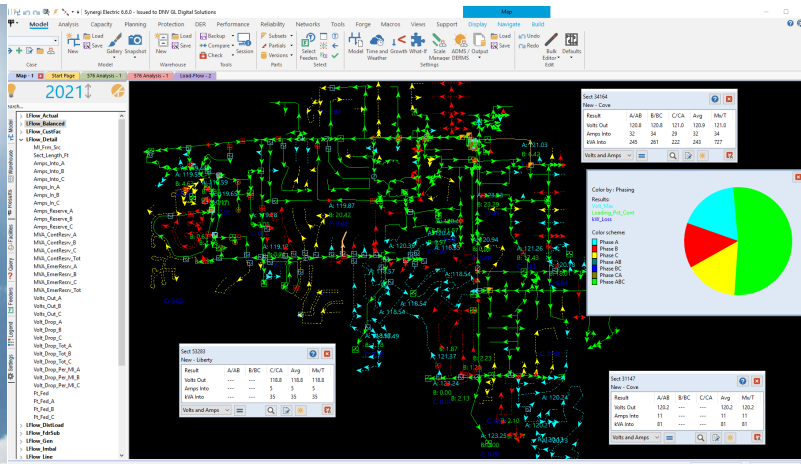
SAFER, SMARTER, GREENER

DNV·GL

DIGITAL SOLUTIONS

SYNERGI™ ELECTRIC

Distribution planning and circuit analysis for the electric grid



Synergi Electric is a comprehensive circuit analysis and modelling software program for power distribution engineers. Synergi Electric models the power system, including detailed loads and generation, from substation to customer.

Advanced modelling solution
Power distribution companies are facing ever increasing challenges to provide safe, reliable and cost-effective energy solutions. Regulations, distributed generation, new technologies and extreme weather events necessitate advanced modelling solutions such as Synergi Electric. Power engineers require software systems that are flexible, comprehensive and tightly integrated to the corporate asset databases. Synergi Electric provides you with the intelligence you need to make decisions that drive business performance, safety and reliability, while mitigating risk.

Synergi Electric has a wide variety of tools and engineering applications integrated into a single model and database. With Synergi Electric you can better understand the performance of your system through different perspectives and analysis results in various functional areas.

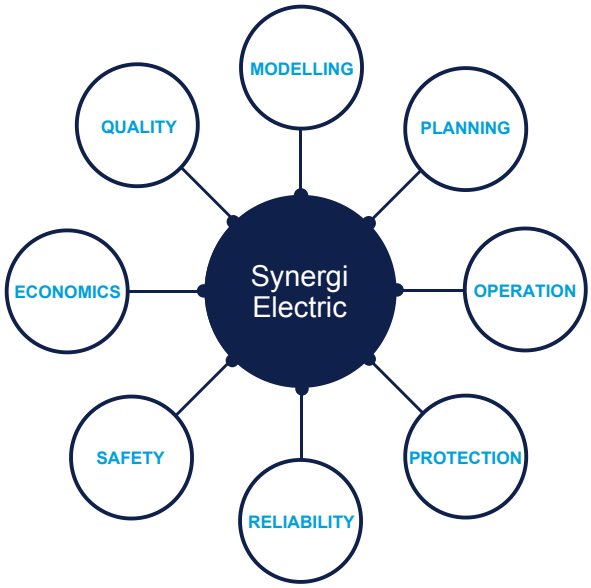
Analysis tools for planning
Synergi Electric incorporates a full suite of analysis tools to perform short and long-term planning studies. Its customer class modelling and weather modelling comprise of a solid basis for diurnal or daily load modelling. Demand levels, voltages, loading and spare capacity can be evaluated each hour of every day over 12 months or 10 years. Synergi Electric analyses determine if the distribution system will adequately meet the utility's design and operation criteria. Synergi Electric models the base year plus 10 years forward, including tools for load allocation, phase balancing, capacitor placement, PV placement and load balancing.

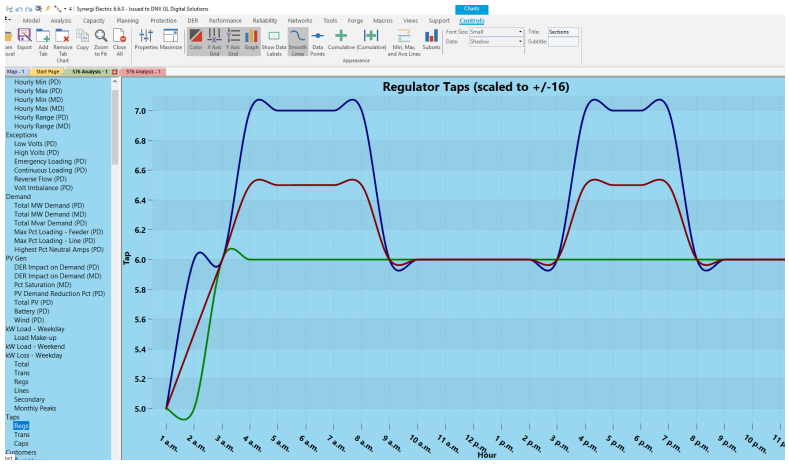
Renewables and Distributed Energy Resources (DER)
Models for PV and wind generation are easy to set up in Synergi Electric. Load-flow, fault analysis, hosting capacity and time-series analyses evaluate the impact of these generators. Time and weather conditions are modelled in Synergi Electric to represent real world output of PV generators, combined with detailed load models that provide the most accurate representation of your distribution system. Synergi Electric also models large battery energy storage systems and a variety of control models.

KEY BENEFITS OF SYNERGI ELECTRIC:

- A complete framework of power analysis tools in a single model and user interface
- Multi-year analysis reporting provides engineers an efficient view for short-range and long-range planning
- Time series analysis has been added to address the variabilities in load and generation on high penetration PV circuits
- Python scripting builds script routines to automate analysis
- Data handling in Synergi Electric is efficient and open, leveraging structured query language for importing external data sources
- COM Solver provides a programming platform to support client-specific analysis applications and automate planning and operations analysis functions
- Publish model results to the web, DXF, GIS, MS Excel, SharePoint or a dashboard

System Protection
Synergi Electric provides an advanced modelling environment for over-current protective devices and allows engineers to quickly evaluate and manage the extensive and complex protection schemes for hundreds or thousands of distribution feeders. Synergi Electric includes numerous fault applications, including





Fault Flow, Fault Voltage, Fault Sequence, PV Fault and Fault Location Analysis. Fault location analysis assists you in quickly troubleshooting outages by accurately predicting the location of fault events and momentary outages. Fault location can be performed manually or automated with Python scripting or our Electric Solver. Synergi Electric also performs Arc flash hazard analysis based on the IEEE 1584 standard

Synergi Electric includes a time current curve explorer where engineers can model their protective devices in the model without requiring separate data stores. Curves for over 15,000 devices are included in the product.

Load growth, customer behaviour, switching configurations and changing facilities are all part of the environment in Synergi Electric and important to protection studies. The Synergi Electric coordination evaluation engine is based on an expert system and a detailed set of over 80 user-defined rules and margins.

Reliability analysis

Reliability metrics are indicators of the value that customers realize through their utility service and are a key concern for power distribution engineers. Outage events are brought into Synergi Electric where they are correlated and used to calculate the performance indices of the base system. You can see root causes of reliability problems, the impact of new or relocated reclosers and switches and evaluate mitigation strategies, such as tree trimming or animal guards. The Synergi Electric reliability simulation is run on the same model and data as all other simulations. While making changes to protection, switching, and loading, you can evaluate the impact of your proposed changes on reliability.

Power quality engineers will find useful tools in Synergi Electric in performing harmonic analysis. Analysis of harmonic curves and total harmonic distortion are native tools in Synergi Electric. Analysis of the loss of a feeder/circuit is simple and automated in Synergi Electric with the contingency switching tool. Synergi Electric has a full suite of tools for capacity planning including: switch assessment, throw-over analysis, optimal switching, load transfer analysis, switch plan analysis, auto-transfer analysis, outage pick up, load at risk, and feeder tie path analysis.

10 good reasons for choosing Synergi Electric:

1. Middlelink Analyze distribution models from the substation to the retail customer within a real world spatially correct mapping environment
2. Integrate load and DER forecasts into data models and perform multi-year analysis
3. Perform Hosting Capacity Analysis, supporting DER including PV, storage and microgrids, model PV & batteries and screen PV
4. Includes detailed load modelling: diurnal load curves, customer classes, spot loads, distributed loads, EVs, growth options
5. Run load flow analysis: 8760, multi-year and quasi stead state load flow
6. Protect critical equipment and improve reliability with a full suite of tools for coordinating protective devices and evaluating system reliability
7. Analyze networks and looped systems
8. Develop and validate contingency switching plans and find the best possible switching configuration for your system
9. Automate planning studies and operations analysis functions and run batch analysis
10. Take advantage of data integration tools to import GIS data, customer meter data (AMR/AMI) and SCADA and integration services with enterprise systems and processes.

Data services (data integration and automation) and Solver
Synergi Electric provides tools to integrate with external data sources. Geographic Information Systems (GIS) can be used to develop distribution system models in Synergi as well as automated model build processes, which ensure that the user always has a current model of their distribution system. Additional data sources can be used to further enhance the model build, such as:

- The Customer Management Module (CMM) provides a link to the utility's billing system, improving the accuracy of load allocation in the model and allowing customer classes to be included
- Advanced Metering Infrastructure (AMI) can be used to import a specific loading condition from a known date and time
- Middlelink and Model Forge tools can be used to interface with records of distributed generation, improving accuracy of hosting capacity and impact studies
- Results from load forecasting studies can be imported to Synergi Electric using the Forecast tool, further enhancing the model for multi-year analysis.

DNV GL's Consulting team has helped many utilities to implement these processes, providing a fully customized model build solution with all data required for distribution engineers to carry out their analyses.

Synergi Electric Viewer
The product provides the option of deploying of a model view-only license. Synergi Electric Viewer allows data technicians to QA/QC models and work with data without having a full copy of Synergi Electric. Viewer has the same data and view capabilities without load flow or other analysis features.

DNV GL AS
digital@dnvgl.com
dnvgl.com/digital

About DNV GL

We are the independent expert in risk management and quality assurance. Driven by our purpose, to safeguard life, property and the environment, we empower our customers and their stakeholders with facts and reliable insights so that critical decisions can be made with confidence. As a trusted voice for many of the world's most successful organizations, we use our knowledge to advance safety and performance, set industry benchmarks, and inspire and invent solutions to tackle global transformations.

Digital Solutions

DNV GL is a world-leading provider of digital solutions and software applications with focus on the energy, maritime and healthcare markets. Our solutions are used worldwide to manage risk and performance for wind turbines, electric grids, pipelines, processing plants, offshore structures, ships, and more. Supported by our domain knowledge and Veracity assurance platform, we enable companies to digitize and manage business critical activities in a sustainable, cost-efficient, safe and secure way.

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