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REGIONAL SEMINAR 2012

APAC

The Power of Data

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Integrating Asset Information Using PI AF and WebParts

Presented by **Brian Francis and Michael O'Brien, Transpower NZ**

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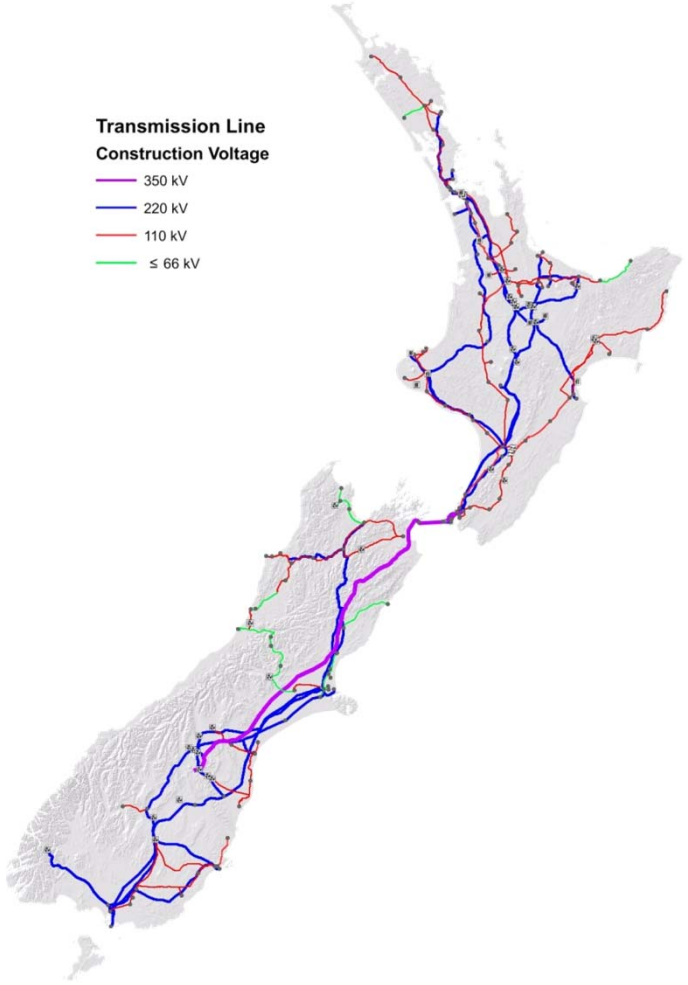
What is Transpower

- New Zealand's sole owner and operator of the high voltage transmission network
- Government owned, but mainly operated in the same way as a private enterprise
- 11,800km of high voltage lines, 178 substations
- 41,000 towers and poles on and over 45,000 properties
- 380 power transformer banks; 2,300 circuit breakers etc
- $2.5 billion worth of total fixed assets



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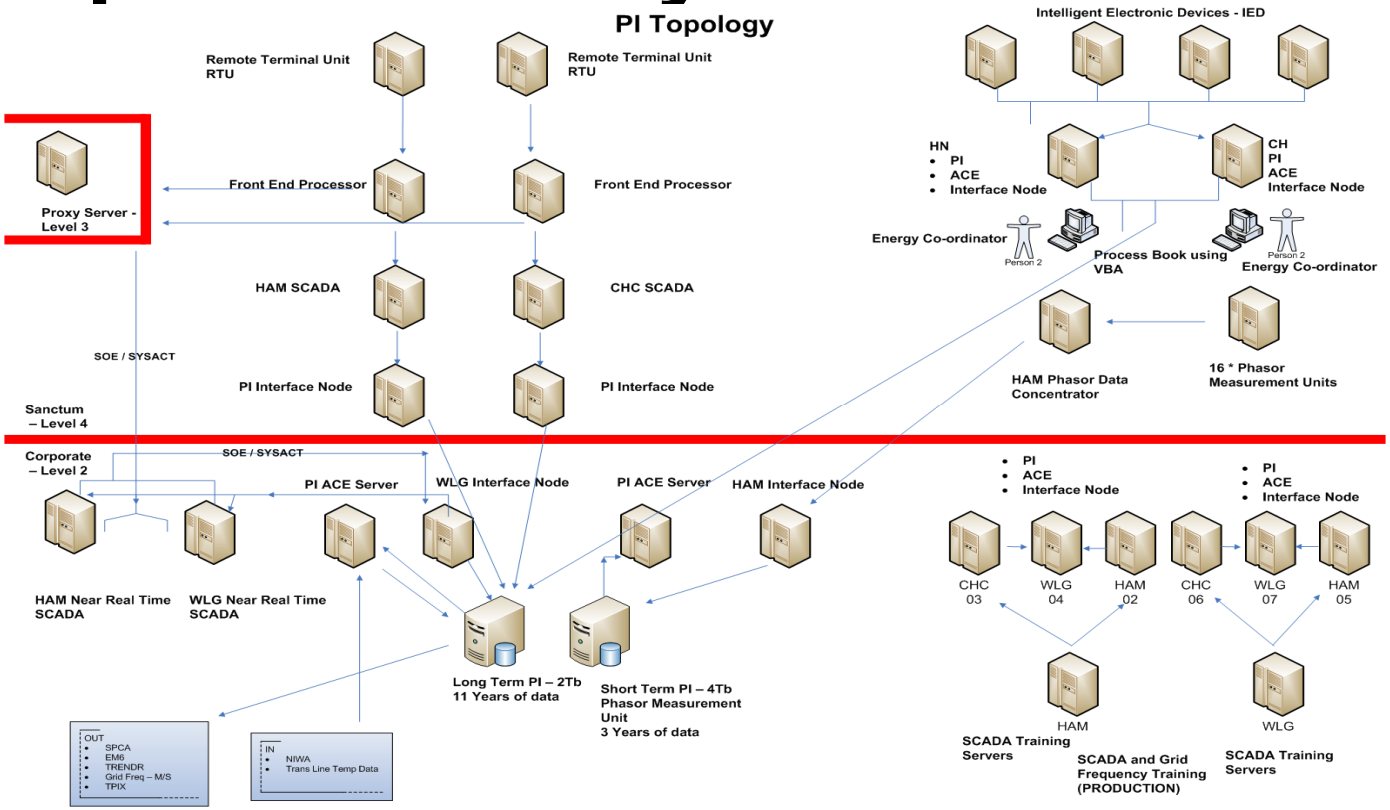
Transpower's PI System



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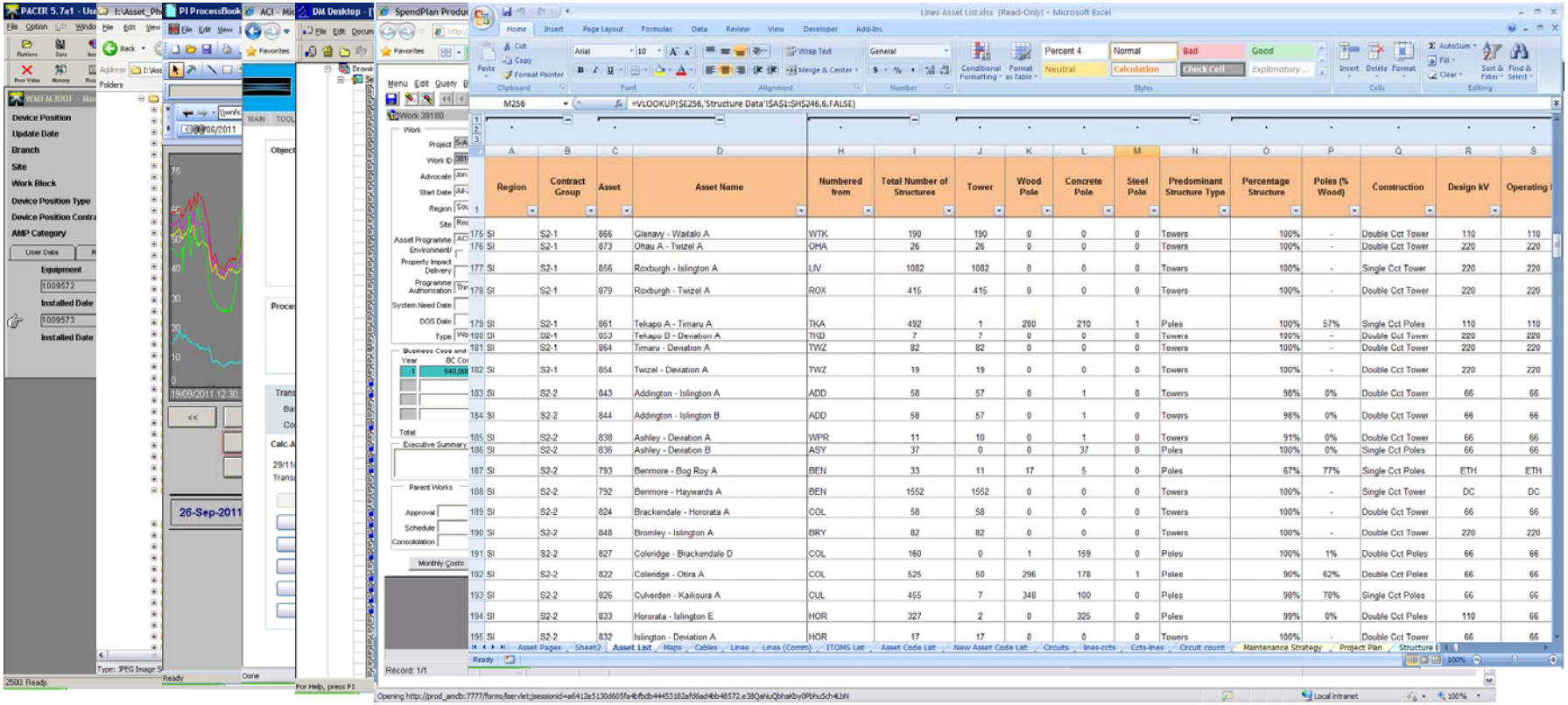
The Problem



Region	Contract Group	Asset	Asset Name	Numbered from	Total Number of Structures	Tower	Wood Pole	Concrete Pole	Steel Pole	Predominant Structure Type	Percentage Structure	Poles (% Wood)	Construction	Design kV	Operating
SI	S2-1	866	Glenavy - Waitaki A	WTK	190	190	0	0	0	Towers	100%	-	Double Cct Tower	110	110
SI	S2-1	873	Ohau A - Twizel A	OHA	26	26	0	0	0	Towers	100%	-	Double Cct Tower	220	220
SI	S2-1	856	Roxburgh - Islington A	LIV	1082	1082	0	0	0	Towers	100%	-	Single Cct Tower	220	220
SI	S2-1	879	Roxburgh - Twizel A	ROX	415	415	0	0	0	Towers	100%	-	Double Cct Tower	220	220
SI	S2-1	861	Tekapo A - Timaru A	TKA	492	1	280	210	1	Poles	100%	57%	Single Cct Poles	110	110
SI	S2-1	863	Tekapo B - Deviation A	TKD	7	7	0	0	0	Towers	100%	-	Double Cct Tower	220	220
SI	S2-1	864	Timaru - Deviation A	TWZ	82	82	0	0	0	Towers	100%	-	Double Cct Tower	220	220
SI	S2-1	854	Twizel - Deviation A	TWZ	19	19	0	0	0	Towers	100%	-	Double Cct Tower	220	220
SI	S2-2	843	Addington - Islington A	ADD	58	57	0	1	0	Towers	98%	0%	Double Cct Tower	66	66
SI	S2-2	844	Addington - Islington B	ADD	58	57	0	1	0	Towers	98%	0%	Double Cct Tower	66	66
SI	S2-2	838	Ashley - Deviation A	WPR	11	10	0	1	0	Towers	91%	0%	Double Cct Tower	66	66
SI	S2-2	836	Ashley - Deviation B	ASY	37	0	0	37	0	Poles	100%	0%	Single Cct Poles	66	66
SI	S2-2	793	Benmore - Bog Roy A	BEN	33	11	17	5	0	Poles	67%	77%	Single Cct Poles	ETH	ETH
SI	S2-2	792	Benmore - Haywards A	BEN	1552	1552	0	0	0	Towers	100%	-	Single Cct Tower	DC	DC
SI	S2-2	824	Brackendale - Hororata A	COL	58	58	0	0	0	Towers	100%	-	Double Cct Tower	66	66
SI	S2-2	848	Bromley - Islington A	BRY	82	82	0	0	0	Towers	100%	-	Double Cct Tower	220	220
SI	S2-2	827	Coleridge - Brackendale D	COL	160	0	1	159	0	Poles	100%	1%	Double Cct Poles	66	66
SI	S2-2	822	Coleridge - Otira A	COL	525	50	296	178	1	Poles	90%	62%	Double Cct Poles	66	66
SI	S2-2	826	Culverden - Kaikoura A	CUL	455	7	348	100	0	Poles	98%	78%	Single Cct Poles	66	66
SI	S2-2	833	Hororata - Islington E	HOR	327	2	0	325	0	Poles	99%	0%	Double Cct Poles	110	66
SI	S2-2	832	Islington - Deviation A	HOR	17	17	0	0	0	Towers	100%	-	Double Cct Tower	66	66

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There must be a better way!

- What if all asset data was in one place?
- What if that one place was easily accessible via the web?
- What if there was an easy to use GUI?
- What if the relationships between different data sets could be easily seen?

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PI AF, ACE and WebParts

- Use PI AF to sort and integrate data
- Use PI ACE to provide basic analytical functions
- Use PI WebParts to present data in an accessible, easy to use environment
- Utilise existing Transpower platforms

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Asset Information Portal

- Contains data across five “asset classes”
  - Transmission lines
  - Circuits
  - Stations
  - Transformers
  - Circuit breakers
- Contains “dashboard” views, summarising fleet statistics

- Integrates data from:
  - PI Historian (SCADA)
  - Maintenance Management System
  - Asset Capability Information (ratings)
  - Asset Management Database (planning tool)
  - Outage Planning System
  - Geospatial
- 20% of the data used 80% of the time

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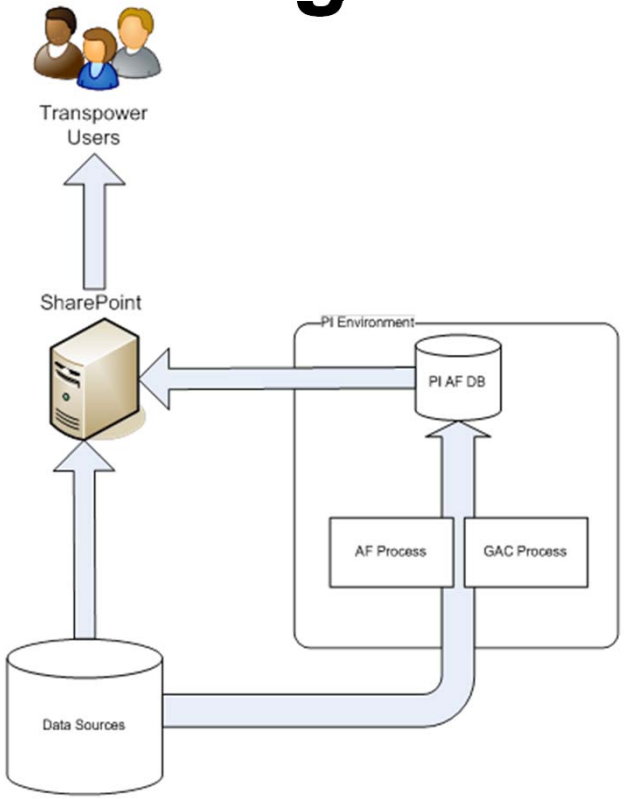
IT High Level Design



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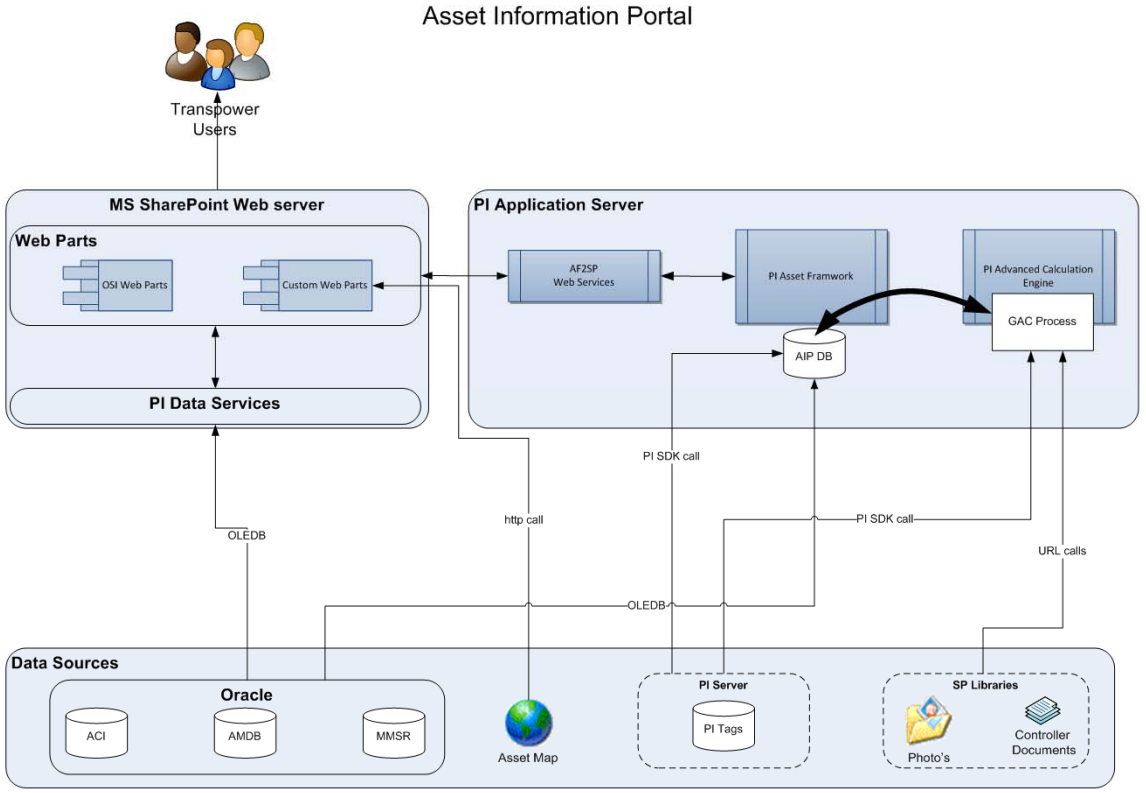
Web Services



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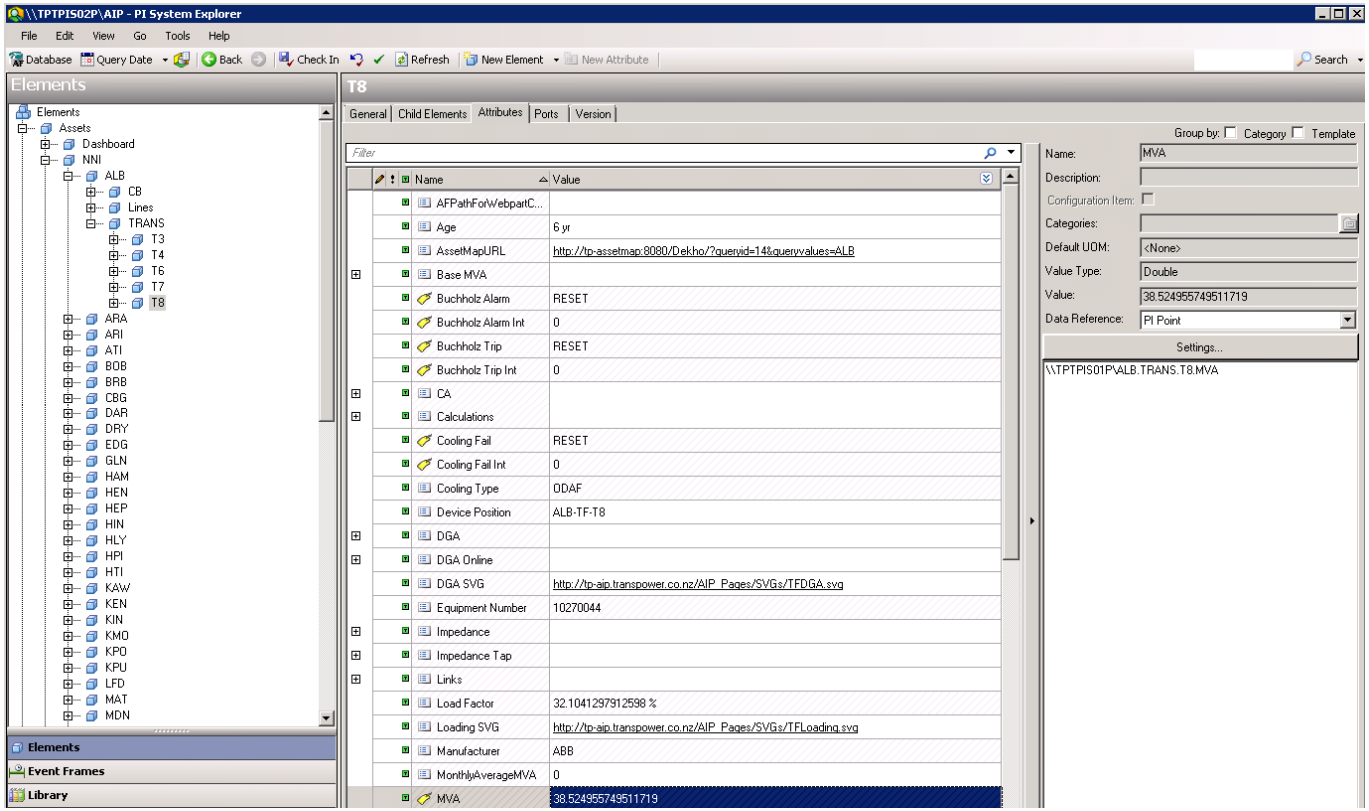
PI Asset Framework



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PI WebParts and SharePoint

- Use PI Treeview to display AF hierarchy
- Treeview is connected to all other webparts, so they ‘understand’ which asset is selected
- Connections allow one SharePoint page to be built per asset type (one page can be used for hundreds of assets)
- Modular approach means it’s easy to add new features and data in the future

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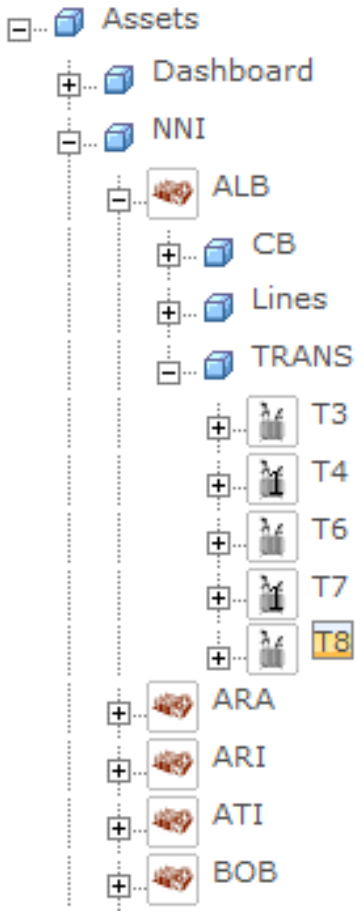
Navigation

- Tree structure aligned to existing systems
- Six regions (three lines, three stations) and a dashboard section
- Hyperlinks used where applicable to navigate without the tree



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Quick Facts

- Every asset page has a ‘quick facts’ webpart at the very top of the page
- Integrates data from different sources without the user having to know

ALB-TF-T8

Manufacturer:	ABB	**Voltages (HV, LV, MV):**	220kV, 33kV, -
Year Of Manufacture:	2006	**Max Cont Rating (HV, LV, MV):**	120.0MVA, 120.0MVA, -
Age:	6yr	**Summer Rating (HV, LV, MV):**	146.0MVA, 146.0MVA, -
Serial Number:	505062	**Winter Rating (HV, LV, MV):**	152.4MVA, 152.4MVA, -
Equipment Number:	10270044	**Impedance (HV-LV):**	20.69%
Cooling Type:	ODAF	**Impedance Tap (HV, LV, MV):**	10, -, -
Vector Group:	YND3	**Monthly Average Load Factor:**	33.0%
		Monthly Peak Load Factor:	41.3%

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Real Time Data

- Displays real time analogues and digitals from the PI system
- Includes formula values from AF
- Can launch an ad-hoc trend from any of the data points

Status	
MVA:	40.6 MVA
MW:	40.4 MW
MVAr:	4.2 MVAr
Load Factor (MCR):	34 %
Power Factor:	0.99
Tap Position:	5
Buchholz Alarm:	RESET
Buchholz Trip:	RESET
Winding Temp Trip:	No Data
Oil Temp Alarm:	No Data
Pressure Relief Trip:	RESET
Oil Level Alarm:	RESET
Cooling Alarm:	RESET

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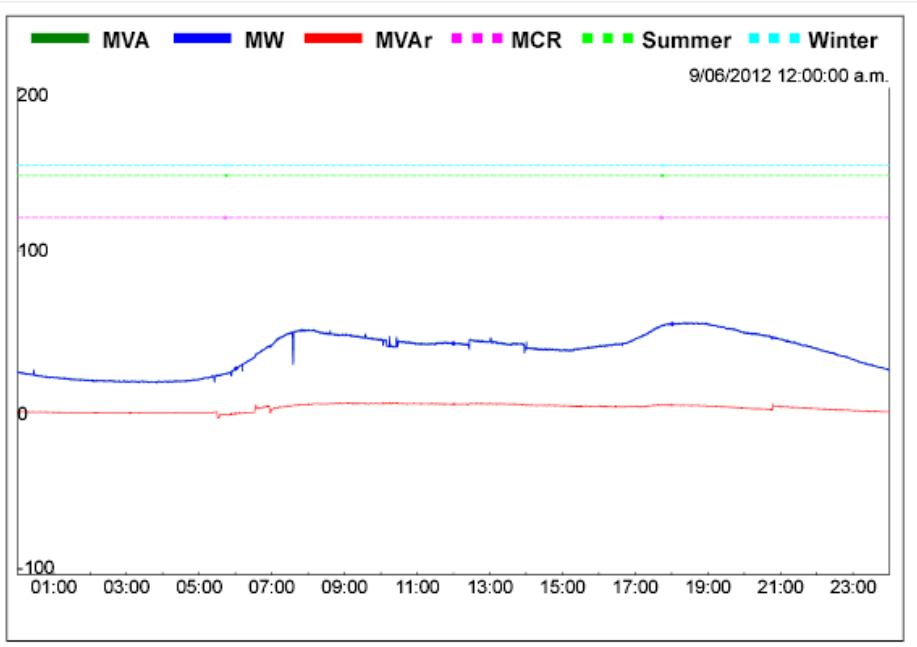
Time Series Data

- Data combined from the PI system and related data sources e.g. ratings information
- Controlled by the time range webpart



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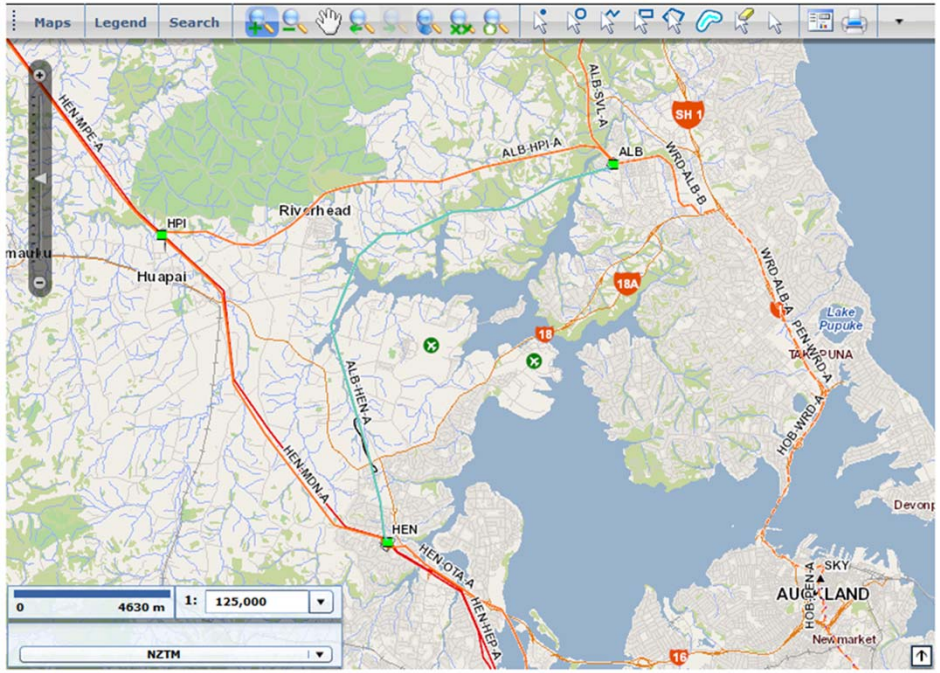
Geospatial

- Integrates Transpower's geospatial viewer
- Webpart simply a webpage viewer that receives a URL from the AF



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Relational Data

- PI Table webparts connected through PI Dataservices
- AF data to filter query

Outage Windows

Outage Block	Window ID	Start Date	End Date	Outage Type	Status	Remarks
ALB_CB_742	2740334	29/03/2012 6:00:00 p.m.	1/05/2013 6:00:00 p.m.	Continuous	Frozen	DEV Release CB 742 for future contruction work
ALB_HEN_1	2754342	5/06/2012 6:00:00 a.m.	20/06/2012 6:00:00 p.m.	Continuous	Frozen	DEV Circuit 1 cable commissioning
ALB_HEN_2	2754343	5/06/2012 6:00:00 a.m.	20/06/2012 6:00:00 p.m.	Continuous	Frozen	DEV Establishing safe working clearances between CCT2 & CCT1
ALB_224_244_267	2754341	20/06/2012 9:00:00 a.m.	20/06/2012 3:00:00 p.m.	Daily	Frozen	DEV Open DS 267 for phasing checks across VT1 and VT2
ALB_HEN_1	2755393	26/06/2012 7:30:00 a.m.	30/06/2012 1:00:00 p.m.	Continuous	Frozen	System split with HEN T5 outage

Showing 1 to 5 of 37

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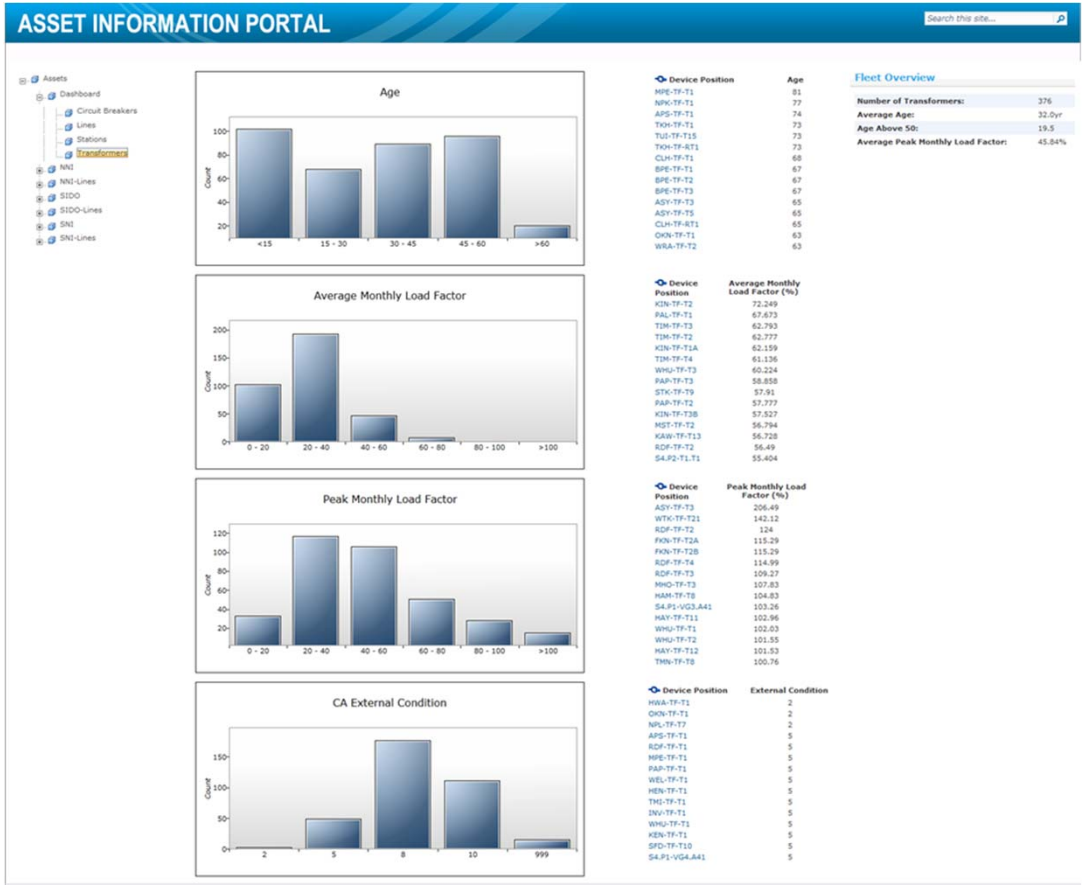
Dashboards

- Summarise fleet wide statistics using the GAC
- Easily see worst performers and high criticality assets
- Hyperlinks to drill down to detail



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ASSET INFORMATION PORTAL

Search this site...

- Assets
  - Dashboard
  - NNI
  - NNI-Lines
    - ALB-HEN-A
    - ALB-HPI-A
    - ALB-SVL-A
    - ARA-WRK-A
    - ARI-EDG-A
    - ARI-EDG-B
    - ARI-HAM-A
    - ARI-HAM-B
    - ARI-ONG-A
    - ARI-ONG-B
    - ATI-TRK-A
    - BOB-MER-A
    - BOB-OTA-A
    - BRB-DEV-A
    - DAR-MPE-A
    - DAR-MPE-B
    - EDG-KAW-A
    - EDG-KAW-B
    - EDG-TRK-A
    - EDG-WAI-B
    - GLN-DEV-A
    - HAI-MTM-A
    - HAI-MTM-B
    - HAI-TGA-A
    - HAI-TMI-A
    - HAI-TRK-A
    - HAM-DEV-A
    - HAM-KPO-A
    - HAM-MER-A
    - HAM-MER-B

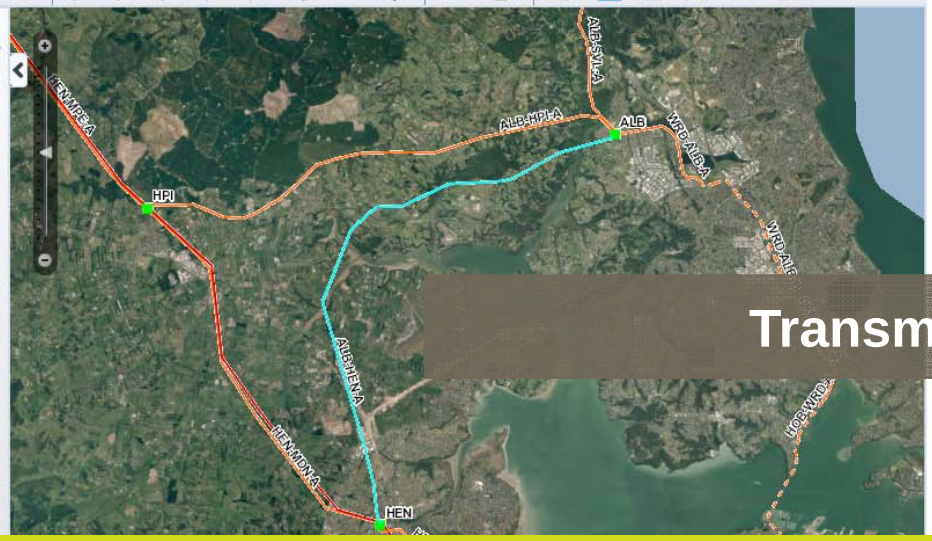
Albany - Henderson A

Predominant Structure Type:	Double Circuit Steel Tower	**Line Length:**	17 km
Structures:	Double Circuit Steel Tower (55), Termination (6)	**Design Voltage:**	110 KV
Conductors:	Wolf ACSR-GZ 80C (112)	**Line Commissioning Year:**	1957
Tower Foundations:	Concrete over Grillage (19), Concrete plug, bored or dug (1), Grillage (41), Other (1)	**Contract Group:**	NL1
Insulators:	Glass cap and pin (Standard) (123), Horizontal line post composite (16), NGK composite (12), Other composite (8)	**Contractor:**	Northpower
Earthwires:	GEHSS 7/2.59 (10)	**Maintenance Manager:**	Mark Mitchell
Urban %:	57.9 %		

Search

Line

Line Name



Useful Links

- Asset Information Portal User Guide
- Service Desk - For incorrect data or other usability issues
- For future improvements please email

Add new link

Links

- Asset Map
- Asset Photos
- Transmission Line Asset Drawings
- Transmission Line Standard Drawings Register
- 02 Service Specifications
- Asset Management Plans and Strategies
- Design and Maintenance
- Transmission Line Schematics
- Programme Overview Documents

Transmission Lines

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ASSET INFORMATION PORTAL

Search this site...

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        - T4
        - T6
        - T7
        - T8
    - ARA
    - ARI
    - ATI
    - BOB
    - BRB
    - CBG
    - DAR
    - DRY
    - EDG
    - GLN
    - HAM
    - HEN
    - HEP
    - HIN
    - HLY
    - HPI
    - HTI
    - KAW
    - KEN
    - KIN
    - KMO

ALB-TF-T8

Manufacturer:	ABB	**Voltages (HV, LV, MV):**	220 kV, 33 kV, -
Year Of Manufacture:	2006	**Max Cont Rating (HV, LV, MV):**	120.0 MVA, 120.0 MVA, -
Age:	6yr	**Summer Rating (HV, LV, MV):**	146.0 MVA, 146.0 MVA, -
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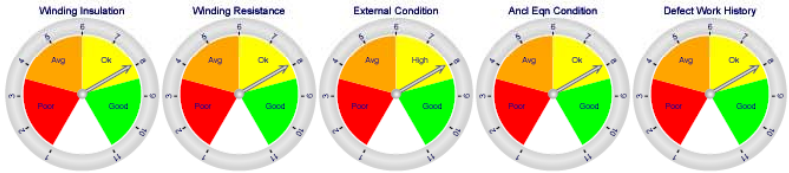
Equipment Number:	10270044	**Impedance (HV-LV, HV-MV):**	20.69 %, -
Cooling Type:	ODAF	**Impedance Tap (HV, LV, MV):**	10, -, -
Vector Group:	YND3	**Average Monthly Load Factor:**	32.0 %
		Peak Monthly Load Factor:	56.1 %

Condition Assessment Summary



Condition Assessment

Inspection Date	Winding Insulation	Winding Resistance	External Condition	Ancl Equipment Conditions	Defect Work History	Comments Recommended Actions
02/12/2010	8	8	8	8	8	As new condition. We derusted and painted the frame. All test completed
02/12/2010	8	8	8	8		
18/01/2007	10	10	10	10		
05/09/2006	10	10	10	10		

Transformer Bushings

Inspection Date	Connected Winding	Phase	Manufacturer	Model	Serial No	Operating Voltage	Rated Voltage	Rated Current	Fault Current Rating	Short Time Current	Short Time Duration
22/03/2006	HV-A	R	ABB	GOE 950-750-2500		220	245	2500	26		
23/03/2006	HV-B	Y	ABB	GOE 950-750-2500		220	245	2500	26		
24/03/2006	HV-C	B	ABB	GOE 950-750-2500		220	245	2500	26		

Contact Us

- Asset Information Portal User Guide
- Service Desk - For incorrect data or other usability issues
- For future improvements please email

Links

Asset Map
Asset Photos
Transformer Asset Strategy TP.TS 20.01
Transformer Asset Management Plan TP.AM-S 20
Transformer Procurement Strategy TP.PS 20.05
Transformer Maintenance TP.SS 02.30
Transformer Testing TP.SS 04.60
Transformer Repairs TP.SS 02.31
Transformer Oil TP.SS 02.35
Substation Condition Assessment TP.SS 02.40
Operation of Transformers TP.OG 41.07
SLDs
R&IDs

Time Range Control

Apply

Analytics

Analytic	Value
Average Load:	39.37 MVA
Average Load Factor:	32.81 %

Power Transformers

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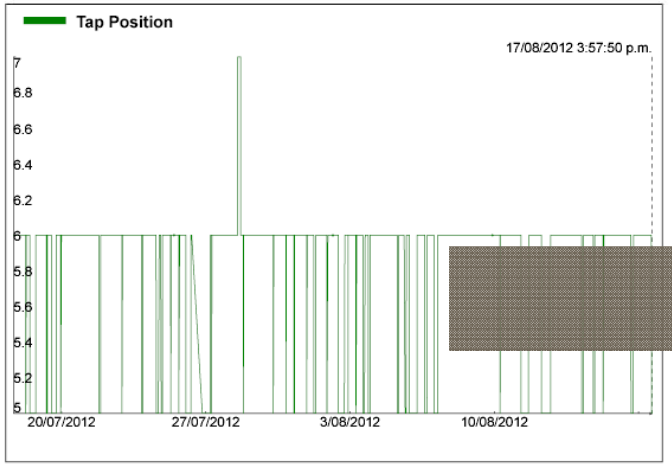
        - T7
        - T8
          - ET8
          - OLTC
    - ARA
    - ARI
    - ATI
    - BOB
    - BRB
    - CBG
    - DAR
    - DRY
    - EDG
    - GLN
    - HAM
    - HEN
    - HEP
    - HIN
    - HLY
    - HPI
    - HTI
    - KAW
    - KEN

ALB-TF-T8

Manufacturer:	ABB	**Max Tap Voltage**	236.5 kV
Model Number:	UCGRN 380/400	**Max Ops between services:**	100000
Year Of Manufacture:	2006	**MMS Operations Count:**	36223
Age:	6yr	**MMS Operations Count Date:**	11/07/2012 12:00:00 a.m.
Serial Number:	1ZSC8674159	**Nominal Tap:**	7
Equipment Number:	10270045	**Number of Steps:**	18
Connected Winding:	HV	**Tap Size:**	2.75 kV
OLTC Location:	In tank	**Added Voltage Per Step**	1.25 %
Rated Current:	400 A	**Min Tap Number**	19
Max Tap Number:	1	**Min Tap Voltage:**	187.0 kV

Tap Position



Condition Assessment Summary

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Status	
Tap Position:	5

Links

Asset Map
SLDs
R&IDs
Asset Photos
Transformer Maintenance TP.SS 02.30
Transformer Testing TP.SS 04.60
Transformer Repairs TP.SS 02.31
Transformer Oil TP.SS 02.35

PI TimeRange

Start Time
*-1mo
End Time
*
Apply

Analytics

On-Load Tap Changers

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Early Benefits

- Time savings
- Finding “hidden” data
- Data relationships
- Encouraging people to look!
- Better decision making (potentially)

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Project Successes

- Born from a Proof of Concept – allowed us to try ideas without committing to a certain path
- Strong business engagement – having someone from the business working directly alongside IT allowed for a much better mutual understanding of requirements and difficulties
- Small agile project avoided a lot of unnecessary project management overhead and process

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Project Obstacles

- Utilising existing platforms – not in charge of your own destiny
- Managing expectations – people get excited easily
- Relatively untested idea – stepping into the unknown
- Data quality – project has exposed numerous errors in the source databases

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Future Improvements

- Improve performance
- More asset types
- Better analytics and dashboards
- More data sources

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Special Thanks

A special thank you to our partner in this project, Dimension Software

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