Key Messages

Active Network Management for All

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Active Network Management solutions to keep up the pace of the energy transition

Enabling the integration of massive amount of renewables – RES – in distribution grids with the agility required to meet international climate goals, we need to consider alternative network development solutions.

The European research project *Active Network Management For All* – **ANM4L** – has been addressing solutions to increase the utilisation of existing grid assets while maintaining the security of supply. The ANM4L project has considered how to prevent overloading and overvoltage situations in distribution grids, originating from increased levels of distributed RES.

Coordinated by RISE Research Institutes of Sweden, the ANM4L project has been an international cooperation, from December 2019 to November 2022, with a consortium comprising: Lund University (SE), RWTH Aachen (DE), Lumenaza (DE), E.ON Eldistribution (SE), E.ON Észak-dunántúli Áramhálózati (HU), E.ON Group Innovation (DE), and the Municipality of Borgholm (SE). The developments in the ANM4L project have been gathered around three pillars: **1st Control solutions, 2nd Business solutions, 3rd ICT solutions**. These pillars collectively resulted in a developed toolbox to support operation & planning of distribution grids. The functionality and replicability of developed solutions have been tested and demonstrated in Sweden and Hungary. This document presents key messages from the ANM4L project.

Key Message 1: Definition of Active Network Management

Active Network Management – ANM – is the exploitation of flexible network assets for the purpose of providing secure means of increasing grid utilisation.

ANM solution *is the concept of a control system, integrated with ICT and the power system, with the ability to manage generation, load and electrical tolerances for DSO-driven purposes.*

Flexible Network Assets *are assets in the grid – load, production, and other controllable equipment – with the ability of being controlled to support grid needs.*

Key Message 2: Categorisation of Flexible Network Assets

As ANM is depending on the external control of various flexible network assets, it is important to assess the *needs, capabilities, limitations,* and *costs* of different type of assets. Categorisation of flexible network assets provide important information in the development and deployment of ANM solutions.

Key Message 3: Creation of a Flexibility Dispatch List

Activation of ANM based control can be distributed among of the flexible network assets located in a part of the network where it is possible to influence and support the specific grid need. Selection of assets can be made based on *technical*- and/or *economic efficiency, fairness*, as well as on other factors. Using a flexibility dispatch list, all relevant flexible network assets can be made available and contribute in an ANM solution according to selected preferences.

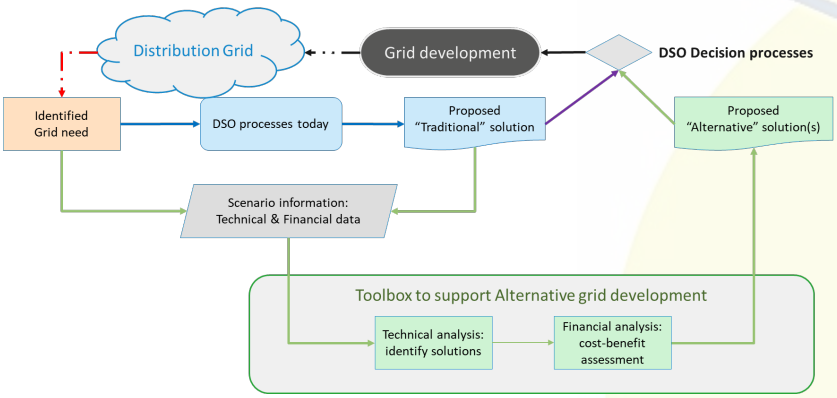
Key Message 4: Need for Observability, Controllability, & Communication

Depending on the grid need, ANM solutions can either be deployed distributed or centralised. In the distributed case, there is no need for communication since monitoring, decision making, and control are all done locally. For the centralised solutions, measurements need to be communicated to a control room where the increased observability of the grid enables centralised decision making, and the interface to all relevant flexible network assets can be selected and set points can be distributed. Standardisation of communication protocols and interfaces have significant importance to enable communication to a vast number of assets. Of similar importance are also the data and cyber security aspects, where measures against malicious intent need to be deployed.

Key Message 5: Implementation and Utilisation of ANM in Planning & Operation

Advances in observability and controllability are the basis for a secure way of an increased grid utilisation.

- In long-term planning, future requirements on control and location of flexible network assets need to be assessed to make optimal decisions of future investments;
- In short-term operational planning, forecasting of demand, production, and availability of flexibility is needed to make decisions on required actions in advance of the operating hour;
- During operation, actual measurements will form the basis for automatic or manual control actions utilising the flexibility required to keep asset loading and bus voltages within specified limits.



Final notes: ANM provides socio-economic and sustainable alternatives to traditional grid development

Active Network Management solutions brings both opportunities and challenges, enabling distribution grid operators to integrate RES far beyond the levels of conventional grid operation.
ANM brings a paradigm shift regarding risk considerations for operation and planning of distribution grids:

- Decreased technical risks, where ANM solutions enable increased RES penetration, and ANM control ensures that operational criteria are always met;
- Increased financial risks, with significant uncertainties of the flexibility procurement cost in the long-term.

To reach broad implementation and deployment of ANM and other non-wire grid development solutions, we need:

- Supportive regulation and alternative business models, including TOTEX, sustainability, etc.;
- Standardisation, including grid-code requirements on inverter control implementations;
- Integration within the grid operator's systems and methods for planning & operation of the power system.

The future energy system will be an integrated system-of-systems, combining values of different energy carriers and sectors. Flexibility solutions are key enablers to manage a 100% fossil-free system in a sustainable and resilient manner, and grid operators need solutions to handle such complex system. The ANM4L project has successfully shown the values which ANM solutions brings to meet the flexibility needs of DSOs for both operational and planning.

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