# APPENDIX I

# UNITIL PROJECT EVALUATION PROCESS

| Unitil | Engineering Procedure | Procedure No. | PR-DT-DS-11 |
|---|---|---|---|
| | Distribution Engineering | Page No. | Cover |
| | | Revision No. | 0 |
| | Project Evaluation Procedure | Revision Date | 7/9/18 |
| | | Supersedes Date: | |

## FOREWORD

The purpose of this document is to define the process for evaluating electric construction projects that propose upgrades to substations, the distribution system or the subtransmission system.

Any questions or inquiries regarding information provided in this document should be referred to the Director of Engineering.

KES 7/30/2018

Kevin E. Sprague Date
Director, Engineering

John J. Bonazoli July 30, 2018

John J. Bonazoli Date

Manager, Distribution Engineering

## REVISION HISTORY

**Date of Review:**

| Revision # | Date | Description of Changes |
|---|---|---|
| 0 | 07/09/2018 | Initial Issue |
| | | |
| | | |
| | | |
| | | |
| | | |

Current copies of this procedure can be found on the Hampton Shared Drive. Hard copies are not version controlled.

## Table of Contents



## List of Appendices

# 1.0 Introduction

Project evaluation is an integral component of maintaining a cost effective system that ensures safe and reliable electric service to Unitil customers. It is imperative that Unitil has a consistent process and documentation criteria for project evaluation.

## 1.1 Purpose

The purpose of this document is to provide a consistent approach and procedure for project evaluation. This document establishes thresholds in which Unitil reviews non-wires alternative projects and performs detailed cost/benefit analyses that include reliability, environmental and economic impacts.

## 1.2 Applicability & Scope

The procedure defined in this document shall be applied whenever the need for a project is identified on the distribution or subtransmission systems and/or within a substation. This procedure also applies to projects identified as part of Unitil's Joint Planning Process with Eversource, NH.

This procedure does not apply to projects being justified based on condition replacement or reliability benefit only. It also does not apply to customer requested projects such as DG interconnections, line relocations to accommodate customer requests, the installation of new developments, etc. However, this procedure does apply to loading and/or voltage driven projects that are required due customer requested projects.

## 1.3 Updating the Guideline

The Director, Engineering is responsible for maintaining this guideline to ensure the guideline is current with changes in the company's organization, policies or to capture good utility practices. All revisions and/or additions shall detail a revision date and number on the top right corner of each page within the header, as well as a brief description in the *Revision History* section on the cover.

Comments are welcomed and should be documented (using the *Request for Procedure/Change Form* reference in Appendix C) and addressed to the Director, Engineering. All documented comments shall be retained in a separate file and reviewed each time this procedure is revised. These comments will keep the contents of the procedure current and enhance its usefulness.

## 1.4 Availability

Current copies of this procedure can be found on the Hampton Shared Drive. Hard copies are not version controlled.

**NOTE:** Only up-to-date versions of the documents are posted on the Hampton Shared Drive. All other revisions (both electronic and hardcopy) should not be referenced.

# 2.0 General Information

## 2.1 Cost Estimates

All dollar amounts and cost estimates referenced in this procedure are without general construction overhead costs unless otherwise noted.

## 2.2 Definitions

| | |
|---|---|
| Constraint | A project driven by a violation of planning criteria such as low voltage, overloaded equipment, equipment replacement, etc. |
| Option | A project identified to address a system constraint. |
| Traditional Option | Conventional electric system upgrades such as reconductoring, voltage conversion, equipment upgrades, etc. |
| Non-wires / DER Alternatives | Non-conventional load reduction projects such as Distributed Generation (DG), Distributed Energy Resources (DER), energy storage, energy efficiency, Volt/VAR optimization (VVO), etc. |

# 3.0 Project Evaluation Workflow

When a constraint is identified that will require upgrades to the distribution or subtransmission systems and/or within a substation the Project Evaluation Workflow Diagram in Appendix A shall be followed to determine the need to identify and review alternatives and the necessary detail of project evaluation that will be required.

The following sections will provide additional details regarding the Project Evaluation Workflow Diagram and examples of its use.

## 3.1 Project Evaluation Workflow Diagram – Details

### 3.1.1 BOX A – Project Need Identified

- Anytime a constraint is identified that involves upgrades to a substation, the distribution or subtransmission systems this project evaluation workflow tool shall be referenced.

### 3.1.2 BOX B – Traditional Option Estimate Greater than $100,000

- An initial traditional option shall be developed and estimated.
- If the estimate for the traditional option is less than $100,000 the option should be recommended for construction.
- If the initial traditional option is estimated to cost more than $100,000 proceed to BOX C.

$100,000 was chosen as a threshold to allow for small scale upgrades to be implemented with no additional evaluation required. Small scale upgrades include projects such as: regulator installations, step-down transformer upgrades, load transfers, etc.

### 3.1.3 BOX C – Multiple Traditional Options Required

- If the initial traditional option is estimated to cost more than $100,000 at least two traditional options shall be evaluated.
- A review of the cost, reliability impact and system master plan compliance is performed to determine a recommended traditional option. Preference should be given to the least cost option that meets the required criteria (i.e. loading, capacity, voltage, reliability, etc.)
- Proceed to BOX D once a recommended traditional option is selected.

### 3.1.4 BOX D – Recommended Traditional Option Greater than $250,000

- If the recommended traditional option estimate is less than $250,000 proceed to BOX H.
- If the recommended traditional option estimate is more than $250,000 proceed to BOX E.

Based on the estimated cost per MW (as of 4/10/18) to implement non-wires alternatives it was determined that non-wires alternatives would not be evaluated if the recommended traditional option has an estimated cost of less than $250,000. This amount may be reviewed in the future as advancements are made in technology that reduces the installed costs of non-wires alternatives.

### 3.1.5 BOX E – Required Construction Start Date

- The required construction start date of the recommended traditional option must be between three and five years into the future to proceed to BOX F. If it is less than three years or more than five years into the future proceed to BOX H.

It is assumed that it will take a minimum of three years to receive and evaluate proposals, implement the project and confirm the results of non-wires alternative projects.

### 3.1.6 BOX F – Loading and/or Voltage Criteria Violation(s)

- If the recommended traditional option addresses only loading and/or voltage violations proceed to BOX G.
  - An example of this type of option is a voltage conversion project that is being recommended to address a conductor loading constraint.
- If the recommended traditional option is not needed to address loading and/or voltage violations proceed to BOX I.
  - An example of this type of option is a breaker replacement project that is being recommended to address an aging piece of equipment.

- If the recommended traditional option has components that address loading and/or voltage concerns and non-loading and/or voltage constraints (i.e. condition based replacement) a more detailed cost breakdown will be necessary.
  - The overall estimate for the option must be broken down into an estimate to address the loading and/or voltage violation and an estimate for the non-loading/voltage component.
  - If the estimate to address the loading and/or voltage violation is more than $250,000 proceed to BOX G, otherwise proceed to BOX I.
  - An example of this type of option is a breaker being removed from service due to condition and a portion of a circuit needs to be reconductor to accommodate transferring load to remove the breaker from service. In this case the reconductoring portion of the option would need to be more than $250,000 to proceed to BOX G.

This step in the workflow is required to determine if non-wires alternatives will be considered. Typically, non-wires alternatives are only viable options to address loading and/or voltage constraints. Non-wires alternatives should not be considered for condition based replacement projects that do not have components to address loading and/or voltage concerns.

### 3.1.7 BOX G – Develop and Issue RFP for Non-Wires Alternative Project

- Develop and issue a request for proposal from non-wires alternative vendors. Once proposals are received proceed to BOX I.

### 3.1.8 BOX H – Planning Process Engineering Judgment Determines the Need to Review Non-Wires Alternatives

- If the constraint was not identified through the distribution system or system planning efforts (i.e. the project is required due to a condition replacement) proceed to BOX J.
- If the constraint was identified through the distribution or system planning efforts, the constraint and recommended traditional option shall be reviewed and engineering judgment shall be used to determine if a review of non-wires alternatives is required.
- Proceed to BOX J if non-wires alternative review is not required
- Proceed to BOX G if non-wires alternative review is required

### 3.1.9 BOX I – Complete Detailed Cost Benefit Analysis of Options

- Complete the Detailed Cost/Benefit Analysis spreadsheet in Appendix B.
  - See section 4.0 below for additional details about the spreadsheet.
- The results of the spreadsheet along with engineering and operational judgment shall be used to determine the recommended option.
- Proceed to Box J.

#### 3.1.10 BOX J – Recommend Project

- For constraints identified as part of the distribution and/or system planning process the option shall be recommended for construction in the associated planning study.
- For projects identified outside of the planning process the option shall be submitted for acceptance to the necessary approvers.
- Preference should be given to the least cost option that meets the required criteria (i.e. loading, capacity, voltage, reliability, etc.)

### 3.2 Project Evaluation Workflow Diagram – Examples

#### 3.2.1 Example 1 – Recommended Traditional Option Estimate less than $100,000

Circuit analysis identifies an overloaded step-down transformer. It is recommended that the step-down transformer should be replaced.

- Estimate Cost: Less than $100,000

<u>Workflow Diagram Walkthrough</u>

- BOX B – Estimated cost is less than $100,000
  - Proceed to BOX J
- BOX J – Recommend Option

#### 3.2.2 Example 2A – Recommended Traditional Option between $100,000 and $250,000

Circuit analysis identifies low voltage at the end of a single-phase lateral. The initial traditional option is to reconductor the line with larger conductor.

- Estimated Cost: $100,000 – $250,000
- Engineering Judgment Determines that non-wires alternatives do not need to be reviewed

<u>Workflow Diagram Walkthrough</u>

- BOX B – Estimate more than $100,000
  - Proceed to BOX C
- BOX C – Develop additional traditional options and perform cost/benefit review to determine a recommended traditional option.
  - The second traditional option is to convert the lateral to a higher operating voltage and is estimated to cost more than $250,000.
  - Cost/benefit review results in the reconductoring option that is estimated to cost between $100,000 and $250,000 is the recommended traditional option.
  - Proceed to BOX D
- BOX D –Estimated cost is less than $250,000
  - Proceed to BOX H
- BOX H – Engineering judgment determines that a review of non-wires alternatives is not needed

  - Proceed to BOX J
- BOX J – Recommend Option

### 3.2.3 Example 2B – Recommended Traditional Option between $100,000 and $250,000

Circuit analysis identifies low voltage at the end of a single-phase lateral. The initial traditional option is to reconductor the line with larger conductor.

- Estimated Cost: $100,000 – $250,000
- Engineering judgment determines that non-wires alternatives do need to be reviewed

<u>Workflow Diagram Walkthrough</u>

- BOX B – Estimate more than $100,000
  - Proceed to BOX C
- BOX C – Develop additional traditional options and perform cost/benefit review to determine a recommended traditional option.
  - The second traditional option is to convert the lateral to a higher operating voltage and is estimated to cost more than $250,000.
  - Cost/benefit review results in the reconductoring project that is estimated to cost between $100,000 and $250,000 is the recommended traditional option.
  - Proceed to BOX D
- BOX D –Estimated cost is less than $250,000
  - Proceed to BOX H
- BOX H – Engineering judgment determines that a review of non-wires alternatives is needed
  - Proceed to BOX G
- BOX G – Develop and issue RFP for non-wires alternative projects
  - Receive and review proposals
  - Proceed to BOX I
- BOX I – Complete Detailed Cost/Benefit Analysis spreadsheet in Appendix B
  - Detail/Cost benefit analysis results in a recommended project.
  - Proceed to BOX J
- BOX J – Recommend Option

### 3.2.4 Example 3A – Recommended Traditional Option Greater than $250,000

Circuit analysis identifies low voltage and overloaded conductor. The initial traditional option is to convert this portion of the system to a higher operating voltage.

- Estimated Cost: More than $250,000
- Required Start Date: Two years in the future
- Engineering judgment determines that non-wires alternatives do not need to be reviewed

Workflow Diagram Walkthrough

- BOX B – Estimate more than $100,000
  - Proceed to BOX C
- BOX C – Develop additional traditional options and perform cost/benefit review to determine a recommended traditional option.
  - The second traditional option is to reconductor the area and install voltage regulators. Estimated Cost $175,000.
  - Cost/benefit review results in the conversion project that is estimated to cost more than $250,000 is the recommended traditional option.
  - Proceed to BOX D
- BOX D –Estimated cost is more than $250,000
  - Proceed to BOX E
- BOX E – Required start date is less than 3 years in the future
  - Proceed to BOX H
- BOX H – Engineering judgment determines that a review of non-wires alternatives is not needed
  - Proceed to BOX J
- BOX J – Recommend Option

### 3.2.5 Example 3B – Recommended Traditional Option Greater than $250,000

Circuit analysis identifies low voltage and overloaded conductor. The initial traditional option is to convert this portion of the system to a higher operating voltage.

- Estimated Cost: More than $250,000
- Required Start Date: Two years in the future
- Engineering judgment determines that non-wires alternatives do need to be reviewed

Workflow Diagram Walkthrough

- BOX B – Estimate more than $100,000
  - Proceed to BOX C
- BOX C – Develop additional traditional options and perform cost/benefit review to determine a recommended traditional option.
  - The second traditional option is to reconductor the area and install voltage regulators. Estimated Cost $175,000.
  - Cost/benefit review results in the conversion project that is estimated to cost more than $250,000 is the recommended traditional option.
  - Proceed to BOX D
- BOX D –Estimated cost is more than $250,000
  - Proceed to BOX E
- BOX E – Required start date is less than 3 years in the future

- Proceed to BOX H
- BOX H – Engineering judgment determines that a review of non-wires alternatives is needed
    - Proceed to BOX G
- BOX G – Develop and issue RFP for non-wires alternative projects
    - Receive and review proposals
    - Proceed to BOX I
- BOX I – Complete Detailed Cost/Benefit Analysis spreadsheet in Appendix B
    - Detail/Cost benefit analysis results in a recommended project.
    - Proceed to BOX J
- BOX J – Recommend Option

### 3.2.6 Example 3C – Recommended Traditional Option Greater than $250,000

Distribution load projections identify overloaded substation equipment. The initial traditional option is to upgrade the equipment.

- Estimated Cost: More than $250,000
- Required Start Date: Four years in the future
- Project is loading related

Workflow Diagram Walkthrough

- BOX B – Estimate more than $100,000
    - Proceed to BOX C
- BOX C – Develop additional traditional options and perform cost/benefit review to determine a recommended traditional option.
    - The second traditional option is to convert circuit to 34.5 kV and remove substation equipment. Estimated Cost more than $250,000.
    - Cost/benefit review results in the conversion project that is estimated to cost more than $250,000 is the recommended traditional option.
    - Proceed to BOX D
- BOX D –Estimated cost is more than $250,000
    - Proceed to BOX E
- BOX E – Required start date is between 3 and 5 years in the future
    - Proceed to BOX F
- BOX F – Project is required to address loading violations
    - Proceed to BOX G
- BOX G – Develop and issue RFP for non-wires alternative projects
    - Receive and review proposals
    - Proceed to BOX I

- BOX I – Complete Detailed Cost/Benefit Analysis spreadsheet in Appendix B
  - Detail/Cost benefit analysis results in a recommended project.
  - Proceed to BOX J
- BOX J – Recommend Option

### 3.2.7 Example 3F – Recommended Traditional Option Greater than $250,000

The system planning study identifies a conductor loading constraint. The initial traditional option is to reconductor the identified line section.

- Estimated Cost: More than $250,000
- Required Start Date: More than five years in the future
- Engineering judgment determines that non-wires alternatives do not need to be reviewed at this time (review maybe required when the project start date is three to five years in the future).

Workflow Diagram Walkthrough

- BOX B – Estimate more than $100,000
  - Proceed to BOX C
- BOX C – Develop additional traditional options and perform cost/benefit review to determine a recommended traditional option.
  - The second traditional option is to construct a second line. Estimated Cost more than $250,000.
  - Cost/benefit review results in the reconductoring project is the recommended traditional option.
  - Proceed to BOX D
- BOX D –Estimated cost is more than $250,000
  - Proceed to BOX E
- BOX E – Required start date is more than 5 years in the future
  - Proceed to BOX H
- BOX H – Engineering judgment determines Project does not need non-wires alternatives reviewed
  - Proceed to BOX J
- BOX J – Recommend Option

### 3.2.8 Example 3G – Recommended Traditional Option Greater than $250,000

The system planning study identifies a conductor loading constraint. The initial traditional option is to reconductor the identified line section.

- Estimated Cost: More than $250,000
- Required Start Date: More than five years in the future
- Engineering judgment determines that non-wires alternatives do need to be reviewed

Workflow Diagram Walkthrough

- BOX B – Estimate more than $100,000
  - Proceed to BOX C
- BOX C – Develop additional traditional options and perform cost/benefit review to determine a proposed traditional option.
  - The second traditional option is to construct a second line. Estimated Cost more than $250,000.
  - Cost/benefit review results in the reconductoring project is the recommended traditional option.
  - Proceed to BOX D
- BOX D –Estimated cost is more than $250,000
  - Proceed to BOX E
- BOX E – Required start date is more than 5 years in the future
  - Proceed to BOX H
- BOX H – Engineering judgment determines Project does need non-wires alternatives reviewed
  - Proceed to BOX G
- BOX G – Develop and issue RFP for non-wires alternative projects
  - Receive and review proposals
  - Proceed to BOX I
- BOX I – Detailed Cost/Benefit Analysis spreadsheet in Appendix B
  - Complete Detail/Cost benefit analysis results in a recommended project.
  - Proceed to BOX J
- BOX J – Recommend Option

### 3.2.9 Example 4 – Customer Requested Project

A proposed commercial development is expected to cause mainline loading and/or voltage concerns on the circuit. The project evaluation for the necessary upgrades to address the mainline loading and/or voltage concerns shall be evaluated per this procedure with a process similar to what is described in examples 3.2.1 through 3.2.10.

### 3.2.10 Example 4 – Projects to Address Condition Concerns

Inspections identify the need to address condition concerns associated with a piece of substation equipment. The desired project is to transfer load to adjacent circuits and retire the aging piece of equipment. Circuit upgrades are required to accommodate the load transfer. The project evaluation for the necessary circuit upgrades to accommodate the load transfer shall be evaluated per this procedure with a process similar to what is described in examples 3.2.1 through 3.2.10.

### 3.2.11 Example 5 – Reliability Project

A reliability project is proposed to create a circuit tie between two circuits. To accommodate the creation of the circuit tie a portion of the circuit(s) must be reconductored. This project would not be evaluated per this guideline, because it is justified based on reliability benefit only. However, engineering judgment shall be used to determine if non-wires alternatives should be evaluated as options to the reconductoring.

## 4.0 Detailed Cost/Benefit Analysis Spreadsheet

The spreadsheet included in Appendix B shall be used to evaluate options that are estimated to cost over $250,000 and are between three and five years in the future. Additionally all constraints that include the evaluation of non-wires alternatives shall be evaluated using this spreadsheet.

For constraints identified through the distribution or system planning efforts, engineering judgment may result in the Detailed Cost/Benefit Analysis Spreadsheet being used to evaluate options that do not meet the requirements above.

Additionally, this spreadsheet can be used at the request of a project approver for any project that is recommended for construction.

It is expected that this spreadsheet will be modified to include all the options being considered to resolve the identified constraint.

An example of a competed Detailed Cost/Benefit Analysis spreadsheet is included in Appendix C.

### 4.1 Scoring Methodology

A weighted scoring methodology is used to calculate an overall option ranking. The evaluation criteria and the default weighting factors can be modified per engineering and operational judgment. The default weighting factors will be reviewed and updated on an as needed basis.

A brief summary of each of the criteria is included below. It is acceptable for multiple options to have the same ranking for each criterion. For example, options with the same tree clearing impacts would get scored the same.

#### 4.1.1 Functionality

The overall functionality score is calculated from the functionality subcategories.

- Operating Flexibility – how the option affects the operating flexibility of the system.
  - Example – An option that creates a new circuit tie or provides SCADA functionality would score higher than an option that does not.
- Availability – is the benefit of the option expected to be available at all times.
  - Example – A PV installation may have a lower availability score than a reconductoring option due to the timing of the peak load.
  - Example – A PV installation with storage would rank higher than a PV installation without storage.

- Maintenance – future maintenance requirements
  - Example – An option that requires minimal future maintenance would have a higher maintenance score than an option that requires annual maintenance.
- Load Servicing Capacity – ability of the option to accommodate future load additions.
  - Example – An option that accommodates 3 MW of future load would score higher than an option that accommodates 2 MW of future load.
- DG Interconnect Capacity – ability of the option to accommodate future DG additions.
  - Example – An option that increases the area's ability to accommodate additional DG would score higher than an option that does not.
- System Master Plan
  - Example – An option that works towards the master plan for the area would score higher than an option that does not.

### 4.1.2 Environmental

The overall environmental score is calculated from the environmental subcategories.

- Wetland Impacts
  - Example – Options with the least impact to wetlands and wetland buffers score the highest.
- Tree Clearing
  - Example – Options with the least amount of tree removals score the highest.
- Residential Area Impact – how the option impacts the residential community
  - Example – Options that require a significant amount of new infrastructure to be constructed in residential neighborhoods would score lower than options that involve upgrades to existing facilities.
- Municipal Considerations – how is the option viewed by the local municipals
  - Example – An option that requires more municipal, state or federal permitting and/or review and approval would rank lower than a project that requires less.
  - Example – A project that requires the construction of a new substation in a highly populated area would ran lower than a project to upgrade and existing substation within the confines of the existing substation footprint.

### 4.1.3 Reliability

The overall reliability score is calculated from the reliability subcategories.

- Customer Exposure
  - Example – Options that decrease customer exposure would score higher than options that increase customer exposure.
- Miles/Equipment Exposure

  - Example – Options that decrease miles of exposure would score higher than options that increase miles exposure.
- Automatic Restoration
  - Example – Options that include the installation of automatic restoration or work towards an automatic restoration scheme would score higher than options that do not.
- Power Quality
  - Example – Options that are expected to improve power quality would score higher than options that do not.

#### 4.1.4 Feasibility

The overall feasibility score is calculated from the feasibility subcategories.

- Likelihood of Completion – confidence in the project being completed on schedule
  - Example – An option being constructed with plenty of slack in the schedule would score higher than an option being constructed with no schedule slack time.
- Long Term Solution
  - Example – An option that is expected to resolve the identified constraint for the next ten years would rank higher than an option that is expected to resolve the constraint for five years.
- Life Span
  - Example – An option that is expected to be in-service for thirty years would score higher than an option that has an expected service life of twenty years.
- Design Standards – how the project complies with company standards, materials and practices.
  - Example – An option that involves new materials and/or technology not previously deployed by Unitil would score lower than options that comply with existing practices.

#### 4.1.5 Unitil Cost

Unitil cost includes all costs to Unitil for the installation of the option. In the event a non-wires alternative has costs that will not be paid by Unitil, the costs not being paid by Unitil will not be included in the evaluation.

  - Example – The option with the lowest cost to Unitil would have the highest score and the option with the highest cost to Unitil would have the lowest score.

#### 4.1.6 Value Added Benefit of DG

Value added benefits of DG are quantifiable and unquantifiable benefits of DG and other non-wires alternatives. These benefits would be detailed in the non-wires alternative proposals. The benefits considered here are benefits to the distribution system (and its customers) as opposed to the benefits to owner/operator of the DG system.

Traditional options would all get a score of 1 (lowest score).

- Example – Options with the most value added benefits of DG would score the highest and traditional options would score the lowest.

## 5.0 Documentation of the Evaluation of Options

This section describes the documentation required for projects that are evaluated utilizing the Project Evaluation Workflow and/or Detail Cost/Benefit Analysis Spreadsheet detailed in this procedure.

### 5.1 Projects Less than $100,000

#### 5.1.1 Projects Identified through the Planning Process

Project need, scope and cost estimate shall be documented in the body of planning study.

#### 5.1.2 Projects Identified Outside of the Planning Process

Project need, scope and cost estimate shall be documented in the Capital Budget and/or sent to the necessary project approvers for acceptance.

### 5.2 Projects Over $100,000 that do not Require Detailed Cost/Benefit Analysis

#### 5.2.1 Project Identified through the Planning Process

The project need and scopes and cost estimates of the recommended option and all other options considered shall be documented in the body of planning study. The justification for selecting the recommended option and a statement regarding non-wires alternatives not needing to be reviewed shall also be documented in the body of planning study.

#### 5.2.2 Project Identified Outside of the Planning Process

The project need, project scopes and cost estimates of the recommended option and all other options considered shall be documented in a company memo or email to the necessary project approvers. The justification for selecting the recommended option shall also be included in the email or memo.

### 5.3 Projects that Require Detailed Cost/Benefit Analysis

#### 5.3.1 Projects Identified through the Planning Process

The body of the planning study shall include the project need, summaries of the options considered with the cost estimates and an explanation for selecting the recommended option.

An appendix shall be added to the planning study for each project that requires Detail Cost/Benefit Analysis. The appendix shall include:

- Detailed description of each option including costs, benefits and negatives
- Description and reasons behind the path taken on the Project Evaluation Workflow Diagram

- Copy of the Detail Cost/Benefit Analysis Spreadsheet

### 5.3.2 Projects Identified Outside of the Planning Process

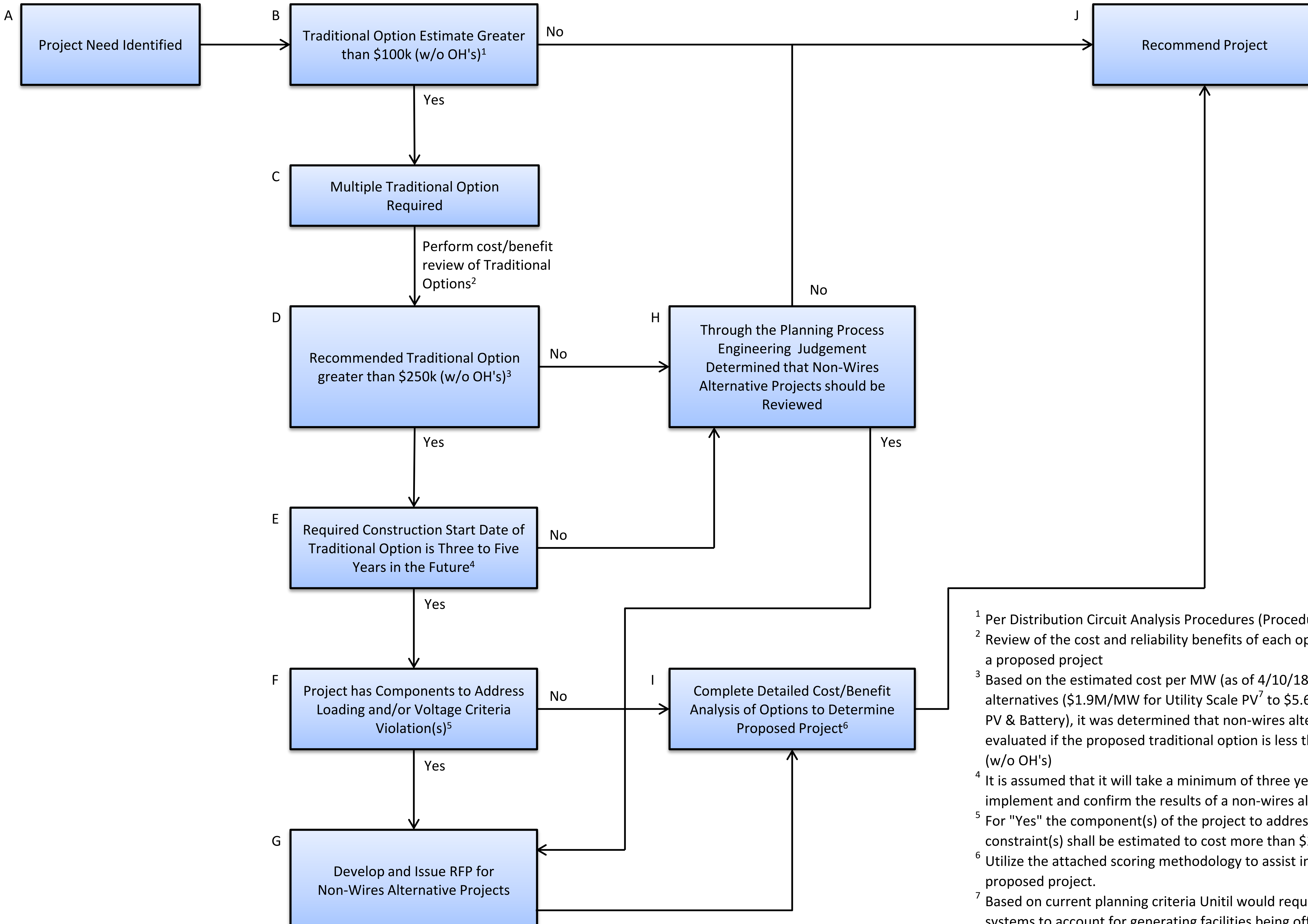
A company memo or study document shall be provided to necessary project approvers. The memo or study document shall include:

- Need for the project
- Detailed description of each option including costs, benefits and negatives
- Description and reasons behind the path taken on the Project Evaluation Workflow Diagram
- Copy of the Detail Cost/Benefit Analysis Spreadsheet
- Justification for selecting the recommended option

# Appendix A
# Project Evaluation Workflow Diagram

# Project Evaluation Workflow

7/9/2018




[1] Per Distribution Circuit Analysis Procedures (Procedure No. PR-DT-DS-03).
[2] Review of the cost and reliability benefits of each option to determine a proposed project
[3] Based on the estimated cost per MW (as of 4/10/18) to implement non-wires alternatives ($1.9M/MW for Utility Scale PV[7] to $5.6M/MW for Roof Top PV & Battery), it was determined that non-wires alternatives would not be evaluated if the proposed traditional option is less than $0.25M (w/o OH's)
[4] It is assumed that it will take a minimum of three years to evaluate, implement and confirm the results of a non-wires alternative project.
[5] For "Yes" the component(s) of the project to address loading and/or voltage constraint(s) shall be estimated to cost more than $250k (w/o OH's).
[6] Utilize the attached scoring methodology to assist in selecting a proposed project.
[7] Based on current planning criteria Unitil would require multiple utility scale systems to account for generating facilities being off-line.

# Appendix B
# Detailed Cost/Benefit Analysis Spreadsheet
# Blank

**Constraint / Need for Project:**

Project Need Year:
Date Evaluation Performed:
Traditional Alternative Construction Start Year:

| | Project Scope |
|---|---|
| Option 1 | |
| Option 2 | |
| Option 3 | |
| Option 4 | |
| Option 5 | |

**User Input** (cell will turn white once value is enetered)

| Evaluation Criteria | Weight Factor | Ranked Score (N Best, 1 Worst, N= # of Options) Option 1 | Option 2 | Option 3 | Option 4 | Option 5 |
|---|---|---|---|---|---|---|
| **Functionality** *(See Below)* | 15% | 1 | 1 | 1 | 1 | 1 |
| **Environemental** *(See Below)* | 10% | 1 | 1 | 1 | 1 | 1 |
| **Reliability** *(See Below)* | 15% | 1 | 1 | 1 | 1 | 1 |
| **Feasibility** *(See Below)* | 25% | 1 | 1 | 1 | 1 | 1 |
| **Unitil Cost** | 30% | | | | | |
| **Value Added Benefit of DG** | 5% | | | | | |
| **Totals** | 100% | **0.65** | **0.65** | **0.65** | **0.65** | **0.65** |

| | Option 1 | Option 2 | Option 3 | Option 4 | Option 5 |
|---|---|---|---|---|---|
| **Overall Rankings** | 1 | 1 | 1 | 1 | 1 |

| **Functionality** Evaluation Criteria | Weight Factor | Ranked Score (N Best, 1 Worst, N= # of Options) Option 1 | Option 2 | Option 3 | Option 4 | Option 5 |
|---|---|---|---|---|---|---|
| Operating Flexibility | 15% | | | | | |
| Availability | 30% | | | | | |
| Maintenance | 10% | | | | | |
| Load Servicing Capacity | 20% | | | | | |
| DG Interconnect Capacity | 10% | | | | | |
| System Master Plan | 15% | | | | | |
| **Totals** | 100% | **0** | **0** | **0** | **0** | **0** |
| | **Rankings** | 1 | 1 | 1 | 1 | 1 |

| **Environmental**<br>Evaluation Criteria | Weight Factor | **Ranked Score (N Best, 1 Worst, N= # of Options)**<br>Option 1 | Option 2 | Option 3 | Option 4 | Option 5 |
|---|---|---|---|---|---|---|
| Wetland Impact | 25% | | | | | |
| Tree Clearing | 25% | | | | | |
| Residential Area Impacts | 25% | | | | | |
| Municipal Considerations | 25% | | | | | |
| **Totals** | 100% | **0** | **0** | **0** | **0** | **0** |
| | **Rankings** | 1 | 1 | 1 | 1 | 1 |

| **Reliability**<br>Evaluation Criteria | Weight Factor | **Ranked Score (N Best, 1 Worst, N= # of Options)**<br>Option 1 | Option 2 | Option 3 | Option 4 | Option 5 |
|---|---|---|---|---|---|---|
| Customer Exposure | 30% | | | | | |
| Miles / Equipment Exposure | 30% | | | | | |
| Automatic Restoration | 20% | | | | | |
| Power Quality | 20% | | | | | |
| **Totals** | 100% | **0** | **0** | **0** | **0** | **0** |
| | **Rankings** | 1 | 1 | 1 | 1 | 1 |

| **Feasibility**<br>Evaluation Criteria | Weight Factor | **Ranked Score (N Best, 1 Worst, N= # of Options)**<br>Option 1 | Option 2 | Option 3 | Option 4 | Option 5 |
|---|---|---|---|---|---|---|
| Likelihood of Completion | 50% | | | | | |
| Long Term Solution | 25% | | | | | |
| Life Span | 20% | | | | | |
| Design Standards | 5% | | | | | |
| **Totals** | 100% | **0** | **0** | **0** | **0** | **0** |
| | **Rankings** | 1 | 1 | 1 | 1 | 1 |

Note: Weight factors and evaluation criteria shall be adjusted as needed

# Appendix C
# Detailed Cost/Benefit Analysis Spreadsheet
# Example

**Constraint / Need for Project:** Example

Project Need Year: 2020
Date Evaluation Performed: 7/9/2018
Traditional Alternative Construction Start Year: 2019

| | **Project Scope** |
|---|---|
| Option 1 | Traditional Option 1 |
| Option 2 | Traditional Option 2 |
| Option 3 | Non-Wires 1 |
| Option 4 | Non-Wires 2 |
| Option 5 | Non-Wires 3 |

**User Input** (cell will turn white once value is enetered)

| | | **Ranked Score (N Best, 1 Worst, N= # of Options)** | | | | |
|---|---|---|---|---|---|---|
| Evaluation Criteria | Weight Factor | Option 1 | Option 2 | Option 3 | Option 4 | Option 5 |
| **Functionality** *(See Below)* | 15% | 4 | 2 | 4 | 1 | 3 |
| **Environemental** *(See Below)* | 10% | 1 | 2 | 4 | 5 | 3 |
| **Reliability** *(See Below)* | 15% | 1 | 5 | 3 | 4 | 2 |
| **Feasibility** *(See Below)* | 25% | 3 | 5 | 3 | 2 | 1 |
| **Unitil Cost** | 30% | 5 | 3 | 1 | 4 | 2 |
| **Value Added Benefit of DG** | 5% | 1 | 1 | 5 | 3 | 2 |
| **Totals** | 100% | **3.15** | **3.45** | **2.75** | **3.1** | **2** |

| | | | | | |
|---|---|---|---|---|---|
| **Overall Rankings** | 2 | 1 | 4 | 3 | 5 |

| **Functionality** | | **Ranked Score (N Best, 1 Worst, N= # of Options)** | | | | |
|---|---|---|---|---|---|---|
| Evaluation Criteria | Weight Factor | Option 1 | Option 2 | Option 3 | Option 4 | Option 5 |
| Operating Flexibility | 15% | 2 | 4 | 3 | 5 | 1 |
| Availability | 30% | 1 | 2 | 3 | 5 | 4 |
| Maintenance | 10% | 3 | 5 | 2 | 4 | 1 |
| Load Servicing Capacity | 20% | 4 | 5 | 2 | 1 | 3 |
| DG Interconnect Capacity | 10% | 5 | 2 | 1 | 3 | 4 |
| System Master Plan | 15% | 4 | 1 | 5 | 2 | 3 |
| **Totals** | 100% | **2.8** | **3.05** | **2.8** | **3.45** | **2.9** |
| **Rankings** | | 4 | 2 | 4 | 1 | 3 |

| **Environmental**<br>Evaluation Criteria | Weight Factor | **Ranked Score (N Best, 1 Worst, N= # of Options)**<br>Option 1 | Option 2 | Option 3 | Option 4 | Option 5 |
|---|---|---|---|---|---|---|
| Wetland Impact | 25% | 4 | 1 | 2 | 3 | 5 |
| Tree Clearing | 25% | 4 | 3 | 5 | 2 | 1 |
| Residential Area Impacts | 25% | 4 | 5 | 2 | 1 | 3 |
| Municipal Considerations | 25% | 4 | 5 | 1 | 3 | 2 |
| **Totals** | 100% | **4** | **3.5** | **2.5** | **2.25** | **2.75** |
| | **Rankings** | 1 | 2 | 4 | 5 | 3 |

| **Reliability**<br>Evaluation Criteria | Weight Factor | **Ranked Score (N Best, 1 Worst, N= # of Options)**<br>Option 1 | Option 2 | Option 3 | Option 4 | Option 5 |
|---|---|---|---|---|---|---|
| Customer Exposure | 30% | 4 | 1 | 2 | 3 | 5 |
| Miles / Equipment Exposure | 30% | 4 | 3 | 5 | 2 | 1 |
| Automatic Restoration | 20% | 1 | 2 | 3 | 5 | 4 |
| Power Quality | 20% | 4 | 5 | 2 | 1 | 3 |
| **Totals** | 100% | **3.4** | **2.6** | **3.1** | **2.7** | **3.2** |
| | **Rankings** | 1 | 5 | 3 | 4 | 2 |

| **Feasibility**<br>Evaluation Criteria | Weight Factor | **Ranked Score (N Best, 1 Worst, N= # of Options)**<br>Option 1 | Option 2 | Option 3 | Option 4 | Option 5 |
|---|---|---|---|---|---|---|
| Likelihood of Completion | 50% | 1 | 2 | 3 | 5 | 4 |
| Long Term Solution | 25% | 4 | 5 | 2 | 1 | 3 |
| Life Span | 20% | 4 | 1 | 2 | 3 | 5 |
| Design Standards | 5% | 5 | 1 | 3 | 4 | 2 |
| **Totals** | 100% | **2.55** | **2.5** | **2.55** | **3.55** | **3.85** |
| | **Rankings** | 3 | 5 | 3 | 2 | 1 |

Note: Weight factors and evaluation criteria shall be adjusted as needed

| Unitil | Engineering Procedure | Procedure No. | PR-DT-DS-11 |
|---|---|---|---|
| | Distribution Engineering | Page No. | D-D |
| | | Revision No. | 0 |
| | Project Evaluation Procedure | Revision Date | 7/9/18 |
| | | Supersedes Date: | |

## Appendix D - Request for Procedure/Change Form

Requestor: ______________________ Item(s)/Section to be changed (if applicable):
Title: ______________________ Section: ______________
Department: ______________________ Page: ______________
Location/DOC: ______________________ Figure: ______________
Date: ______________________ Appendix ______________
Procedure No.: ______________________ Other: ______________

**For New Procedures**

Description of new procedure to be developed: ______________________

Reason for new procedure: ______________________

**For Changes to Existing Procedures**

Description of requested change(s): ______________________

Reason for requested change(s): ______________________

**Instructions:** The individual requesting a new procedure or change(s) to existing procedures shall complete this form and submit it to the Director of the applicable department. For changes to procedures please attach a copy of the existing procedure with revisions marked on the copy.

Requestors Signature: ______________________ Date: ______________

| **For Reviewers Use Only** |
|---|
| Change(s) Approved? YES NO If No, briefly explain ______________ |
| Changes Implemented? YES NO Date Implemented: ______________ |
| Reviewers Signature: Date: |