

Balancing Services Standing Group

Reactive Power - CAP169 Review and Offshore arrangements

Agenda

- CAP169 Review
 - Action update
- Offshore – Re-run of last meetings slides (in the main)
 - Current Position
 - Comparison of onshore and offshore

CAP169 Review

Meeting 3 – Action Update

CAP169 Action update

- Action 1 – National Grid to review the operational impact of the current baseline
- Action 2 – Large Embedded connection process – who else is involved and are there any Implications associated with the user choice (except direct connection costs)?

Offshore Reactive

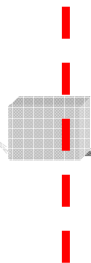
Meeting 3 – Comparison of the onshore, offshore reactive power costs?

Offshore Go-live

Pre Go Live

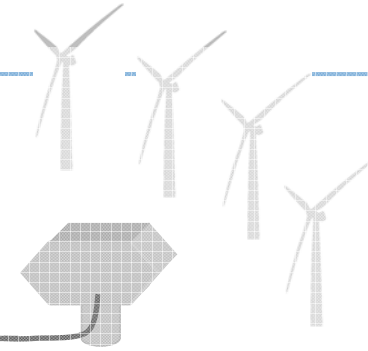


Onshore TO



Grid Entry Point

- Grid Code CC6.3.2
- 0.95/0.95 (lead/lag) capability
- Generator assets forming part of PPM



Offshore PPM

Post Go Live



Onshore TO



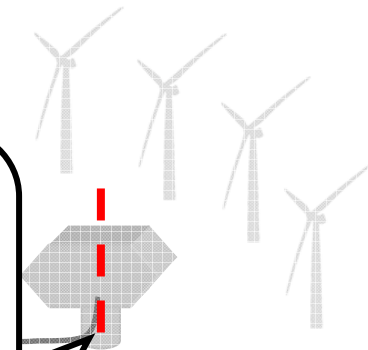
Interface Point

- **STC Section K**
- 0.95/0.95 (lead/lag) capability
- **TO assets** forming part of offshore network

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Grid Entry Point

- Grid Code CC6.3.2
- Ability to maintain unity power factor +/- 5% tolerance
- Generator assets forming part of PPM



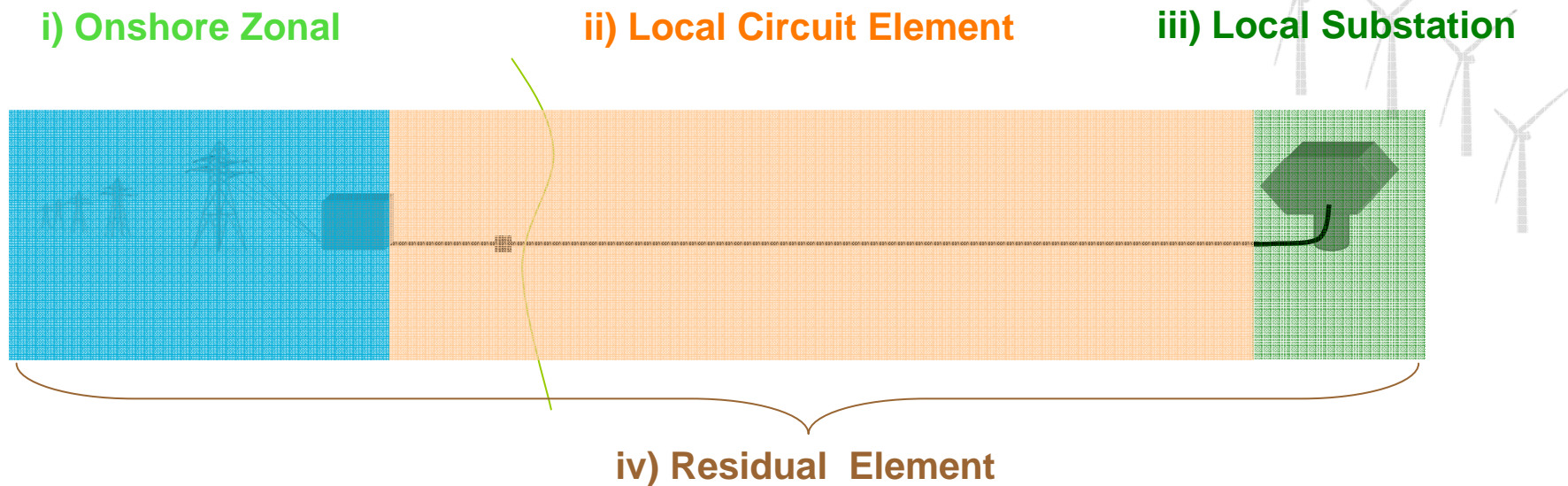
Offshore PPM

Grid Code

- 3 options are allowed
 - Full OFTO – the OFTO installs static compensation to meet the full reactive obligation
 - Part OFTO, Part generator – the OFTO installs static compensation to meet the difference between the generator capability and the Grid Code obligations and agreement is reached between all parties – [MSA for generator contribution](#)
 - Full generator – the generator has the capability to meet the full reactive obligation, and agreement is reached between all parties – [MSA for generator reactive output](#)

Charging

- 4 elements of offshore TNUoS tariff



- Capital and operational costs associated with reactive power provision at the onshore interface point recovered through the **local circuit element**

Offshore compared to Onshore

- The technical reactive requirements for offshore and onshore generators are no longer aligned. However, the principle of the generator bearing the costs of reactive provision is still prominent regardless of whether the generator is onshore or offshore. The only difference being the mechanisms that brings about the costs.
- This presentation assumes no difference between onshore and offshore generators where the offshore generator is meeting the full OFTO requirement

Comparison – Capital Costs

Costs;

- Installation of the reactive assets

Situation;

- Onshore and offshore bear the capital cost
 - Offshore either through owning the assets or through paying the OFTO



Comparison – Operating Costs

1. Maintenance Costs (fixed and variable)

- Fixed costs – asset maintenance (non usage)
 - Onshore and offshore bear the cost
 - Offshore either through owning the assets or through paying the OFTO
- Variable – costs incurred through operation
 - Difference between onshore and offshore exists here
 - Onshore receive default payment (CUSC specially states to cover this element)
 - Offshore will be charge by the OFTO
 - Illustrative example
 - 200MW offshore generator (+/- 66MVar requirement, +/- 80MVar SVC capacitive gain)
 - Maintenance cost estimated at £10K per year



Comparison – Operating Costs

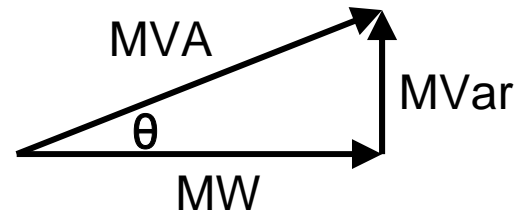
2. Power losses in reactive equipment
 - Primary Plant losses – power losses in transformers, reactors etc
 - These are treated differently but arguably hold both onshore and offshore neutral
 - Onshore covered through default payment
 - Offshore, primary plant losses will be classified as transmission losses
 - Auxiliary Power – power consumed by cooling and control systems
 - Onshore and offshore bear the cost of electricity usage



Comparison – Cable Costs

- Reactive range obligation onshore rather than offshore
- 0.95 lead to 0.95 lag reactive power provision

power factor = $\cos \theta$



- Every 1MW of cable capacity requires ~1.05MVA capacity
- Cost is very project specific; simplified illustration possible
- Assume average cost of £5k/MVAkm, ignore *lumpiness*, 50km cable length, 200MW project
- Example additional cost based on assumptions ~ £2.5m

Conclusion

- Is there a defect with the commercial arrangements?
 - Material cost difference?
 - Maintenance vs. potential cable saving?

Reference – CUSC default payment

- Appendix 7; Schedule 3 of CUSC outlines principles for basis of default payment arrangements based on the following variable costs:
 - Additional heat losses as a consequence of Reactive power provision
 - Maintenance costs as a direct result of Reactive power provision
- Payments shall not account for fixed costs