Case 45

Should the Transmission Intertie Be Built?

Transmission interties are high-voltage power lines that link different electric power generation sources into networks. Goals include increased reliability, decreased power cost, and shared reserve capacity. However, interties cost money to build and operate. Power is lost during long-distance transmission.

In scenic and wilderness areas transmission lines and towers generate controversy. Many consider interties to be visual eyesores which have economic impacts through decreased tourism. Access roads and right-of-ways also increase human pressures on wildlife. In urban and suburban environments there are concerns over a possible link between electro-magnetic force (EMF) and human health. All electricity users receive benefits, but disbenefits affect only those who live, work, or play near the transmission line. This creates political problems due to a NIMBY attitude (not in my backyard).

A proposed 230kV intertie would create a second connection between Anchorage and Fairbanks. This is along a separate geographical route from the existing 138kV transmission line, which was built in the late 1960s. That line is scheduled for major maintenance that will shut it down for 5 construction seasons. The geographical separation means that a single cause, such as an avalanche, cannot sever both links. With this connection, Fairbanks can rely less on coal- and oil-fueled generation and more on cheaper Anchorage sources (natural gas and hydro). With the single existing transmission line the system is vulnerable to failure, and very cold winter temperatures in Fairbanks (it can be -50^{o}F for a month at a time) increase the costs and risks of system failure. The project includes upgrades of stability-enhancing equipment, which would also improve performance of the existing intertie within the Matanuska Valley (en route from Anchorage to Fairbanks). The stability-enhancing equipment (SEE) could be installed by itself, but the intertie requires the SEE.

Capital costs for the stability enhancing equipment total $20.5M. In addition, $50,000 per year will be spent on insurance and maintenance for it. The equipment will have no salvage value after 25 years. To simplify the analysis, assume that the costs for the equipment and the intertie occur at time 0. This is basically equivalent to treating the project start-up as time 0 with the future worth of the investment cost incurred at that time.

The new 230 kV intertie costs $57.1M. The towers would be steel. Most utilities assume a 50-year life; however, most steel-pole lines that have been constructed are still operating. This includes a 1932 project by B.C. Hydro and a 1904/06 project by Pacific Gas & Electric. Expected costs to maintain and operate the line average $145,000 annually, stated in constant value dollars.

The intertie would increase system reliability in Fairbanks, and the stability-enhancing equipment would enhance reliability in the Matanuska Valley. The value to the utilities of increased reliability is based on saving 12% of the Fairbanks and 10% of the Matanuska Valley unserved energy (= amount not received due to outages). Economic values for this unserved energy equal the cost of being without power. Recent estimates from different studies are $2.18, $3.45, and $9.78/kWh for residential customers. At $5/kWh, the outage cost to Fairbanks residents is $.18M/year. For Matanuska residential customers the cost is $.68M/year. For commercial and industrial customers much of the cost of power outages is a fixed cost if the outage occurs. Thus, a 20-minute outage is only 3 times as expensive as a 1-minute outage. For these customers the outage cost is $2.71M/year in Fairbanks and $1.87M/year in the Matanuska Valley.

The project's principal cost justification is to substitute Anchorage's lower power generation cost of $18.05/MWh for Fairbanks' higher cost of $33.47/MWh. Power transfers from Anchorage to Fairbanks would increase by 67 GWh/year by adding the stabilization equipment—measured in Anchorage before transmission losses. Over 15 years this would increase to 106 GWh/year, where it would remain for the rest of the project's horizon. The transmission loss is 33% for the current transmission link. If the stabilization equipment and the new intertie are added, power transfers would increase by 122 Gwh/year, which would increase to 186 Gwh/year over 15 years. The higher capacity intertie dramatically reduces transmission losses. At 122 GWh/year losses would be only 2 GWh/year, and at 186 they are only 23 Gwh/year.

The contractual arrangements between the Anchorage and Fairbanks utilities are still subject to negotiation, but the perspective of the state power authority is clear. What is the bottom line for the state? From that perspective the value of the transferred power equals the power received at the Fairbanks price minus the cost of the power generated at the Anchorage price.

The forecasting of future electric power needs is difficult, as can be illustrated by the Washington Public Power Supply System (WPPSS) or "whoops." To meet anticipated increased power needs, five new nuclear power plants were once in progress. When demand failed to materialize, only 1 was completed, 1 was left incomplete, and 1 was taken back down to the ground. In 1983, WPPSS defaulted on $2.5B on bonds issued for the construction of the facilities.

An intertie allows generation systems to share reserve capacity. This computation is complex, since it includes some capacity expansions that can be deferred and other expansions that can be avoided. The result can be approximated as $455,000/year for the stabilization equipment and another $420,000/year for adding the new 230kV intertie.

The final benefit from the new 230kV intertie is that reconstruction of the existing line can be delayed until the new line is complete. Then there will not be power interruptions during 5 years of 7-month construction seasons. The cost of using more expensive Fairbanks-generated power would be $7.7M/year for each construction season. If the intertie is not built, those costs will start next year.

The power authority uses a 4.5% real discount rate (all costs and benefits in constant value dollars). There will be a 50/50 cost sharing between the utilities and the state power authority on all first costs. What should the state power authority recommend? How did you value the disbenefits to scenic and wildlife values? Is there a difference in the state's and the utilities' conclusions on the wisdom of these projects?

Prepare an analysis to support a perspective—objective, green, or pro-development.