Effective Management of Distribution Grid Model Data

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EPRI

CIGRE Grid of the Future Symposium
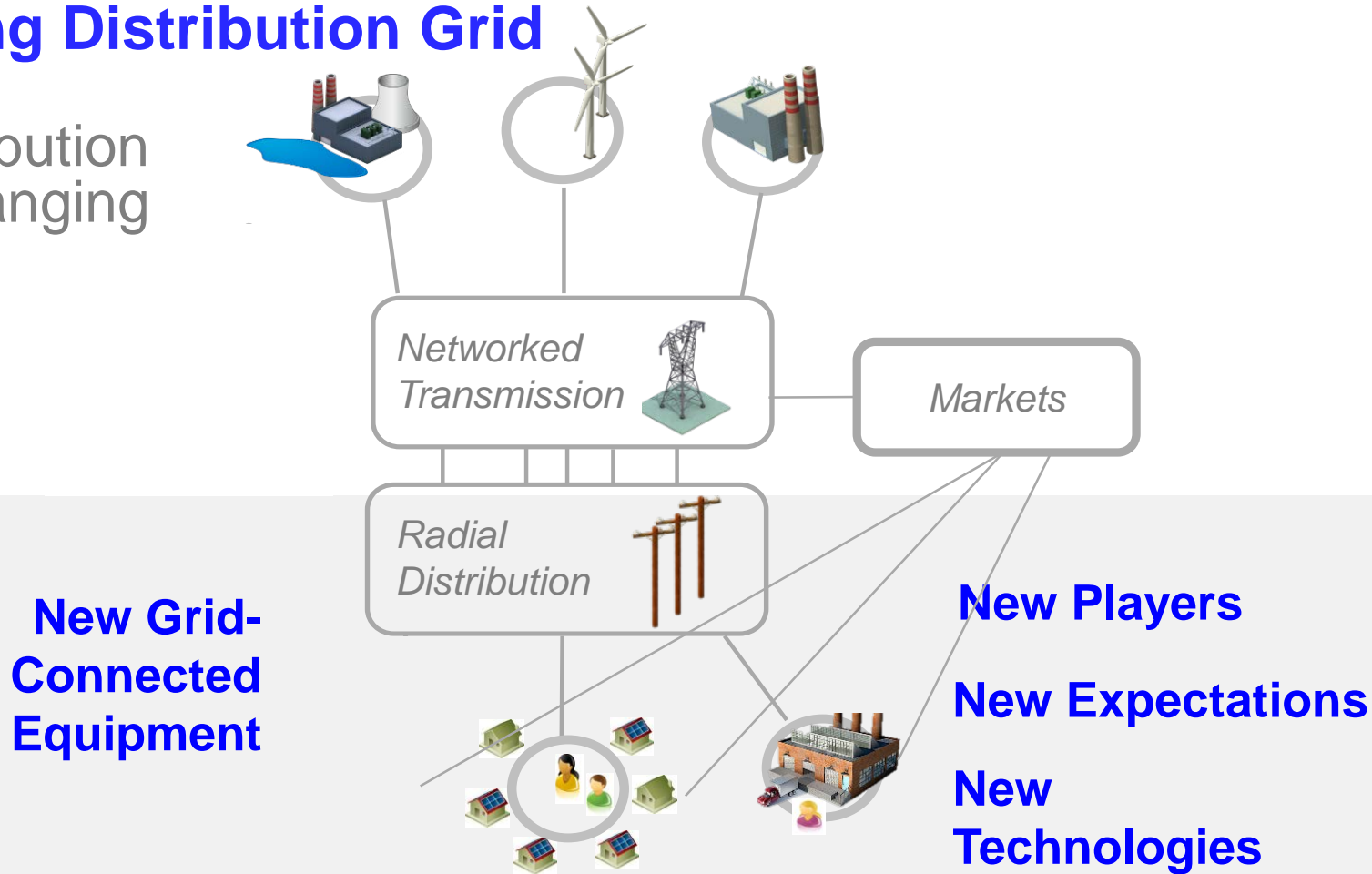
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Effective Grid Model Data Management
A Changing Distribution Grid

- The Distribution grid is changing

Networked Transmission

Markets

Radial Distribution

New Grid-Connected Equipment

New Players

New Expectations

New Technologies

- Grid planning & operation requires new analytics & simulations
- Effective data management is an enabling foundation

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Effective Grid Model Data Management
New Analytics and Simulations

Planning

- Hosting Capacity Analysis
- Expansion Planning
- Non-Wires Solution Evaluation
- Interconnection Evaluation
- T &D Reliability Planning
- Protection Design
- DER & Load Forecasting

Operations

- DER Monitoring/ Control
- Situational Awareness
- Short-term DER & Load Forecasting
- Outage Management & Scheduling
- Volt-VAr Control
- Load Shedding
- Adaptive Settings
- Training Simulator
- FLISR
- Demand Response

Supporting Technologies

- Communications
- Data Management
- Cyber Security
- Field Devices

3

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Effective Grid Model Data Management
New Analytics and Simulations

■ **What do those 'future applications' do?**

– Execute power flow-based simulations (network analysis functions)

■ **What do those 'future applications' need?**

– 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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Effective Grid Model Data Management
Challenges to Managing Grid Model Data

- Grid model data is complex to manage because it:
  - Is big
  - Is made up of different types of data with different update cycles
  - Represents one grid past & multiple grid futures
  - Has different parts from different sources
  - Typically has a primary source:
    - With major consistency / completeness issues
    - That serves primary purposes other than providing grid model data
  - Must be assembled into internally consistent, 'electrically logical' cases

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Effective Grid Model Data Management
In Summary

- Distribution utilities will deploy new analytics and simulations
- Many of which require accurate grid model data
- That is difficult to manage

- Can we head the problem off at the pass?

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Effective Grid Model Data Management
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
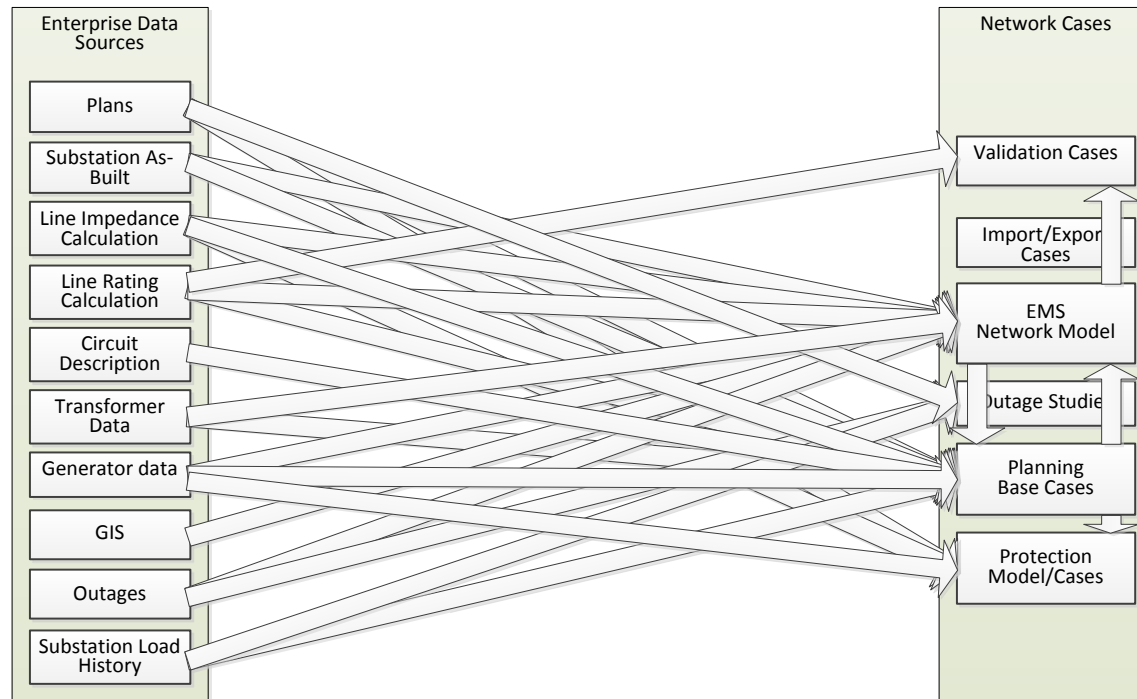 - Silos are both technical and organizational

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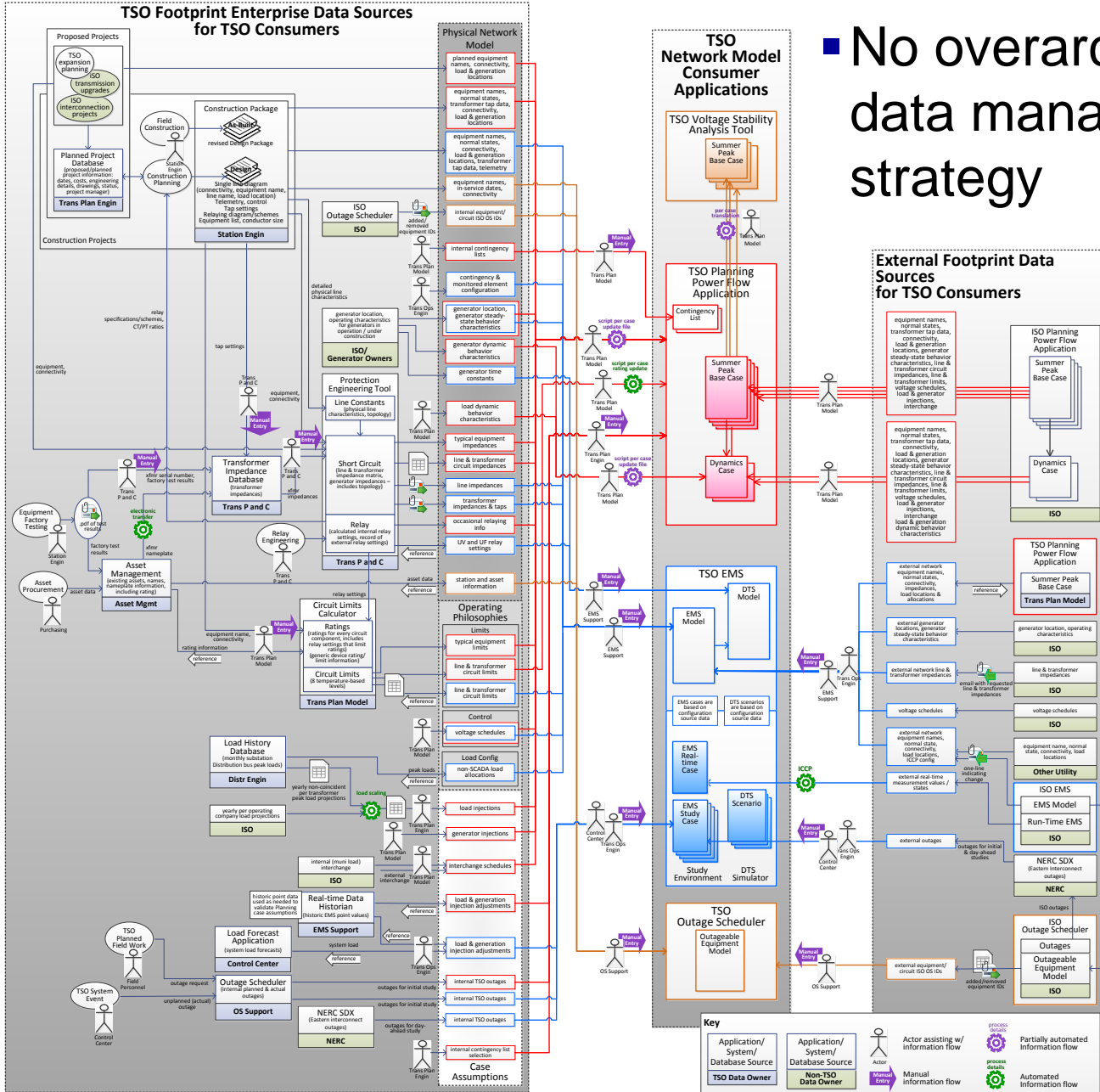
Effective Grid Model Data Management
Network Model Data Management in Transmission
"Learning from Older Brother's Mistakes"

- Consistently across industry
- In well-established silos

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- No overarching data management strategy

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Effective Grid Model Data Management
Network Model Data Management in Transmission
"Learning from Older Brother's Mistakes"

- EPRI work in Transmission

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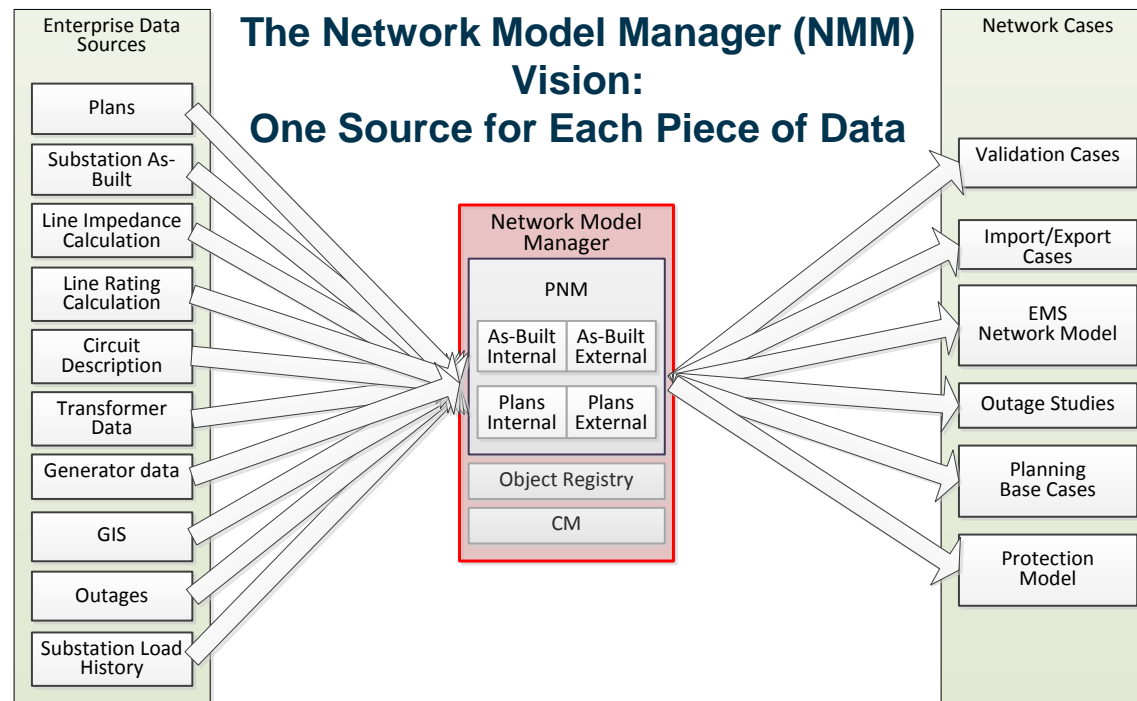
Effective Grid Model Data Management
Network Model Data Management in Transmission

In Transmission, EPRI

- Outlined the strategy in reports

  - **Network Model Manager Technical Market Requirements** (Product ID 3002003053)

  - **Using the Common Information Model for Network Analysis Data Management: A CIM Primer Series Guide** (Product ID 3002002587)

  - **Network Model Manager and Repository: A Guide to Exploring the Potential of Centralized Network Model Management** (Product ID 3002000609)

- Socialized the strategy via multiple presentations, articles
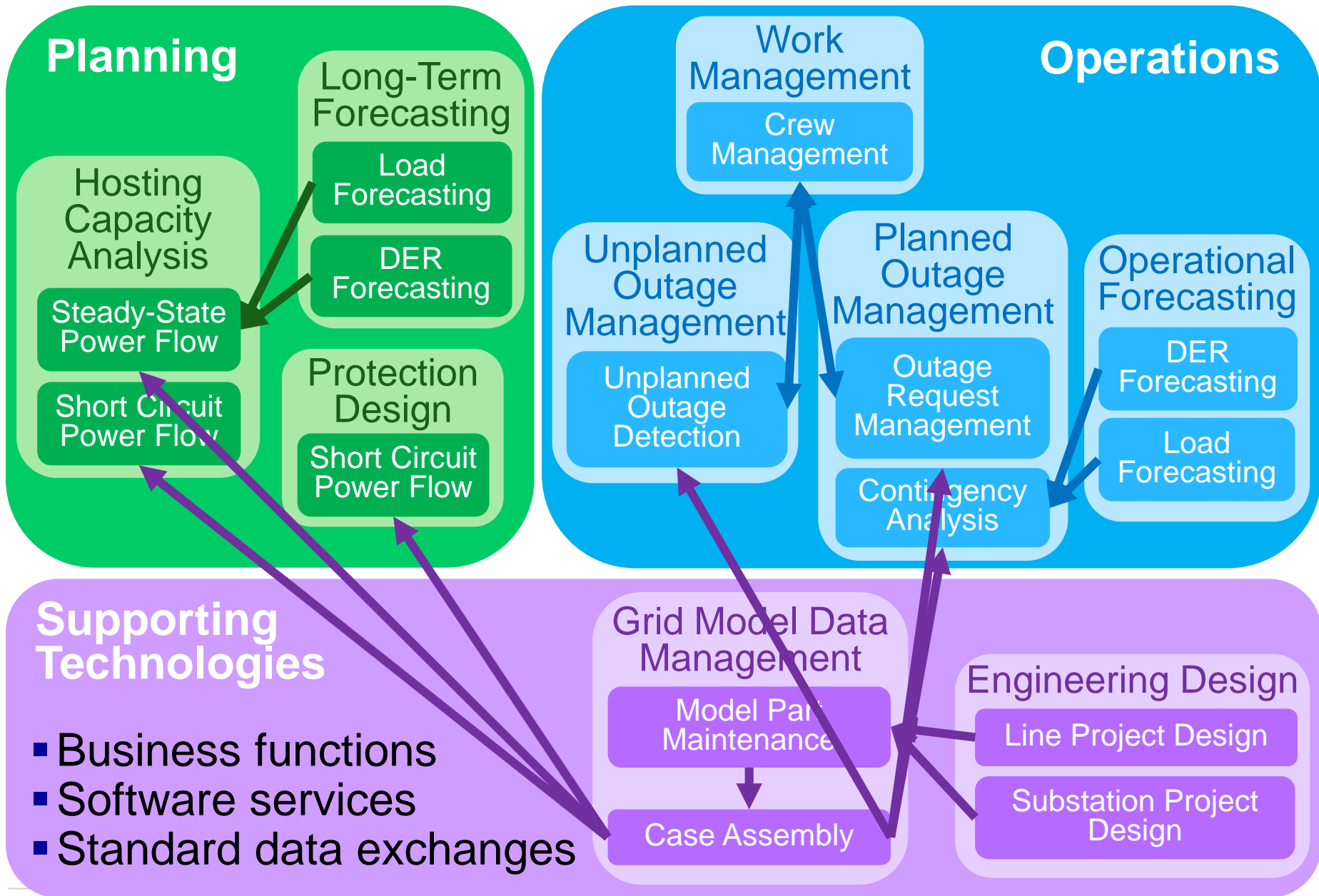- Is seeing increased utility and vendor interest

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Effective Grid Model Data Management
In the Distribution Domain

- A data management foundation for GIS/grid model data would:
  - Reduce risk of bad data causing errors in
    - operations decisions
    - study results
    - capital planning decisions
    - maintenance decisions
  - Save labor wasted in duplicate entry, chasing bad data
  - Improve timeliness of results, decisions and actions
  - Provide a platform for deploying as-yet-unthought-of future applications

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Effective Grid Model Data Management
Meeting the Challenge

- Develop an industry vision for grid model data management
  - Based on requirements synthesized from many utilities
  - That recognizes and supports the unique role of field activity
  - Expressed in terms of business functions and supporting software services
  - That allows the definition of industry standard data exchanges

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Planning

Long-Term Forecasting
- Load Forecasting
- DER Forecasting

Hosting Capacity Analysis
- Steady-State Power Flow
- Short Circuit Power Flow

Protection Design
- Short Circuit Power Flow

Operations

Work Management
- Crew Management

Unplanned Outage Management
- Unplanned Outage Detection

Planned Outage Management
- Outage Request Management
- Contingency Analysis

Operational Forecasting
- DER Forecasting
- Load Forecasting

Supporting Technologies

- Business functions
- Software services
- Standard data exchanges

Grid Model Data Management
- Model Part Maintenance
- Case Assembly

Engineering Design
- Line Project Design
- Substation Project Design

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Effective Grid Model Data Management
Meeting the Challenge

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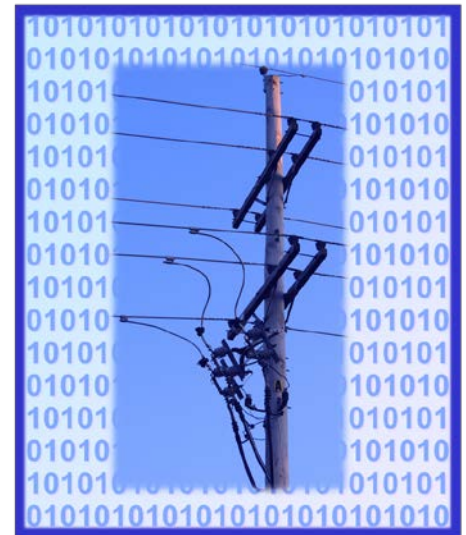 - That allows the definition of industry standard data exchanges
- **Enhance the CIM standard**
- **Functional requirements for distribution grid model data management tool**
- **Socialize the vision**
  - Utility understanding
  - Vendor interfaces on products – both data producers and consumers
  - Enable utilities to implement product-based solutions which reinforce good data management

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Distribution GIS & Grid Model Data Management Project

- EPRI has launched multi-year, multi-utility collaborative supplemental project
  - GIS data cleanup
    - 'Technologies of Promise' exploration
    - Geo-spatial modeling best practices
  - Field crew enablement
    - Solution architecture evaluation & demonstration
  - Distribution enterprise grid model data management
    - Utility deep dives (up to 5)
    - Define grid model management architecture
    - CIM standard advancement

- More information
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