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Balancing Services Standing Group

Reactive Power - CAP169 Review and Offshore arrangements

Agenda

- CAP169 Review
  - Progress
  - Baseline & debate
- Offshore
  - Current Position
  - Comparison of onshore and offshore

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CAP169 Review

Meeting 2 – Large Embedded Connection Process and the new baseline

CAP169 Review Recap

- Consider the issues highlighted from CAP169 (Provision of Reactive Power from Power Park Modules, Large Power Stations and Embedded Power Stations), specifically the suitability of the default payment arrangements for embedded power stations.
- Ofgem approved WGAA3
  - Ofgem considered that there is enough evidence to determine on WGAA3
  - Concerns that there was insufficient evidence to justify the assessment of the other options, or the panel recommendation

Progress from last meeting

- Embedded connection process – User choice?
- What was done?
  - National Grid attended the DCUSA
  - Questionnaire sent to generators and distribution operators

Responses

- 3 response received to date;
  - Western Power Distribution / CE Electric UK / Scottish Power
- Western Power
  - 1 site – Barry, required to remain around unity pf
  - Transient operation is allowed within 0.95 / 0.95
- CE Electric UK
  - 2 sites – Alcan & Brigg
  - Current policy is to design to allow Grid Code compliance, however, less flexible connections could be offered where material saving can be made.
  - Legacy sites are also a factor
- SP
  - 2 sites – Tongland & Shoreham
  - Shoreham restricted to 0.9 – 0.97, within the connection agreement

Debate – What is the baseline?

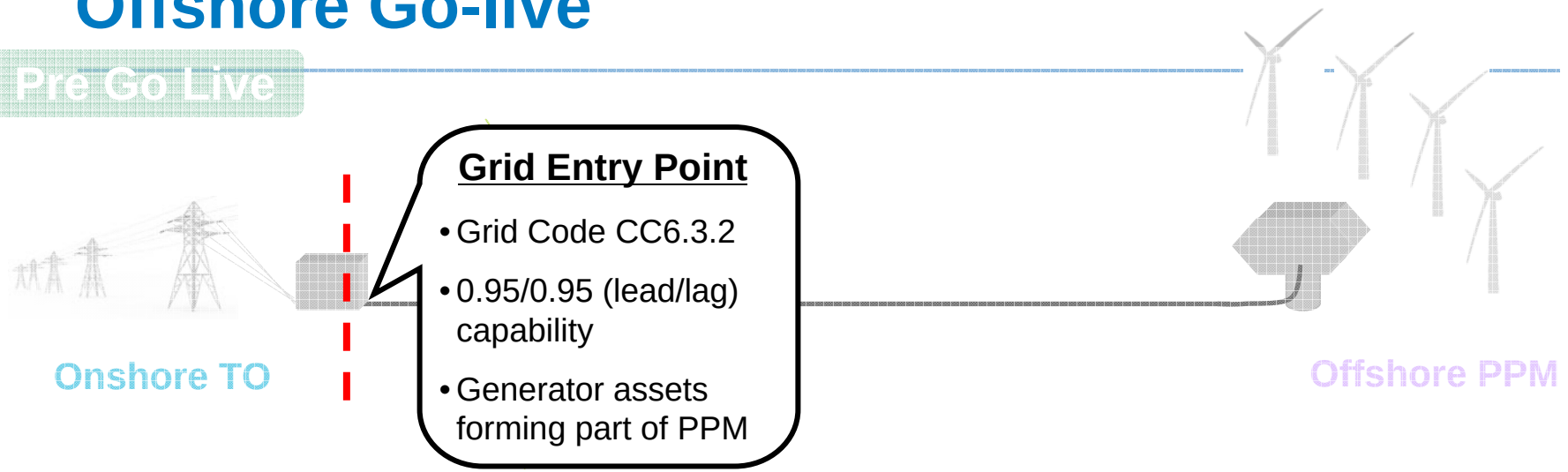
- Ofgem have requested a review of the payment for restricted large embedded plant but CAP169 also prevents National Grid instructing this plant. Different baseline?
  - Should this class of plant be paid for no service?
  - What about dynamic benefit?
  - What about the Grid Code obligations?
  - What about User choice?
  - What about legacy embedded plant?

Offshore Reactive

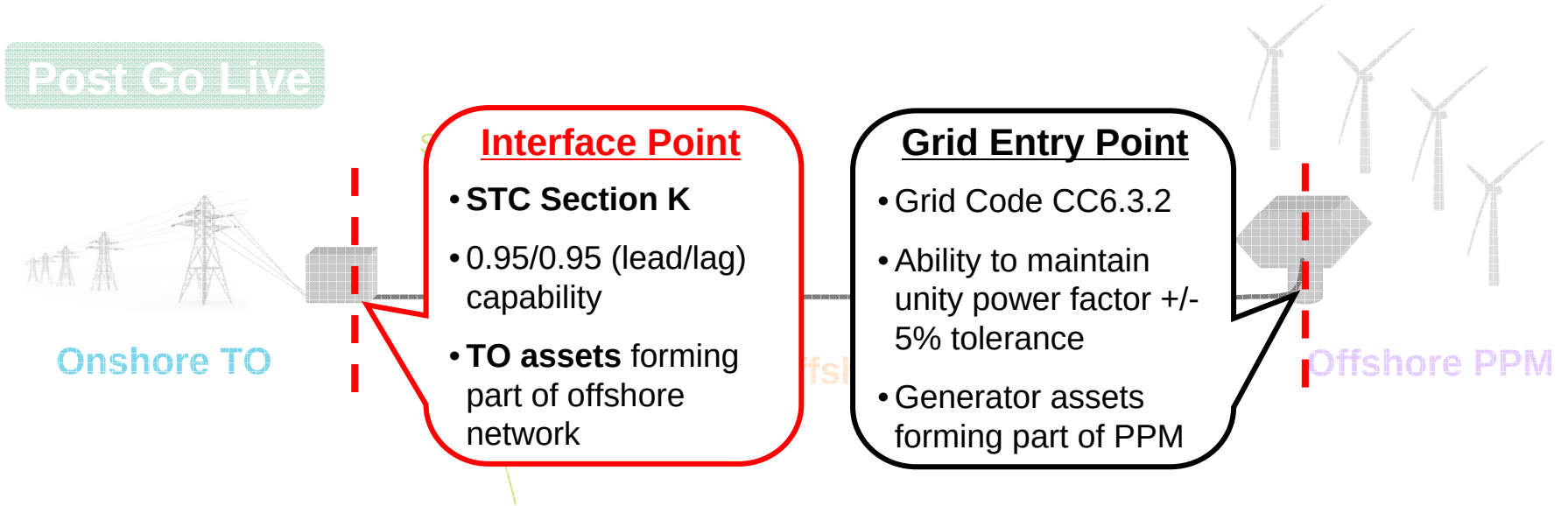
Meeting 2 – What is the defect?

Offshore Go-live

Pre Go Live



Post Go Live

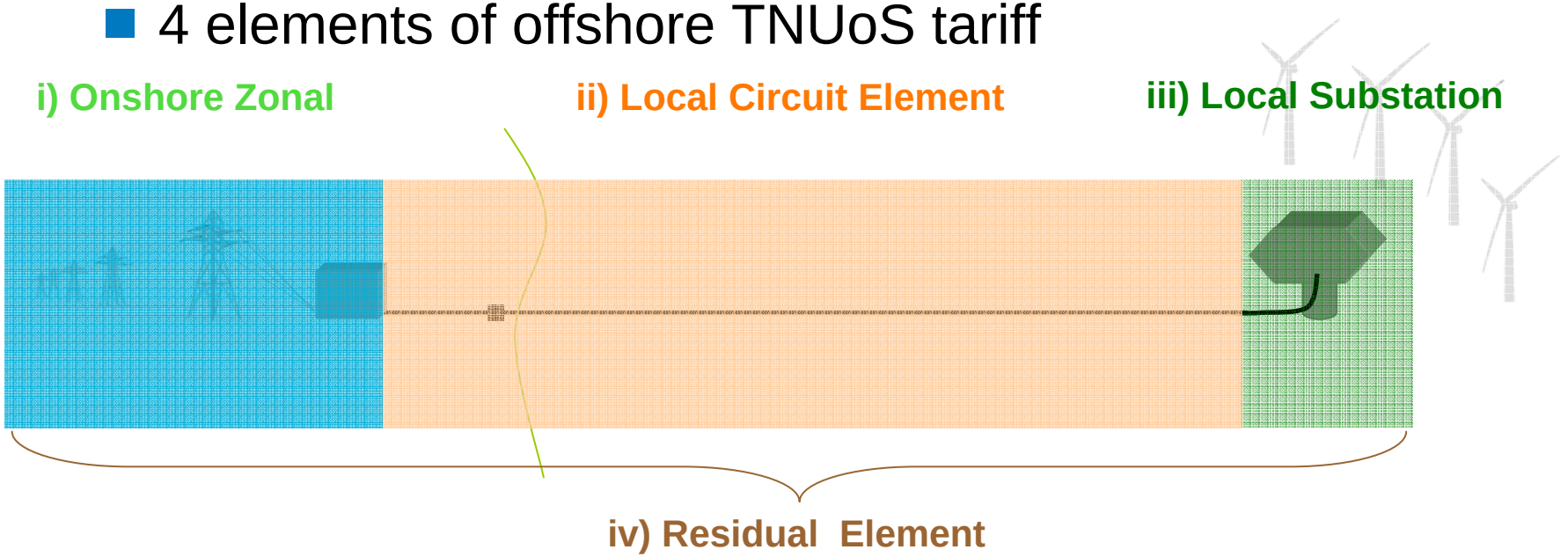


Grid Code

- 3 options are allowed
  - Full OFTO – the OFTO installs static compensation to meet the full reactive obligation – No Mandatory Service Agreement
  - 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 – Potentially, MSA for generator component
  - Full generator – the generator has the capability to meet the full reactive obligation, and agreement is reach between all parties – Potentially, MSA for generator

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.

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

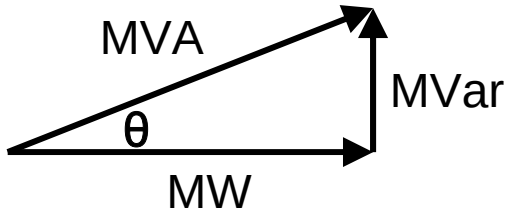
- Primary Plant losses – power losses in transformers, reactors etc
  - These are treated differently but arguably hold both onshore and offshore neutral
    - Onshore covered through default payment
    - Offshore, primary plant losses will be classified as transmission losses

- 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 θ



- 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?
- Material issue?
- 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