

Maintenance Frequencies

WPD Assets

Typical Electricity Distribution Plant -Maintenance Frequency Interval (years)

Network Voltage	132kV	66/33kV	11kV
Distribution Plant			
Transformer	3	6 (3 yrs for highly loaded transformers)	18
Tap Changers	6/3/1 (dependant on manufacturer & type)	6/1 (dependant on manufacturer & type)	N/A
Circuit Breakers	6/3/1 (dependant on manufacturer & type)	12/6/3/1 25,000/10,000 operations (dependant on manufacturer, type and enviroment)	18/12/9/6/3 (dependant on manufacturer, type and enviroment)
Reclosers	N/A	8/5 (dependant on manufacturer & type)	8/5 (dependant on manufacturer & type)
Voltage Regulators	N/A	8	8
Disconnectors	6	12/6	6
Fault Throwers	6	12/6	N/A
Neutral Earth Resistor/Liquid Earth Resistor	N/A	12/3	N/A
Protection Maintenance	12/6/3 numerous protection schemes employed not all require an outage	12/6/3 numerous protection schemes employed not all require an outage	12/6/3 numerous protection schemes employed not all require an outage

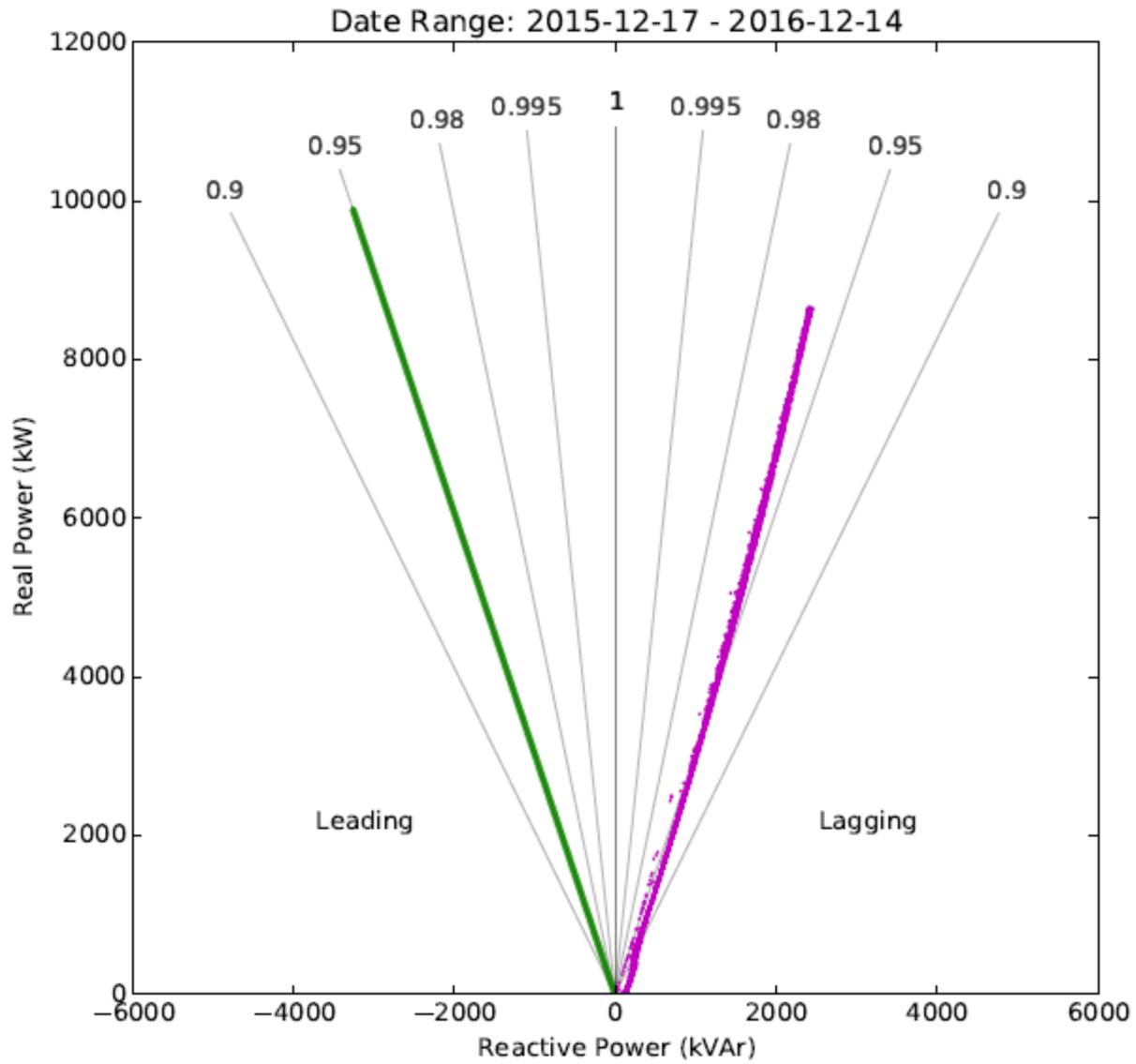
Safety Modifications via DIN's & NEDER's (Dangerous Incident Notification, National Equipment Defect Report)
 Infra Red Thermal Imaging - completed annually BSP & GSP substation apparatus immediate remedial work require
 Partial Discharge & Thermal imaging - completed annually 132kV, 66kV, 33kV & 11kV switchgear
 Post fault maintenance required on oil filled circuit breakers after clearing faulted networks

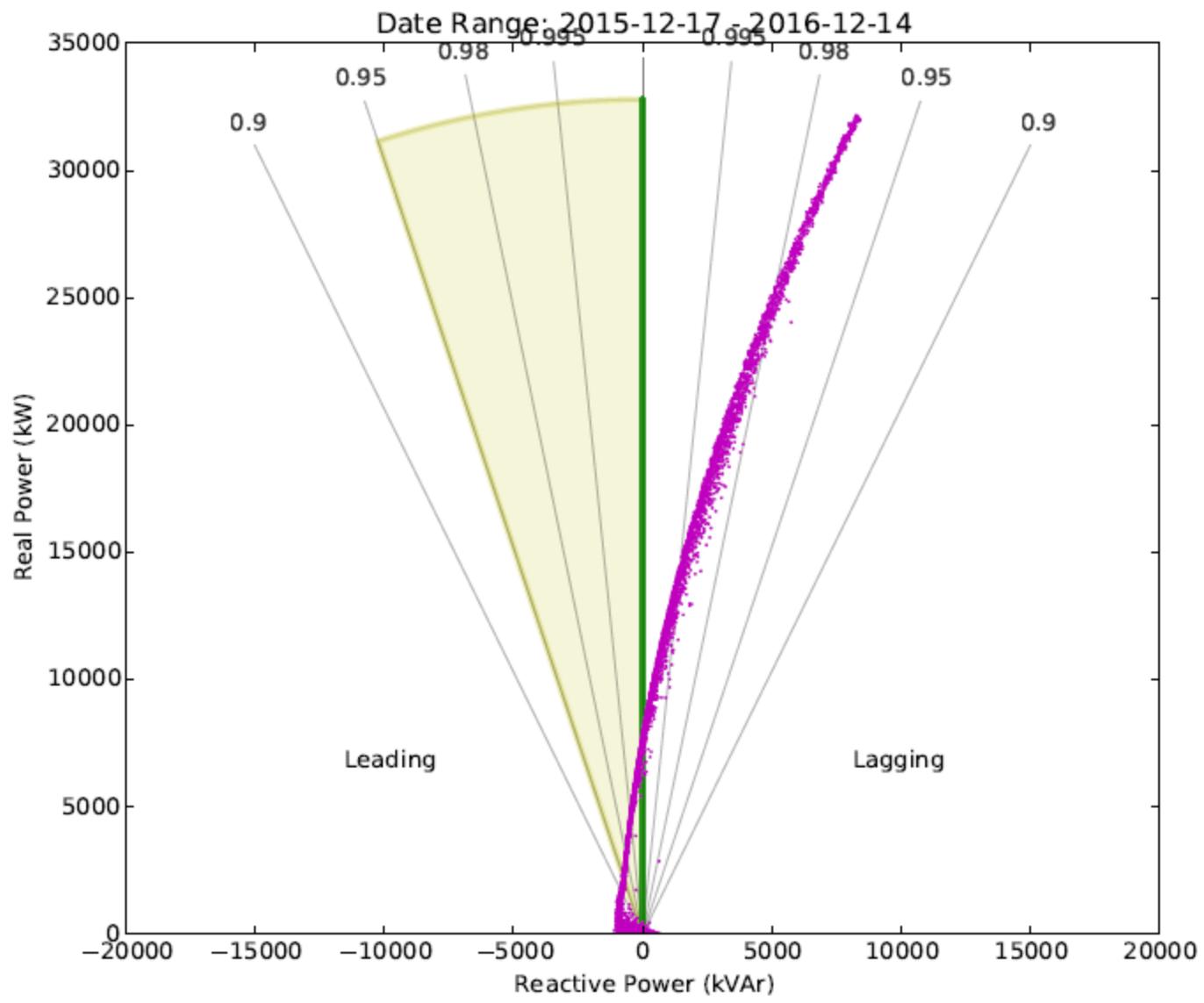
Power factors

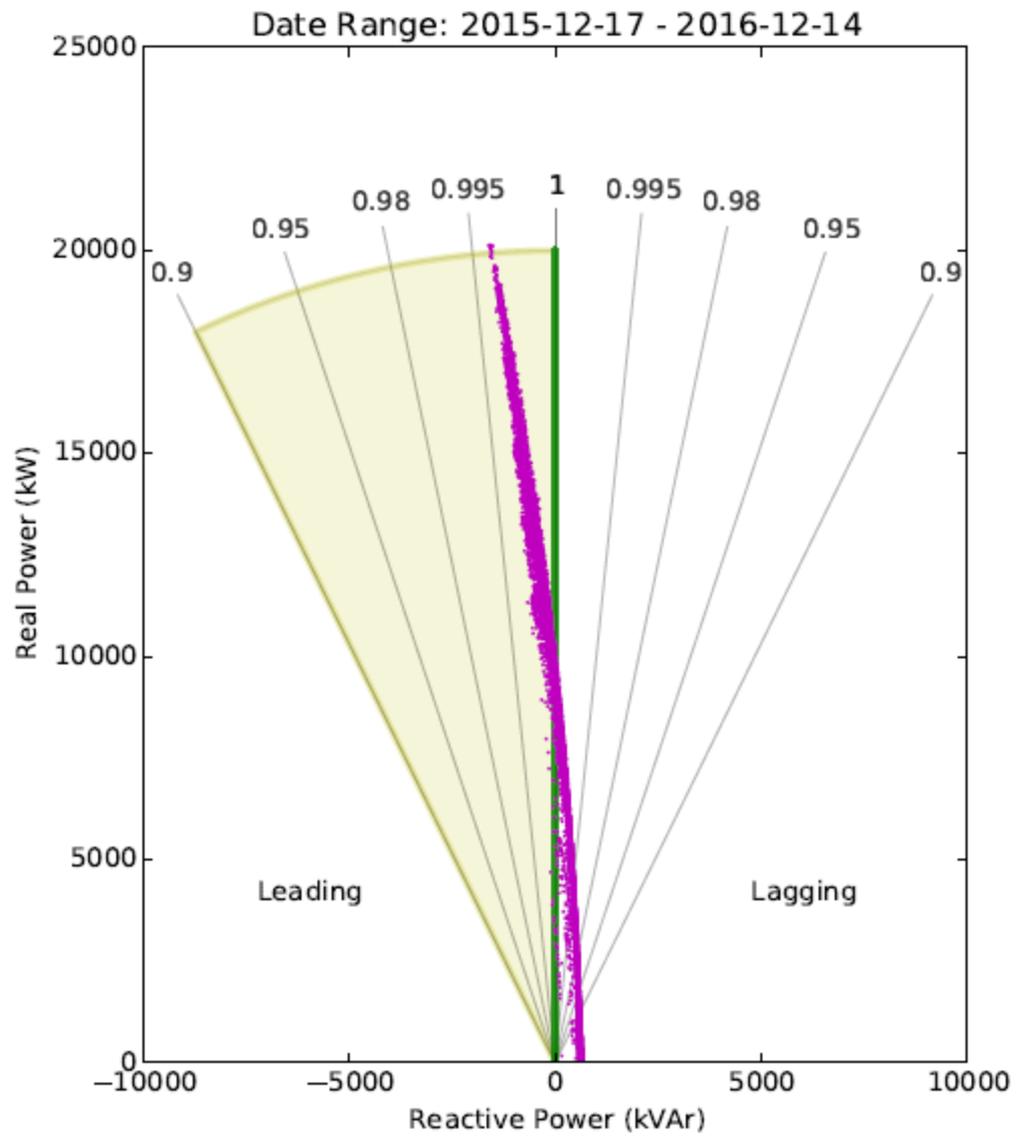
Connection Agreement compliance

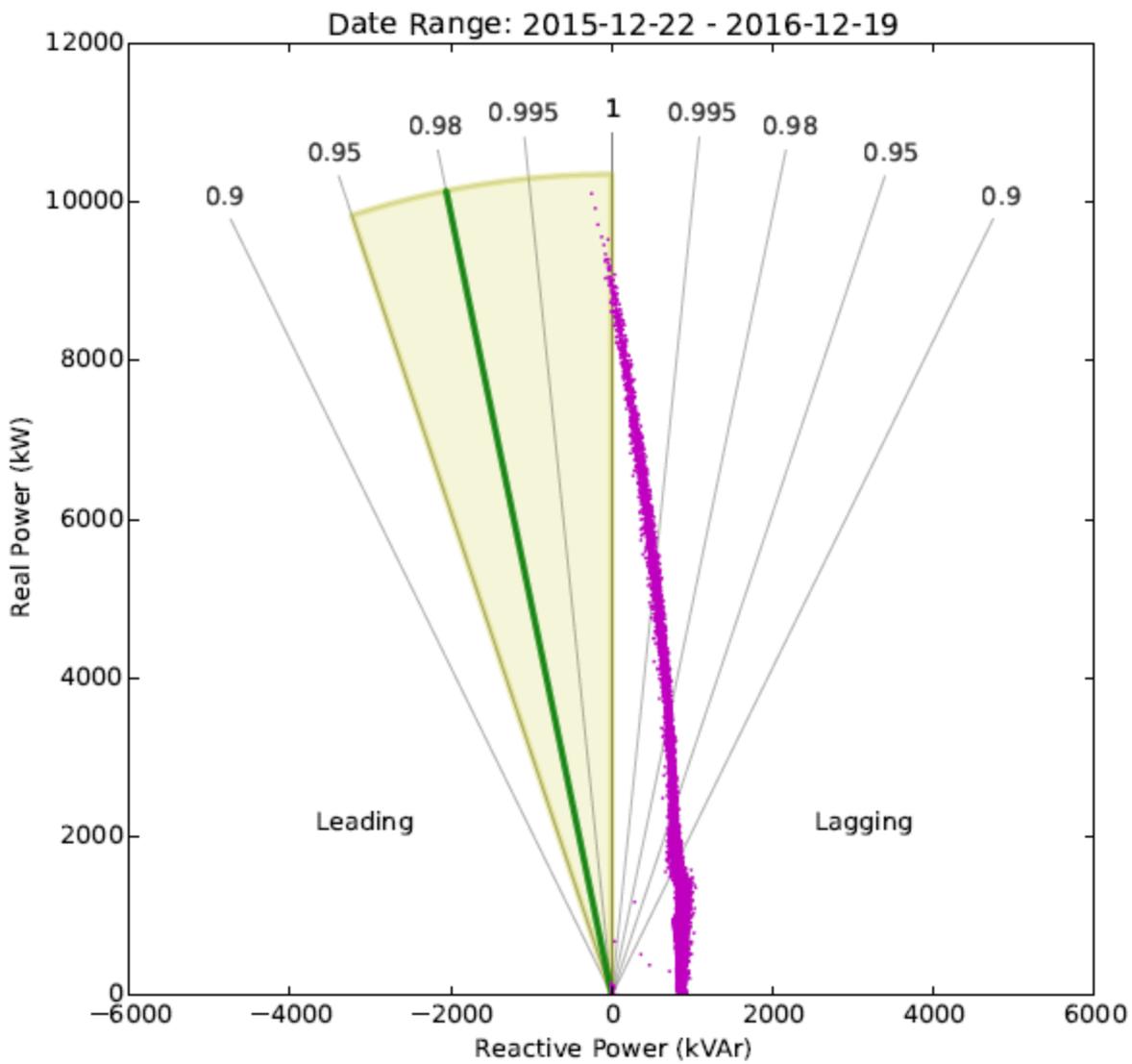
- WPD recently undertook a small trial to look at maintaining compliance with the Connection Agreement for EHV generation connections.
- A number of sites were chosen, specifically to look at compliance with the power factor requirements of the CA, that were known to be operating outside of limits.
- Letters were sent to customers requesting changes to be made.
- Most sites have been rectified, some have on-going discussions.

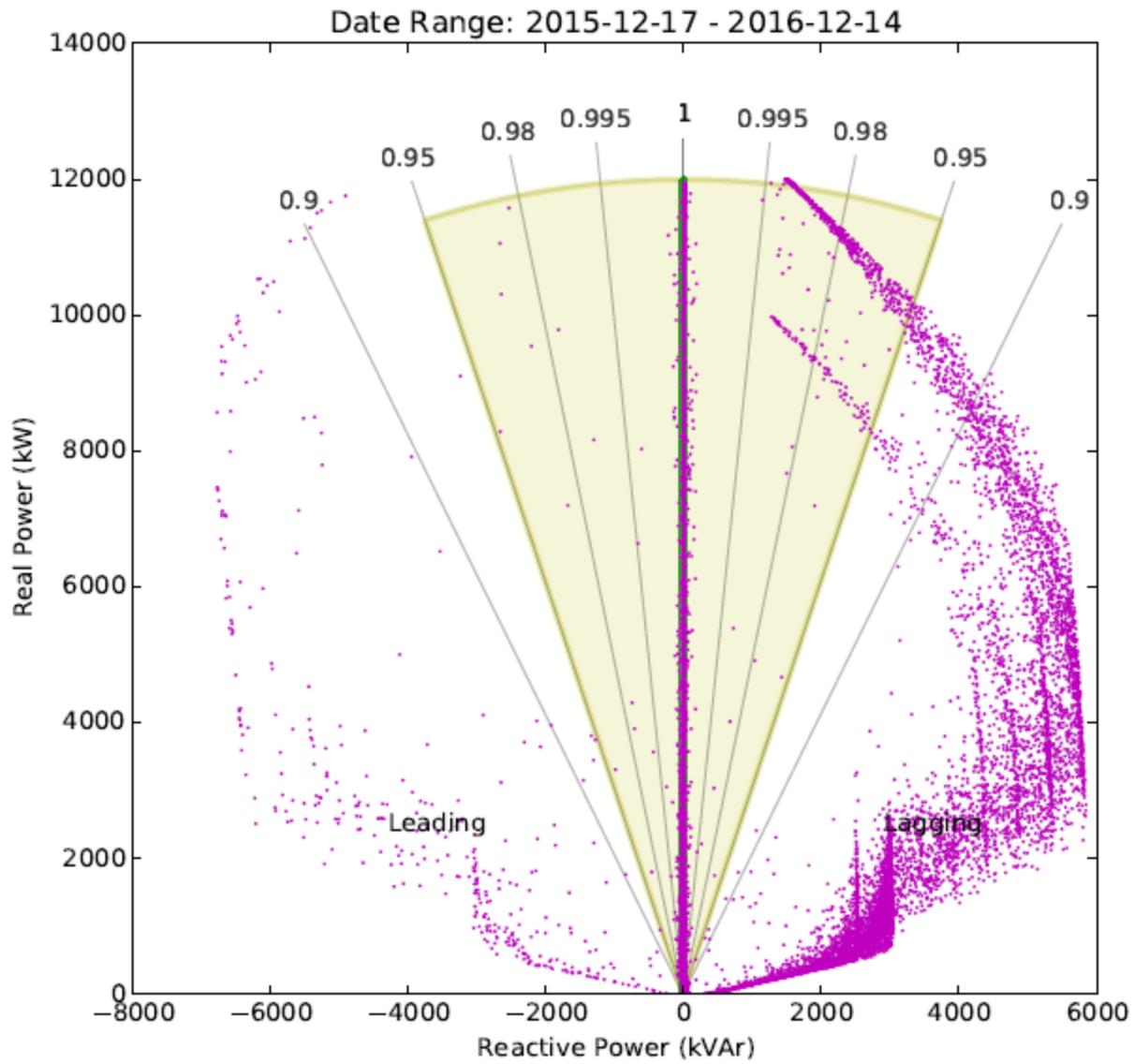
Examples of MW:MVAR export plots



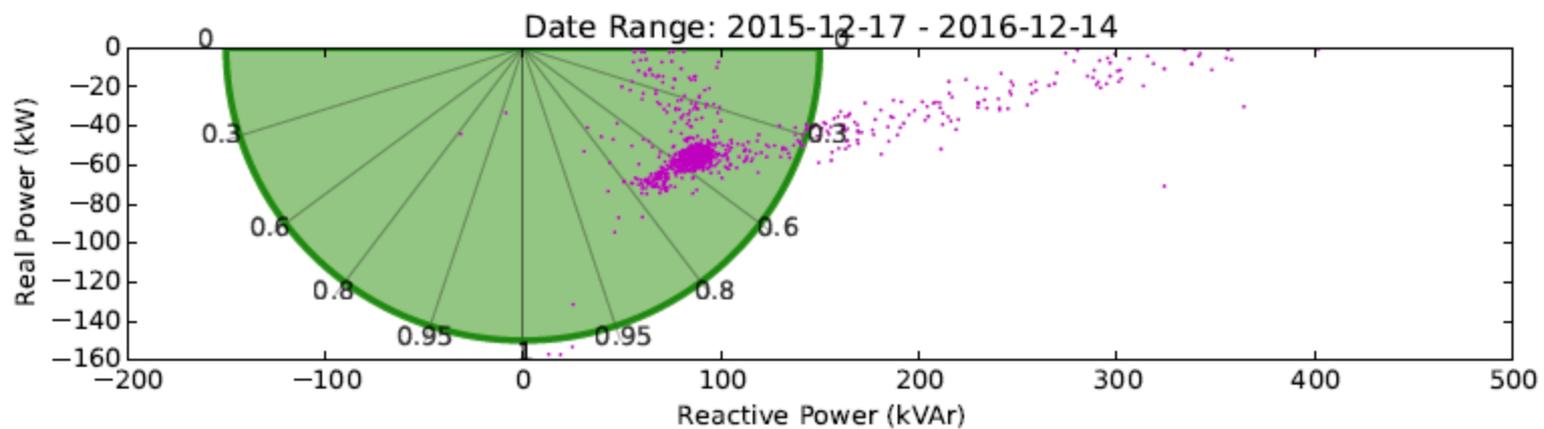


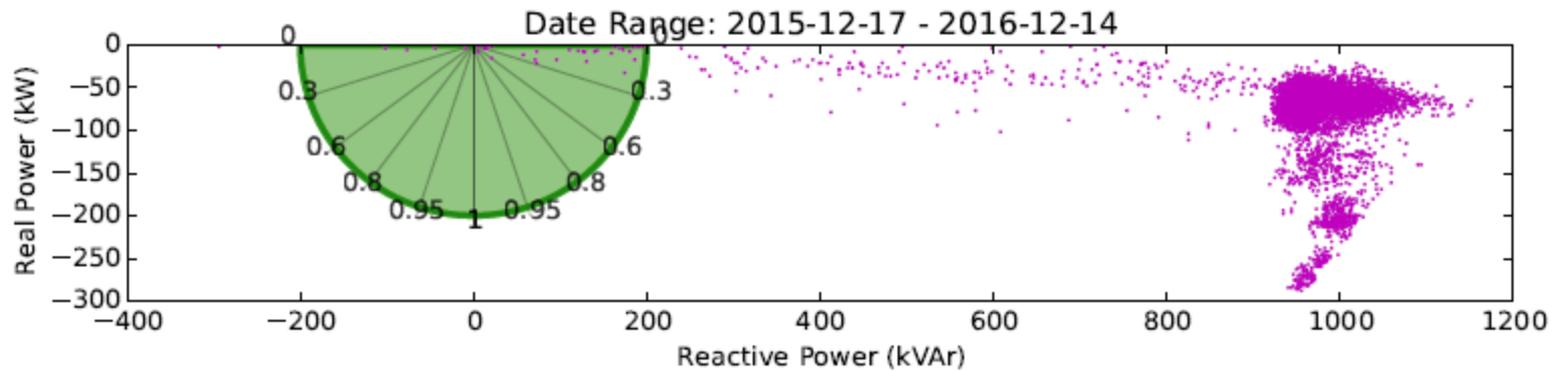






Examples of MW:MVAR import plots





Affects of incorrect power factor

- Potential exceedances of thermal or voltage conditions on a DNO network.
 - This mostly concerns the export power factor
- Potential exceedances of voltage on the transmission system (400kV)
 - This concerns the import power factor

Initial outcomes of the trial

- All customers were very helpful and wanted to engage with the process.
- Changing export power factor has generally been achieved.
 - Modifying inverter characteristics
 - Adding shunt compensation
- Import power factor is difficult to rectify and is likely to require some form of shunt compensation device.

How customers can help

- Undertake a review of your power factor
- Review your connection agreements to understand the requirements for power factor
- Try to address any exceedances
- Contact WPD if you need any help