



S&P 500	2,171	+25	+1.09
GlobalDow	1,104	+13	+1.14
Gold	1,965	+30	+1.53
Oil	77.56	0.09	0.12

POWER SUPPLY | GENERATION | FINANCIAL | MEMBER SERVICES | RISK MANAGEMENT | IT | SUSTAINABILITY

AMP/ODEC Presentation to MRC

January 24, 2019



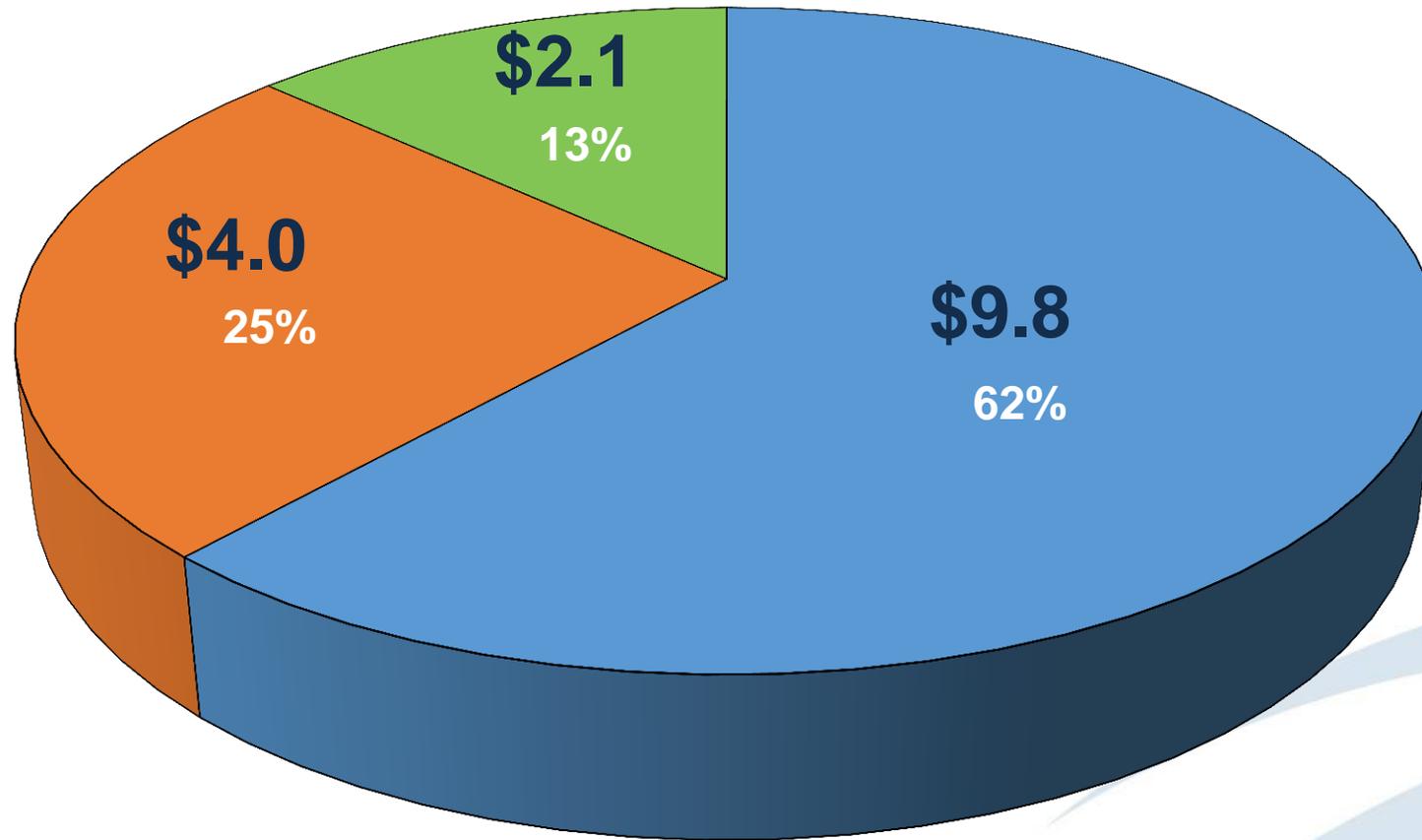
What TDUs and Customers Want?

- Consistent with FERC direction and principles of coordination, openness, transparency, information exchange and comparability:
 - the ability to ensure that planned facilities are indeed necessary and economical
 - transparent criteria, assumptions and models
 - meaningful opportunity for review and input
 - consistency and uniformity to the extent practical

AMP/ODEC Proposal

- Brought forth 7/26/18
- Result of Stakeholder Process efforts since 1/28/16
- Since then:
 - **\$9.8B** Supplemental Projects (**\$5.7B** in **2018**)
 - **\$4B** TO Baseline (**\$1.5B** in **2018**)
 - **\$2.1B** PJM Baseline (**\$0.56B** in **2018**)

Submitted RTEP Project Cost Since Jan 1-2017



■ Supplemental ■ TO Initiated ■ PJM Baseline

2018 Record Year!

- Total \$ of Supplemental Projects approaching Baseline (**\$26.2B** vs. **\$29.8B**)
- Highest Single Year Investment (**\$7.81B**)
 - **\$5.7B** Supplemental (**\$0.56B** PJM Baseline)
- **\$4.2B** in EOL Supplemental Projects
 - **219%** increase over **2017**
- 2018 Cost of PJM Baseline Projects were 2.8 times < 13 year average
- 2018 Cost of TO Baseline Projects were 3 times > 13 year average
- 2018 Cost of Supplemental Projects were also 3 times > 13 year average
- **93% Projects TO driven**
- <https://pjm.com/-/media/committees-groups/committees/teac/20190110/20190110-project-statistics-2018.ashx>

2.8.2 Assumptions Meeting

TOs provide overview of asset management program as they relate to end of life projects. Include **5 year look ahead** which will indicate whether there is the potential future replacements of specific equipment or group of equipment at a location, or any group of assets which may be the subject of concerns relating to specific equipment manufacturers, models, types, etc.

TOs provide (and PJM posts) all TO planning criteria, EOL models, criteria, and assumptions 20 calendar days in advance of scheduled SRRTEP or TEAC meeting. The TOs shall provide **sufficient information for stakeholders to be able to understand how assets will be prioritized for replacement, how the replacement versus maintenance decision is made, how assets rank relative to other assets on the system and the system average values. The level of detail will be sufficient to enable stakeholders to replicate the TO decision-making process for EOL facilities.** Dependent on the TO's process, to the extent available:

- a. Criteria must be **quantifiable and include details about associated criteria thresholds**. Each TO proposing EOL driven projects must have and share an **established, company-approved, public set of quantifiable criteria** that can be replicated by stakeholders.
- b. Provide **asset specific scoring criteria** (to facilitate prioritization during needs meeting(s))
- c. For developed criteria thresholds used to justify the replacement of an asset, the TO will provide **system level averages** specific to that type/class of asset to support their replacement decision. These system level averages will include but not be limited to any data inputs used to **rank and prioritize** an individual asset's replacement against another asset of same type/class located on the TO's system.

7/26/18 MRC

2.8.3 Needs Meeting

TO shall post identified criteria violations and needs no fewer than 10 days in advance of the Needs Meeting. Dependent on the TO's process, to the extent available:

- a. Criteria assessments must include at a minimum: **asset scoring data inputs, analysis, and final results**. All TO facilities need to continue to be part of the **overall system asset averages**.
- b. Drivers contributing to EOL determination (including performance, condition and risk) should be included. TOs will provide **quantifiable values** pertaining to what is driving facility's need to be replaced. These values must include system asset averages. As applicable, TOs shall provide **documentation developed of condition assessments** (e.g. photographs, field assessment reports, etc.).
- c. On an annual basis, the TOs must provide a **complete list of all assets** (CB, Transformer, **Line, Station, etc.**), **and their relative ranking from highest priority to lowest priority, and the** associated input data supporting their ranked priorities, in order to discuss prioritization rather than just dealing with individual projects.
- d. TOs provide **5 year annual forecast** of upcoming end of life projects based on currently known information.
- e. TOs must also **identify the specific company** that owns the asset and if the asset is currently a transmission or distribution asset, as well as what entity will be owning, operating and maintaining the replacement facility.
- f. When EOL transmission projects are replacing distribution assets, the TO also provides drivers to support a **transmission improvement over a distribution improvement**, including the supporting evidence that demonstrates the transmission alternative is lower in cost and/or the distribution alternative would not meet the needs. Finally, for any EOL project that is replacing a distribution facility, the TO must demonstrate that the distribution replacement need is imminent.

7/26/18 MRC

2.8.4 Solutions Meeting(s)

Dependent on the TO's process, to the extent available, only EOL solutions that include the following information should be brought forward for consideration:

- a. Asset specific EOL **scoring data** inputs, analysis, and final results;
- b. Asset specific EOL **priority ranking** relative to entire system under study; and,
- c. Asset specific EOL **Quantifiable values** pertaining to what is driving the replacement selection of the facility.

Alternative Project Solutions Meeting:

Only applies to those projects where alternatives have been identified.

Project Finalization:

The TOs shall share and post their proposed final solution no fewer than 10 days before the final Solutions Meeting. TOs shall provide justification and documentation for their selected solution.

2.8.5 Finalization of Projects for Local Plan

Each TO will submit to PJM EOL Projects that were finalized through the TEAC or Subregional RTEP committees from January through May for inclusion in the finalized PJM RTEP base case and Local Plan for that planning year.

Projects for the PJM RTEP and the Local Plan will not be final “finalized” until the conclusion of Dispute Resolution (if applicable).

9/13/18 Special MRC

1.4.5 End- of- Life Analyses

Maintaining the Transmission System also requires a ***transparent and replicable process*** for determining that a transmission facility should be replaced or subject to other capital improvement in accordance with good utility practice due to End (EOL) issues. The RTEP process shall incorporate TO planned Form 715 and Supplemental Projects in a manner that supports transparency and cost effective regional planning.

1.5.3 EOL Planning

The EOL decision making process is driven by each PJM Transmission Owner and memorialized through either a PJM Transmission Owner's FERC Form 715 criteria under the Operating Agreement, Schedule 6 or individual transmission owner local planning criteria under OATT, Attachment M-3. Such EOL criteria should include ***articulable objectives that are measurable and replicable and, to the extent available, quantifiable*** (e.g., asset replacement prioritization schedule). Such criteria should be provided by each TO to PJM for posting 30 days in advance of the assumptions meeting for the applicable RTEP cycle.

9/13/18 Special MRC

2.8 Supplemental Project Planning

Maintaining the Transmission System also requires a ***transparent and replicable process*** for planning Supplemental Projects in a manner that supports transparency and cost effective regional planning.

The planning process for Supplemental Projects (including projects required to address the end of life of existing facilities as determined in accordance with good utility practice and/or the PJM TO's M-3 assumptions) is driven by each PJM TO and follows the OATT Attachment M-3 process. Such Supplemental Project criteria should include ***articulable objectives that are measurable and replicable and, to the extent available, quantifiable*** (e.g., asset replacement prioritization schedule).

For each Supplemental Project, dependent on the TO's process and to the extent available, each PJM TO should: (i) identify the owner of the asset(s); and (ii) provide an ***asset-specific condition assessment*** (e.g., assessments, photographs, etc.) that supports the need and proposed solution for the Supplemental Project consistent with the TO's criteria.

12/11/18 Special MRC; 12/20/18 & 1/24/19 MRC

1.5.4 Supplemental Project Planning

The criteria driving the need for Supplemental Projects (which *could* include criteria to address end of *useful* life of existing transmission facilities as determined in accordance with good utility practice) are provided by each Transmission Owner consistent with the OATT Attachment M-3 process.

Supplemental Projects *should* be based on articulable criteria, models and guidelines that are measurable and, *to the extent available*, quantifiable (e.g. asset replacement prioritization) so stakeholders can replicate TO planning decisions and validate their proposed solutions.

In accordance with the coordination and transparency principles set forth in Order 890, for each Supplemental Project, *to the extent available*, each PJM TO *should*: (i) identify the owner of the asset(s); and (ii) provide an asset-specific condition assessment (e.g., assessments, outage history, operational challenges, etc.) that supports the need and proposed solution for the Supplemental Project consistent with the TO's models, guidelines or criteria. Also, each TO *should* provide the criteria, models, guidelines they utilized to identify the need and validate their proposed solutions so stakeholders can replicate their results.

AMP/ODEC Proposal Supported by M3:

M-3

- Preamble: This document provides additional details of the process that PJM and the PJM Transmission Owners will follow in connection with planning Supplemental Projects, as defined in section 1.42A.02 of the Operating Agreement, in accordance with Schedule 6 of the Operating Agreement. This process will only apply to Transmission Owners that plan Supplemental Projects.
- 2. Review of Assumptions and Methodology. In accordance with sections 1.3(d), 1.5.4(a), and 1.5.6(b) and 1.5.6(c) of Schedule 6 of the Operating Agreement, each Subregional RTEP Committee shall schedule and facilitate a minimum of one Subregional RTEP Committee meeting to review the criteria, assumptions, and models Transmission Owners propose to use to plan and identify Supplemental Projects (Assumptions Meeting). Each Transmission Owner shall provide the criteria, assumptions, and models to PJM for posting at least 20 days in advance of the Assumptions Meeting to provide Subregional RTEP Committee Participants sufficient time to review this information. Stakeholders may provide comments on the criteria, assumptions, and models to the Transmission Owner for consideration either prior to or following the Assumptions Meeting. The Transmission Owner shall review and consider comments that are received within 10 days of the Assumptions Meeting and may respond or provide feedback as appropriate.

AMP/ODEC Proposal Supported by OA:

Operating Agreement

- OA, Schedule 6, Section 1.54(c): The Office of the Interconnection also shall solicit from the Members, Transmission Customers and other interested parties, including but not limited to electric utility regulatory agencies within the States in the PJM Region, Independent State Agencies Committee, and the State Consumer Advocates, information required by, or anticipated to be useful to, the Office of the Interconnection in its preparation of the enhancement and expansion study, including information regarding potential sensitivity studies, modeling assumption variations, scenario analyses, and Public Policy Objectives that may be considered.
- 1.5.6 Development of the Recommended Regional Transmission Expansion Plan: (a) The Office of the Interconnection shall be responsible for the development of the Regional Transmission Expansion Plan and for conducting the studies, including sensitivity studies and scenario analyses on which the plan is based. The Regional Transmission Expansion Plan, including the Regional RTEP Projects, the Subregional RTEP Projects and the Supplemental Projects shall be developed through an open and collaborative process with opportunity for meaningful participation through the Transmission Expansion Advisory Committee and the Subregional RTEP Committees.

AMP/ODEC Proposal Supported by Prior FERC Direction

P77 2/15/18 Show Cause Order:

As a result, stakeholders are unable to use this information in the manner that Order No. 890 required that they be able to use it, including to “***replicate the results of planning studies and thereby reduce the incidence of after-the-fact disputes regarding whether planning has been conducted in an unduly discriminatory fashion.***” ***Without the ability to identify the underlying transmission needs identified in the planning studies performed by the PJM Transmission Owners, stakeholders will often be ill-positioned, or entirely unable, to provide timely and meaningful input on those needs or the transmission solutions proposed to meet those needs, at least when those needs and solutions are presented at the same time.***

“Useful”

- New term in the PJM arena
- Concern:
 - *Connotes accounting term associated with a depreciable life*
 - *Unnecessarily narrow; properly maintained facilities can last beyond their depreciable life*
 - *Unintended consequence of replacing facilities simply because they are fully depreciated*

“Useful”

- Not one of PJM presented cases defines “useful” life
 - 9 cited are referring to operational life
 - 3 cited are referring to accounting life
- Equal number of other FERC citations where “useful” life is an accounting term (see appendix)
- Without any context, the use of the phrase “useful life” lacks clarity and does nothing more than create confusion
 - Manuals are intended to provide clarity regarding the transmission planning process.

Useful

- Suggest removing “useful” when talking about end of life projects
- Alternatively, could replace “useful” with “operational” as the PJM TOs did in the FERC filing for the Show Cause Order, P4 Docket EL16-071 [...replacing equipment that has reached the end of its operational life...]
- Either way is acceptable to AMP/ODEC, but leaving “useful” is not acceptable

Questions?

Appendix

- Commission Guidance
- “Useful Life”
- Detail to Meaningfully Replicate Transmission Replacement Decisions
- Analysis of 2018 PJM Project Statistics

Commission Guidance

Commission Guidance

- **P73 2/15/18 Show Cause Order :**

Order No. 890's transparency principle "require[s] transmission providers to disclose to all customers and other stakeholders the basic criteria, assumptions, and data that underlie their transmission system plans." To comply with that requirement, transmission providers must "***reduce to writing and make available the basic methodology, criteria, and processes they use to develop their transmission plans.***" "This information should enable customers, other stakeholders, or an independent third party to ***replicate the results of planning studies*** and thereby reduce the incidence of after-the-fact disputes regarding whether planning has been conducted in an unduly discriminatory fashion.

Commission Guidance

- **P77 2/15/18 Show Cause Order :**

Based on this evidence, we find that the PJM Transmission Owners are implementing the transmission planning process for Supplemental Projects in a manner that is inconsistent with Order No. 890's transparency principle. ***The record indicates that, in practice, the PJM Transmission Owners are providing transmission planning information, including models, criteria, and assumptions, that is inadequate to allow stakeholders to replicate their planning studies, as Order No. 890 requires.*** In addition, we find that this information is often provided too late in the transmission planning process for stakeholders to participate before the PJM Transmission Owners have taken significant steps toward developing Supplemental Projects.

Commission Guidance

- **P77 2/15/18 Show Cause Order :**

As a result, stakeholders are unable to use this information in the manner that Order No. 890 required that they be able to use it, including to ***“replicate the results of planning studies and thereby reduce the incidence of after-the-fact disputes regarding whether planning has been conducted in an unduly discriminatory fashion.” Without the ability to identify the underlying transmission needs identified in the planning studies performed by the PJM Transmission Owners, stakeholders will often be ill-positioned, or entirely unable, to provide timely and meaningful input*** on those needs or the transmission solutions proposed to meet those needs, at least when those needs and solutions are presented at the same time.

Commission Guidance

- **P30 of September 26 Rehearing Order**
- FERC determined that the requests that AMP made were alternative solutions not needed to ensure compliance with Order No. 890.
 - “the list of purported defects more accurately constitutes a menu of alternative proposals, none of which is necessary to ensure compliance with Order No. 890.”
 - Our rehearing (at 19-requested: 1) FERC to require the TOs to demonstrate how assets have been prioritized for replacement, how the replacement versus maintenance decision is made, how assets rank relative to other assets on the system, and the system average values and the level of detail required by FERC Form 715, part 6 for Supplementals. A minimum of 2 solutions meetings, more time between meetings and for comments, and written responses from the TOS to questions.
- Not what we’re asking for here:
 - “Supplemental Projects should be based on articulable criteria, models and guidelines that are measurable and, to the extent available, quantifiable (e.g. asset replacement prioritization) so stakeholders can replicate TO planning decisions and validate their proposed solutions.”
 - “In accordance with the coordination and transparency principles set forth in Order 890, for each Supplemental Project, to the extent available, each PJM TO should: (i) identify the owner of the asset(s); and (ii) provide an asset-specific condition assessment (e.g., assessments, outage history, operational challenges, etc.) that supports the need and proposed solution for the Supplemental Project consistent with the TO’s models, guidelines or criteria. Also, each TO should provide the criteria, models, guidelines they utilized to identify the need and validate their proposed solutions so stakeholders can replicate their results.”

“Useful”

Useful

- “The useful life of an asset is an *accounting estimate* of the number of years it is likely to remain in service for the purpose of cost-effective revenue generation. The Internal Revenue Service employs useful life estimates to determine *the amount of time during which an asset can be depreciated*. There are a variety of factors that can affect useful life estimates, including usage patterns, the age of the asset at the time of purchase and technological advances.” www.investopedia.com/terms/u/usefullife.asp
- “The useful life concept as employed within a business does not necessarily reflect the entire lifespan of an asset; it may be sold off to a third party, which then continues to use the asset for an extended period of time. Thus, the useful life figure used by a business may be a subset of an asset's actual usage period.” www.accountingtools.com/articles/2017/5/11/useful-life

Useful

	Case	Use of “useful life”	Accounting or Operational?	Defined?
1.	Tex. E. Transmission, LP, 129 F.E.R.C. P61,014, 61060 (2009)	Action: Order Issuing Certificate and Approving Abandonment ¶ 21. Texas Eastern requests authorization to abandon by removal the existing natural gas-powered turbine and compressor at its Kosciusko Compressor Station which it alleges is out-dated, inefficient, and at the end of its useful life. The fuel used to power the existing unit is projected to be more expensive than the electricity needed to power the proposed new electric compressor. Accordingly, the Commission finds that approval of the requested abandonment is in the public interest.”	Operational	No – but context
2.	South Carolina Public Service Authority, 67 F.E.R.C. P62,098, 64168 (1994)	Action: Order Amending Transmission Line License “South Carolina Public Service Authority filed an application to replace an existing transmission line. The existing line is nearly 40 years old and has reached the end of its useful life. The transmission line is 27.6 miles long, originating at the switchyard bus of the Clark Hill Dam on the Savannah River and terminating at Santee-Cooper’s Aiken No. 1 substation. The line is 115 kV, 3-phase, 60-cycle, single circuit on wood pole H-frame structures.”	Operational	No- but context – 40 years
3.	Fraser Papers Inc., Flambeau Hydro, LLC, 89 F.E.R.C. P61,286, 61897 (1999)	Action: Order Granting Rehearing and Approving Transfer of Licenses Footnote 4: “As we noted in our prior order (87 at p. 61,692), citing our 1990 Decommissioning Policy Statement, it is the Commission’s policy to take a hard look at license transfer applications under circumstances in which the transferee’s financial resources are in question and there is reason to believe that the project may be approaching the end of its useful life. We have taken that hard look here, and have not found any significant physical infirmities or other problems that would cause us to believe that the projects are likely to face decommissioning during the term of the licenses. As discussed above, in the absence of a demonstrated need for significant construction investment, we are unwilling to use economic forecasting by itself as a basis for denying license authority or license transfer authority.”	Not clear – probably accounting	This case regards FERC’s examination of whether the transferee of a hydro license has sufficient financial resources to undertake ownership. The reference to useful life, in a fn, references whether the hydropower project has financial viability.
4.	S. Cal. Edison Co., 143 F.E.R.C. P62,177, 64464 (2013)	Action: Order Amending License ¶ 2. The existing 12-kV substation at Big Creek No. 3 was installed in the late 1950s. The substation has aged and is near the end of its useful life. The auxiliary devices such as the protective relays, meters and switches are also aging and facing obsolescence. In addition, most of the equipment and protective devices are no longer available or difficult to find replacement parts. Moreover, the substation lacks protection such that animal intrusion may cause electrical failures and resulting outages.”	Operational	No but context – installed in 1950s
5.	Ala. Power Co., 93 F.E.R.C. P62,239, 64451 (2000)	Action: Order Amending License Articles C. Proposed Action and Alternative 2. Alternative “The only viable alternative to the proposed action is no-action, which would be to deny the application to amend the license to upgrade the turbine runner. APC states that without the upgrade, the unit is nearing the end of its useful life. Breakdowns could lead to unplanned outages and inefficient operation of the project.”	Operational	No but context – breakdown, license issued in

Useful

	Case	Use of “useful life”	Accounting or Operational?	Defined?
6.	<p>Kimberly-Clark Tissue Co., 90 F.E.R.C. P62,163, 64221-64222 (2000)</p>	<p>Action: Order Amending License</p> <p>6a) “The Hydro-Kennebec Project consists of a dam, an impoundment, a head-gate/intake structure and a power canal leading to an old powerhouse that contains 11 generating units with an installed capacity of 3,730 kW, a forebay structure and another powerhouse containing 2 generating units with an installed capacity of 15,433 kW, and appurtenant facilities. The total installed capacity of the project is 19,163 kW. The old powerhouse is located at the end of the canal and has not been operating since 1998. The license indicated in its 1985 filing for a new license that it will retire the old powerhouse at the end of its useful life. In a letter dated August 28, 1998 to the Commission’s New York Regional Office, the licensee has indicated that the older generating units have reached the end of their useful life. The licensee shut down the old generating units and drained the canal leading from the gatehouse and headgate structure to the old powerhouse.”</p> <p>6b) (Pincite: 90 F.E.R.C. P62,163, 64224)</p> <p>“B. Purpose and Need for Action</p> <p>In general, the project licensee proposes to delete from the license an inoperable old powerhouse, containing 11 non-operating generating units, a wood-framed gatehouse, and a canal that connects a project headgate structure to the old powerhouse. The old powerhouse has an authorized capacity of 3,730 kilowatts (kW). The licensee proposes to reduce the installed capacity of the project from 19,163kW to 15,433 kW.</p> <p>The licensee states the older generating units, installed in the early 1900s, have reached the end of their useful life and are no longer needed for project operations. In 1998, the licensee ceased generating power from the old powerhouse, closed the canal headgate structure, and dewatered the canal.”</p>	Operational	No – but lots of context.
7.	<p>Public Serv. Co., 75 F.E.R.C. P61,111, 61382 (1996)</p>	<p>Action: Order Issuing New License</p> <p>“The evidence in the record before us indicates that the Ayers Island Hydroelectric Project is economically and physically sound. No party has requested that the project be decommissioned now or at any time in the foreseeable future, and no one has advanced any reason to expect that the project will reach the end of its useful life during the term of the new license. Thus, there is nothing in the record to support establishing a decommissioning fund.”</p>	Not clear	

Useful

	Case	Use of “useful life”	Accounting or Operational?	Defined?
8.	Duke Energy Ky., 149 F.E.R.C. P62,111, 64290 (2014)	<p>Action: Order Approving Abandonment</p> <p>“The pipeline segment to be abandoned by sale and conveyed to Duke Ohio (AM-1 River Crossing) originates at a pipeline valve in Kenton County, Kentucky, about 400 feet south of the Ohio River, and extends northward about 2,100 feet, under the river, to an interconnection with distribution facilities of Duke Ohio at a pipeline valve in Hamilton County, Ohio. It is part of Duke Kentucky’s Line AM-1 natural gas pipeline. Duke Kentucky states that AM-1 River Crossing was constructed in 1947 and was not included in the portion of Line AM-1 that was replaced in 1971. Consequently, the AM-1 River Crossing is approaching the end of its useful life and may need to be replaced in the future.</p> <p><i>Proposed Service Area</i></p> <p>Duke Ohio requests a Section 7(f) service area determination permitting it to enlarge or extend its facilities as described in their application without the need to apply to the Commission for further authorization. Duke Ohio states that its proposed service area will encompass the AM-1 River Crossing, the associated right-of-way and sufficient adjacent right-of-way to accommodate future replacement of the existing pipeline segment. Duke Ohio states that if the service area determination is granted, it will allow Duke Ohio to replace the line that is approaching the end of its useful life and thereby ensure continued reliable delivery of gas via the line to Duke Ohio’s distribution system.”</p>	Operational	No but described: “was constructed in 1947 and was not included in the portion of Line AM-1 that was replaced in 1971.”
9.	N. Am. Elec. Reliability Corp., 133 F.E.R.C. P61,008, 61030 (2010)	<p>Action: Order on Compliance Filing</p> <p>“¶ 38. The Commission rejects KCP&L’s proposal regarding a “grace period” for new cyber assets. With respect to newly installed assets, the Commission addressed this issue in Order No. 706, in which the Commission made clear that TFEs do not apply to future assets. The Commission found that “the justification for technical feasibility exceptions is rooted in the problem of long-life legacy equipment and the economic considerations involved in the replacement of such equipment before the end of its useful life.”</p>	Operational	No – but described: “when the legacy equipment... is supplemented, upgraded or replaced.” P38. This is the same as #12
10.	1980 FERC LEXIS 2425, *39 (1980)	<p>Action: Initial Decision on Justness and Reasonableness of Rate Increase</p> <p>“When a nuclear power plant reaches the end of its useful life, the owner cannot simply whistle in a commercial wrecker to swing an iron ball against the facade, reduce the structure to a pile of rubble, and cart the detritus off for disposal God Knows Where.”</p>	Operational	Can’t find. But context makes clear referring to operational performance.

Useful

	Case	Use of "useful life"	Accounting or Operational?	Defined?
11.	Consolidated Gas Supply Corp., 1 F.E.R.C. P63,003, 65027 (1976)	<p>"The curve was selected because it best fit Consolidated's experience with a prior extraction plant which had reached the end of its useful life in 1969. However, the old plant was an absorption-type plant, while the Hastings facility uses an entirely different, and much improved, technology -- a cryogenic process -- for extracting heavy hydrocarbons from the natural gas flow."</p>	Accounting	<p>This case presents a narrow skein of issues: whether the Commission should grant the requests of Consolidated Gas Supply Corporation, a jurisdictional pipeline, for an increase in the rates of depreciation of its transmission and underground storage plant and its products extraction plant, and, if so, what rates are appropriate and supported by the evidence under the criteria of the Court of Appeals decision in the <i>Memphis</i>.¹</p> <p>But, said the Court, the Commission may not do so simply on the ground that there is a growing shortage of gas or because the pipeline's reserve life index is declining. The Commission, said the Court, "must make affirmative findings that the exhaustion of natural resources has caused the useful life of this particular property to be reduced to the extent that physical life (of less expense to consumers) is no longer an appropriate measure of useful life."⁷</p> <p>The Commission must make a fair attempt to determine what future supply conditions for the particular pipeline will be before it can validly conclude that lack of adequate supplies have reduced the present useful life of the company's depreciable property, thereby warranting a higher rate of depreciation upon that property, the Court added. The Court summed up its conclusions as follows.¹⁰</p> <p>**2 * * * a reserve life depreciation rate must be based upon the useful life of the particular property involved. We therefore believe that it is the Commission's obligation to make some reasoned estimate of the useful life of the property *65023 here involved, even though to do so would no doubt require an estimate of future reserves.</p>

Detail Needed to Meaningfully Replicate Transmission Replacement Decisions

Detail Needed to Meaningfully Replicate Transmission Replacement Decisions

- October 19, 2017 TRPSTF
- Templates for Baseline and Supplemental Projects
 - Overall Project Description
 - Station Driven Performance Driven Projects
 - Station and Station Asset Condition Driven Projects
 - Transmission Line Rehab Projects

<https://pjm.com/-/media/committees-groups/task-forces/trpstf/20171025/20171025-item-06-baseline-and-supplemental-projects.ashx>

Transmission Owner, PJM region, Zone, Area,

Baseline Project: Description of Project

Problem Statement: PJM/NERC/TO Criteria violation and description

Criteria Violated: NERC or PJM or TO

XXXXX, list of all criteria violations and contingencies

XXXXX, Description of facilities, And first, second, third review, etc.. Reviewed date by previous subregional meeting(s)

Proposed Solution:

- Describe proposed solution for first presentation of the violation. . Provide the following details for line projects:
 - Current line rating: XXXMVA New line rating: XXXMVA
 - Current line conductor: XXXX, New line conductor: XXXX
 - Line loading percent for when new line is required by PJM to be in-service using worst contingency on transmission system.
 - Provide normal loading for new line
 - In-service loading: XX% [best guess on date if no firm date for first review]
 - 10 year loading: XX% [same here, best guess if firm date is not known]
 - Loading % “Deltas” changes on ALL facilities impacted by project.
 - Delta Loading Increase = MVA after projects – MVA before project
 - Delta Loading Decrease = MVA before project – MVA after project
 - Asset Class: Identify if overloaded facility is distribution or transmission based upon current owners accounting records. Identify if upgraded facility is distribution or transmission.

Estimated Project Cost: \$XX.X M [only show transmission costs that will be paid for under FERC rate]

Alternative Solutions:

- Description of Alternatives. Include a description of all options that can solve this type of problem such as a new line, line upgrade, capacitor bank, then let us know why these solutions were eliminated and the details on there feasibility & cost
- Provide line ratings, conductor and both loadings as above.

Estimated Project Cost: \$XX M (Estimate Class, Class 1-5)

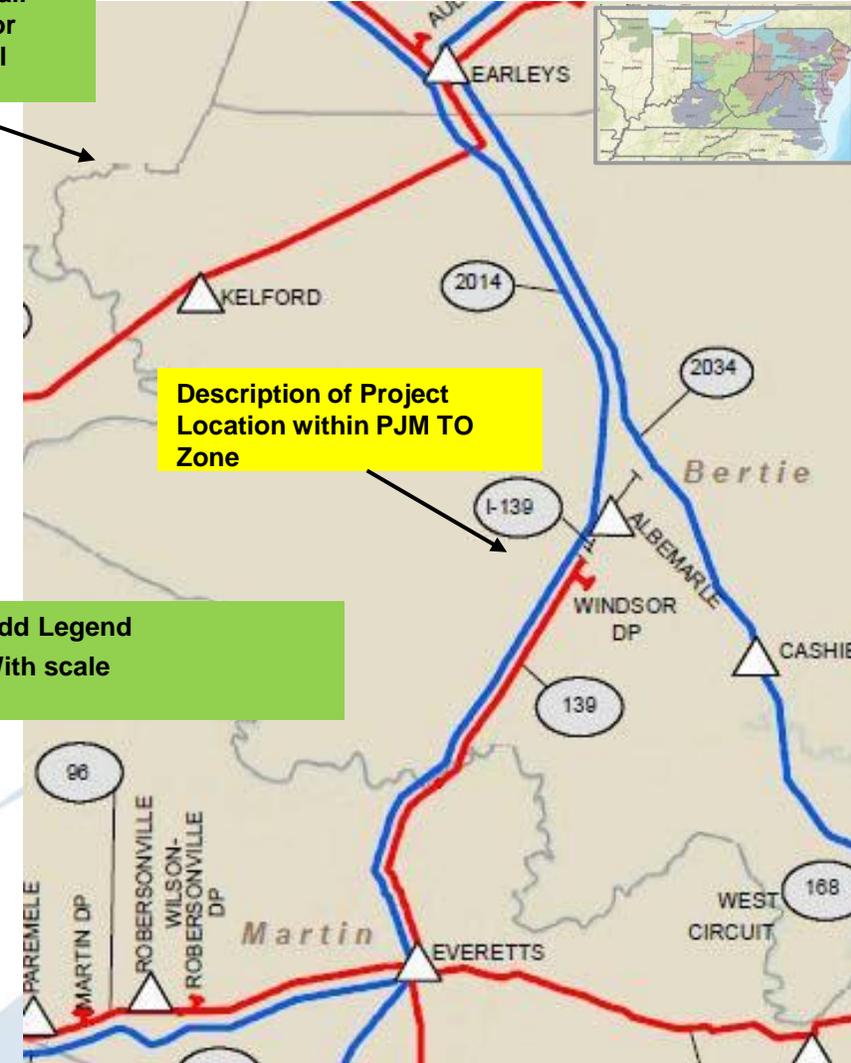
Possible IS Date Submitted by Designated Entity or Transmission Owner: XX/XX/XXXX

Required IS Date Identified by PJM: XX/XX/XXXX

PJM Determined Project Status: Conceptual, Engineering, Under Construction, Completed or whatever the categories are.

Associated Projects: list any other approved or proposed connected with these facilities or nearby (same line)

Add detailed map for all facilities mentioned for project with locational PJM map as shown.



Add Legend With scale

Transmission Owner, PJM region, Zone, Area,

Supplemental Project:

Problem Statement: Operational Performance/Reliability/Risk etc. Value used to determine

Criteria Violated: Local Utility Planning Guide reference, detailed description of primary driver's for project, detailed description of all other project drivers

Date Project Presented Previously at: XX/XX/XXXX Southern/Mid-Atlantic/Western RTEP

- Description of Project, ratings current and new, conductors, equipment, any contingency loadings or in-service loadings for lines and transformers.
- Any comments, data requests or action items resulting from first review of project at stakeholder meetings

Recommended Solution:

Description of solution and justification and decisions made by TO to determine this solution. Whether we use Potential Solution or Recommended Solution is up for discussion. Guess it would be Potential for first review, Recommended for second or other review.

Alternatives: Description or None. Include a description of all options that can solve this type of problem such as a new line, line upgrade, capacitor bank, then let us know why some of these were eliminated and the details of the feasible solutions, include cost break down, and one-line diagrams of alternative proposal.

Estimated Project Cost: \$XX M

Projected IS Date: XX/XX/XXXX

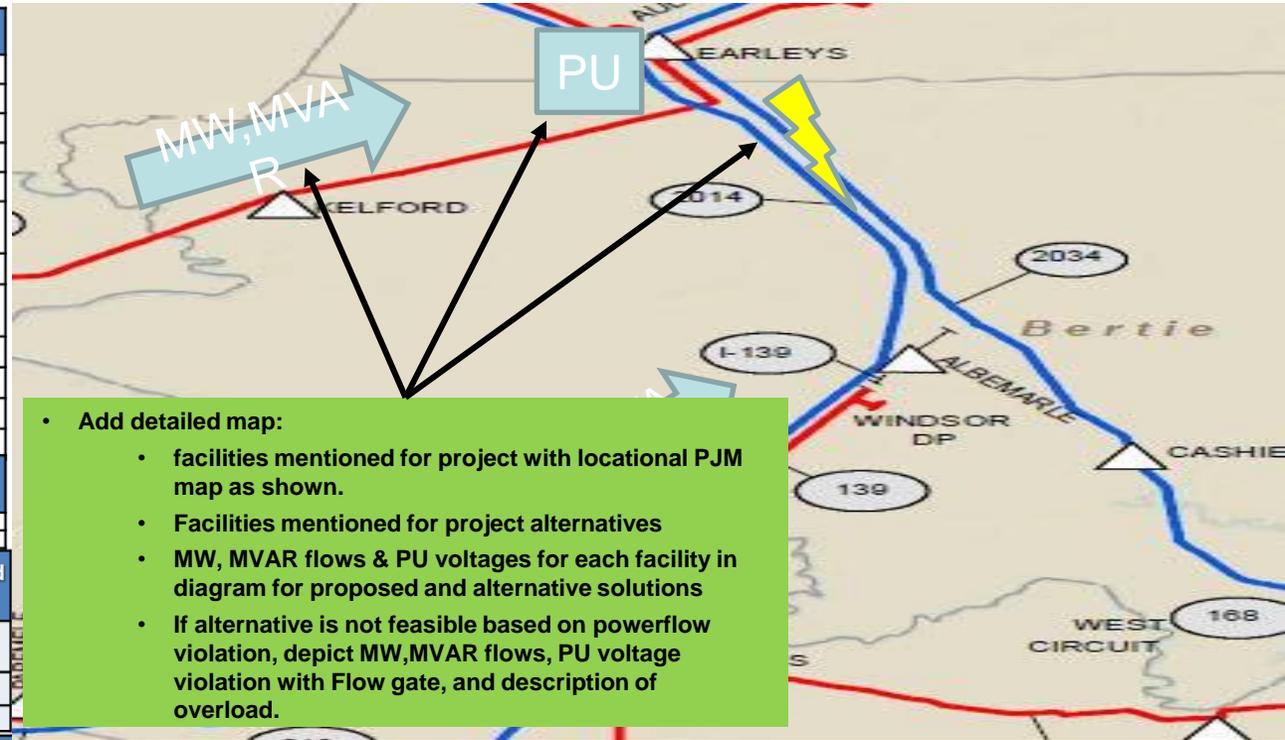
Project Status: Current status options.

Associated Projects: list any other approved or proposed connected with these facilities or nearby (same line), list of any other assets or facilities in the sounding? and their rehab/condition/performance/risk issues

Show current and proposed substation one lines so stakeholders can understand the reasoning behind the need for the re-design. Show substation location on TO map and PJM location map as typical. Show legend as needed to understand one-lines.

Transmission Owner, PJM region, Zone, Area,

Project Title											
Problem Statement											
Transmission Owner or Designated entity											
Supplemental/TO Baseline/ PJM Baseline											
Zone (Southern/Mid-Atlantic/Western, TEAC)											
Date Project Was Previously Presented											
Primary Project Driver (Description)											
For Rehab Driven (Tlines See Tline Section) (Station See Station Section)											
Description of impacted facilities											
Description of load delivery points served by impacted facilities and their ownership											
Drivers Accounting Class (Distribution, Transmission)											
Proposal Cost											
Proposal Need Date											
Proposal Targeted In-service Date											
"Individual" Stakeholder Comments	Comment	Organization	Date	Documented Response							
Power Flow Criteria		Criteria Description	Criteria Measure	Criteria Threshold	Simulated Value						
Bus, Branch, Facility, Equipment in Violation and/or Driver (PSSE bus Number, Branch Identifier)											
Contingency or Contingency Causing violation											
PJM's Verification of TO results											
Justification Driver											
Criteria Threshold	Probability of Failure Description	Impact of Failure Description	Risk of Failure Description	Age	Criticality Measure	Equipment Health Value	Historical Reliability Impacts	Historical Performance Measure	Maintenance (O&M)	Spare Part Availability, Software Compatibility, Vendor Support (Description)	Environmental and/or Safety Descriptions
Threshold	P(x)	I(x)	$P(x) * I(x) = R(x)$	Years	Peak Flow MWh Delivered Load Served Transformation	H(x)	CMI CI SAIDI SAIFI CAIDI Loss of Load	List of Outages Momentary Outage, Initiating Cause, Sustained Cause, Date List of Outages Permanent Outage, Initiating Cause, Sustained Cause, Date, Duration System Averages (T-SAIDI, T-SAIFI, T-SAIFI-S, T-MAIFI)	Maintenance Completed and Cost Maintenance Findings and Estimated Cost	Spares in inventory Number of similar assets on system	Description of Issue Number of these issues on the system
Written Description of All Area Issues and Needs											



- Add detailed map:
 - facilities mentioned for project with locational PJM map as shown.
 - Facilities mentioned for project alternatives
 - MW, MVAR flows & PU voltages for each facility in diagram for proposed and alternative solutions
 - If alternative is not feasible based on powerflow violation, depict MW, MVAR flows, PU voltage violation with Flow gate, and description of overload.

Transmission Owner, PJM region, Zone, Area,

**CEII Version
(One-Line Diagrams)**

**Photo Of Transmission
Line
Or Station**

Description of Proposed Solution			
Description of Proposed Project and Reasoning for Selecting Solution	Component Description	Estimated Component Cost	Component In-Service Date

Was Retirement Considered Why or Why not?	
Was rebuild considered: Why or Why not	

Proposed Facility Details				
Current Overloaded Line's Rate "A" Normal (MVA) , Rate "B" Emergency (MVA)			Rate A	Rate B
"Proposed" Line's Rate "A" Normal (MVA), Rate "B" Emergency (MVA)			Rate A	Rate B

Proposed & Impacted Facilities Analysis		
Description	Loading % Rate A	Loading % Rate B
"Proposed" Line's "% Loading System Normal (N-0)		

Analysis For: 5 Year Forward 10 Year Forward	Proposed Facility	N-1 Thermal Overload	Generation Deliverability Thermal Overload	Load Deliverability Thermal Overload	N-1-1 Thermal Overload	N-1 Voltage Drop	N-1 Voltage Magnitude	N-1-1 Voltage Magnitude	Any TO specific analysis and criteria	
	"Proposed" Line's/stations Highest "% Loading, lowest voltage, or largest voltage deviation for all study scenarios									
	Impacted Facilities	Branch 1.....N								
		Facility Name, To Bus, From Bus, ID	N-1 Thermal Overload	Generation Deliverability Thermal Overload	Load Deliverability Thermal Overload	N-1-1 Thermal Overload	N-1 Voltage Drop	N-1 Voltage Magnitude	N-1-1 Voltage Magnitude	Any TO specific analysis and criteria
		Existing Line's & Transformers with "% Changes greater than +- 40% for (N-0)								
		Existing Line's & Transformers crossing the 80% loading threshold for (N-0)								
		Existing Line's & Transformers crossing the 80% loading threshold for all study scenarios								
		Existing Line's & Transformers crossing the 80% loading threshold for all study scenarios								
		Existing station's PU change of more than 2%, or within 2% of TO criteria threshold								

*N/A for all none applicable fields

**Request Same Detail Above for Alternative Project Review

Transmission Owner, PJM region, Zone, Area,

Station Performance Driven Projects

Transmission Owner, PJM region, Zone, Area,

Performance Driven Projects Stations:

- Number of Forced Permanent Outage
 - Causes of each outage (Initiating cause and sustained cause)
 - Duration of each outage
- Number of Momentary Outages
 - Causes of each outage (Initiating cause)
- List of the Equipment Outages caused by each event
- Individual event details including number of customers impacted (CI) by each event
- Amount of recorded customer minutes of interruption (CMI) for each event
- Amount of load impacted by each event
- Amount of consequential generation loss due to outage (Generation served by the station)
- Event date & event time
- Calculated System (All voltage classes & each kV class) Average Availability Rate for, Assets Availability Rate
- System (All voltage classes & each kV class) Average values (TSAIDI, TSAIFI, TMAIFI, TSAIFI-S, IEEE SAIDI, IEEE SAIFI, IEEE CAIDI, Number of customers used to calculate SAIDI, SAIFI, CAIDI)
 - References: https://www9.nationalgridus.com/non_html/transmission_ntwk_perf_rpt2008.pdf
 - References: <http://grouper.ieee.org/groups/td/dist/sd/doc/Benchmarking-Results-2015.pdf>
 - Reference : <http://www.pjm.com/~media/committees-groups/committees/srtep-w/20170124/20170124-aep-transmission-owner-needs-guidelines.ashx>
- Station's performance ranking and overall ranking relative to all other station/Tlines in system
- Any and all other referenced inputs including but not limited to: Table #1 and Table #2
- Detailed description of how TO applies the data noted above, or any other data not included to determine EOL

*For each item listed use multiple sheets or (.xls) spreadsheet if required

Transmission Owner, PJM region, Zone, Area,

Station and Station Asset Condition Driven Projects

http://assets.fiercemarkets.net/public/smartgridnews/End_to_end_asset_health.pdf

https://www.satcs.co.za/Transformer_Oil_Analysis.pdf

Transmission Owner, PJM region, Zone, Area,

Station Condition Inspection Details: Station & Station Structures

- Date of last inspection
- Date condition was first identified and action taken when identified
- List of conditions identified (example: cracked foundations, rusted steel, damaged conductor terminations, missing grounds, broken insulators, cap-N-pin insulators, damaged capacitor cans, flooding/drainage issues)
 - Foundation conditions, number of foundation conditions and severity of conditions
 - Structural conditions, number of conditions, and severity of conditions (rusted, bent, rotten, cracked, split)
 - Grounding conditions, number of conditions, and severity of conditions
 - Insulation conditions, number of conditions, and severity of conditions (insulation type, crack, broken, deteriorated, failed)
- List of operational constraints associated with station
 - Abnormal conditions, date first identified
 - Known failed/Un-operable equipment, date first identified
 - Non-Functioning equipment, date first identified
 - Non-standard Electrical configurations, date configurations was installed
 - Site constraints (clearance issues, drive island concerns, known flooding issues, site access)
- List of safety issues at station
- Station obsolesce items
- Station vandalism reports (stolen grounds, break-ins, gun shots, etc.)
- Station ground assessment details.
- Station shielding
- Telecommunication, RTU needs (Mode of communications, bandwidth, fiber, cable, RTU type and maker, channel available, channels used, RTU install date)
- Relaying needs (relay type, electromechanical, static, microprocessor)
- List of all known conditions at a station and the station's relative condition ranking to all station on the system

*For each item listed use multiple sheets or (.xls) spreadsheet if required

https://www.satcs.co.za/Transformer_Oil_Analysis.pdf

http://assets.fiercemarkets.net/public/smartgridnews/End_to_end_asset_health.pdf

Transmission Owner, PJM region, Zone, Area,

Condition Driven Projects: Station Equipment “Transformers, Series & Shunt Reactors”

- **Transformers** (Values if used to assess transformers health or EOL or life expectancy)
 - All recorded test dates and their corresponding data listed below:
 - Date when recorded data first exceeded TO thresholds, action taken prior or date threshold exceeded
 - Past electrical test results if conducted
 - Core ground test result
 - Total combustible gas
 - Gas concentration levels and trending, (IEC 567)
 - Hydrogen (H₂) ppm, system average ppm
 - Methane (CH₄) ppm, system average ppm
 - Ethane (C₂H₆) ppm, system average ppm
 - Ethylene (C₂H₄) ppm, system average ppm
 - Acetylene (C₂H₂) ppm, system average ppm
 - Carbon Monoxide (CO) ppm, system average ppm
 - Carbon Dioxide (CO₂) ppm, system average ppm
 - Water concentration levels and trending (IEC 814)
 - Oil Dielectric Strength and trending (IEC 156)
 - Oil Acidity or Neutralization Numbers and trends (ATSM D971)
 - Interfacial Tension and trends (ASTM D971)
 - Calculated Likelihood of failure, risk of failure, and asset criticality, system averages for each of previously stated items
 - Health score and/or replacement score and/or remaining useful life
 - Recommend solutions and time lines provided by assessment software
 - Asset Age
 - O&M tasks completed on unit, date completed

*For each item listed use multiple sheets or (.xls) spreadsheet if required

http://assets.fiercemarkets.net/public/smartgridnews/End_to_end_asset_health.pdf

Show photo of each TF being replaced including name plate details

Transmission Owner, PJM region, Zone, Area,

Condition Driven Projects: Station Equipment “Circuit Breakers”

- Breaker “Accessories”
 - Function of cabinet, mechanism, and tank heaters
 - Number of hydraulic pump starts
 - Total accumulated run hours of the air compressor
 - Total accumulated run hours of the SF6 compressor
- Breaker “Dielectric”
 - Insulating oil dielectric strength
 - Rated voltage vs. applied voltage
 - Rated current vs. applied current
 - SF6, or oil moisture content, pressure, and purity
 - High-pressure SF6 moisture content, pressure, and purity
 - SF6 Density
- Breaker “Mechanical”
 - Closing time, velocity and acceptable limits
 - Trip time, velocity, trip coil currents and acceptable limits
 - Interpole close time, trip time deltas and acceptable limits
 - Resistor preinsertion time and acceptable limits
 - Total interrupter travel and acceptable limits
- Breaker “Wear”
 - Contact wear (switch operations) and acceptable limits
 - Main nozzle wear and acceptable limits
 - Auxiliary nozzle wear and acceptable limits
 - Contact resistance and acceptable levels
 - Interrupter wear and acceptable levels
- Breaker “Other”
 - Mechanism stored energy state
 - Motor current and run time
 - Time elapsed since last inspection, maintenance and overhaul
 - Breaker age
 - Breaker test or switch operations and acceptable limits
 - Breaker event operations “fault” interruptions
 - Breaker nameplate arc times
- Additional Values if used to make replacement decision
 - Risk of Failure and acceptable levels
 - Asset Criticality Values
 - Probability of failure and acceptable levels
 - Replacement score and maintenance score
 - Asset Health score, Remaining useful life
 - Forecasted Maintenance
 - Priority of asset replacement
 - List of all circuit breakers and their associated scores and rankings

**Show photo of
each CB being
replaced**

*For each item listed use multiple sheets or (.xls) spreadsheet if required

https://static.selinc.com/assets/Literature/Publications/Technical%20Papers/6772_RealTime_RS_20170130_Web.pdf?v=20170404-145043

Transmission Owner, PJM region, Zone, Area,

Risk Driven Projects: Stations

- **Transmission Lines or Substation** (Values if used to assess transmission lines risk, EOL or life expectancy, only if used in TO's assessment)
 - Calculated probability of failure with detailed inputs
 - Associated impact values used to calculate risk
 - Customers impacted
 - Load Impacted
 - System impacts
 - Generation Impacts (Per Planning Model)
 - Expected energy not delivered
 - Dynamic reactive devices impacted and their MVA
 - Number of stations with voltage sags
 - Number of tie line interconnections interrupted
 - Arming of SPS scheme's due to stability or thermal constraints
 - Number of real time operational constraints resulting in load drop warnings
 - Any impacts not listed above
 - List of all stations and their associated Risk scores and risk rankings

*For each item listed use multiple sheets or (.xls) spreadsheet if required

https://www.satcs.co.za/Transformer_Oil_Analysis.pdf

http://assets.fiercemarkets.net/public/smartgridnews/End_to_end_asset_health.pdf

Transmission Owner, PJM region, Zone, Area,

Transmission Line Rehab Driven Projects

Transmission Owner, PJM region, Zone, Area,

Performance Driven Projects Transmission Lines:

- Number of Forced Permanent Outage
 - Causes of each outage (Initiating cause and sustained cause)
 - Duration of each outage
- Number of Momentary Outages
 - Causes of each outage (Initiating cause)
- List of the Equipment Outages caused by each event
- Individual event details including number of customers impacted (CI) by each event
- Amount of recorded customer minutes of interruption (CMI) for each event
- Amount of load impacted by each event
- Amount of generation impacted
- Event date & event time
- Calculated System (All voltage classes & each kV class) Average Availability Rate for, Assets Availability Rate
- System (All voltage classes & each kV class) Average values (TSAIDI, TSAIFI, TMAIFI, TSAIFI-S, IEEE SAIDI, IEEE SAIFI, IEEE CAIDI, Number of customers used to calculate SAIDI,SAIFI,CAIDI)
 - References: https://www9.nationalgridus.com/non_html/transmission_ntwk_perf_rpt2008.pdf
 - References: <http://grouper.ieee.org/groups/td/dist/sd/doc/Benchmarking-Results-2015.pdf>
 - Reference: <http://www.pjm.com/~media/committees-groups/committees/srtepw/20170124/20170124-aep-transmission-owner-needs-guidelines.ashx>
- Tline's performance ranking and overall ranking relative to all other Tlines in system
- Any and all other referenced inputs including but not limited to: Table #1 and Table 2

*For each item listed use multiple sheets or (.xls) spreadsheet if required

Transmission Owner, PJM region, Zone, Area,

Condition Driven Projects: Transmission Lines

- Date maintenance was last perform (per structure basis, and on entire asset)
- Asset Age
 - List of each structure's age associated
 - Total count of all structure
 - Conductor used on each span and conductor age
 - Identified data gaps and/or missing data
- Asset Design
 - Material comprising structure (Steel, Aluminum, Wood, Concrete, Composite, Underground)
 - Structure design (Monopole, H frame, Lattice)
 - Cross arm material (Wood, Steel: if applicable)
 - Insulators (Glass, Porcelain, composite)
 - Shielding features of each structure (Double/single shield wire, OPGW, structure grounded Y/N)
 - Grounding status of each structure and ground resistance
- Condition List
 - Detailed description of each condition including component and condition
 - structure or span associated with each condition
 - geographic location of condition
 - severity of condition, date that condition was first identified, date of last inspection
 - Any additional known defects with structure design or components comprising structure
- Asset's condition ranking and asset's ranking overall as compared to the all other T-line in the system

*For each item listed use multiple sheets or (.xls) spreadsheet if required

https://www.satcs.co.za/Transformer_Oil_Analysis.pdf

http://assets.fiercemarkets.net/public/smartgridnews/End_to_end_asset_health.pdf

Show photo of each condition being addressed including pole/structure tag

Transmission Owner, PJM region, Zone, Area,

Risk Driven Projects: Transmission Line and Stations

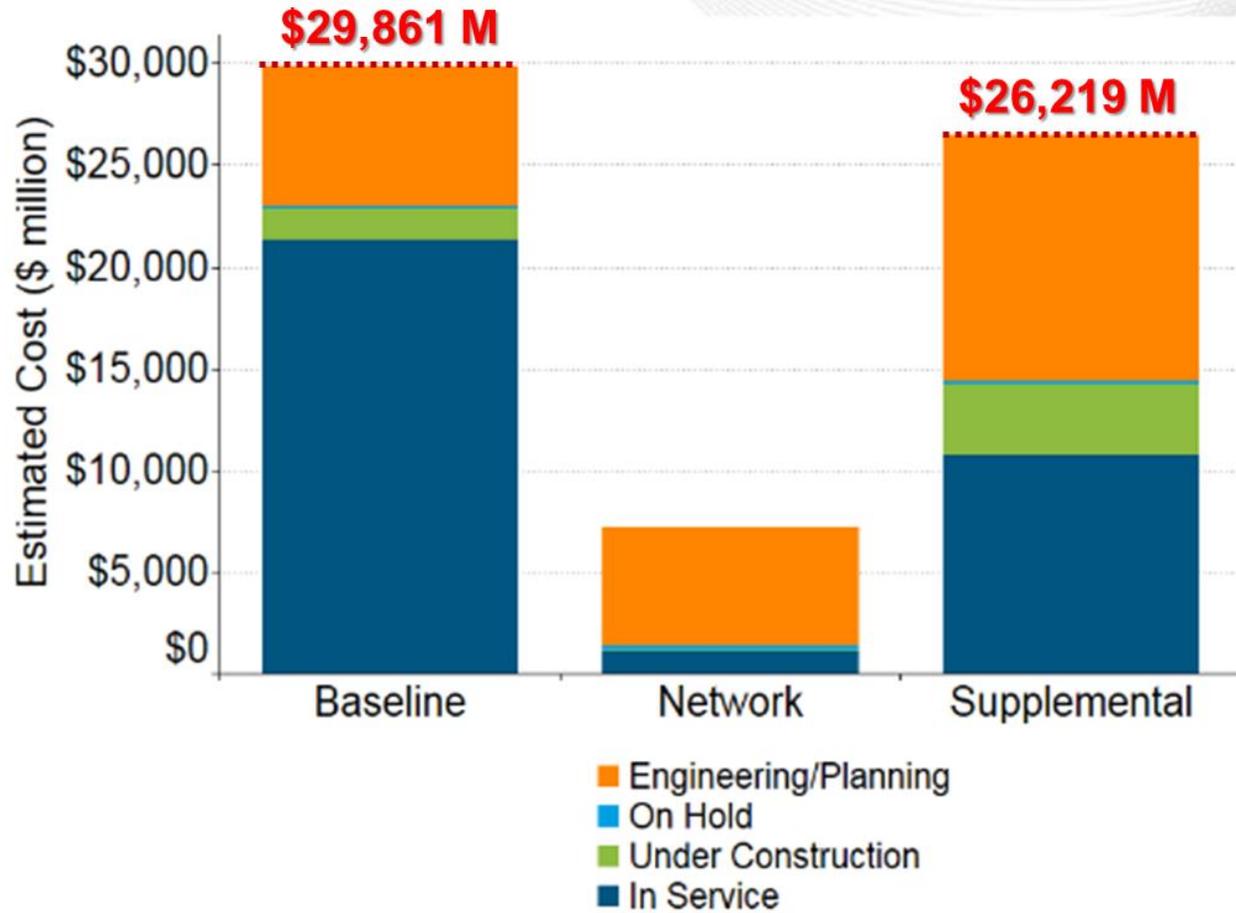
- **Transmission Lines or Substation** (Values if used to assess transmission lines risk, EOL or life expectancy only if used in TO's assessment)
 - Calculated probability of failure with detailed inputs
 - Associated impact values used to calculate risk
 - Customers impacted
 - Load Impacted
 - System impacts
 - Generation Impacts
 - Expected energy not delivered
 - Dynamic reactive devices impacted and their MVA
 - Number of stations with voltage sags
 - Number of tie line interconnections interrupted
 - Arming of SPS scheme's due to stability or thermal constraints
 - Number of real time operational constraints resulting in load drop warnings
 - Any impacts not listed above
 - List of all stations or lines and their associated Risk scores and risk rankings

*For each item listed use multiple sheets or (.xls) spreadsheet if required

https://www.satcs.co.za/Transformer_Oil_Analysis.pdf

http://assets.fiercemarkets.net/public/smartgridnews/End_to_end_asset_health.pdf

Analysis of 2018 PJM Project Statistics



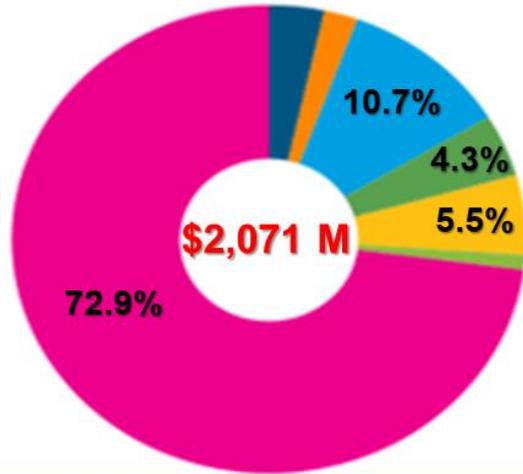
	Baseline	Network	Supplemental
Engineering/Planning	\$6,926	\$5,800	\$12,037
On Hold	\$162	\$208	\$155
Under Construction	\$1,494	\$36	\$3,541
In Service	\$21,307	\$1,133	\$10,707
Grand Total	\$29,889	\$7,177	\$26,440

The total dollar amount for Supplemental Projects is approaching the total amount of Baseline Projects



New Projects in 2018 Project Drivers

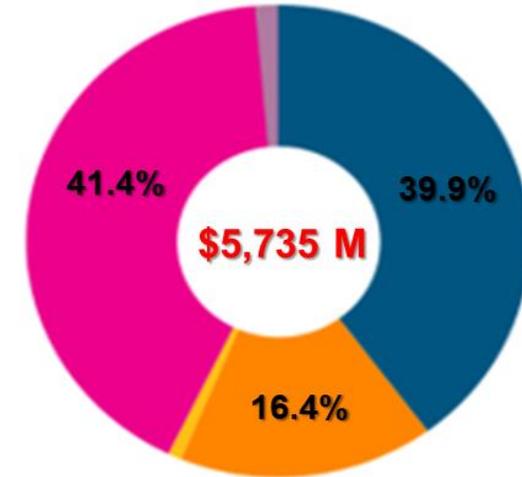
Estimated Cost of Baseline Projects Approved by PJM Board



- PJM's Baseline Projects 7.2%
- TO's Baseline Projects 19.3%
- TO's Supplemental Projects 73.5%

**2018 Set a New PJM Record for
the Highest Amount of Proposed
Transmission Investment
\$7,805 M**

Estimated Cost of Supplemental Projects Presented by TOs to the TEAC

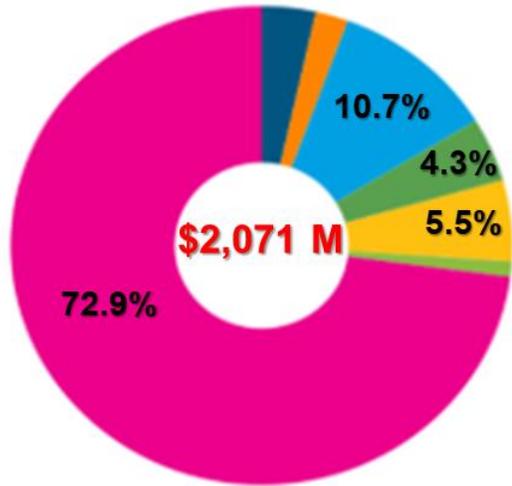


Baseline Load Growth Deliverability & Reliability	\$72
Congestion Relief - Economic	\$44
Generator Deactivation	\$221
Not Specified	\$90
Operational Performance	\$113
Short Circuit	\$22
TO Criteria Violation	\$1,509

Equipment Material Condition, Performance and Risk	\$2,287
Operational Flexibility and Efficiency	\$942
Customer Service	\$49
Other	\$1
Multiple Drivers	\$2,377
Null	\$79



Estimated Cost of Baseline Projects Approved by PJM Board

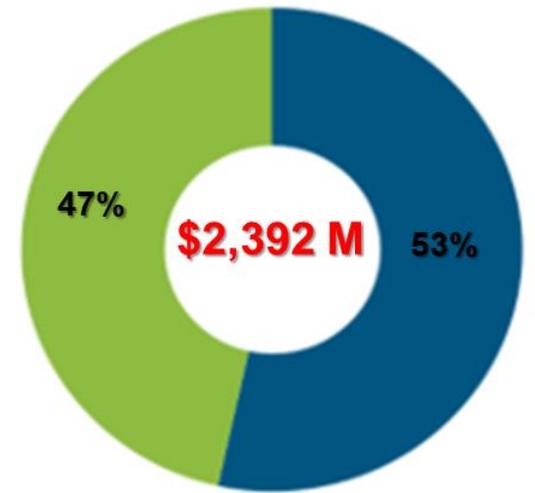


Baseline Load Growth Deliverability & Reliability	\$72
Congestion Relief - Economic	\$44
Generator Deactivation	\$221
Not Specified	\$90
Operational Performance	\$113
Short Circuit	\$22
TO Criteria Violation	\$1,509



New Projects in 2018 Baseline Project Drivers Estimated Cost of Baselines Projects Driven by TO Criteria Violations

- **53% of TO “Criteria Violation” 2018 Baseline Projects were associated with End-of-Life Drivers**
- **39% of all 2018 Baseline Projects**



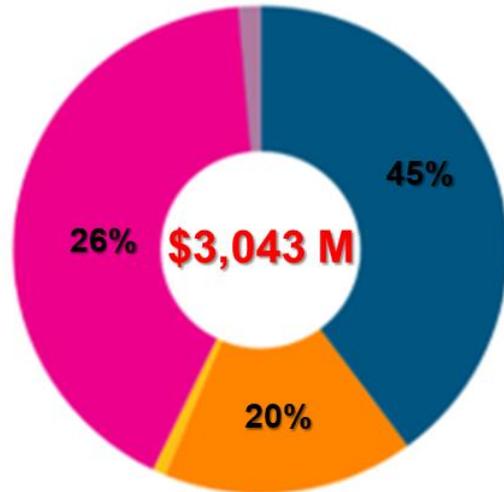
Aging Infrastructure	\$807
Other TO Criteria	\$702





New Projects in 2018 Supplemental Project Drivers

Estimated Cost of Supplemental Projects Presented by TOs to the TEAC



Estimated Cost of Supplemental Projects with Multiple Drivers



- 72.8% of 2018 TO Proposed Supplemental Projects were associated with End-of-Life Drivers

\$ 4.173 B

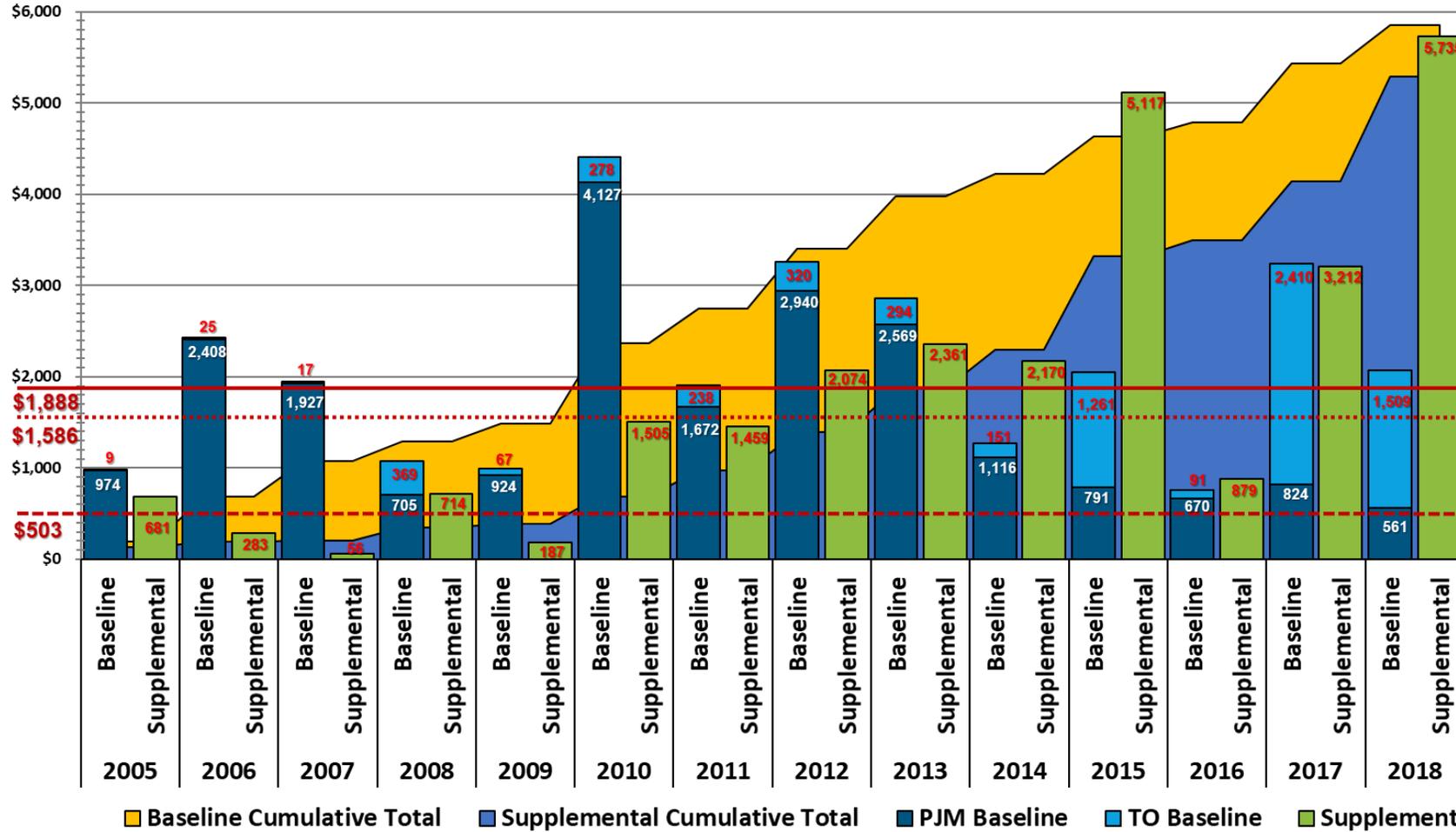
Increase of 219% Compared to 2017

Equipment Material Condition, Performance and Risk	\$2,287
Operational Flexibility and Efficiency	\$942
Customer Service	\$49
Other	\$1
Multiple Drivers	\$2,377
Null	\$79

Equipment Material Condition, Performance and Risk / Customer Service	\$105
Equipment Material Condition, Performance and Risk / Infrastructure Resilience	\$532
Equipment Material Condition, Performance and Risk / Infrastructure Resilience / Customer Service	\$0
Equipment Material Condition, Performance and Risk / Operational Flexibility and Efficiency	\$1,246
Equipment Material Condition, Performance and Risk / Operational Flexibility and Efficiency / Customer Service	\$391
Equipment Material Condition, Performance and Risk / Operational Flexibility and Efficiency / Infrastructure Resilience	\$1
Operational Flexibility and Efficiency / Customer Service	\$99

Baseline & Supplemental Projects By Year 2005-2018

*TO Driven Project (%)



- 2005: 41%
- 2006: 11%
- 2007: 4%
- 2008: 61%
- 2009: 22%
- 2010: 30%
- 2011: 50%
- 2012: 45%
- 2013: 51%
- 2014: 68%
- 2015: 89%
- 2016: 59%
- 2017: 87%
- 2018: 93%

2005-18 Averages:

- PJM Baseline
- TO Baseline
- Supplemental

*TO Driven Project (%) = (TO Baseline + Supplemental) / (PJM Baseline + TO Baseline + Supplemental)