

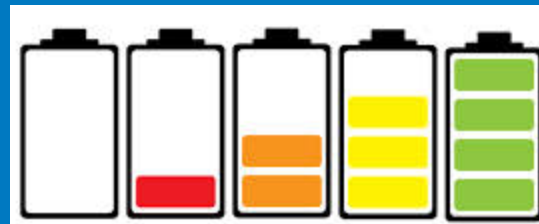
Distributed Generation Direct Transfer Trip (DTT)



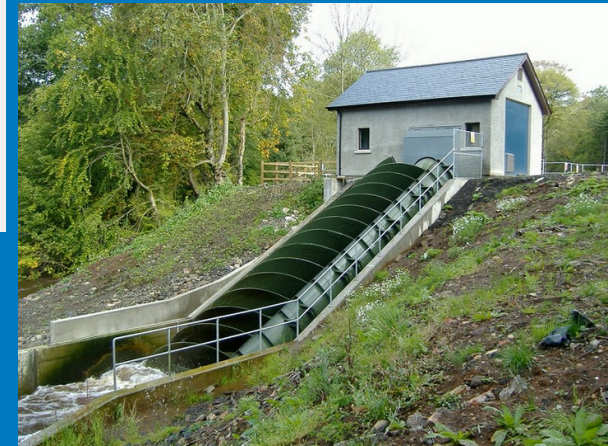
Wind



Solar



Battery



Hydro

URI Capstone Project 2016

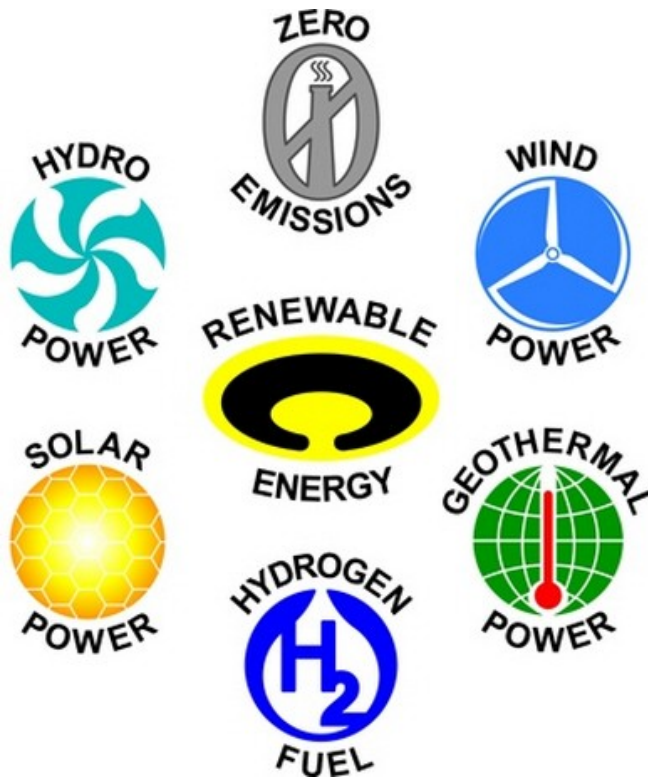
Introduction

- **nationalgrid**
 - We are an international electricity and gas company and one of the largest investor-owned energy companies in the world. We play a vital role in providing energy to millions of customers across the northeastern U.S. and Great Britain in an efficient, reliable and safe manner.

Introduction

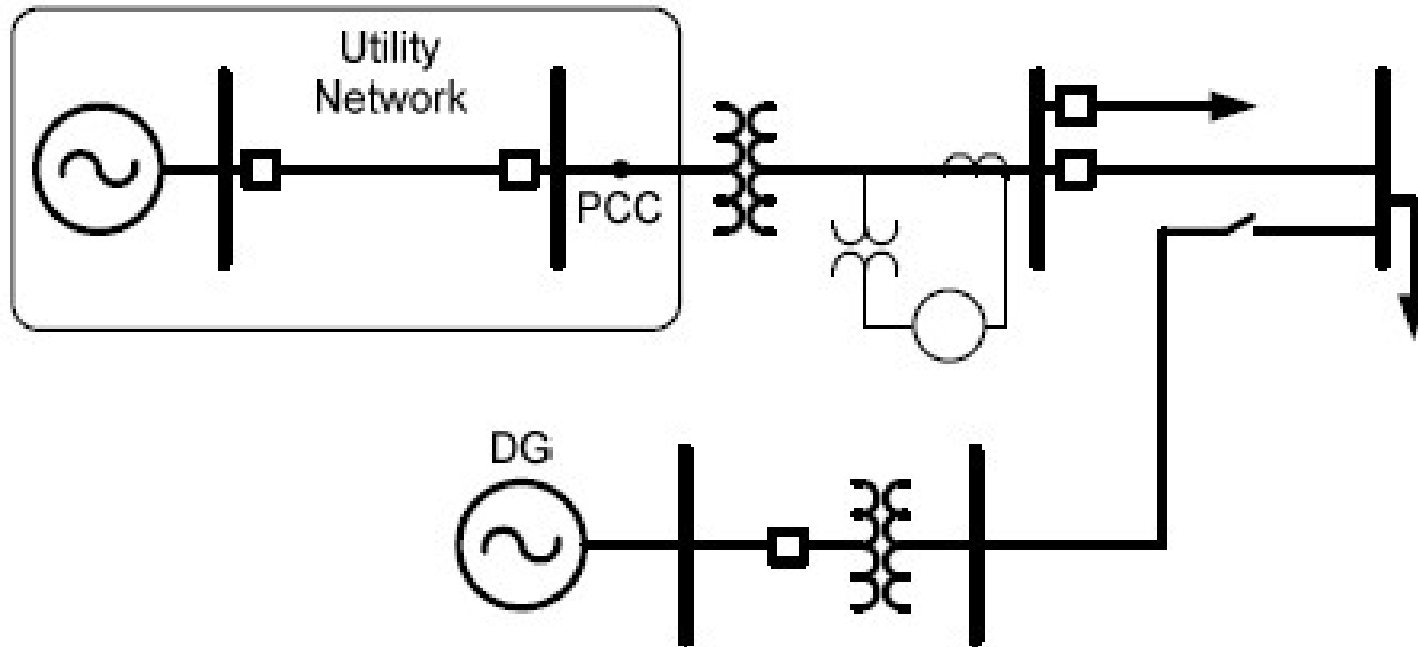
- Erica Salk – Program Manager
 - 4 years experience with National Grid
 - Engineer – Protection Engineering – NE
 - BSEE – Trinity College, MSEE – Brown University
- Luis Rodriguez – Coordinator
 - 2 years Experience with National Grid
 - Associate Engineer – Telecom Engineering
 - BSEE – University of Rhode Island
 - Part of Capstone Project in 2014 - 2015

DG Interconnection and Protection Schemes



What type of protection is required when connecting generators to the grid?

DG Interconnection – Typical



- DG Generators typically range from 1 to 10 MW
- The number of generators varies by site, i.e. (6 ea) 500kW generators

Island Formation Concerns

Distributed generators can not always power other utility customers without being connected to the utility grid?

Why?

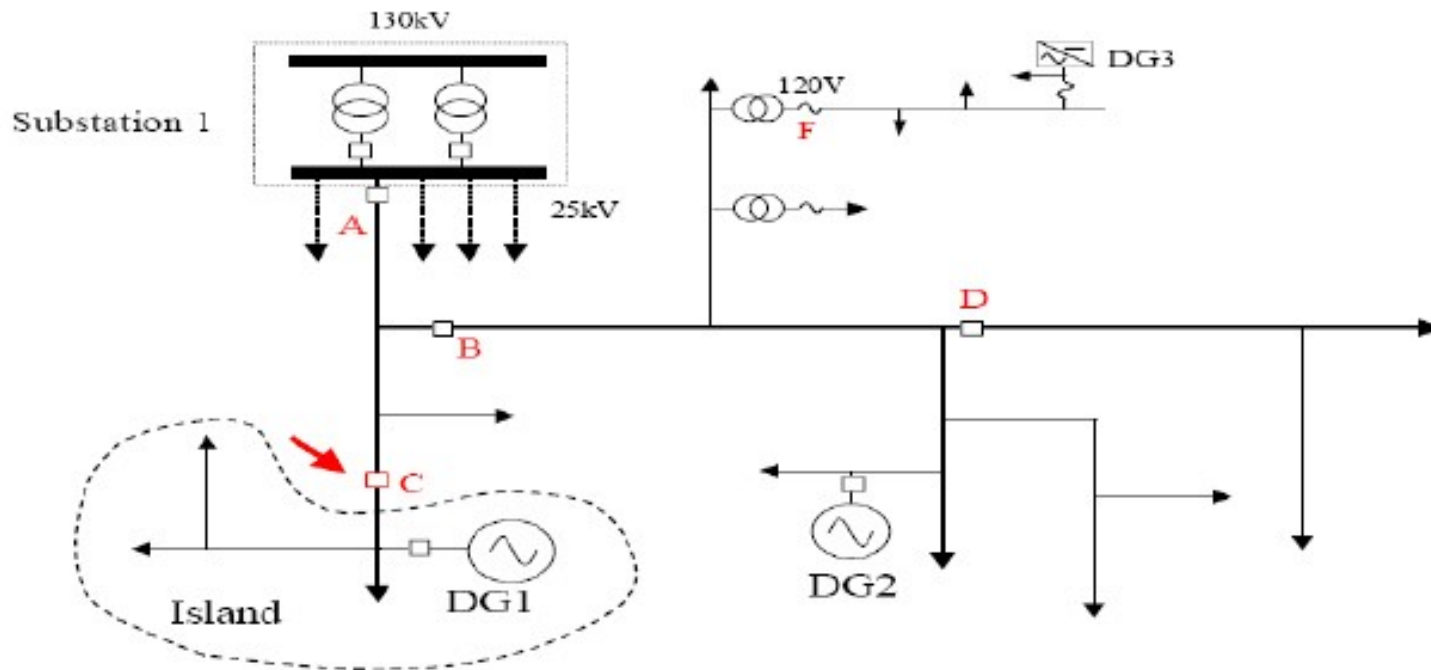
Islanding - Definition

- Islanding occurs when a portion of the distribution system becomes electrically isolated from the remainder of the power system



Formation of Islands

- An island can form with DG1 if recloser C or breaker A opens up
- Similarly an island can also form with DG2



Unintentional Islanding

- Unintentional islanding can be detrimental to the utilities' customers if left to operate and carry the load of the customers
- The island becomes an unregulated power system. Its behavior is unpredictable due to the power mismatch between the load and the generation

Implications of Islanding - Safety



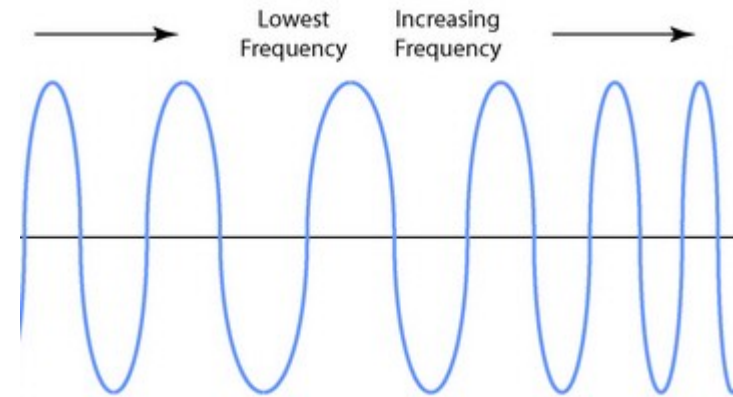
- Islanding of a generator can create a hazard for utility line workers by causing a line to remain energized that is assumed to be disconnected from energy sources

- The islanded system may be inadequately grounded



Implications of Islanding - Voltage

- Voltage and frequency can vary if the generator does not provide regulation. The supply utility is no longer controlling voltage and frequency



- This can potentially cause voltage sags, potentially damaging customer equipment which the utility is responsible for, but has no control over

Traditional Transfer Trip Methods – DTT

Direct Transfer Trip (DTT) is a standard method to trip islanded generator breakers



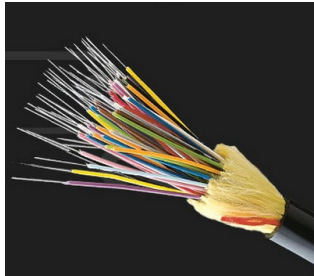
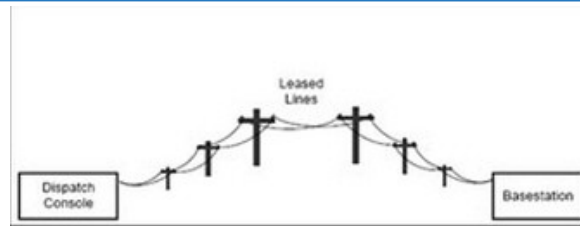
Direct transfer trip – Sends a trip signal to the DG when an upstream breaker opens. Due to the remote location, communication is required

Existing Direct Transfer Trip Methods

- Traditional methods incorporate the monitoring of circuit breakers and reclosers that could island a DG system
- A signal is sent using a communication scheme from the tripped device to the generator breaker to trip



DTT Communications - methods



- Leased copper line tone circuit with constant connection
- Fiber optics communication with direct connection – can be cost prohibitive
- Microwave radio with direct channel
- Serial 900Mhz radio with direct channel



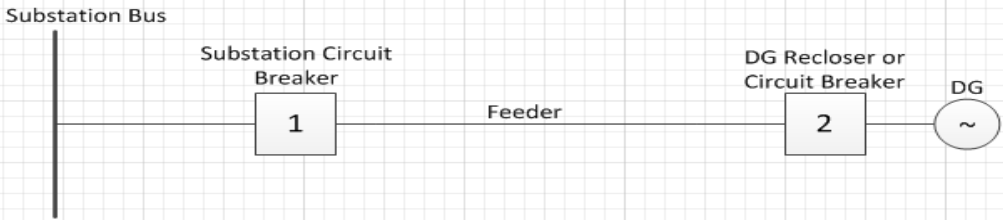
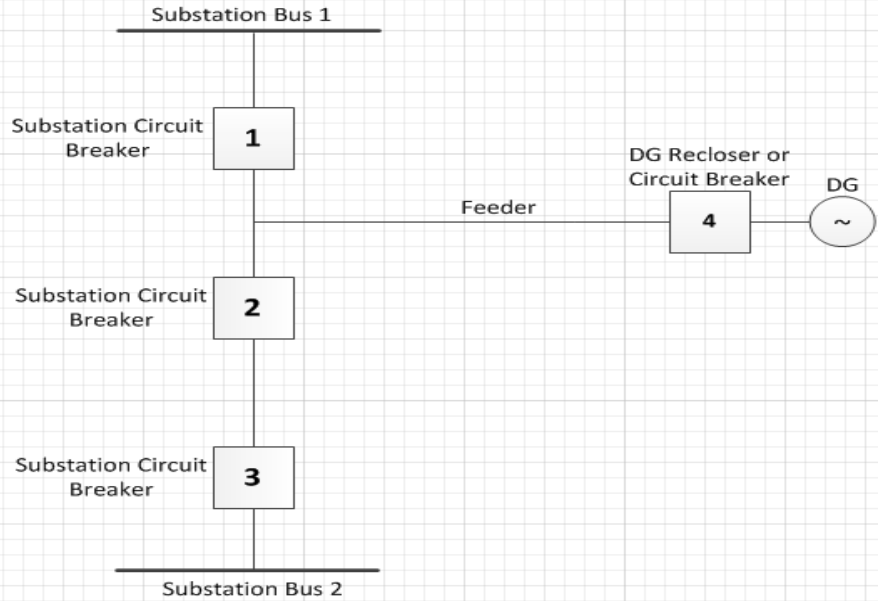
Project 1 – Direct Transfer Trip (DTT)

- This Project is to develop alternate way to provide Transfer Trip for Distributed Generation (DG) Projects.
- What is a Direct Transfer Trip?
 - DTT communicates a trip signal to a remote location.
 - DTT is used in DG applications to avoid islanding and detect remote faults
 - Current methods used:
 - Leased Phone Lines
 - Dedicated Fiber
 - Licensed and Non-Licensed Microwave Radio
 - DTT Barriers:
 - Costly – equipment & leased phone charges
 - Lead times – Lead times with phone companies can be up to a year.

Project 1 – Direct Transfer Trip (DTT)

- Develop alternates to the traditional way of providing DTT.
- Project is looking for lower cost and quicker implementation that would be available to DG Owners.

Typical Transfer Trip

Power System Layout	DTT Initiator
	<p>If 1 is open, then DTT signal is sent from the substation to open 2</p>
	<p>If 1 AND 2 are open, then DTT signal is sent from the substation to open 4</p>

Task to be completed

- Conceptual Design
 - What you anticipate it will look like
- Project Cost Estimate
 - Financial Cost to achieve
- Create Technical Specifications
 - Product Technical Reviews
- Design and Configuration of the System
 - Using actual RI locations for pilot
- Project Closeout
 - Review of Conceptual Design and Cost Estimates vs Actual

Why is this important?

- Renewable Energy Sources are everywhere
- Customers want quicker ways to interconnect to the National Grid System
- Demand is increasing for cleaner power
- Customers want higher levels of reliability
- Cost Savings !
- Job Opportunities !

Required Skills

- Project Team – Two teams of 2 EE's
- General electronics and some power / control theory
- Ability to read and understand technical manuals
- Technical drawing skills
- Ability to work with vendors and other SME's

Security Clearances

- Must have a clean driving record
- May be subject to a personal background check



Contact information

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