

DYNRED Dynamic Reduction

DYNRED is a software program developed by Powertech for EPRI in 1990s for creating dynamically equivalent models of large power systems.

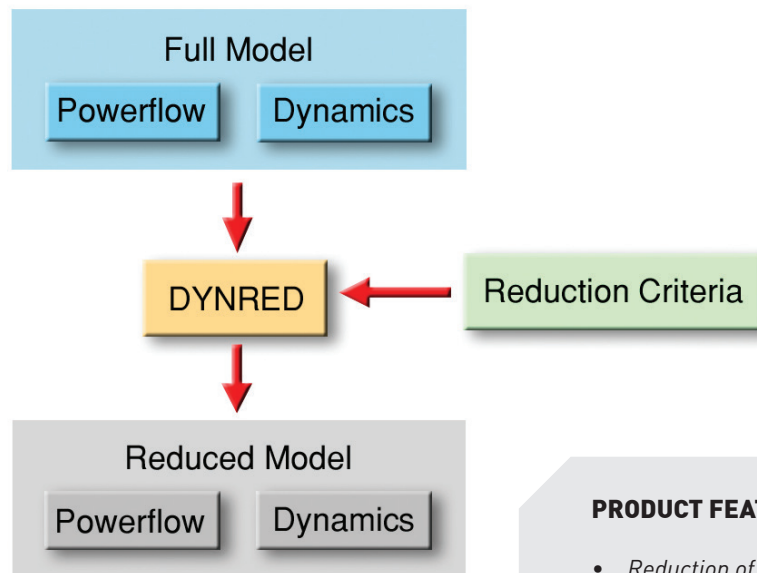


APPLICATION SCOPE

DYNRED starts with a set of models for a power system: powerflow and dynamics. For a specified set of system reduction criteria, DYNRED reduces the system in the external region by replacing it with static and dynamic equivalents. The result is a smaller system model that allows fast computations for system performance analysis.

DYNRED can be used for:

- Development of base models for system planning.
- Building models for on-line dynamic security assessment.
- Construction of appropriate models for control system design and tuning.



REDUCTION CRITERIA AND METHODS

To achieve the required reduction objectives, a set of criteria and methods can be specified:

- Regions of the system to be retained and to be reduced ("retained system specification").
- Grouping of generators in the external region ("coherency identification"). Choices can go from the simple weak link method to more advanced tolerance-based method.
- Handling of the coherent generators in the system ("generator aggregation"). Either classical or hybrid method can be used.

PRODUCT FEATURES:

- Reduction of large power system models for static and dynamic performance analysis
- Choice of reduction algorithms
- Compatibility in data formats with industry practices
- Performance benchmarking tools for reduced model validation
- Graphical user interface

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MODEL VALIDATION

A reduced model created can be validated by using the performance metrics computed by DYNRED from various types of applications, including:

- Basic powerflow performance.
- Extended powerflow performance at post-contingency conditions.
- Time-domain performance from no-fault simulations and simulations for specified contingencies.
- Frequency-domain performance from comparison of dominant modes in the system.
- Stability limit comparison subject to voltage and transient criteria.

SPECIFICATIONS AND REQUIREMENTS

- Processing power systems of up to 100,000 buses and 15,000 generators.
- Runs on MS Windows 7/10/server 2012 R2/server 2016

OTHER POWERTECH SERVICES

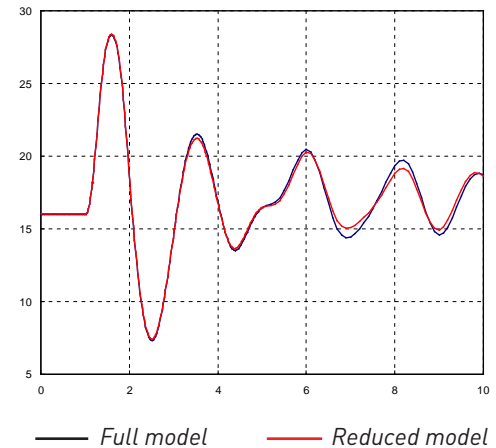
- Licensing of the power system analysis software package *DSATools™*
- Licensing of other software products for utility applications
- Implementation of on-line dynamic security assessment (DSA) systems
- Development of custom software systems
- Development of models for use in power system analysis
- Generator field testing, model development and validation
- Training
- Technical consultancy studies including
 - Development of power system base cases
 - System planning and operation studies
 - Facility (including renewables) interconnection studies
 - Compliancy studies (such as NERC TPL, CIP, UFLS, etc.)
 - Post-mortem analysis of system disturbances

APPLICATION EXAMPLE

This example shows a dynamic reduction done using DYNRED for a large power system model. The following table gives the details on the full and reduced models.

	# of Buses	# of Generators
Full model	54,735	7,887
Reduced model	25,941	3,099
Reduction ratio	47.4%	39.3%

Using the reduced model, the time it takes to complete a typical time-domain simulation is only 25.8% of the time for the full model. The figure on the right shows the quality of the reduced model.



Comparison of the time-domain simulation results for the rotor angle response of the same generator following a contingency.

ABOUT POWERTECH LABS

PowerTech Labs Inc. is one of the largest testing and research laboratories in North America, situated in beautiful British Columbia, Canada. Our 11-acre facility offers 15 different testing labs for a one-stop-shop approach to managing utility generation, transmission and distribution power systems.

Outside of the utilities industry, PowerTech provides routine testing capabilities, product development, research and consulting services to support an array of industrial-type operations, electrical equipment manufacturers and automotive original equipment manufacturers.

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