655	82,400	5,880	8.25	0.59
2043	0	13,302	28,187	14,400	1.268	20,265	7,885	84,038	5,522	8.42	0.55
2044	0	13,701	29,032	23,808	1.280	20,468	8,121	95,130	5,756	9.53	0.58
2045	0	14,112	29,903	14,400	1.293	20,673	8,365	87,452	4,872	8.76	0.49
2046	0	14,535	30,800	14,400	1.306	20,879	8,616	89,231	4,578	8.94	0.46
2047	0	14,971	31,724	14,400	1.319	21,088	8,874	91,058	4,301	9.12	0.43
2048	0	15,420	32,676	14,400	1.332	21,299	9,141	92,936	4,042	9.31	0.40
2049	0	15,883	33,656	14,400	1.346	21,512	9,415	94,866	3,800	9.50	0.38
2050	0	16,359	34,666	14,400	1.359	21,727	9,697	96,850	3,572	9.70	0.36
2051	0	16,850	35,706	14,400	1.373	21,945	9,988	98,889	3,358	9.90	0.34
2052	0	17,355	36,777	14,400	1.387	22,164	10,288	100,984	3,158	10.11	0.32
2053	0	17,876	37,880	14,400	1.400	22,386	10,597	103,139	2,970	10.33	0.30
2054	0	18,412	39,017	80,325	1.414	22,609	10,914	171,278	4,541	17.15	0.45
2055	0	18,965	40,187	14,400	1.429	22,836	11,242	107,630	2,628	10.78	0.26
2056	0	19,534	41,393	14,400	1.443	23,064	11,579	109,970	2,472	11.01	0.25
2057	0	20,120	42,635	14,400	1.457	23,295	11,927	112,375	2,326	11.25	0.23
2058	0	20,723	43,914	14,400	1.472	23,528	12,284	114,849	2,189	11.50	0.22
2059	0	21,345	45,231	14,400	1.487	23,763	12,653	117,392	2,061	11.76	0.21
									Net Levelized Cost (c/kWh)		**22.97**
									Net Levelized Cost ($000s)		**229,351**

Pumped Storage Bus-Bar Calculation - 10% Capacity Factor - Low Coal

Plant Input Data				Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)			1,136,411	First Year Staffing ($ 1,000)	4,179.2	3.0%
Total Net Capacity (kW)			600,000	Annual O&M Costs ($ 1,000)	8,000	3.0%
Capacity Factor			10.0%	First Year Coal Cost ($/MBtu)	0.913	1.0%
Transmission Tariff ($/kW-mo) ; % Losses	$	1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost			10,862	Levelized Fixed Charge Rate	10.17%	
				Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	115,618	4,179	8,000	7,200	0.913	7,297	1,486	143,781	143,781	28.80	28.80
2011	115,618	4,305	8,240	7,200	0.922	7,370	1,531	144,264	132,839	28.89	26.60
2012	115,618	4,434	8,487	7,200	0.931	7,443	1,577	144,760	122,740	28.99	24.58
2013	115,618	4,567	8,742	7,200	0.941	7,518	1,624	145,269	113,418	29.09	22.71
2014	115,618	4,704	9,004	9,138	0.950	7,593	1,673	147,730	106,206	29.59	21.27
2015	115,618	4,845	9,274	7,200	0.959	7,669	1,723	146,330	96,869	29.31	19.40
2016	115,618	4,990	9,553	7,200	0.969	7,745	1,775	146,881	89,534	29.42	17.93
2017	115,618	5,140	9,839	7,200	0.979	7,823	1,828	147,448	82,762	29.53	16.57
2018	115,618	5,294	10,134	7,200	0.989	7,901	1,883	148,031	76,509	29.65	15.32
2019	115,618	5,453	10,438	7,200	0.998	7,980	1,939	148,629	70,735	29.77	14.17
2020	115,618	5,616	10,752	7,200	1.008	8,060	1,998	149,244	65,403	29.89	13.10
2021	115,618	5,785	11,074	7,200	1.019	8,141	2,058	149,876	60,479	30.02	12.11
2022	115,618	5,959	11,406	7,200	1.029	8,222	2,119	150,524	55,931	30.15	11.20
2023	115,618	6,137	11,748	7,200	1.039	8,304	2,183	151,191	51,730	30.28	10.36
2024	115,618	6,321	12,101	20,780	1.049	8,387	2,248	165,456	52,127	33.14	10.44
2025	115,618	6,511	12,464	7,200	1.060	8,471	2,316	152,580	44,264	30.56	8.86
2026	115,618	6,706	12,838	7,200	1.070	8,556	2,385	153,304	40,952	30.70	8.20
2027	115,618	6,908	13,223	7,200	1.081	8,641	2,457	154,047	37,892	30.85	7.59
2028	115,618	7,115	13,620	7,200	1.092	8,728	2,530	154,811	35,064	31.00	7.02
2029	115,618	7,328	14,028	7,200	1.103	8,815	2,606	155,596	32,451	31.16	6.50
2030	115,618	7,548	14,449	7,200	1.114	8,903	2,685	156,403	30,037	31.32	6.02
2031	115,618	7,775	14,883	7,200	1.125	8,992	2,765	157,233	27,805	31.49	5.57
2032	115,618	8,008	15,329	7,200	1.136	9,082	2,848	158,086	25,742	31.66	5.16
2033	115,618	8,248	15,789	7,200	1.148	9,173	2,934	158,962	23,835	31.84	4.77
2034	115,618	8,495	16,263	135,704	1.159	9,265	3,022	288,367	39,813	57.75	7.97
2035	115,618	8,750	16,751	7,200	1.171	9,357	3,112	160,789	20,441	32.20	4.09
2036	115,618	9,013	17,253	7,200	1.182	9,451	3,206	161,741	18,934	32.39	3.79
2037	115,618	9,283	17,771	7,200	1.194	9,545	3,302	162,719	17,540	32.59	3.51
2038	115,618	9,562	18,304	7,200	1.206	9,641	3,401	163,726	16,251	32.79	3.25
2039	115,618	9,849	18,853	58,210	1.218	9,737	3,503	215,770	19,721	43.21	3.95
2040	0	10,144	19,418	7,200	1.230	9,835	3,608	50,205	4,225	10.05	0.85
2041	0	10,448	20,001	7,200	1.243	9,933	3,716	51,298	3,975	10.27	0.80
2042	0	10,762	20,601	7,200	1.255	10,032	3,828	52,423	3,741	10.50	0.75
2043	0	11,085	21,219	7,200	1.268	10,133	3,942	53,579	3,521	10.73	0.71
2044	0	11,417	21,856	11,904	1.280	10,234	4,061	59,471	3,598	11.91	0.72
2045	0	11,760	22,511	7,200	1.293	10,336	4,183	55,990	3,119	11.21	0.62
2046	0	12,112	23,187	7,200	1.306	10,440	4,308	57,247	2,937	11.46	0.59
2047	0	12,476	23,882	7,200	1.319	10,544	4,437	58,539	2,765	11.72	0.55
2048	0	12,850	24,599	7,200	1.332	10,650	4,570	59,869	2,604	11.99	0.52
2049	0	13,236	25,337	7,200	1.346	10,756	4,707	61,236	2,453	12.26	0.49
2050	0	13,633	26,097	7,200	1.359	10,864	4,849	62,642	2,310	12.55	0.46
2051	0	14,042	26,880	7,200	1.373	10,972	4,994	64,088	2,176	12.84	0.44
2052	0	14,463	27,686	7,200	1.387	11,082	5,144	65,575	2,051	13.13	0.41
2053	0	14,897	28,517	7,200	1.400	11,193	5,298	67,105	1,932	13.44	0.39
2054	0	15,344	29,372	40,163	1.414	11,305	5,457	101,640	2,695	20.36	0.54
2055	0	15,804	30,253	7,200	1.429	11,418	5,621	70,296	1,716	14.08	0.34
2056	0	16,278	31,161	7,200	1.443	11,532	5,790	71,961	1,618	14.41	0.32
2057	0	16,766	32,096	7,200	1.457	11,647	5,963	73,673	1,525	14.75	0.31
2058	0	17,269	33,059	7,200	1.472	11,764	6,142	75,434	1,438	15.11	0.29
2059	0	17,788	34,050	7,200	1.487	11,881	6,326	77,246	1,356	15.47	0.27
									Net Levelized Cost (c/kWh)		**29.07**
									Net Levelized Cost ($000s)		**145,170**

Pumped Storage Bus-Bar Calculation - 15% Capacity Factor - Low Coal

Plant Input Data				Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)			1,762,342	First Year Staffing ($ 1,000)	5,015.0	3.0%
Total Net Capacity (kW)			1,200,000	Annual O&M Costs ($ 1,000)	10,627	3.0%
Capacity Factor			15.0%	First Year Coal Cost ($/MBtu)	0.913	1.0%
Transmission Tariff ($/kW-mo) ; % Losses	$	1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost			10,862	Levelized Fixed Charge Rate	10.17%	
				Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	179,301	5,015	10,627	14,400	0.913	21,890	4,459	235,692	235,692	15.73	15.73
2011	179,301	5,165	10,946	14,400	0.922	22,109	4,593	236,514	217,784	15.79	14.54
2012	179,301	5,320	11,274	14,400	0.931	22,330	4,731	237,356	201,252	15.85	13.44
2013	179,301	5,480	11,612	14,400	0.941	22,553	4,873	238,219	185,989	15.90	12.42
2014	179,301	5,644	11,961	18,276	0.950	22,779	5,019	242,979	174,683	16.22	11.66
2015	179,301	5,814	12,320	14,400	0.959	23,006	5,169	240,010	158,884	16.02	10.61
2016	179,301	5,988	12,689	14,400	0.969	23,236	5,325	240,939	146,868	16.08	9.80
2017	179,301	6,168	13,070	14,400	0.979	23,469	5,484	241,891	135,772	16.15	9.06
2018	179,301	6,353	13,462	14,400	0.989	23,703	5,649	242,868	125,525	16.21	8.38
2019	179,301	6,543	13,866	14,400	0.998	23,941	5,818	243,869	116,061	16.28	7.75
2020	179,301	6,740	14,282	14,400	1.008	24,180	5,993	244,895	107,320	16.35	7.16
2021	179,301	6,942	14,710	14,400	1.019	24,422	6,173	245,947	99,246	16.42	6.63
2022	179,301	7,150	15,152	14,400	1.029	24,666	6,358	247,026	91,788	16.49	6.13
2023	179,301	7,365	15,606	14,400	1.039	24,913	6,548	248,133	84,898	16.56	5.67
2024	179,301	7,586	16,074	41,560	1.049	25,162	6,745	276,428	87,089	18.45	5.81
2025	179,301	7,813	16,557	14,400	1.060	25,413	6,947	250,431	72,651	16.72	4.85
2026	179,301	8,048	17,053	14,400	1.070	25,667	7,156	251,625	67,217	16.80	4.49
2027	179,301	8,289	17,565	14,400	1.081	25,924	7,370	252,849	62,195	16.88	4.15
2028	179,301	8,538	18,092	14,400	1.092	26,183	7,591	254,105	57,554	16.96	3.84
2029	179,301	8,794	18,635	14,400	1.103	26,445	7,819	255,394	53,265	17.05	3.56
2030	179,301	9,058	19,194	14,400	1.114	26,710	8,054	256,715	49,301	17.14	3.29
2031	179,301	9,329	19,769	14,400	1.125	26,977	8,295	258,072	45,637	17.23	3.05
2032	179,301	9,609	20,363	14,400	1.136	27,247	8,544	259,463	42,249	17.32	2.82
2033	179,301	9,898	20,973	14,400	1.148	27,519	8,801	260,891	39,118	17.42	2.61
2034	179,301	10,195	21,603	271,408	1.159	27,794	9,065	519,365	71,706	34.67	4.79
2035	179,301	10,500	22,251	14,400	1.171	28,072	9,337	263,860	33,545	17.61	2.24
2036	179,301	10,815	22,918	14,400	1.182	28,353	9,617	265,404	31,069	17.72	2.07
2037	179,301	11,140	23,606	14,400	1.194	28,636	9,905	266,988	28,780	17.82	1.92
2038	179,301	11,474	24,314	14,400	1.206	28,923	10,202	268,614	26,662	17.93	1.78
2039	179,301	11,818	25,043	116,419	1.218	29,212	10,508	372,302	34,028	24.85	2.27
2040	0	12,173	25,795	14,400	1.230	29,504	10,824	92,695	7,801	6.19	0.52
2041	0	12,538	26,569	14,400	1.243	29,799	11,148	94,454	7,320	6.31	0.49
2042	0	12,914	27,366	14,400	1.255	30,097	11,483	96,260	6,869	6.43	0.46
2043	0	13,302	28,187	14,400	1.268	30,398	11,827	98,113	6,447	6.55	0.43
2044	0	13,701	29,032	23,808	1.280	30,702	12,182	109,425	6,621	7.30	0.44
2045	0	14,112	29,903	14,400	1.293	31,009	12,548	101,971	5,681	6.81	0.38
2046	0	14,535	30,800	14,400	1.306	31,319	12,924	103,978	5,334	6.94	0.36
2047	0	14,971	31,724	14,400	1.319	31,632	13,312	106,039	5,009	7.08	0.33
2048	0	15,420	32,676	14,400	1.332	31,949	13,711	108,156	4,705	7.22	0.31
2049	0	15,883	33,656	14,400	1.346	32,268	14,122	110,329	4,419	7.37	0.30
2050	0	16,359	34,666	14,400	1.359	32,591	14,546	112,562	4,151	7.51	0.28
2051	0	16,850	35,706	14,400	1.373	32,917	14,982	114,855	3,901	7.67	0.26
2052	0	17,355	36,777	14,400	1.387	33,246	15,432	117,210	3,665	7.82	0.24
2053	0	17,876	37,880	14,400	1.400	33,578	15,895	119,630	3,445	7.99	0.23
2054	0	18,412	39,017	80,325	1.414	33,914	16,372	188,040	4,986	12.55	0.33
2055	0	18,965	40,187	14,400	1.429	34,253	16,863	124,668	3,044	8.32	0.20
2056	0	19,534	41,393	14,400	1.443	34,596	17,369	127,291	2,862	8.50	0.19
2057	0	20,120	42,635	14,400	1.457	34,942	17,890	129,986	2,691	8.68	0.18
2058	0	20,723	43,914	14,400	1.472	35,291	18,426	132,755	2,531	8.86	0.17
2059	0	21,345	45,231	14,400	1.487	35,644	18,979	135,600	2,380	9.05	0.16
									Net Levelized Cost (c/kWh)		**16.00**
									Net Levelized Cost ($000s)		**239,676**

Pumped Storage Bus-Bar Calculation - 15% Capacity Factor - Low Coal

Plant Input Data			Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)		1,136,411	First Year Staffing ($ 1,000)	4,179.2	3.0%
Total Net Capacity (kW)		600,000	Annual O&M Costs ($ 1,000)	10,627	3.0%
Capacity Factor		15.0%	First Year Coal Cost ($/MBtu)	0.913	1.0%
Transmission Tariff ($/kW-mo) ; % Losses	$ 1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost		10,862	Levelized Fixed Charge Rate	10.17%	
			Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	115,618	4,179	10,627	7,200	0.913	10,945	2,230	150,799	150,799	20.13	20.13
2011	115,618	4,305	10,946	7,200	0.922	11,054	2,296	151,420	139,429	20.22	18.62
2012	115,618	4,434	11,274	7,200	0.931	11,165	2,365	152,057	128,928	20.30	17.21
2013	115,618	4,567	11,612	7,200	0.941	11,277	2,436	152,710	119,228	20.39	15.92
2014	115,618	4,704	11,961	9,138	0.950	11,389	2,509	155,320	111,662	20.74	14.91
2015	115,618	4,845	12,320	7,200	0.959	11,503	2,585	154,071	101,993	20.57	13.62
2016	115,618	4,990	12,689	7,200	0.969	11,618	2,662	154,778	94,348	20.67	12.60
2017	115,618	5,140	13,070	7,200	0.979	11,734	2,742	155,505	87,284	20.76	11.65
2018	115,618	5,294	13,462	7,200	0.989	11,852	2,824	156,251	80,758	20.86	10.78
2019	115,618	5,453	13,866	7,200	0.998	11,970	2,909	157,017	74,727	20.96	9.98
2020	115,618	5,616	14,282	7,200	1.008	12,090	2,996	157,803	69,154	21.07	9.23
2021	115,618	5,785	14,710	7,200	1.019	12,211	3,086	158,611	64,004	21.18	8.55
2022	115,618	5,959	15,152	7,200	1.029	12,333	3,179	159,440	59,243	21.29	7.91
2023	115,618	6,137	15,606	7,200	1.039	12,456	3,274	160,292	54,844	21.40	7.32
2024	115,618	6,321	16,074	20,780	1.049	12,581	3,372	174,748	55,055	23.33	7.35
2025	115,618	6,511	16,557	7,200	1.060	12,707	3,474	162,066	47,016	21.64	6.28
2026	115,618	6,706	17,053	7,200	1.070	12,834	3,578	162,990	43,539	21.76	5.81
2027	115,618	6,908	17,565	7,200	1.081	12,962	3,685	163,938	40,325	21.89	5.38
2028	115,618	7,115	18,092	7,200	1.092	13,092	3,796	164,912	37,352	22.02	4.99
2029	115,618	7,328	18,635	7,200	1.103	13,223	3,910	165,913	34,603	22.15	4.62
2030	115,618	7,548	19,194	7,200	1.114	13,355	4,027	166,942	32,060	22.29	4.28
2031	115,618	7,775	19,769	7,200	1.125	13,488	4,148	167,998	29,708	22.43	3.97
2032	115,618	8,008	20,363	7,200	1.136	13,623	4,272	169,084	27,533	22.58	3.68
2033	115,618	8,248	20,973	7,200	1.148	13,760	4,400	170,200	25,520	22.72	3.41
2034	115,618	8,495	21,603	135,704	1.159	13,897	4,532	299,850	41,399	40.03	5.53
2035	115,618	8,750	22,251	7,200	1.171	14,036	4,668	172,524	21,933	23.03	2.93
2036	115,618	9,013	22,918	7,200	1.182	14,176	4,808	173,734	20,338	23.20	2.72
2037	115,618	9,283	23,606	7,200	1.194	14,318	4,953	174,978	18,862	23.36	2.52
2038	115,618	9,562	24,314	7,200	1.206	14,461	5,101	176,257	17,495	23.53	2.34
2039	115,618	9,849	25,043	58,210	1.218	14,606	5,254	228,580	20,892	30.52	2.79
2040	0	10,144	25,795	7,200	1.230	14,752	5,412	63,303	5,328	8.45	0.71
2041	0	10,448	26,569	7,200	1.243	14,900	5,574	64,691	5,013	8.64	0.67
2042	0	10,762	27,366	7,200	1.255	15,049	5,741	66,117	4,718	8.83	0.63
2043	0	11,085	28,187	7,200	1.268	15,199	5,914	67,584	4,441	9.02	0.59
2044	0	11,417	29,032	11,904	1.280	15,351	6,091	73,795	4,465	9.85	0.60
2045	0	11,760	29,903	7,200	1.293	15,505	6,274	70,641	3,936	9.43	0.53
2046	0	12,112	30,800	7,200	1.306	15,660	6,462	72,234	3,706	9.64	0.49
2047	0	12,476	31,724	7,200	1.319	15,816	6,656	73,872	3,490	9.86	0.47
2048	0	12,850	32,676	7,200	1.332	15,974	6,856	75,556	3,287	10.09	0.44
2049	0	13,236	33,656	7,200	1.346	16,134	7,061	77,287	3,096	10.32	0.41
2050	0	13,633	34,666	7,200	1.359	16,295	7,273	79,067	2,916	10.56	0.39
2051	0	14,042	35,706	7,200	1.373	16,458	7,491	80,897	2,747	10.80	0.37
2052	0	14,463	36,777	7,200	1.387	16,623	7,716	82,779	2,589	11.05	0.35
2053	0	14,897	37,880	7,200	1.400	16,789	7,947	84,714	2,439	11.31	0.33
2054	0	15,344	39,017	40,163	1.414	16,957	8,186	119,666	3,173	15.98	0.42
2055	0	15,804	40,187	7,200	1.429	17,127	8,431	88,749	2,167	11.85	0.29
2056	0	16,278	41,393	7,200	1.443	17,298	8,684	90,853	2,043	12.13	0.27
2057	0	16,766	42,635	7,200	1.457	17,471	8,945	93,017	1,926	12.42	0.26
2058	0	17,269	43,914	7,200	1.472	17,646	9,213	95,242	1,816	12.72	0.24
2059	0	17,788	45,231	7,200	1.487	17,822	9,490	97,530	1,712	13.02	0.23
									Net Levelized Cost (c/kWh)		**20.58**
									Net Levelized Cost ($000s)		**154,142**

Pumped Storage Bus-Bar Calculation - 20% Capacity Factor - Low Coal/Low Capital Cost

Plant Input Data				Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)			1,409,873	First Year Staffing ($ 1,000)	5,015.0	3.0%
Total Net Capacity (kW)			1,200,000	Annual O&M Costs ($ 1,000)	10,627	3.0%
Capacity Factor			20.0%	First Year Coal Cost ($/MBtu)	0.913	1.0%
Transmission Tariff ($/kW-mo) ; % Losses	$	1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost			10,862	Levelized Fixed Charge Rate	10.17%	
				Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	143,441	5,015	10,627	14,400	0.913	29,186	5,946	208,615	208,615	10.44	10.44
2011	143,441	5,165	10,946	14,400	0.922	29,478	6,124	209,554	192,960	10.49	9.66
2012	143,441	5,320	11,274	14,400	0.931	29,773	6,308	210,516	178,495	10.54	8.94
2013	143,441	5,480	11,612	14,400	0.941	30,071	6,497	211,501	165,129	10.59	8.27
2014	143,441	5,644	11,961	18,276	0.950	30,371	6,692	216,385	155,563	10.83	7.79
2015	143,441	5,814	12,320	14,400	0.959	30,675	6,893	213,542	141,362	10.69	7.08
2016	143,441	5,988	12,689	14,400	0.969	30,982	7,099	214,599	130,812	10.74	6.55
2017	143,441	6,168	13,070	14,400	0.979	31,292	7,312	215,682	121,061	10.80	6.06
2018	143,441	6,353	13,462	14,400	0.989	31,605	7,532	216,792	112,048	10.85	5.61
2019	143,441	6,543	13,866	14,400	0.998	31,921	7,758	217,928	103,716	10.91	5.19
2020	143,441	6,740	14,282	14,400	1.008	32,240	7,990	219,092	96,013	10.97	4.81
2021	143,441	6,942	14,710	14,400	1.019	32,562	8,230	220,285	88,891	11.03	4.45
2022	143,441	7,150	15,152	14,400	1.029	32,888	8,477	221,507	82,306	11.09	4.12
2023	143,441	7,365	15,606	14,400	1.039	33,217	8,731	222,760	76,216	11.15	3.82
2024	143,441	7,586	16,074	41,560	1.049	33,549	8,993	251,203	79,142	12.58	3.96
2025	143,441	7,813	16,557	14,400	1.060	33,884	9,263	225,358	65,377	11.28	3.27
2026	143,441	8,048	17,053	14,400	1.070	34,223	9,541	226,706	60,560	11.35	3.03
2027	143,441	8,289	17,565	14,400	1.081	34,566	9,827	228,087	56,104	11.42	2.81
2028	143,441	8,538	18,092	14,400	1.092	34,911	10,122	229,503	51,982	11.49	2.60
2029	143,441	8,794	18,635	14,400	1.103	35,260	10,426	230,955	48,168	11.56	2.41
2030	143,441	9,058	19,194	14,400	1.114	35,613	10,738	232,443	44,640	11.64	2.24
2031	143,441	9,329	19,769	14,400	1.125	35,969	11,061	233,969	41,374	11.71	2.07
2032	143,441	9,609	20,363	14,400	1.136	36,329	11,392	235,533	38,353	11.79	1.92
2033	143,441	9,898	20,973	14,400	1.148	36,692	11,734	237,138	35,556	11.87	1.78
2034	143,441	10,195	21,603	271,408	1.159	37,059	12,086	495,791	68,451	24.82	3.43
2035	143,441	10,500	22,251	14,400	1.171	37,430	12,449	240,470	30,571	12.04	1.53
2036	143,441	10,815	22,918	14,400	1.182	37,804	12,822	242,200	28,353	12.13	1.42
2037	143,441	11,140	23,606	14,400	1.194	38,182	13,207	243,975	26,299	12.22	1.32
2038	143,441	11,474	24,314	14,400	1.206	38,564	13,603	245,795	24,397	12.31	1.22
2039	143,441	11,818	25,043	116,419	1.218	38,949	14,011	349,682	31,960	17.51	1.60
2040	0	12,173	25,795	14,400	1.230	39,339	14,432	106,138	8,933	5.31	0.45
2041	0	12,538	26,569	14,400	1.243	39,732	14,864	108,103	8,377	5.41	0.42
2042	0	12,914	27,366	14,400	1.255	40,130	15,310	110,120	7,858	5.51	0.39
2043	0	13,302	28,187	14,400	1.268	40,531	15,770	112,189	7,372	5.62	0.37
2044	0	13,701	29,032	23,808	1.280	40,936	16,243	123,719	7,486	6.19	0.37
2045	0	14,112	29,903	14,400	1.293	41,345	16,730	116,490	6,490	5.83	0.32
2046	0	14,535	30,800	14,400	1.306	41,759	17,232	118,726	6,091	5.94	0.30
2047	0	14,971	31,724	14,400	1.319	42,177	17,749	121,021	5,717	6.06	0.29
2048	0	15,420	32,676	14,400	1.332	42,598	18,281	123,376	5,367	6.18	0.27
2049	0	15,883	33,656	14,400	1.346	43,024	18,830	125,793	5,038	6.30	0.25
2050	0	16,359	34,666	14,400	1.359	43,455	19,395	128,274	4,731	6.42	0.24
2051	0	16,850	35,706	14,400	1.373	43,889	19,977	130,821	4,443	6.55	0.22
2052	0	17,355	36,777	14,400	1.387	44,328	20,576	133,436	4,173	6.68	0.21
2053	0	17,876	37,880	14,400	1.400	44,771	21,193	136,121	3,920	6.82	0.20
2054	0	18,412	39,017	80,325	1.414	45,219	21,829	204,802	5,430	10.25	0.27
2055	0	18,965	40,187	14,400	1.429	45,671	22,484	141,707	3,460	7.09	0.17
2056	0	19,534	41,393	14,400	1.443	46,128	23,158	144,613	3,251	7.24	0.16
2057	0	20,120	42,635	14,400	1.457	46,589	23,853	147,597	3,055	7.39	0.15
2058	0	20,723	43,914	14,400	1.472	47,055	24,569	150,661	2,872	7.54	0.14
2059	0	21,345	45,231	14,400	1.487	47,526	25,306	153,807	2,700	7.70	0.14
									Net Levelized Cost (c/kWh)		**10.85**
									Net Levelized Cost ($000s)		**216,619**

Pumped Storage Bus-Bar Calculation - 20% Capacity Factor - Low Coal/Low Capital

Plant Input Data				Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)			909,128	First Year Staffing ($ 1,000)	4,179.2	3.0%
Total Net Capacity (kW)			600,000	Annual O&M Costs ($ 1,000)	8,000	3.0%
Capacity Factor			20.0%	First Year Coal Cost ($/MBtu)	0.913	1.0%
Transmission Tariff ($/kW-mo) ; % Losses	$	1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost			10,862	Levelized Fixed Charge Rate	10.17%	
				Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	92,495	4,179	8,000	7,200	0.913	14,593	2,973	129,440	129,440	12.96	12.96
2011	92,495	4,305	8,240	7,200	0.922	14,739	3,062	130,041	119,743	13.02	11.99
2012	92,495	4,434	8,487	7,200	0.931	14,887	3,154	130,656	110,782	13.08	11.09
2013	92,495	4,567	8,742	7,200	0.941	15,035	3,248	131,287	102,502	13.15	10.26
2014	92,495	4,704	9,004	9,138	0.950	15,186	3,346	133,872	96,243	13.41	9.64
2015	92,495	4,845	9,274	7,200	0.959	15,338	3,446	132,598	87,778	13.28	8.79
2016	92,495	4,990	9,553	7,200	0.969	15,491	3,550	133,278	81,242	13.35	8.14
2017	92,495	5,140	9,839	7,200	0.979	15,646	3,656	133,976	75,200	13.42	7.53
2018	92,495	5,294	10,134	7,200	0.989	15,802	3,766	134,691	69,615	13.49	6.97
2019	92,495	5,453	10,438	7,200	0.998	15,960	3,879	135,425	64,451	13.56	6.45
2020	92,495	5,616	10,752	7,200	1.008	16,120	3,995	136,178	59,677	13.64	5.98
2021	92,495	5,785	11,074	7,200	1.019	16,281	4,115	136,950	55,263	13.71	5.53
2022	92,495	5,959	11,406	7,200	1.029	16,444	4,238	137,742	51,181	13.79	5.13
2023	92,495	6,137	11,748	7,200	1.039	16,608	4,366	138,555	47,406	13.87	4.75
2024	92,495	6,321	12,101	20,780	1.049	16,774	4,497	152,968	48,193	15.32	4.83
2025	92,495	6,511	12,464	7,200	1.060	16,942	4,632	140,243	40,685	14.04	4.07
2026	92,495	6,706	12,838	7,200	1.070	17,112	4,770	141,121	37,698	14.13	3.77
2027	92,495	6,908	13,223	7,200	1.081	17,283	4,914	142,022	34,934	14.22	3.50
2028	92,495	7,115	13,620	7,200	1.092	17,456	5,061	142,946	32,377	14.31	3.24
2029	92,495	7,328	14,028	7,200	1.103	17,630	5,213	143,894	30,011	14.41	3.01
2030	92,495	7,548	14,449	7,200	1.114	17,806	5,369	144,868	27,821	14.51	2.79
2031	92,495	7,775	14,883	7,200	1.125	17,985	5,530	145,867	25,795	14.61	2.58
2032	92,495	8,008	15,329	7,200	1.136	18,164	5,696	146,892	23,919	14.71	2.40
2033	92,495	8,248	15,789	7,200	1.148	18,346	5,867	147,945	22,183	14.81	2.22
2034	92,495	8,495	16,263	135,704	1.159	18,529	6,043	277,529	38,317	27.79	3.84
2035	92,495	8,750	16,751	7,200	1.171	18,715	6,224	150,135	19,087	15.03	1.91
2036	92,495	9,013	17,253	7,200	1.182	18,902	6,411	151,274	17,709	15.15	1.77
2037	92,495	9,283	17,771	7,200	1.194	19,091	6,603	152,443	16,432	15.27	1.65
2038	92,495	9,562	18,304	7,200	1.206	19,282	6,802	153,644	15,250	15.39	1.53
2039	92,495	9,849	18,853	58,210	1.218	19,475	7,006	205,886	18,818	20.62	1.88
2040	0	10,144	19,418	7,200	1.230	19,669	7,216	63,648	5,357	6.37	0.54
2041	0	10,448	20,001	7,200	1.243	19,866	7,432	64,948	5,033	6.50	0.50
2042	0	10,762	20,601	7,200	1.255	20,065	7,655	66,283	4,730	6.64	0.47
2043	0	11,085	21,219	7,200	1.268	20,265	7,885	67,654	4,445	6.77	0.45
2044	0	11,417	21,856	11,904	1.280	20,468	8,121	73,766	4,463	7.39	0.45
2045	0	11,760	22,511	7,200	1.293	20,673	8,365	70,509	3,928	7.06	0.39
2046	0	12,112	23,187	7,200	1.306	20,879	8,616	71,995	3,693	7.21	0.37
2047	0	12,476	23,882	7,200	1.319	21,088	8,874	73,521	3,473	7.36	0.35
2048	0	12,850	24,599	7,200	1.332	21,299	9,141	75,089	3,266	7.52	0.33
2049	0	13,236	25,337	7,200	1.346	21,512	9,415	76,699	3,072	7.68	0.31
2050	0	13,633	26,097	7,200	1.359	21,727	9,697	78,354	2,890	7.85	0.29
2051	0	14,042	26,880	7,200	1.373	21,945	9,988	80,054	2,719	8.02	0.27
2052	0	14,463	27,686	7,200	1.387	22,164	10,288	81,801	2,558	8.19	0.26
2053	0	14,897	28,517	7,200	1.400	22,386	10,597	83,596	2,407	8.37	0.24
2054	0	15,344	29,372	40,163	1.414	22,609	10,914	118,402	3,139	11.86	0.31
2055	0	15,804	30,253	7,200	1.429	22,836	11,242	87,335	2,132	8.75	0.21
2056	0	16,278	31,161	7,200	1.443	23,064	11,579	89,282	2,007	8.94	0.20
2057	0	16,766	32,096	7,200	1.457	23,295	11,927	91,283	1,890	9.14	0.19
2058	0	17,269	33,059	7,200	1.472	23,528	12,284	93,340	1,779	9.35	0.18
2059	0	17,788	34,050	7,200	1.487	23,763	12,653	95,454	1,675	9.56	0.17
									Net Levelized Cost (c/kWh)		**13.42**
									Net Levelized Cost ($000s)		**133,969**

Pumped Storage Bus-Bar Calculation - 10% Capacity Factor - Low Coal/Low Capital Cost

Plant Input Data			Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)		1,409,873	First Year Staffing ($ 1,000)	5,015.0	3.0%
Total Net Capacity (kW)		1,200,000	Annual O&M Costs ($ 1,000)	10,627	3.0%
Capacity Factor		10.0%	First Year Coal Cost ($/MBtu)	0.913	1.0%
Transmission Tariff ($/kW-mo) ; % Losses	$ 1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost		10,862	Levelized Fixed Charge Rate	10.17%	
			Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	143,441	5,015	10,627	14,400	0.913	14,593	2,973	191,049	191,049	19.13	19.13
2011	143,441	5,165	10,946	14,400	0.922	14,739	3,062	191,753	176,568	19.20	17.68
2012	143,441	5,320	11,274	14,400	0.931	14,887	3,154	192,476	163,198	19.27	16.34
2013	143,441	5,480	11,612	14,400	0.941	15,035	3,248	193,217	150,854	19.35	15.11
2014	143,441	5,644	11,961	18,276	0.950	15,186	3,346	197,853	142,241	19.81	14.24
2015	143,441	5,814	12,320	14,400	0.959	15,338	3,446	194,758	128,928	19.50	12.91
2016	143,441	5,988	12,689	14,400	0.969	15,491	3,550	195,559	119,206	19.58	11.94
2017	143,441	6,168	13,070	14,400	0.979	15,646	3,656	196,380	110,227	19.66	11.04
2018	143,441	6,353	13,462	14,400	0.989	15,802	3,766	197,224	101,934	19.75	10.21
2019	143,441	6,543	13,866	14,400	0.998	15,960	3,879	198,089	94,274	19.84	9.44
2020	143,441	6,740	14,282	14,400	1.008	16,120	3,995	198,977	87,198	19.92	8.73
2021	143,441	6,942	14,710	14,400	1.019	16,281	4,115	199,889	80,660	20.02	8.08
2022	143,441	7,150	15,152	14,400	1.029	16,444	4,238	200,825	74,621	20.11	7.47
2023	143,441	7,365	15,606	14,400	1.039	16,608	4,366	201,785	69,040	20.21	6.91
2024	143,441	7,586	16,074	41,560	1.049	16,774	4,497	229,932	72,441	23.02	7.25
2025	143,441	7,813	16,557	14,400	1.060	16,942	4,632	203,784	59,118	20.41	5.92
2026	143,441	8,048	17,053	14,400	1.070	17,112	4,770	204,824	54,715	20.51	5.48
2027	143,441	8,289	17,565	14,400	1.081	17,283	4,914	205,891	50,644	20.62	5.07
2028	143,441	8,538	18,092	14,400	1.092	17,456	5,061	206,987	46,882	20.73	4.69
2029	143,441	8,794	18,635	14,400	1.103	17,630	5,213	208,112	43,404	20.84	4.35
2030	143,441	9,058	19,194	14,400	1.114	17,806	5,369	209,267	40,189	20.96	4.02
2031	143,441	9,329	19,769	14,400	1.125	17,985	5,530	210,454	37,216	21.07	3.73
2032	143,441	9,609	20,363	14,400	1.136	18,164	5,696	211,673	34,467	21.20	3.45
2033	143,441	9,898	20,973	14,400	1.148	18,346	5,867	212,925	31,926	21.32	3.20
2034	143,441	10,195	21,603	271,408	1.159	18,529	6,043	471,218	65,059	47.19	6.51
2035	143,441	10,500	22,251	14,400	1.171	18,715	6,224	215,531	27,401	21.58	2.74
2036	143,441	10,815	22,918	14,400	1.182	18,902	6,411	216,887	25,390	21.72	2.54
2037	143,441	11,140	23,606	14,400	1.194	19,091	6,603	218,280	23,529	21.86	2.36
2038	143,441	11,474	24,314	14,400	1.206	19,282	6,802	219,712	21,808	22.00	2.18
2039	143,441	11,818	25,043	116,419	1.218	19,475	7,006	323,202	29,540	32.36	2.96
2040	0	12,173	25,795	14,400	1.230	19,669	7,216	79,253	6,670	7.94	0.67
2041	0	12,538	26,569	14,400	1.243	19,866	7,432	80,805	6,262	8.09	0.63
2042	0	12,914	27,366	14,400	1.255	20,065	7,655	82,400	5,880	8.25	0.59
2043	0	13,302	28,187	14,400	1.268	20,265	7,885	84,038	5,522	8.42	0.55
2044	0	13,701	29,032	23,808	1.280	20,468	8,121	95,130	5,756	9.53	0.58
2045	0	14,112	29,903	14,400	1.293	20,673	8,365	87,452	4,872	8.76	0.49
2046	0	14,535	30,800	14,400	1.306	20,879	8,616	89,231	4,578	8.94	0.46
2047	0	14,971	31,724	14,400	1.319	21,088	8,874	91,058	4,301	9.12	0.43
2048	0	15,420	32,676	14,400	1.332	21,299	9,141	92,936	4,042	9.31	0.40
2049	0	15,883	33,656	14,400	1.346	21,512	9,415	94,866	3,800	9.50	0.38
2050	0	16,359	34,666	14,400	1.359	21,727	9,697	96,850	3,572	9.70	0.36
2051	0	16,850	35,706	14,400	1.373	21,945	9,988	98,889	3,358	9.90	0.34
2052	0	17,355	36,777	14,400	1.387	22,164	10,288	100,984	3,158	10.11	0.32
2053	0	17,876	37,880	14,400	1.400	22,386	10,597	103,139	2,970	10.33	0.30
2054	0	18,412	39,017	80,325	1.414	22,609	10,914	171,278	4,541	17.15	0.45
2055	0	18,965	40,187	14,400	1.429	22,836	11,242	107,630	2,628	10.78	0.26
2056	0	19,534	41,393	14,400	1.443	23,064	11,579	109,970	2,472	11.01	0.25
2057	0	20,120	42,635	14,400	1.457	23,295	11,927	112,375	2,326	11.25	0.23
2058	0	20,723	43,914	14,400	1.472	23,528	12,284	114,849	2,189	11.50	0.22
2059	0	21,345	45,231	14,400	1.487	23,763	12,653	117,392	2,061	11.76	0.21
									Net Levelized Cost (c/kWh)		**19.62**
									Net Levelized Cost ($000s)		**195,969**

Pumped Storage Bus-Bar Calculation - 10% Capacity Factor - Low Coal/Low Capital

Plant Input Data			Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)		909,128	First Year Staffing ($ 1,000)	4,179.2	3.0%
Total Net Capacity (kW)		600,000	Annual O&M Costs ($ 1,000)	8,000	3.0%
Capacity Factor		10.0%	First Year Coal Cost ($/MBtu)	0.913	1.0%
Transmission Tariff ($/kW-mo) ; % Losses	$ 1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost		10,862	Levelized Fixed Charge Rate	10.17%	
			Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	92,495	4,179	8,000	7,200	0.913	7,297	1,486	120,657	120,657	24.16	24.16
2011	92,495	4,305	8,240	7,200	0.922	7,370	1,531	121,140	111,547	24.26	22.34
2012	92,495	4,434	8,487	7,200	0.931	7,443	1,577	121,636	103,134	24.36	20.65
2013	92,495	4,567	8,742	7,200	0.941	7,518	1,624	122,145	95,365	24.46	19.10
2014	92,495	4,704	9,004	9,138	0.950	7,593	1,673	124,606	89,582	24.96	17.94
2015	92,495	4,845	9,274	7,200	0.959	7,669	1,723	123,206	81,561	24.67	16.33
2016	92,495	4,990	9,553	7,200	0.969	7,745	1,775	123,758	75,439	24.79	15.11
2017	92,495	5,140	9,839	7,200	0.979	7,823	1,828	124,325	69,783	24.90	13.98
2018	92,495	5,294	10,134	7,200	0.989	7,901	1,883	124,907	64,558	25.02	12.93
2019	92,495	5,453	10,438	7,200	0.998	7,980	1,939	125,506	59,730	25.14	11.96
2020	92,495	5,616	10,752	7,200	1.008	8,060	1,998	126,120	55,270	25.26	11.07
2021	92,495	5,785	11,074	7,200	1.019	8,141	2,058	126,752	51,148	25.38	10.24
2022	92,495	5,959	11,406	7,200	1.029	8,222	2,119	127,401	47,338	25.51	9.48
2023	92,495	6,137	11,748	7,200	1.039	8,304	2,183	128,068	43,818	25.65	8.78
2024	92,495	6,321	12,101	20,780	1.049	8,387	2,248	142,333	44,842	28.51	8.98
2025	92,495	6,511	12,464	7,200	1.060	8,471	2,316	129,457	37,556	25.93	7.52
2026	92,495	6,706	12,838	7,200	1.070	8,556	2,385	130,180	34,775	26.07	6.96
2027	92,495	6,908	13,223	7,200	1.081	8,641	2,457	130,923	32,204	26.22	6.45
2028	92,495	7,115	13,620	7,200	1.092	8,728	2,530	131,688	29,827	26.37	5.97
2029	92,495	7,328	14,028	7,200	1.103	8,815	2,606	132,473	27,629	26.53	5.53
2030	92,495	7,548	14,449	7,200	1.114	8,903	2,685	133,280	25,596	26.69	5.13
2031	92,495	7,775	14,883	7,200	1.125	8,992	2,765	134,109	23,716	26.86	4.75
2032	92,495	8,008	15,329	7,200	1.136	9,082	2,848	134,962	21,976	27.03	4.40
2033	92,495	8,248	15,789	7,200	1.148	9,173	2,934	135,838	20,367	27.20	4.08
2034	92,495	8,495	16,263	135,704	1.159	9,265	3,022	265,243	36,621	53.12	7.33
2035	92,495	8,750	16,751	7,200	1.171	9,357	3,112	137,665	17,502	27.57	3.51
2036	92,495	9,013	17,253	7,200	1.182	9,451	3,206	138,617	16,227	27.76	3.25
2037	92,495	9,283	17,771	7,200	1.194	9,545	3,302	139,596	15,048	27.96	3.01
2038	92,495	9,562	18,304	7,200	1.206	9,641	3,401	140,602	13,956	28.16	2.79
2039	92,495	9,849	18,853	58,210	1.218	9,737	3,503	192,646	17,607	38.58	3.53
2040	0	10,144	19,418	7,200	1.230	9,835	3,608	50,205	4,225	10.05	0.85
2041	0	10,448	20,001	7,200	1.243	9,933	3,716	51,298	3,975	10.27	0.80
2042	0	10,762	20,601	7,200	1.255	10,032	3,828	52,423	3,741	10.50	0.75
2043	0	11,085	21,219	7,200	1.268	10,133	3,942	53,579	3,521	10.73	0.71
2044	0	11,417	21,856	11,904	1.280	10,234	4,061	59,471	3,598	11.91	0.72
2045	0	11,760	22,511	7,200	1.293	10,336	4,183	55,990	3,119	11.21	0.62
2046	0	12,112	23,187	7,200	1.306	10,440	4,308	57,247	2,937	11.46	0.59
2047	0	12,476	23,882	7,200	1.319	10,544	4,437	58,539	2,765	11.72	0.55
2048	0	12,850	24,599	7,200	1.332	10,650	4,570	59,869	2,604	11.99	0.52
2049	0	13,236	25,337	7,200	1.346	10,756	4,707	61,236	2,453	12.26	0.49
2050	0	13,633	26,097	7,200	1.359	10,864	4,849	62,642	2,310	12.55	0.46
2051	0	14,042	26,880	7,200	1.373	10,972	4,994	64,088	2,176	12.84	0.44
2052	0	14,463	27,686	7,200	1.387	11,082	5,144	65,575	2,051	13.13	0.41
2053	0	14,897	28,517	7,200	1.400	11,193	5,298	67,105	1,932	13.44	0.39
2054	0	15,344	29,372	40,163	1.414	11,305	5,457	101,640	2,695	20.36	0.54
2055	0	15,804	30,253	7,200	1.429	11,418	5,621	70,296	1,716	14.08	0.34
2056	0	16,278	31,161	7,200	1.443	11,532	5,790	71,961	1,618	14.41	0.32
2057	0	16,766	32,096	7,200	1.457	11,647	5,963	73,673	1,525	14.75	0.31
2058	0	17,269	33,059	7,200	1.472	11,764	6,142	75,434	1,438	15.11	0.29
2059	0	17,788	34,050	7,200	1.487	11,881	6,326	77,246	1,356	15.47	0.27
									Net Levelized Cost (c/kWh)		**24.76**
									Net Levelized Cost ($000s)		**123,644**

Pumped Storage Bus-Bar Calculation - 15% Capacity Factor - Low Coal/Low Capital Cost

Plant Input Data			Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)		1,409,873	First Year Staffing ($ 1,000)	5,015.0	3.0%
Total Net Capacity (kW)		1,200,000	Annual O&M Costs ($ 1,000)	10,627	3.0%
Capacity Factor		15.0%	First Year Coal Cost ($/MBtu)	0.913	1.0%
Transmission Tariff ($/kW-mo) ; % Losses	$ 1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost		10,862	Levelized Fixed Charge Rate	10.17%	
			Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	143,441	5,015	10,627	14,400	0.913	21,890	4,459	199,832	199,832	13.34	13.34
2011	143,441	5,165	10,946	14,400	0.922	22,109	4,593	200,653	184,764	13.40	12.33
2012	143,441	5,320	11,274	14,400	0.931	22,330	4,731	201,496	170,847	13.45	11.41
2013	143,441	5,480	11,612	14,400	0.941	22,553	4,873	202,359	157,991	13.51	10.55
2014	143,441	5,644	11,961	18,276	0.950	22,779	5,019	207,119	148,902	13.83	9.94
2015	143,441	5,814	12,320	14,400	0.959	23,006	5,169	204,150	135,145	13.63	9.02
2016	143,441	5,988	12,689	14,400	0.969	23,236	5,325	205,079	125,009	13.69	8.35
2017	143,441	6,168	13,070	14,400	0.979	23,469	5,484	206,031	115,644	13.75	7.72
2018	143,441	6,353	13,462	14,400	0.989	23,703	5,649	207,008	106,991	13.82	7.14
2019	143,441	6,543	13,866	14,400	0.998	23,941	5,818	208,009	98,995	13.89	6.61
2020	143,441	6,740	14,282	14,400	1.008	24,180	5,993	209,035	91,605	13.95	6.12
2021	143,441	6,942	14,710	14,400	1.019	24,422	6,173	210,087	84,776	14.02	5.66
2022	143,441	7,150	15,152	14,400	1.029	24,666	6,358	211,166	78,463	14.10	5.24
2023	143,441	7,365	15,606	14,400	1.039	24,913	6,548	212,273	72,628	14.17	4.85
2024	143,441	7,586	16,074	41,560	1.049	25,162	6,745	240,568	75,791	16.06	5.06
2025	143,441	7,813	16,557	14,400	1.060	25,413	6,947	214,571	62,248	14.32	4.16
2026	143,441	8,048	17,053	14,400	1.070	25,667	7,156	215,765	57,637	14.40	3.85
2027	143,441	8,289	17,565	14,400	1.081	25,924	7,370	216,989	53,374	14.49	3.56
2028	143,441	8,538	18,092	14,400	1.092	26,183	7,591	218,245	49,432	14.57	3.30
2029	143,441	8,794	18,635	14,400	1.103	26,445	7,819	219,533	45,786	14.66	3.06
2030	143,441	9,058	19,194	14,400	1.114	26,710	8,054	220,855	42,414	14.74	2.83
2031	143,441	9,329	19,769	14,400	1.125	26,977	8,295	222,212	39,295	14.83	2.62
2032	143,441	9,609	20,363	14,400	1.136	27,247	8,544	223,603	36,410	14.93	2.43
2033	143,441	9,898	20,973	14,400	1.148	27,519	8,801	225,031	33,741	15.02	2.25
2034	143,441	10,195	21,603	271,408	1.159	27,794	9,065	483,505	66,755	32.28	4.46
2035	143,441	10,500	22,251	14,400	1.171	28,072	9,337	228,000	28,986	15.22	1.94
2036	143,441	10,815	22,918	14,400	1.182	28,353	9,617	229,544	26,871	15.32	1.79
2037	143,441	11,140	23,606	14,400	1.194	28,636	9,905	231,128	24,914	15.43	1.66
2038	143,441	11,474	24,314	14,400	1.206	28,923	10,202	232,754	23,103	15.54	1.54
2039	143,441	11,818	25,043	116,419	1.218	29,212	10,508	336,442	30,750	22.46	2.05
2040	0	12,173	25,795	14,400	1.230	29,504	10,824	92,695	7,801	6.19	0.52
2041	0	12,538	26,569	14,400	1.243	29,799	11,148	94,454	7,320	6.31	0.49
2042	0	12,914	27,366	14,400	1.255	30,097	11,483	96,260	6,869	6.43	0.46
2043	0	13,302	28,187	14,400	1.268	30,398	11,827	98,113	6,447	6.55	0.43
2044	0	13,701	29,032	23,808	1.280	30,702	12,182	109,425	6,621	7.30	0.44
2045	0	14,112	29,903	14,400	1.293	31,009	12,548	101,971	5,681	6.81	0.38
2046	0	14,535	30,800	14,400	1.306	31,319	12,924	103,978	5,334	6.94	0.36
2047	0	14,971	31,724	14,400	1.319	31,632	13,312	106,039	5,009	7.08	0.33
2048	0	15,420	32,676	14,400	1.332	31,949	13,711	108,156	4,705	7.22	0.31
2049	0	15,883	33,656	14,400	1.346	32,268	14,122	110,329	4,419	7.37	0.30
2050	0	16,359	34,666	14,400	1.359	32,591	14,546	112,562	4,151	7.51	0.28
2051	0	16,850	35,706	14,400	1.373	32,917	14,982	114,855	3,901	7.67	0.26
2052	0	17,355	36,777	14,400	1.387	33,246	15,432	117,210	3,665	7.82	0.24
2053	0	17,876	37,880	14,400	1.400	33,578	15,895	119,630	3,445	7.99	0.23
2054	0	18,412	39,017	80,325	1.414	33,914	16,372	188,040	4,986	12.55	0.33
2055	0	18,965	40,187	14,400	1.429	34,253	16,863	124,668	3,044	8.32	0.20
2056	0	19,534	41,393	14,400	1.443	34,596	17,369	127,291	2,862	8.50	0.19
2057	0	20,120	42,635	14,400	1.457	34,942	17,890	129,986	2,691	8.68	0.18
2058	0	20,723	43,914	14,400	1.472	35,291	18,426	132,755	2,531	8.86	0.17
2059	0	21,345	45,231	14,400	1.487	35,644	18,979	135,600	2,380	9.05	0.16
									Net Levelized Cost (c/kWh)		**13.77**
									Net Levelized Cost ($000s)		**206,294**

Pumped Storage Bus-Bar Calculation - 15% Capacity Factor - Low Coal/Low Capital

Plant Input Data			Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)		909,128	First Year Staffing ($ 1,000)	4,179.2	3.0%
Total Net Capacity (kW)		600,000	Annual O&M Costs ($ 1,000)	10,627	3.0%
Capacity Factor		15.0%	First Year Coal Cost ($/MBtu)	0.913	1.0%
Transmission Tariff ($/kW-mo) ; % Losses	$ 1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost		10,862	Levelized Fixed Charge Rate	10.17%	
			Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	92,495	4,179	10,627	7,200	0.913	10,945	2,230	127,675	127,675	17.05	17.05
2011	92,495	4,305	10,946	7,200	0.922	11,054	2,296	128,296	118,136	17.13	15.77
2012	92,495	4,434	11,274	7,200	0.931	11,165	2,365	128,933	109,321	17.21	14.60
2013	92,495	4,567	11,612	7,200	0.941	11,277	2,436	129,587	101,175	17.30	13.51
2014	92,495	4,704	11,961	9,138	0.950	11,389	2,509	132,196	95,038	17.65	12.69
2015	92,495	4,845	12,320	7,200	0.959	11,503	2,585	130,947	86,686	17.48	11.57
2016	92,495	4,990	12,689	7,200	0.969	11,618	2,662	131,655	80,252	17.58	10.71
2017	92,495	5,140	13,070	7,200	0.979	11,734	2,742	132,381	74,305	17.67	9.92
2018	92,495	5,294	13,462	7,200	0.989	11,852	2,824	133,127	68,806	17.77	9.19
2019	92,495	5,453	13,866	7,200	0.998	11,970	2,909	133,893	63,722	17.88	8.51
2020	92,495	5,616	14,282	7,200	1.008	12,090	2,996	134,679	59,021	17.98	7.88
2021	92,495	5,785	14,710	7,200	1.019	12,211	3,086	135,487	54,673	18.09	7.30
2022	92,495	5,959	15,152	7,200	1.029	12,333	3,179	136,317	50,651	18.20	6.76
2023	92,495	6,137	15,606	7,200	1.039	12,456	3,274	137,169	46,932	18.31	6.27
2024	92,495	6,321	16,074	20,780	1.049	12,581	3,372	151,624	47,769	20.24	6.38
2025	92,495	6,511	16,557	7,200	1.060	12,707	3,474	138,943	40,308	18.55	5.38
2026	92,495	6,706	17,053	7,200	1.070	12,834	3,578	139,866	37,362	18.67	4.99
2027	92,495	6,908	17,565	7,200	1.081	12,962	3,685	140,814	34,637	18.80	4.62
2028	92,495	7,115	18,092	7,200	1.092	13,092	3,796	141,789	32,115	18.93	4.29
2029	92,495	7,328	18,635	7,200	1.103	13,223	3,910	142,790	29,780	19.06	3.98
2030	92,495	7,548	19,194	7,200	1.114	13,355	4,027	143,818	27,620	19.20	3.69
2031	92,495	7,775	19,769	7,200	1.125	13,488	4,148	144,875	25,619	19.34	3.42
2032	92,495	8,008	20,363	7,200	1.136	13,623	4,272	145,960	23,767	19.49	3.17
2033	92,495	8,248	20,973	7,200	1.148	13,760	4,400	147,076	22,052	19.64	2.94
2034	92,495	8,495	21,603	135,704	1.159	13,897	4,532	276,726	38,206	36.95	5.10
2035	92,495	8,750	22,251	7,200	1.171	14,036	4,668	149,400	18,994	19.95	2.54
2036	92,495	9,013	22,918	7,200	1.182	14,176	4,808	150,611	17,631	20.11	2.35
2037	92,495	9,283	23,606	7,200	1.194	14,318	4,953	151,854	16,369	20.27	2.19
2038	92,495	9,562	24,314	7,200	1.206	14,461	5,101	153,133	15,200	20.45	2.03
2039	92,495	9,849	25,043	58,210	1.218	14,606	5,254	205,456	18,778	27.43	2.51
2040	0	10,144	25,795	7,200	1.230	14,752	5,412	63,303	5,328	8.45	0.71
2041	0	10,448	26,569	7,200	1.243	14,900	5,574	64,691	5,013	8.64	0.67
2042	0	10,762	27,366	7,200	1.255	15,049	5,741	66,117	4,718	8.83	0.63
2043	0	11,085	28,187	7,200	1.268	15,199	5,914	67,584	4,441	9.02	0.59
2044	0	11,417	29,032	11,904	1.280	15,351	6,091	73,795	4,465	9.85	0.60
2045	0	11,760	29,903	7,200	1.293	15,505	6,274	70,641	3,936	9.43	0.53
2046	0	12,112	30,800	7,200	1.306	15,660	6,462	72,234	3,706	9.64	0.49
2047	0	12,476	31,724	7,200	1.319	15,816	6,656	73,872	3,490	9.86	0.47
2048	0	12,850	32,676	7,200	1.332	15,974	6,856	75,556	3,287	10.09	0.44
2049	0	13,236	33,656	7,200	1.346	16,134	7,061	77,287	3,096	10.32	0.41
2050	0	13,633	34,666	7,200	1.359	16,295	7,273	79,067	2,916	10.56	0.39
2051	0	14,042	35,706	7,200	1.373	16,458	7,491	80,897	2,747	10.80	0.37
2052	0	14,463	36,777	7,200	1.387	16,623	7,716	82,779	2,589	11.05	0.35
2053	0	14,897	37,880	7,200	1.400	16,789	7,947	84,714	2,439	11.31	0.33
2054	0	15,344	39,017	40,163	1.414	16,957	8,186	119,666	3,173	15.98	0.42
2055	0	15,804	40,187	7,200	1.429	17,127	8,431	88,749	2,167	11.85	0.29
2056	0	16,278	41,393	7,200	1.443	17,298	8,684	90,853	2,043	12.13	0.27
2057	0	16,766	42,635	7,200	1.457	17,471	8,945	93,017	1,926	12.42	0.26
2058	0	17,269	43,914	7,200	1.472	17,646	9,213	95,242	1,816	12.72	0.24
2059	0	17,788	45,231	7,200	1.487	17,822	9,490	97,530	1,712	13.02	0.23
									Net Levelized Cost (c/kWh)		**17.71**
									Net Levelized Cost ($000s)		**132,617**

Pumped Storage Bus-Bar Calculation - 20% Capacity Factor - Low Capital Cost

Plant Input Data				Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)			1,409,873	First Year Staffing ($ 1,000)	5,015.0	3.0%
Total Net Capacity (kW)			1,200,000	Annual O&M Costs ($ 1,000)	10,627	3.0%
Capacity Factor			20.0%	First Year Coal Cost ($/MBtu)	0.997	2.5%
Transmission Tariff ($/kW-mo) ; % Losses	$	1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost			10,862	Levelized Fixed Charge Rate	10.17%	
				Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	143,441	5,015	10,627	14,400	0.997	31,886	5,946	211,314	211,314	10.58	10.58
2011	143,441	5,165	10,946	14,400	1.022	32,683	6,124	212,759	195,910	10.65	9.81
2012	143,441	5,320	11,274	14,400	1.048	33,500	6,308	214,243	181,655	10.73	9.10
2013	143,441	5,480	11,612	14,400	1.074	34,337	6,497	215,767	168,460	10.80	8.43
2014	143,441	5,644	11,961	18,276	1.101	35,196	6,692	221,209	159,032	11.08	7.96
2015	143,441	5,814	12,320	14,400	1.128	36,076	6,893	218,942	144,937	10.96	7.26
2016	143,441	5,988	12,689	14,400	1.157	36,978	7,099	220,595	134,467	11.04	6.73
2017	143,441	6,168	13,070	14,400	1.186	37,902	7,312	222,293	124,772	11.13	6.25
2018	143,441	6,353	13,462	14,400	1.215	38,850	7,532	224,037	115,793	11.22	5.80
2019	143,441	6,543	13,866	14,400	1.246	39,821	7,758	225,828	107,476	11.31	5.38
2020	143,441	6,740	14,282	14,400	1.277	40,816	7,990	227,669	99,771	11.40	5.00
2021	143,441	6,942	14,710	14,400	1.309	41,837	8,230	229,560	92,633	11.49	4.64
2022	143,441	7,150	15,152	14,400	1.341	42,883	8,477	231,502	86,019	11.59	4.31
2023	143,441	7,365	15,606	14,400	1.375	43,955	8,731	233,497	79,890	11.69	4.00
2024	143,441	7,586	16,074	41,560	1.409	45,054	8,993	262,708	82,767	13.15	4.14
2025	143,441	7,813	16,557	14,400	1.444	46,180	9,263	237,653	68,944	11.90	3.45
2026	143,441	8,048	17,053	14,400	1.481	47,334	9,541	239,817	64,062	12.01	3.21
2027	143,441	8,289	17,565	14,400	1.518	48,518	9,827	242,039	59,536	12.12	2.98
2028	143,441	8,538	18,092	14,400	1.556	49,731	10,122	244,323	55,338	12.23	2.77
2029	143,441	8,794	18,635	14,400	1.594	50,974	10,426	246,669	51,445	12.35	2.58
2030	143,441	9,058	19,194	14,400	1.634	52,248	10,738	249,079	47,834	12.47	2.39
2031	143,441	9,329	19,769	14,400	1.675	53,555	11,061	251,554	44,484	12.59	2.23
2032	143,441	9,609	20,363	14,400	1.717	54,893	11,392	254,098	41,376	12.72	2.07
2033	143,441	9,898	20,973	14,400	1.760	56,266	11,734	256,711	38,491	12.85	1.93
2034	143,441	10,195	21,603	271,408	1.804	57,672	12,086	516,404	71,297	25.86	3.57
2035	143,441	10,500	22,251	14,400	1.849	59,114	12,449	262,154	33,328	13.13	1.67
2036	143,441	10,815	22,918	14,400	1.895	60,592	12,822	264,988	31,021	13.27	1.55
2037	143,441	11,140	23,606	14,400	1.943	62,107	13,207	267,900	28,878	13.41	1.45
2038	143,441	11,474	24,314	14,400	1.991	63,659	13,603	270,891	26,888	13.56	1.35
2039	143,441	11,818	25,043	116,419	2.041	65,251	14,011	375,984	34,364	18.82	1.72
2040	0	12,173	25,795	14,400	2.092	66,882	14,432	133,681	11,251	6.69	0.56
2041	0	12,538	26,569	14,400	2.144	68,554	14,864	136,925	10,611	6.86	0.53
2042	0	12,914	27,366	14,400	2.198	70,268	15,310	140,258	10,009	7.02	0.50
2043	0	13,302	28,187	14,400	2.253	72,025	15,770	143,683	9,441	7.19	0.47
2044	0	13,701	29,032	23,808	2.309	73,825	16,243	156,609	9,475	7.84	0.47
2045	0	14,112	29,903	14,400	2.367	75,671	16,730	150,816	8,402	7.55	0.42
2046	0	14,535	30,800	14,400	2.426	77,563	17,232	154,530	7,928	7.74	0.40
2047	0	14,971	31,724	14,400	2.487	79,502	17,749	158,346	7,480	7.93	0.37
2048	0	15,420	32,676	14,400	2.549	81,490	18,281	162,267	7,058	8.12	0.35
2049	0	15,883	33,656	14,400	2.613	83,527	18,830	166,295	6,661	8.33	0.33
2050	0	16,359	34,666	14,400	2.678	85,615	19,395	170,435	6,286	8.53	0.31
2051	0	16,850	35,706	14,400	2.745	87,755	19,977	174,688	5,933	8.75	0.30
2052	0	17,355	36,777	14,400	2.813	89,949	20,576	179,058	5,599	8.97	0.28
2053	0	17,876	37,880	14,400	2.884	92,198	21,193	183,548	5,285	9.19	0.26
2054	0	18,412	39,017	80,325	2.956	94,503	21,829	254,086	6,737	12.72	0.34
2055	0	18,965	40,187	14,400	3.030	96,865	22,484	192,901	4,710	9.66	0.24
2056	0	19,534	41,393	14,400	3.106	99,287	23,158	197,772	4,446	9.90	0.22
2057	0	20,120	42,635	14,400	3.183	101,769	23,853	202,777	4,198	10.15	0.21
2058	0	20,723	43,914	14,400	3.263	104,313	24,569	207,919	3,963	10.41	0.20
2059	0	21,345	45,231	14,400	3.344	106,921	25,306	213,203	3,742	10.67	0.19
									Net Levelized Cost (c/kWh)		**11.37**
									Net Levelized Cost ($000s)		**227,096**

Pumped Storage Bus-Bar Calculation - 10% Capacity Factor - Low Capital Cost

Plant Input Data				Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)			1,409,873	First Year Staffing ($ 1,000)	5,015.0	3.0%
Total Net Capacity (kW)			1,200,000	Annual O&M Costs ($ 1,000)	10,627	3.0%
Capacity Factor			10.0%	First Year Coal Cost ($/MBtu)	0.997	2.5%
Transmission Tariff ($/kW-mo) ; % Losses	$	1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost			10,862	Levelized Fixed Charge Rate	10.17%	
				Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	143,441	5,015	10,627	14,400	0.997	15,943	2,973	192,398	192,398	19.27	19.27
2011	143,441	5,165	10,946	14,400	1.022	16,341	3,062	193,355	178,043	19.36	17.83
2012	143,441	5,320	11,274	14,400	1.048	16,750	3,154	194,339	164,778	19.46	16.50
2013	143,441	5,480	11,612	14,400	1.074	17,169	3,248	195,350	152,519	19.56	15.27
2014	143,441	5,644	11,961	18,276	1.101	17,598	3,346	200,265	143,975	20.05	14.42
2015	143,441	5,814	12,320	14,400	1.128	18,038	3,446	197,458	130,715	19.77	13.09
2016	143,441	5,988	12,689	14,400	1.157	18,489	3,550	198,556	121,033	19.88	12.12
2017	143,441	6,168	13,070	14,400	1.186	18,951	3,656	199,685	112,082	20.00	11.22
2018	143,441	6,353	13,462	14,400	1.215	19,425	3,766	200,846	103,807	20.11	10.39
2019	143,441	6,543	13,866	14,400	1.246	19,910	3,879	202,039	96,154	20.23	9.63
2020	143,441	6,740	14,282	14,400	1.277	20,408	3,995	203,265	89,077	20.35	8.92
2021	143,441	6,942	14,710	14,400	1.309	20,918	4,115	204,526	82,532	20.48	8.26
2022	143,441	7,150	15,152	14,400	1.341	21,441	4,238	205,822	76,478	20.61	7.66
2023	143,441	7,365	15,606	14,400	1.375	21,977	4,366	207,154	70,877	20.74	7.10
2024	143,441	7,586	16,074	41,560	1.409	22,527	4,497	235,684	74,253	23.60	7.44
2025	143,441	7,813	16,557	14,400	1.444	23,090	4,632	209,932	60,902	21.02	6.10
2026	143,441	8,048	17,053	14,400	1.481	23,667	4,770	211,379	56,466	21.17	5.65
2027	143,441	8,289	17,565	14,400	1.518	24,259	4,914	212,867	52,360	21.32	5.24
2028	143,441	8,538	18,092	14,400	1.556	24,865	5,061	214,396	48,560	21.47	4.86
2029	143,441	8,794	18,635	14,400	1.594	25,487	5,213	215,969	45,043	21.63	4.51
2030	143,441	9,058	19,194	14,400	1.634	26,124	5,369	217,585	41,786	21.79	4.18
2031	143,441	9,329	19,769	14,400	1.675	26,777	5,530	219,247	38,771	21.95	3.88
2032	143,441	9,609	20,363	14,400	1.717	27,447	5,696	220,955	35,979	22.13	3.60
2033	143,441	9,898	20,973	14,400	1.760	28,133	5,867	222,711	33,393	22.30	3.34
2034	143,441	10,195	21,603	271,408	1.804	28,836	6,043	481,525	66,482	48.22	6.66
2035	143,441	10,500	22,251	14,400	1.849	29,557	6,224	226,373	28,779	22.67	2.88
2036	143,441	10,815	22,918	14,400	1.895	30,296	6,411	228,281	26,724	22.86	2.68
2037	143,441	11,140	23,606	14,400	1.943	31,053	6,603	230,243	24,819	23.06	2.49
2038	143,441	11,474	24,314	14,400	1.991	31,830	6,802	232,260	23,054	23.26	2.31
2039	143,441	11,818	25,043	116,419	2.041	32,625	7,006	336,353	30,742	33.68	3.08
2040	0	12,173	25,795	14,400	2.092	33,441	7,216	93,024	7,829	9.32	0.78
2041	0	12,538	26,569	14,400	2.144	34,277	7,432	95,216	7,379	9.53	0.74
2042	0	12,914	27,366	14,400	2.198	35,134	7,655	97,469	6,955	9.76	0.70
2043	0	13,302	28,187	14,400	2.253	36,012	7,885	99,785	6,557	9.99	0.66
2044	0	13,701	29,032	23,808	2.309	36,913	8,121	111,575	6,751	11.17	0.68
2045	0	14,112	29,903	14,400	2.367	37,836	8,365	104,615	5,828	10.48	0.58
2046	0	14,535	30,800	14,400	2.426	38,781	8,616	107,133	5,496	10.73	0.55
2047	0	14,971	31,724	14,400	2.487	39,751	8,874	109,721	5,183	10.99	0.52
2048	0	15,420	32,676	14,400	2.549	40,745	9,141	112,381	4,888	11.25	0.49
2049	0	15,883	33,656	14,400	2.613	41,763	9,415	115,117	4,611	11.53	0.46
2050	0	16,359	34,666	14,400	2.678	42,807	9,697	117,930	4,349	11.81	0.44
2051	0	16,850	35,706	14,400	2.745	43,878	9,988	120,822	4,103	12.10	0.41
2052	0	17,355	36,777	14,400	2.813	44,975	10,288	123,795	3,871	12.40	0.39
2053	0	17,876	37,880	14,400	2.884	46,099	10,597	126,852	3,653	12.70	0.37
2054	0	18,412	39,017	80,325	2.956	47,251	10,914	195,920	5,195	19.62	0.52
2055	0	18,965	40,187	14,400	3.030	48,433	11,242	133,227	3,253	13.34	0.33
2056	0	19,534	41,393	14,400	3.106	49,644	11,579	136,549	3,070	13.67	0.31
2057	0	20,120	42,635	14,400	3.183	50,885	11,927	139,966	2,897	14.02	0.29
2058	0	20,723	43,914	14,400	3.263	52,157	12,284	143,478	2,735	14.37	0.27
2059	0	21,345	45,231	14,400	3.344	53,461	12,653	147,090	2,582	14.73	0.26
									Net Levelized Cost (c/kWh)		**20.15**
									Net Levelized Cost ($000s)		**201,208**

Pumped Storage Bus-Bar Calculation - 15% Capacity Factor - Low Capital Cost

Plant Input Data				Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)			1,409,873	First Year Staffing ($ 1,000)	5,015.0	3.0%
Total Net Capacity (kW)			1,200,000	Annual O&M Costs ($ 1,000)	10,627	3.0%
Capacity Factor			15.0%	First Year Coal Cost ($/MBtu)	0.997	2.5%
Transmission Tariff ($/kW-mo) ; % Losses	$	1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost			10,862	Levelized Fixed Charge Rate	10.17%	
				Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	143,441	5,015	10,627	14,400	0.997	23,914	4,459	201,856	201,856	13.48	13.48
2011	143,441	5,165	10,946	14,400	1.022	24,512	4,593	203,057	186,977	13.56	12.48
2012	143,441	5,320	11,274	14,400	1.048	25,125	4,731	204,291	173,216	13.64	11.56
2013	143,441	5,480	11,612	14,400	1.074	25,753	4,873	205,559	160,489	13.72	10.71
2014	143,441	5,644	11,961	18,276	1.101	26,397	5,019	210,737	151,503	14.07	10.11
2015	143,441	5,814	12,320	14,400	1.128	27,057	5,169	208,200	137,826	13.90	9.20
2016	143,441	5,988	12,689	14,400	1.157	27,733	5,325	209,576	127,750	13.99	8.53
2017	143,441	6,168	13,070	14,400	1.186	28,426	5,484	210,989	118,427	14.09	7.91
2018	143,441	6,353	13,462	14,400	1.215	29,137	5,649	212,441	109,800	14.18	7.33
2019	143,441	6,543	13,866	14,400	1.246	29,866	5,818	213,934	101,815	14.28	6.80
2020	143,441	6,740	14,282	14,400	1.277	30,612	5,993	215,467	94,424	14.38	6.30
2021	143,441	6,942	14,710	14,400	1.309	31,378	6,173	217,043	87,583	14.49	5.85
2022	143,441	7,150	15,152	14,400	1.341	32,162	6,358	218,662	81,249	14.60	5.42
2023	143,441	7,365	15,606	14,400	1.375	32,966	6,548	220,326	75,384	14.71	5.03
2024	143,441	7,586	16,074	41,560	1.409	33,790	6,745	249,196	78,510	16.64	5.24
2025	143,441	7,813	16,557	14,400	1.444	34,635	6,947	223,793	64,923	14.94	4.33
2026	143,441	8,048	17,053	14,400	1.481	35,501	7,156	225,598	60,264	15.06	4.02
2027	143,441	8,289	17,565	14,400	1.518	36,388	7,370	227,453	55,948	15.18	3.73
2028	143,441	8,538	18,092	14,400	1.556	37,298	7,591	229,360	51,949	15.31	3.47
2029	143,441	8,794	18,635	14,400	1.594	38,230	7,819	231,319	48,244	15.44	3.22
2030	143,441	9,058	19,194	14,400	1.634	39,186	8,054	233,332	44,810	15.58	2.99
2031	143,441	9,329	19,769	14,400	1.675	40,166	8,295	235,401	41,628	15.71	2.78
2032	143,441	9,609	20,363	14,400	1.717	41,170	8,544	237,527	38,677	15.86	2.58
2033	143,441	9,898	20,973	14,400	1.760	42,199	8,801	239,711	35,942	16.00	2.40
2034	143,441	10,195	21,603	271,408	1.804	43,254	9,065	498,965	68,890	33.31	4.60
2035	143,441	10,500	22,251	14,400	1.849	44,336	9,337	244,264	31,054	16.31	2.07
2036	143,441	10,815	22,918	14,400	1.895	45,444	9,617	246,635	28,872	16.46	1.93
2037	143,441	11,140	23,606	14,400	1.943	46,580	9,905	249,071	26,848	16.63	1.79
2038	143,441	11,474	24,314	14,400	1.991	47,745	10,202	251,575	24,971	16.79	1.67
2039	143,441	11,818	25,043	116,419	2.041	48,938	10,508	356,168	32,553	23.78	2.17
2040	0	12,173	25,795	14,400	2.092	50,162	10,824	113,353	9,540	7.57	0.64
2041	0	12,538	26,569	14,400	2.144	51,416	11,148	116,071	8,995	7.75	0.60
2042	0	12,914	27,366	14,400	2.198	52,701	11,483	118,864	8,482	7.94	0.57
2043	0	13,302	28,187	14,400	2.253	54,019	11,827	121,734	7,999	8.13	0.53
2044	0	13,701	29,032	23,808	2.309	55,369	12,182	134,092	8,113	8.95	0.54
2045	0	14,112	29,903	14,400	2.367	56,753	12,548	127,716	7,115	8.53	0.48
2046	0	14,535	30,800	14,400	2.426	58,172	12,924	130,831	6,712	8.73	0.45
2047	0	14,971	31,724	14,400	2.487	59,626	13,312	134,033	6,332	8.95	0.42
2048	0	15,420	32,676	14,400	2.549	61,117	13,711	137,324	5,973	9.17	0.40
2049	0	15,883	33,656	14,400	2.613	62,645	14,122	140,706	5,636	9.39	0.38
2050	0	16,359	34,666	14,400	2.678	64,211	14,546	144,182	5,318	9.63	0.35
2051	0	16,850	35,706	14,400	2.745	65,816	14,982	147,755	5,018	9.86	0.33
2052	0	17,355	36,777	14,400	2.813	67,462	15,432	151,426	4,735	10.11	0.32
2053	0	17,876	37,880	14,400	2.884	69,148	15,895	155,200	4,469	10.36	0.30
2054	0	18,412	39,017	80,325	2.956	70,877	16,372	225,003	5,966	15.02	0.40
2055	0	18,965	40,187	14,400	3.030	72,649	16,863	163,064	3,981	10.89	0.27
2056	0	19,534	41,393	14,400	3.106	74,465	17,369	167,161	3,758	11.16	0.25
2057	0	20,120	42,635	14,400	3.183	76,327	17,890	171,371	3,548	11.44	0.24
2058	0	20,723	43,914	14,400	3.263	78,235	18,426	175,699	3,349	11.73	0.22
2059	0	21,345	45,231	14,400	3.344	80,191	18,979	180,146	3,162	12.03	0.21
									Net Levelized Cost (c/kWh)		**14.30**
									Net Levelized Cost ($000s)		**214,152**

Pumped Storage Bus-Bar Calculation - 20% Capacity Factor - Low Capital Cost

Plant Input Data				Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)			909,128	First Year Staffing ($ 1,000)	4,179.2	3.0%
Total Net Capacity (kW)			600,000	Annual O&M Costs ($ 1,000)	8,000	3.0%
Capacity Factor			20.0%	First Year Coal Cost ($/MBtu)	0.997	2.5%
Transmission Tariff ($/kW-mo) ; % Losses	$	1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost			10,862	Levelized Fixed Charge Rate	10.17%	
				Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	92,495	4,179	8,000	7,200	0.997	15,943	2,973	130,790	130,790	13.10	13.10
2011	92,495	4,305	8,240	7,200	1.022	16,341	3,062	131,643	121,218	13.18	12.14
2012	92,495	4,434	8,487	7,200	1.048	16,750	3,154	132,520	112,362	13.27	11.25
2013	92,495	4,567	8,742	7,200	1.074	17,169	3,248	133,421	104,168	13.36	10.43
2014	92,495	4,704	9,004	9,138	1.101	17,598	3,346	136,284	97,978	13.65	9.81
2015	92,495	4,845	9,274	7,200	1.128	18,038	3,446	135,298	89,566	13.55	8.97
2016	92,495	4,990	9,553	7,200	1.157	18,489	3,550	136,276	83,069	13.65	8.32
2017	92,495	5,140	9,839	7,200	1.186	18,951	3,656	137,281	77,055	13.75	7.72
2018	92,495	5,294	10,134	7,200	1.215	19,425	3,766	138,314	71,487	13.85	7.16
2019	92,495	5,453	10,438	7,200	1.246	19,910	3,879	139,375	66,331	13.96	6.64
2020	92,495	5,616	10,752	7,200	1.277	20,408	3,995	140,466	61,556	14.07	6.16
2021	92,495	5,785	11,074	7,200	1.309	20,918	4,115	141,587	57,134	14.18	5.72
2022	92,495	5,959	11,406	7,200	1.341	21,441	4,238	142,739	53,038	14.29	5.31
2023	92,495	6,137	11,748	7,200	1.375	21,977	4,366	143,923	49,243	14.41	4.93
2024	92,495	6,321	12,101	20,780	1.409	22,527	4,497	158,721	50,005	15.89	5.01
2025	92,495	6,511	12,464	7,200	1.444	23,090	4,632	146,391	42,469	14.66	4.25
2026	92,495	6,706	12,838	7,200	1.481	23,667	4,770	147,677	39,449	14.79	3.95
2027	92,495	6,908	13,223	7,200	1.518	24,259	4,914	148,998	36,650	14.92	3.67
2028	92,495	7,115	13,620	7,200	1.556	24,865	5,061	150,356	34,055	15.06	3.41
2029	92,495	7,328	14,028	7,200	1.594	25,487	5,213	151,751	31,649	15.20	3.17
2030	92,495	7,548	14,449	7,200	1.634	26,124	5,369	153,185	29,419	15.34	2.95
2031	92,495	7,775	14,883	7,200	1.675	26,777	5,530	154,659	27,350	15.49	2.74
2032	92,495	8,008	15,329	7,200	1.717	27,447	5,696	156,174	25,430	15.64	2.55
2033	92,495	8,248	15,789	7,200	1.760	28,133	5,867	157,732	23,650	15.79	2.37
2034	92,495	8,495	16,263	135,704	1.804	28,836	6,043	287,836	39,740	28.82	3.98
2035	92,495	8,750	16,751	7,200	1.849	29,557	6,224	160,977	20,465	16.12	2.05
2036	92,495	9,013	17,253	7,200	1.895	30,296	6,411	162,668	19,043	16.29	1.91
2037	92,495	9,283	17,771	7,200	1.943	31,053	6,603	164,405	17,722	16.46	1.77
2038	92,495	9,562	18,304	7,200	1.991	31,830	6,802	166,191	16,496	16.64	1.65
2039	92,495	9,849	18,853	58,210	2.041	32,625	7,006	219,037	20,019	21.93	2.00
2040	0	10,144	19,418	7,200	2.092	33,441	7,216	77,419	6,516	7.75	0.65
2041	0	10,448	20,001	7,200	2.144	34,277	7,432	79,359	6,150	7.95	0.62
2042	0	10,762	20,601	7,200	2.198	35,134	7,655	81,352	5,805	8.15	0.58
2043	0	11,085	21,219	7,200	2.253	36,012	7,885	83,401	5,480	8.35	0.55
2044	0	11,417	21,856	11,904	2.309	36,913	8,121	90,211	5,458	9.03	0.55
2045	0	11,760	22,511	7,200	2.367	37,836	8,365	87,672	4,884	8.78	0.49
2046	0	12,112	23,187	7,200	2.426	38,781	8,616	89,897	4,612	9.00	0.46
2047	0	12,476	23,882	7,200	2.487	39,751	8,874	92,184	4,355	9.23	0.44
2048	0	12,850	24,599	7,200	2.549	40,745	9,141	94,534	4,112	9.47	0.41
2049	0	13,236	25,337	7,200	2.613	41,763	9,415	96,951	3,883	9.71	0.39
2050	0	13,633	26,097	7,200	2.678	42,807	9,697	99,434	3,667	9.96	0.37
2051	0	14,042	26,880	7,200	2.745	43,878	9,988	101,987	3,464	10.21	0.35
2052	0	14,463	27,686	7,200	2.813	44,975	10,288	104,611	3,271	10.48	0.33
2053	0	14,897	28,517	7,200	2.884	46,099	10,597	107,309	3,090	10.75	0.31
2054	0	15,344	29,372	40,163	2.956	47,251	10,914	143,044	3,793	14.32	0.38
2055	0	15,804	30,253	7,200	3.030	48,433	11,242	112,932	2,757	11.31	0.28
2056	0	16,278	31,161	7,200	3.106	49,644	11,579	115,862	2,605	11.60	0.26
2057	0	16,766	32,096	7,200	3.183	50,885	11,927	118,873	2,461	11.90	0.25
2058	0	17,269	33,059	7,200	3.263	52,157	12,284	121,969	2,325	12.21	0.23
2059	0	17,788	34,050	7,200	3.344	53,461	12,653	125,151	2,197	12.53	0.22
									Net Levelized Cost (c/kWh)		**13.94**
									Net Levelized Cost ($000s)		**139,208**

Pumped Storage Bus-Bar Calculation - 10% Capacity Factor - Low Capital Cost

Plant Input Data				Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)			909,128	First Year Staffing ($ 1,000)	4,179.2	3.0%
Total Net Capacity (kW)			600,000	Annual O&M Costs ($ 1,000)	8,000	3.0%
Capacity Factor			10.0%	First Year Coal Cost ($/MBtu)	0.997	2.5%
Transmission Tariff ($/kW-mo) ; % Losses	$	1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost			10,862	Levelized Fixed Charge Rate	10.17%	
				Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	92,495	4,179	8,000	7,200	0.997	7,971	1,486	121,332	121,332	24.30	24.30
2011	92,495	4,305	8,240	7,200	1.022	8,171	1,531	121,941	112,285	24.42	22.49
2012	92,495	4,434	8,487	7,200	1.048	8,375	1,577	122,568	103,924	24.55	20.81
2013	92,495	4,567	8,742	7,200	1.074	8,584	1,624	123,212	96,197	24.68	19.27
2014	92,495	4,704	9,004	9,138	1.101	8,799	1,673	125,812	90,449	25.20	18.11
2015	92,495	4,845	9,274	7,200	1.128	9,019	1,723	124,556	82,455	24.95	16.51
2016	92,495	4,990	9,553	7,200	1.157	9,244	1,775	125,257	76,352	25.09	15.29
2017	92,495	5,140	9,839	7,200	1.186	9,475	1,828	125,977	70,710	25.23	14.16
2018	92,495	5,294	10,134	7,200	1.215	9,712	1,883	126,718	65,494	25.38	13.12
2019	92,495	5,453	10,438	7,200	1.246	9,955	1,939	127,481	60,670	25.53	12.15
2020	92,495	5,616	10,752	7,200	1.277	10,204	1,998	128,264	56,209	25.69	11.26
2021	92,495	5,785	11,074	7,200	1.309	10,459	2,058	129,070	52,083	25.85	10.43
2022	92,495	5,959	11,406	7,200	1.341	10,721	2,119	129,899	48,267	26.02	9.67
2023	92,495	6,137	11,748	7,200	1.375	10,989	2,183	130,752	44,736	26.19	8.96
2024	92,495	6,321	12,101	20,780	1.409	11,263	2,248	145,209	45,748	29.08	9.16
2025	92,495	6,511	12,464	7,200	1.444	11,545	2,316	132,530	38,448	26.54	7.70
2026	92,495	6,706	12,838	7,200	1.481	11,834	2,385	133,458	35,651	26.73	7.14
2027	92,495	6,908	13,223	7,200	1.518	12,129	2,457	134,412	33,062	26.92	6.62
2028	92,495	7,115	13,620	7,200	1.556	12,433	2,530	135,392	30,666	27.12	6.14
2029	92,495	7,328	14,028	7,200	1.594	12,743	2,606	136,401	28,448	27.32	5.70
2030	92,495	7,548	14,449	7,200	1.634	13,062	2,685	137,439	26,394	27.53	5.29
2031	92,495	7,775	14,883	7,200	1.675	13,389	2,765	138,506	24,493	27.74	4.91
2032	92,495	8,008	15,329	7,200	1.717	13,723	2,848	139,603	22,732	27.96	4.55
2033	92,495	8,248	15,789	7,200	1.760	14,066	2,934	140,732	21,101	28.18	4.23
2034	92,495	8,495	16,263	135,704	1.804	14,418	3,022	270,397	37,332	54.15	7.48
2035	92,495	8,750	16,751	7,200	1.849	14,779	3,112	143,086	18,191	28.66	3.64
2036	92,495	9,013	17,253	7,200	1.895	15,148	3,206	144,314	16,894	28.90	3.38
2037	92,495	9,283	17,771	7,200	1.943	15,527	3,302	145,577	15,692	29.16	3.14
2038	92,495	9,562	18,304	7,200	1.991	15,915	3,401	146,876	14,579	29.42	2.92
2039	92,495	9,849	18,853	58,210	2.041	16,313	3,503	199,221	18,208	39.90	3.65
2040	0	10,144	19,418	7,200	2.092	16,721	3,608	57,091	4,805	11.43	0.96
2041	0	10,448	20,001	7,200	2.144	17,139	3,716	58,504	4,534	11.72	0.91
2042	0	10,762	20,601	7,200	2.198	17,567	3,828	59,957	4,278	12.01	0.86
2043	0	11,085	21,219	7,200	2.253	18,006	3,942	61,452	4,038	12.31	0.81
2044	0	11,417	21,856	11,904	2.309	18,456	4,061	67,694	4,096	13.56	0.82
2045	0	11,760	22,511	7,200	2.367	18,918	4,183	64,571	3,597	12.93	0.72
2046	0	12,112	23,187	7,200	2.426	19,391	4,308	66,198	3,396	13.26	0.68
2047	0	12,476	23,882	7,200	2.487	19,875	4,437	67,871	3,206	13.59	0.64
2048	0	12,850	24,599	7,200	2.549	20,372	4,570	69,592	3,027	13.94	0.61
2049	0	13,236	25,337	7,200	2.613	20,882	4,707	71,361	2,858	14.29	0.57
2050	0	13,633	26,097	7,200	2.678	21,404	4,849	73,182	2,699	14.66	0.54
2051	0	14,042	26,880	7,200	2.745	21,939	4,994	75,054	2,549	15.03	0.51
2052	0	14,463	27,686	7,200	2.813	22,487	5,144	76,980	2,407	15.42	0.48
2053	0	14,897	28,517	7,200	2.884	23,049	5,298	78,961	2,274	15.81	0.46
2054	0	15,344	29,372	40,163	2.956	23,626	5,457	113,961	3,022	22.82	0.61
2055	0	15,804	30,253	7,200	3.030	24,216	5,621	83,095	2,029	16.64	0.41
2056	0	16,278	31,161	7,200	3.106	24,822	5,790	85,250	1,917	17.07	0.38
2057	0	16,766	32,096	7,200	3.183	25,442	5,963	87,468	1,811	17.52	0.36
2058	0	17,269	33,059	7,200	3.263	26,078	6,142	89,749	1,711	17.97	0.34
2059	0	17,788	34,050	7,200	3.344	26,730	6,326	92,095	1,616	18.44	0.32
									Net Levelized Cost (c/kWh)		**25.29**
									Net Levelized Cost ($000s)		**126,264**

Pumped Storage Bus-Bar Calculation - 15% Capacity Factor - Low Capital Cost

Plant Input Data				Economic Input Data	Rate	Escalation
Plant Capital Cost with Transmission Lines ($ 1,000)			909,128	First Year Staffing ($ 1,000)	4,179.2	3.0%
Total Net Capacity (kW)			600,000	Annual O&M Costs ($ 1,000)	10,627	3.0%
Capacity Factor			15.0%	First Year Coal Cost ($/MBtu)	0.997	2.5%
Transmission Tariff ($/kW-mo) ; % Losses	$	1.00	5%	First Year Coal Plant VOM ($/MWh)	2.02	3.0%
Off-Peak Heat Rate Tied to Replacement Energy Cost			10,862	Levelized Fixed Charge Rate	10.17%	
				Present Worth Discount Rate	8.60%	

Year	Capital ($ 1,000)	Staffing Costs ($ 1,000)	Annual O&M ($ 1,000)	Trans. Tariff & Major Maint. ($ 1,000)	Fuel (Coal) Rate ($/MBtu)	Fuel (Coal) Cost ($ 1,000)	VOM Coal Plant ($ 1,000)	Total Cost ($ 1,000)	PW Total Cost ($ 1,000)	Busbar Cost (c/kWh)	Net PW Cost (c/kWh)
2010	92,495	4,179	10,627	7,200	0.997	11,957	2,230	128,688	128,688	17.18	17.18
2011	92,495	4,305	10,946	7,200	1.022	12,256	2,296	129,498	119,243	17.29	15.92
2012	92,495	4,434	11,274	7,200	1.048	12,562	2,365	130,330	110,506	17.40	14.75
2013	92,495	4,567	11,612	7,200	1.074	12,876	2,436	131,187	102,424	17.52	13.68
2014	92,495	4,704	11,961	9,138	1.101	13,198	2,509	134,005	96,339	17.89	12.86
2015	92,495	4,845	12,320	7,200	1.128	13,528	2,585	132,972	88,026	17.75	11.75
2016	92,495	4,990	12,689	7,200	1.157	13,867	2,662	133,903	81,623	17.88	10.90
2017	92,495	5,140	13,070	7,200	1.186	14,213	2,742	134,860	75,696	18.01	10.11
2018	92,495	5,294	13,462	7,200	1.215	14,569	2,824	135,844	70,210	18.14	9.37
2019	92,495	5,453	13,866	7,200	1.246	14,933	2,909	136,855	65,132	18.27	8.70
2020	92,495	5,616	14,282	7,200	1.277	15,306	2,996	137,896	60,430	18.41	8.07
2021	92,495	5,785	14,710	7,200	1.309	15,689	3,086	138,965	56,076	18.55	7.49
2022	92,495	5,959	15,152	7,200	1.341	16,081	3,179	140,065	52,044	18.70	6.95
2023	92,495	6,137	15,606	7,200	1.375	16,483	3,274	141,195	48,310	18.85	6.45
2024	92,495	6,321	16,074	20,780	1.409	16,895	3,372	155,938	49,129	20.82	6.56
2025	92,495	6,511	16,557	7,200	1.444	17,317	3,474	143,553	41,645	19.17	5.56
2026	92,495	6,706	17,053	7,200	1.481	17,750	3,578	144,783	38,676	19.33	5.16
2027	92,495	6,908	17,565	7,200	1.518	18,194	3,685	146,047	35,924	19.50	4.80
2028	92,495	7,115	18,092	7,200	1.556	18,649	3,796	147,346	33,374	19.67	4.46
2029	92,495	7,328	18,635	7,200	1.594	19,115	3,910	148,682	31,009	19.85	4.14
2030	92,495	7,548	19,194	7,200	1.634	19,593	4,027	150,056	28,818	20.03	3.85
2031	92,495	7,775	19,769	7,200	1.675	20,083	4,148	151,469	26,785	20.22	3.58
2032	92,495	8,008	20,363	7,200	1.717	20,585	4,272	152,922	24,901	20.42	3.32
2033	92,495	8,248	20,973	7,200	1.760	21,100	4,400	154,416	23,153	20.62	3.09
2034	92,495	8,495	21,603	135,704	1.804	21,627	4,532	284,456	39,274	37.98	5.24
2035	92,495	8,750	22,251	7,200	1.849	22,168	4,668	157,532	20,027	21.03	2.67
2036	92,495	9,013	22,918	7,200	1.895	22,722	4,808	159,156	18,631	21.25	2.49
2037	92,495	9,283	23,606	7,200	1.943	23,290	4,953	160,826	17,336	21.47	2.31
2038	92,495	9,562	24,314	7,200	1.991	23,872	5,101	162,544	16,134	21.70	2.15
2039	92,495	9,849	25,043	58,210	2.041	24,469	5,254	215,320	19,680	28.75	2.63
2040	0	10,144	25,795	7,200	2.092	25,081	5,412	73,631	6,197	9.83	0.83
2041	0	10,448	26,569	7,200	2.144	25,708	5,574	75,499	5,851	10.08	0.78
2042	0	10,762	27,366	7,200	2.198	26,351	5,741	77,419	5,525	10.34	0.74
2043	0	11,085	28,187	7,200	2.253	27,009	5,914	79,394	5,217	10.60	0.70
2044	0	11,417	29,032	11,904	2.309	27,685	6,091	86,129	5,211	11.50	0.70
2045	0	11,760	29,903	7,200	2.367	28,377	6,274	83,513	4,653	11.15	0.62
2046	0	12,112	30,800	7,200	2.426	29,086	6,462	85,661	4,394	11.44	0.59
2047	0	12,476	31,724	7,200	2.487	29,813	6,656	87,869	4,151	11.73	0.55
2048	0	12,850	32,676	7,200	2.549	30,559	6,856	90,140	3,921	12.04	0.52
2049	0	13,236	33,656	7,200	2.613	31,323	7,061	92,476	3,704	12.35	0.49
2050	0	13,633	34,666	7,200	2.678	32,106	7,273	94,877	3,499	12.67	0.47
2051	0	14,042	35,706	7,200	2.745	32,908	7,491	97,347	3,306	13.00	0.44
2052	0	14,463	36,777	7,200	2.813	33,731	7,716	99,887	3,124	13.34	0.42
2053	0	14,897	37,880	7,200	2.884	34,574	7,947	102,499	2,951	13.69	0.39
2054	0	15,344	39,017	40,163	2.956	35,439	8,186	138,147	3,663	18.44	0.49
2055	0	15,804	40,187	7,200	3.030	36,325	8,431	107,947	2,636	14.41	0.35
2056	0	16,278	41,393	7,200	3.106	37,233	8,684	110,788	2,491	14.79	0.33
2057	0	16,766	42,635	7,200	3.183	38,163	8,945	113,709	2,354	15.18	0.31
2058	0	17,269	43,914	7,200	3.263	39,118	9,213	116,714	2,225	15.58	0.30
2059	0	17,788	45,231	7,200	3.344	40,095	9,490	119,804	2,103	16.00	0.28
									Net Levelized Cost (c/kWh)		**18.23**
									Net Levelized Cost ($000s)		**136,546**