

Dominion's Journey with PI

Dr. Tao Xia, Dominion

Scottsdale, AZ 09/15/2016

Business Driver – Data is an Asset

Relays and Meters



tMEDIC



Dynamic Ratings



Bushing Monitor



Battery Monitor



Cap Bank Impedance IED



Hathaway Recorder



Tap Changer Monitor



Gas Monitor

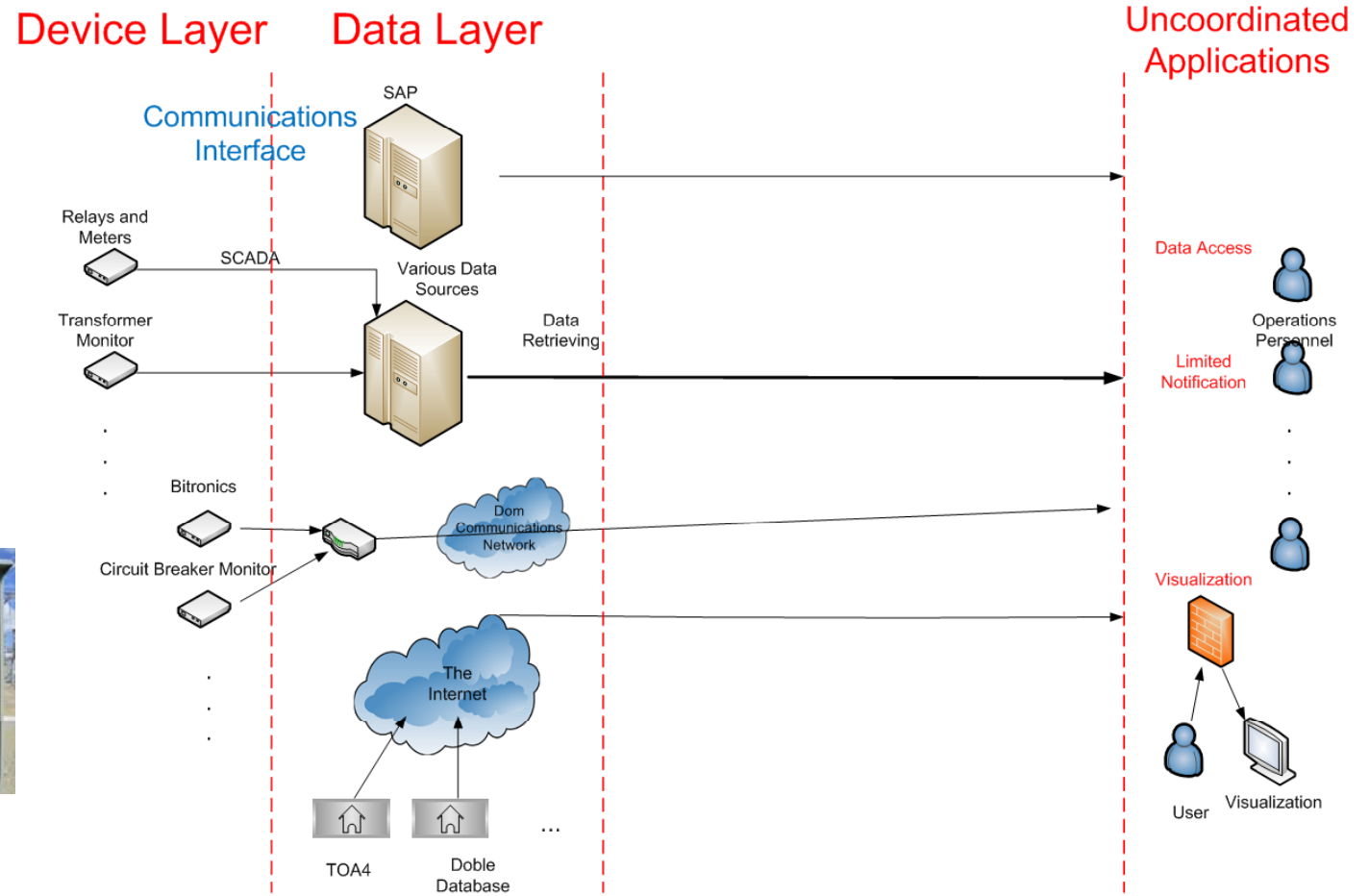


and many more...

Business Driver – Data Silos

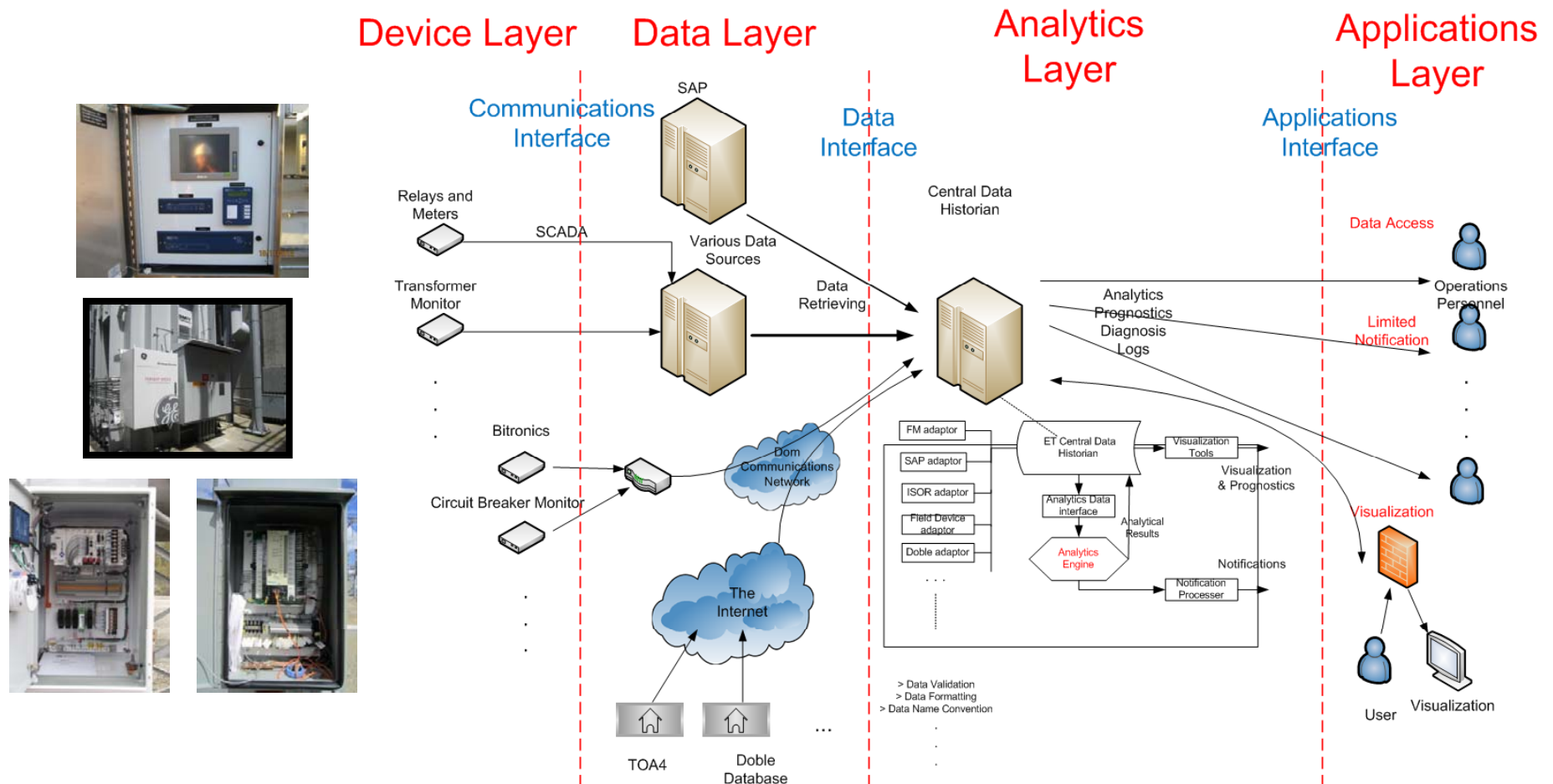
EMS	AMI	OLCM	Lightning
DMS	MDM	GIS	Weather
PMU	Work Order Management	Construction Plans	Load Forecast
LIMS	Field Testing	Network Connectivity	DFR
Lab Results	Inspections	Line Impedance	Fault
EQ Nameplate	EQ Failure Record	Circuit Description	Short Circuit
EQ Ratings	SAP	One Line	Relay Settings
NMS	TRS	OMS	...

Previous Data Utilization Process



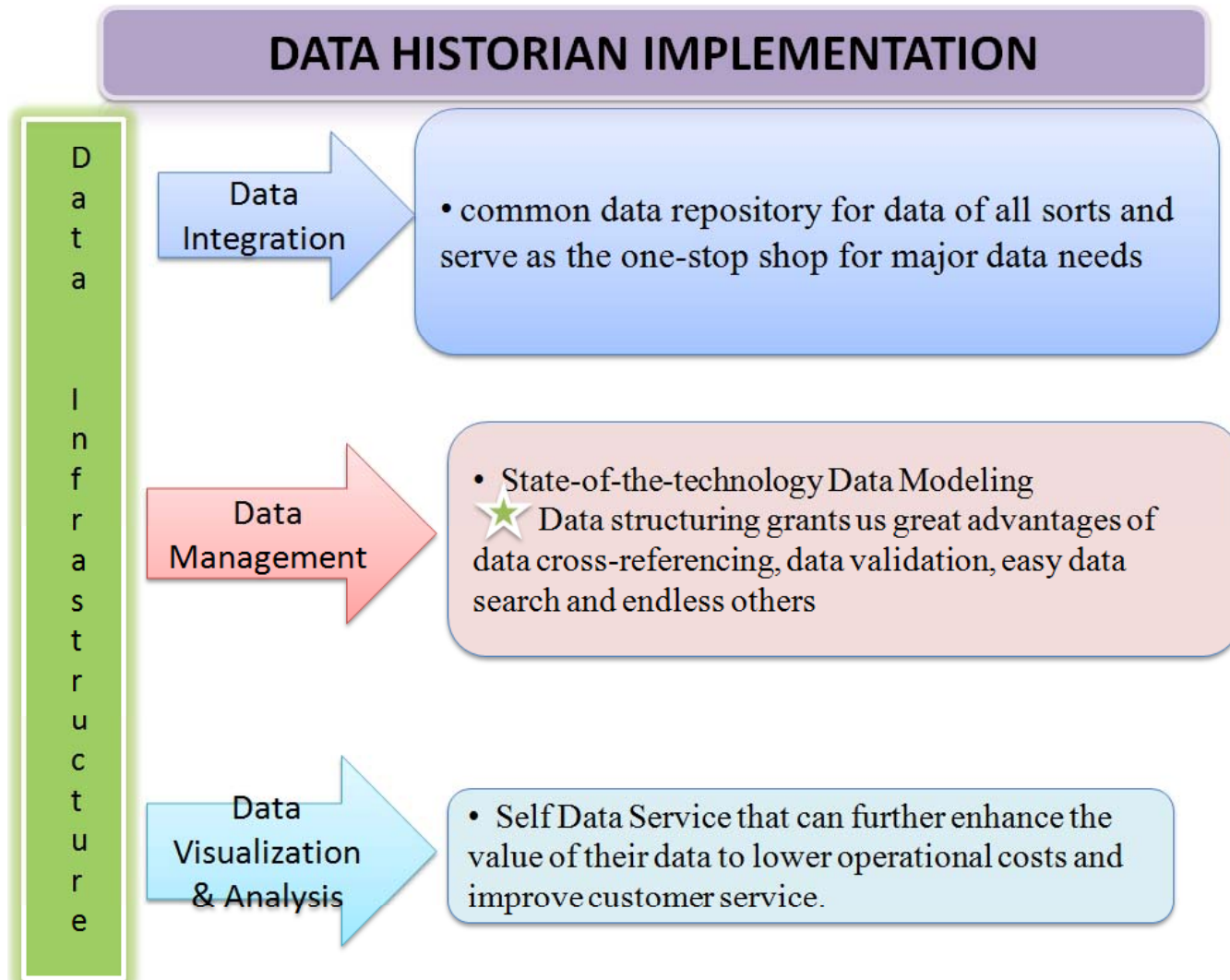
Data Flow Without PI

New Data Utilization Process

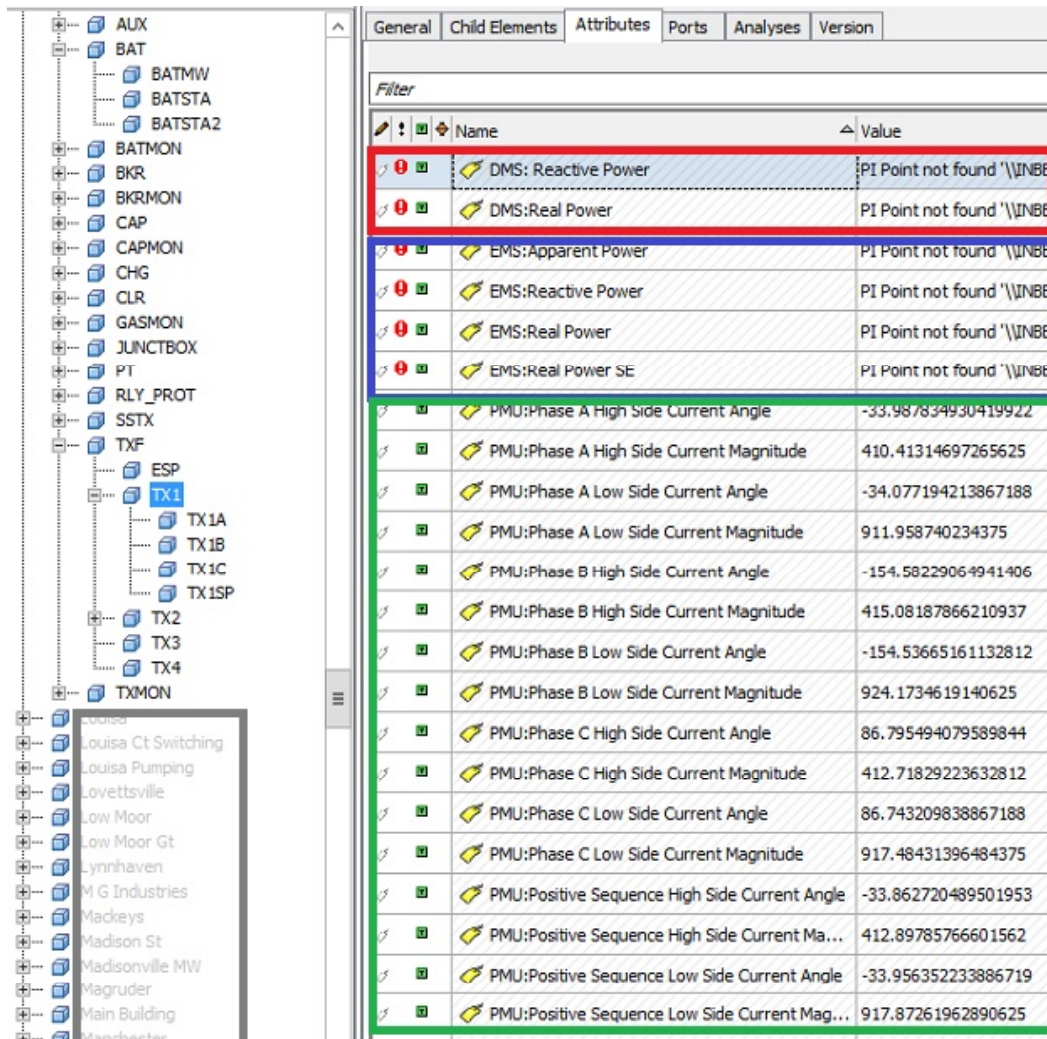


Data Flow With PI – Facilitate Automation and Data Analytics

Project Goals and Objectives



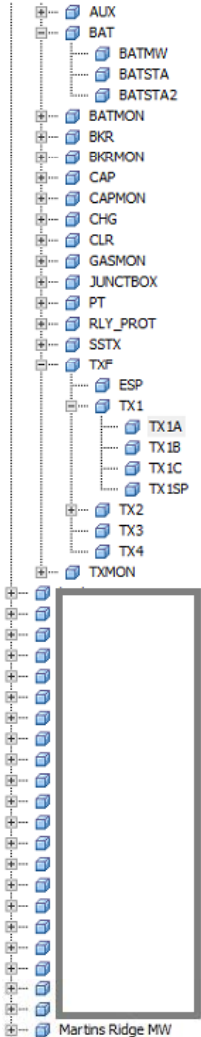
Data Aggregation - Transformer



The screenshot displays the Dominion Energy data aggregation interface. On the left is a tree view showing a hierarchy of assets. The 'TXF' (Transformer) node is expanded, showing sub-nodes like 'ESP', 'TX1', 'TX1A', 'TX1B', 'TX1C', 'TX1SP', 'TX2', 'TX3', 'TX4', and 'TXMON'. The 'TX1' node is selected. On the right is a data table with tabs for 'General', 'Child Elements', 'Attributes', 'Ports', 'Analyses', and 'Version'. The 'General' tab is active, showing a table of data points. The table has columns for 'Name' and 'Value'. The data points are grouped into three categories: DMS (Distribution Management System), EMS (Energy Management System), and PMU (Phasor Measurement Unit). The DMS and EMS sections are highlighted with red and blue boxes respectively, and the PMU section is highlighted with a green box.

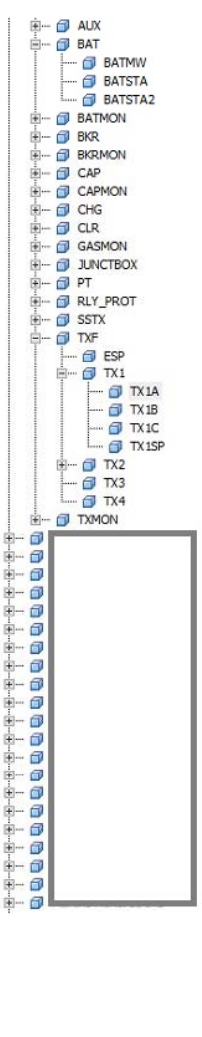
Name	Value
DMS: Reactive Power	PI Point not found '\\INBE T
DMS:Real Power	PI Point not found '\\INBE T
EMS:Apparent Power	PI Point not found '\\INBE T
EMS:Reactive Power	PI Point not found '\\INBE T
EMS:Real Power	PI Point not found '\\INBE T
EMS:Real Power SE	PI Point not found '\\INBE T
PMU:Phase A High Side Current Angle	-33.987834930419922
PMU:Phase A High Side Current Magnitude	410.41314697265625
PMU:Phase A Low Side Current Angle	-34.077194213867188
PMU:Phase A Low Side Current Magnitude	911.958740234375
PMU:Phase B High Side Current Angle	-154.58229064941406
PMU:Phase B High Side Current Magnitude	415.08187866210937
PMU:Phase B Low Side Current Angle	-154.53665161132812
PMU:Phase B Low Side Current Magnitude	924.1734619140625
PMU:Phase C High Side Current Angle	86.795494079589844
PMU:Phase C High Side Current Magnitude	412.71829223632812
PMU:Phase C Low Side Current Angle	86.743209838867188
PMU:Phase C Low Side Current Magnitude	917.48431396484375
PMU:Positive Sequence High Side Current Angle	-33.862720489501953
PMU:Positive Sequence High Side Current Ma...	412.89785766601562
PMU:Positive Sequence Low Side Current Angle	-33.956352233886719
PMU:Positive Sequence Low Side Current Mag...	917.87261962890625

Data Aggregation - Transformer



Martins Ridge MW

General	Child Elements	Attributes	Ports	Analyses	Version
Filter					
Name	Value				
General_Connected	A				
General_Ctrl Pnl Type					
General_Form	C				
General_GIC Design	YES				
General_LTC Filter	N				
General_LTC Interrupter Type					
General_LTC Type	NONE				
General_Manufacturer	SMIT				
General_NLTC Date Set	01/01/1900				
General_Oil System	AB CONSERVATOR				
General_Phase	1				
General_Serial Num	3230088				
General_Sound Panel Design	Yes				
General_Sound Panels/Enclosures Installed	YES				
General_Spare Group	TT011				
General_Temp Rise	65				
General_Thermal Trip					
General_Use	TT				
General_Year Mfrd					
HKV Bushing Amps	2000 A				
HKV Bushing BIL	1550				
HKV Bushing Catalog Num	B65240-137-70				
HKV Bushing Kv	500 kV				
HKV Bushing Mfr	LAPP				
HKV Bushing Type	POC				
HV Taps_Cur Pos					
HV Taps_Tap1 Label	1				



General	Child Elements	Attributes	Ports	Analyses	Version
Filter					
Name	Value				
Neu 2 Bushing Amps	0 A				
Neu 2 Bushing BIL	0				
Neu 2 Bushing Catalog Num					
Neu 2 Bushing Kv	0 kV				
Neu 2 Bushing Mfr					
Neu 2 Bushing Type					
Neu 3 Bushing Amps	0 A				
Neu 3 Bushing BIL	0				
Neu 3 Bushing Catalog Num					
Neu 3 Bushing Kv	0 kV				
Neu 3 Bushing Mfr					
Neu 3 Bushing Type					
OLCM:Absolute H2O Content in Oil	2				
OLCM:Top Oil Temperature	39.099998474121094				
OLCM:Winding Temperature	41.899997711181641				
Owner	T				
Parent	LOUDOUN SUB				
Rebuilt	NO				
Safety Spec	Thomas R Hazlett				
Selector	0				
SEOL	No Data				
SerialNum	3230088				
Ship Height	182				
Ship Length	253				
Ship Weight	254410				
Ship Width	152				
SNOL	No Data				

Data Aggregation – Naming Convention

VALLEY.IND.29312-I SLOWCLS
 NANNA.IND.57502 SLO_CL_PI
 TWELFTHS.IND.H6T150 SLOWCLSE
 FENTRESS.IND.27122-I SLOWCLO
 LANEXA.IND.2016T2024 SLCLS
 EVERETTS.IND.SR112_SLCLOSE

LAKEVIEW.IND.21362_SLOWCLOS
 LAKEVIEW.IND.SR162_SL_CLOSE
 ROVALLEY.IND.2012T2060 SCL
 THELMA.IND.213T232 SLOWCLS
 CHICKHOM.IND.2050T2075 SCLOS

...



Breaker Slow Close

SLOWCLS

SLO_CL_PI

SLOWCLSE

SLOWCLO

SLCLS

SLCLOSE

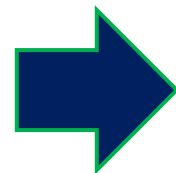
SLOWCLOS

SCL

SLOWCLS

SCLOS

...



SCBRI.CIsTmAIm.stVal

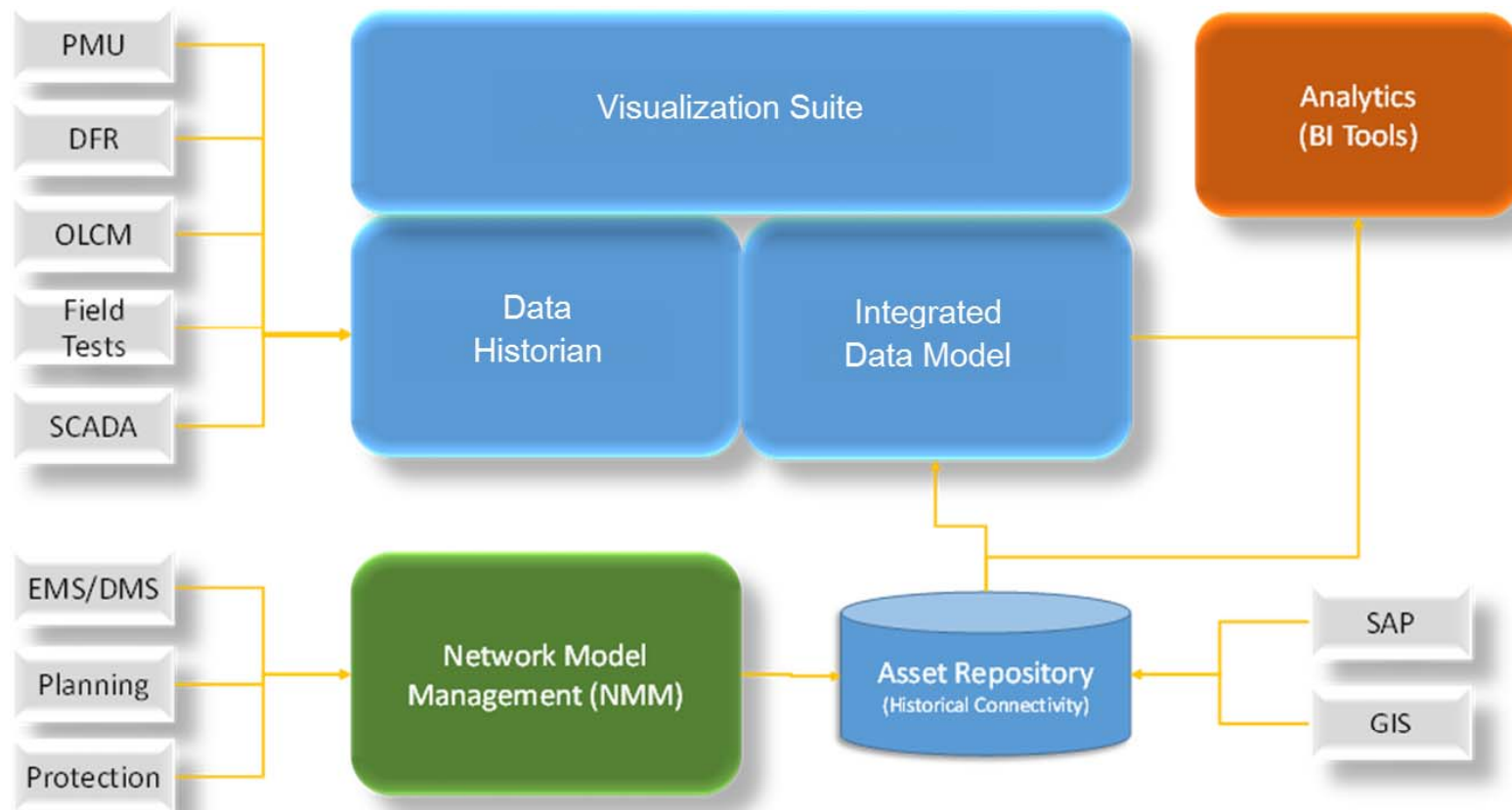


Slow Close

**IEC 61850 Names with
 Dominion Extensions as the
 Enterprise Semantics Layer**

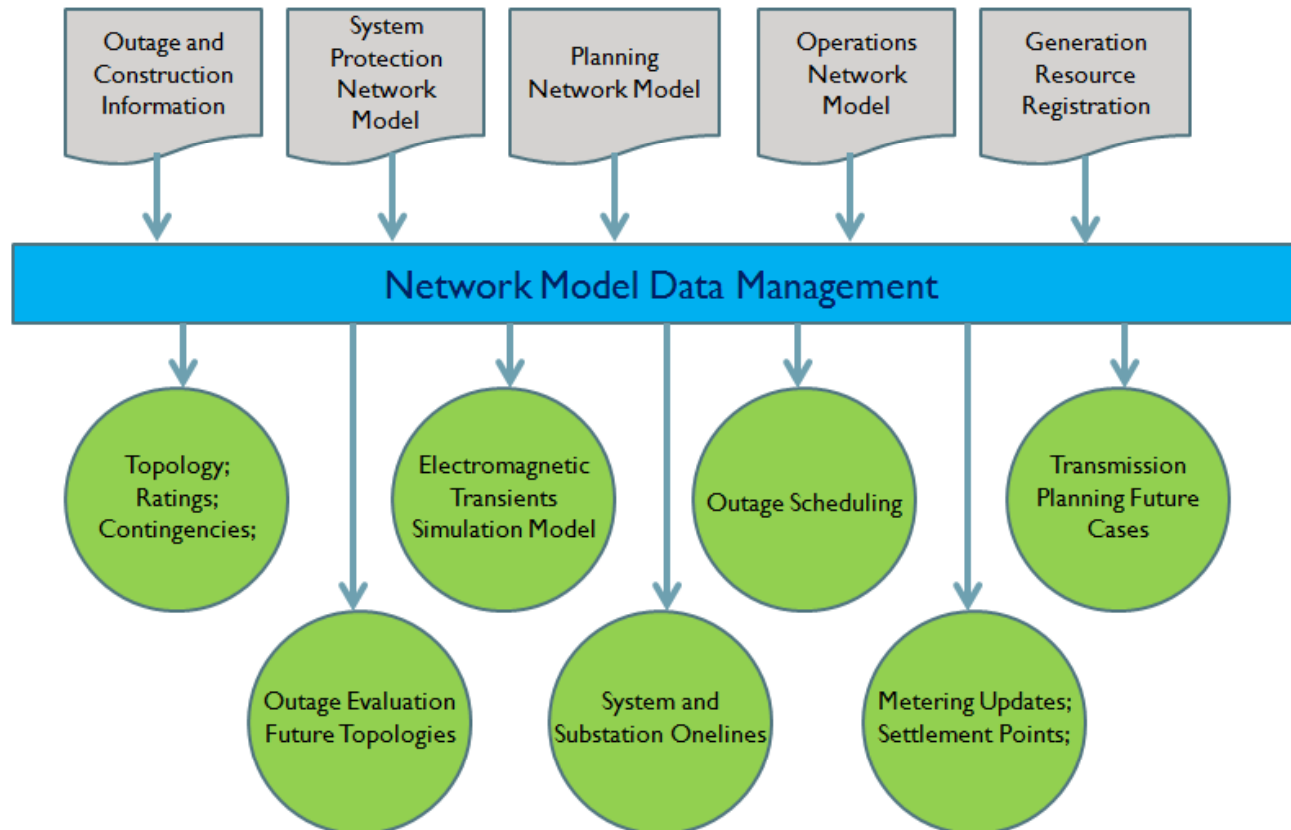
Application Specific Names

Integrated Data Model



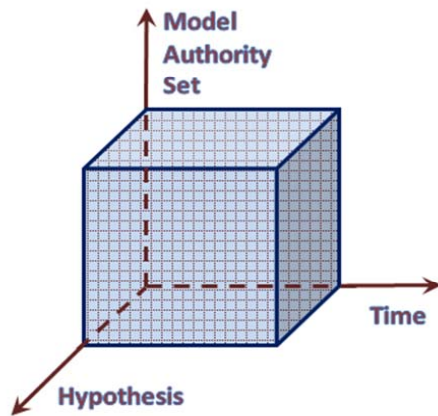
Asset and Network Model Integrated Solution Architecture - Dominion

Integrated Data Model – Connectivity



- ▶ Full Automation instead of Emails and Prints
- ▶ Reduce Model Errors and Improve Compliance
- ▶ Sync-up Models and Propagate Data Changes Faster

Integrated Data Model – NM Integration



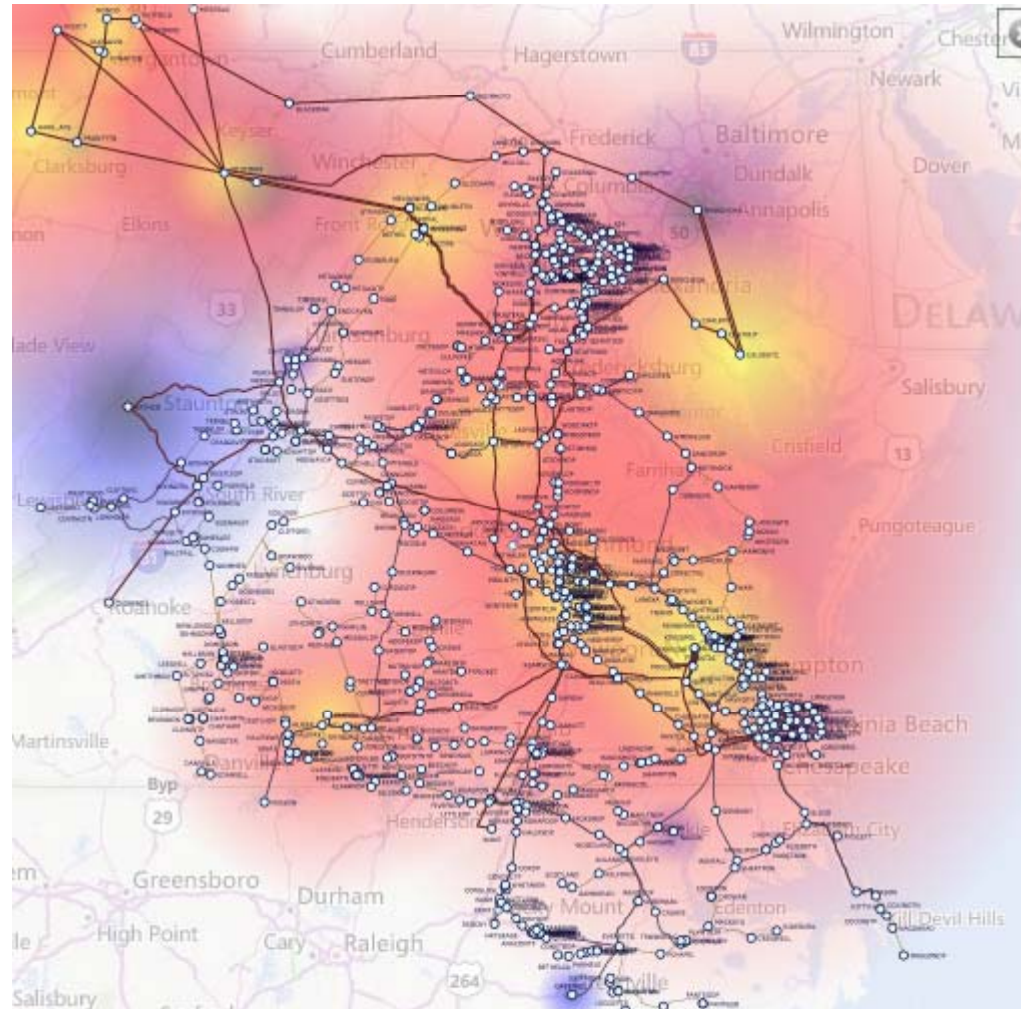
I, Connectivity in PI



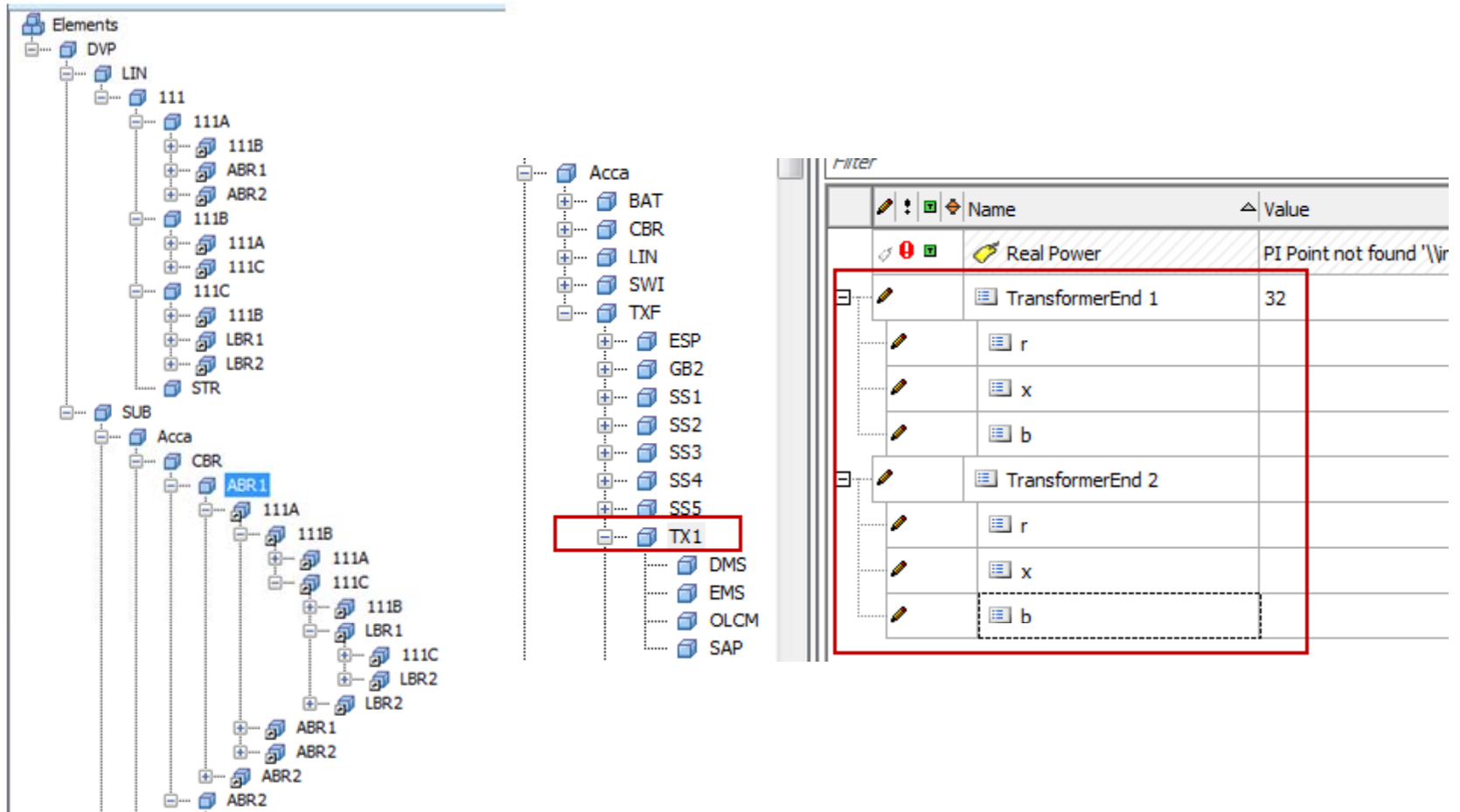
II, Operational Model Validated



III, Planning Aware



Integrated Data Model - Example



Advance Data Applications and Analytics



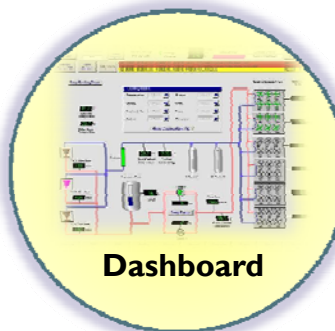
Optimal VAR Support



Geographical Data Visualization



Alarm and notification



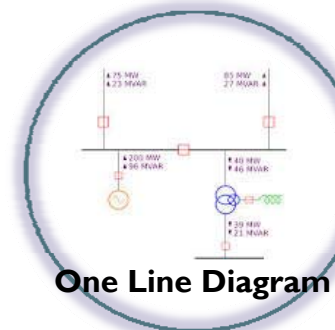
Dashboard



SOC Displays



Operational Report



One Line Diagram

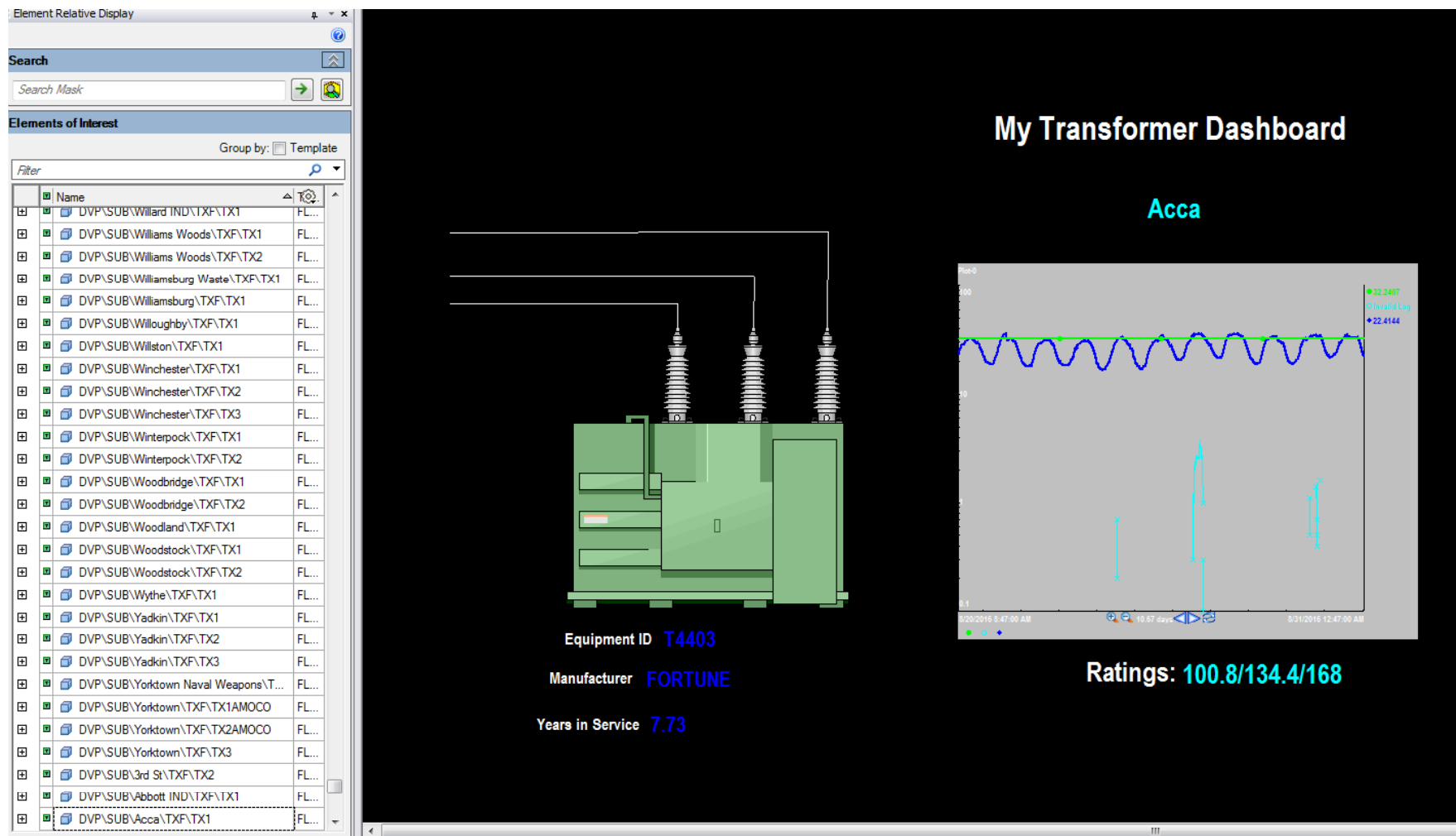


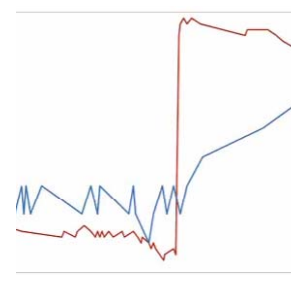
Equipment Monitoring



Storm Center Support

Transformer Dashboard





General		Inservice	
Update	Initial Inservice	RVV	200
Manufacturer	SMT	LVK	230
Serial Num	3230087	TKV	0
Your Mfr'd	Phase 1	MVA	260
	Class	ONAN/ONAF/ONAF	
Temp Rise	65		
Thermal Type		HV Tanks	
Connected A		1	5250000
Use TT		3	325000
Form C		3	3000000
Oil System	AB CONSERVATOR	4	4875000
LV Filter	N	5	4750000
	LTC Type	Cur Pos	
	LTC Type	NONE	
	LTC Interceptor		
	Type	Main Tank	14768
	Ctrl Pul Type	LTC	0
	N LTC Date Set	Selector	0
	Space Group	Total	14768
	TT011		
	Square Panel Design		
	Yes		
	Sound		
Panels/Enclosures	YES		
Installed			
Anti Vibration	Foundations	NOOL	NOOL
Foundation	Pads	mva	mva
GIC Design	YES		

These overleaf ratings are to be used for aluminum core only.

Questions?



Dominion®