Advantages at a Glance

Maximal Hosting Capacity Analysis

or

How much Distributed Energy Resources (DER) can your Distribution systems handle?
The Challenge

Utilities have to deal with a high number of Renewables being integrated onto their Distribution Systems and still have to provide reliable operation of the grid while trying to minimize the cost of energy.

NY State Energy Plan

The New York State Energy Plan sets forth a vision for New York’s energy future that connects a vibrant private sector market with communities and individual customers to create a dynamic, clean energy economy.

The Plan:

- Contains actionable policy recommendations and analyses to guide the State’s efforts to advance new energy technologies that foster an innovative clean energy economy
- Addresses energy use, its sources and impacts, and provides details on how the State developed its overarching vision and initiatives
- Forecasts energy supply and demand
- Provides a statewide inventory of greenhouse gas emissions and vulnerabilities of the energy system
- Informs New Yorkers on the environmental and public health impacts associated with energy production and use

Renewable Energy Programs

California, with its abundant natural resources, has a long history of support for renewable energy.

In 2009, 11.6 percent of all electricity came from renewable resources such as wind, solar, geothermal, biomass and small hydroelectric facilities. Large hydro plants generated another 9.2 percent of our electricity.

On October 7, 2015, Governor Edmund G. Brown, Jr. signed legislation to require 50 percent of the state’s electricity to come from renewable energy by December 31, 2030.
Maximal Hosting Capacity

The extensive growth of distributed energy resources (DER) integration on the power system has fundamentally changed the operation and planning of the power grid.

In addition, integrating new technologies and moving towards a smarter grid increases the risk of system reliability and optimal supply, creating a challenge for utilities to remain competitive while reducing costs.

Renewable energy resources cost less than ever before.

The energy infrastructure is aging.

With the hosting capacity module for each network node:

PSS®SINCAL evaluates the generator interconnection studies along with consistently calculating the maximum load capacity that can be installed on to the network without adversely impacting any reliability or power quality concerns.
Hosting Capacity Analysis Module

Step 1: Define scope of nodes for evaluation

Step 2: Define DER/Load that has to be linked to the nodes and its technical behavior

Step 3: Define scope of testing criteria with user-defined limits
Hosting Capacity Analysis (Integrated Capacity Analysis) Simulation

Calculation process for this Hosting Capacity Analysis Simulation

• Model a network with the actual integrated DER
• Get historical forecasted load models along with critical operation points for the system
• Select an area or a group of nodes for the evaluation
• Link temporarily a DER or load and
• Increase the connected power until one of the pre-defined constraints are violated.
Hosting Capacity Analysis Simulation Criteria

The Hosting Capacity Analysis module will check:

- Thermal limit violation
- Voltage limit violation
- Change in voltage magnitude due to DER switching on/off or Voltage fluctuations
- Short Circuit Limitation
- Transformer reverse feed
- Protection check
Summary

1. How much can I integrate?
2. How much will it cost me?
3. What is the most ideal location?
4. Where would it be cheaper?
PSS®SINCAL
Integrated T&D Planning
IEEE PES General Meeting 2017
Chicago - July 16-21, 2017
usa.siemens.com/digitalgrid
T&D Integration

The extensive growth of distributed energy resources (DER) integrating on the power system has fundamentally changed the operation and planning of the grid.

• Consumers are turning into Prosumers

The interaction between T&D systems is becoming greater as DER integration increases, these DERs are impacting the distribution system which is leading to reliability concerns on the transmission system.

Optimization of operation cannot stop at the same voltage levels.

• Influences of the different voltage level have to be taken into consideration.

In addition to the impacts of DER on the distribution system, the disturbances on the transmission system must also be evaluated to understand overall impact on the power system.
Evaluate the effects of LV and MV system on HV

Increasing volatility on the distribution networks will cause flow in both directions to be constantly changing.

Static Load flow analysis will not be sufficient, there will be a need to conduct load profile simulation.

High Voltage systems have to be modeled with the low voltage grids to achieve accurate impacts on the system.

Short circuits have to take into consideration the contributions from the distribution networks.
Integrating Transmission (PSS®E) and Distribution (CYME) Systems
Importing PSS®E Transmission Base case to PSS®SINCAL

Importing a PSS®E Network

A wizard guides you through the process.
If available, the following files are imported:
*.raw, *.seq., *.dyr and *.drw

Step 1: PSS®E case in *.raw format
Step 2: Import *.raw file using PSS®SINCAL
Step 3: Run load flow to ensure successful import
Step 4: Create network diagram
Step 5: Zoom into any given substation using the View options in PSS®SINCAL
Importing CYME Distribution Base case into PSS®SINCAL

Import a Cymdist network

A wizard guides you through the process
If available the following files are imported:
Equipment, Network and Load File
Integrating PSSE Transmission Model to the CYMDIST Distribution Model

Link both network together by "Include Network" feature of PSS®SINCAL

When Power Flow is simulated the whole network has to be modeled unbalanced, if one element is unbalanced!
Include Network Function

Include the Transmission Network with the Distribution Network using the Include Network function
Include the Distribution Network with the Transmission Network using the Include Network function
Results – Integrated T&D Network

The integration results in a single Unbalanced T&D Network!!
Thank you

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