# ERAG Multi-regional Modeling Working Group (MMWG) Current and Future Activities

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# Agenda

- Background
- Scope
- Annual Model Series Development
- ERAG Assessment Model Development
- Software Utilized
- Future Development
- Questions

# Background

- Modeling your neighbors' systems is necessary to get valid results for internal studies of the interconnected transmission system
  - Loop flows
  - Reactive influences
- In the past, utilities had to gather models from each of their neighbors individually
- MMWG was formed to gather together models of all the systems and create a single model for the whole Eastern Interconnection
- Because of program limitations, the first models were very high level with lots of equivalents formed before the cases could be assembled
- A utility would replace the high level model of their system with a more detailed model for their analysis
- As the modeling software evolved the submitted model details was increased
- Now almost every company submits fully detailed models

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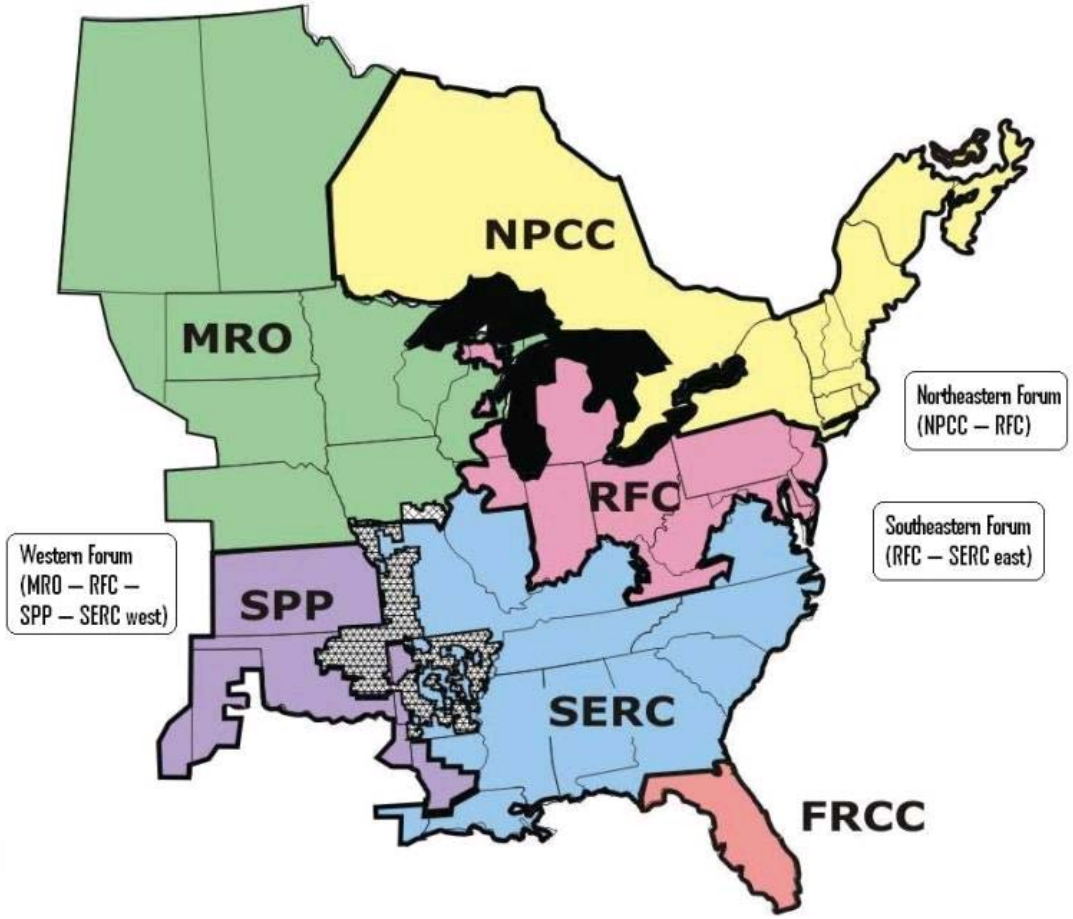
# Eastern Interconnection Reliability Assessment Group (ERAG)

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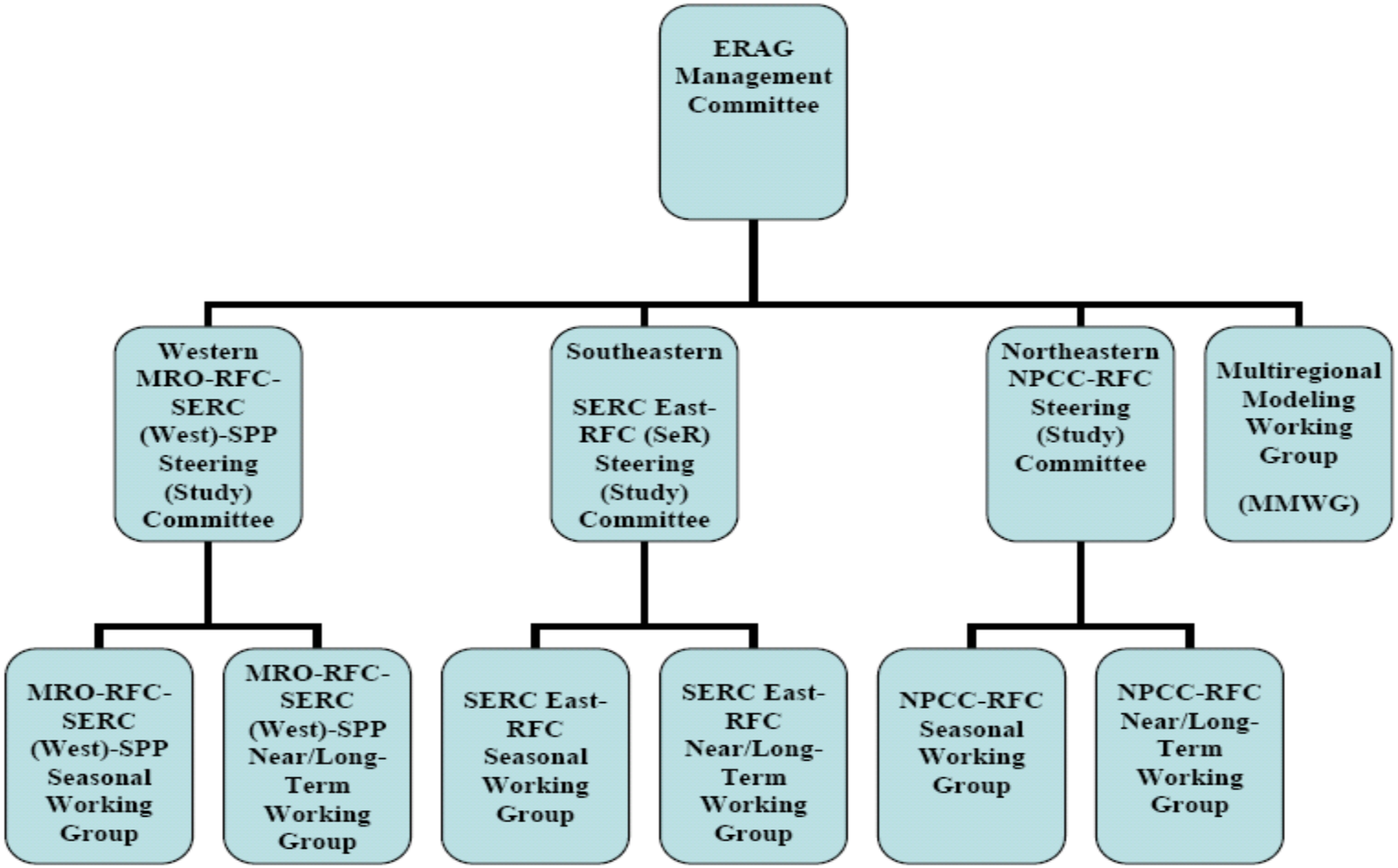
# Eastern Interconnection Reliability Assessment Group- Organization Chart

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# Scope

- Annually review and recommend the list of power flow base cases and system dynamic simulation models.
- Develop and maintain a library of Power Flow and Dynamic base case models. The library of cases is maintained for the benefit of members of the ERAG.
- Maintain a Procedural Manual for use by the Regions in submitting power flow and system dynamic modeling data.
- Work with the Regions to coordinate and ensure the timely submission of the regional and member system data.
- Keep abreast of the modeling requirements of the Regions and member systems and adopt or develop improved modeling and data handling techniques as required.

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# Annual Model Series Development

- List of Models

# MMWG Annual List of Base Case Models

***2011 Series Model Selection***

| Year | Season | Power Flow Models | Dynamics |
|---|---|---|---|
| 2012 | Light Load | X | X |
| 2012 | Spring | X | |
| 2012 | Summer | X | X |
| 2012 | Summer Shoulder | X | X |
| 2012 | Fall | X | |
| 2012 | Winter | X | X |
| 2013 | Spring | X | |
| 2013 | Summer | X | X |
| 2013 | Winter | X | |
| 2017 | Light Load | X | X |
| 2017 | Summer | X | X |
| 2017 | Winter | X | X |
| 2021 | Summer | | |
| 2022 | Summer | X | |

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# Annual Model Series Development

- List of Models
- Tie Lines and Interchange Coordination

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# Tie Line and Interchange Coordination

- Only the interregional tie lines are coordinated by MMWG and will appear in the final power flow models as populated.
- A tie line will not be represented in a particular power flow base case model unless both parties involved have agreed to include it.
- The Regional Coordinators should only submit tie line changes (additions, deletions, and changes) from the prior year's Master Tie Line Database to the Power Flow Coordinator.
- The schedule shall show net scheduled interchange for each Region and for each area within that Region.
- All interchanges must net to zero for all models.

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# Annual Model Series Development

- List of Models
- Tie Lines and Interchange Coordination
- Regional Data Submission

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# Data Submission

- Data submitted should be in accordance with Power Flow Modeling and System Dynamic Modeling Guidelines
- Each region performs an N-1 screening of its bulk electric system

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# Annual Model Series Development

- List of Models
- Tie Lines and Interchange Coordination
- Regional Data Submission
- Data Check Resolution

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# Data Checks

- Unrealistic PMAX and PMIN
- Unrealistic QMAX and QMIN
- PGEN outside range
- Reactive device regulating node voltage more than one bus away. Exceptions to include three winding transformers and zero impedance lines.
- Switch shunts with VHI - VLOW < 0.0005
- Controlled Bus Checks (CNTB) - Errors shall be corrected and warnings should be reviewed.
- Transformers with voltage band < 1.95 * step
- RAW read warnings produced by PSSE.
- Buses with duplicate bus names within the same control area. Duplicate bus names are defined as having the same twelve character name and six character voltage fields.
- Buses with blank voltage fields.
- Machines connected to a Code 1 bus.
- Code 2 buses with no machines modeled.
- Machines with MBASE < PMAX or MBASE = 100. Exceptions shall be documented.
- Machines with zero or non-positive RMPCT.
- Machines with GENTAP > 1.1 or < 0.9.
- Branches with Rate B < Rate A (Required) or Rate A = 0.0 and Rate B = 0.0 (Warning) for 100 kV and above. Exceptions to include circuit 99 and zero impedance branches.
- Three winding transformers with Rate B < Rate A (Required) or Rate A = 0.0 and Rate B = 0.0 (Warning).
- Transformers with RMAX <= RMIN or VMAX <= VMIN. Required for non-fixed tap transformers only.
- Transformers with RMAX = 1.5 and RMIN = 0.51. Required for non-fixed tap transformers only.
- Transformers with VMAX = 1.5 and RMIN = 0.51. Required for non-fixed tap transformers only.
- Transformers with RMAX, RMIN, VMAX or VMIN = 0. Required for non-fixed tap transformers only.
- Switched shunts with missing Block 1 steps.
- Branches with loading above 100% of Rate A or B for 100 kV and above.
- Bus voltages under 90% or above 110% for 100 kV and above.
- Branches with resistance > |reactance| for 100 kV and above. Exceptions shall be documented.
- Buses with owner numbers out of range.
- Buses with zone numbers out of range.
- Buses with numbers out of range.

# Annual Model Series Development

- List of Models
- Tie Lines and Interchange Coordination
- Regional Data Submission
- Data Check Resolution
- Final Power Flow Model Published
- Dynamic Data Submission
- Final Dynamic Model Published

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# ERAG Assessment Model Development

- MMWG develops two models for ERAG Assessment Studies
  - Summer Assessment
  - Winter Assessment/ Near term study/ Long term study

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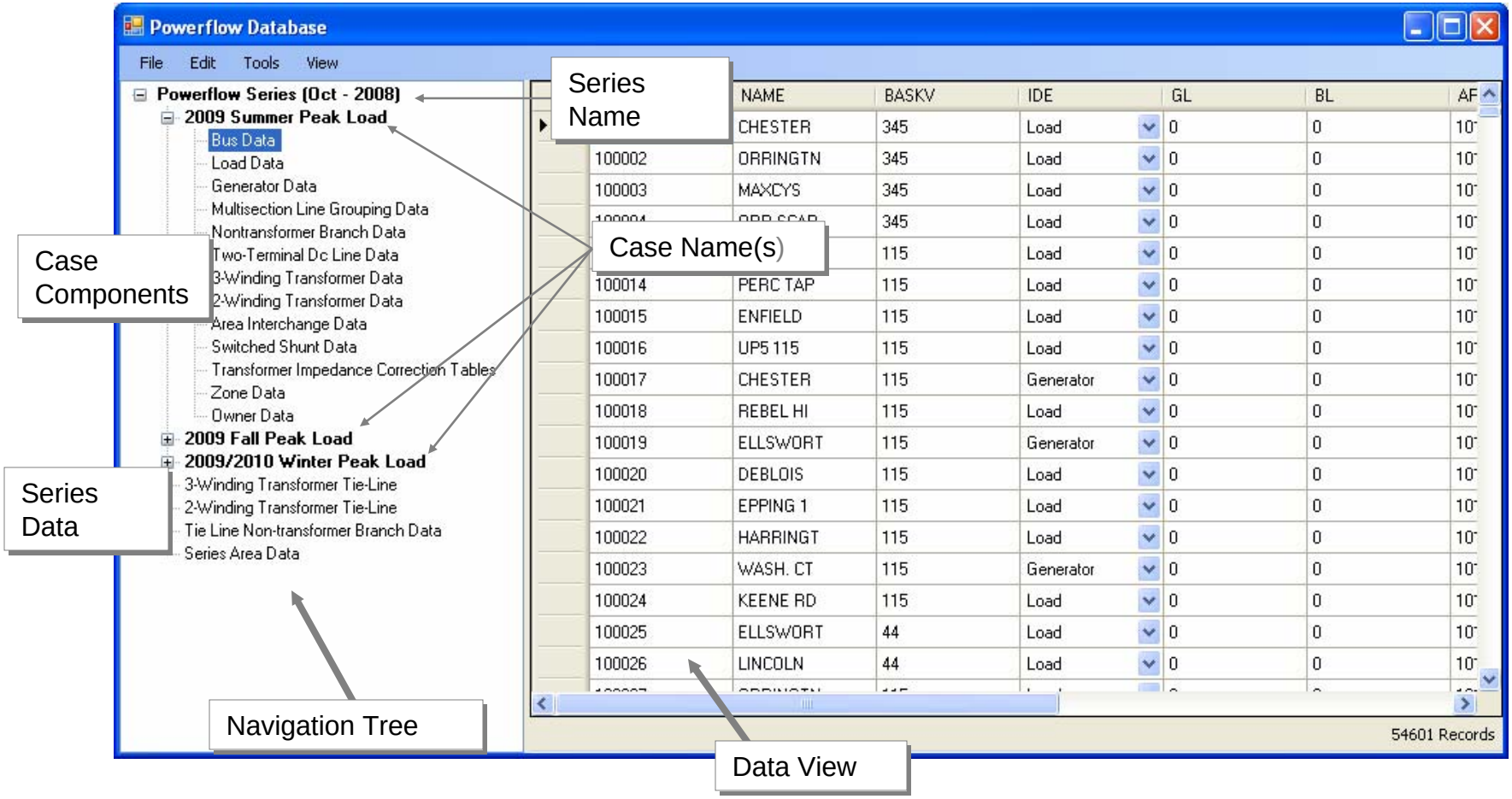
# Software Utilized

- Siemens PTI- PSS/E
- GE -PSLF
- Powertech – Power Flow Database (PFDB)
- Powertech- Dynamic Database (SDDB)

# Power Flow Database (Powertech)

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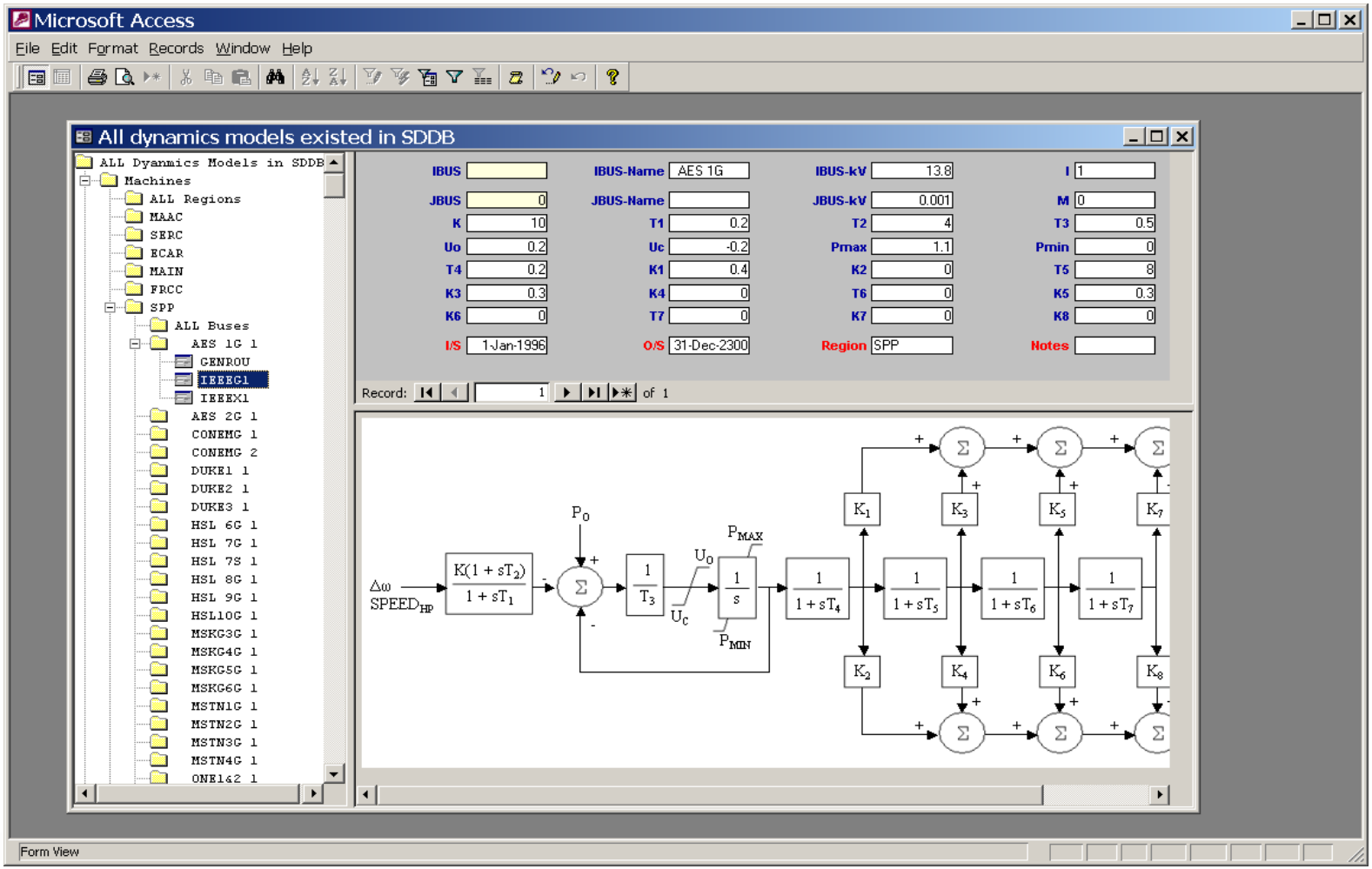
# Dynamic Database (Powertech)







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# Database Pros

- Consistent Topological Information
- Centralized Storage System
- Reduced Effort to Coordinate Tie Lines and Interchange
- Consolidated Error Checking
- Reduction in Annual Model Development Cost

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# Future Developments

- Data accuracy
- Data Submission
- Tracking Modeling Changes
- Industry Input

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**http://erag.info/**

# Questions?