T-D Interconnections: Best Value Planning White Paper

Updated January 2016

1. Purpose

This paper defines the process and criteria that together constitute joint best value planning (BVP) between ATC and its customers. BVP completed as a joint effort between ATC and its customers is essential to ensuring the most appropriate solution selection and implementation for ATC's customers, the electric grid and other impacted stakeholders.

2. Background

According to Attachment FFATCLLC of the Midcontinent Independent System Operator, Inc. Open Access Transmission, Energy and Operating Reserve Markets Tariff ("Tariff"), ATC has an obligation to a party that requests a distribution interconnect to engage in BVP. This document discusses roles and responsibilities among ATC and its customers in satisfying this obligation.

3. Reference

ATC Load Interconnection Guide seen at http://www.atcllc.com/customer-relations/connecting-to-the-grid/

4. Definitions

Best Value Planning (BVP): Through the use of this coordinated joint planning process, the intent is to select an electrical solution (best value solution) that meets performance criteria, while minimizing overall rate impact to end-use customers, in a manner that addresses the concerns of the impacted stakeholders.

T-D Interconnections: Transmission to distribution connections on the transmission grid.

Local Distribution Company (LDC): An entity receiving transmission service from the ATC transmission system at a nominal voltage level ≥50 kV.

Regional Reliability Organization (RRO): The regional council that governs transmission system reliability planning and operating criteria.

Electric Reliability Organization (ERO): The successor to NERC that delegates compliance reliability efforts to the RROs.

End-use customer: The retail or wholesale customer served by the LDC.

Initiator: The LDC that begins the planning process in order to meet its system needs. For network projects this will be ATC.

Load Interconnection Request Form (LIRF): Form available on ATC's Customer Relations, Connecting to the Grid page (http://www.atcllc.com/customer-relations/connecting-to-the-grid/) to be completed by the LDC when a new or changed interconnection is expected.

Load Interconnection Queue: Located on the ATC Connecting to the Grid webpage as a reference for all LIRFs submitted and deemed complete, listing pertinent project information.

5. Process

The BVP process and steps can be seen in Appendix A: Best Value Planning Process Map. This process will be used as a basis for Economic or Unforecasted load projects; however, planning studies for these types of projects will be initiated in an expedited manner through the Customer Relations and Interconnection Services departments at ATC using the Economic Development Process. Modifications may be made to the process to accommodate the need of the request.

5.1. Applicability

The BVP process shall be initiated for all project types discussed below. However the level of assessment will differ based on project type (as described below in Section 5.2 and Appendix C). Types of LDC load interconnection projects requiring BVP include:

1. A new LDC substation interconnecting to the ATC transmission system
2. Upgrading of an LDC substation transformer interconnected to the ATC transmission system
3. LDC substation expansion (for example: additional feeders, a new control house or anything that may change the common facilities agreement)
4. LDC substation rebuild
5. Change in LDC substation transformer protection
6. Addition or removal of capacitor banks
7. Addition, removal, or modification of distribution connected generators (greater than 1 MW accumulative)
8. Addition of unforecasted load (this type of project will use the Economic Development process)

5.2. Initiation and Evaluation

The BVP Process will be initiated with the submittal of a LIRF, notifying ATC of a future LDC – initiated project that may affect ATC facilities. If there is question as to whether a LIRF is needed, ATC Planning or Interconnection Services should be contacted. Once a LIRF is submitted ATC will evaluate completeness of the form. If complete, ATC will route internally to start the identification of the impact on the ATC transmission system, determining the type of BVP necessary for the proposed project (see Section 6 and Appendix C). Process steps to be completed after a completeness determination is made can be seen in Appendix A. Appendix D contains the LIRF Support Document which can assist in answering the Project Characteristic questions on the LIRF.

While the BVP process does not formally start until a LIRF is submitted and complete, the LDC's are encouraged to engage in planner-to-planner discussions and project-specific conceptual planning meetings as early as practical to assist in the development of alternative solutions for any electrical system project that may have significant impact on other electrical utilities in the study area. Early discussion is especially important where LDC-initiated projects may require a significant lead time to put into service. Joint planning discussions are facilitated by several vehicles of communication between ATC and its customers (see 5.3 below).

ATC maintains the load interconnection queue as a reference to facilitate mutual understanding between ATC's capabilities and its customer needs. Since it is advantageous to manage all stakeholders' expectations clearly and consistently as early as possible in the planning effort, ATC can include projects (even pre-LIRF) in

the queue as early as desired; however, only projects with a complete LIRF will be published to the public queue and are those projects that ATC will take action on.

5.3. Communication

Cooperative BVP requires frequent and open communication between ATC and the LDC from the earliest stages of project conception to formalization of the selected best value solution via a project commitment agreement (PCA). Such joint planning will be most effective by making the best use of the following communication mechanisms and tools:

1. Meetings as listed in the BVP Process Map in Appendix A (scoping discussions, team meetings during transmission analysis, etc.)
2. Personal ATC planner to LDC planner discussions
3. Quarterly planning meetings between ATC and each of its shareholder customers
4. Planning dialogue meetings among ATC and its shareholder customers
5. ATC's 10-year assessment, published semi-annually
6. ATC's load interconnection queue posted to ATC's Customer Relations, Connecting to the Grid page (http://www.atcllc.com/customer-relations/connecting-to-the-grid/)

5.4. Completion

The culmination of a joint BVP will typically be a BVP scoping report – depending on the BVP assessment type (see Section 6 and Appendix C). This report will provide details of the distribution and transmission analysis performed and the distribution and transmission alternatives that were studied. The report will be reviewed and signed by both parties and is essential for preparing any necessary internal approvals and/or regulatory submittals. It will form the basis for continued detailed scope development and ultimately the Project Commitment Agreement (PCA) between the LDC and ATC in order to implement the project. The report will ultimately represent an agreed upon best value solution with sufficient details necessary to enable the affected party to make appropriate budget provisions in order to ultimately meet the initiator's projected in-service date. Information provided in the LDC distribution report will be incorporated into the BVP scoping report. A guide for information that should be included in the LDC report can be seen in Appendix B.

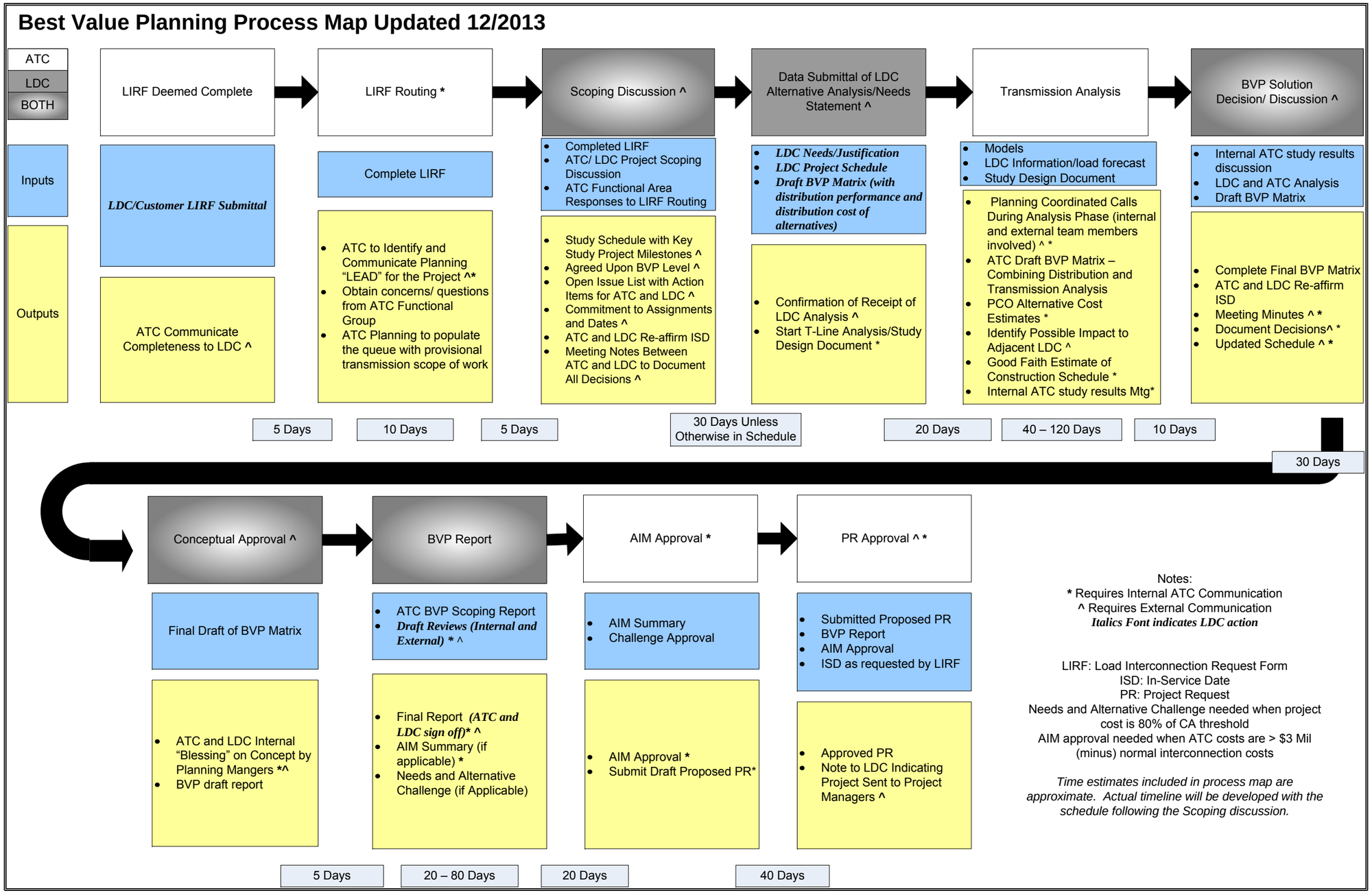
6. Best Value Planning Assessment Type and Criteria

The BVP assessment type will vary for each proposed project depending on the needs identified and the possible solutions identified to address those needs. The Best Value Planning Assessment Type Table in Appendix C is meant to be used as a guide as to the extent of analysis and documentation which is needed within each BVP assessment type.

Transmission system performance criteria are governed by the Midwest Reliability Organization, ReliabilityFirst Corporation, and NERC. Although some of these requirements are voluntary at this time, many others have become mandatory requirements due to their approval by the FERC under the Energy Policy Act of 2005. Thus, transmission system performance criteria cannot be changed; therefore making it a high priority for any joint BVP assessment.

Distribution system planning and performance criteria are governed by applicable state statutes and are typically restricted to point of use voltage requirements. Reliability indices are often used for distribution utility corporate targets and are an acceptable system performance metrics to use in BVP. If additional LDC planning and/or operational criteria are used in LDC decision making, it should also be included in BVP.

Appendix A Best Value Planning Process Map


Best Value Planning Process Map Updated 12/2013
ATC
LDC
BOTH
Inputs
Outputs
LIRF Deemed Complete
LIRF Routing *
Scoping Discussion ^
Data Submittal of LDC Alternative Analysis/Needs Statement ^
Transmission Analysis
BVP Solution Decision/ Discussion ^
LDC/Customer LIRF Submittal
ATC Communicate Completeness to LDC ^
Complete LIRF
ATC to Identify and Communicate Planning "LEAD" for the Project ^*
Obtain concerns/ questions from ATC Functional Group
ATC Planning to populate the queue with provisional transmission scope of work
Completed LIRF
ATC/ LDC Project Scoping Discussion
ATC Functional Area Responses to LIRF Routing
Study Schedule with Key Study Project Milestones ^
Agreed Upon BVP Level ^
Open Issue List with Action Items for ATC and LDC ^
Commitment to Assignments and Dates ^
ATC and LDC Re-affirm ISD
Meeting Notes Between ATC and LDC to Document All Decisions ^
LDC Needs/Justification
LDC Project Schedule
Draft BVP Matrix (with distribution performance and distribution cost of alternatives)
Confirmation of Receipt of LDC Analysis ^
Start T-Line Analysis/Study Design Document *
Models
LDC Information/load forecast
Study Design Document
Planning Coordinated Calls During Analysis Phase (internal and external team members involved) ^ *
ATC Draft BVP Matrix – Combining Distribution and Transmission Analysis
PCO Alternative Cost Estimates *
Identify Possible Impact to Adjacent LDC ^
Good Faith Estimate of Construction Schedule *
Internal ATC study results Mtg*
Internal ATC study results discussion
LDC and ATC Analysis
Draft BVP Matrix
Complete Final BVP Matrix
ATC and LDC Re-affirm ISD
Meeting Minutes ^ *
Document Decisions^ *
Updated Schedule ^ *
5 Days
10 Days
5 Days
30 Days Unless Otherwise in Schedule
20 Days
40 – 120 Days
10 Days
30 Days
Conceptual Approval ^
BVP Report
AIM Approval *
PR Approval ^ *
Final Draft of BVP Matrix
ATC BVP Scoping Report
Draft Reviews (Internal and External) * ^
AIM Summary
Challenge Approval
Submitted Proposed PR
BVP Report
AIM Approval
ISD as requested by LIRF
ATC and LDC Internal "Blessing" on Concept by Planning Mangers *^
BVP draft report
Final Report (ATC and LDC sign off)* ^
AIM Summary (if applicable) *
Needs and Alternative Challenge (if Applicable)
AIM Approval *
Submit Draft Proposed PR*
Approved PR
Note to LDC Indicating Project Sent to Project Managers ^
5 Days
20 – 80 Days
20 Days
40 Days
Notes:
* Requires Internal ATC Communication
^ Requires External Communication
Italics Font indicates LDC action
LIRF: Load Interconnection Request Form
ISD: In-Service Date
PR: Project Request
Needs and Alternative Challenge needed when project cost is 80% of CA threshold
AIM approval needed when ATC costs are > $3 Mil (minus) normal interconnection costs
Time estimates included in process map are approximate. Actual timeline will be developed with the schedule following the Scoping discussion.

Appendix B
LDC BVP Report Guide (to be incorporated into the ATC BVP scoping report)

Introduction and Background

Describe the distribution electrical system and how the system serves the study area. Other general comments can be added in this section, such as relevant historical information, load growth rates and recent developments, nature of the area electrical load demands, etc. Maps of the distribution system and tables/graphs for load growth and reliability are desired to tell the background of the area.

Project Need

- System normal (in-tact) conditions—
  - Describe Planning Criteria violations (voltage, capacity and/or reliability) throughout the planning horizon
  - Discussion on load growth, type of customers and economic impacts
  - A table or a diagram can be included showing the in-tact system with voltages and element loadings
- System Contingency Conditions
  - Describe planning criteria violations (voltage, capacity and/or reliability) throughout the planning horizon and the cause of the system problems:
    - Contingency type (lines, transformers, etc.)
    - Area with load at risk under contingency
- System Concerns—other reliability issues such as:
  - Extraordinary needs. For example, “Area loads require more secure power supplies due to severe cost impacts for long term outages.” OR “Area residents face extreme conditions when this outage occurs, because there are no bridging capabilities on the distribution system.”
  - Relevant outage statistics on poor performing lines or substations
  - Electrical system maintenance needs
  - Other reliability issues.

Project Alternatives

A project alternative is defined as a solution that will solve all area concerns in the area (ranking at a minimum of Poor in the BVP Matrix as seen below). Any distribution alternatives that were analyzed but didn’t solve the area concerns should be included as a “dismissed option”. The project alternative section should include the following:

- Description of each alternative considered
- Performance discussion and/or tabular evaluation of each alternative
- Cost estimates for each alternative distribution costs (ATC will provide the transmission costs)
- Economic evaluation of each alternative on a time comparative basis
- Discussion on options that have been dismissed

It is recommended that one distribution only alternative is included with a transmission/distribution alternative – even if the distribution only alternative is not likely to be constructed. This is important for comparison purposes to show the need of transmission additions/upgrades. A distribution alternative could also include distribution upgrades to defer a new substation. In this case the alternative will include the costs of the distribution upgrades and the cost of the new substation.

BVP Matrix

A BVP matrix including all alternatives including the distribution performance of each alternative should be included for each proposed project with BVP level greater than 1. The LDC is responsible for completing the Distribution System Performance and Financial Performance (for any distribution costs or credits) sections.

The Planning Problem/Descriptions listed in the first column are just suggestions; change according to specific problems within the study area. For example if there is a substation transformer loading problem, the Planning Problem/Description would be listed as Substation X transformer overloaded during loss of Substation Y. Likewise a voltage example would be Feeder 2 is below 114 V during the loss of Substation Y.

ATC will complete the Transmission System Performance section and related transmission system costs.

Planning Problem/Description	Alternative 1 (name)	Alternative 2 (name)	Alternative 3 (name)	Comments
Distribution System Performance				
Normal Capacity				
Normal Voltage Support				
Contingency Capacity				
Contingency Voltage Support				
Contingency Loss of a Substation/transformer				
Contingency Loss of a Distribution Feeder				
Outage Frequency/Exposure				
Fault Current Impacts on Distribution Facilities due to Transmission System Changes/outages				
Motor Starting Capabilities				
Overcurrent Protection/Coordination Capabilities				
Real Estate Risk (Substation or Feeder ROW)				
Constructability				

Distribution Underbuild Impact				
(Any other project specific concerns)				
(Any other project specific concerns)				
(Any other project specific concerns)				
(Any other project specific concerns)				
Transmission System Performance				
Normal Voltage				
Normal Loading				
Contingency Voltage				
Contingency Loading				
Real Estate Risks				
Constructability				
New Transmission Line (miles)				
Environmental Impacts				
Aesthetic Impacts				
Flexibility for Additional Load Growth				
Regulatory Impacts				
Financial Performance (In 20__ dollars)				
Total Loss Savings				
ATC Capital Cost				
Distribution Capital Cost				
Total Capital Cost				
Key to Ratings *+++ Excellent ++ Good + Acceptable* *- Marginal - -Poor - - - Unacceptable* N/A *Not Applicable to the Alternative*				

Approximate Location of new substation

Please provide information of the following concerning a new (or Greenfield) substation site:

- If more than one substation location was considered, discuss what is the preferred site, why and why were others not preferred

- Process in which the land will be acquired (for example, it is acquired, it has an offer to purchase, needs permits, haven't started acquiring yet, etc)
- How much land you intend or have purchased
- A map of the area

Conclusion / Recommendation

Conclusion and recommendation should be stated here. A final summary of the reasons for choosing the preferred alternative can also be given here.

Appendix C

Best Value Planning Level Table

BVP Assessment Type	Explanation*	LDC Information (minimum)	Transmission Analysis	ATC Documentation
NCW**/MCW	No or Minimal ATC Capital Work (< $100,000) and no transmission analysis	Completed LIRF	No planning analysis – internal ATC routing only	Letter stating assessment completed
Alternative Assessment	May include a transmission alternative interconnecting load to the transmission line currently serving the local load or assessment of multiple substation configurations	Completed LIRF and LDC distribution assessment (as listed in guidelines in Appendix B)	Potential for planning analysis of alternatives including a difference analysis (compared to the base case model) including Category B and C contingencies and possibly different transmission system network and load configurations – amount determined by engineering judgment and team meetings	BVP Scoping Report – describing the pertinent assumptions and assessment that was performed
System Study	ATC AIM Governance approval needed ($3 million minus substation costs or an abnormal T-D interconnection configuration) or ATC Needs and Alternatives challenge is needed (ATC project cost of 80% of the CA threshold) or multiple transmission alternatives	Completed LIRF and LDC distribution assessment (as listed in guidelines in Appendix B) with at least one viable distribution alternative (see Project Alternatives in Appendix B)	Modeling analysis for at least two alternatives including a difference analysis (compared to the base case model) including Category B and C contingencies with different transmission system network and load configurations. Modeling will encompass at least a 10 year planning horizon	BVP Scoping Report
System Study	ATC needs to file a Certificate of Authority (CA) or Certificate of Public Convenience and Necessity (CPCN) with the PSCW	Completed LIRF and LDC distribution assessment (as listed in guidelines in Appendix B) with at least one viable distribution alternative (see Project Alternatives in Appendix B)	Modeling analysis for at least two alternatives including a difference analysis (compared to the base case model) including Category B and C contingencies with different transmission system network and load configurations. Modeling will encompass at least a 10 year planning horizon	BVP Scoping Report and support for CPCN or CA filing documentation

*These are typical explanations of BVP Assessment types however any given project may change during BVP if the scope of work changes.
**No ATC Capital Work (NCW) projects are classified as either “LDC Only” or “LDC Support”. The LIRF Support Document in Appendix D explains how ATC determines the NCW classification based on the Project Characteristic questions provided in the LIRF.

Appendix D

LIRF Support Document

Purpose: This document assists ATC in determining the type of No Capital Work project. If yes, to any of the following questions on the LIRF, the project will be deemed "LDC Support" work. This will require additional review and input from ATC. If no to all questions, this project will be deemed "LDC Only" work and will be tracked by ATC Interconnection Services through the Load Interconnection Queue.

A. Will the proposed work require wiring changes to ATC owned protective systems?

Examples (but not limited to):

- adding or removing a current input to a bus differential
- adding/removing a trip output from a lockout
- adding/removing a transfer trip scheme
- adding/removing breaker failure trips
- using a potential from ATC owned instrument transformer

If yes, ATC System Protection needs an opportunity to review drawings during the engineering cycle and ATC Commissioning needs be engaged in the development of the commissioning plan for the work. During the drawing review, ATC would assess the need for setting changes.

B. Will the proposed work require setting changes to ATC owned protective relays?

Examples (but not limited to):

- adding a current input to a bus differential
- modifying remote transfer trip implementation

If yes, ATC System Protection needs to develop and issue modified settings, ATC Commissioning needs to be engaged in the development of the plan to apply and test the revised settings.

C. Will the proposed work require that ATC complete a companion project at other stations?

Examples (but not limited to):

- LDC replacing an over-dutied circuit switcher with a circuit breaker may eliminate the need for transfer trip to a remote location

If yes, ATC must initiate a project at the remote end to make the physical and electrical modifications. All routine ATC Project Functional Areas must be involved.

D. Will the proposed work require modeling in the ATC short circuit case?

Examples (but not limited to):

- a new distribution load tap location on an existing transmission line
- replacing an existing distribution transformer

If yes, ATC System Protection needs details about the location of the tap (TLUF form), size of the transformer, and detail of the protection scheme (fuse size, or overcurrent relay setting) to update the short circuit model. ATC System Protection will issue updated transmission line impedance information to SELD, ATC Planning and ATC EMS will perform model updates.

E. Does this project require ATC to make any drawing changes?

If yes, ATC Design Engineering needs to update and provide any required drawings.