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Results from the EPRI White Paper

Case Studies and Methodologies for Using DER for T&D Support Applications

Presented to the Massachusetts DG Collaborative

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Case Studies White Paper

Introduction

Utility Case Studies and Methodologies for Using DER for T&D Support Applications

Case study data was gathered from:

- Detroit Edison
- a New York utility

A methodology was taken from SCE's proposal to the CPUC

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Background

- Utility transmission and distribution (T&D) systems require extensive investment for infrastructure upkeep.
- For some utilities, these investments may require a budget of $50 million or more annually.
- Exacerbating the situation, increasing T&D system capacity is becoming more costly.
- A number of projects have faced difficulties in securing approval for new right of ways or increases in line voltage over an existing right of way.

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Background

- At the same time that T&D costs have been rising and utility investments have been declining, distributed energy resources (DER) has surfaced as a potential solution.
- This technology has been used historically by utilities as solution to reducing T&D system overloads – until new T&D equipment can be installed.
- DER has also been deployed by many end use customers to meet their own power needs - whether for baseload, cogeneration, peak shaving, or for some other application.

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The Economics of DER for T&D Deferral

- T&D upgrades in $ per kVA for the installed T&D capacity are generally less than the least expensive DER option
- However, if you approach the problem from a capacity shortfall standpoint (e.g. 2 MWs versus a 20 MW T&D capacity addition) the DER may be economic
- As such, the DER is intended to serve only the amount needed in the near term

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Lessons Learned at DTE Energy

- Real Management Support is Essential
- A Champion is Needed to Shepherd DER Integration
- Change the Evaluation Measure
  - Cost of the DER alternative not based on cost per kVA of T&D capacity added but compared to the cost to resolve the capacity shortfall problem
- Develop a DER Capacity Budget

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Lessons Learned at DTE Energy

- It's Just Like a Portable Substation
  - Repeated use over time
  - Once purchased, can use an installation cost
- Consider Automatic Operation & Innovative Protection
- Get the Word Out within Utility and Build Community Partnerships
- It's Just Another Tool

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Collins Case Study at DTE Energy

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Collins Case Study at DTE Energy

- Emergency application of a leased 2 MW generator on the end of an overloaded distribution circuit to end daily circuit outages to 3500 customers.
- The outages caused by a delay in completing a new substation.
- The $565K spent on an emergency generator and other circuit work was roughly equivalent to annual charges for a one-year delay of the $6.4M Collins substation project.
- If planned, this emergency alternative including the DG installation would have been more economical.

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Collins Case Study at DTE Energy

Economic Evaluation

Project	Total Cost	Annual Cost
T&D Collins New Substation installation	$6,400K	$640K

	Emergency Cost	Annual Cost
T&D Emergency Capital Cost	$250K	$25K
T&D Emergency Total Cost	$250K	$25K
DER Capital Installation	$135K	$14K
O&M Lease & Operating	$180K	$180K
DER Installation Total Cost	$315K	$194K
Total Emergency Cost	$565K	$219K

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3 Case Studies Evaluated at a New York Utility

- Project #1. This project entailed reconductoring a feeder and upgrading a substation. The project cost was estimated at $2 million and the annual load growth was estimated at 3.8 percent.
- Project #2. Project #2 also entailed a reconductoring and upgrading a substation. In this case, however, the upgrade was more costly and was estimated at $7.3 million. The annual load growth was estimated to be 3.2 percent.
- Project #3. This project also entailed a reconductoring and upgrading a substation. This project cost was estimated at $4.9 million and the annual load growth was 3.9 percent.

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3 Case Studies Evaluated at a New York Utility

T&D Project	Diesel Reciprocating Engines				Solar Mercury Turbines			
	NPV Savings ($000)	Years Deferral	DG Capacity (kW)	Maximum Hours Operating	NPV Savings ($000)	Years Deferral	DG Capacity (kW)	Maximum Hours Operating
Project #1	-98	1	1,250	47	-1,056	4	4,600	89
Project #2	2,021	6	8,500	245	690	9	13,800	394
Project #3	-41	1	2,250	42	-925	2	4,600	63

Deferral Characteristics of Most Attractive DER Options

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Case Study Results

- Based on the assumptions, the most economically attractive DER options were for deferral periods of 1-9 years, with DER in both the Project #1 and Project #3 cases being more expensive than the T&D option.

- For Project #2, there are attractive deferral options for both the diesel units ($2 million savings) and the Solar Mercury turbines ($690k savings) when compared with the $10.3 million T&D option.

- In all cases, the most the diesel DER would be required to operate was less than 300 hours annually.

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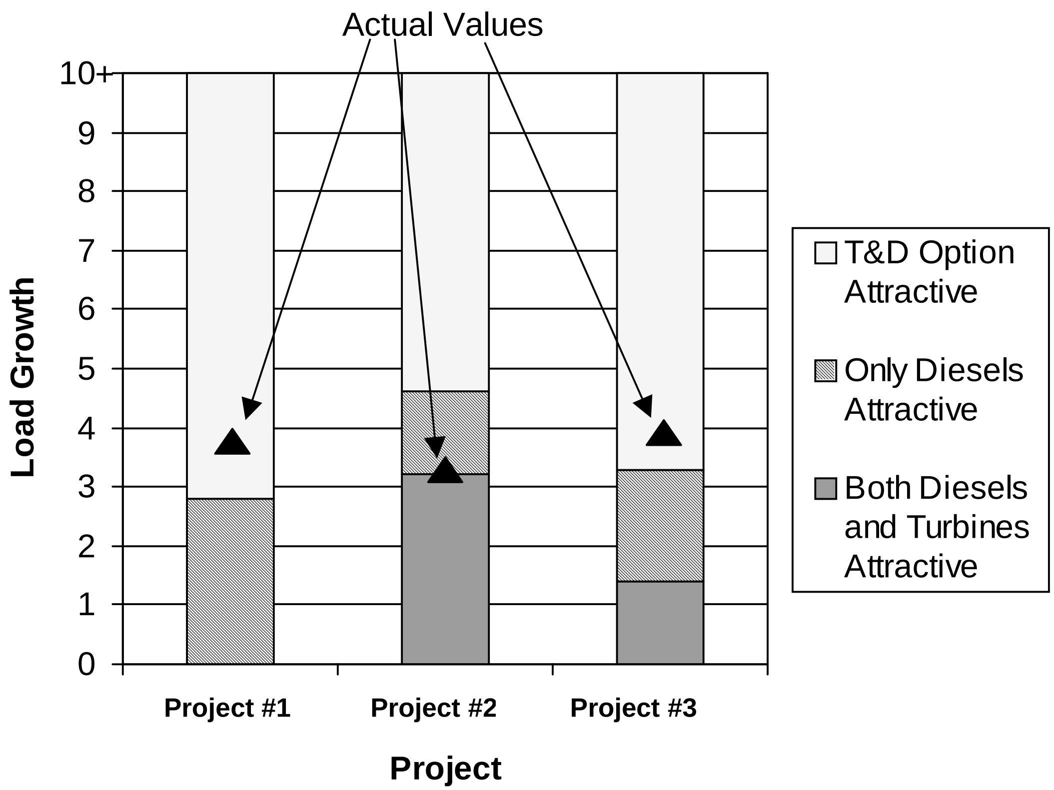
Results from Sensitivity Analyses



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Results from Sensitivity Analyses on Load Growth

- When each project is assessed with load growth around 3 percent, DER options begin to become economic.
  - With Project #1, diesel DER becomes economic at a 2.8 percent growth rate, which is about a percent lower than the base case of 3.8 percent.
  - Project #2 is attractive for diesel DER anywhere below 4.6 percent, and even the Solar Turbines become attractive at load growth rates below 3.2 percent, right at the base case.
  - Project #3 becomes attractive for diesel DER at 3.3 percent, only 0.6 percent lower than the base case, and for Solar Turbines at 1.4 percent.
- These findings show that slower load growth benefits DER as it means that a smaller investment in DER is necessary to defer the T&D option, and thus offer more favorable economics.

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New Methodology for Evaluating the Integration of Customer-Operated DER into SCE's Distribution Planning

- The overall objective of SCE's efforts is to reduce T&D costs by integrating customer-operated DER into the distribution planning process.

- Such cost reductions will be realized by entering into operating agreements with customer-owned DER that to allow the deferral of identified upgrades required by SCE's distribution system.

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New Methodology for Evaluating the Integration of Customer-Operated DER into Distribution Planning at SCE

The criteria are that the DER based alternative arrangements must:

- Be located in the right place
- Provide sufficient capacity
- Be installed and operational
- Provide physical assurance

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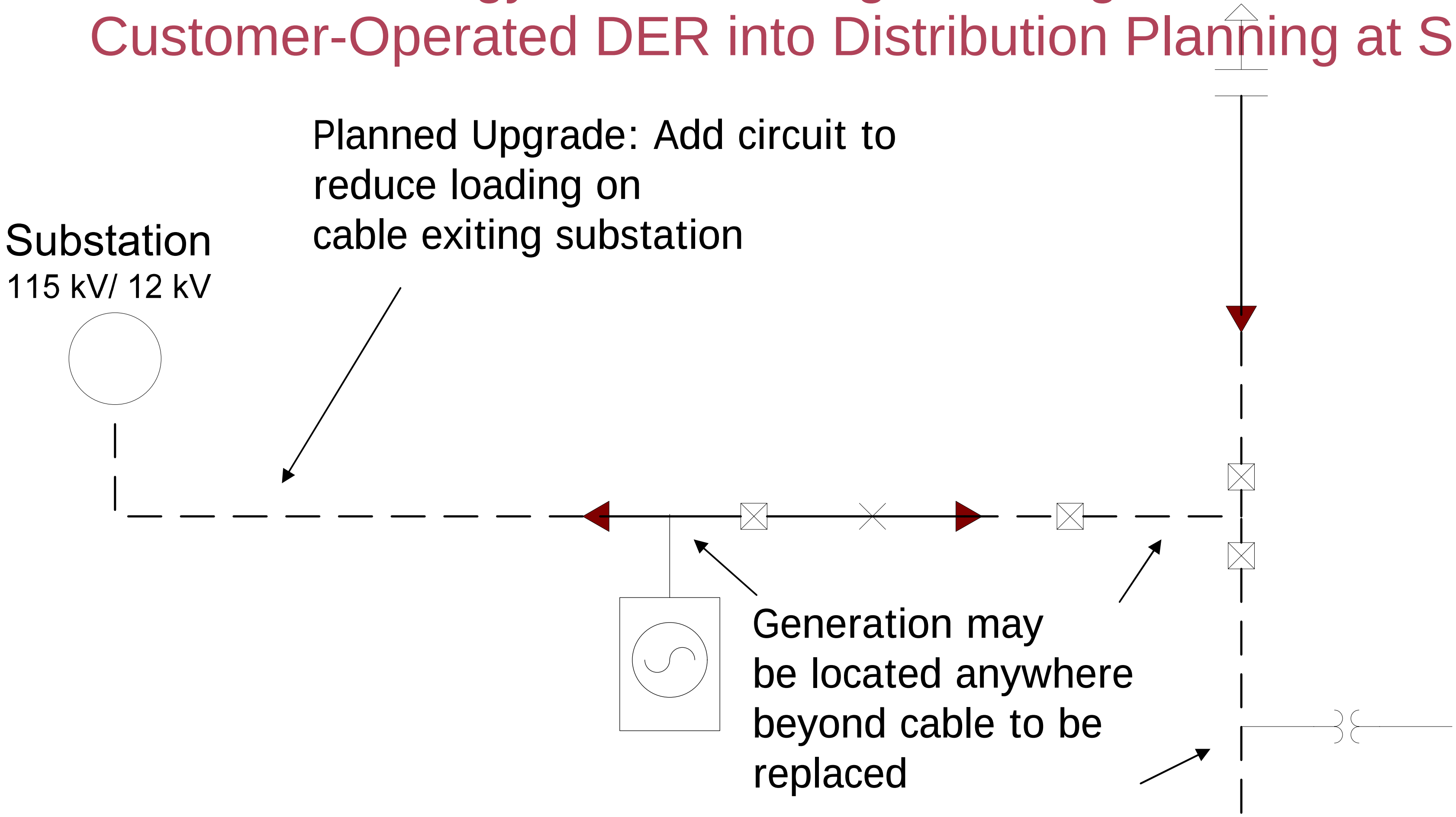
New Methodology for Evaluating the Integration of Customer-Operated DER into Distribution Planning at SCE



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Key Findings

- For some applications, DER may offer a cost effective way to defer T&D capacity additions and should be considered a tool to resolve distribution problems
- Sensitivity analyses have revealed that the most sensitive parameter to make DER economic is load growth
- T&D cost reductions may be realized by integrating customer-owned DER into the utility planning process via prudent operating agreements
- Utility management support is required for DER to be successful