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FILE

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June 11, 2007

VIA HAND DELIVERY
Ohio Power Siting Board
180 E. Broad Street,
Columbus, Ohio 43215
Attn: Docketing Division

Re: Supplement No. 1 to AMP-Ohio's Certificate Application. *Case No. 06-1358-EL-BGN – In the matter of the Application of American Municipal Power- Ohio, Inc. for a certificate for an electric generation facility.*

Dear Docketing Division:

Please docket in the above-referenced case, the following documents, attached hereto, that are being submitted to supplement American Municipal Power-Ohio, Inc.'s ("AMP-Ohio") application for a certificate to construct an electric generation facility:

- Attachment 1 – PJM Generator Interconnection Request – Feasibility Study (June 2006)
- Attachment 2 – PJM Generator Interconnection Request – Impact Study (May 2007).

I appreciate your assistance with the above request. Please contact me with any questions.

Very truly yours,

Bobby Singh
Chester, Willcox & Saxbe LLP
Attorneys for American Municipal Power-Ohio, Inc.

Attachments

Service made to:

cc: Jon Pawley, Ohio Power Siting Board, w/additional copies

276849

PJM Generator Interconnection Request
Queue #P54
Sporn-Waterford 345kV
Feasibility Study

376382
June 2006

ATTACHMENT 1

Preface

The intent of the feasibility study is to determine a plan, with ballpark cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, may also contribute to the need for the same network reinforcement. The possibility of sharing the reinforcement costs with other projects may be identified in the feasibility study, but the actual allocation will be deferred until the impact study is performed.

The Feasibility Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

Sporn-Waterford 345kV P54 Feasibility Study Report

General

American Municipal Power-Ohio, Inc. (AMP Ohio) proposes to install PJM Project #P54, a 1035 MW (net) generating facility comprised of two (2) pulverized coal units. The proposed generating facility site is located in Racine, Meigs County, Ohio. Two different connection point options have been requested for study. The first is a connection point on the Sporn–N42 345 kV line. The second is a connection point on the Sporn-Amos and Sporn-Kanawha River 345 kV tower circuits. For both of these cases, it is assumed AMP Ohio will provide a new graded station site at or near the above mentioned existing AEP owned 345 kV tower lines. The project is scheduled in-service May 1, 2012.

*The estimates below are preliminary in nature and based in 2006 dollars, as they were determined without detailed engineering and design studies. Final estimates will require detailed engineering analysis, including on-site review and coordination with the Interconnection Customer to determine final construction requirements. It will take approximately 36 months after obtaining the authorization to construct the facilities as outlined above excluding any potential issues related to acquiring required right-of-way or station site.

Direct Connection

Option #1: Tapping into the Sporn-N42 345 kV line (See Exhibit marked "AMP Ohio 345 kV IPP Plan A")

AMP Ohio has requested tapping into the Sporn–N42 345 kV line as a first option for connecting their generating facility to the AEP system. The proposed plan is for AEP to build a 345 kV station near the Sporn – N42 345 kV line on a site provided by AMP-Ohio. AMP-Ohio will be responsible for constructing the 345 kV line required to connect the generating plant to the new 345 kV station to be built beside the Sporn–N42 345 kV line.

Direct Connection Costs:

Construct a new 345 kV station (AMP-Ohio Station) near the Sporn–N42 345 kV line including: three (3) 345 kV circuit breakers in a breaker and a half configuration, line disconnect switches, 345 kV line traps, 345 kV CCVTs, and 345 kV metering on the AMP Ohio line, 345 kV line surge arresters, breaker control and line relaying for the station and all lines coming into the station and station service equipment. A graded station site is to be provided by AMP-Ohio.

Estimated Cost* **$8,800,000**

Option #2: Tapping into the Sporn-Amos and Sporn-Kanawha River 345 kV tower circuits (See Exhibit marked "AMP Ohio 345 kV IPP Plan B")

AMP-Ohio has requested tapping into the Sporn-Amos and Sporn-Kanawha River 345 kV tower circuit as a second option for connecting their generating facility to the AEP system. The proposed plan is for AEP to build a 345 kV station near the Sporn-Amos and Sporn-Kanawha

River 345 kV tower circuits on a site provided by AMP-Ohio. AMP-Ohio will be responsible for constructing the 345 kV line required to connect the generating plant to the new 345 kV station to be built beside the Sporn-Amos and Sporn-Kanawha River 345 kV tower circuits.

Direct Connection Costs:

Construct a new 345 kV station (AMP-Ohio Station) near the Sporn-Amos and Sporn-Kanawha River 345 kV tower circuits including: eight (8) 345 kV circuit breakers in a breaker and a half configuration, line disconnect switches, 345 kV line traps, 345 kV CCVTs, 345 kV metering on both of AMP Ohio's lines, 345 kV line surge arresters, breaker control and line relaying for the station and all lines coming into the station and station service equipment. A graded station site is to be provided by AMP Ohio.

Estimated Cost* **$ 14,100,000**

Network Impacts

The #P54 project was studied as a 1035 MW capacity resource at two distinct points of interconnection in the AEP system. Option #1 considers the injection to be a tap of the Sporn-N42 345 kV line, while Option #2 considers it to be a tap of the Amos-Sporn and Sporn-Kanawha River 345 kV tower circuit. Project #P54 was evaluated for compliance with reliability criteria for summer peak conditions in 2010. Potential network impacts were as follows:

Option 1: Tapping into the Sporn-N42 345 kV line:

Generator Deliverability

1. The Muskingum-Ohio Central 345 kV line loads to 107% of its normal rating (972 MVA) for N-0 conditions. Project #P54 contributes approximately 61 MW to cause this overload.
2. The Poston to Eliot 138 kV line loads to 100% of its emergency rating (301 MVA) for the outage of the Muskingum-Waterford 345 kV line. The #P54 contributes approximately 26 MW to cause this overload.
3. The Sporn-P54 345 line loads to 129% of its emergency rating (1918 MVA) for the outage of the Muskingum-Waterford 345 kV line for loss of the Muskingum-Waterford 345 kV line. The #P54 contributes approximately 1030 MW to cause this overload.

Multiple Facility Contingency

No identified problems

Normal System

4. The Waterford – Muskingum River 345 kV line overloads under an N-0 condition. The limiting elements of this line are approximately 1 mile of conductor and the line risers at Muskingum.
5. The Sporn A-Rutland 138kV line overloads under N-0 conditions to 101% of its normal rating (297 MVA). The P54 project contributes approximately 17 MW to cause this overload.

Single Contingency

6. The Waterford – Muskingum River 345 kV line also overloads under an N-1 condition for an outage of the Sporn – AMP Ohio Station 345 kV line.

Short Circuit

No problems identified

Contribution to Previously Identified Overloads

1. Contribution of 124 MW to further overload the Harrison-Prunty Town 500 kV line, which was originally caused by the #O69 project for outage of the 500 kV line from the G30_W51 to Ft. Martin.
2. Contribution of 115 MW to further overload the Kammer 765/500 kV transformer previously caused by the N42 project for loss of the Harrison to Belmont 500 kV line.
3. Contribution of 411 MW to further overload the Waterford-Muskingum 345 kV. The overload was originally caused by the N42 for N-0 conditions
4. Contribution of 13 MW to further overload the Mahans Lane-Tidd 138 kV line previously identified as a base case overload for the Tidd-Collier 345 kV tower circuit outage. The corresponding network upgrades are being prepared by APS.

New System Reinforcements

1. The overload of the Muskingum – Ohio Central 345 kV line under an N-0 condition can be alleviated by replacing the 1600A line switch, the line's service entrance conductor, a bus and risers with higher rated equipment. The Estimated Cost* to do this work is **$1,300,000.**

2. The overload of the Poston – Elliot 138 kV line can be alleviated by rebuilding the line with 7.2 miles of higher rating conductors, replacing a 1200A circuit breaker, a 1200A wave-trap, bus conductors & line risers at Poston substation. The Estimated Cost* to do this work is **$10,200,000.**

3. The overload of the Sporn-P54 345 kV can be alleviated by reconductoring approximately 2.2 miles of the existing 6-wire line. The Estimated Cost* to reconductor the line is **$5,600,000.**

4. The normal system overload on the Waterford-Muskingum 345kV circuit can be alleviated by reconductoring approximately 1 mile of the circuit out of Waterford and changing line risers at Muskingum. (Upgrade # n0479) This upgrade originally defined for the N42 project. These changes can be accomplished prior to May 2010. The estimated cost is **$1.2 million**.

5. The overload on the Sporn A-Rutland 138kV line can be alleviated by replacing the service entrance line. The Estimated Cost* to replace the service entrance line is **$900,000**.

6. The single contingency overload on the Waterford-Muskingum 345kV circuit can be alleviated by reconductoring an additional 5 miles of the existing line. The estimated cost for the additional reconductoring is **$12,500,000.**

Fixes for Contribution to Previously Identified System Reinforcements

1. The Harrison-Pruntytown 500kV line overload can be alleviated by construction of a second 500kV line between Fort Martin SS and the proposed North Longview SS and additions at Fort Martin and North Longview Switching Stations.

Second Fort Martin - North Longview 500kV line. Install a 1.5 mile 500kV line consisting of 8 structures between Fort Martin and North Longview. Assume R/W acquisition will be required. (This cost can be highly variable).

Estimated cost Line	**$2,150,000**
Estimated cost R/W	**$ 500,000**

Fort Martin Switching Station Extend the 2 main 500kV buses and install a new 500kV cross bus with 2 500kV breakers, 4 switches, 3 CVTs, 3 line arresters and a 500kV deadend structure.

Estimated cost **$4,150,000**

North Longview Switching Station Install 3 500kV breakers, 6 switches, 2 bus CVTs, 500kV deadend structure, 3 line arresters and 3 line CVTs

Estimated cost **$3,200,000**

Estimated costs are in 2009 dollars.

This project will have an allocated portion of the costs for this upgrade.

2. 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.

3. The Waterford-Muskingum River upgrades are described above. This project will have an allocated portion of those costs.

4. The Mahans Lane-Tidd 138kV line overload can be alleviated by rebuilding and replacing 7.3 miles of 556 conductor with 954 conductor. The estimated cost is **$1,750,000.**

Option 2: Tapping into the Sporn-Amos and Sporn-Kanawah R 345 kV tower circuit:

Generator Deliverability

1. The Muskingum-Ohio Central 345 kV line loads to 101% of its normal rating (972 MVA) for N-0 conditions. Project #P54 contributes approximately 27 MW to cause this overload.
2. The Poston to Eliot 138 kV line loads to 100% of its emergency rating (301 MVA) for the outage of the Muskingum-Waterford 345 kV line. The #P54 contributes approximately 26 MW to cause this overload.

Multiple Facility Contingency

No problems identified

Normal System

3. The Waterford – Muskingum River 345 kV line overloads under an N-0 condition. The limiting elements of this line are approximately 1 mile of conductor and the line risers at Muskingum.

4. The Sporn A-Rutland 138kV line overloads under N-0 conditions to 101% of its normal rating (297 MVA). The P54 project contributes approximately 17 MW to cause this overload.

Short Circuit

No problems identified

Contribution to Previously Identified Overloads

1. Contribution of 113 MW to further overload the Harrison-Prunty Town 500 kV line for the loss of the loss of the Ft. Martin-G30_W51 500 kV line. This thermal violation was first caused by the O69 project.
2. Contribution of 111 MW to further overload the Kammer 765/500 kV transformer for the loss of Harrison-Belmont 500 kV line. This violation was originally caused by the N42 project.
3. Contribution of 223 MW to further overload the Waterford-Muskingum 345 kV line for N-0 conditions. This violation was originally cause by the N42 project.
4. Contribution of 10 MW to further overload the Mahans Lane-Tidd 138 kV line previously identified as a base case overload for the Tidd-Collier 345 kV tower circuit outage.

New System Reinforcements

1. The overload of the Muskingum – Ohio Central 345 kV line under an N-0 condition can be alleviated by replacing the 1600A line switch, the line's service entrance conductor, a bus and risers with higher rated equipment. The Estimated Cost* to do this work is **$1,300,000.**

2 The overload of the Poston – Elliot 138 kV line can be alleviated by rebuilding the line with 7.2 miles of higher rating conductors, replacing a 1200A circuit breaker, a 1200A wave-trap, bus conductors & line risers at Poston substation. The Estimated Cost* to do this work is **$10,200,000.**

3 The overload on the Sporn A-Rutland 138kV line can be alleviated by replacing the service entrance line. The Estimated Cost* to replace the service entrance line is **$900,000.**

Fixes for Contribution to Previously Identified System Reinforcements

1. The Harrison-Pruntytown 500kV line overload can be alleviated by construction of a second 500kV line between Fort Martin SS and the proposed North Longview SS and additions at Fort Martin and North Longview Switching Stations.

Second Fort Martin - North Longview 500kV line. Install a 1.5 mile 500kV line consisting of 8 structures between Fort Martin and North Longview. Assume R/W acquisition will be required. (This cost can be highly variable).

Estimated cost Line	**$2,150,000**
Estimated cost R/W	**$ 500,000**

Fort Martin Switching Station Extend the 2 main 500kV buses and install a new 500kV cross bus with 2 500kV breakers, 4 switches, 3 CVTs, 3 line arresters and a 500kV deadend structure.

Estimated cost **$4,150,000**

North Longview Switching Station Install 3 500kV breakers, 6 switches, 2 bus CVTs, 500kV deadend structure, 3 line arresters and 3 line CVTs

Estimated cost **$3,200,000**

Estimated costs are in 2009 dollars.

This project will have an allocated portion of the costs for this upgrade.

2 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.

3 The Waterford-Muskingum River upgrades are described below. This project will have an allocated portion of those costs.

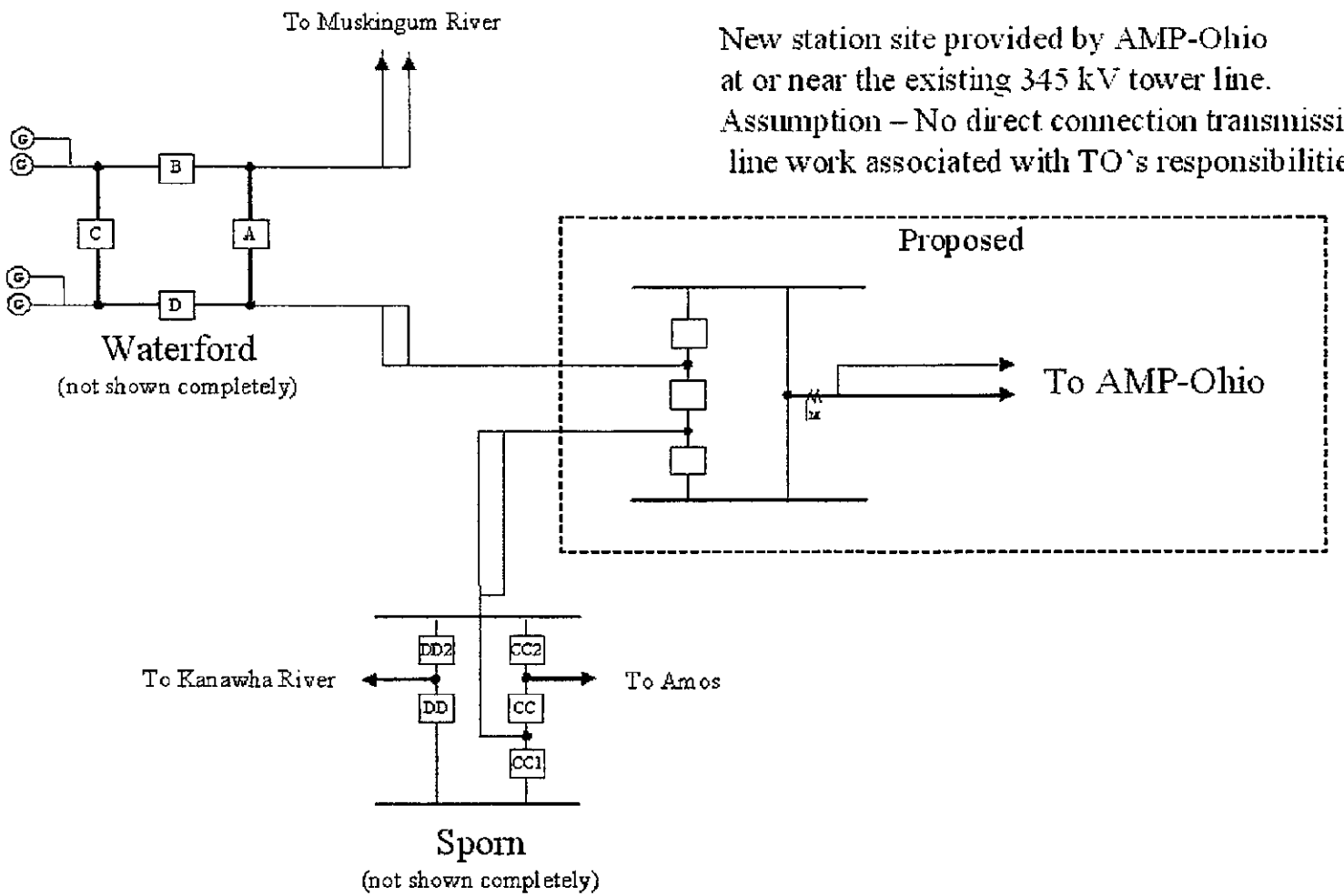
The normal system overload on the Waterford-Muskingum 345kV circuit can be alleviated by reconductoring approximately 1 mile of the circuit out of Waterford and changing line risers at Muskingum. (Upgrade # n0479) This upgrade originally defined for the N42 project. These changes can be accomplished prior to May 2010. The estimated cost is **$1.2 million**.

4. The Mahans Lane-Tidd 138kV line overload can be alleviated by rebuilding and replacing 7.3 miles of 556 conductor with 954 conductor. The estimated cost is **$1,750,000.**

Potential Issues

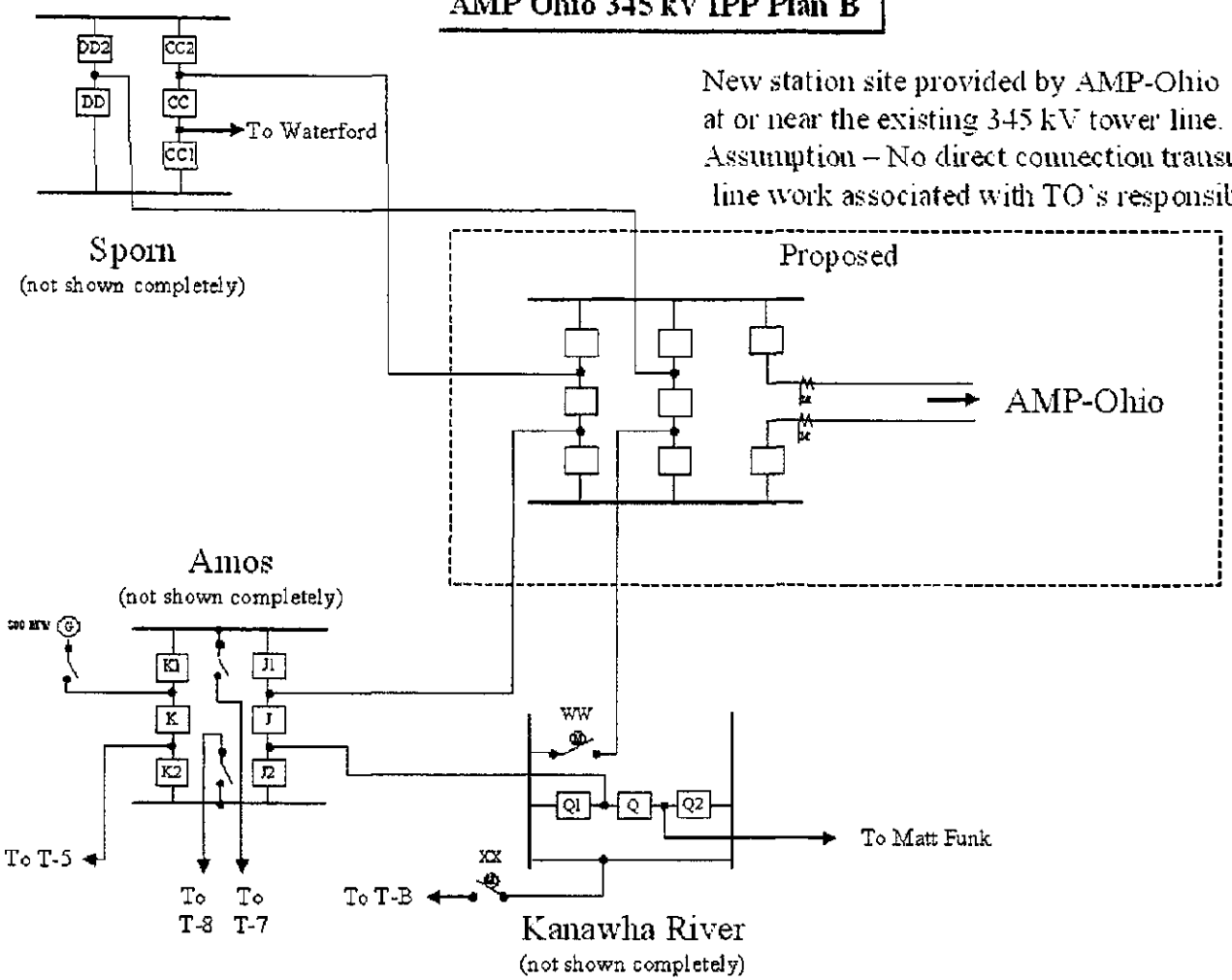
1. The Fort Martin-G30_W51 500 kV line loads to 99% of its emergency rating (3502 MVA) for the outage of the Prunty Town-Harrison 500 kV line. The P54 contributes 127 MW to the loading of this facility.

AMP Ohio 345 kV IPP Plan A



AMP Ohio 345 kV IPP Plan B

New station site provided by AMP-Ohio
at or near the existing 345 kV tower line.
Assumption – No direct connection transmission
line work associated with TO's responsibilities



PJM Generator Interconnection Request
Queue #P54
Sporn-Waterford 345kV
Impact Study

420321
May 2007

ATTACHMENT 2

P54 Sporn-Waterford 345kV Impact Study Report

General

American Municipal Power-Ohio, Inc. (AMP Ohio) proposes to install PJM Project #P54, a 1035 MW (net) generating facility comprised of two (2) pulverized coal units. The proposed generating facility site is located in Racine, Meigs County, Ohio. After review of the Feasibility Study report AMP Ohio selected connection to the Sporn–N42 345 kV line. It is assumed AMP Ohio will provide a new graded station site at or near the above mentioned existing AEP owned 345 kV tower lines. The project is scheduled in-service May 1, 2012.

The intent of the Feasibility / Impact study is to determine system reinforcements and associated costs and construction time estimates required to facilitate the addition of the new generating plant to the transmission system. The reinforcements include the direct connection of the generator to the system and any network upgrades necessary to maintain the reliability of the transmission system.

The short-circuit and stability analysis performed during this study assumed that the transmission system improvements associated with PJM Project #P54 (described in the "Systems Reinforcement Costs" section below) were in service. A load flow study was performed as well to verify that the addition of these improvements would not cause additional overloads.

Direct Connection

To connect the PJM Project #P54 generating facility to the AEP system, AMP Ohio has asked to tap the N42 - Sporn 345 kV line. The proposed plan is then for AEP to build a 345 kV station near the N42 - Sporn 345 kV line, on a **site provided by AMP Ohio,** and for **AMP Ohio to construct the 345 kV line** required to connect their generating plant to this new 345 kV station.

Direct Connection Costs:

The following cost estimate is for AEP to build a new 345 kV station (P54 Station) near the N42 - Sporn 345 kV line, including: three (3) 4000 A 345 kV circuit breakers in a ring bus configuration, 4000 A line disconnect switches, 345 kV metering, 345 kV bus and structures, a control building, relays and controls, control cables, grounding grid, fence and all associated equipment. See Figure #1. This estimate includes the cost for grading of a station property. (Upgrade #n0605)

Estimated Cost	**$ 14,800,000**
Estimated Construction Time	**24 months**

As part of the direct connection requirements for the new P54 interconnect station, it will be necessary to replace the existing relaying equipment at Sporn Station, on the P54 - Sporn 345 kV line. It may also be necessary to replace the existing relaying equipment at a second terminal, depending on the timing of future generator additions proposed on the Sporn – Waterford 345 kV line. (Upgrade #n0606)

Estimated Relaying Costs per Terminal $ 650,000

This estimate is greater than the one provided during the Feasibility Study phase of this project for the following reasons:

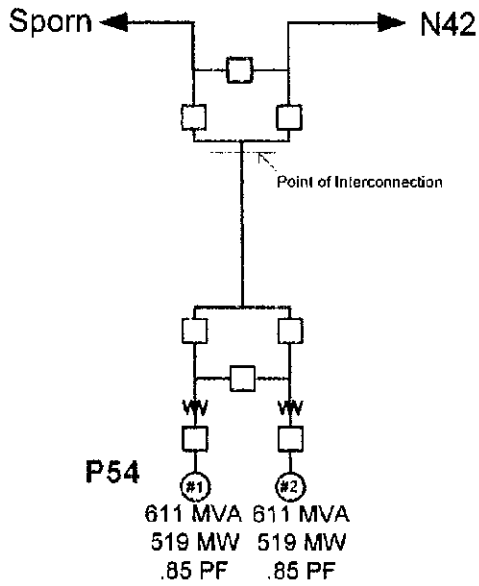
1. It will be necessary to install 4000 Amp station equipment (circuit breakers, switches, bus equipment, etc.) due to the thermal loading associated with certain double-contingency outage conditions.

2. This estimate includes the cost for grading of a station property.

3. The labor costs included in this estimate have been adjusted to those expected in 2012.

Figure #1

R54 Sporn-Waterford 345kV



Network Impacts

The following problems have been identified during the study of PJM Project #P54 based upon a 2011 system. The normal system and single contingency overloads presented here are the same as those presented in the Feasibility Study phase of this project. The double contingency overloads presented below were identified during this Impact Study phase. Due to the dependence of these double contingency overloads on circuit breaker outages at each affected station, they have been separated by station. See Appendix A for a one-line diagram of the anticipated future switching configuration of the Sporn – Muskingum River 345 kV circuit with PJM Project #P54 in service.

System Normal

1. The Elliot Tap – Poston 138 kV line overloads and exceeds its normal rating of 223 MVA.

Single Contingency

2. The P54 - Sporn 345 kV line overloads and exceeds its emergency rating of 1918MVA for an outage of the Muskingum River – Waterford 345 kV line. Project #P54 contributes 1030MW causing the loading on the line to increase from 73.7% to 127.1%.

3. The Muskingum River – Waterford 345 kV line overloads and exceeds its emergency rating 2374MVA for an outage of the P54 - Sporn 345 kV line. Project #P54 contributes 1030MW causing the loading on the line to increase from 60.4% to 102.0%.

Multiple Contingency

4. The Tidd-Carnegie 138 kV line overloads and exceeds its emergency rating of 173MVA for a tower line outage of the Tidd-Collier and Tidd-Wylie Ridge 345kV lines. Project #P54 contributes 8.4MW causing the flow on the line to increase from 96.71% to 101.55%.

5. The Heaters-French Creek 138 kV line overloads and exceeds its emergency rating 101MVA for a bus fault outage of the Back Fork-Cowen 138kV line and the Cowen-Cruppemeck 138kV line. Project #P54 contributes 6.6MW causing the flow on the line to increase from 96.34% to 102.83%.

Double Contingency

6. Sporn 345 kV Station:

1. Sporn circuit breaker "CC" overloads and exceeds its emergency rating* for an outage of the Muskingum River – Waterford 345 kV line and an outage of Sporn circuit breaker "CC1".

2. Sporn circuit breaker "CC1" overloads and exceeds its emergency rating for an outage of the Muskingum River – Waterford 345 kV line and an outage of Sporn circuit breaker "CC".

7. Waterford Station:

1. Waterford circuit breaker "52-A" and its disconnect switches overload and exceed their emergency ratings† for an outage of the P54 - Sporn 345 kV line and an outage of Waterford circuit breaker "52-B".

2. Waterford circuit breaker "52-B" and its disconnect switches overload and exceed their emergency ratings for an outage of the P54 - Sporn 345 kV line and an outage of Waterford circuit breaker "52-A".

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* Sporn 345 kV circuit breakers "CC" & "CC1" have a 3150 Amp emergency rating.

† Waterford 345 kV circuit breakers "52-A", "52-B" & "52-C" and their associated disconnect switches have 3150 Amp and 4020 Amp emergency ratings, respectively.

3. Waterford circuit breaker "52-C" and its disconnect switches overload and exceed their emergency ratings for an outage of the P54 - Sporn 345 kV line and an outage of Waterford circuit breaker "52-A".

8. Muskingum River Station:

1. Muskingum River circuit breaker "SD" and its disconnect switches overload and exceed their emergency ratings[‡] for an outage of the P54 - Sporn 345 kV line and an outage of Muskingum circuit breaker "SE".

2. Muskingum River circuit breaker "SE" and its disconnect switches overload and exceed their emergency ratings for an outage of the P54 - Sporn 345 kV line and an outage of Muskingum River circuit breaker "SD".

3. Muskingum River circuit breaker "SF" and its disconnect switches overload and exceed their emergency ratings for an outage of the P54 - Sporn 345 kV line and an outage of Muskingum River circuit breaker "SD".

Short Circuit Analysis

No problems identified.

Stability Analysis

Stability analysis was performed at 2011 summer light load conditions and peak load conditions. The maximum generation output is considered. Attachment #1 lists the fault cases evaluated. The range of contingencies evaluated included all that were deemed necessary to assess expected compliance with ECAR criteria.

Results of the study indicate that with all transmission facilities in service, dynamic performance of the system with the proposed project was acceptable. However, with the pre-disturbance outage of N42- Waterford 345 KV line, Waterford- Muskingum River 345 KV line, Sporn-Kyger Creek 345 KV line and Sporn 345KV/SpornB 138KV #4 Transformer several faults would result in instability of the two P54 generators as well as several generators in the area . To avoid the instability the study indicates the output of P54 will need to be restricted to the following:

Pre-Disturbance outage	P54 Gross output in MW
N42- Waterford 345 KV line	766
Waterford- Muskingum River 345 KV line	0 (P54 units have to be out of service)
Sporn- Kyger Creek 345 KV line	1065
Sporn 345KV/SpornB 138KV #4 Transformer	0 (P54 units have to be out of service)

[‡] Muskingum River 345 kV circuit breakers "SD", "SE" & "SF" and their associated disconnect switches have 3150 Amp and 4020 Amp emergency ratings, respectively.

Note: While the stability analysis has been performed at expected extreme system conditions, there is a potential that evaluation at a different level of generator MW and/or MVAR output at different system load levels and operating conditions would disclose unforeseen stability problems. The regional reliability analysis routinely performed to test all system changes will include one such evaluation. Any problems uncovered in that or other operating or planning studies will need to be resolved.

Moreover, when the proposed generating station is designed and unit specific dynamics data for the turbine generators and its controls are available, and if it is different than the data provided for this study, a transient stability analysis at a variety of expected operating conditions using the more accurate data shall be performed to verify impact on the dynamic performance of the system. As more accurate or unit specific dynamics data for the proposed facility, as well as Plant layout become available, it must be forwarded to PJM.

System Reinforcement Costs:

1. The overload of the Elliot Tap – Poston 138 kV line under an N-0 conditions can be alleviated by rebuilding approximately 3 miles of the 138 kV line between the Poston Station and the Elliot Tap. (Upgrade #n0589)

   The estimated cost to do this work is $3,000,000 and it should take approximately 12 months to be completed.

2. The overload of the P54 – Sporn 345 kV line under an N-1 condition can be alleviated by replacing risers and switches at the Sporn Station and by rebuilding approximately 4 miles of the 345 kV line between the Sporn Station and the new P54 Interconnect Station. (Upgrade #n0590)

   The estimated cost to do this work is $13,400,000 and it should take approximately 12 months to be completed.

3. The overload the Muskingum River – Waterford 345 kV line under and N-1 condition can be alleviated by (in addition to the N-0 related upgrades) rebuilding approximately 4 miles of 345 kV line between the Muskingum River and Waterford Stations. (Upgrade #n0591)

   The estimated cost to do this work is $10,700,000 and it should take approximately 12 months to be completed.

4. The overload of the Tidd-Carnegie 138kV line can be alleviated by Allegheny Power reconductoring 1.21 miles of 556 ACSR with 954 ACSR conductor at an estimated cost of **$320,000** in 2011 dollars. (Upgrade #n0592)

5. The overload of the French Creek-Heaters Tap line section overload can be alleviated by Allegheny Power reconductoring the 25.11 mile line section

with 954 ACSR conductor at an estimated cost of **$9,500,000** in 2012 dollars. (Upgrade #n0593)

6. The overload of Sporn Station 345kV circuit breaker "CC" under an N-2 condition can be alleviated by replacing the circuit breaker. (Upgrade #0594)

   The estimated cost to do this work is $1,900,000 and it should take approximately 12 months to be completed.

   The overload of Sporn Station 345kV circuit breaker "CC1" under and N-2 condition can be alleviated by replacing the circuit breaker. (Upgrade #n0595)

   The estimated cost to do this work is $1,900,000 and it should take approximately 12 months to be completed.

7. The overload of Waterford Station circuit breaker "52-A" and its disconnect switches under an N-2 condition can be alleviated by replacing the circuit breaker and switches. (Upgrade #n0596)

   The estimated cost to do this work is $2,000,000 and it should take approximately 12 months to be completed.

   The overload of Waterford Station circuit breaker "52-B" and its disconnect switches under an N-2 condition can be alleviated by replacing the circuit breaker and switches. (Upgrade #n0597)

   The estimated cost to do this work is $2,000,000 and it should take approximately 12 months to be completed.

   The overload of Waterford Station circuit breaker "52-C" and its disconnect switches under an N-2 condition can be alleviated by replacing the circuit breaker and switches. (Upgrade #n0598)

   The estimated cost to do this work is $2,000,000 and it should take approximately 12 months to be completed.

8 The overload of Muskingum River Station circuit breaker "SD" and its disconnect switches under an N-2 condition can be alleviated by replacing the circuit breaker and switches. (Upgrade #n0599)

   The estimated cost to do this work is $1,700,000 and it should take approximately 12 months to be completed.

   The overload of Muskingum River Station circuit breaker "SE" and its disconnect switches under an N-2 condition can be alleviated by replacing the circuit breaker and switches. (Upgrade #n0600)

The estimated cost to do this work is $1,700,000 and it should take approximately 12 months to be completed.

The overload of Muskingum River Station circuit breaker "SF" and its disconnect switches under an N-2 condition can be alleviated by replacing the circuit breaker and switches. (Upgrade #0601)

The estimated cost to do this work is $1,700,000 and it should take approximately 12 months to be completed.

Contribution to Previously Identified Overloads

1. The Belmont – Harrison 500 kV line overloads and exceeds its emergency rating 2285MVA for a fault on the 765 kV line from Kammer to South Canton with a stuck "NN" breaker in Kammer substation causing the outage of the 765 kV line from Kammer to South Canton, the 756/500kV transformer at Kammer substation, and the 765/345kV transformer at South Canton substation.

   Project #P54 contributes 119MW causing the loading on the line to increase from 100.4% to 105.7%. Project #P46 in ComEd area is the first to cause this overload.

2. The #P54 project contributes 131.5MW to the overload on the Hatfield-Ronco 500 kV circuit for the stuck breaker contingency at Mt. Storm 500kV station for Mt. Storm-Pruntytown line fault. The circuit was initially overloaded due to the #O73 project in ComEd.

3. The #P54 project contributes 134.0MW to the overload on the Kammer 765/500 kV transformer for the stuck breaker contingency at Belmont 500kV station for a fault on the Belmont-Harrison 500kV line. The Kammer transformer was initially overloaded due to the #O22 project in AEP.

4. The #P54 project contributes 312.9MW to the Overload on the Waterford-Muskingum River 345kV line for system normal conditions. This Waterford-Muskingum River 345kV line was initially overloaded due to the #N42 project in AEP.

Contribution to Previously Identified Upgrades

1. The overload on the Belmont - Harrison 500 kV circuit can be alleviated by replacing terminal equipment in 2008 to bring the circuit loadability up to the conductor rating of 3153 Amp 2731 MVA summer continuous / 4044 Amp 3502 MVA summer 4 hour / 4651 Amp 4028 MVA. The cost is **$100,000** in 2008 dollars. The cost allocation to the P54 project is shown below. (Upgrade #n0602)

	MW(above rating)	% of $100K	$K
P46	6.62	5%	5
P54	119	95%	95

2. The overload on the Hatfield-Ronco 500kV circuit can be alleviated by reconductoring 1.42 miles of the circuit with 1113 ACSS conductor. The estimated cost of the project is **$2.8 million** in 2010 dollars. The cost allocation to the P54 project is shown below. (Upgrade #n0603)

	MW	% of $2.8M	$K
O73	7	5%	140
P54	131.5	95%	**2,660**

3. The overload on the Kammer 765/500kV transformer can be alleviated by installing a third breaker in the Harrison - Belmont line cross bus at Belmont 500kV station. The estimated cost of the project is **$1.5 million** in 2009 dollars. The cost allocation to the P54 project is shown below. (Upgrade #n0604)

PJT ID	MW Contr	% of 1.5M	$K
O22	2.8	0.005364	8.0
O23	40.443	0.077477	116.2
O24	40.323	0.077247	115.9
O27	40.5	0.077586	116.4
O29	29.65725	0.056815	85.2
O49	26.47	0.050709	76.1
O50	26.85	0.051437	77.2
O51	39.981	0.076592	114.9
P10	26.934	0.051598	77.4
P11	26.438	0.050648	76.0
P20	28.2051	0.054033	81.0
P36	31.4952	0.060336	90.5
P37	27.93948	0.053524	80.3
P54	134.0015	0.256708	**385.1**

4. The overload Waterford-Muskingum River 345kV line can be alleviated by reconductoring approximately 1 mile of the Waterford-Muskingum River 345kV line near Waterford and replacing the line risers at Muskingum River.

(Upgrade n0479) The estimated cost for this upgrade is $3,000,000. The cost allocation to the P54 project is shown below.

	MW	%	$M
N42	37	10.57%	0.32
P54	312.9	89.43%	**2.537**

Cost Responsibility

The P54 project is responsible for 100% of the Direct Connection costs described above of **$15, 450,000.** This cost responsibility could increase by $650,000 to **$16,100,000** if the Facilities Study report identifies that the relays need to be upgraded on the Waterford terminal of the line.

The P54 project is responsible for the costs shown in the chart below for network upgrades.

n0589	$3,000,000
n0590	$13,400,000
n0591	$10,700,000
n0592	$320,000
n0593	$5,900,000
n0594	$1,900,000
n0595	$1,900,000
n0596	$2,000,000
n0597	$2,000,000
n0598	$2,000,000
n0599	$1,700,000
n0600	$1,700,000
n0601	$1,700,000
n0602	$95,000
n0603	$2,660,000
n0604	$385,100
n0479	$2,537,000
Total	**$53,897,100**

Appendix A

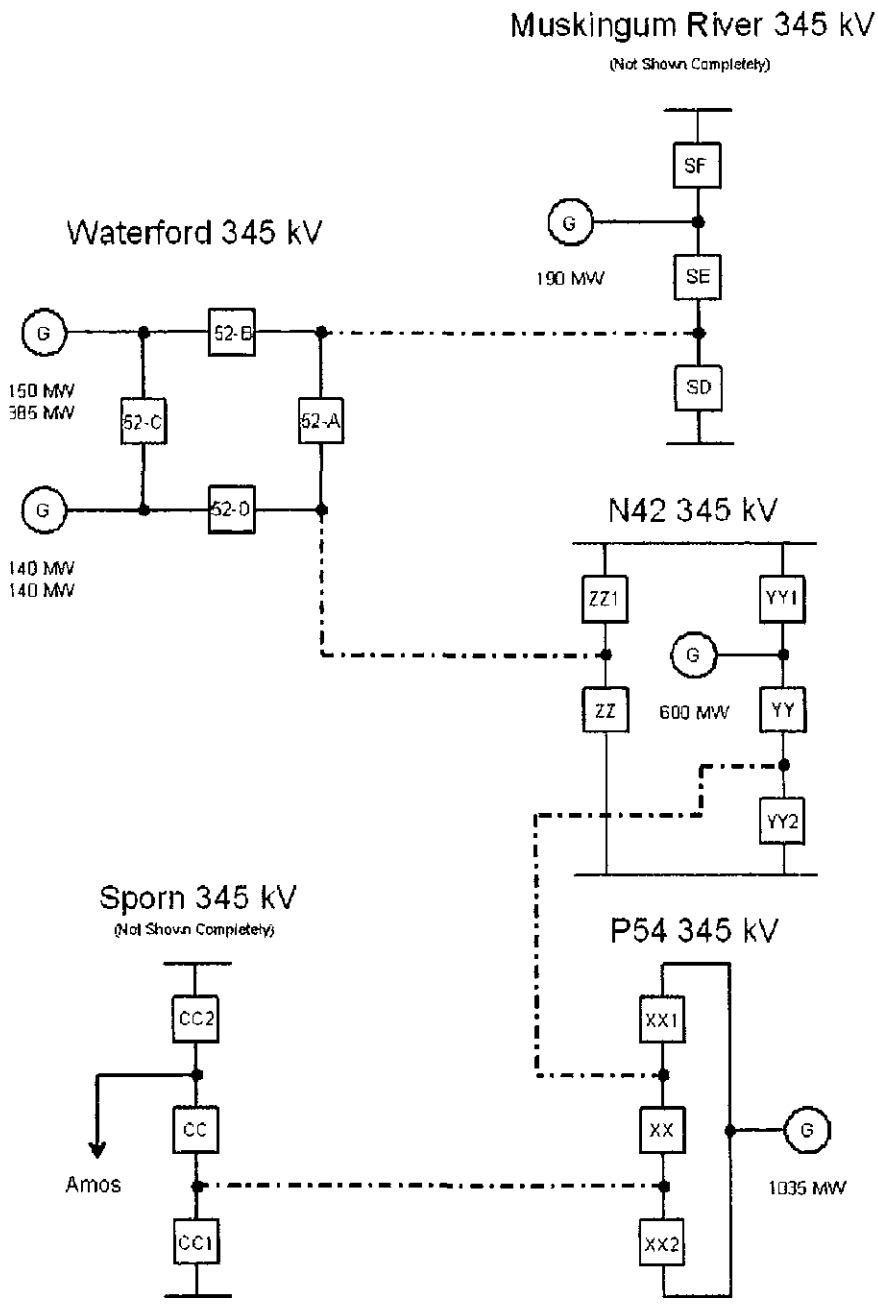


Figure 1: Anticipated future one-line switching configuration of the Sporn – Muskingum River 345 kV circuit with the PJM Project #P54 in service.

Attachment #1

P54

2011 Summer Light/Peak Load Case Stability Faults

BREAKER CLEARING TIMES (CYCLES)

Station	Primary (3ph/slg)	Stuck Breaker (total)	Zone 2 (total)	Re-closing
345 kV	4	15	24	-
138 kV	5	18	63	-

Faults in red are unstable
Faults in blue shows slow damping

With all Transmission Facilities in Service:

P54-1A: 3PH @ P54 on P54 – Sporn 345 kV line
P54-1C: SLG @ P54 – Sporn 345 kV line, 80% from P54, Zone 2 operation at P54

P54-2A: 3PH @ P54 on P54 –N42 345 kV line
P54-2C: SLG @ P54 – N42 345 kV line, 80% from P54, Zone 2 operation at P54

P54-3A: 3PH @ Sporn on Sporn – Kyger Creek 345 kV line
P54-3B: SLG @ Sporn on Sporn – Kyger Creek 345 kV line, stuck at Sporn, l/o Sporn 345/138 kVxfmr '4'

P54-4A: 3PH @ Sporn on Sporn – Amos 345 kV line
P54-4B1: SLG @ Sporn on Sporn – Amos 345 kV line, stuck at Sporn, l/o Sporn – Kyger Creek 345 kV line and Sporn 345/138 kV xfmr '4'
P54-4B2: SLG @ Sporn on Sporn – Amos 345 kV line, stuck at Sporn, l/o Sporn –P54 345 kV line

P54-5A: 3PH @ Sporn on Sporn – Kanawha River 345 kV line
P54-5B1: SLG @ Sporn on Sporn – Kanawha River 345 kV line, stuck at Sporn, l/o Sporn – Kyger Creek 345 kV line and Sporn 345/138 kV xfmr '4'
P54-5B2: SLG @ Sporn on Sporn – Kanawha River 345 kV line, stuck at Sporn, l/o of Sporn 345/138kV xfmrs '3' and 'B'

P54-6A: 3PH @ Sporn on Sporn 345/138 kV xfmr '3'
P54-6B1: SLG @ Sporn on Sporn 345/138 kV xfmr '3', stuck at Sporn 345 kV side, l/o Sporn – P54 345 kV line
P54-6B2: SLG @ Sporn on Sporn 345/138 kV xfmr '3', stuck at Sporn 345 kV side, l/o Sporn –Kanawha River 345 kV line

P54-7A: 3PH @ Sporn on Sporn 345/138 kV xfmr '4'

P54-7B1: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn –Amos 345 kV line
P54-7B2: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn –Kanawha River 345 kV line
P54-7B3: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn –Kyger Creek 345 kV line

P54-8B1: SLG @ Sporn on Sporn –P54 345 kV line, stuck at Sporn, l/o Sporn – Amos 345 kV line
P54-8B2: SLG @ Sporn on Sporn –P54 345 kV line, stuck at Sporn, l/o Sporn 345/138 kV xfmrs'3' & 'B'

P54-9A: 3PH @ Waterford on Waterford – Muskingum River 345 kV line
P54-9B1: SLG @ Waterford on Waterford – Muskingum River 345 kV line, stuck at Waterford, l/oWaterford – N42 345 kV line
P54-9B2: SLG @ Waterford on – Muskingum River 345 kV line, stuck at Waterford, l/o Waterford units '1A' and '1S'

P54-10B1: SLG @ Waterford on Waterford – N42 345 kV line, stuck at Waterford, l/o Waterford –Muskingum River 345 kV line
P54-10B2: SLG @ Waterford on Waterford – N42 345 kV line, stuck at Waterford, l/o Waterford units '1B' and '1C'

P54-11A: 3PH @ N42 on N42 – Waterford 345 kV line
P54-11B: SLG @ N42 on N42 – Waterford 345 kV line, stuck at N42
P54-11C: SLG @ N42 – Waterford 345 kV line, 80% from N42, Zone 2 operation at N42

With P54 – N42 345 kV line out of service (Pre-disturbance outage P):

P54P-3A: 3PH @ Sporn on Sporn – Kyger Creek 345 kV line
P54P-3B: SLG @ Sporn on Sporn – Kyger Creek 345 kV line, stuck at Sporn, l/o Sporn 345/138 kVxfmr '4'
P54P-4A: 3PH @ Sporn on Sporn – Amos 345 kV line
P54P-4B1: SLG @ Sporn on Sporn – Amos 345 kV line, stuck at Sporn, l/o Sporn – Kyger Creek 345 kV line and Sporn 345/138 kV xfmr '4'

P54P-5A: 3PH @ Sporn on Sporn – Kanawha River 345 kV line
P54P-5B1: SLG @ Sporn on Sporn – Kanawha River 345 kV line, stuck at Sporn, l/o Sporn – Kyger Creek 345 kV line and Sporn 345/138 kV xfmr '4'
P54P-5B2: SLG @ Sporn on Sporn – Kanawha River 345 kV line, stuck at Sporn, l/o of Sporn 345/138kV xfmrs '3' and 'B'

P54P-6A: 3PH @ Sporn on Sporn 345/138 kV xfmr '3'
P54P-6B2: SLG @ Sporn on Sporn 345/138 kV xfmr '3', stuck at Sporn 345 kV side, l/o Sporn - Kanawha River 345 kV line

P54P-7A: 3PH @ Sporn on Sporn 345/138 kV xfmr '4'
P54P-7B1: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn – Amos 345 kV line
P54P-7B2: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn –Kanawha River 345 kV line
P54P-7B3: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn –Kyger Creek 345 kV line

With N42 – Waterford 345 kV line out of service (Pre-disturbance outage Q):

P54Q-3A: 3PH @ Sporn on Sporn – Kyger Creek 345 kV line
P54Q-3B: SLG @ Sporn on Sporn – Kyger Creek 345 kV line, stuck at Sporn, l/o Sporn 345/138 kVxfmr '4'

P54Q-4A: 3PH @ Sporn on Sporn – Amos 345 kV line
P54Q-4B1: SLG @ Sporn on Sporn – Amos 345 kV line, stuck at Sporn, l/o Sporn – Kyger Creek 345 kV line and Sporn 345/138 kV xfmr '4'

P54Q-5A: 3PH @ Sporn on Sporn – Kanawha River 345 kV line
P54Q-5B1: SLG @ Sporn on Sporn – Kanawha River 345 kV line, stuck at Sporn, l/o Sporn – Kyger Creek 345 kV line and Sporn 345/138 kV xfmr '4'
P54Q-5B2: SLG @ Sporn on Sporn – Kanawha River 345 kV line, stuck at Sporn, l/o of Sporn 345/138kV xfmrs '3' and 'B'

P54Q-6A: 3PH @ Sporn on Sporn 345/138 kV xfmr '3'
P54Q-6B2: SLG @ Sporn on Sporn 345/138 kV xfmr '3', stuck at Sporn 345 kV side, l/o Sporn – Kanawha River 345 kV line

P54Q-7A: 3PH @ Sporn on Sporn 345/138 kV xfmr '4'
P54Q-7B1: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn – Amos 345 kV line
P54Q-7B2: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn – Kanawha River 345 kV line
P54Q-7B3: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn – Kyger Creek 345 kV line

With Waterford – Muskingum River 345 kV line out of service (Pre-disturbance outage R):

P54R-3A: 3PH @ Sporn on Sporn – Kyger Creek 345 kV line
P54R-3B: SLG @ Sporn on Sporn – Kyger Creek 345 kV line, stuck at Sporn, l/o Sporn 345/138 kVxfmr '4'

P54R-4A: 3PH @ Sporn on Sporn – Amos 345 kV line
P54R-4B1: SLG @ Sporn on Sporn – Amos 345 kV line, stuck at Sporn, l/o Sporn – Kyger Creek 345 kV line and Sporn 345/138 kV xfmr '4'

P54R-5A: 3PH @ Sporn on Sporn – Kanawha River 345 kV line
P54R-5B1: SLG @ Sporn on Sporn – Kanawha River 345 kV line, stuck at Sporn, l/o Sporn - Kyger Creek 345 kV line and Sporn 345/138 kV xfmr '4'
P54R-5B2: SLG @ Sporn on Sporn – Kanawha River 345 kV line, stuck at Sporn, l/o of Sporn 345/138kV xfmrs '3' and 'B'

P54R-6A: 3PH @ Sporn on Sporn 345/138 kV xfmr '3'
P54R-6B2: SLG @ Sporn on Sporn 345/138 kV xfmr '3', stuck at Sporn 345 kV side, l/o Sporn – Kanawha River 345 kV line

P54R-7A: 3PH @ Sporn on Sporn 345/138 kV xfmr '4'
P54R-7B1: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn – Amos 345 kV line
P54R-7B2: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn – Kanawha River 345 kV line
P54R-7B3: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn – Kyger Creek 345 kV line

With Sporn – Amos 345 kV line out of service (Pre-disturbance outage S):

P54S-1A: 3PH @ P54 on P54 – Sporn 345 kV line

P54S-2A: 3PH @ P54 on P54 –N42 345 kV line

P54S-3A: 3PH @ Sporn on Sporn – Kyger Creek 345 kV line
P54S-3B: SLG @ Sporn on Sporn – Kyger Creek 345 kV line, stuck at Sporn, l/o Sporn 345/138 kVxfmr '4'

P54S-5A: 3PH @ Sporn on Sporn – Kanawha River 345 kV line
P54S-5B1: SLG @ Sporn on Sporn – Kanawha River 345 kV line, stuck at Sporn, l/o Sporn – Kyger Creek 345 kV line and Sporn 345/138 kV xfmr '4'
P54S-5B2: SLG @ Sporn on Sporn – Kanawha River 345 kV line, stuck at Sporn, l/o of Sporn 345/138kV xfmrs '3' and 'B'

P54S-6A: 3PH @ Sporn on Sporn 345/138 kV xfmr '3'
P54S-6B1: SLG @ Sporn on Sporn 345/138 kV xfmr '3', stuck at Sporn 345 kV side, l/o Sporn – P54 345 kV line
P54S-6B2: SLG @ Sporn on Sporn 345/138 kV xfmr '3', stuck at Sporn 345 kV side, l/o Sporn – Kanawha River 345 kV line

P54S-7A: 3PH @ Sporn on Sporn 345/138 kV xfmr '4'
P54S-7B1: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn – Amos 345 kV line
P54S-7B2: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn – Kanawha River 345 kV line
P54S-7B3: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn – Kyger Creek 345 kV line

P54S-8B2: SLG @ Sporn on Sporn –P54 345 kV line, stuck at Sporn, l/o Sporn 345/138 kV xfmrs '3' & 'B'

P54S-9A: 3PH @ Waterford on Waterford – Muskingum River 345 kV line
P54S-9B1: SLG @ Waterford on Waterford – Muskingum River 345 kV line, stuck at Waterford, l/o Waterford – P54 345 kV line
P54S-9B2: SLG @ Waterford on – Muskingum River 345 kV line, stuck at Waterford, l/o Waterford units '1A' and '1S'

P54S-10B1: SLG @ Waterford on Waterford – N42 345 kV line, stuck at Waterford, l/o Waterford – Muskingum River 345 kV line
P54S-10B2: SLG @ Waterford on Waterford – N42 345 kV line, stuck at Waterford, l/o Waterford units '1B' and '1C'

P54S-11A: 3PH @ N42 on N42 – Waterford 345 kV line
P54S-11B: SLG @ N42 on N42 – Waterford 345 kV line, stuck at N42

With Sporn – Kanawha River 345 kV line out of service (Pre-disturbance outage T):

P54T-1A: 3PH @ P54 on P54 – Sporn 345 kV line

P54T-2A: 3PH @ P54 on P54 – N42 345 kV line

P54T-3A: 3PH @ Sporn on Sporn – Kyger Creek 345 kV line
P54T-3B: SLG @ Sporn on Sporn – Kyger Creek 345 kV line, stuck at Sporn, l/o Sporn 345/138 kVxfmr '4'

P54T-4A: 3PH @ Sporn on Sporn – Amos 345 kV line
P54T-4B1: SLG @ Sporn on Sporn – Amos 345 kV line, stuck at Sporn, l/o Sporn – Kyger Creek 345 kV line and Sporn 345/138 kV xfmr '4'
P54T-4B2: SLG @ Sporn on Sporn – Amos 345 kV line, stuck at Sporn, l/o Sporn –P54 345 kV line

P54T-6A: 3PH @ Sporn on Sporn 345/138 kV xfmr '3'
P54T-6B1: SLG @ Sporn on Sporn 345/138 kV xfmr '3', stuck at Sporn 345 kV side, l/o Sporn – P54 345 kV line

P54T-6B2: SLG @ Sporn on Sporn 345/138 kV xfmr '3', stuck at Sporn 345 kV side, l/o Sporn – Kanawha River 345 kV line

P54T-7A: 3PH @ Sporn on Sporn 345/138 kV xfmr '4'
P54T-7B1: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn – Amos 345 kV line
P54T-7B2: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn – Kanawha River 345 kV line
P54T-7B3: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn – Kyger Creek 345 kV line

P54T-8B1: SLG @ Sporn on Sporn –P54 345 kV line, stuck at Sporn, l/o Sporn – Amos 345 kV l line
P54T-8B2: SLG @ Sporn on Sporn –P54 345 kV line, stuck at Sporn, l/o Sporn 345/138 kV xfmr '3' & 'B'

P54T-9A: 3PH @ Waterford on Waterford – Muskingum River 345 kV line
P54T-9B1: SLG @ Waterford on Waterford – Muskingum River 345 kV line, stuck at Waterford, l/o Waterford – P54 345 kV line
P54T-9B2: SLG @ Waterford on – Muskingum River 345 kV line, stuck at Waterford, l/o Waterford units '1A' and '1S'

P54T-10B1: SLG @ Waterford on Waterford – P54 345 kV line, stuck at Waterford, l/o Waterford – Muskingum River 345 kV line
P54T-10B2: SLG @ Waterford on Waterford – P54 345 kV line, stuck at Waterford, l/o Waterford units '1B' and '1C'

P54T-11A: 3PH @ N42 on N42 – Waterford 345 kV line
P54T-11B: SLG @ N42 on N42 – Waterford 345 kV line, stuck at N42

With Sporn – Kyger Creek 345 kV line out of service (Pre-disturbance outage U):

P54U-1A: 3PH @ P54 on P54 – Sporn 345 kV line

P54U-2A: 3PH @ P54 on P54 –N42 345 kV line

P54U-4A: 3PH @ Sporn on Sporn – Amos 345 kV line
P54U-4B1: SLG @ Sporn on Sporn – Amos 345 kV line, stuck at Sporn, l/o Sporn – Kyger Creek 345 kV line and Sporn 345/138 kV xfmr '4'
P54U-4B2: SLG @ Sporn on Sporn – Amos 345 kV line, stuck at Sporn, l/o Sporn –P54 345 kV line

P54U-5A: 3PH @ Sporn on Sporn – Kanawha River 345 kV line
P54U-5B1: SLG @ Sporn on Sporn – Kanawha River 345 kV line, stuck at Sporn, l/o Sporn – Kyger Creek 345 kV line and Sporn 345/138 kV xfmr '4'

P54U-5B2: SLG @ Sporn on Sporn – Kanawha River 345 kV line, stuck at Sporn, l/o of Sporn 345/138kV xfmrs '3' and 'B'

P54U-6A: 3PH @ Sporn on Sporn 345/138 kV xfmr '3'
P54U-6B1: SLG @ Sporn on Sporn 345/138 kV xfmr '3', stuck at Sporn 345 kV side, l/o Sporn – P54 345 kV line
P54U-6B2: SLG @ Sporn on Sporn 345/138 kV xfmr '3', stuck at Sporn 345 kV side, l/o Sporn – Kanawha River 345 kV line

P54U-7A: 3PH @ Sporn on Sporn 345/138 kV xfmr '4'
P54U-7B1: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn – Amos 345 kV line
P54U-7B2: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn – Kanawha River 345 kV line
P54U-7B3: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn – Kyger Creek 345 kV line

P54U-8B1: SLG @ Sporn on Sporn –P54 345 kV line, stuck at Sporn, l/o Sporn – Amos 345 kV line
P54U-8B2: SLG @ Sporn on Sporn –P54 345 kV line, stuck at Sporn, l/o Sporn 345/138 kV xfmrs '3' & 'B'

P54U-9A: 3PH @ Waterford on Waterford – Muskingum River 345 kV line
P54U-9B1: SLG @ Waterford on Waterford – Muskingum River 345 kV line, stuck at Waterford, l/o Waterford – P54 345 kV line
P54U-9B2: SLG @ Waterford on – Muskingum River 345 kV line, stuck at Waterford, l/o Waterford units '1A' and '1S'

P54U-10B1: SLG @ Waterford on Waterford – P54 345 kV line, stuck at Waterford, l/o Waterford – Muskingum River 345 kV line
P54U-10B2: SLG @ Waterford on Waterford – P54 345 kV line, stuck at Waterford, l/o Waterford units '1B' and '1C'

P54U-11A: 3PH @ N42 on N42 – Waterford 345 kV line
P54U-11B: SLG @ N42 on N42 – Waterford 345 kV line, stuck at N42

With Sporn 345/138 kV Transformer (4) out of service (Pre-disturbance outage V):

P54V-1A: 3PH @ P54 on P54 – Sporn 345 kV line

P54V-2A: 3PH @ P54 on P54 – Waterford 345 kV line

P54V-3A: 3PH @ Sporn on Sporn – Kyger Creek 345 kV line
P54V-3B: SLG @ Sporn on Sporn – Kyger Creek 345 kV line, stuck at Sporn, l/o Sporn 345/138 kVxfmr '4'

P54V-4A: 3PH @ Sporn on Sporn – Amos 345 kV line
P54V-4B1: SLG @ Sporn on Sporn – Amos 345 kV line, stuck at Sporn, l/o Sporn – Kyger Creek 345 kV line and Sporn 345/138 kV xfmr '4'
P54V-4B2: SLG @ Sporn on Sporn – Amos 345 kV line, stuck at Sporn, l/o Sporn –P54 345 kV line

P54V-5A: 3PH @ Sporn on Sporn – Kanawha River 345 kV line
P54V-5B1: SLG @ Sporn on Sporn – Kanawha River 345 kV line, stuck at Sporn, l/o Sporn – Kyger Creek 345 kV line and Sporn 345/138 kV xfmr '4'
P54V-5B2: SLG @ Sporn on Sporn – Kanawha River 345 kV line, stuck at Sporn, l/o of Sporn 345/138kV xfmrs '3' and 'B'

P54V-6A: 3PH @ Sporn on Sporn 345/138 kV xfmr '3'
P54V-6B1: SLG @ Sporn on Sporn 345/138 kV xfmr '3', stuck at Sporn 345 kV side, l/o Sporn – P54 345 kV line
P54V-6B2: SLG @ Sporn on Sporn 345/138 kV xfmr '3', stuck at Sporn 345 kV side, l/o Sporn – Kanawha River 345 kV line

P54V-8B1: SLG @ Sporn on Sporn –P54 345 kV line, stuck at Sporn, l/o Sporn – Amos 345 kV line
P54V-8B2: SLG @ Sporn on Sporn –P54 345 kV line, stuck at Sporn, l/o Sporn 345/138 kV xfmrs '3' & 'B'

P54V-9A: 3PH @ Waterford on Waterford – Muskingum River 345 kV line
P54V-9B1: SLG @ Waterford on Waterford – Muskingum River 345 kV line, stuck at Waterford, l/o Waterford – P54 345 kV line
P54V-9B2: SLG @ Waterford on – Muskingum River 345 kV line, stuck at Waterford, l/o Waterford units '1A' and '1S'

P54V-10B1: SLG @ Waterford on Waterford – P54 345 kV line, stuck at Waterford, l/o Waterford – Muskingum River 345 kV line
P54V-10B2: SLG @ Waterford on Waterford – P54 345 kV line, stuck at Waterford, l/o Waterford units '1B' and '1C'

P54V-11A: 3PH @ N42 on N42 – Waterford 345 kV line
P54V-11B: SLG @ N42 on N42 – Waterford 345 kV line, stuck at N42

With **Sporn 345/138 kV Transformer (B) out of service (Pre-disturbance outage W):**

P54W-1A: 3PH @ P54 on P54 – Sporn 345 kV line

P54W-2A: 3PH @ P54 on P54 – Waterford 345 kV line

P54W-3A: 3PH @ Sporn on Sporn – Kyger Creek 345 kV line
P54W-3B: SLG @ Sporn on Sporn – Kyger Creek 345 kV line, stuck at Sporn, l/o Sporn 345/138 kVxfmr '4'

P54W-4A: 3PH @ Sporn on Sporn – Amos 345 kV line
P54W-4B1: SLG @ Sporn on Sporn – Amos 345 kV line, stuck at Sporn, l/o Sporn – Kyger Creek 345 kV line and Sporn 345/138 kV xfmr '4'
P54W-4B2: SLG @ Sporn on Sporn – Amos 345 kV line, stuck at Sporn, l/o Sporn –P54 345 kV line

P54W-5A: 3PH @ Sporn on Sporn – Kanawha River 345 kV line
P54W-5B1: SLG @ Sporn on Sporn – Kanawha River 345 kV line, stuck at Sporn, l/o Sporn – Kyger Creek 345 kV line and Sporn 345/138 kV xfmr '4'
P54W-5B2: SLG @ Sporn on Sporn – Kanawha River 345 kV line, stuck at Sporn, l/o of Sporn 345/138kV xfmrs '3' and 'B'

P54W-6A: 3PH @ Sporn on Sporn 345/138 kV xfmr '3'
P54W-6B1: SLG @ Sporn on Sporn 345/138 kV xfmr '3', stuck at Sporn 345 kV side, l/o Sporn – P54 345 kV line
P54W-6B2: SLG @ Sporn on Sporn 345/138 kV xfmr '3', stuck at Sporn 345 kV side, l/o Sporn – Kanawha River 345 kV line

P54W-7A: 3PH @ Sporn on Sporn 345/138 kV xfmr '4'
P54W-7B1: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn – Amos 345 kV line
P54W-7B2: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn –Kanawha River 345 kV line
P54W-7B3: SLG @ Sporn on Sporn 345/138 kV xfmr '4', stuck at Sporn 345 kV side, l/o Sporn - Kyger Creek 345 kV line

P54W-8B1: SLG @ Sporn on Sporn –P54 345 kV line, stuck at Sporn, l/o Sporn – Amos 345 kV line
P54W-8B2: SLG @ Sporn on Sporn –P54 345 kV line, stuck at Sporn, l/o Sporn 345/138 kV xfmrs '3' & 'B'

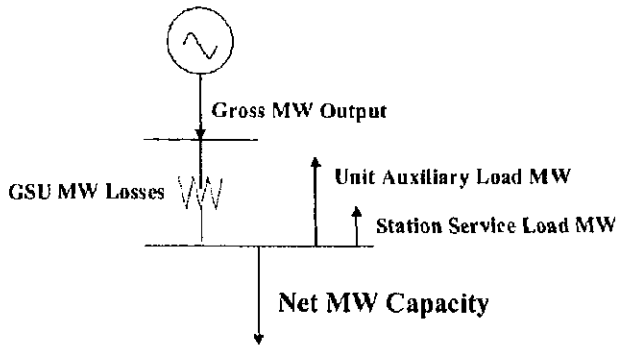
P54W-9A: 3PH @ Waterford on Waterford – Muskingum River 345 kV line
P54W-9B1: SLG @ Waterford on Waterford – Muskingum River 345 kV line, stuck at Waterford, l/o Waterford – P54 345 kV line
P54W-9B2: SLG @ Waterford on – Muskingum River 345 kV line, stuck at Waterford, l/o Waterford units '1A' and '1S'

P54W-10B1: SLG @ Waterford on Waterford – P54 345 kV line, stuck at Waterford, l/o Waterford – Muskingum River 345 kV line
P54W-10B2: SLG @ Waterford on Waterford – P54 345 kV line, stuck at Waterford, l/o Waterford units '1B' and '1C'

P54W-11A: 3PH @ N42 on N42 – Waterford 345 kV line
P54W-11B: SLG @ N42 on N42 – Waterford 345 kV line, stuck at N42

ATTACHMENT #2

Unit Capability Data



Net MW Capacity = (Gross MW Output - GSU MW Losses* – Unit Auxiliary Load MW - Station Service Load MW)

Queue Letter/Position/Unit ID: _____ **P54/ST**

Primary Fuel Type: _____ **Coal**

Maximum Summer (92° F ambient air temp.) Net MW Output**: _____ **1035**

Maximum Summer (92° F ambient air temp.) Gross MW Output: _____ **1135**

Minimum Summer (92° F ambient air temp.) Gross MW Output: _____ **0**

Maximum Winter (30° F ambient air temp.) Gross MW Output: _____ **1135**

Minimum Winter (30° F ambient air temp.) Gross MW Output: _____ **0**

Gross Reactive Power Capability at Maximum Gross MW Output – Please include Reactive Capability Curve (Leading and Lagging): _____ **298 MVAR**

Individual Unit Auxiliary Load at Maximum Summer MW Output (MW/MVAR): ___ **0**

Individual Unit Auxiliary Load at Minimum Summer MW Output (MW/MVAR): **100/25**

Individual Unit Auxiliary Load at Maximum Winter MW Output (MW/MVAR): _____ **0**

Individual Unit Auxiliary Load at Minimum Winter MW Output (MW/MVAR): **100/25**

Station Service Load (MW/MVAR): _____ **Included in unit**

* GSU losses are expected to be minimal.

** Your project's declared MW, as first submitted in Attachment N, and later confirmed or modified by the Impact Study Agreement, should be based on either the 92 °F Ambient Air Temperature rating of the unit(s) or, if less, the declared Capacity rating of your project.

Unit Generator Dynamics Data

Queue Letter/Position/Unit ID: P54/ST

MVA Base (upon which all reactances, resistance and inertia are calculated): 567

Nominal Power Factor: 0.85

Terminal Voltage (kV): 22

Unsaturated Reactances (on MVA Base)

- Direct Axis Synchronous Reactance, $X_{d(i)}$: 2.24
- Direct Axis Transient Reactance, X'd(i): 0.325
- Direct Axis Sub-transient Reactance, X"d(i): 0.24
- Quadrature Axis Synchronous Reactance, Xq(i): 2.06
- Quadrature Axis Transient Reactance, X'q(i): 0.47
- Quadrature Axis Sub-transient Reactance, X"q(i): 0.24
- Stator Leakage Reactance, Xl: 0.191
- Negative Sequence Reactance, X2(i): 0.014
- Zero Sequence Reactance, X0: 0.007

Saturated Sub-transient Reactance, X"d(v) (on MVA Base): 0.17

Armature Resistance, Ra (on MVA Base): 0.00117

Time Constants (seconds)

- Direct Axis Transient Open Circuit, T'_{do}: 4.6
- Direct Axis Sub-transient Open Circuit, T''_{do}: 0.03
- Quadrature Axis Transient Open Circuit, T'_{qo}: 0.4
- Quadrature Axis Sub-transient Open Circuit, T''_{qo}: 0.06
- Inertia, H (kW-sec/kVA, on KVA Base): 3.4

Speed Damping, D: 0

Saturation Values at Per-Unit Voltage [S(1.0), S(1.2)]: 0.081.0.286

Units utilize a Generator model.

Unit GSU Data

Queue Letter/Position/Unit ID: _____ **P54/ST**

Generator Step-up Transformer MVA Base: _____ **567**

Generator Step-up Transformer Impedance (R+jX, or %, on transformer MVA Base): ___ **12%**

Generator Step-up Transformer Reactance-to-Resistance Ration (X/R): _____ **N/A**

Generator Step-up Transformer Rating (MVA): _____ **567**

Generator Step-up Transformer Low-side Voltage (kV): _____ **22**

Generator Step-up Transformer High-side Voltage (kV): _____ **345**

Generator Step-up Transformer Off-nominal Turns Ratio: _____ **16.5%**

Generator Step-up Transformer Number of Taps and Step Size: _____ **±2.5,±5**