ifiec europe
international federation of industrial energy consumers

Network Code on Grid Connection of Demand Sites, Distribution networks, CDS

ENTSO-e Workshop - 18 April 2012

IFIEC advices

Industries own & operate large Demand Sites

own and operate Industrial Site Power Networks (CDS or not)

pay, in fine, all the costs, via energy price, transmission tariff, surcharges

1- Specification at Network Interface

Industrial Site = Network:

- The “Demand” site connected to TSO grid is not a “load”, an “equipment” !
- Industrial site contains its own, private, power network with several voltage levels, on which loads and, perhaps, generators are connected.

Legal situation:

- If one company on site: private installations: a “demand site”
- If subsidiaries, subcontractors,… => a (closed) distribution system

=> Same specifications for “Demand Site” and Industrial (Closed) Distribution Networks, at the Interface Point between “public grid” and private site !

Specifications for Connection on Industrial Distribution Network (IDN)?:

- Important: comportment of the whole site at interface with “Public Grid”

  If the Code specifies equipments for connection on IDN, risk of
  - incompatibilities with specifications at interface with public grid
  - wrong technical solutions (f.i.: multiple filters at same location)

=> Code should impose the “Relevant Distribution System Operator” to define specifications for connection on its network, in order to respect its own specifications at the interface between its network and “Public Grid”.

=> To avoid sentence so as “unless national law gives TSO authority to decide …” (with reference to Generator Connection Code)

2- Specification Level

General Comment:

To avoid that specifications exceed Connection Code mission (to specify performances) and impose that, f.i., TSO prohibits disconnection, imposes P,Q set-points, …) => to be in the future Access Code.

Industrial Networks ≠ "Public Distribution" Network:

- Specific comportments, V range & Q needs :
  - direct starting asynchronous motors > 10MW …
  - asynchronous motors = 90 % of load → motor reacceleration after V drop!

=> Network design, impedances, protection, V control must be specific.

=> Specifications must consider these comportments.

Specification levels:

- must be compatible with equipment standards: ranges of V and Frequency (otherwise, installation will never receive its FON)
- must be really needed for the Electrical System (f.i.: not impose to run at too low frequency, below the threshold for emergency plan load-shedding)
- should be based on a minimum level of reliability of supply, quality of voltage and short-circuit power that TSO must warrant
- should be based on sufficient levels of 1ary, 2ary and 3ary reserves
- should not consider local grid weaknesses, to be solved by TSO

3- Right to Island an Industrial Network

The Network Code must authorize

- **Industrial site owner to Island (a portion of) its Industrial Network with Generator and Critical loads when he estimates that the Public Grid voltage weave becomes dangerous for its site supply**

but, may impose that this islanding does not increase the off-take from the "Public Grid" at interface point

This islanding is really crucial to be able to benefit from local generation as back-up source for critical processes (Seveso sites, high value products, production installation damages)

N.B.: this islanding order must occur before a too low frequency, because the frequency may continue to decrease a few after islanding, during additional load-shedding to equilibrate the load, and, in fine must remain sufficient to permit generation unit to restore the supply

4- Specifying Interactive Issues TSO-IDNO

Interactive issues "Public Grid" – "Industrial Distribution Network":

Lines connecting IDN to grid, operation modes (if possible couplings), protection, automatism, … depends on both Public Grid and Industrial network

Code should impose that RNO (Grid Operator) & Demand / IDN Operator

- **define objectives, then scheme, then parameters**
- **together, trying to find an agreement; if impossible, the RNO position taking precedence concerning its grid protection and impacts on grid voltage**

Code should impose that RNO & Generator Owner exchange information

Each party should provide the other one with

- **its network topologies and both positive and zero sequence impedances of its network equipments in the vicinity of the interconnection**
- **short-circuit power, at interface point, which means the maximum one, the minimum one and the minimum zero sequence one, the minimum one (or max grid impedance) at harmonic frequencies.**

Otherwise, the Demand Site owner is unable to calculate its network.

Code should impose TSO to warrant min Scc, max harmonic V,… compatible with its specifications for Industrial Site.

- **Too small Scc increases difficulties to protect network, to limit harmonics, …**

5- Ancillary Services provided by Demand

Code must clearly distinguish the several types of load variations

- mandatory load-shedding, imposed to all consumers by emergency plan
- contracted P and/or Q off-take variations on TSO request, to provide TSO with a voluntary ancillary service
- but, “Demand Response” = voluntary consumption modulation justified by market prices = market issue, out of code scope

IFIEC request the Code imposes

- TSOs to contract voluntary load-shedding before emergency one
- TSOs to include large industrial consumers in ancillary services “market”.

What are the Ancillary Services a Demand Site may provide ?

- types and volumes of ancillary services that an industrial site may contract depend on the load specificities of its production unit(s) => each site owner has to define the ancillary service types and volumes he whish to offer
- fast (some sec) partial load-shedding for quick tertiary reserve
- fast partial load-shedding to palliate “N-1” congestions (to accept new loads on “N” base, during the delay to de-bottleneck the grid)
- reactive power variations (by blocs or continuous) for V control (by filters)
- fast active power off-take reduction for primary reserve (special processes)

5- Ancillary Services provided by Demand

How to Specify these Ancillary Services ?

For each Ancillary Service,

- TSO and delegates of industrial consumers should elaborate together the specification (at European or national level), analyzing the best solutions in order to warrant both the appropriateness to local grid needs and the ability of national industries to provide the service

  (f.i.: to lower consumption under a threshold is better as by a warranted power, because industry owner will offer less warranted power will, based on maintenance, incidents, …to avoid penalties)

- Clear rules and limits must be defined for each ancillary service, to estimate industrial feasibility and cost; examples:
  - load-sheddings should be limited in number and duration with a minimum delay between two ones
  - off-take power reductions should be limited in total energy
  - number of hours of unavailability
  - …

6- Specifications for existing Installations

Existing Installations:

Attention: if too strong specifications in the Code, these will be too hard for existing sites, implying very high cost to update the site installations.

=> Code might define 2 groups of categories A, B, C, … : existing & new.

7- Specification at Network Interface

Specifications for Connection on Industrial Distribution Network (IDN)?:

Important: comportment of the whole site at interface with "Public Grid"

=> present Code should

- **provide specifications at interface point**
- **avoid to impose rules inside the industrial installations**

Examples:

- **If specifications impose too large V ranges and its system defense require to block transformer On-Load Tap Changer, voltage on motors terminals may become incompatibles with standards, creating a security problem for EX-e equipments. But, the wish to limit P and Q at interface may be obtain with active OLTC if stopping some loads.**
- **The production unit may automatically start, stop motors, modify their consumption, … ; in parallel, if the site includes a cogeneration unit, its production depends, in normal conditions, on the process needs of steam; all that influences P and Q at interface point. But, the site operator may use several site equipments to respect conditions at interface point.**