

PI Development @ PJM

PJM Interconnection

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- Who is PJM
- One-line Display Converter
- AF Database Automation
- Dispatch Interactive Map Application
- Questions

Who is PJM

PJM's Role as a Regional Transmission Organization

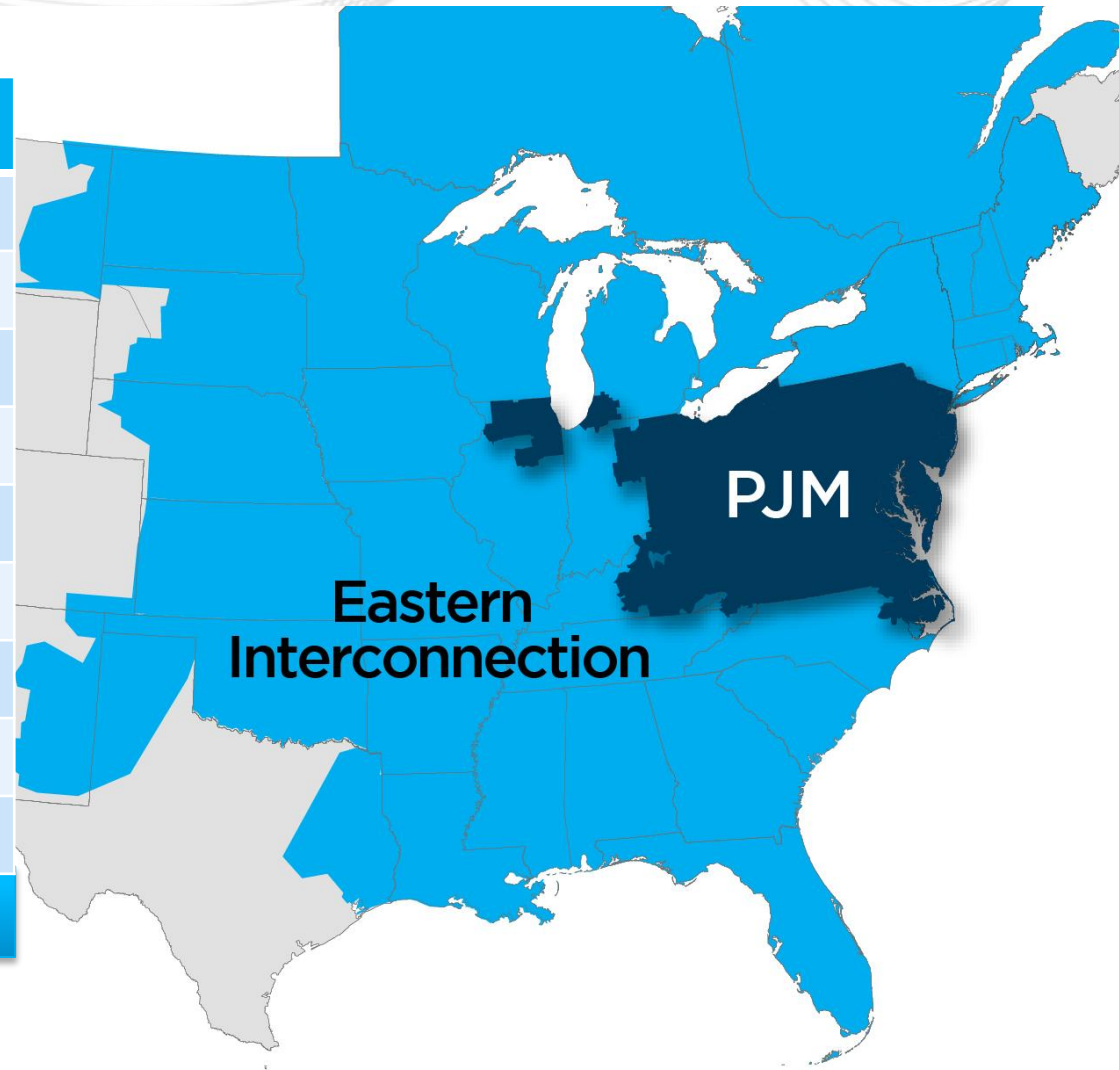


- Ensures the reliability of the high-voltage electric power system
- Administers a competitive wholesale electricity market
- Coordinates and directs the operation of the region's transmission grid
- Plans regional transmission expansion improvements to maintain grid reliability and relieve congestion

Key Statistics

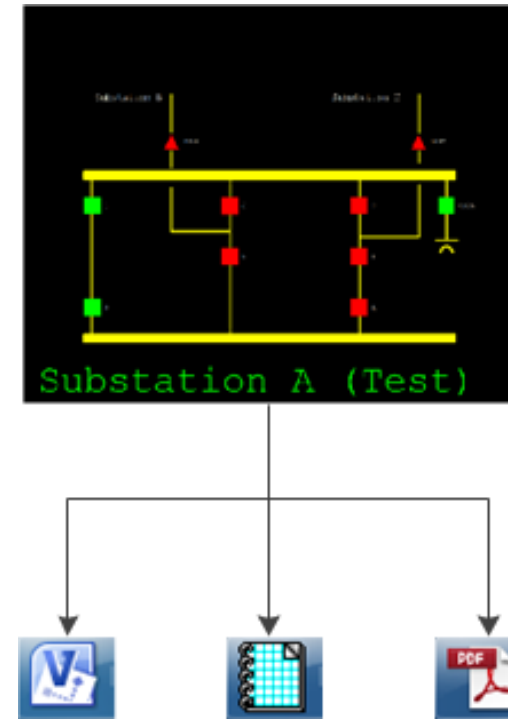
Member companies	960+
Millions of people served	61
Peak load in megawatts	165,492
MW of generating capacity	171,648
Miles of transmission lines	81,736
2014 GWh of annual energy	792,580
Generation sources	1,304
Square miles of territory	243,417
States served	13 + DC

21% of U.S. GDP produced in PJM

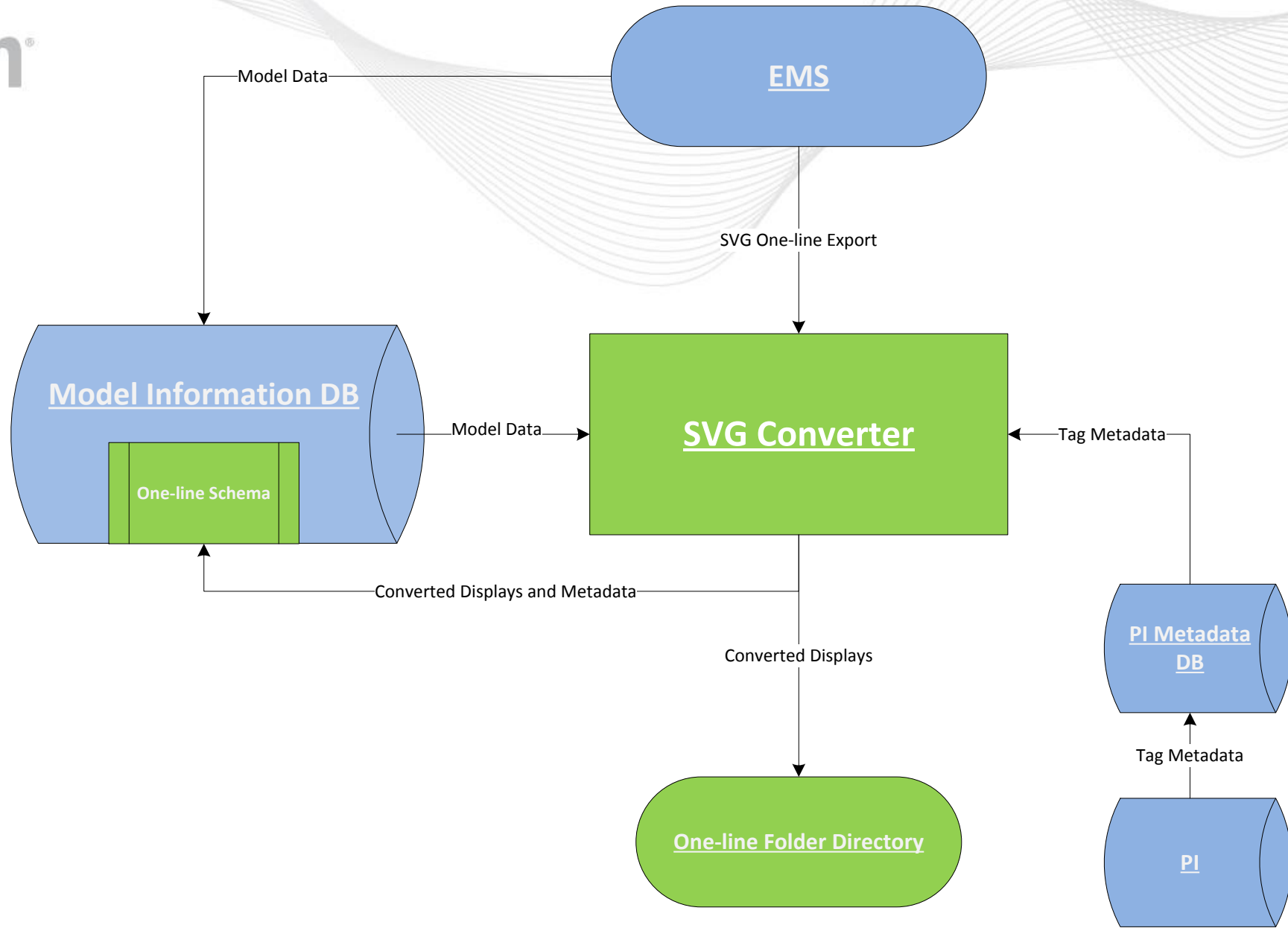


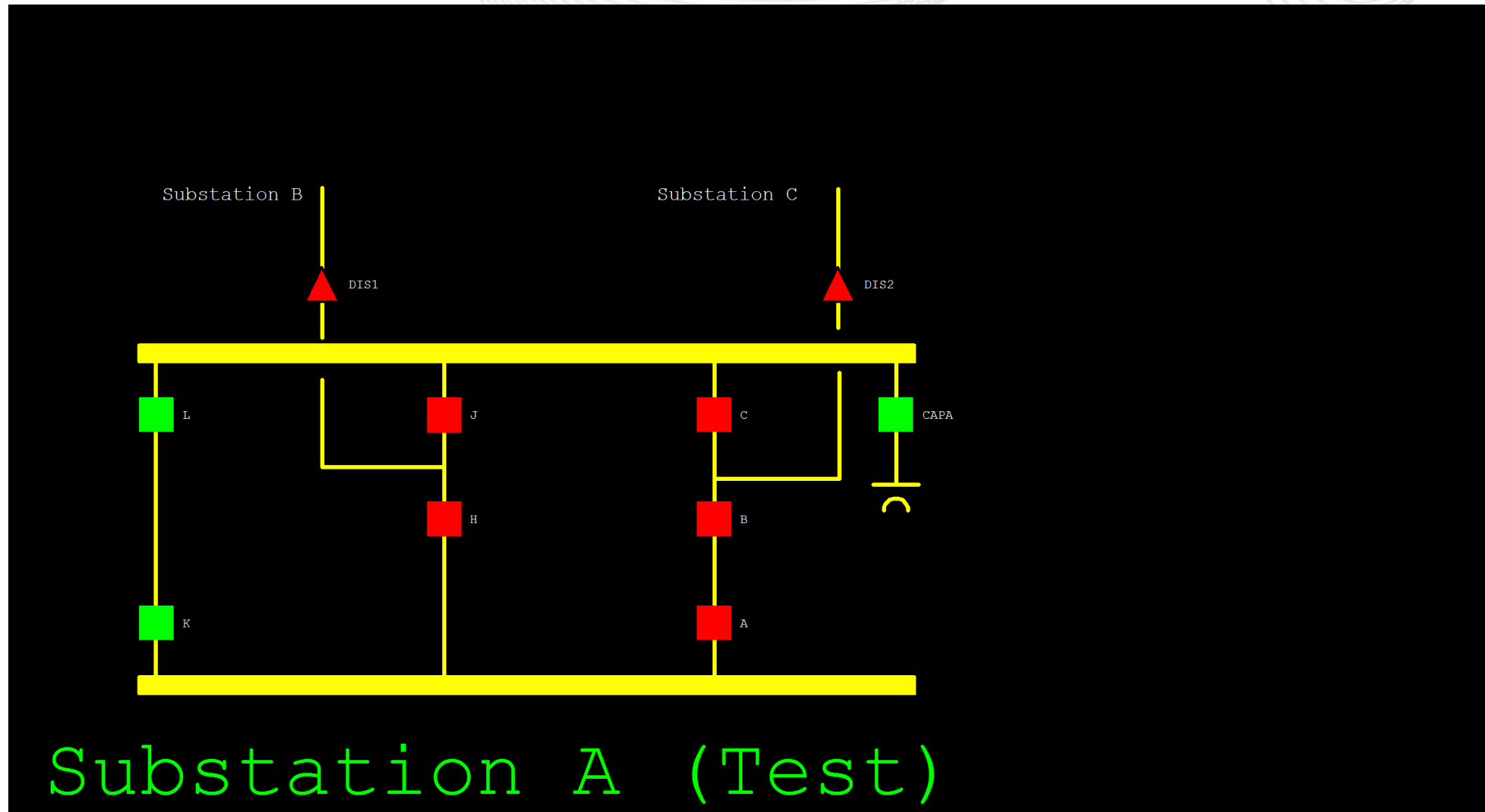
One-line Converter

- File formats
 - ProcessBook (Real-time and State Estimator data)
 - Visio
 - PDF
 - SVG
- Directory structure
- Historical/Mapping database



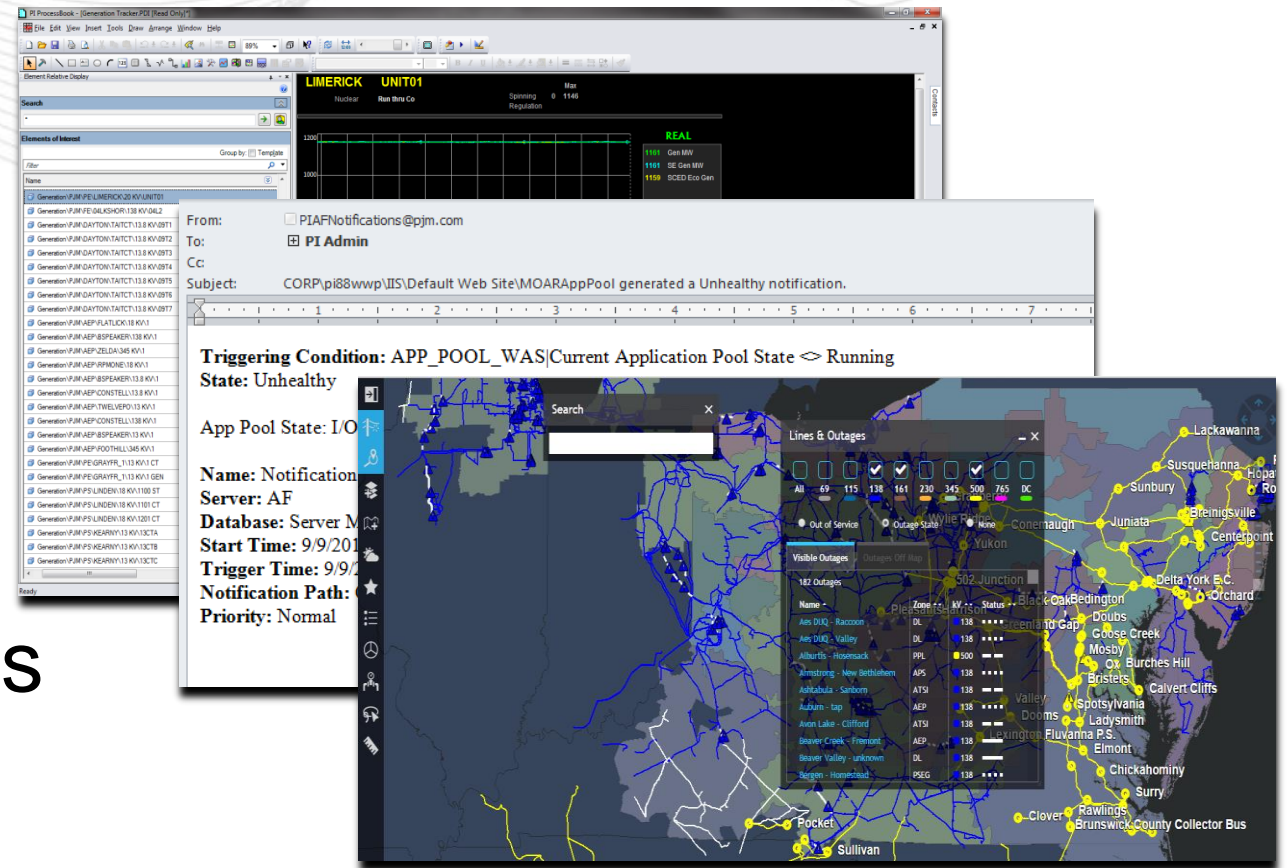
- Resolve one-line related business concerns
 - Modeling/Display errors
 - Model build display process
 - Historical data and versioning
 - System integration



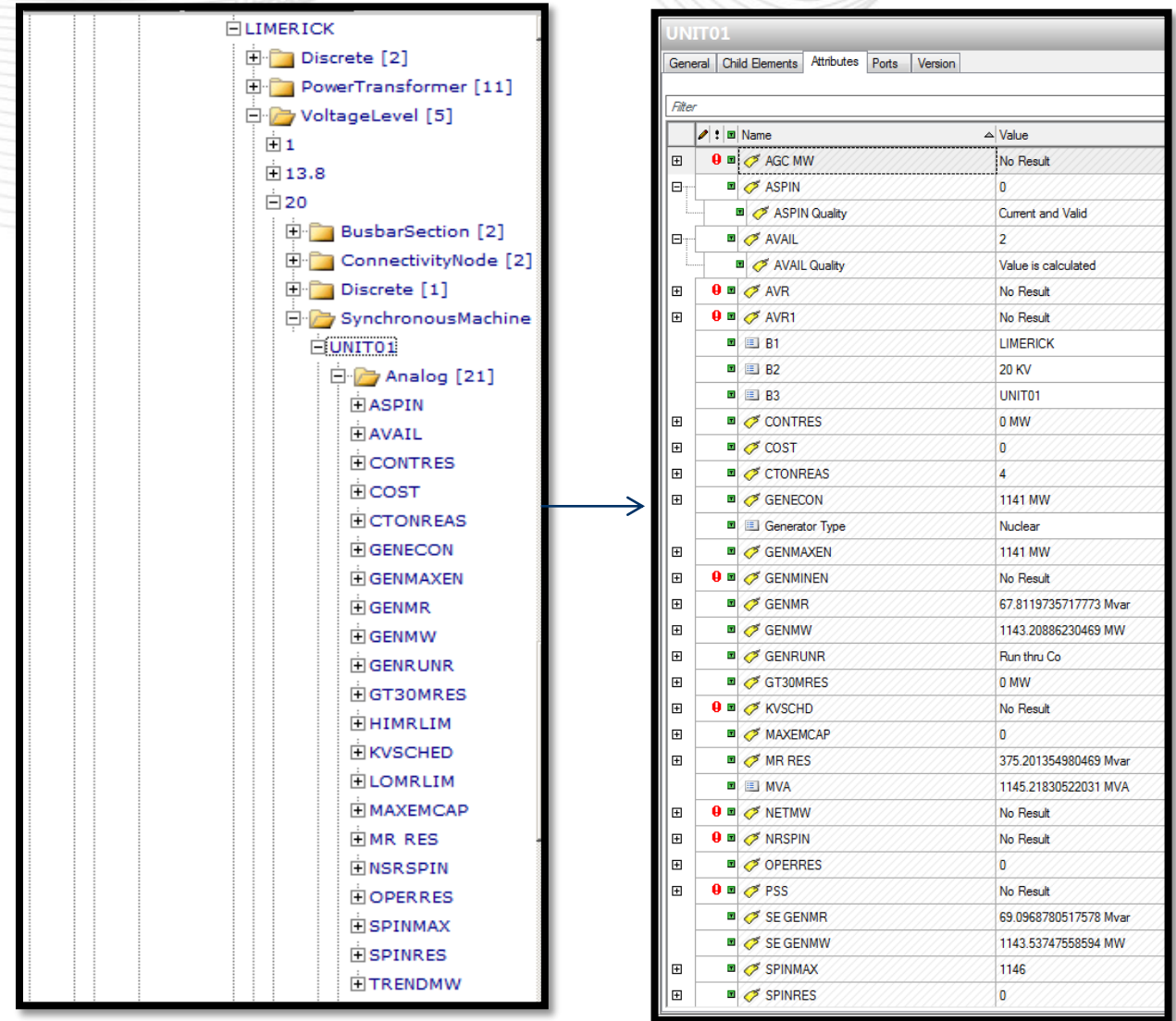


AF Automation

- Application integration
- Calculations
- Monitoring
- Find tags
- Element relative displays



- Targeted Equipment Models
 - Generators
 - Lines
- AGC
- Monitoring



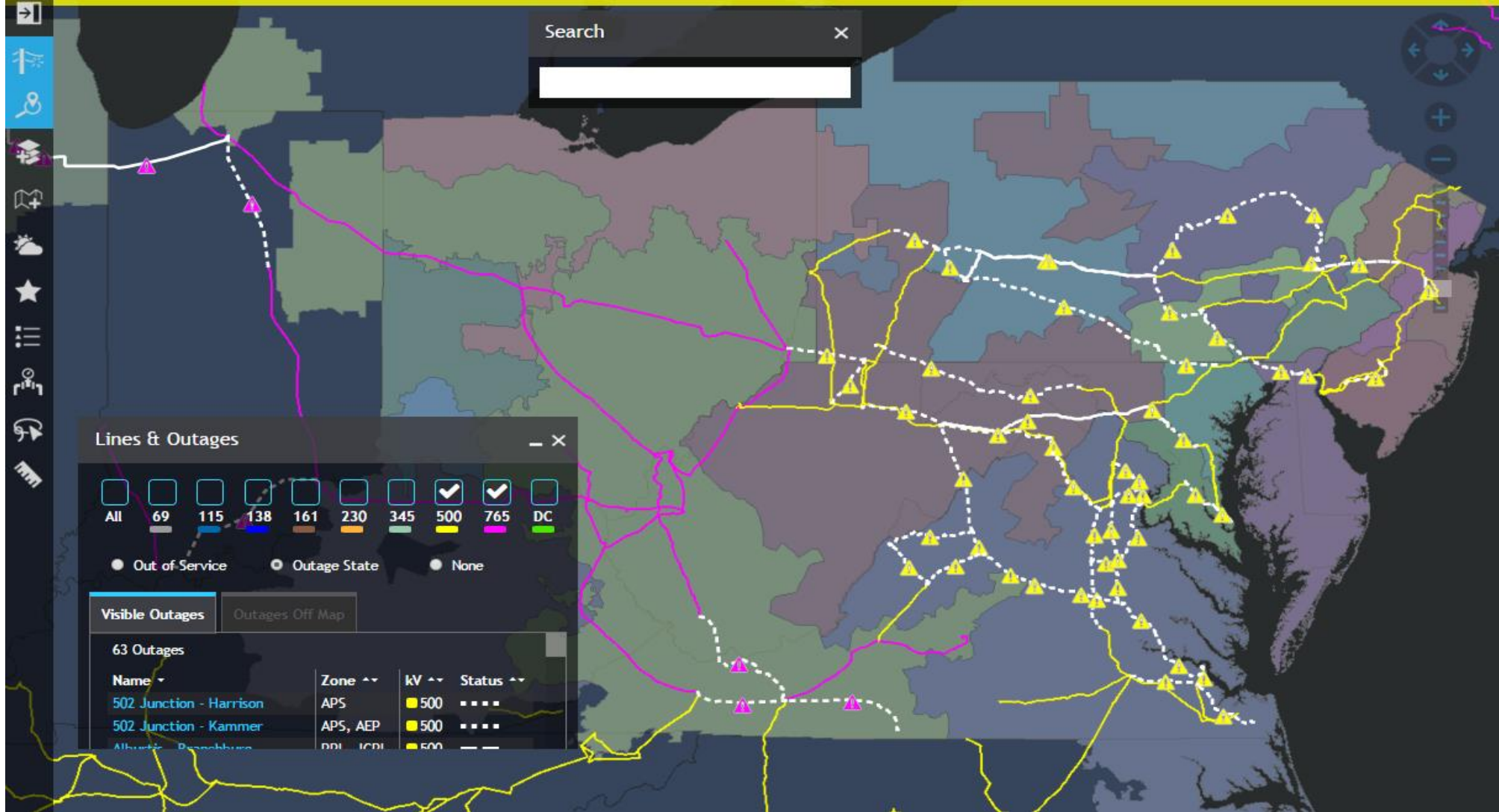
The screenshot displays the PJM software interface. On the left, a hierarchical tree view shows the project structure for 'LIMERICK'. The tree includes folders for 'Discrete [2]', 'PowerTransformer [11]', 'VoltageLevel [5]', 'BusbarSection [2]', 'ConnectivityNode [2]', 'Discrete [1]', 'SynchronousMachine', and 'UNIT01'. The 'UNIT01' folder is expanded, showing a list of equipment models including ASPIN, AVAIL, CONTRES, COST, CTONREAS, GENECON, GENMAXEN, GENMR, GENMW, GENRUNR, GT30MRES, HIMRLIM, KVSCHED, LOMRLIM, MAXEMCAP, MR RES, NSRSPIN, OPERRES, SPINMAX, SPINRES, and TRENDMW.

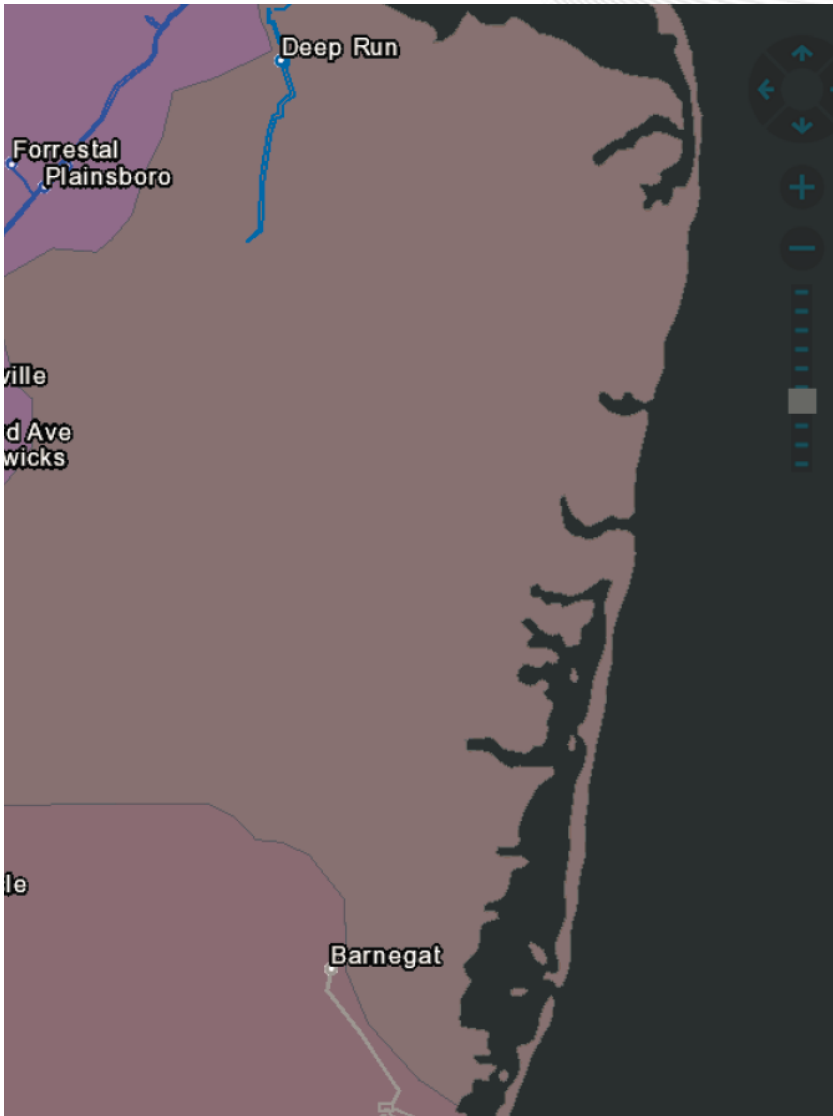
On the right, a table titled 'UNIT01' displays the data for the selected equipment models. The table has columns for 'Name' and 'Value'. The data is as follows:

Name	Value
AGC MW	No Result
ASPIN	0
ASPIN Quality	Current and Valid
AVAIL	2
AVAIL Quality	Value is calculated
AVR	No Result
AVR1	No Result
B1	LIMERICK
B2	20 KV
B3	UNIT01
CONTRES	0 MW
COST	0
CTONREAS	4
GENECON	1141 MW
Generator Type	Nuclear
GENMAXEN	1141 MW
GENMINEN	No Result
GENMR	67.8119735717773 Mvar
GENMW	1143.20886230469 MW
GENRUNR	Run thru Co
GT30MRES	0 MW
KVSCHD	No Result
MAXEMCAP	0
MR RES	375.201354980469 Mvar
MVA	1145.21830522031 MVA
NETMW	No Result
NRSPIN	No Result
OPERRES	0
PSS	No Result
SE GENMR	69.0968780517578 Mvar
SE GENMW	1143.53747558594 MW
SPINMAX	1146
SPINRES	0

- Network Model DB
- PI Metadata DB
- .Net using AF SDK
 - Loads source model and tag names from Oracle/SQL databases
 - Builds hierarchy of pools, companies, stations and voltage levels using AF templates
 - Adds equipment using templates based on equipment types

Dispatch Interactive Map Application (DIMA)





Substation Detail

Connection Level 1 Collapse All Expand All

Salem (New Jersey) 500 kV ✕

Facility ID SALENJ500
Zone Public Service Electric and Gas Company View One-Line

Generators (3)

Name	Type	Current MW	ICAP MW	EcoMax	Gas	Status
LIMERICK 1	Nuclear	1,000	1,800	1,700	No	●
LIMERICK 2	Nuclear	1,100	1,500	1,300	No	●
LIME 1	CT	80	100	85	Yes	●

Equipment

Type	Total	Status
Capacitors	2	● ●
Reactors	8	● ● ● ● ● ● ● ●
Gas Pipelines	3	● ● ●

[Show Connected Substations](#)

Limerick (Pennsylvania) 500 kV ✕

Facility ID LIMEPA500
Zone PECO Energy Company View One-Line

Generators (3)

Name	Type	Current MW	ICAP MW	EcoMax	Gas	Status
LIMERICK 1	Nuclear	1,000	1,800	1,700	No	●
LIMERICK 2	Nuclear	1,100	1,500	1,300	No	●
LIME 1	CT	80	100	85	Yes	●

Equipment

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Gas Pipelines	3	● ● ●

Pipeline Capacity ✕

20 MW

Connection
Delaware

Gas to Start
Yes

Pipeline Capacity ✕

20 MW

Connection
Delaware

Gas to Start
Yes

- **Resolve Business Challenges**
 - Multiple tools used for situational awareness
 - Limited geographic awareness
 - Need to process a significant amount of data

- PI Integrator for ESRI ArcGIS
- GeoEvent Extension for ArcGIS Server
- AF Models
- PI Metadata DB



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