Demand Connection Code Public workshop
Call for Stakeholder Input

ReactiveCapabilities

26th April 2012 – London ENA

entsoe

Reliable Sustainable Connected

Reactive Capabilities – Introduction

Fundamental

- Voltage in electricity grids can only be influenced by the use of devices that are able of either absorbing or feeding reactive power.
- Reactive power cannot be transmitted over long distances.
- Local reactive power capabilities are crucial for voltage stability which is a key issue for system security.

Today

- DSO networks and consumers are mostly passive concerning reactive power.
- Reactive power comes from large transmission connected generators.
- TSO adapts the reactive power produced (or absorbed) by the large generators to the reactive need of the consumers.

Future

- In future only few (or even no) big generators will be in service to the transmission grid.
- Generation will either be far away from load centers or will be dispersed in distribution networks.
- In both cases, there will be significantly less reactive reserves directly available for the TSO.
- As a consequence, other reactive power sources must be installed.

Reactive Capabilities – Options

Options for reactive power sources in future:

- Compensation devices installed by the TSO.
- Compensation devices installed by the DSO.
- Compensation devices installed by the demand facility owner.
- Use of the reactive capabilities of dispersed generation.

ENTSOE opinion:

- All options will be needed in future.
- Therefore: Requirements for the interfaces
- TSO – DSO and
- transmission connected demand facilities – TSO

  must be defined in the code.

Reactive Capabilities – Costs for compensation devices (1/3)

- According to three CBAs from Italy (not published to date), Ireland and GB, installation of reactive compensation on lower voltage levels is more economical than on the TSO level.
- Main reason:
  Breaker costs on the different voltage levels:

Circuit breaker and associated equipment cost in k€	Voltage
1050	220kV
730	110kV
54	38kV

Cost of connection according the Irish CBA

Circuit breaker and associated equipment cost in k€		Voltage
Air Insulated System (AIS)	Gas Insulated System (GIS)	
980	2250	380kV
650	1300	220kV
450	950	150 - 132kV

Cost of connection according the Italian CBA

Reactive Capabilities – General Questions

- Do you agree that increasing displacement of large synchronous generation is a significant new challenge?
- Do you agree that a review of existing requirements is needed, to take into account the new challenges mentioned above?
- Do you agree with the conclusion from the initial CBAs (Italy, Ireland and GB) that the societal benefits are greater for reactive management to occur closer to the reactive demand? In either case please provide the rational with supporting evidence where available on the aspects of the conclusion of the CBA that you agree or do not agree with.

Reactive Capabilities – Questions specifically relevant for DSO connections

- Do you agree that the development of cables and embedded generation introduce further challenges regarding reactive power control, including risk of high voltage during minimum demand?
- Is it reasonable to ask DSOs to avoid adding to the problem of high voltage on the transmission system during minimum demand by avoiding injecting reactive power at these times?

Reactive Capabilities – Which options do you prefer?

- Do nothing. Leave the TSO to sort out reactive balancing. The CBA of the transmission located reactive capability option in the CBA is relevant here.
- General limit on power factor at transmission to distribution interface, e.g. better than 0.90 or 0.95, with the value set in each country by each TSO subject to public consultation and NRA decision or an equivalent process as provided by the applicable legal framework, such as the definition of a limit in MVAr.
- As in the previous point except the power factor limit set on a local (or zone basis) by the TSO following CBA & consultation / NRA decision.
- Total separation between distribution and transmission reactive flows (i.e. 0 MVAr at the interface).
- The DSO at network exit points treated in the same way as generation is treated in network entry points with the DSO expected to regulate voltage continuously. Should this be limited to slow time scales of minutes (e.g. achieved by means including transformer tapping) or extended to fast acting reactive power support for disturbed conditions?
- Establishment of full reactive markets (e.g. in zones) encompassing DSO contributions as exist in some countries with respect to generation today?