

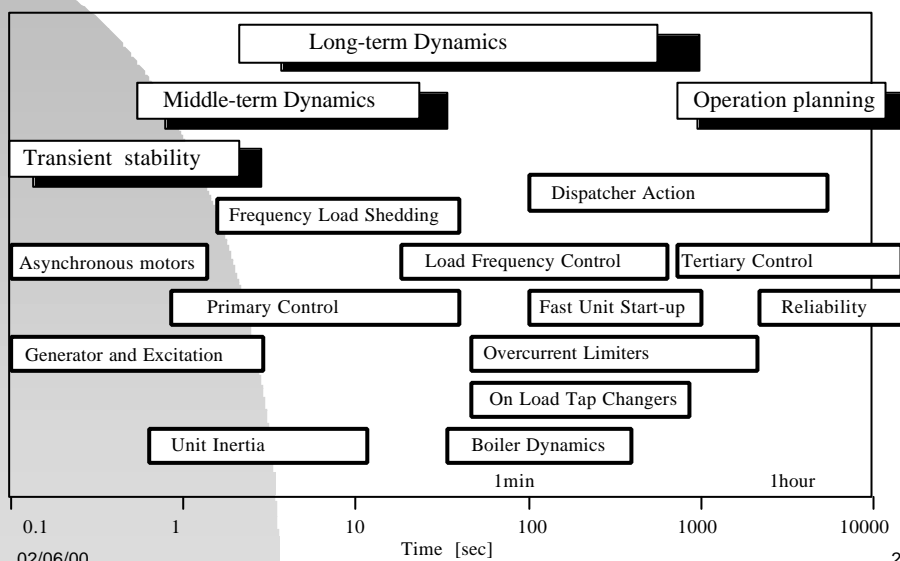
Power System Dynamic MODES Network Simulator

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02/06/00

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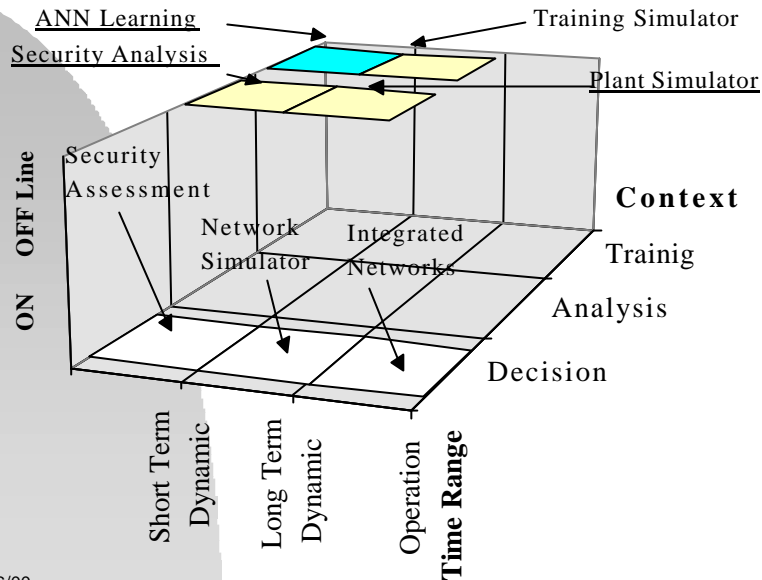
Purpose program MODES



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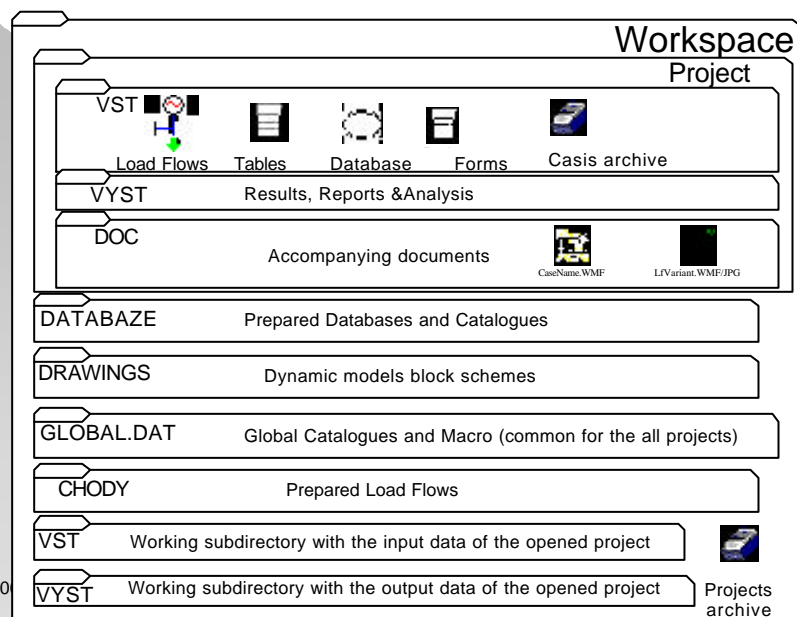
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MODES applications overview

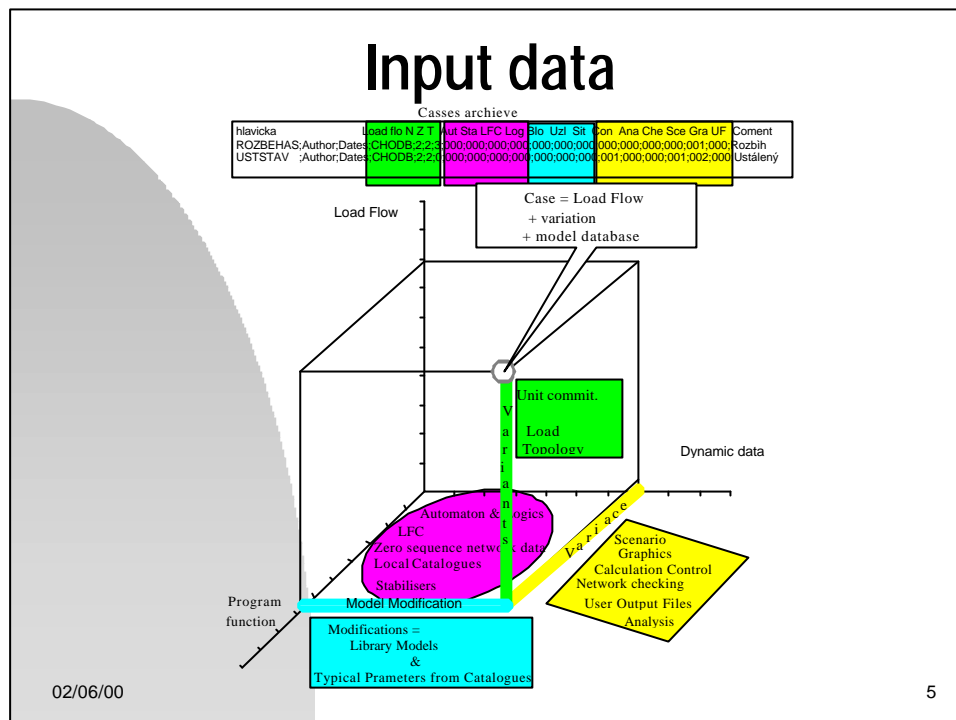


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Data managing – workspace concept



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Output data

- The MODES provides the following possibilities:
- showing information on display during calculation (so called graphic)
- saving the simulated variables time courses into output files (so called user output files)
- checking of values of predefined network variables (so called network checking)
- reporting the calculation into output files (so called reports)
- providing analysis of network state, primary and secondary control (so called analysis).

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The Graphic

The graphic mediates interaction between user and program during simulation.

- ◆ Case and projects name information
- ◆ Events messages
- ◆ Instantaneous values of variables from charts
- ◆ Up to four charts with up to seven time courses of selected variables
- ◆ Hotkeys F1-F8
- ◆ Escape key for stop calculation Limits signalling for „on line“ checking

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User files

- The user files can be used for:
- results visualisation by a text editor
- charts creation by a spreadsheet application (e.g. EXCEL)
- results visualisation as a chart, coping and pasting it into the documents
- predefined EXCEL sheets

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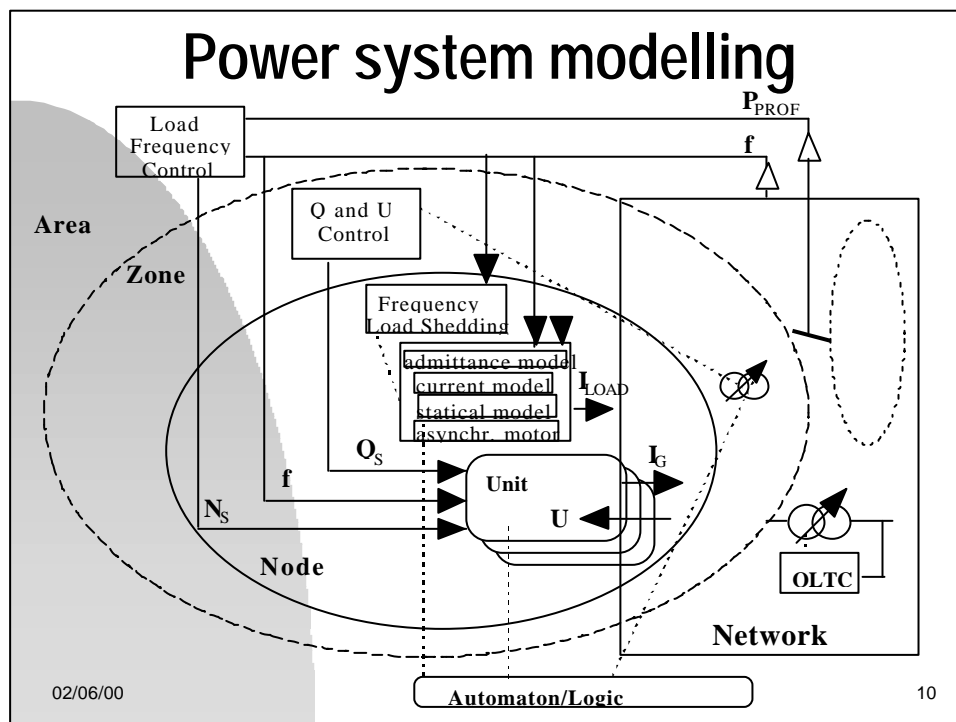
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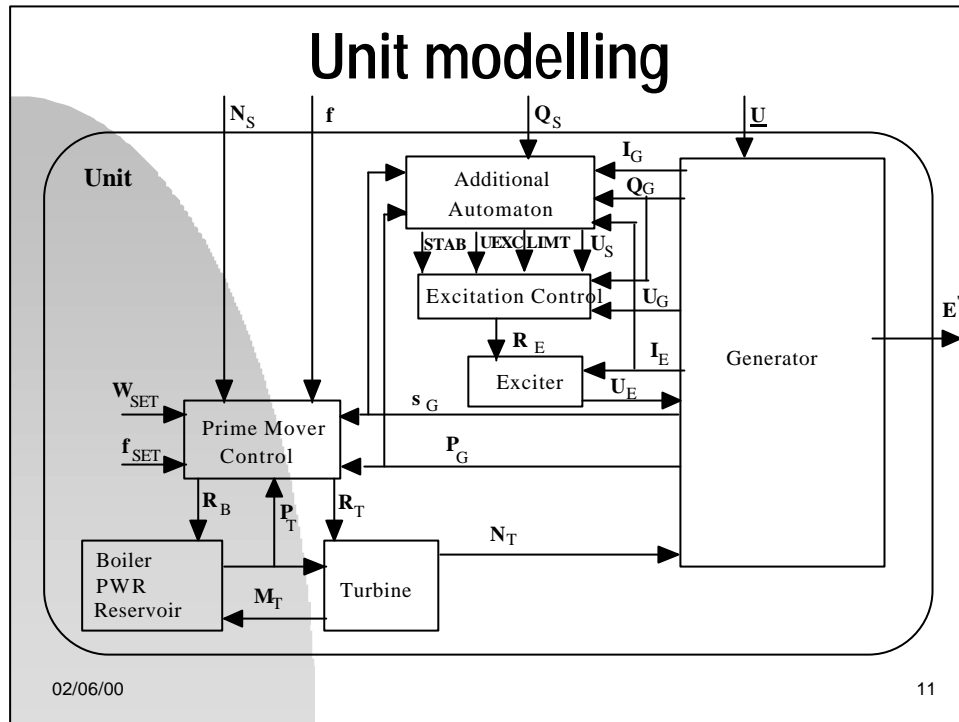
User interface - MODMAN

- The MODMAN provides:
- navigation in workspace by the Explorer
- projects management by the Project menu
- cases management by the Cases menu
- new projects creation by the Project editor
- new cases creation by the Case editor
- starting the package applications by menu or the toolbar
- Context and What this help, ToolTips and the status bar
- access to input files by menu in text or dialogue regime load flow data editing by integrated the Load Flow Editor
- dynamic data editing by integrated the Unit Model Editor
- access to the user output in text or graphic regime

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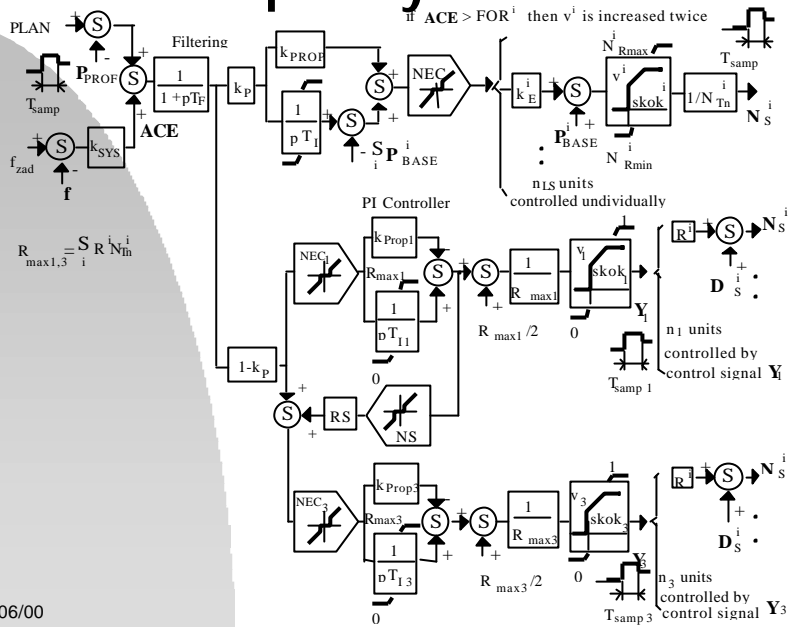
Control equipment modelling

- Four stage load frequency shedding
- On load tape changers
- Load frequency controllers
- External stabilisers
- Automaton and logics
- External regulators

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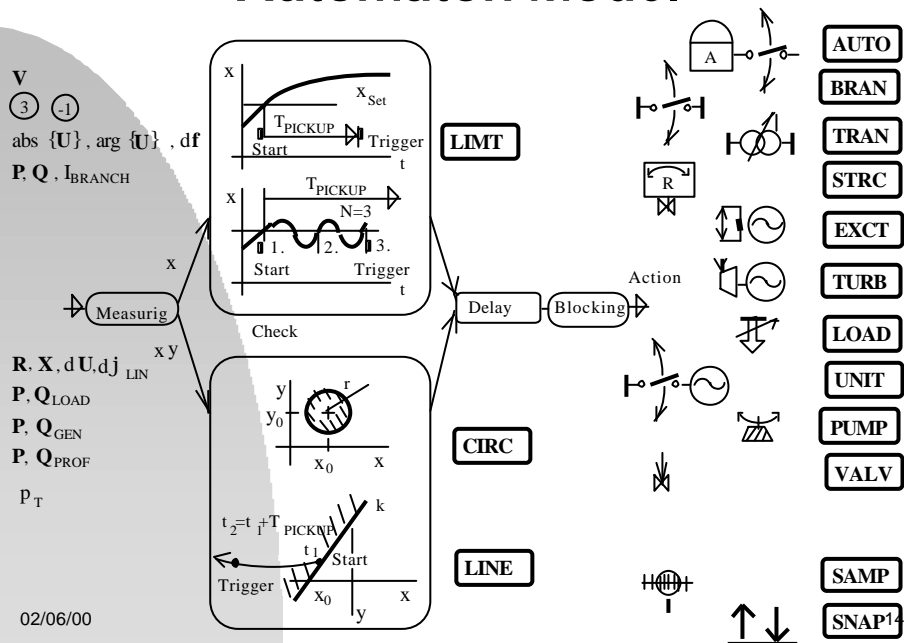
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Load Frequency Control Model

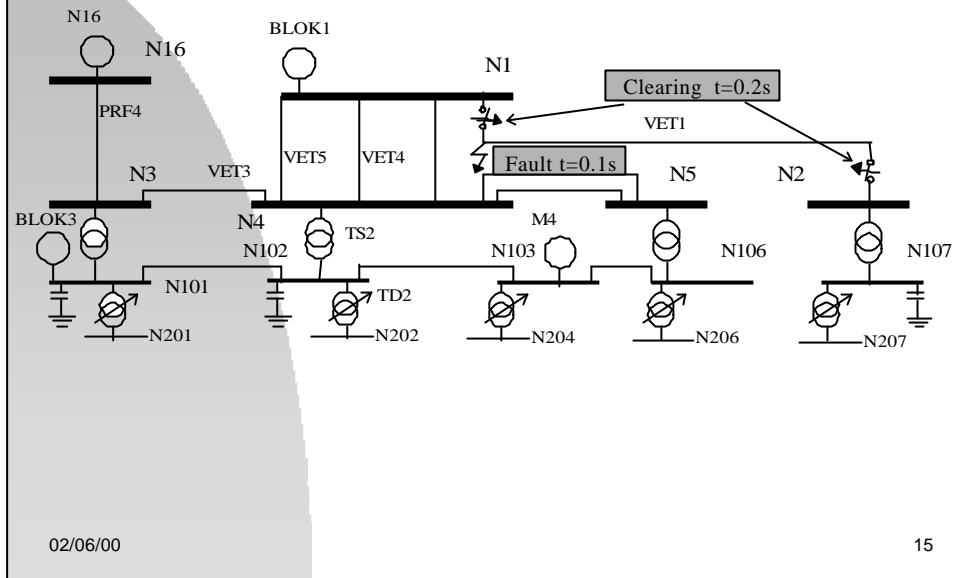


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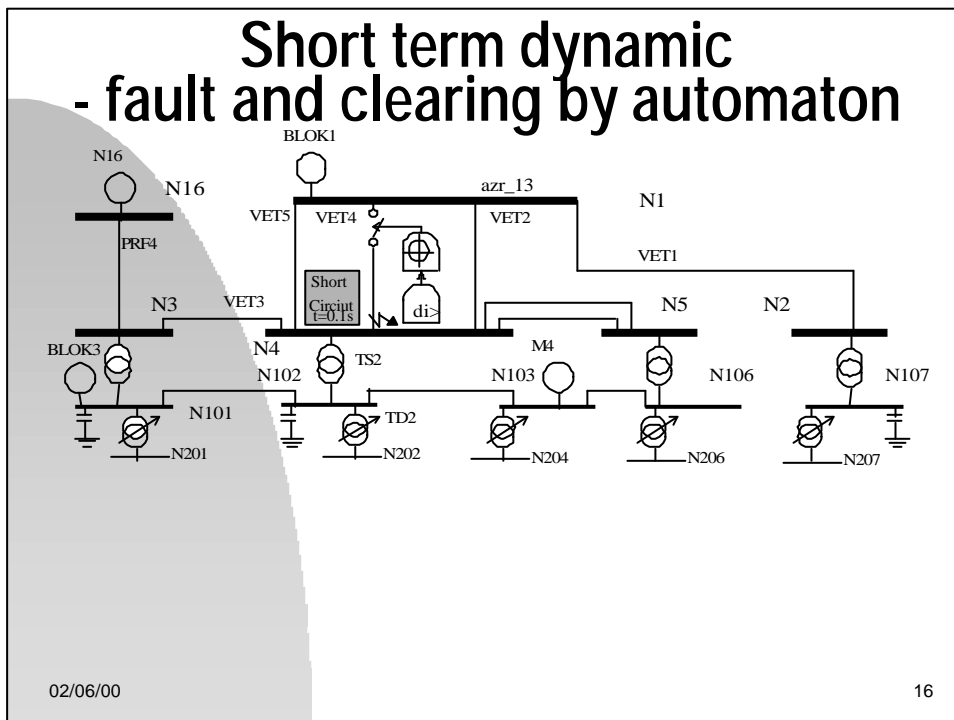
Automaton Model



Short term dynamic - fault and clearing by scenario



Short term dynamic - fault and clearing by automaton



Short term dynamic - fault and clearing by a logic

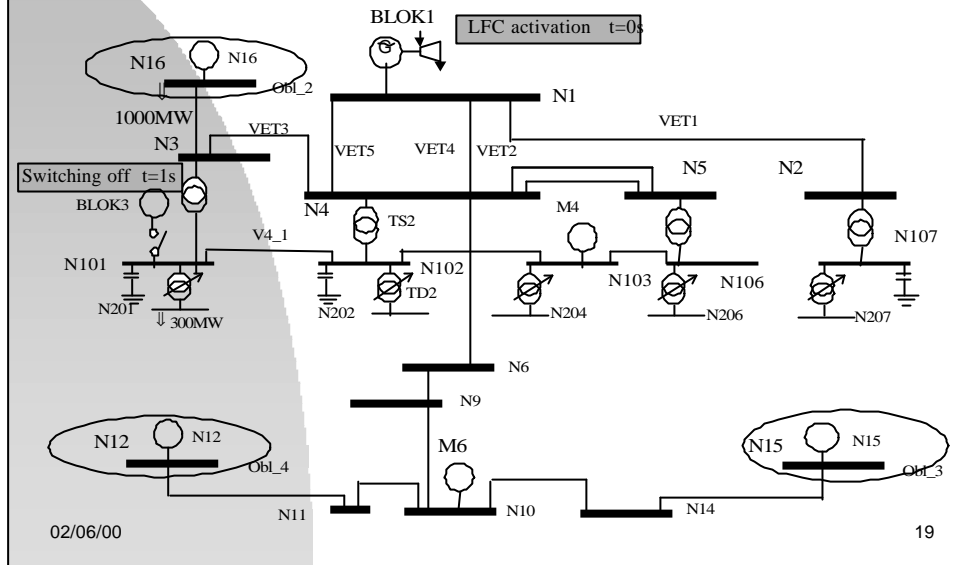
The diagram illustrates a power system configuration and a fault-clearing logic. The power system includes several buses (N1, N2, N3, N4, N5, N6, N10, N101, N102, N103, N106, N107, N11, N14, N15, N16, N204, N206, N207, N202), breakers (VET1, VET2, VET3, VET5, VET8), transformers (M4, M6), and a fault (F1) on line N1-N2. A fault is shown on line N1-N2, with a fault clearing time of 0.1s. The logic for fault clearing is implemented using a digital logic circuit. The logic circuit includes two input channels, Zona_1 and Zona_2, each with an AND gate and an OR gate. The output of the logic circuit is connected to a breaker (VET8) and a fault clearing unit (Short Circuit t=0.1s). The logic circuit also includes a delay block (D 2st) and a status block (stav).

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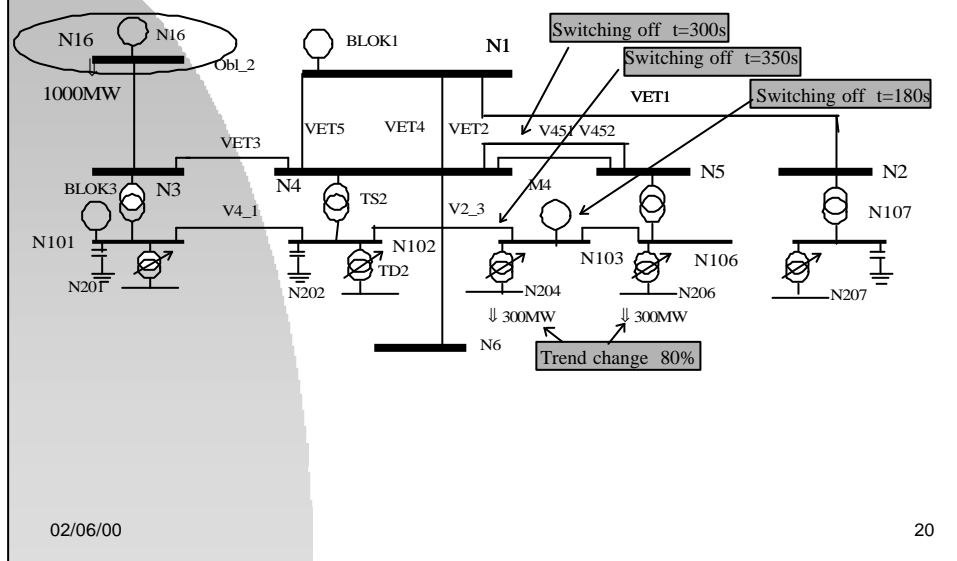
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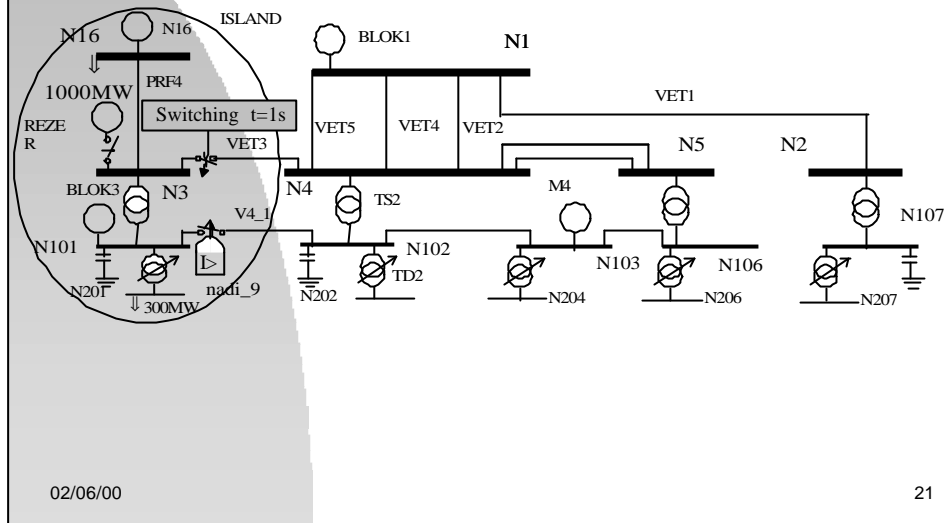
Long- term dynamic - unit outage load frequency control



Long- term dynamic Voltage collapse



Island operation -frequency collapse



Conclusions

- The MODES is suitable for education and study of power system transients
- The MODES is suitable as an engineering tool for power system analysis, planning and design
- It can be used as stand alone application with the MODMAN user interface
- It can be used as dynamic linking library in frame of a user application
- It contains library of dynamic models and set of standard parameters

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