Distribution GIS & Grid Model Data Management

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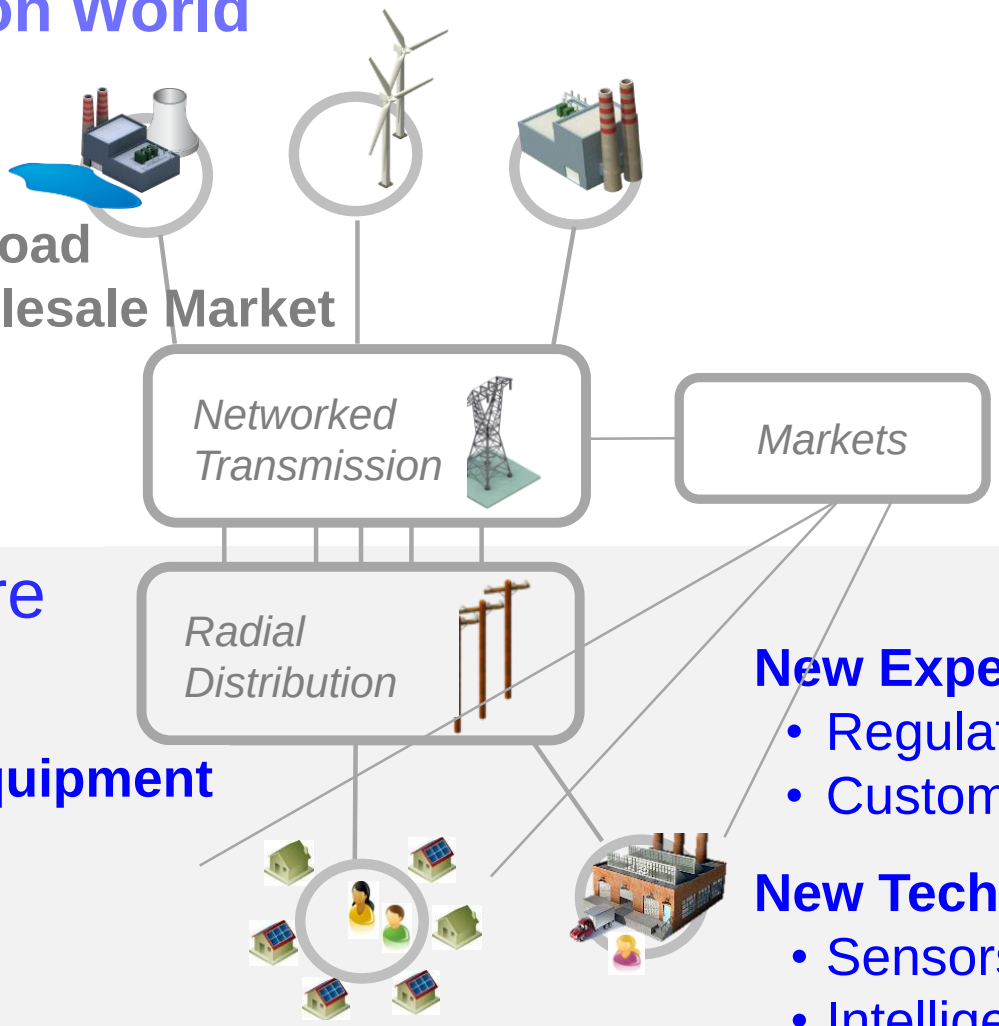
Distribution GIS & Grid Model Data Management Project

The New Distribution World

- Now
  - **Transmission Network**
  - **Radial Distribution to Load**
  - **Bulk Generation in Wholesale Market**



- Not-too-distant future

New Grid-Connected Equipment
- PV
- Storage
- EV

New Players
- DER Aggregators

New Expectations
- Regulatory
- Customer

New Technologies
- Sensors
- Intelligent Relays
- Tablets
- AR

Not your grandfather's grid

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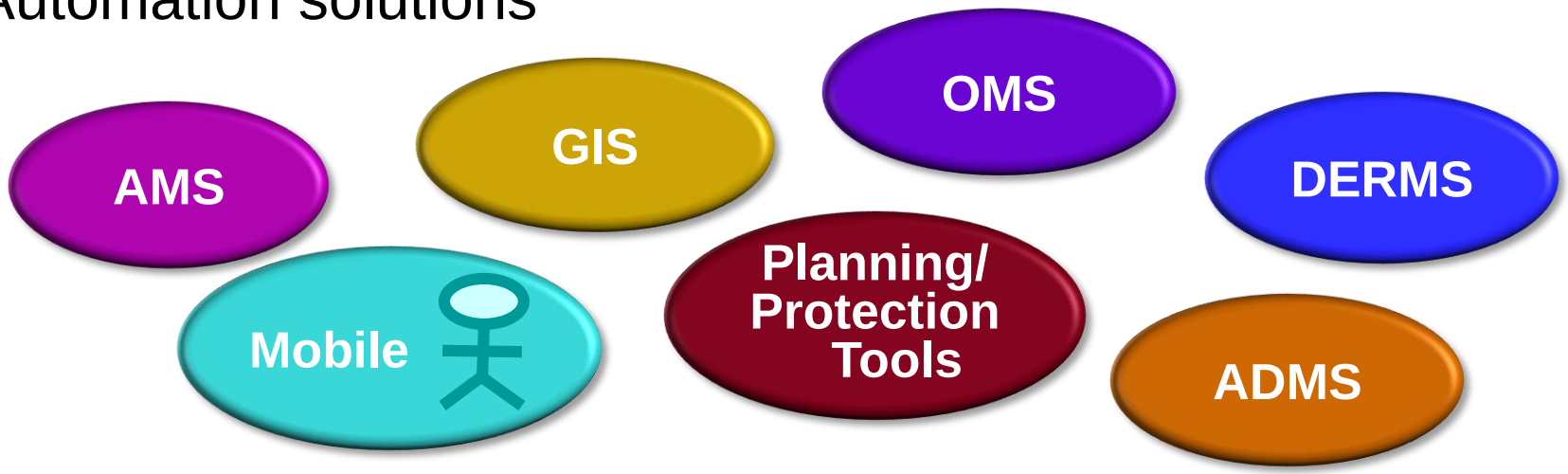
The New Distribution World

- Utility aspirations
  - Proactively leverage the benefits of Distributed Energy Resources
  - Accurate fault location, isolation and service restoration
  - Effective asset management to prioritize expenditures, improve reliability & reduce maintenance costs
  - Benefit from the energy efficiency improvements of advanced Volt/VAr control
- Automation solutions



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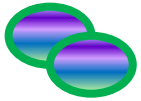
Aspirations Require Data

Utility-owned grid asset data



Field data

- AMI readings, load
- Real-time measurements, multi-second and sub-cycle

Geospatial data

Non-utility owned asset data

Non-grid asset data

- Protection assets
- Communications assets
- Cyber security assets

Grid model data

Field device configuration data

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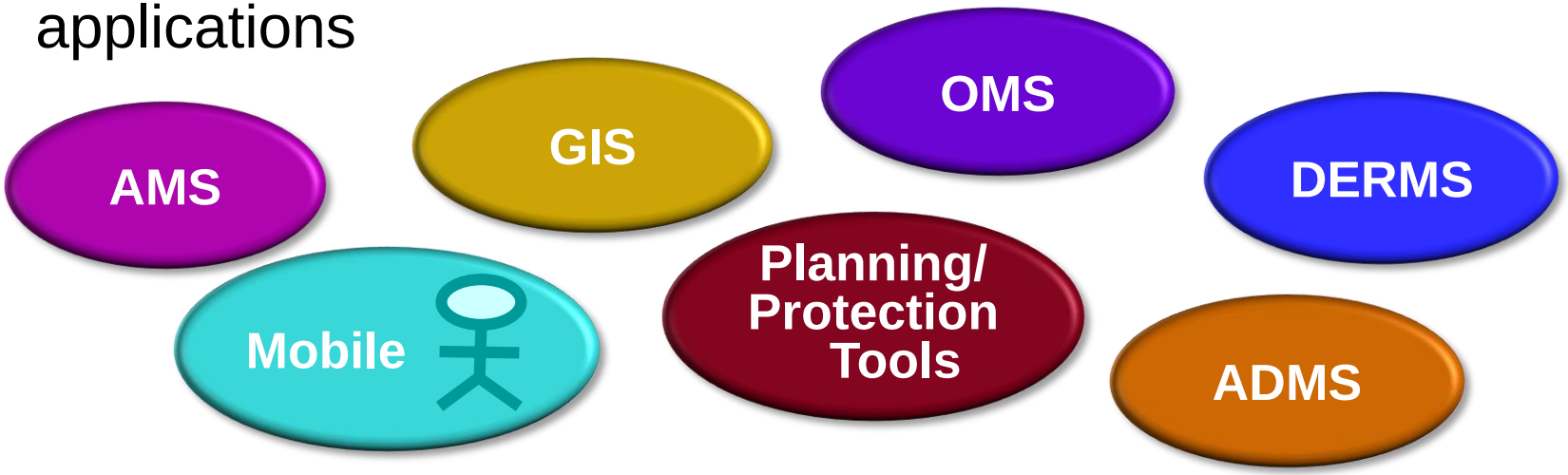
Why GIS and Grid Model Data?

- Because **grid model data** underpins many future applications



- Because **GIS data** is the usual source from which grid models are derived

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What do those ‘future applications’ do?

Allow the utility plan and operate a grid that is safe, reliable and affordable (in the face of significant changes)

- Planning the grid
  - Grid extension and replacement
  - Protection systems design
  - Optimizing third-party engagement (hosting capacity, non-wires alternatives)
- Operating the grid
  - Outage detection/restoration
  - Maintenance outage management
  - Situational awareness
  - Efficiency optimization
- It’s more than Watts (or ‘real’ power)
  - It’s voltage, frequency, ‘reactive power’
  - Behavior and response over time (ramping, power quality)

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What do those 'future applications' do?

- Execute power flow-based simulations (network analysis functions) which need high-quality network (grid) model data.

Network (grid) model data:

Data representing a simplified view of the electrical grid, including equipment, its electrical behavior and its connectivity, as well as its operating state at a moment in time, that is sufficient to describe a starting point for network analysis.

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Why is managing GIS and Grid Model Data a Challenge?

Because…

- Grid model data
  - Is big (variety and volume)
  - Must be cohesive to serve network analysis functions
  - Is made up of different types of data
  - Comes from multiple sources (including the field)
  - Is needed for the past and future
- GIS data
  - Often has major consistency / completeness issues
  - Often serves primary purposes other than providing grid model data

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So….

- In summary
  - Distribution utilities will deploy multiple applications/tools/systems
  - Many of which require accurate grid model data
  - That is difficult to manage
- A data management foundation for GIS and grid model data
  - Reduces risk of bad data causing errors in
    - operations decisions
    - study results
    - capital planning decisions
    - maintenance decisions
  - Saves labor wasted in duplicate entry, chasing bad data
  - Improves timeliness of results, decisions and actions

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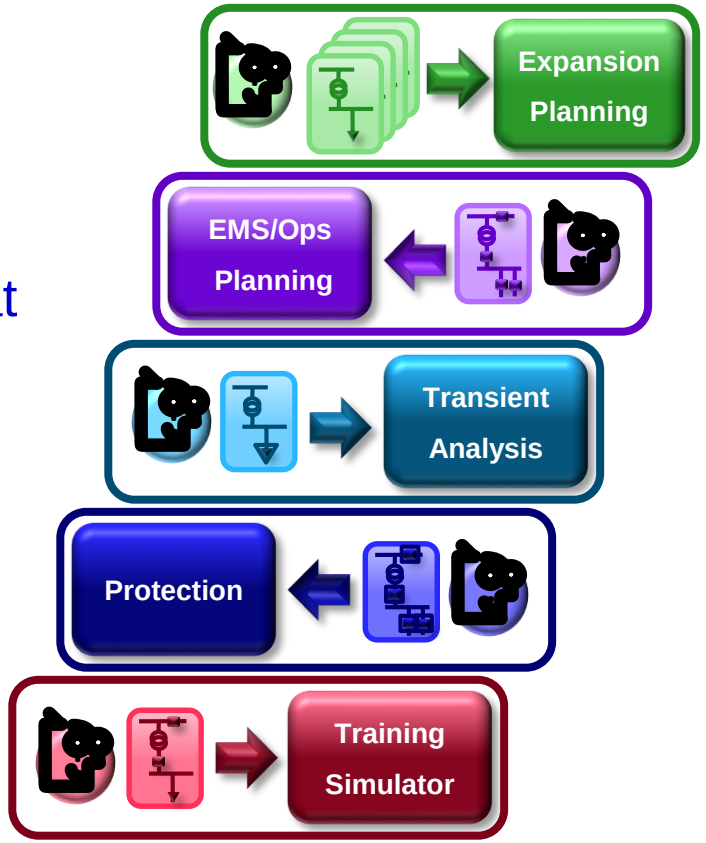
Network Model Data Management in Transmission

"Learning from Older Brother's Mistakes"

- Consistently across industry
- In well-established silos
  - Every tool requires its own network model, in its own format
  - Every tool has its own users and maintainers
  - Silos are both technical and organizational



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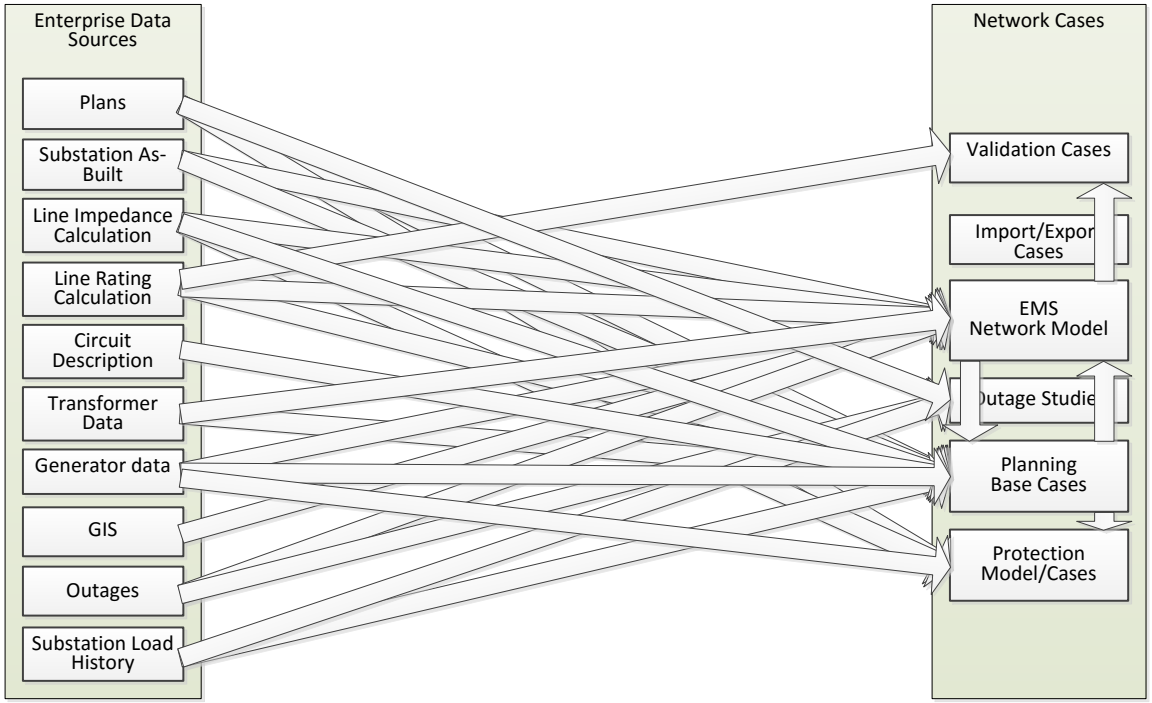

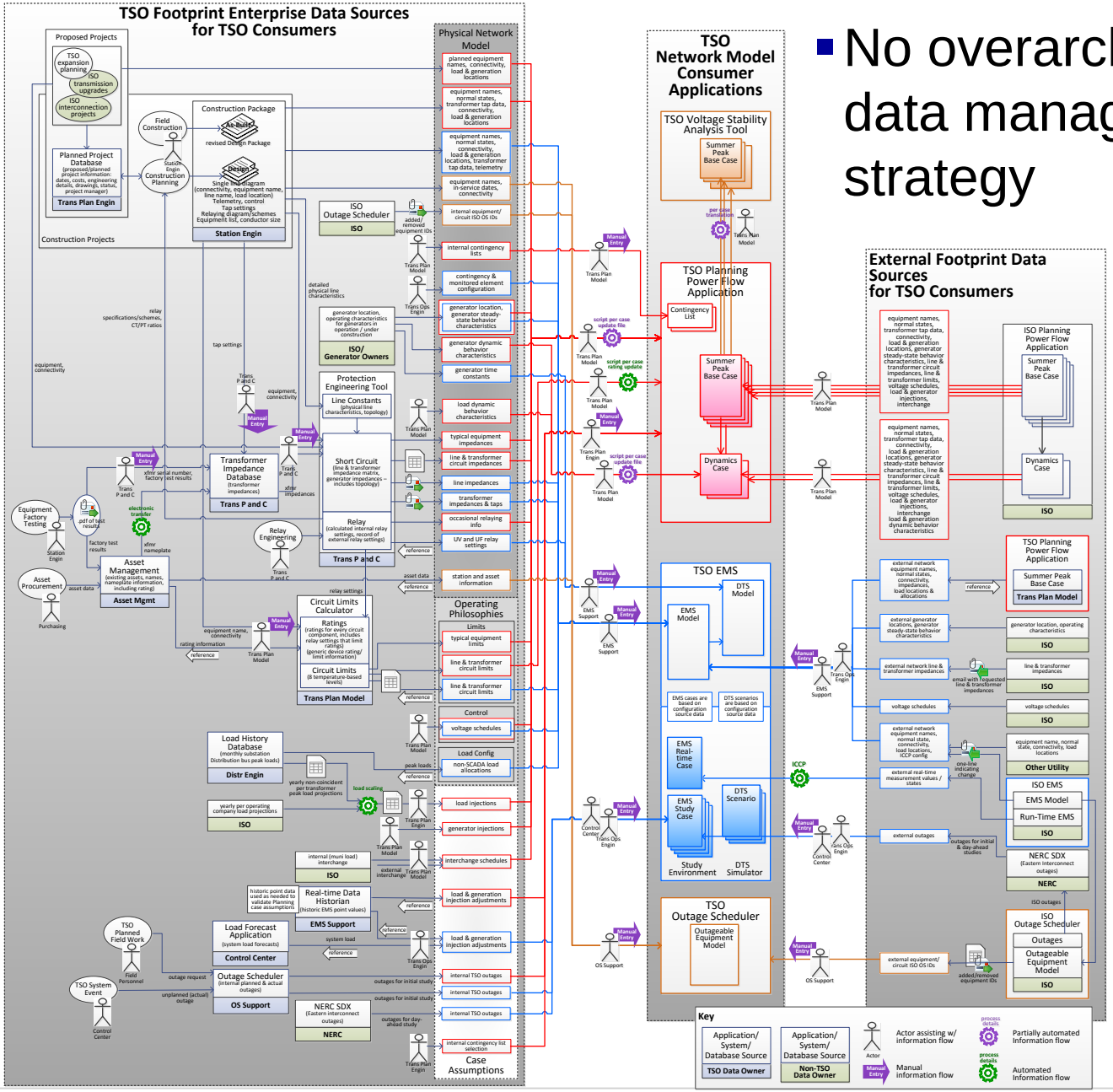

- No overarching data management strategy

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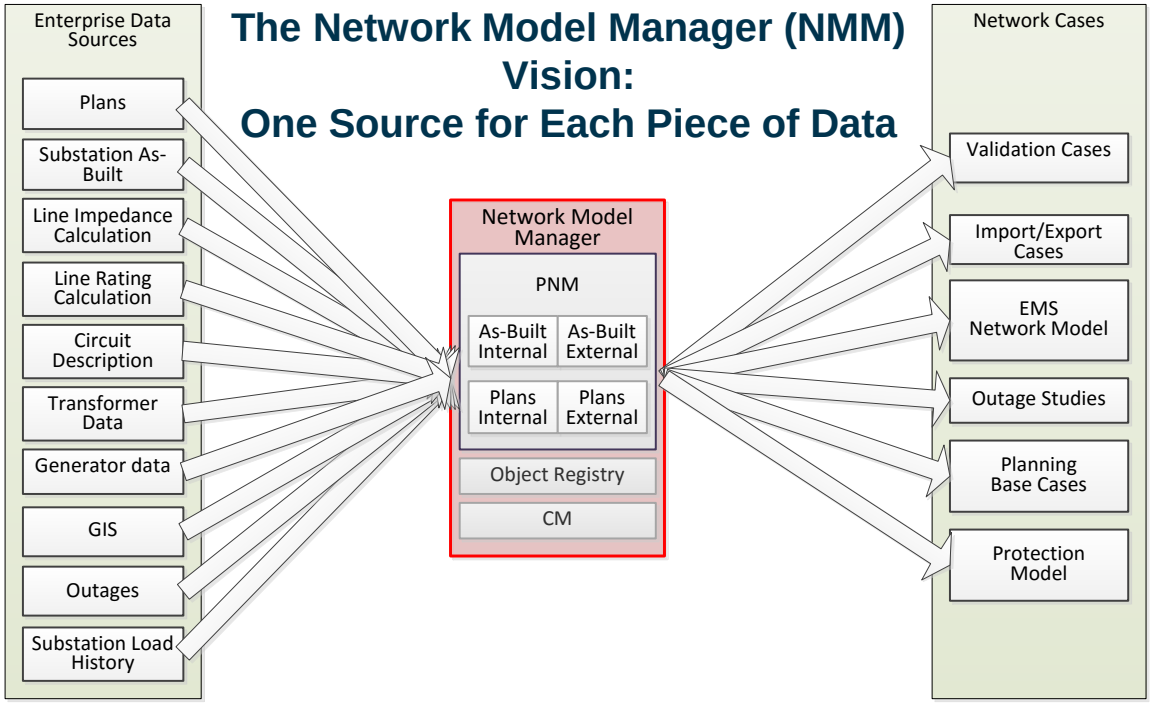
Network Model Data Management in Transmission

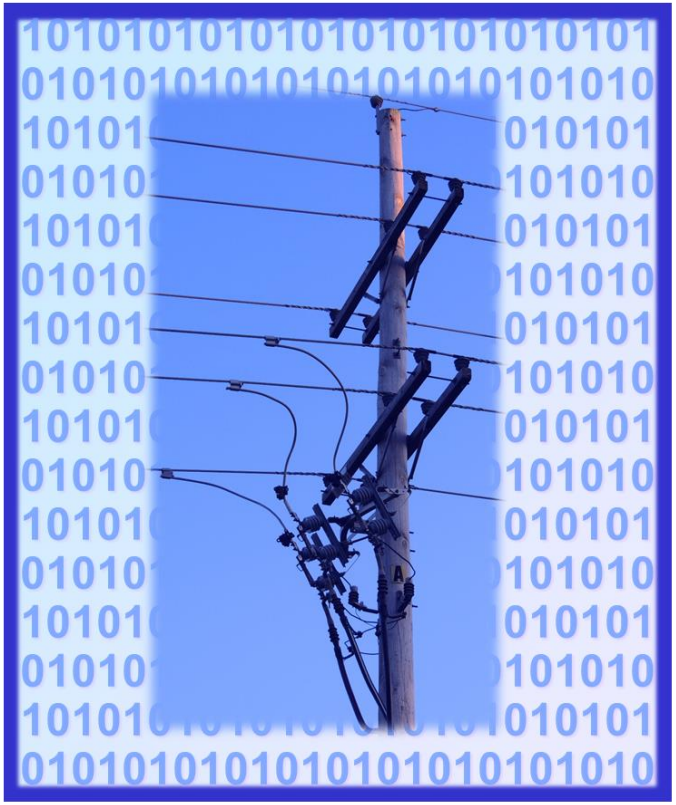
”Learning from Older Brother’s Mistakes”

- EPRI has done work in Transmission
  - Growing utility buy-in
  - Growing vendor product support



Distribution GIS & Grid Model Data Management Project

- Multi-year, multi-utility collaborative supplemental project
- Goals
  - Define architecture for Distribution grid model data management
  - Promote industry understanding of grid model data management and vendor product support for it
  - Provide participating utilities with actionable strategies for improving GIS data and grid model data derived from it
  - Advance the data exchange standards to fully support Distribution grid models
- More conversation…
  - Pat Brown pbrown@epri.com



Together…Shaping the Future of Electricity