March 2022

Response to the Greek Network Development Plan 2023-2032 (RAE)

CurrENT

Enabling Network Technology throughout Europe currENT is the industry association representing innovative grid technology companies that operate in Europe and empower the grid. currENT aims to generate greater awareness of new Grid Enhancing Technologies (GETs), as well as innovative technologies for new grid development, and accelerate their implementation. We do so by working with the broader stakeholder ecosystem on future-proofing regulatory and policy frameworks in Europe.

We believe that renewable generation and energy efficiency are the 'first order' solution for taking the Fit for 55 ambition and the Climate Law from promise to practice. Renewable-based electricity solutions can meet more than 70% of our total energy needs by 2050. Making the 'can do' a 'will do' requires powerful yet climate-proof 'clean' power grids. Such grids are already possible today.

- Power networks – both transmission and distribution – have to become even stronger enablers and accelerators of the energy transition, paving the way for further electrification, rising demand and sector coupling.
- Innovative network technologies will assist and promote the integration of higher levels of renewables and speed their deployment.
- Long term grid plans must consider innovation in transmission technologies, and work towards greater coordination with neighbouring grids.
- These state-of-the-art technologies must be implemented now and in the years to come to future-proof the grid, and ultimately deliver on the Paris Agreement and European Green Deal.

Therefore, energy system operators must be informed, encouraged, and incentivised to update their toolbox for existing and future grids.
On the qualification and the use of innovative technologies in NDPs, currENT recommends to:

- Require system operators to consider all possible solutions for an identified network need.
- Use the NOVA principle in regulation to make sure already available new solutions are used for existing grids as the first step in network development. The NOVA approach should be applied with reference to ENTSO-E's Technopedia and other available grid enhancing technology overviews.
- Develop 'best practices' across Europe for qualifying new technologies: Increase transparent sharing of learnings among system operators, countries and broader industry to avoid duplication of pilot projects, which slows down the uptake of new solutions and ultimately delays the benefit to customers.
- Align the priorities for innovation to ensure the highest potential innovations are funded, developed, trialled and ultimately deployed.

We specifically refer to the following publications both on available technologies and recommendations for updating the regulatory approach to accommodate new solutions.
Reports on the technological advancement are showcased on a large scale through:

- WATT's Brattle Report evaluating the economic and renewables deployment benefits of applying

GETs in the U.S.[1];
- ENTSO-E's Technopedia underlining the readiness levels of innovative new technologies[2];
- The German Ministry for Economy and Energy's study on the central role of grid optimisation and higher utilisation of the existing networks[3];
- THEMA Consulting's report on higher available capacity and increased market integration in Northern Europe[4];
- IAEW's scientific exemplary study on modular power flow control enhancing the German transmission grid capacity as commissioned by Smart Wires[5];
- Consentec's study for currENT on the economic and renewables deployment benefits of smart transition technologies[6].

Recommendations for updating the regulatory approach have been stated by:
- The Ecorys Report at the European Energy Infrastructure Forum 2019[7];
- CSEI's and FSR's paper on the economic issues and regulatory options to promote energy network innovation for a green transition[8];
- Decision No 35/2020 of the European Union agency for the Cooperation of Energy Regulators (ACER)[9].

currENT thanks the Regulatory Authority for Energy for the opportunity to contribute to this National

[1] WATT, Brattle. 2021. Unlocking the Queue with Grid-Enhancing Technologies: Case study of the southwest power pool. https://watt-transmission.org/wp-content/uploads/2021/02/Brattle__Unlocking-the-Queue-with-Grid-Enhancing-Technologies__Final-Report_Public-Version.pdf90.pdf
[2] ENTSO-E Technopedia. https://www.entsoe.eu/Technopedia/
[3] Bundesministerium für Wirtschaft und Energie. 2021. Netzbetriebsmittel und Systemdienstleistungen im Hoch- und HöchstspannungsnetzErster Ergebnisbericht zur „Netzbetriebsmittel Studie“. https://www.bmwi.de/Redaktion/DE/Publikationen/Energie/netzbetriebsmittel-und-systemdienstleistungen-im-hoch-und-hoechstspannungsnetz.html
[4] Heimdall Power, THEMA Consulting Group. 2021. Effects of higher available Capacity and increased Market Integration. https://heimdallpower.com/wp-content/uploads/2021/08/Report_Thema_Consulting_Group.pdf.
[5] IAEW, RWTH Aachen. 2020. Modular Power Flow Control enhancing German Transmission Grid Capacity: An Investigation.
[6] Consentec GmbH for currENT Europe. 2021. The Benefits of Innovative Grid Technologies.
[7] https://ec.europa.eu/info/publications/energy-infrastructure-forum-2019-background-papers_en
[8] Copenhagen School of Energy Infrastructure (CSEI), Florence School of Regulation (FSR). 2020. Energy Network Innovation for Green Transition: Economic Issues and Regulatory Options.
[9] https://documents.acer.europa.eu/Official_documents/Acts_of_the_Agency/Individual%20decisions/ACER%20Decision%2035-2020%20on%20Core%20RDCT%2035.pdf

Development Plan. currENT would be delighted to deepen our exchange through a joint workshop and organise a public webinar by mid-2022 focusing on the Greek NDP.

currENT proposes the following points for consideration:

1. GRID ENHANCING TECHNOLOGIES ARE READY FOR WIDE-SCALE USE IN GREECE

A great deal more optimisation and grid enhancement will be needed to significantly increase the levels of transferred capacity. The 2022 NDP clearly lays out the challenges faced by Greece in completing large scale renewable integration. Optimisation technologies such as those represented by currENT membership - FACTS devices, modular SSSC, dynamic line rating (DLR) and superconductors - can significantly contribute. These technologies are widely described in ENTSO-E's Technopedia[10], as well as on currENT's website[11]. Regulatory support is needed to ensure these technologies are considered alongside other alternatives to deliver the most cost-effective solutions.

2. NOVA PRINCIPLE TO BE INTRODUCED IN GREEK GRID PLANNING

Countries like Germany, Austria and Switzerland are committed to the so-called NOVA principle[12], which holds that optimisation of the existing grid should happen before reinforcement and grid expansion. currENT recognises the need to interconnect the Greek Islands, but once this is achieved, further reinforcements should be minimised in favour of maximising the use of existing networks. currENT advocates efficiently combining optimisation, followed by reinforcement and only then expansion to address to put our networks at the centre of our electrification and renewables uptake needs. The potential of GETs has been assessed by a range of studies that are listed at the beginning of our contribution.

3. INNOVATIVE NEW GRID SOLUTIONS MUST BE ADDED TO THE NETWORK

Innovative transmission technologies are being developed and many are ready for deployment today. Long term grid planning must include innovative technologies to maximise the efficiency and effectiveness of new grid developments required for integrating renewables. Technologies such as FACTS devices, modular SSSC and DLR have been widely deployed across many countries, bringing the advantages of both

[10] ENTSO-E Technopedia - ENTSO-E (entsoe.eu)
[11] www.currenteurope.eu
[12] see the principle explained for example here on the website of TransnetBW NOVA principle | TransnetBW GmbH

significant increases in transmission capacity and cost-effective, speedy deployment. Superconductors are already in use in distribution grids today in cities such as Essen, Germany, and Seoul, South Korea. Their implementation has proved invaluable due to their high-power density and small footprint.
Superconductors are also being developed for use in the transmission system and in the near future will facilitate the bulk transfer of power from Greece's solar resource to areas of demand. High Temperature Superconductors (HTS) are considered to be at TRL 8 for AC applications and TRL 6 for DC applications according to ENTSO-E's Technopedia[13].
All of these technologies will play important roles in facilitating higher levels of renewables so as to help Greece achieve its climate targets.

4. PLANNING TOOLBOX

Given the decades-long lifetime of new grid assets, the latest innovative and technological advancements must be taken into account when planning new grids. currENT recommends that RAE reviews the processes for qualifying new technologies that have been proven in other geographies that are similar to Greece in terms of power network structure, power flow constraints, physical conformations and climate to ensure that technologies that can deliver significant value to Greece in the long-term are sufficiently included and reasonably considered as possible solutions as part of the network development planning. Such analysis would need to be supported by a substantial sharing of learnings and 'best practices' between RAE and stakeholders to minimise the risk of wasting research money and duplicating work on proving technologies that have already been proven on other networks.

There is a need to include GETs in the current and future NDPs, particularly those GETs that have higher TRLs (Technology Readiness Levels) and thus proven benefits. Such measures are in line with recent European legislation which seeks to accelerate the transition to smarter low carbon grids. For example, NRAs have been tasked to develop Smart Grid Indicators by the end of 2020, and relevant provisions in the Energy Efficiency Directive also relate to ensuring the efficiency of networks[14]. Such tools are valuable for the Greek transmission network and national targets, as well as on cross borderlines where GETs can support Greece's linear progress towards the EU 70% market available capacity target (so-called MinRam).

5. RAPIDLY DEPLOYABLE SOLUTIONS ENABLE DELIVERY OF PROJECTS AND RENEWABLES INTEGRATION

Given that delays are common in implementing new infrastructure projects due to permitting, public acceptance challenges and the identified limitations in volume of connecting new renewable generation in

[13] https://www.entsoe.eu/Technopedia/techsheets/high-temperature-superconductor-hts-cables
[14] Please see the report commissioned by currENT's sister association in the US, WATT Report: Unlocking the Queue – WATT (watt-transmission.org). See here also the JRC report of December 2020 Improving Energy Efficiency in Electricity Networks | EU Science Hub (europa.eu).

the NDP, there may be particular value in using such rapidly deployable solutions as DLR and modular power flow control solutions such as SSSC devices[15]. Such rapidly deployable solutions can often be delivered in a matter of months, leading to quicker increases in transmission capacity and efficiency of the existing network without compromising the safety of operation. currENT recommends that the Regulatory Authority for Energy consider how the existing projects identified in the NDP could be improved through using rapidly deployable solutions as an interim or enabling measure, or in some cases, as a solution that can defer the need for other reinforcement. As highlighted in the annex of the NDP, such technologies have already been deployed in research projects. RAE should also review existing selection and evaluation processes for projects to ensure that the methods fairly value the benefits of rapidly deployable solutions. This approach does not preclude ROI and "time-to-money" evaluations and benchmarking, but should ensure research projects move from evaluation to actual implementation within the technology toolbox.

6. COMPLEMENTARY SOLUTIONS OPTIMISE THE USE OF THE EXISTING GRID

Finally, currENT would like to highlight the complementarity of GETs, particularly in maintaining network resilience, managing congestion and optimising power flow across the network. By leveraging multiple GETs with different functionalities to meet a network need, in most cases, the overall impact will be far more significant than if only one technology was used in isolation[16]. currENT recommends that RAE consider GETs not only as standalone solutions but also as solutions that can be combined to maximise the benefits of an existing or new project, and ultimately provide maximum value to both the network and consumers.

[15] The static synchronous series compensator (SSSC) is a power quality FACTS device that employs a VSC connected in series to a transmission line through a transformer or multilevel inverters [ENTSO-E Technopedia].
[16] Consentec GmbH for currENT Europe. 2021. The Benefits of Innovative Grid Technologies.