Generation Interconnection

This analysis was completed to assess the reliability impact for a new generator interconnecting to the PJM system as a capacity resource.

Network Impacts and Required System Upgrades

The impact of the proposed generating facility on the AEP System was assessed for adherence with applicable reliability criteria. AEP planning criteria require that the transmission system meet single contingency performance criteria in accordance with the AEP FERC Form 715. Therefore, this criterion was used to assess the impact of the proposed facility on the AEP System. The project was studied as a 600 MW net capacity.

The West Lima Station will provide three 138 kV line exits to the generating complex: Southwest Lima, East Lima, and Rockhill (see Exhibit 3). The Rockhill – West Lima and East Lima – West Lima circuits are expected to experience single contingency overload conditions with the generation output at 600 MW. Additionally, the Rockhill and East Lima circuits share common transmission structures for approximately seven miles. A single tower outage would cause the remaining Southwest Lima 138 kV exit to overload and this would lead to the loss of all 138 kV circuits and the entire West Lima Station. The most effective solution is to establish a fourth 138 kV line exit from the West Lima Station.

Therefore, It is proposed that a fourth 138 kV line exit - a new West Lima – Sterling 138 kV circuit - be created by un-six-wiring the existing tower line between the two stations (some reconductoring would be required). The addition of a fourth exit will also be beneficial from generator stability and reliability standpoints and will allow for maintenance outages without curtailing generation. This configuration was examined during the original evaluation of the project in 2001, and continues to be effective with the updated system conditions.

In addition to the Direct Connection facilities at the West Lima Station, system improvements are required to alleviate the above mentioned line overloads and other transmission system problems caused by the P55 generation. The various transmission system problems, both thermal and short circuit duty concerns, are summarized in Tables 1-3.

The scope of the AEP System Improvements includes:

- East Lima Station – Replace four (4) existing overdutied 138 kV circuit breakers (B, C, E1, and E2) with 3000 A, 63 kA circuit breakers.

  Estimated cost = $1,300,000

- West Moulton Station – Install a 69 kV, 1600 A, 8% series reactor on the leads of the 138/69 kV transformer. Install/modify associated facilities, as necessary. Replace 69 kV circuit breaker disconnects and risers on circuit breaker E (DPL's St. Mary's 69 kV circuit). Install supervisory control.

Estimated cost = $825,000

- North Delphos – South Delphos 69 kV Line – Reconductor approximately 1.5 miles of line, replacing the existing 4/0 copper conductor with 556.5 kcm ACSR conductor. Six-wire approximately 1.0 mile of existing double-circuit 69 kV line. Replace structures as necessary to accommodate the new conductor.

  Estimated cost = $500,000

- Cridersville – Shawnee Road 69 kV Line – Reconductor approximately 4.6 miles of line, replacing the existing 336.4 kcm ACSR conductor with 556.5 kcm ACSR conductor.

  Estimated cost = $625,000

- West Lima Station – Install one (1) new 138 kV, 3000 A, 63 kA circuit breaker to terminate the new 138 kV circuit to Sterling. Replace three (3) existing overdutied 138 kV circuit breakers (B, C, and M) with 3000 A, 63 kA breakers. Install/modify system protection, system control and other associated station facilities.

  Estimated cost = $1,400,000

- Sterling Station – Replace three (3) existing overdutied 138 kV circuit breakers (G, H, and J) with 3000 A, 63 kA breakers. Replace the associated disconnect switches and relays, etc. Install one (1) new 138 kV, 3000 A, 63 kA circuit breaker to terminate the new 138 kV circuit to West Lima. Replace the existing 500 kcm copper main bus with 1700 kcm Al. Install/modify system protection, system control and other associated station facilities.

  Estimated cost = $1,625,000

- Sterling – West Lima 138 kV Tower Line – Un-six-wire this double-circuit tower line. The circuit on the east side of the towers will comprise the new Sterling – West Lima 138 kV circuit. Reconductor the east side of the tower line between Sterling and West Lima (approx. 2.4 miles) with 795 kcm SSAC conductor. The circuit on the west side of the tower line will comprise portions of the Southwest Lima – West Lima 138 kV circuit and the Ordnance Junction – Sterling 138 kV circuit. Reconductor the west side of the tower line between Ordnance Junction and West Lima (approx. 0.8 miles) with 795 kcm SSAC conductor. Modify the line section between Ordnance Junction and Sterling to provide adequate sag clearance (reconductoring of this line section is not required).

  Estimated cost = $2,000,000

- East Side Lima – Sterling 138 kV Line – Reconductor 4.04 miles of 4/0 copper conductor with 795 kcm ACSR conductor. Replace structures as necessary to accommodate new conductor.

  Estimated cost = $2,000,000

Total Estimated System Upgrade Cost = $10,275,000

With the proposed facilities outlined above, the AEP transmission system will be capable of accommodating the connection of the 600 MW generation. Conceptual diagrams of the proposed 138 kV systems at West Lima Station and Sterling Station are shown in Exhibit 4 and Exhibit 5 respectively.

The estimates provided in this Feasibility Study are preliminary in nature, as they were determined without detailed engineering and design studies. The above cost estimates are based on 2008 dollars and could vary. An increase of 3% per year for inflation is assumed. The estimates include AEP loaded costs (including Capital, Maintenance, and Removal costs). The estimates do not include any gross-up for taxes. To the extent that any contribution toward the above costs by the customer is taxable income to AEP, the customer would be required to contribute the grossed-up total.

It is assumed that the customer will construct and own the new 138 kV line that will be physically routed between the P55 generating site and the West Lima Station. It is also assumed that the customer will obtain all required right-of-way permits for this line, up to and including the point where the new line enters AEP's West Lima Station**.** Since the exact line routing and point of entry at the West Lima Station are not known at this time, additional costs for any modifications required to AEP facilities are not included in the above project scope. The customer will also need to provide fiber optic cable between the generating plant site and the West Lima Station.

Additional cost has been allocated in the West Lima Station estimate for environmental remediation. However, the exact scope and cost required for environmental remediation at West Lima Station cannot be determined at this time. Consequently, the cost estimates for the work at West Lima could vary from the estimates provided above.
The costs shown in this report are the estimated costs of the project for Direct Connection and System Upgrade facilities required to accommodate the generating facility. The customer will be responsible for the actual project cost. It will take approximately 18-24 months after obtaining the authorization to engineer and construct the facilities as outlined above.

Network Impacts

The #P55 project was studied as a 600 MW capacity resource at the West Lima 138 kV substation. Project #P55 was evaluated for compliance with reliability criteria for summer peak conditions in 2010 utilizing a base case that includes the 502 Junction - Mt. Storm - Meadowbrook - Loudoun 500 kV line model. Including this line in the 2010 case model allows us to obtain Feasibility Study results that concur with the ones at the Impact Study phase, for which a 2011 base case will be used**.** Potential transmission network impacts are as follows:

Generator Deliverability
No problems were identified

Multiple Facility Contingency
No problems were identified

Short Circuit
No transmission breakers 230kV and above need replacement.

Contribution to Previously Identified Overloads

1. Contribution of 59 MW to further overload the Kammer 765/500 kV transformer to increase its loading from 133% to 137% of its emergency rating (1434 MVA) for the Beverly-Tidd-W. Bellair and Kammer-W. Bellair 345 kV tower outage.

New System Reinforcements

No new transmission reinforcements required

Contribution to Previously Identified System Reinforcements

1. The overload of the Kammer transformer can be alleviated by replacing the existing 1500 MVA transformer with three single phase units rated at 600 MVA each and a 600 MVA spare and replacing other substation equipment as required. (Upgrade # n0480) The estimated cost for the replacement is **$ 18,000,000.** The estimated lead time for replacement is 24 months. This project will have an allocated portion of the costs for this upgrade, percentage to be calculated in the Impact Study.