DNV GL - SOFTWARE

Integrated Grid Planning Symposium

Hawaii Convention Center

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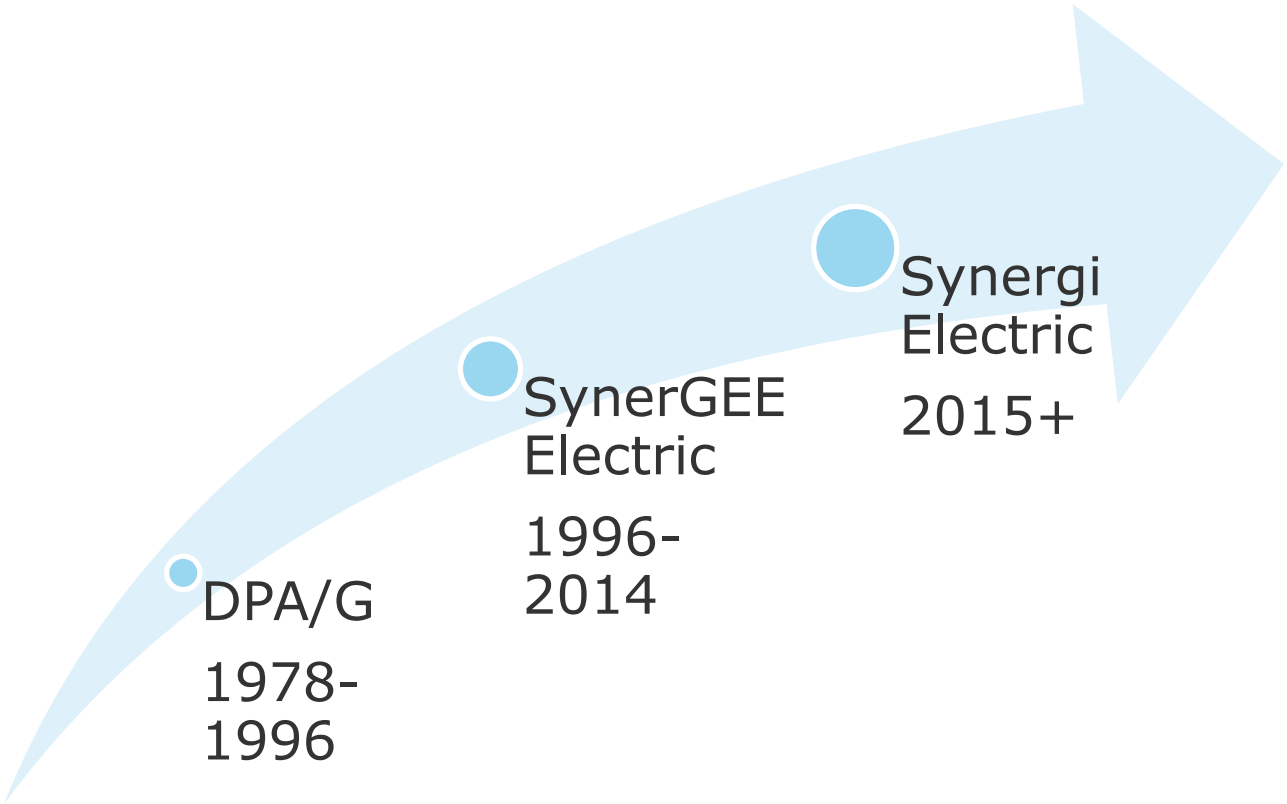
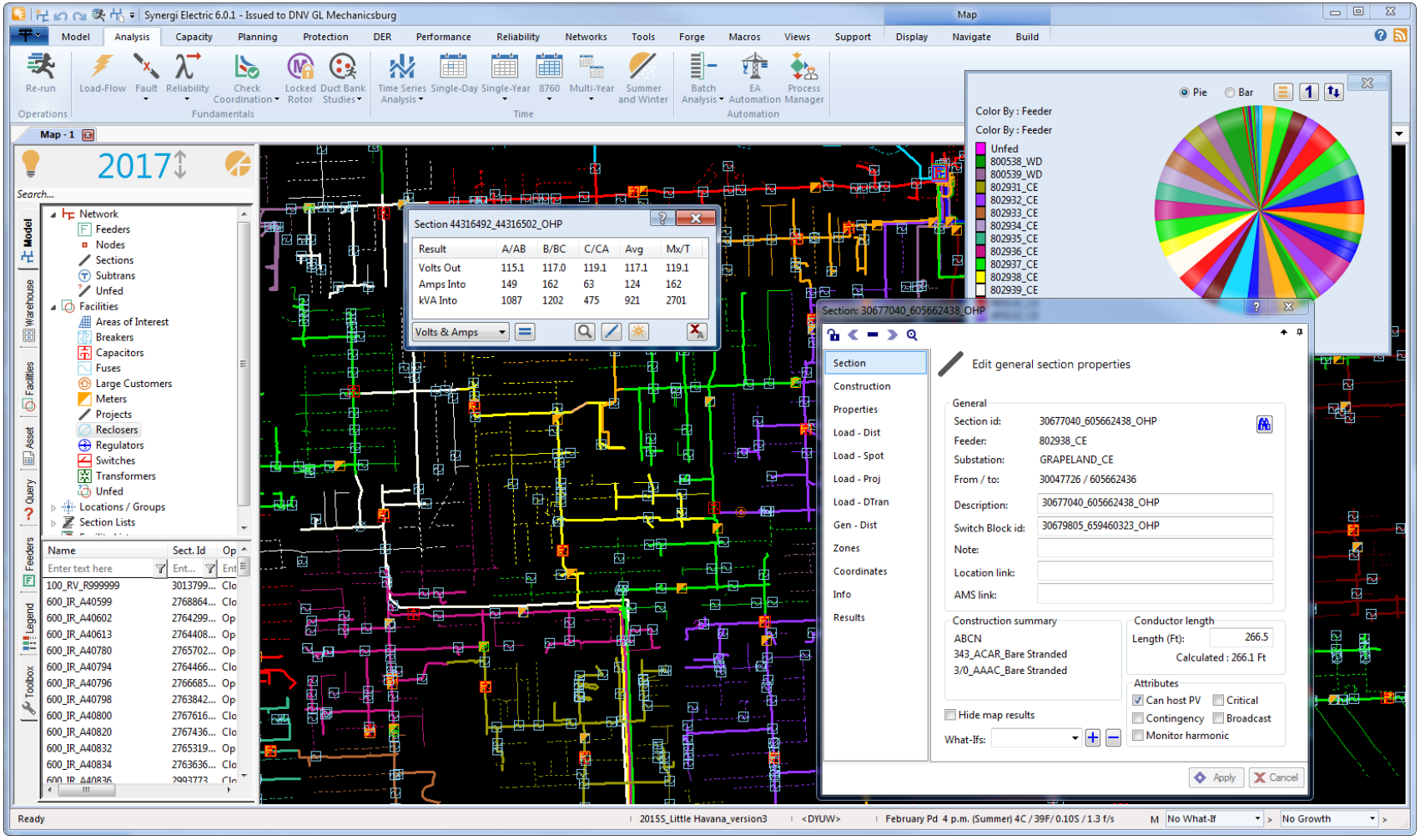
DNV·GL
Consolidation of industry leading
Software and Advisory Services
KEMA
Stoner Associates
NOBLE DENTON
DNV
GL Group
ADVANTICA
DIGITAL INSPECTIONS

Synergi Electric Heritage

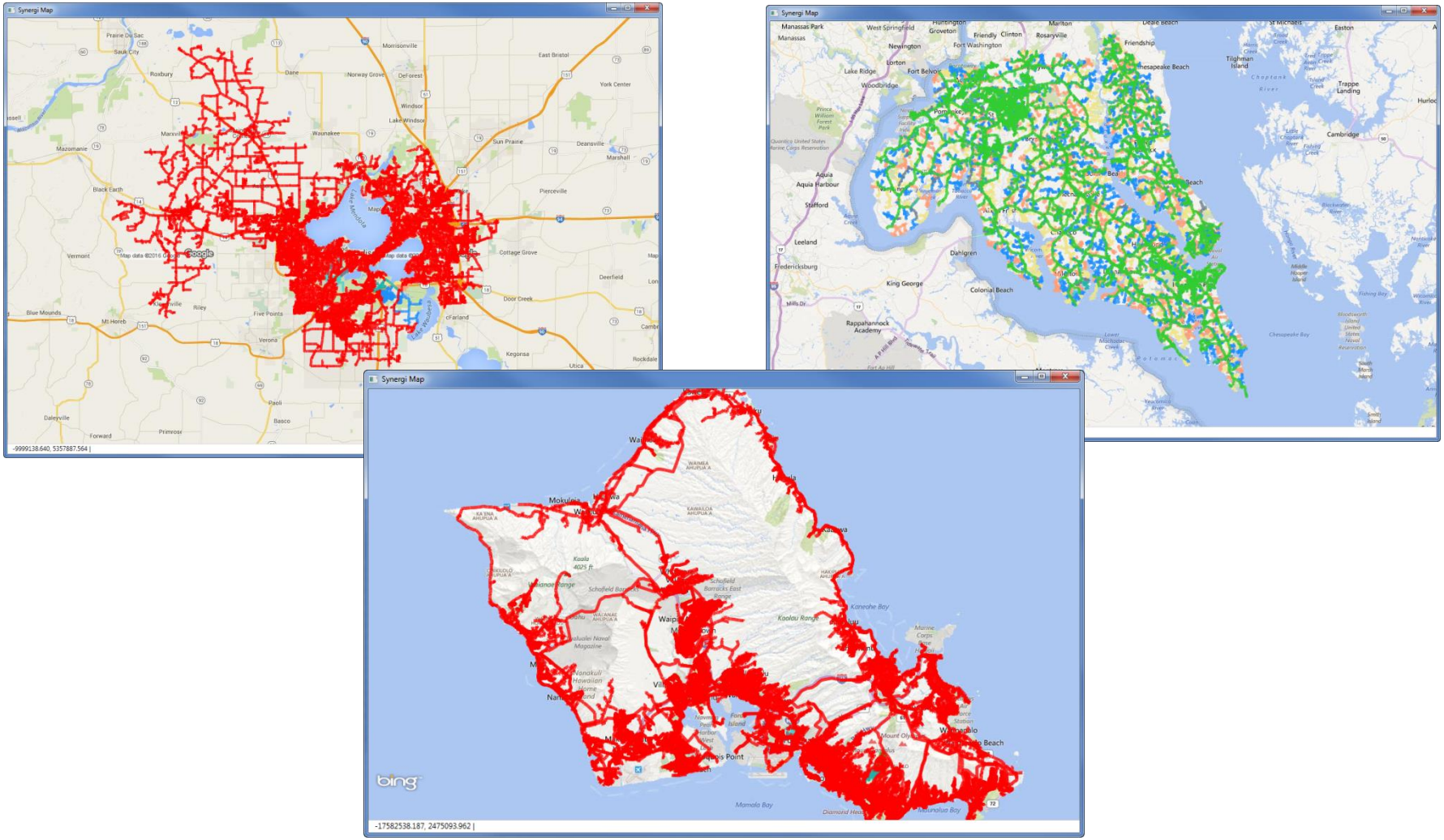


Powerful tools for engineering simulation & analysis



Private and confidential

Distribution models



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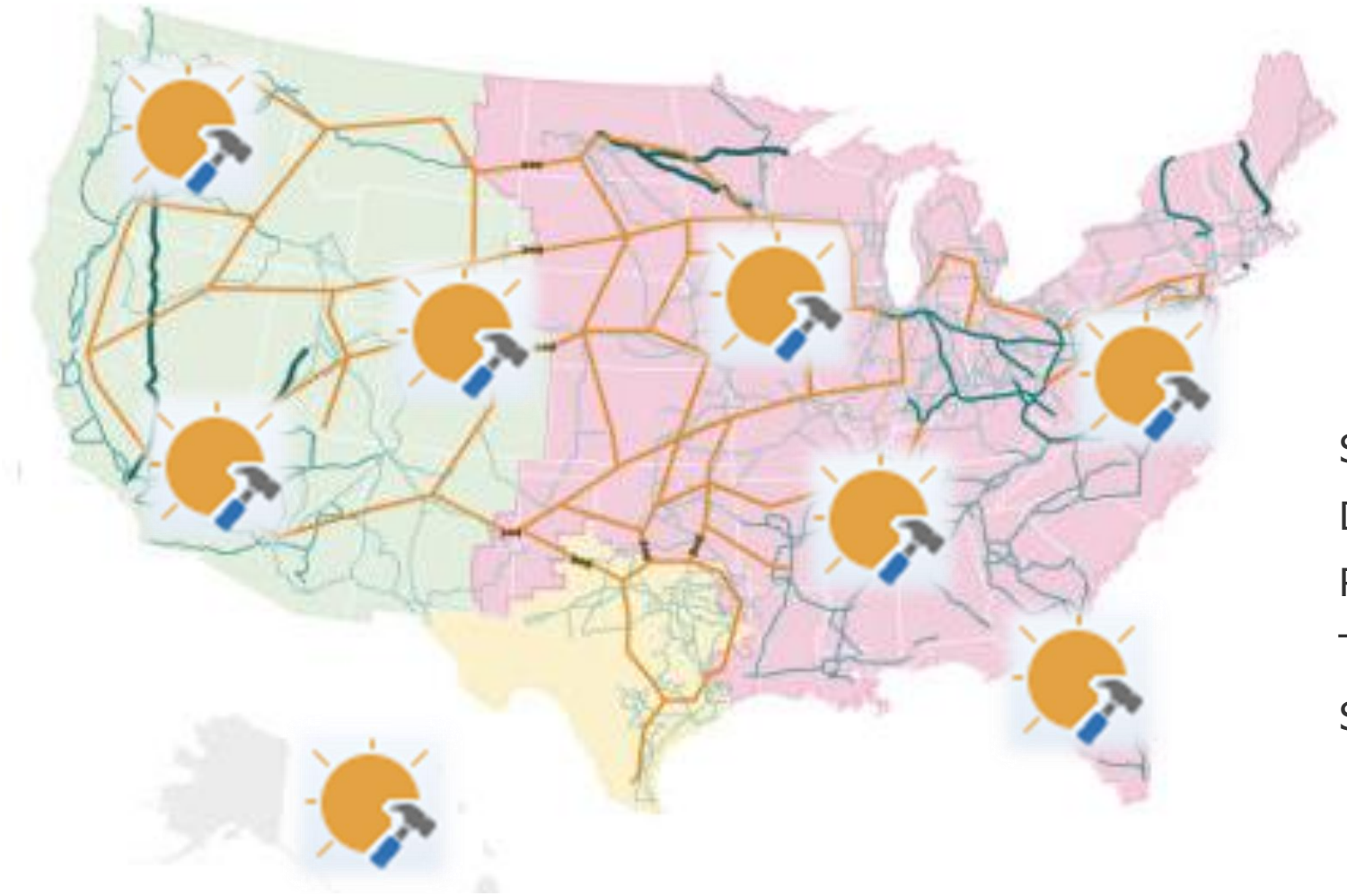
DER perspectives differ



Size

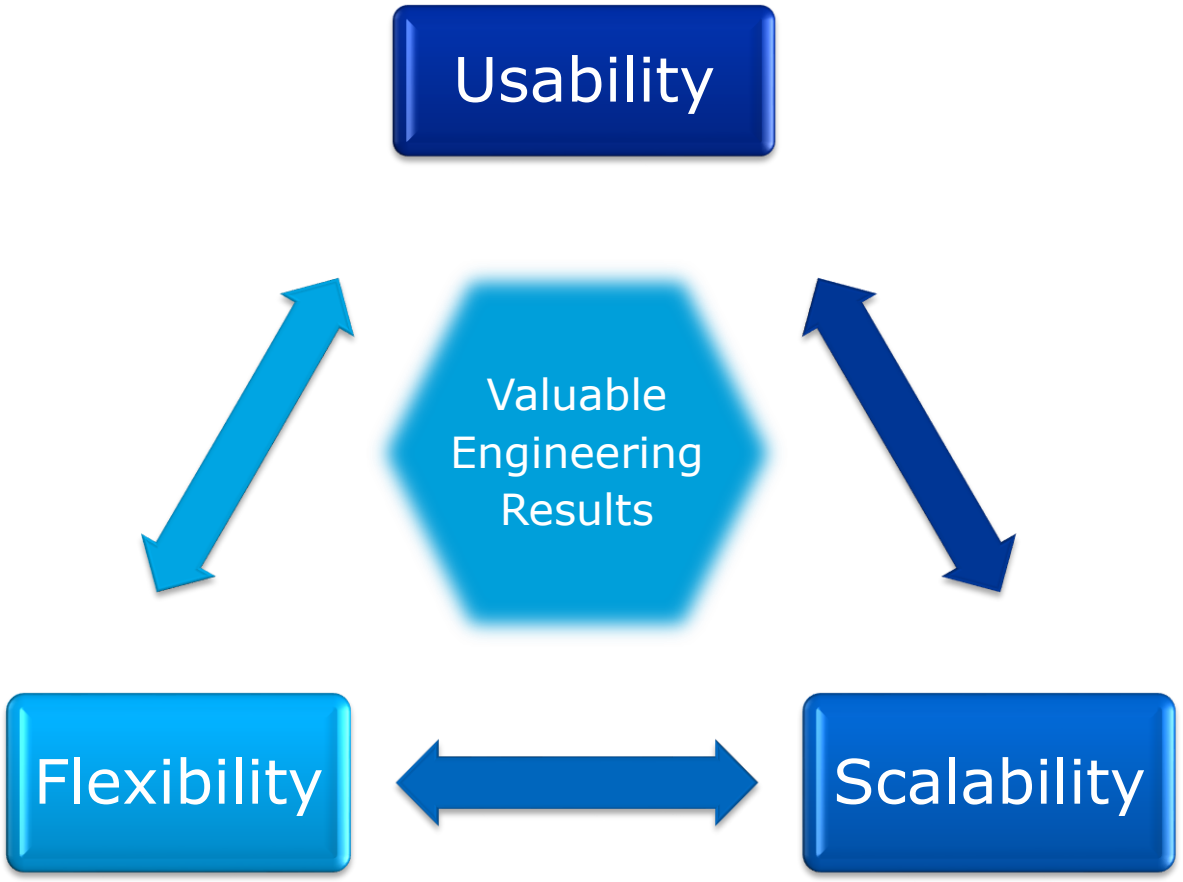
Density

Rate

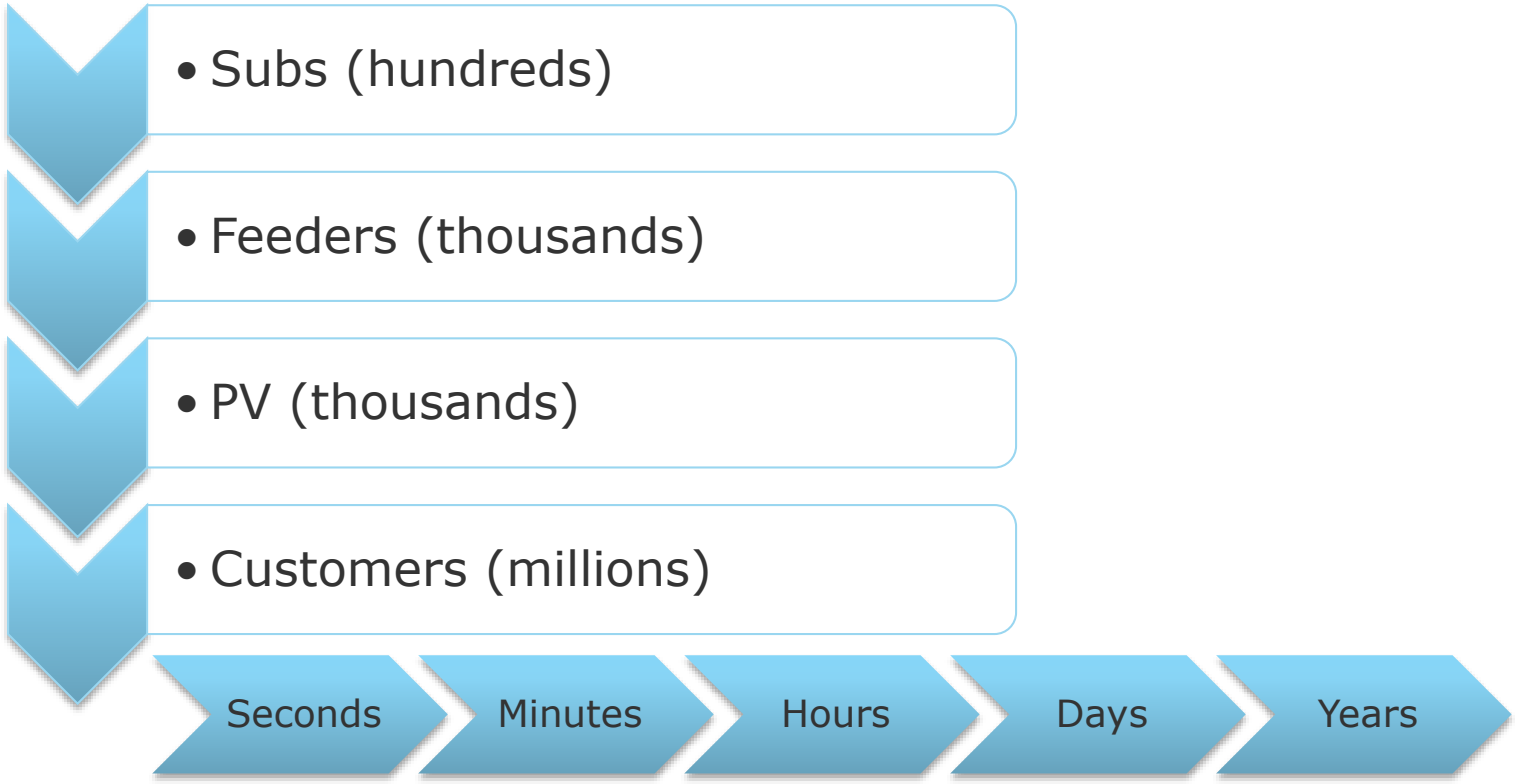
Topology

Strategy

Engineering analysis challenge

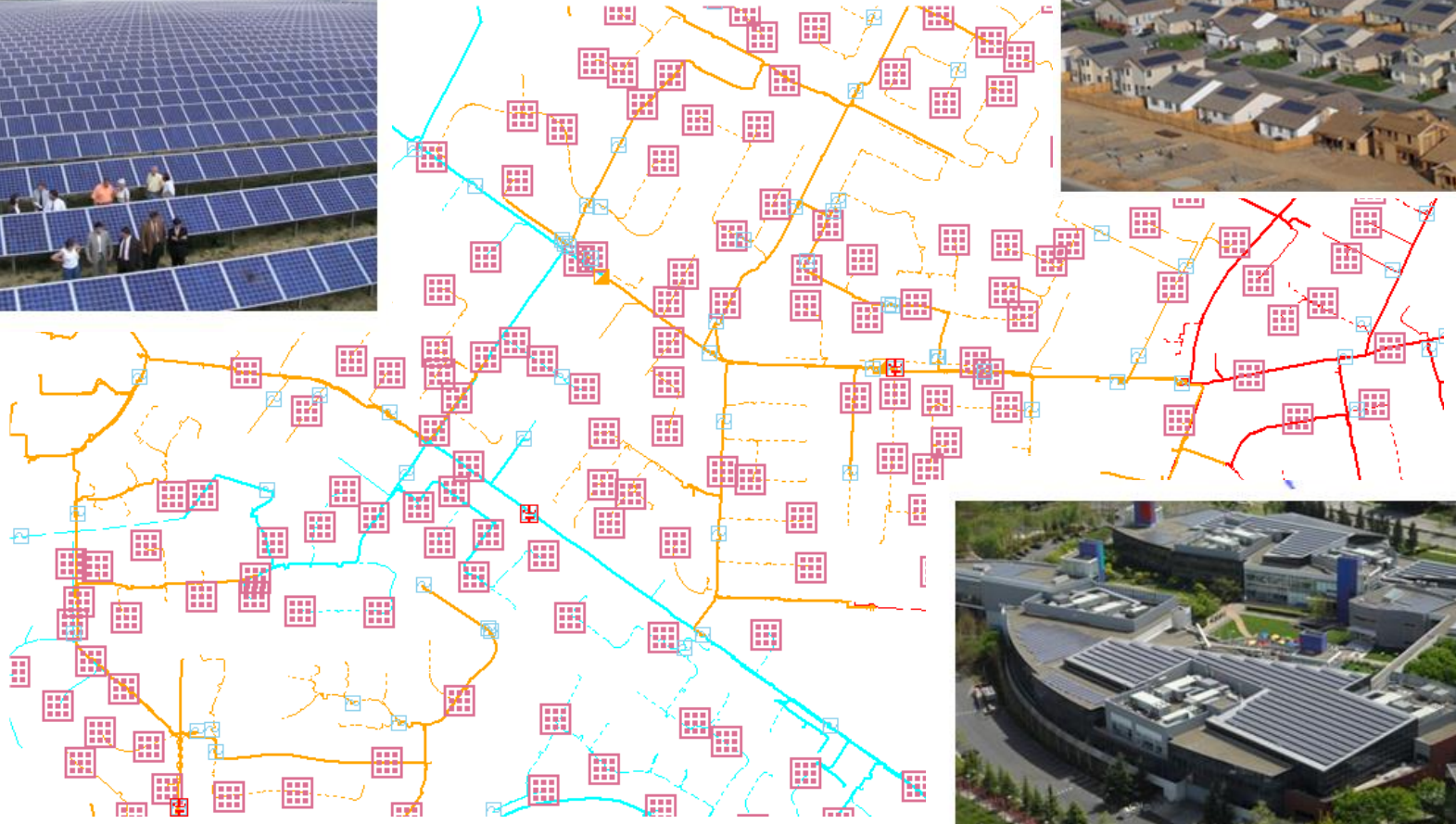


The scale of PV analysis

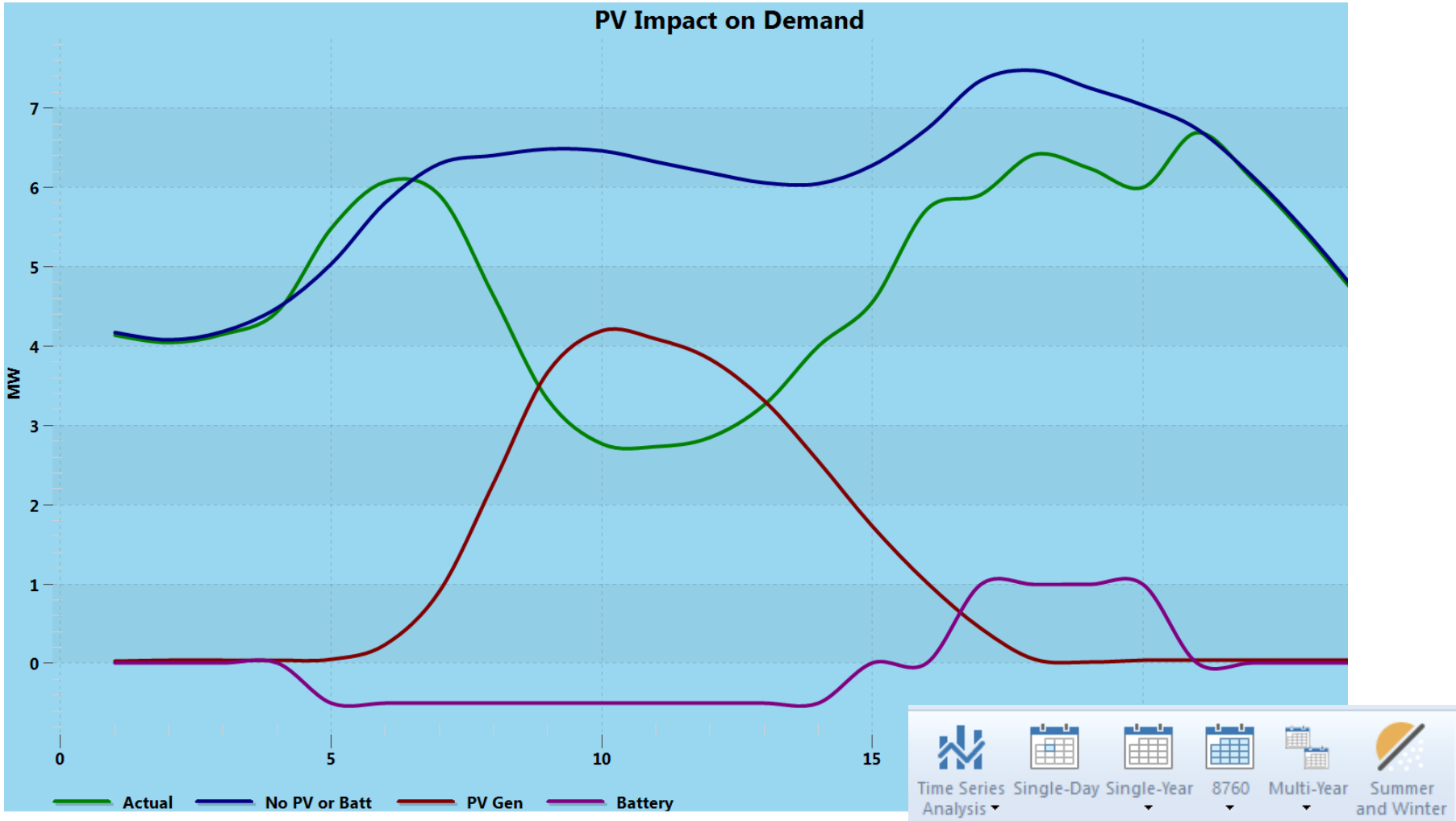


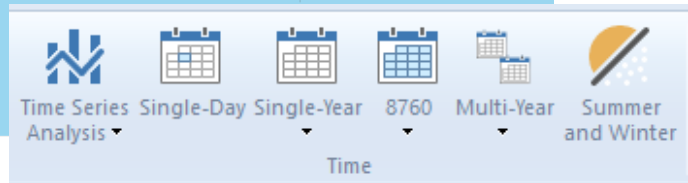
Distribution systems are big, complex, and data intensive

Three types of solar installations modelled with Synergi

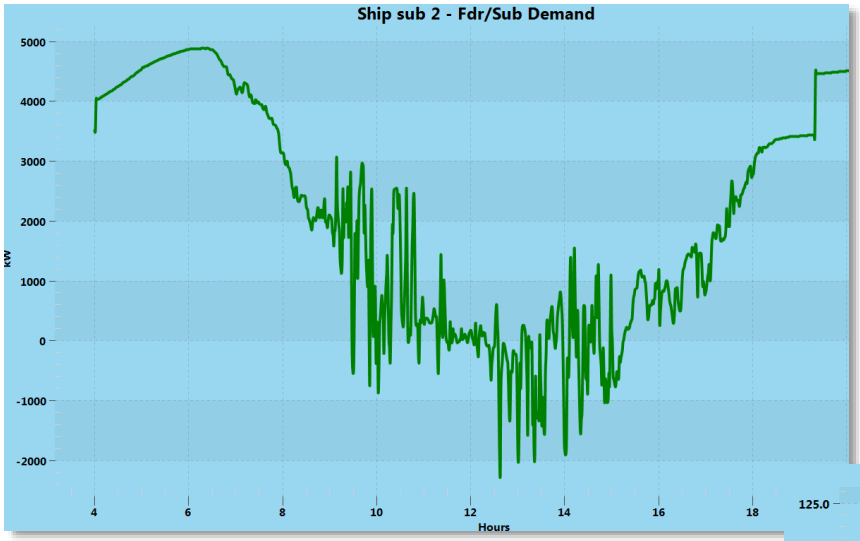


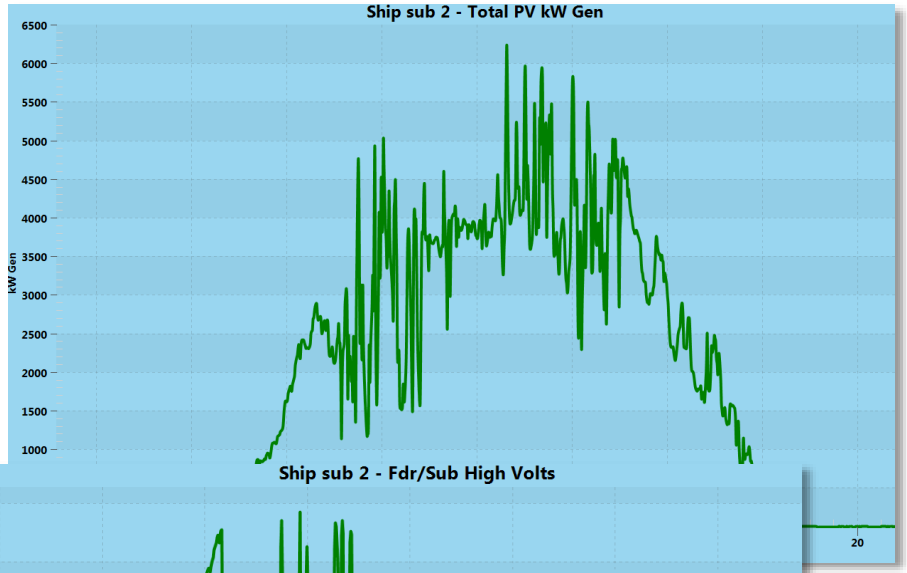
Single day analysis

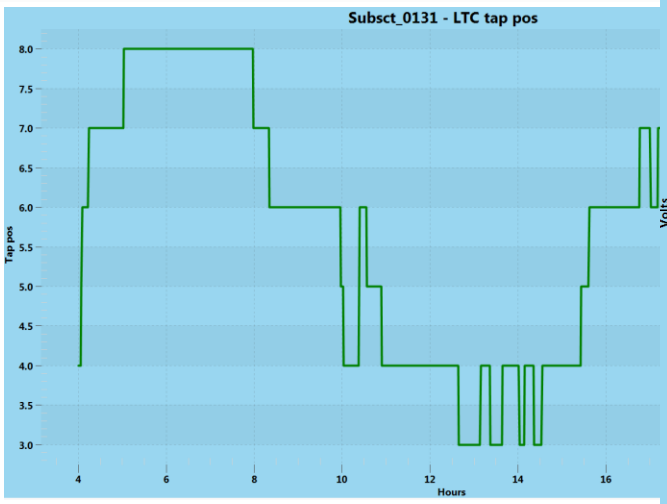


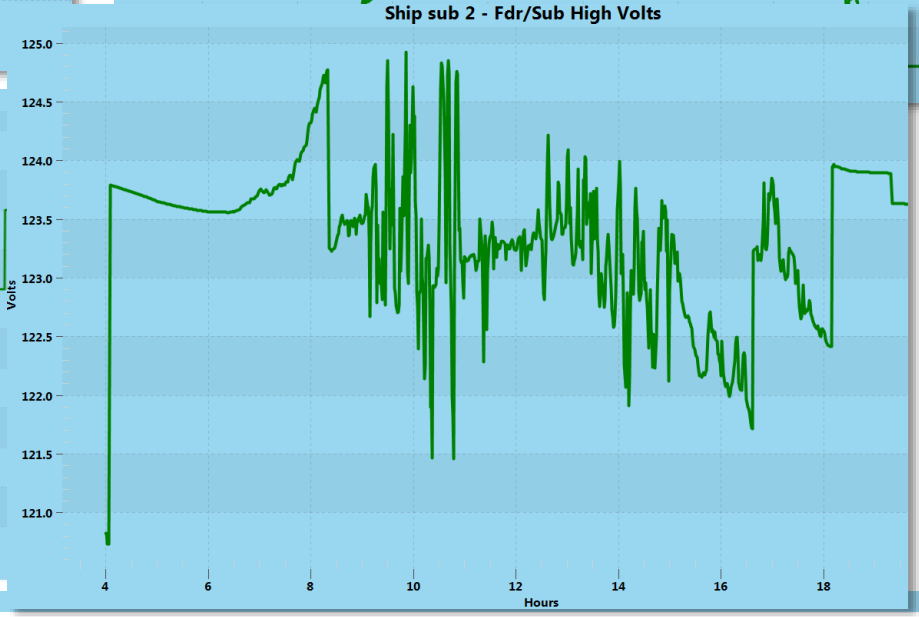


Time-series analysis

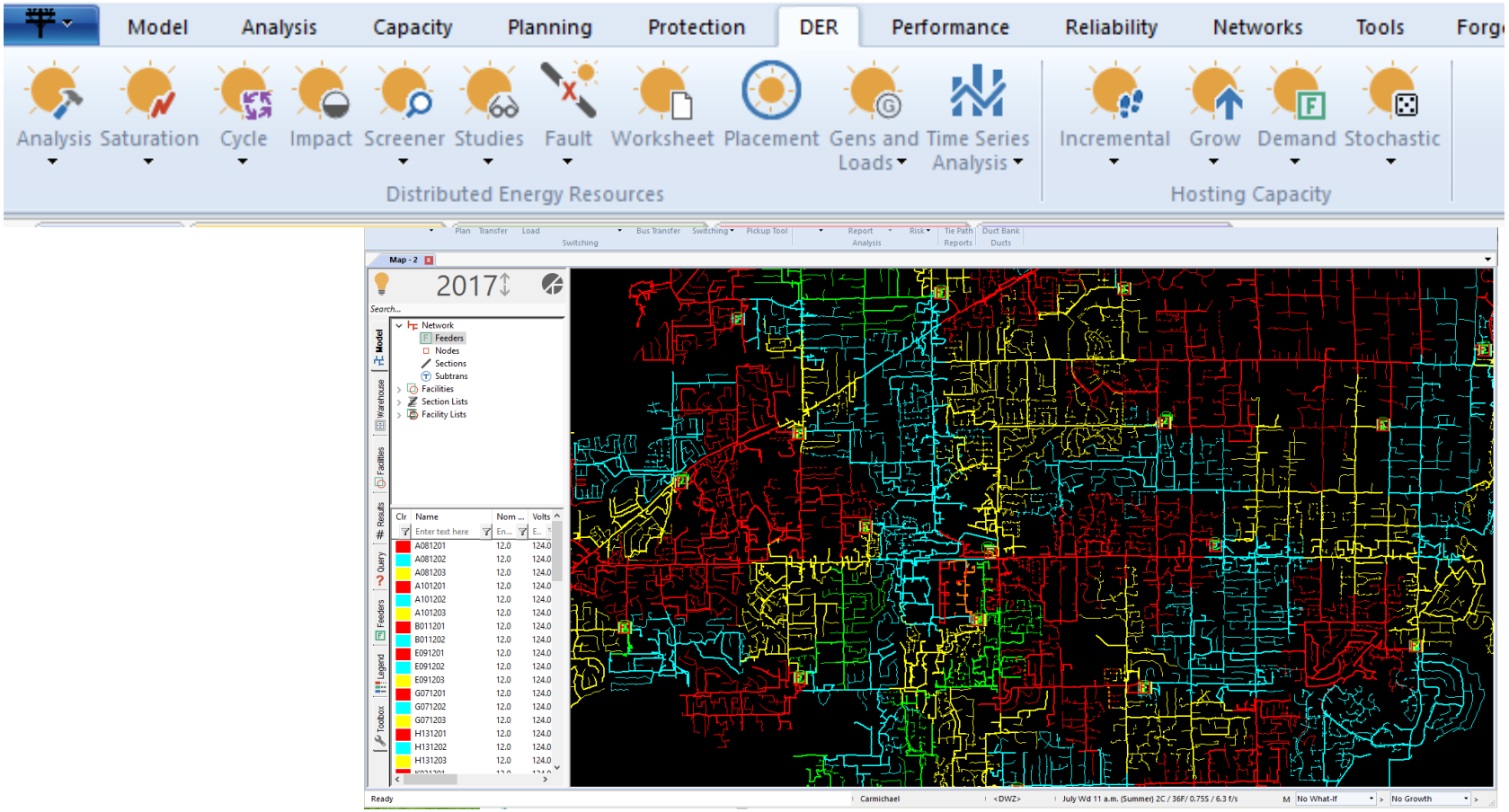








Applications for DER modelling and analysis



Private and confidential

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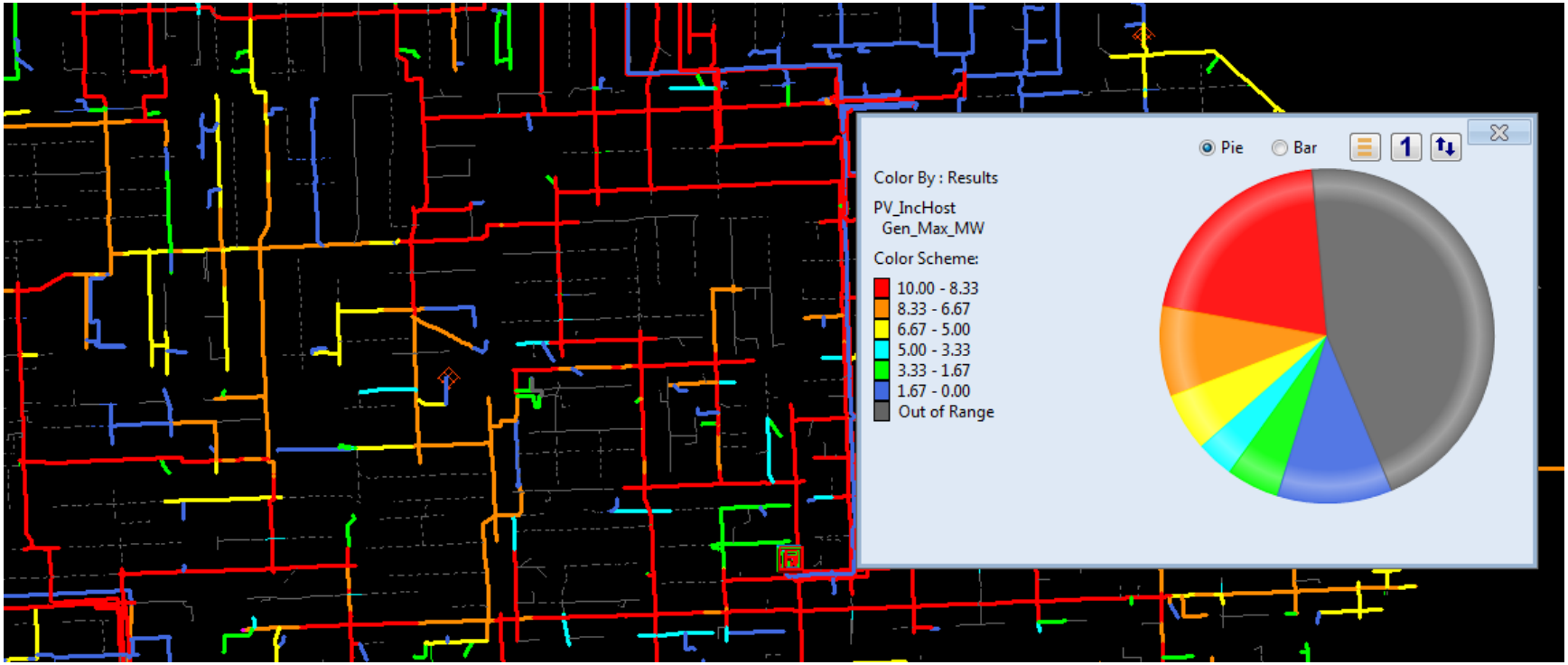
PV Hosting - Feeder hosting capacity

Feeder ID	Load MW	PV MW Base	Max	PctSat	Remaining
Feeder New - Big Spring	0.70	3.74	9.07	1344	5.33
Feeder New - Cove	4.40	-0.00	13.08	299	13.08
SubTran Newville 2	5.10	3.74	22.15	431	18.41
Feeder New - Liberty	1.70	0.75	8.50	500	7.76
Feeder New - Springfield	2.70	1.87	8.60	320	6.73
SubTran Newville 1	4.50	2.62	17.11	382	14.49
Feeder Ship - South Penn	0.80	3.26	12.95	1618	9.69
SubTran Ship sub 1	0.90	3.26	12.95	1488	9.69
Feeder Ship - West Martin	-0.50	5.05	10.96	2255	5.91
SubTran Ship sub 2	-0.40	5.05	10.96	2630	5.91

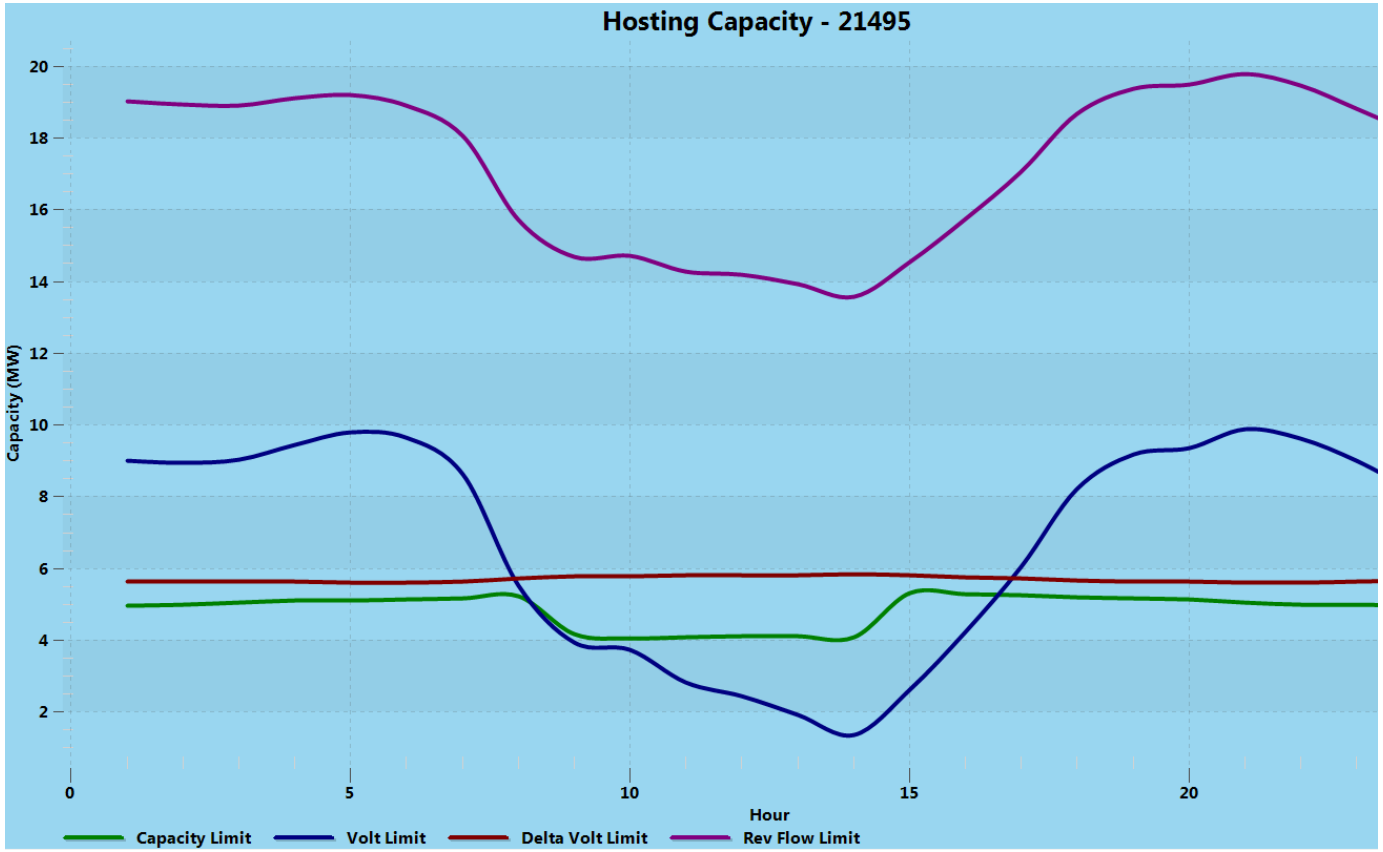
PV Hosting – Incremental capacity

- Maximum PV on each section
- Hours & months

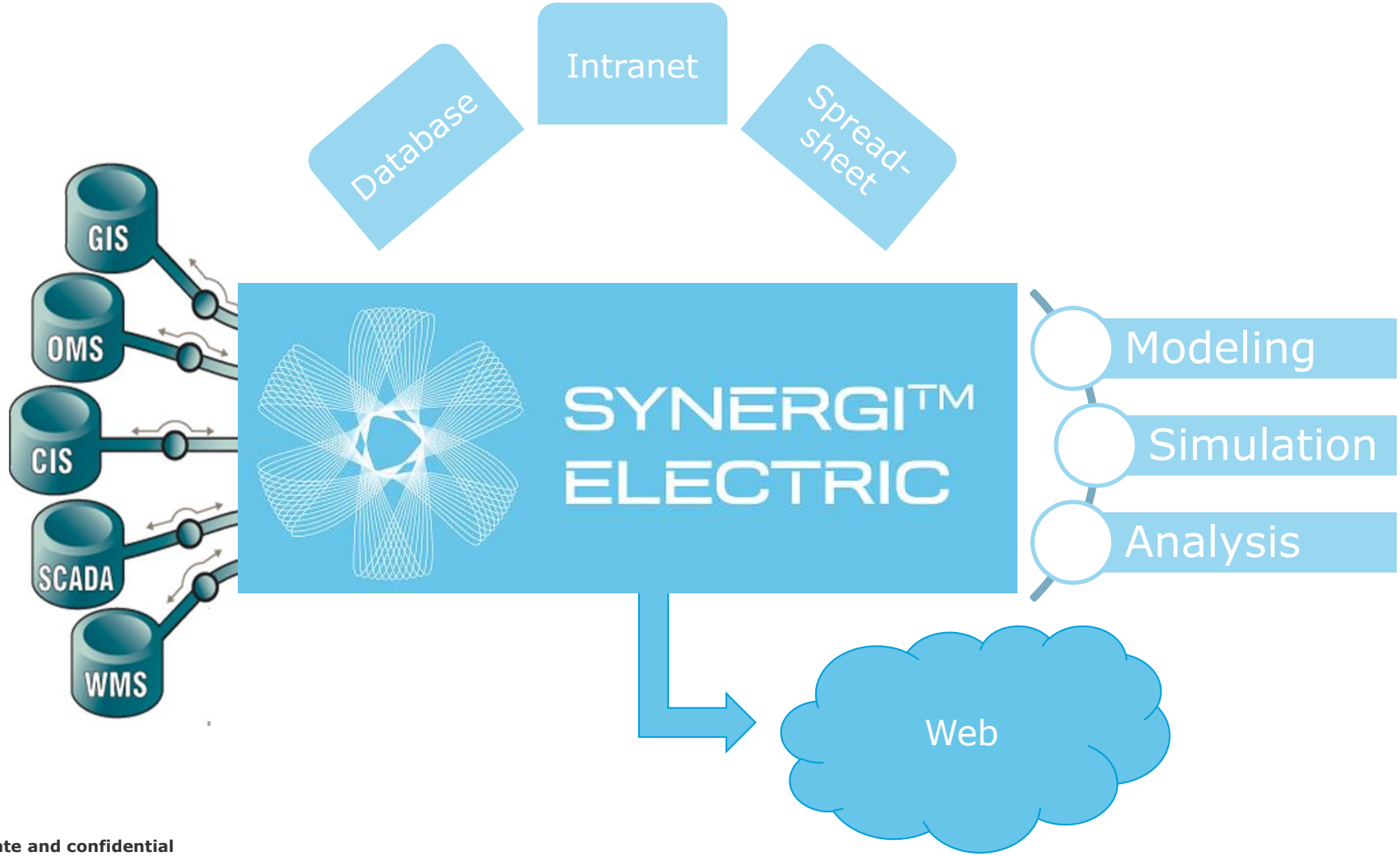


PV Hosting – Incremental capacity

July Weekday – section 1 miles out



Synergi Electric integration



Smart Inverters

Edit general inverter properties

Description:

Verified

Volt trip

High: 126.00

Low: 112.00

Frequency trip

High: 60.50

Low: 59.50

Other settings

Time delay (sec): 1.0

Watt gradient (%/sec): 10.0

Var gradient (%/sec): 20.0

Volt / var function

Max volts for max vars: 116.0

Deadband start volts: 118.0

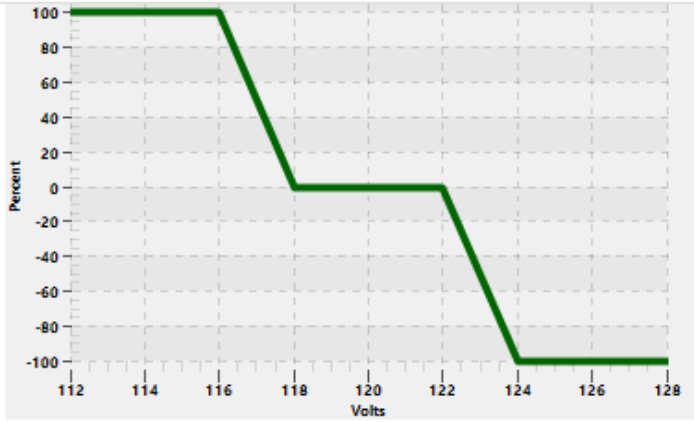
Deadband end volts: 122.0

Min volts for min vars: 124.0

Max leading pf (-%) -95.0

Min lagging pf (+%) 90.0

Reactive power priority



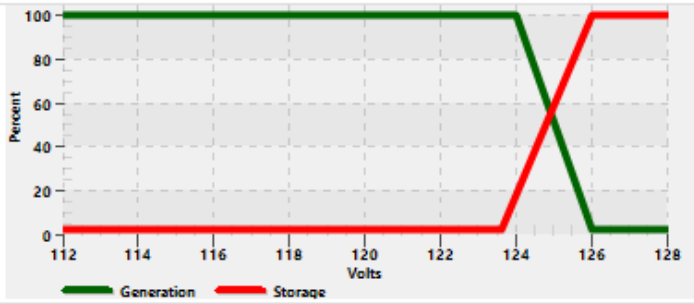
Volt / watt function

Gen mode - Start volts: 124.0

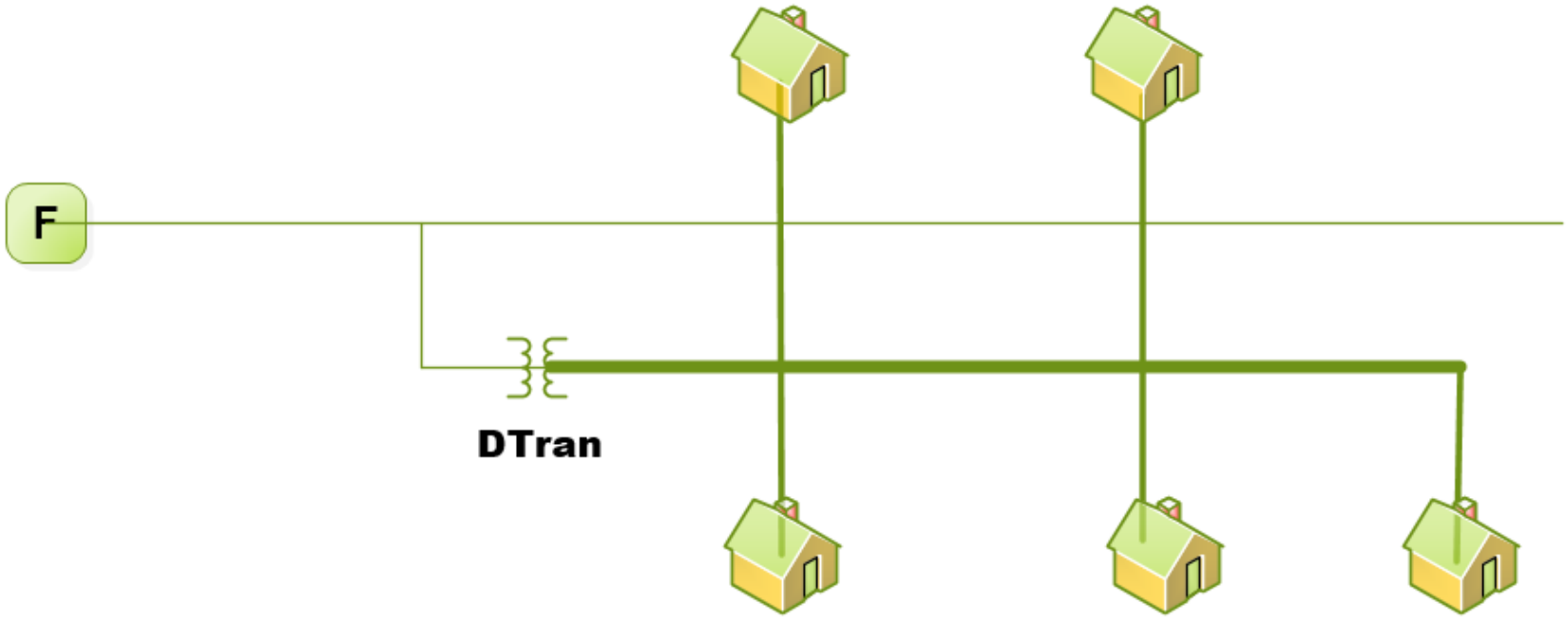
Gen mode - Max volts: 126.0

Batt mode - Start volts: 123.6

Batt mode - Max volts: 126.0

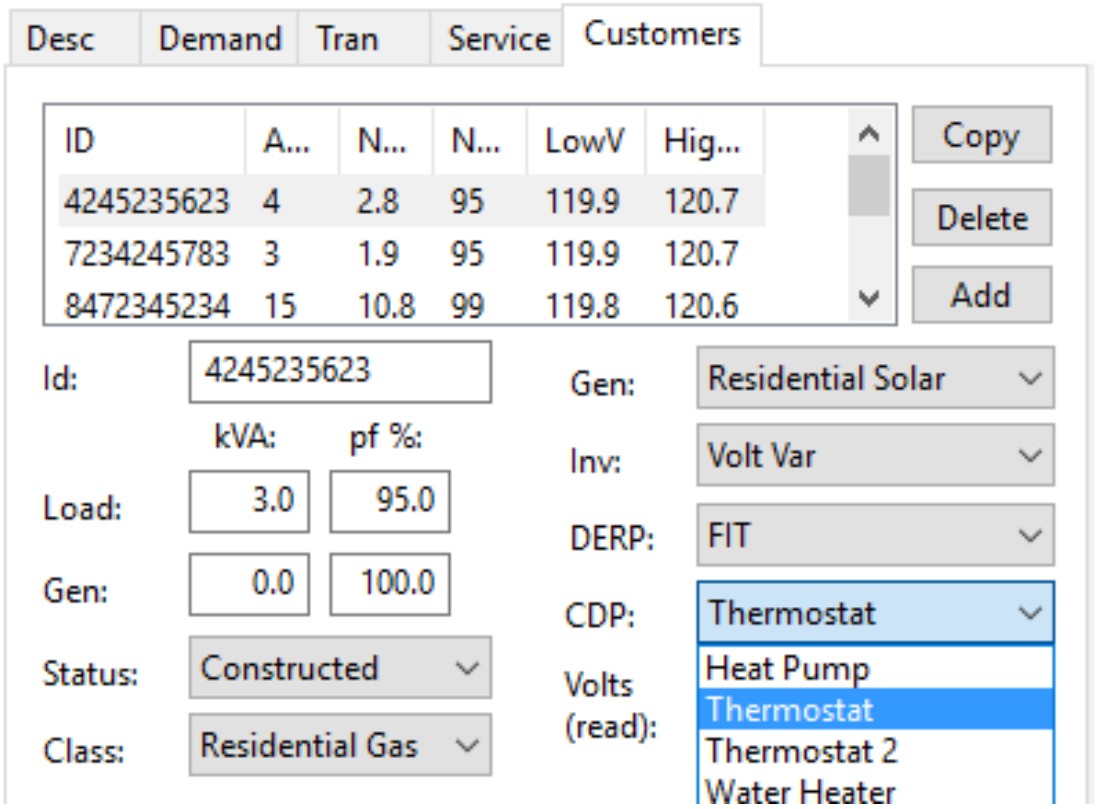


Secondary modeling



Secondary Main
Service Drop

Customer modelling



Batteries

Type: Large Battery | Unknown

Review status: Constructed | DERP: NEM

Specify rated output

	A	B	C	Total
Rated kW:	333.3	333.3	333.3	999.9
Pf %:	100.0	100.0	100.0	100.0

Inverter kVA (as % of kW): 120.0 %

Battery energy: 40000 kWHr

Generator output

Rated kW output

Specify output % 80

Weather based performance Derating factor: 1.00

Battery

Discharge

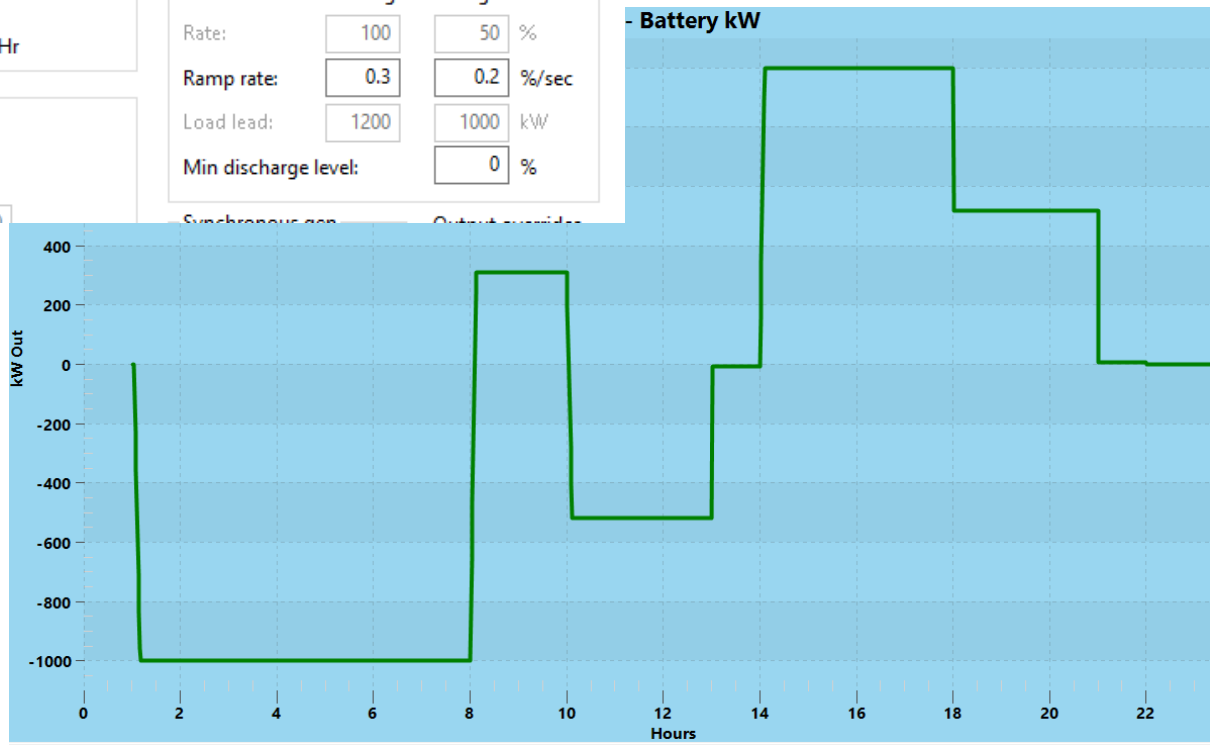
Charge

DER profile Battery Schedule

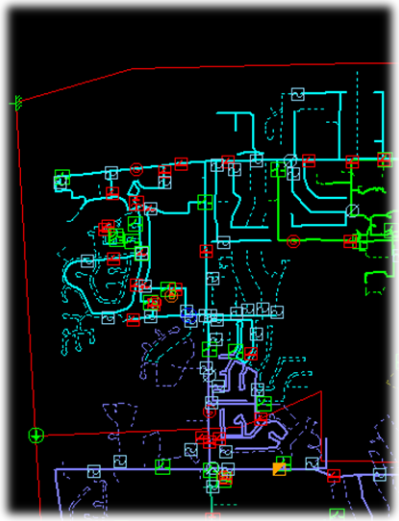
Load following

Ramp rate reduction

	Discharge	Charge	
Rate:	100	50	%
Ramp rate:	0.3	0.2	%/sec
Load lead:	1200	1000	kW
Min discharge level:		0	%



Integrated analysis



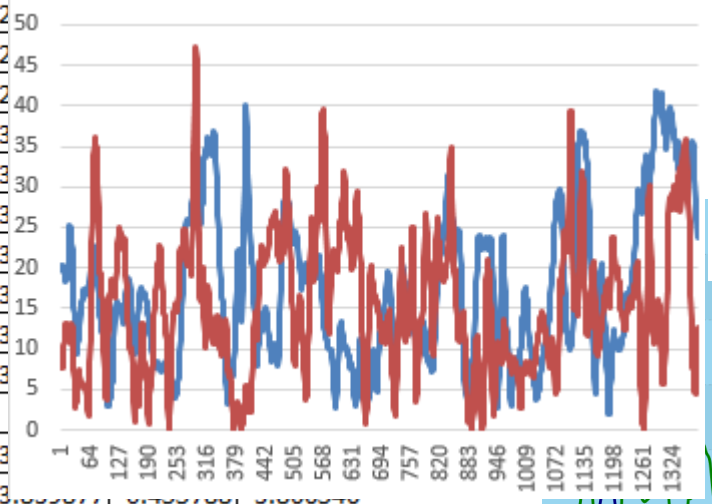
Transmission

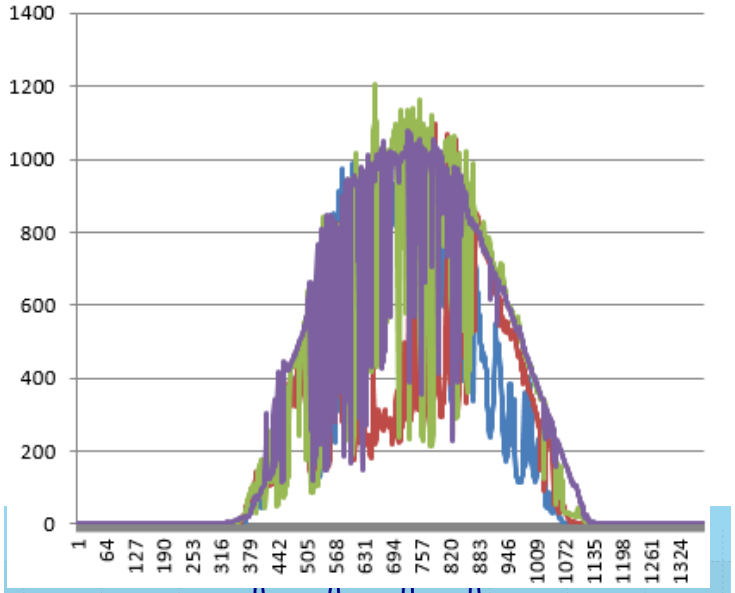
Distribution

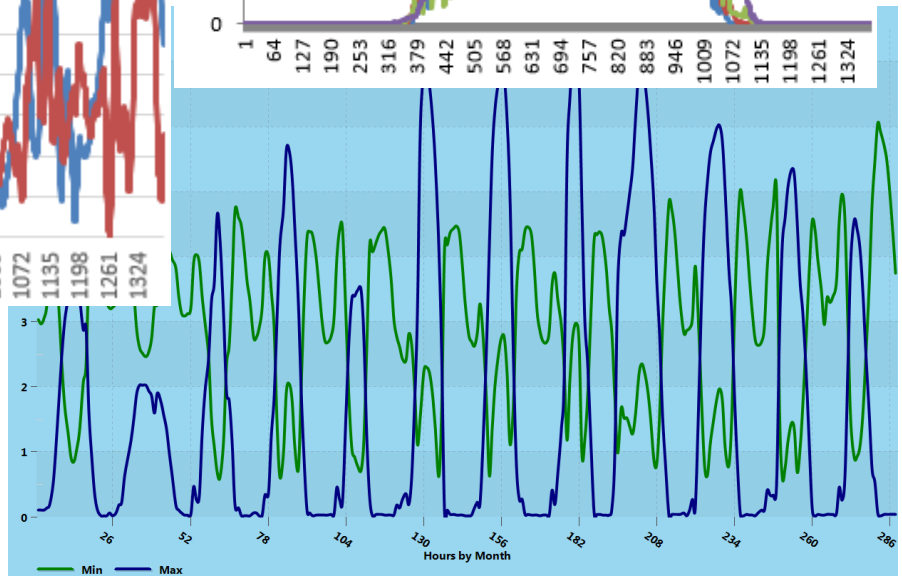
Secondary

Measurement driven analysis

14-Jun-16 04:45:00	2.655473	-0.22124	2.665121
14-Jun-16 05:00:00	2.665211	-0.24743	2.676446
14-Jun-16 05:15:00	2.638736	-0.23721	2.649973
14-Jun-16 05:30:00	2.559336	-0.22649	2.569528
14-Jun-16 05:45:00	2.565304	-0.18899	2.572471
14-Jun-16 06:00:00	2.594926	-0.1934	2.602407
14-Jun-16 06:15:00	2		
14-Jun-16 06:30:00	2		
14-Jun-16 06:45:00	2		
14-Jun-16 07:00:00	3		
14-Jun-16 07:15:00	3		
14-Jun-16 07:30:00	3		
14-Jun-16 07:45:00	3		
14-Jun-16 08:00:00	3		
14-Jun-16 08:15:00	3		
14-Jun-16 08:30:00	3		
14-Jun-16 08:45:00			
14-Jun-16 09:00:00	3		
14-Jun-16 09:15:00	3		
14-Jun-16 09:30:00	3.943664	0.50142	3.974853
14-Jun-16 09:45:00	3.937696	0.499018	3.969177
14-Jun-16 10:00:00	4.043734	0.556693	4.081128
14-Jun-16 10:15:00	4.112446	0.580287	4.152799







Down the road…

- Customer behaviour
- ADMS
- Protection
- Contingency
- Reliability
- Protection
- Safety

Thank you

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