Progress Energy Carolinas, Inc.
Western Area Transmission System
Future Import Capability Study

May 13, 2005
Transmission Department

Purpose

This study was prompted by the 2009 expiration of the 250 MW Rockport purchase from AEP. As connected load continues to increase in the western division of PEC-W, along with increased parallel path flows, the trend to PEC-W's import capability is a reduction in capability. The purpose of this report is to examine import capability after the AEP purchase ends on December 31, 2009. Additionally, the study identifies limits to import capability and transmission options to increase it that include estimates of cost, schedule and feasibility.

PEC's Western Control Area System

PEC's western service territory lies in a unique geographic location amidst national forests and parklands. Adequate consideration must be given to minimize the environmental impacts of supplying electric power to the region. The environmental sensitivity of this area offers special challenges in the siting and design of new facilities.

Future import reservations in the western area through 2009 into the PEC-W total 606 MW. As Figure 1 shows, the 606 MW is comprised of 364 MW of base imports and 242 MW of TRM reservations. Starting in 2010 with the expiration of the Rockport purchase the total base imports reduce to 114 MW for a total import obligation of 356 MW.

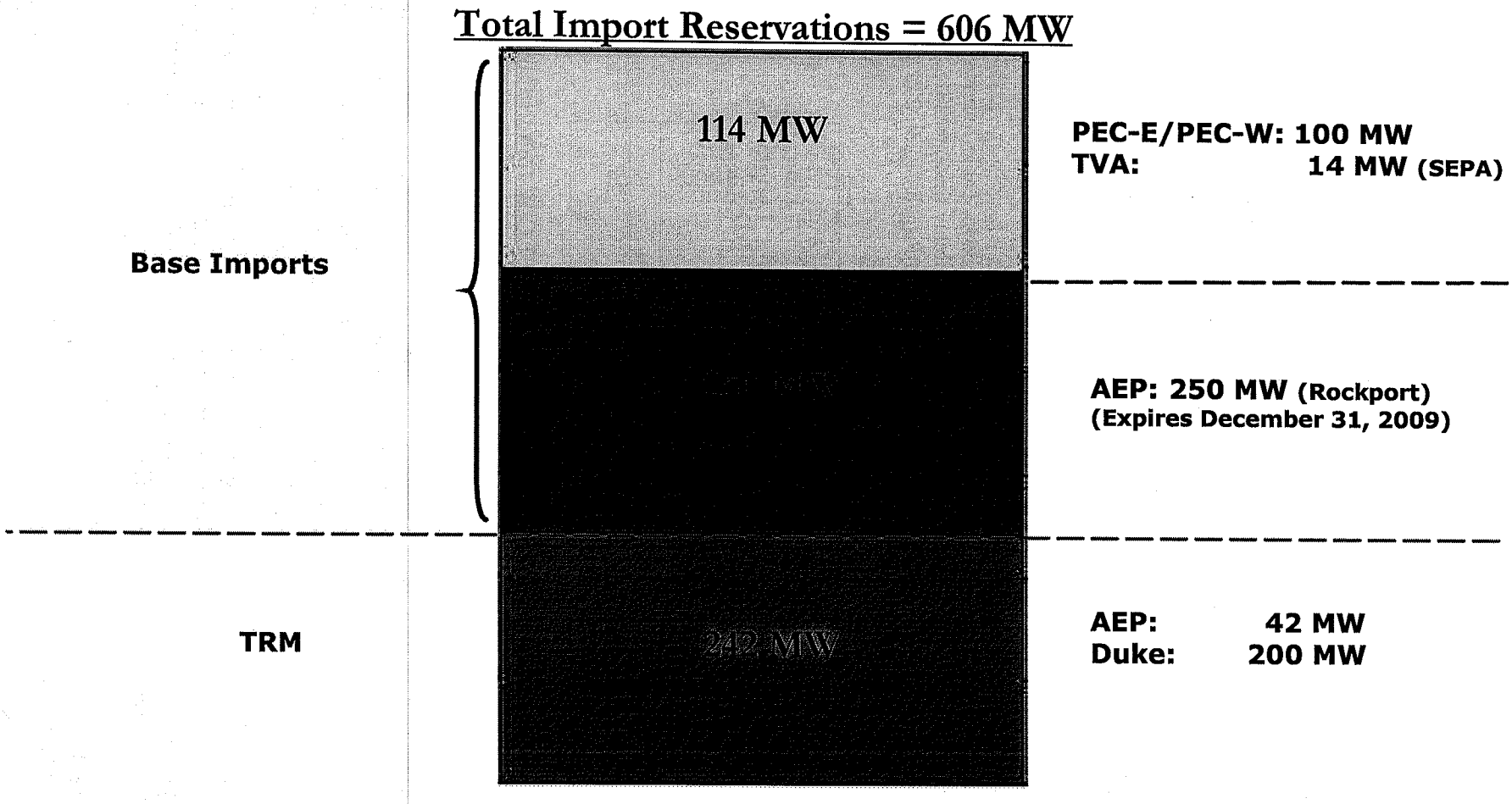
PEC-W's generation includes 3 power plants with capacities totaling 832 MW. This is comprised of one plant with 2 fossil units and 2 CT units, one plant with 3 hydroelectric units, and one plant with 2 hydroelectric units. The bulk transmission system is composed of approximately 50 miles of 230 kV and 400 miles of 115 kV transmission. PEC-W's transmission system includes 3-230 kV and 5-115 kV interconnections with other transmission systems. At 230 kV, PEC-W has one interconnection to the north with APCo at PEC-W's Cane River 230 kV Substation and has two interconnections in the southern portion of the system with Duke Energy at PEC's Asheville Plant.

Methodology

Since PEC-W is a winter peaking control area, winter power flow models were used in the analysis. To assess import capability for 2010 and beyond, first the system was modeled using PTI's PSSE loadflow tool to reflect existing import obligations for PEC-W. Next, PTI's MUST software tool was used to determine the additional import capability that exists above these import obligations.

In the assessment, power was imported from adjacent control areas in increments as generation was reduced within PEC-W to accommodate imports. At each incremental import level, transmission system facilities were screened for overloads using contingency analysis.

Figure 1
PEC Western Control Area
Import Obligations Through 2009



Results

PEC-W has 2 parallel 230 kV lines at Asheville Plant that tie to Duke Power's Pisgah 230 kV Substation and then continue within the Duke control area to their Shiloh 230 kV Substation. Studies in 2010 show that an outage of one of these lines will result in an overload of the parallel circuit for import levels above 500 MW. These results represent a step-change decrease in import capability of approximately 100 MW beginning in 2010. With the expiration of the 250 MW Rockport purchase and its associated transmission reservation, studies show that approximately 150 MW of import capability will be available on the AEP interface. Since the identified overload condition is on the Duke/PEC-W interface, the limiting Asheville-(DPCo)Pisgah-Shiloh 230 kV lines will be more sensitive to imports from Duke, therefore, the import capability from the Duke control area will be significantly less than 150 MW.

Alternatives

To identify a transmission solution for the limits identified above, Table 1 shows transmission options tested that maintain or increase PEC-W import capability through 2015. Each of these solutions reduces loading on the two Asheville-(DPCo)Pisgah-Shiloh 230 kV lines therefore improving import capability for PEC-W.

New Tie-Line	**Line Length (Miles)**
Hazelwood-Tuckasegee(Duke) 230 kV line	16
Asheville-(Duke)Shiloh 230 kV Line	46
Black Mountain-(Duke)McDowell 230 kV Line	26

Table 1: Studied Solutions to Maintain/Increase PEC-W Import Capability

Hazelwood-Tuckasegee (Duke) 230 kV Line

Construction of a 16-mile single circuit 230 kV line using 1-1590 MCM conductor per phase, and construction of Hazelwood 230/115 kV Substation would be required. Major uprates to the Canton-Hazelwood 115 kV Feeder and the Canton-Blue Ridge Paper section of the Canton-Craggy 115 kV Line would also be required with this solution. An uprate to the Asheville Plant 115 kV North Tie Line will also be necessary. The route would require that the new 230 kV line cross the Nantahala National Forest and the Blue Ridge Parkway. Determining the feasibility of crossing these environmentally sensitive areas would require additional study and consultation with the appropriate governmental agencies. The long-term total import capability (2015) for the Western Division with this alternative is 719 MW and estimated cost is approximately $32 million.

Asheville-Shiloh (Duke) 230 kV Line

A 230 kV interconnection from Duke's Shiloh 230 kV Substation to PEC's Asheville Plant will provide a long-term total import capability (2015) of 760 MW for the Western Division. This alternative consists of construction of a 46-mile single circuit 230 kV line using 1-1590 MCM conductor per phase and converting both Asheville Plant-Enka 115 kV Lines to 230 kV. Two 230/115 kV transformers will be required at Enka to help relieve loading on the Asheville Plant transformers and to deliver power to the local area load. While this alternative does not involve crossing the Blue Ridge Parkway, it may involve siting issues with some state parks. This option is, however, the only one of the three options where there are existing lines which could possibly be paralleled. Extensive development along almost any possible route, especially around Greenville, will make right-of-way purchase difficult. Even with these difficulties, this is considered the most viable alternative when compared with the difficulties of crossing national forest or wilderness areas. Estimated cost of this alternative is approximately $68 million.

Black Mountain-McDowell (Duke) 230 kV Line

A 230 kV tie between the Black Mountain 115 kV Substation and Duke's McDowell 230 kV Substation will provide a long-term total import capability (2015) of 745 MW for the Western Division. This alternative involves the construction of a 26-mile single circuit 230 kV line using 1-1590 MCM conductor per phase and construction of a 230/115 kV substation at Black Mountain. A 230 kV, 350 MVA phase shifter would also be installed at the Black Mountain 230 kV Substation. Minor uprates would be required for the Asheville Plant 115 kV North and South Tie Lines. A major uprate would be required for the Black Mountain-Oteen section of the Asheville Plant-Oteen 115 kV East Line. Routing of the 230 kV line will likely have impact upon the Pisgah National Forest. Estimated cost of the alternative is $51 million.

Schedule and Risks

The cost estimates included in this report should not be considered the expected full cost of the transmission options but do represent the relative cost of the solutions if only normal siting issues are encountered. The feasibility of the alternatives can be determined only after detailed siting studies and consultation with state and federal regulatory agencies. Recent experience in 'hard to build' areas has shown that actual costs can easily double from the original estimates.

The permits and licensing process for the transmission alternatives is estimated to be five to ten years. In addition to federal requirements, some transmission line construction solutions will involve two states and therefore two state regulatory commissions. Potential risks associated with regulatory, public opposition, ROW acquisition and construction could increase the time required to complete projects and result in a higher cost than estimated. It is worth noting that AEP's Jackson Ferry-Wyoming 765 kV line required more than a decade to permit. Similar issues could be faced associated transmission expansion in a scenic mountain region amidst national forests and parklands.

New transmission tie-lines will require coordinated efforts with neighboring control areas that have not been initiated. Studies by neighboring systems have not been performed and such studies would likely discover the need for additional facilities on the neighbors systems created by these new tie-lines.

Conclusions

Studies show that beginning in 2010 import capability into PEC-W decreases approximately 100 MW due to a limit on the Asheville-(DPCo)Pisgah-Shiloh 230 kV parallel lines. As a result, an import from AEP similar to the expiring Rockport purchase would be limited to 150 MW with less being available for an import from the Duke interface.

Three solutions were identified with each being a reasonable technical remedy to the limiting factors to PEC-W's future import capability. However, schedule is a major concern for each of the solutions. Permitting and ROW acquisition will likely take extended time due to the location, possibly five to ten years and a solution would need to be in place by the end of 2009. Upgrade costs are estimated to range from $30 M to $70 M.