



DUKE OHIO KENTUCKY (DEOK) and City of Hamilton BASELINE RTEP REPORT

For the 2012-2014 Period

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**CATEGORY 3 GENERATOR DELIVERABILITY RESULTS ERROR! BOOKMARK NOT
DEFINED.**

INTRODUCTION

The PJM Regional Transmission Expansion Planning (RTEP) Process requires that cost responsibility for facility enhancements be established. There are three types of facility enhancements for which cost assignment must be made:

- Attachment Facilities required solely to interconnect a new generation project,
- Network Facilities that are required to enhance the network solely or in part because of a proposed project, and
- Network Facilities required to support load growth.

In order to establish a starting point for development of Regional Transmission Expansion Plans and determine cost responsibility for expansion facilities, a „baseline“ analysis of system adequacy and security is necessary. The purpose of this analysis is threefold:

- to identify areas where the system, as planned, is not in compliance with the applicable reliability standards (for purposes of this report, “applicable reliability standards” will be defined as NERC, RFC, DUKE and PJM Reliability Planning Criteria). The baseline system will be analyzed using the same criteria and analysis methods that will be used for assessing the impact of proposed new generation projects. This will ensure that the need for system enhancement of the baseline system and enhancements due to generation projects are determined in a consistent and equitable manner.
- to bring those areas into compliance, develop and recommend facility expansion plans, including cost estimates and estimated in-service dates.
- to establish what will be included as baseline costs in the allocation of the costs of expansion for those generation projects proposing to connect to the PJM system.

The system as planned is tested for its compliance with applicable reliability standards and PJM design standards to accommodate the forecast demand, committed resources, and commitments for firm transmission services for a specified time frame. Areas not in compliance with the standards are identified and enhancement plans are developed to achieve compliance.

This „baseline“ analysis and the resulting expansion plans served as the base system for the generator deliverability studies that were conducted for all generation that had an executed Interconnection Agreement with DEOK and City of Hamilton as of May 20, 2010.

The focus of this first DEOK and City of Hamilton baseline analysis was on the PJM Generator Deliverability test. Generators that already had firm transmission rights on the DEOK and City of Hamilton system were assumed to be part of the base system. This assumption is based on the fact that MISO and/or DEOK and City of Hamilton had previously studied these generators for compliance with RFC, NERC and DUKE criteria when these generators applied for interconnection and transmission service. A generator deliverability test had not previously been performed since firm rights to transfer the generator MWs within the DEOK and City of Hamilton was provided through point to point transmission service request. In addition to the PJM Generator Deliverability test, preliminary Load Deliverability analysis and baseline thermal and voltage analysis were completed for the DEOK and City of Hamilton control area on 2014 RTEP case. This report documents the results of these analyses and the deliverability results for

all generators that had executed an Interconnection Agreement with DEOK and City of Hamilton as of May 20, 2010.

The next RTEP Baseline report (2011 RTEP) and analysis, will include a review of all applicable RFC and DUKE and City of Hamilton planning criteria along with a re-evaluation of the PJM load and generator deliverability studies. The reference year for analysis will be 2016 and the DEOK and City of Hamilton results will be included within the PJM RTEP Baseline Report which will also include results for the existing PJM system.

EXECUTIVE SUMMARY

PJM has responsibility for the development of a Regional Transmission Expansion Plan (RTEP) for the PJM system that will meet the needs of the region in a reliable, economic and environmentally acceptable manner. PJM also is responsible for recommending the assignment of any transmission expansion costs to the appropriate parties. In order to carry out these responsibilities, it is necessary to establish a starting point or „baseline“ from which the need and responsibility for enhancements can be determined.

In order to establish the baseline, PJM has defined the five (5) year period from 2010 through 2014 as the initial DEOK and City of Hamilton “baseline” planning period. The existing system plus any planned modifications to the transmission system scheduled to be in service prior to the 2014 summer peak period was chosen as the base system. Generators in the DEOK and City of Hamilton Control Area were studied in three categories as explained below:

1. Generators with a MISO or DEOK and City of Hamilton Interconnection Agreement (IA) effective prior to May 20, 2010: This group of generators will maintain the deliverability (i.e., capacity) rights granted under their current IAs. To the extent any system upgrades are needed to ensure they are deliverable in PJM, such upgrades will be considered baseline upgrades in the DEOK and City of Hamilton territory, and DEOK and City of Hamilton shall have the responsibility for providing the upgrade. In addition to the deliverability study, the PJM system will also be re-evaluated for transient stability and short circuit capability. Any upgrades required to meet PJM criteria for stability or short circuit will be considered baseline upgrades in the DEOK and City of Hamilton territory and paid for by DEOK and City of Hamilton.
2. Generators with a MISO or DEOK and City of Hamilton IA effective after May 20, 2010: Any system upgrades for deliverability, including short circuit and transient study analysis, that are needed to ensure that generation is deliverable in PJM in addition to those identified through the MISO study process, will be communicated to the generator, and the costs for the upgrades shall be the responsibility of the generator.
3. Generators that are in the MISO study process but without an IA: All Interconnection Requests pending under the MISO Tariff at the time of integration shall be assigned the same priority date under the PJM Tariff. These projects will be assigned PJM queue identifiers so that their priority dates relative to existing PJM queued generation can be easily determined. All such generators will be integrated into the existing PJM queue effective on the integration date, and will be subject to the PJM Tariff, which would include applicable study agreements and tariffs. On the integration date, PJM will assume the technical studies that have been started by MISO, and determine if the generating units qualify as both energy and capacity resources. After the studies are complete, the generator will be required to pay for any system upgrades that are needed for the unit to qualify as a capacity resource under the PJM Tariff.

Category 1 generators were modeled in the original basecase. This category of generation was considered to have firm delivery rights and the responsibility for any identified reliability impacts and the associated system upgrades would be assigned to DEOK and City of Hamilton. This basecase was tested for compliance with DUKE and RFC Planning Criteria. Any system problems were documented, upgrades were identified to mitigate all problems and the system

model was updated accordingly. This was the reference system by which the category 2 generation was studied.

KEY FINDINGS

The following areas of the system as planned through 2014 were found to be non-compliant with applicable reliability criteria without additional system upgrades. These areas are described below along with the identified reinforcements to achieve compliance.

- 1) In 2014, the Todhunter 345/138KV transformers 15 &17 are overloaded for breaker failure operation of the Todhunter 345kV Breaker 1385 or Breaker 1387. The Todhunter 345KV ring bus will be reconfigured. The estimated cost is \$1.325M. The projected IS date is 06/01/2014. (B1573)
- 2) In 2014, the Port Union - Dimmick 138kV circuit (#5483) and Dimmick – Cornell Tap 138KV circuit are overloaded for the several multiple facility contingencies at Foster 138kV bus. The circuits will be re-conducted for 6 miles with the 556 ACSS conductor. The estimated cost is \$1.85M. The projected IS date is 06/01/2014. (B1574)
- 3) In 2014, the Todhunter - Trenton 138kV circuit (#3284) is overloaded for the several multiple facility contingencies. The circuit will be re-conducted for 5 miles with the 556 ACSS conductor. The estimated cost is \$1.05M. The projected IS date is 06/01/2013. (B1576)
- 4) In 2014, the Miami Fort - Terminal 345kV circuit (#4515) is overloaded for the tower contingency of losing both circuit #4561 and circuit #4562. The wavetraps and line switch equipment will be replaced. The estimated cost is \$104K. The projected IS date is 06/01/2013. (B1585)
- 5) In 2014, the Woodsdale - Todhunter 345kV circuit (#4561) is overloaded for the loss of circuit #4562. The wavetraps and line switches equipments will be replaced. The estimated cost is \$210K. The projected IS date is 06/01/2013. (B1586)
- 6) In 2014, the Woodsdale - Todhunter 345kV circuit (#4562) is overloaded for the loss of circuit #4561. The wavetraps and line switches equipments will be replaced. The estimated cost is \$210K. The projected IS date is 06/01/2013. (B1587)
- 7) In 2014, the Beckjord - Tobasco 345kV circuit (#1885) is overloaded for various contingencies. At Newtown substation, add a 138/69 kV transformer and two new 69kv lines, one to Mt Washington and the other to Berkshire. Reconfigure 69kv loop. The estimated cost is \$8M. The projected IS date is 06/01/2014. (B1588.1 –B1588.4)

OBJECTIVE AND SCOPE

The objectives of this study were as follows:

- To identify areas where the system as planned for the period 2012 through 2014 would not be in compliance with applicable reliability criteria.
- To develop and recommend preliminary facility expansion plans, including cost estimates and estimated in service dates, to bring those areas into compliance.
- To establish what will be included as baseline expansion costs for the allocation of the costs of expansion for future DEOK and City of Hamilton generation projects.

The scope of this study included analysis for the period 2012 through 2014 to determine compliance with the PJM Deliverability requirements.

The system was not analyzed under non-peak load flow conditions on the basis that the system can and will be dispatched to remain within first contingency operating limits. Transmission constraints on market dispatch are economic constraints. Economic constraints are not considered violations of reliability criteria as long as the system can be adjusted to remain within reliability limits on a pre-contingency basis. Performance of the planned system under intermediate and light load conditions will be analyzed in the PJM Reliability Assessment to verify that the system as planned can indeed be operated in compliance with applicable reliability criteria. This will include a determination that the generation resources in DEOK and City of Hamilton are sufficient and are appropriately dispersed so that the generation dispatch can be adjusted to maintain the system within established thermal equipment ratings and voltage criteria limits under intermediate and light load conditions.

DELIVERABILITY ANALYSIS METHODOLOGY

Deliverability analysis was based on a representation of the 2014 forecast peak load with all firm transmission services committed for the 2014 period represented in the base case (see below).

FROM	TO	MW-2014
PJM	AMIL (AMRN)	-628.4
PJM	CIN	-192
PJM	EKPC	0
PJM	FE	0
PJM	IPL	50
PJM	LGEE	-159
PJM	OVEC	-2467
PJM	ALTW	264
PJM	ALTE	140
PJM	CPLC	88
PJM	CPLW	0
PJM	DUK	113
PJM	MEC	1220
PJM	MECS	-196
PJM	NIPS	0
PJM	NYIS	1509
PJM	WEC	750
PJM	DLCO	0
PJM	TVA	6
PJM	MISO (DEOK) GEN	704
PJM	NEPTUNE	685
Total		1886.6

A study of all voltage limits was completed using this base system. For analysis pertaining to thermal limits including Generator Deliverability a multitude of dispatch patterns were analyzed. A complete description of the Generator Deliverability procedures is contained in Attachment E of PJM Manual M14B.

The 2014 base case was used to analyze network transfer capability. To maintain reliability in a competitive capacity market, resources must contribute to the deliverability of electricity in the Control Area in two ways: 1) energy must be deliverable from the aggregate of resources available to the Control Area to load in portions of the Control Area experiencing a localized capacity emergency, or deficiency, 2) capacity resources within a given electrical area must, in aggregate, be able to be exported to other areas of the Control Area within some bounds that separate the reliability requirements of the Control Area from the reasonable economic function of the market place. PJM has developed two methods for evaluating the adequacy of network transfer capability for each of these deliverability requirements. These methods are described in more detail in Attachment E of PJM Manual M14B.

Deliverability Analysis Methodology

The CETO/CETL method will be used to determine if the Capacity Emergency Transfer Limit (CETL) to each of the various electrical areas of PJM is sufficient to deliver each respective area's Capacity Emergency Transfer Objective (CETO).

The PJM Generation Deliverability procedure was used to determine if Network Transfer Capability was adequate to deliver all capacity resources out of defined areas to the network.

Generator Deliverability Results

Category 1&2 Generator Deliverability Results

PSSE Name	ID	Unit Commercial Name	Capacity Injection Rights (MWs)	Resource Type	Result
08STCLAR 69.00	1	Smart Paper	24.9	Capacity Resource	Deliverable
08YANKEE 69.00	1	Middletown Coke/ Sun Coke	67	Capacity Resource	Deliverable
08BCKJD2 13.800	2	Walter C Beckjord #2	94	Capacity Resource	Deliverable
08BCKJD3 18.000	3	Walter C Beckjord #3	128	Capacity Resource	Deliverable
08BCKJD4 18.000	4	Walter C Beckjord #4	150	Capacity Resource	Deliverable
08BCKJD5 22.000	5	Walter C Beckjord #5	238	Capacity Resource	Deliverable
08BCKJD6 24.000	6	Walter C Beckjord #6	414	Capacity Resource	Deliverable
08BECJD1 13.800	1	Walter C Beckjord #1	94	Capacity Resource	Deliverable
08BKJGT1 13.800	1	Walter C Beckjord GT1	47	Capacity Resource	Deliverable
08BKJGT2 13.800	2	Walter C Beckjord GT2	47	Capacity Resource	Deliverable
08BKJGT3 13.800	3	Walter C Beckjord GT3	47	Capacity Resource	Deliverable
08BKJGT4 13.800	4	Walter C Beckjord GT4	47	Capacity Resource	Deliverable
08D.CRK1 10.000	1	Dicks Creek #1	92	Capacity Resource	Deliverable
08D.CRK3 13.000	3	Dicks Creek #3	14	Capacity Resource	Deliverable
08D.CRK4 13.000	4	Dicks Creek #4	15	Capacity Resource	Deliverable
08D.CRK4 13.000	5	Dicks Creek #5	15	Capacity Resource	Deliverable
08EBND2 20.000	2	East Bend	600	Capacity Resource	Deliverable
08M.FRT6 18.000	6	Miami Fort#6	163	Capacity Resource	Deliverable
08M.FRT7 22.000	7	Miami Fort #7	510	Capacity Resource	Deliverable
08M.FRT8 22.000	8	Miami Fort #8	510	Capacity Resource	Deliverable
08MADSN1 13.800	1	Madison #1	80	Capacity Resource	Deliverable
08MADSN2 13.800	2	Madison #2	80	Capacity Resource	Deliverable
08MADSN3 13.800	3	Madison #3	80	Capacity Resource	Deliverable
08MADSN4 13.800	4	Madison #4	80	Capacity Resource	Deliverable
08MADSN5 13.800	5	Madison #5	80	Capacity Resource	Deliverable
08MADSN6 13.800	6	Madison #6	80	Capacity Resource	Deliverable
08MADSN7 13.800	7	Madison #7	80	Capacity Resource	Deliverable
08MADSN8 13.800	8	Madison #8	80	Capacity Resource	Deliverable
08MFTGT1 13.800	3	Miami Fort GT3	14	Capacity Resource	Deliverable
08MFTGT1 13.800	4	Miami Fort GT4	14	Capacity Resource	Deliverable
08MFTGT2 13.800	5	Miami Fort GT5	14	Capacity Resource	Deliverable
08MFTGT2 13.800	6	Miami Fort GT6	14	Capacity Resource	Deliverable
08WSDLE1 13.800	G	Woodsdale GT1	81.6	Capacity Resource	Deliverable
08WSDLE2 13.800	G	Woodsdale GT2	81.6	Capacity Resource	Deliverable
08WSDLE3 13.800	G	Woodsdale GT3	81.6	Capacity Resource	Deliverable
08WSDLE4 13.800	G	Woodsdale GT4	81.6	Capacity Resource	Deliverable
08WSDLE5 13.800	G	Woodsdale GT5	81.6	Capacity Resource	Deliverable
08WSDLE6 13.800	G	Woodsdale GT6	81.6	Capacity Resource	Deliverable
08ZIMRHP 26.000	1	W H Zimmer #1	840	Capacity Resource	Deliverable
08ZIMRLP 22.000	1	W H Zimmer #1	460	Capacity Resource	Deliverable
1LOVE HY 4.160	1	Greenup Hydro #1	23.4	Capacity Resource	Deliverable
1LOVE HY 4.160	1	Greenup Hydro #2	23.4	Capacity Resource	Deliverable
1LOVE HY 4.160	1	Greenup Hydro #3	23.4	Capacity Resource	Deliverable