Ecodesign Transformers Stakeholders forum – Kick-off

Feedback of the Belgian DSO's on the current EU Directive

Wim De Maesschalck - Eandis

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EU, Brussels

Implementation of Ecodesign

Implementation Ecodesign in **new tender**

- Tier I losses = minimum requirement
  - Impact: still to be assessed (new designs)
- Tier II losses = bonus requirement
  - TCO capitalisation of losses ~ Cenelec formula
  - Energy price + interest rate ~actual values for DSO

- Dimensions: **no increase possible**
  - Limited by available space in substations
- Weight: **no increase possible**
  - Limited by load limits of structural elements (floor/pole)

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Evaluation of Tier I

- Implementation is ongoing by DSO's
  - Not possible to draw conclusions yet (new designs)
  - Results may vary…

- ***Focus of study should be evaluation of effectiveness of Tier I***
  - Projected costs & benefits achieved?
  - Is the transformer still "fit for use"?
    - Dimensions
    - Weight
    - Special types of transformers
- Evaluation of Tier I = base for Tier II

Evaluation of Ecodesign

Targets of DSO

- Balanced performance of assets
  - Costs >< Safety >< CML-Caidi-Saifi >< Environment
- Maintain open market with multiple vendors
- Enabler of new technologies
- Public responsibilities
  - National policies (e.g. safety, renewables, …)
  - European policies (e.g. ecodesign, 20-20-20)

Ecodesign transformers:

- evaluation based on these targets

DSO – specific constraints

- Regulated market:
  - Budgets for investments are regulated
    - Limited ratio of replacement: typically 2% - 3% annually
    - Specific tendering process & long term contracts
    - Focus on Total Cost of Ownership
- Very large installed base
  - e.g. Belgium:
    - 60.000+ MV substations
    - trafos: +/- 2000 annually
- Transformers are part of a larger installation
  - Interchangeability is critical
    - Upgrade / Renewal
    - New functionalities

Impact on MV substations

- Dimensions are limited:
  - Width → limited space for access & installation
    - Typical doorway: 90 cm
    - Limited floor space in substations
    - New functionalities require more space
  - Height → limited in buildings (ceiling)
    - Typical ceiling (basement/ concrete substation): 2m20
- Weight is limited
  - structural limit of substation
    - Total weight of ALL equipment COMBINED (trafo + switch)
      - Floor / Pole
  - Impact on logistics

Sibelga - Brussels

Underground substation in sidewalk: very little space available & limited height

Tecteo - Liège

Underground substation: very narrow acces to substation

Mounted on 1 pole

350 000 units

50-160 kVA

Max. 550 kg

Semi-rural substation

130 000 units

Max. 250 kVA

Max. 1500 kg

Urban substation

270 000 units

Max. 1000 kVA

Max. 2500 kg

Floor space < 2,5 m² Height < 1,5 m

Enedis (ErDF)– typical cases

Different standardised types have specific limits in weight & volume of transformer

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Liander - Amsterdam

Typical compact substation in the streets of Amsterdam. Impossible to install a larger building.

Soure: Alfen pdf-catalog: http://alfen.com/sites/alfen.com/files/downloads/Peperbus.pdf

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Impact on MV substations

- Replacing a substation is not an option
  - Not easy to obtain a “green field”
    - Available space / NIMBY
    - Permits
    - City Center?
  - Very high cost
    - Construction of new building or support
    - Cable works
- Retrofit is very important and must be possible!

Impact on MV substations

- New functionalities requires additional space in substation
  - Smart meter equipment
  - Voltage regulator on transformers
  - Smart grid control bays

→ impact of other EU policies!

Impact on Network

- How to improve energy efficiency?
  - Network efficiency vs. individual component
    - Investments where they yield most results
  - Optimisation of losses based on actual load profiles
    - Rated power I_n
    - Efficiency I_o & I_k
    - Actual prices & interest rates
  - Special transformers allow transformation of the network
    - Retrofit should remain possible
    - E.g. Voltage upgrade → less losses

Impact on use in network

- Choosing the right **power rating** is key
  - Long lifetime: 30 to 50 years
  - Load profile and estimated evolution are important
    - Variations in time & season
    - Impact of new technologies
  - Global economics >< individual optimisation
    - Effect of eco-design on the transformer price
    - Price, losses, transport, stock, batch size, …
- Optimisation of losses is required
  - DSO: specific load profile with high variation
    - Flexibility needed to have best combination of losses (I_o vs. I_k)

Impact on use in network

- Choosing the right **type** is key
  - Different historic network lay-out
    - To change network structure → high costs
      - Modify all substation + cables
      - Limited budgets: only 2 - 3 % annually!!
  - Changes are gradual but effective
    - E.g. higher voltage for lower losses and higher capacity
      - 230 V → 400 V
      - 6000 V → 15000 V
- Special types are needed to facilitate transition

Optimising the network vs. component

- Optimising of network requires global approach
  - Cables, substations, transformers, …
- Specific network optimisation can yield much greater results
  - Upgrade LV / MV voltage → lower losses
  - Investment in bigger cables → lower losses & higher capacity in the network
  - Voltage regulators → allow higher capacity & renewables
- Too strict policies can yield opposite results
  - Dry type transformers vs. Oil type
    - Dry transformer = higher losses but more compact – possible loophole?
  - Overloading smaller transformers (higher total losses)

Summary

Ecodesign should

- Take into account feedback of Stakeholders
- Additional cash-out should result in benefits for users
- Allow retrofit and improvement of existing installation
- Be flexible to allow optimisation according the intended use and network system
- Encourage correct use of products

Ecodesign should not

- create products which are no longer suited for use
- Result in higher cost with little benefits
- Limit new technologies
- Encourage the wrongful use of products
- Encourage proprietary technology