



Duke Integration Assumptions

In the following document, “**Duke**” is referring to the Duke Energy affiliates that are integrating into PJM on January 1, 2012, namely, Duke Energy—Ohio, Inc. and Duke Energy—Kentucky, Inc. and associated regulated and unregulated generation assets, unless otherwise specifically identified.

General Assumptions -

The industry will request additional information surrounding the potential impacts of this integration. Such request will generate the need to conduct the following studies:

- i. Impacts on flowgates
- ii. Administrative Cost Analysis to all PJM members
- iii. MMU Assessment/Study
[Planning will verify that there are no significant differences in IRM due to Duke integration]

Transmission Service

OASIS

1. Transition

- There will be one OASIS node, the PJM OASIS.
- Transmission customers will submit and receive transmission reservations to the PJM single node OASIS. It will be available to transmission customers one month prior to integration to allow reservation of monthly transmission service.

2. Reservation Conversion

- Reservations purchased on the MISO OASIS node prior to one month ahead of integration will be converted to the appropriate PJM RTO product and subject to the PJM RTO rates as filed in the PJM OATT. Customers who have reservations that need to be converted will be contacted directly by PJM. Converted reservations and long term firm contracts will be converted to PJM equivalent products.

3. Transmission Provider

- PJM becomes the Transmission Provider and approver for **Duke** transmission customers under the PJM tariff, using PJM rates including a single RTOR (Regional Through and Out Rate).

4. Path Selection

- PORs/PODs and Sources/Sinks will be redefined to reflect the inclusion of **Duke** within PJM. Based on the POR and POD selected on the OASIS, only one path will be allowed. PJM will determine the allowable path based on a load-flow analysis.



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5. AFC/ATC

- There will be one AFC/ATC engine, to be run by PJM.
- Additional flow gates will be introduced to the AFC/ATC engine and calculation.
- Decrementing of ATC will be based on reservations, IDC schedule data, EES, and Super Regional Congestion Management (SRCM) flow gate limits.

6. Losses

- Losses on transmission reservations for block schedules will be financial and marginal.
- Exceptions to marginal losses for any grandfathered transactions will be handled on a case by case basis and recorded in “special case” documentation.

7. Long Term Reservation

- PJM will manage the granting of Long-Term Firm transmission service requests for **Duke**.

Tagging & Scheduling

1. Tagging

- E-Tag 1.8.1 will be used; however, PJM will not support vertical stacking of OASIS reservations on schedules sinking, leaving, or going through PJM. PJM will provide for horizontal stacking of OASIS reservations on schedules in all situations.
- Conversion of existing NERC Tags must be evaluated.

2. Tagging Service

PJM will use OATI for tagging services (agent, authority, and approval) for the **Duke** Control Zone. Transmission customers will be required to specify the full contract path on their tags, including all Scheduling Entities on the path. PJM must appear as the Transmission Provider on the tag.

3. External Energy Scheduling

- Generators will submit External Energy Schedules using the PJM Enhanced Energy Scheduling (EES) application for scheduling outside the PJM RTO.
- Scheduling of imports, exports, or wheels through multiple interfaces of the new PJM footprint will be managed through EES.
- There will be additional valid contract paths in EES for external schedules that include **Duke** in PJM footprint.
- There will be one ramp limit for the PJM RTO. Because ramp is limited, PJM allows for scheduling on 15-minute increments.

System Operations

1. Energy Management



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- PJM will be responsible for the operation of the **Duke** transmission system under the current system operating policies and procedures. PJM is registered and as the BA and TOP for this additional footprint.
- **Duke's** network model will be incorporated into the current PJM EMS model down to at least 100 kV. The model building will occur incrementally in the succeeding model builds leading up to the January 1, 2012 integration date.
- There will be one State Estimator solution for the PJM footprint.
- PJM will receive **Duke's** operational data through ICCP links from the **Duke** control room in Cincinnati.
- **Duke's** EMS will be the backup for generation dispatch in the event of communication problems with the PJM EMS via PJMnet.
- **Duke** will receive a GT (generation transfer) signal for backup AGC purposes.
- The PJM-calculated **Duke** control zone ACE will provide separate fleet regulation signals to the generators' EMS systems and any directly connected SCADA plant that participates in the regulation market.
- A Reactive Interface Analysis may need to be done to determine if any additional Reactive Interfaces are necessary.

2. Reliability Coordination

- PJM will take over responsibility for reliability coordination ("RC") for **Duke** as of the integration date of January 1, 2012. As the Reliability Coordinator for **Duke**, PJM has the authority to direct **Duke** operations, in accordance with the PJM Reliability Plan, NERC Standards, and good utility practice in order to preserve the reliability on the interconnection.

3. Emergency Coordination

- As the RC/TOP/BA, PJM will direct/coordinate emergencies (i.e. emergency conditions, TLR 5 events, restoration).

4. Congestion Management

- PJM will provide congestion management in accordance with the PJM Market, CM2 processes, and the NERC Transmission Loading Relief (TLR) Standard as per the JOAs.
- AFC coordination will be addressed through PJM's CM2 application as well as any other existing AFC processes adhered to by PJM.
- **Duke** and PJM must perform Flow gate studies to determine the updated flow gate list.
- Flowgate data will be exchanged per the processes defined between PJM and MISO

5. Dispatch

- PJM will economically dispatch the PJM RTO as a single, security constrained solution.
- PJM will direct all generation owners to redispatch, for most internal constraints.
- PJM Dispatch will include effective marginal losses.



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- Individual Generator Dispatch (IGD) signals will be sent to all generators within the Duke footprint upon integration into PJM.
- PJM Dispatch will have to consider flow gates outside of the PJM footprint as they do today.
- Transmission and generation operators will be PJM Certified before integration.

6. Checkout

- PJM will handle checkout for **Duke** footprint transactions.

7. eDART

1. Generator Outage Ticket

- a. Generators will need to comply with the rules set out for the following ticket types Forecasted Planned, Maintenance and Unplanned.
 - i. Forecasted Planned tickets will need to be submitted at least thirty days before the start of the outage to be considered Forecasted Planned. Forecasted Planned tickets are approved based on the amount of Available Reserve, Blackstart Scenario checkout, and are approved when not within the time period for Peak Period Maintenance season (for non- Hydro-Run of River units).
 - ii. Maintenance tickets are postpone-able to after the following Monday.
 - iii. Unplanned tickets are those that must happen at the time stated such as in the case of a unit trip.

2. Transmission Outage Ticket

- a. **Duke** will submit the tentative dates of all planned transmission outages of Reportable Transmission Facilities to PJM via eDART as far in advance as possible and update PJM at least monthly. For transmission outages exceeding five days, **Duke** shall use reasonable efforts to submit the planned outage schedule via eDART one year in advance but no later than the first of the month six months in advance of the requested start date along with a minimum of monthly updates.
- b. **Duke** is required to submit all outage requests in excess of 5 days in duration by the 1st of the month six months in advance of the start of the outage.
- c. **Duke** is required to submit all other outage requests by the 1st of the month prior to the month of the requested start date of the outage.
- d. Outages scheduled for the following Planning year (i.e. June 1 – May 31) exceeding 30 days in duration are to be submitted via eDART by February 1 for use in the annual FTR auction.
- e. As the Reliability Coordinator, PJM has the ultimate approval of transmission outage requests in order to maintain system reliability.
- f. **Duke** will designate an engineer responsible for support of PJM peak seasonal (OATF) and interregional assessments to ensure an accurate model reflective of expected upcoming system topology including both generator and transmission outages and upgrades.

3. Transmission Equipment Ratings Monitor (TERM)

- a. **Duke** will now be responsible for the semi-annual review of all equipment ratings (i.e. May and November)



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4. Overload Reporting
 - a. Reports will be adjusted to include overloads for **Duke**.
5. Instantaneous Reserve Check (IRC)
 - a. One new column for the control zone **Duke** will be added to the reports.
 - b. **Duke** generator owners will now be included as part of the IRC and will need to submit data for the IRC whenever one is called.
6. Minimum Generation Report (MinGen)
 - a. **Duke** generator owners will now be included as part of the MinGen and will need to submit data for the MinGen whenever a MinGen Event or Alert is called.
7. Status Reports (SR)
 - a. Current Status Report
 - i. The Interchange will be adjusted to no longer include **Duke**.
 - ii. All of the other values for the report will be adjusted to include **Duke**
 - b. Peak Status Report
 - i. The Interchange will be adjusted to no longer include **Duke**.
 - ii. All of the other values for the report will be adjusted to include **Duke**
 - c. Supplemental Status Report (SSR)
 - i. One new column for the control zones **Duke** will be added to the reports.
 - ii. **Duke** footprint generator and transmission owners will now be included as part of the SSR and will need to submit data for the SSR whenever one is called.
8. NERC Data

Duke will supply NERC SDX data as they progress through the levels of submission below, with level 1 being the initial level and level 3 being the ultimate result. There will be a period where they are in between levels 2 and 3. They will advance through these levels independent of each other.

 - i. Level 1 – **Duke** will continue to send their own pre-constructed SDX file to be appended to the PJM file
 - ii. Level 2 – They will be entering load forecast data into the Load Forecast form. This data will be merged with the MW Outage Generator Tickets and the Transmission Outage Tickets when sent to NERC.
 - iii. Level 3 - They will no longer need to enter Load Forecast data as it will be derived from other means (i.e. GDB, eMKT, eDART – Generator Tickets, and EES).
9. Restoration Data
 - a. Restoration plans in the event of an outage must be updated and coordinated by **Duke** and delivered to PJM.
 - b. **Duke** generator and transmission owners will now be included as part of the Restoration Drill and will need to submit data for the Restoration Drill whenever a Restoration Drill is called.



Billing and Settlement

1. Internal Energy Schedules

- Load serving entities will submit internal schedules using the PJM eSchedules application. Internal Schedules includes any schedules within the **Duke** and PJM boundaries.

2. MSET

- PJM will perform the Billing and Settlements functions for the **Duke** zone through the current PJM MSET application.
- The weekly and monthly billing cycles will be consistent with that of the remainder of the PJM membership
- Settlements and billing data will expand to include additional customers, eMTR accounts, energy schedules, and LMP nodes for the new buses, aggregates, and zones.
- There may be municipal entities that may choose to serve their load via point-to-point transmission service. (need to identify if there are any entities that currently serve their load in this manner)
- **Duke** zone settlements will reconcile Load Responsibility energy schedules on a two calendar month lag to be consistent with that of the remainder of the PJM membership
- PJM will distribute Market Settlements Reports via the MSRS application.
- PJM will calculate and distribute invoices for Transmission, Energy, Capacity, and Ancillary Services billing line items.
- Special Schedules (Joint-owned units, Dynamic Schedules, etc.) will be handled on a case by case basis and recorded via special case documentation.
- Market to Market allocation methodology remains the same.

3. Ancillary Services

- The **Duke** zone will be included in the RTO Regulation Market and will not be included in any reserve sub-zones (i.e., Mid-Atlantic).
- Generators will need to qualify units for the Regulation Market by providing past data to prove the generator can support regulation approximately 60 days before integration.
- Generators will need to qualify units for Black Start approximately 90 days before integration.
- PJM will select resources hourly to provide regulation and certain resources to provide synchronized reserve based on a co-optimization between energy, regulation and synchronized reserve. These hourly assignments may be updated in real-time via PJM. Hourly assignments will be communicated to owners/operators through the eMKT user interface. Intra-hour Regulation assignments will be communicated to owners/operators by the PJM generation dispatcher. Intra-hour synchronized reserve assignments will be communicated via dispatch signals.



Market Operations

1. Capacity - RPM

- **Duke** will submit Capacity Transactions and Load Contributions using the eRPM application. There will be a transition period following integration during which **Duke** will participate in RPM via an FRR plan. The FERC-filed integration agreement will document whether **Duke** participates in the RPM Base Residual Auctions following integration as opposed to waiting the minimum 5 years otherwise applicable to FRR entities.
- **Duke** will contract bi-laterally with capacity resource providers for capacity needed to meet their capacity obligations for the remainder of the 2011/12 delivery year and the entirety of the 2012/13 and 2013/14 delivery years.
- A new LDA will be established for the Duke transmission zone.
- The Reliability Assurance Agreement (RAA) will be updated to reflect changes due to **Duke** Market Integration.

2. ARR/FTR Allocations and FTR Auctions

- **Duke** footprint Network and Firm Point-to-Point transmission customers will participate in the annual allocation for ARRs effective on June 1, 2012. This allocation will be conducted approximately 3 months prior to when the ARRs become effective. ARRs allocated in this allocation may be directly converted into FTRs prior to the annual FTR Auction.
- A Special FTR Allocation will be conducted for the **Duke** zone since the integration date is not on the first of June. This special allocation of FTRs will cover the period of time between the implementation of the **Duke** zone on January 1, 2012 and the next Annual ARR Allocation in which the **Duke** zone actually integrates into PJM (ARRs effective for June 1, 2012).
- **Duke** pricing points will be available in the Annual, Long-Term and Monthly Balance of Planning Period FTR Auctions through eFTR beginning with the first auction after integration.

3. Markets

- **Duke** and generators in the **Duke** footprint will submit Generation / Demand Bids using the PJM eMKT application.
- There will be a single Energy Market.
- The inclusion of generators in the **Duke** footprint in the PJM wholesale energy markets will be based on PJM's current market rules.
- The timeline for clearing the market and posting the results for day ahead and real-time markets will remain the same based on Eastern Prevailing Time. All PJM Market applications assume EPT unless otherwise specified.
- Market trials will be conducted approximately two months prior to Market Integration.
- **Duke** and generators in the **Duke** footprint will join the PJM Balancing Authority as a separate Control Zone; PJM will assume BA Operations.



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- There will be one Area Control Error (ACE) for the PJM BA, any adjustments to the definition of PJM interface pricing points post-**Duke** integration will need to be determined based on the distribution factor analysis.
- There will be a single Duke transmission zone

4. Revenue Quality Metering

- The **Duke** utilities and the generators in the **Duke** footprint will submit Meter Data (Internal / External Ties to PJM and Generators) using the PJM eMTR application. If generator metering is only available on a plant basis, this limits the eMKT offer data for those generators to also be only on a plant basis.
- **Duke** will be incorporated into the single PJM Inadvertent calculation.

5. Locational Marginal Price

- **Duke** and the generators in the **Duke** footprint will be included in the single PJM energy market; and will have LMP.
- LMPs will include the effective marginal losses.

6. eData

- The contour map will be updated to include the **Duke** control zone within the PJM Control Area.

7. Market Monitoring

- Monitoring Analytics will perform the Market Monitoring functions for **Duke** and generators in the **Duke** footprint.

8. Demand Response

- PJM will administer economic and emergency demand response for market participants in the **Duke** zone according to the PJM rules.

Business Support

1. Control Documents

- PJM's tariff will require a compliance filing to include **Duke**'s rates.
- PJM Tariff (OATT) and Operating Agreement will need to be modified to accommodate the **Duke** integration.

2. PJMnet

- PJM will continue to use PJMnet for retrieving telemetry and SCADA data for **Duke**. Cincinnati control center links will be used to transmit EMS data to PJM.

3. Participant Readiness/Training Development

- PJM has developed a comprehensive approach to assist new PJM market customers with the integration of **Duke** into the PJM footprint. This approach consists of two parallel and complimentary efforts: Participant Readiness and Training Delivery.



Duke Integration Assumptions

- Participant Readiness includes distribution of relevant information, references to whitepaper and other PJM resources to provide details and requirements, and a customized checklist for each customer which highlights the major topics that need to be covered to prepare for integration.
- To facilitate the Participant Readiness process, PJM will establish client manager teams that will work with the various customer groups (i.e. Generation Owners, Load Servers, etc.) to conduct meetings, recommend training, and monitor progress.
- Training should continue with the objective of increasing customer comfort with PJM systems, processes, and markets. A comprehensive training schedule of in person classroom training will be developed for delivery within the **Duke** footprint. The schedule will include the following courses and programs. PJM 101, Load Serving Entity (LSE) Program (LSE 201, 202, 203, 204, 205), Market Operations Center Program (Generation 101, 201 and 301 and Operations 101), Local Control Center (LCC) Program (Transmission 101, 201, and Operations 101), System Restoration Workshop, and Market Settlements 301, Additional topics may be developed as needs are identified and delivered in person or via synchronous on-line training (WebEx). Additionally, asynchronous training, or on-line on-demand training, covering many of the above topics will be available on the PJM website or through the PJM LMS 24/7.
- Transmission and generation operational personnel who will be communicating with and carrying out directives from the PJM control center will need to be identified along with a company designated Training Liaison (role of the Training Liaison is outlined in Manual M-40). Information and assistance will be provided regarding PJM Certification for this audience. It will be necessary for this group to individually earn their PJM Certification credential (Transmission or Generation) prior to the integration date.
- **Duke** operators will need to maintain or acquire a NERC Certification (Transmission Operator, RC, or TO/BI) prior to integration in PJM.
- If necessary, an additional course will be developed for existing PJM members to provide an overview of changes and highlight specific business rule and application changes (if any) related to the **Duke** integration.
- The Dispatch Training system at PJM will be used to train dispatchers on the new systems. **Duke** will need to assist in training PJM System Operators on the nuances of the Duke system.

NERC and Regional Compliance

1. NERC Certification

- PJM will request from RFC and NERC that a certification team be constituted to certify PJM as the RC, TOP, and BA for the Duke footprint.
- Certification process will likely involve field visits to PJM and Duke as part of the process.
- The certification process will likely occur in late 2011, just ahead of the integration date.



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- PJM will need to demonstrate that it has the processes, tools, and properly trained personnel to execute the integration.
2. NERC Registration
 - Duke will drop its registration as a TOP and re-register as a TO as most of the existing transmission owning member of PJM have done.

Outage Planning

1. **Transmission Outage**
 - Prior to integration, transmission outages must be entered directly into eDART in accordance with the timing in the current PJM Transmission ticket outage rules highlighted in “System Operations” section 7.2 “eDART Transmission Outage Ticket” above.
 - As the Reliability Coordinator, PJM has the ultimate approval of transmission outage requests in order to maintain system reliability.
2. **Generation Outage**
 - Generators within the **Duke** control zone will enter generation outages directly into eDART 30 days prior to integration.

Membership & Credit

1. **Membership**
 - **Duke** and any entities operating within the Duke area must register as PJM transmission customer (point to point), member or affiliate 60 days prior to integration.

Stakeholder Process

- PJM will schedule Stakeholder meetings in the **Duke** service territory to discuss market integration timing and issues.
- PJM will utilize regularly scheduled Committee meetings to discuss and recommend or approve any necessary changes for **Duke** market integration. For example:
 - PJM Members Committee (MC) meeting to review OA and OATT changes
 - Markets and Reliability Committee (MRC) meeting to review and endorse Manual changes prior to MC review
 - Tariff Advisory meeting to review tariff changes
 - TOA-AC meeting to review any changes to transmission rates.
 - NERC OC approval of PJM Reliability Plan



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Risks

- Need to coordinate with **Duke** to ensure they are able to use their EMS systems as backup for generation dispatch in the event of communication problems with the PJM EMS via PJMnet.