R&D NESTER

18 NL jun 2020

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EDITORIAL | HIGHLIGHTS | TECHNICAL INFORMATION | LITERATURE REVIEW | EVENTS | LINKS | QUIZ - This specific Quiz deals with concepts related to substations. The definitions have been taken from www.electropedia.org



## EDITORIAL

Dear Reader,

This edition of our Newsletter is a good example of the whole gamut of topics that have to be addressed when working on the energy transition!

On one side we address our involvement in the development of operational planning tools for an efficient and effective System Operation, with our participation in the European Project TDX_ASSIST ("**T**ransmission and **D**istribution data e**X**changes for renewables integration in the European marketplace through **A**dvanced, **S**calable and **S**ecure **I**CT **S**ystems and **T**ools").

In complement to this "operational" dimension, we then present our work on the European Project INTERPRETER, where the dimension of longer-term grid planning is addressed.

In a more global, systemic and overarching approach, we discuss the latest developments on an envisaged novel power system architecture that we are developing in the European Project INTERRFACE ("TSO-DSO-Consumer INTERFACE aRchitecture to provide innovative grid services for an efficient power system").

Furthermore, we bring you news on our process of digitalization of the substations world, with the developments of the Smart Substation project using IEC61850.

Clearly, a lot on innovations are needed and are surely underway, as can be confirmed by going through one of our selected "Literature Reviews", the ETIP-SNET 2021-2024 Research & Innovation Implementation Plan, towards the end of this Newsletter.

Despite the overwhelming world on innovations going on, don't forget to relax and enjoy answering our usual quiz at the end of the Newsletter checking your knowledge on some power system trivia.

Navigating through this challenging energy transition clearly requires several dimensions of leadership, to ensure that the entities involved in this process can keep doing their work in an efficient, effective and responsible manner, while exploring new opportunities that the future may bring!

On our side, we continue "Creating a Smart Energy Future"!

Sincerely,

Nuno de Souza e Silva

Managing Director

## HIGHLIGHTS

# R&D Nester and REN continue cooperation on the EU Project TDX ASSIST to develop operational planning tools for an efficient and effective System

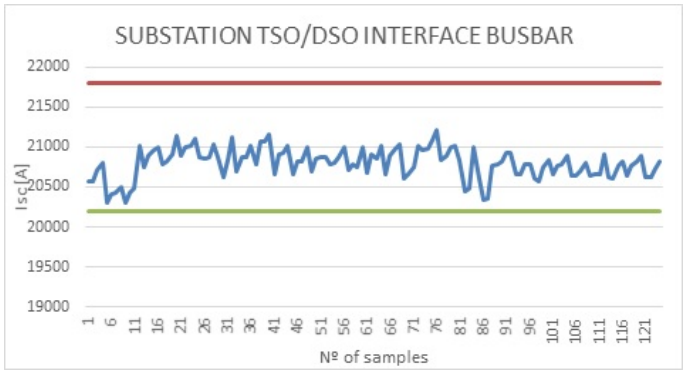
# Operation

TDX-ASSIST stands for Transmission and Distribution data eXchanges for renewables integration in the European marketplace through Advanced, Scalable and Secure ICT Systems and Tools. This project aims to design and develop ICT tools and techniques that facilitate data exchange between Transmission System Operator (TSO) and Distribution System Operator (DSO).

The project is funded by the European Commission R&D Program H2020 (LCE-5-2017), has 12 partners from 6 countries and a duration of 3 years. REN and R&D Nester are partners in this project. Together with EDPD, they developed three use cases associated with three demos in Portugal in order to improve the information exchange between system operators in a timeframe linked with operational planning activities.

The three use cases are:

- Exchange of three-phase short circuit levels for the next 24 hours: this is needed to allow the SO to monitor the evolution of the short circuit current levels for a better planning (e.g. substation reinforcement) and operation of the power system (e.g. topology configuration). The use case involves the automatic calculation of three-phase short circuit currents (Icc) taking into account topology information and market results. The Icc calculation is performed at bay level, i.e., at the physical interface busbar between REN (Portuguese TSO) and EDPD (Portuguese DSO) and with a time step of 30 minutes. Typical results from the simulations are shown in the next figure where in blue is shown the variations of the short circuit current along a certain timeframe. The limits indicated in red and green are values that are typically published in the planning document (PDIRT).




- Disaggregated consumption and generation forecast at nodal level: This is useful for operational planning purposes. This forecast corresponds to a bottom-up approach valid for the next 72 hours with ganularity of 15 minutes and disaggregated at each node defined within an observability area previously agreed between TSO and DSO. The nodes belong to all EHV/HV substations but also to all the HV buses in meshes that connect two or more EHV/HV substations.

With this information together with a top-down approach currently in place in REN one aims to consolidate both approaches and contribute to a better description of the system state (e.g. to be used to improve further the state estimation) within the above mentioned timeframe.

- Improve fault location close to the TSO-DSO interface: In this use case of cooperation with the DSO, the information that is collected and recorded by the TSO protection equipment is exchanged with the DSO (triggered on event). By doing so the DSO can improve the fault location accuracy and therefore be able to optimize its operations, locating faults faster and reducing downtimes of the distribution lines at the interface with the transmission network.

All the information exchange is done based on current standards and with high security levels. Field tests are being done at the moment in order to improve the information exchange and the models needed to perform all the calculations involved.

This will allow the System Operation to of the global power system to be done in an efficient and effective way, in particular in the presence of an increased amount of renewable energy in the system.




# 'Substation of the Future' installed at the Monte da Pedra switching station



Within the scope of the 'Substation of the Future' project, developed by R&D Nester in collaboration with REN, a testing platform was installed at the Monte da Pedra Switching Station, with the objective of validating on-site the new architecture for protection, automation and control (PAC) systems developed in the mentioned project.

During an estimated period of nine months, this platform will work in parallel with the PAC system in service in this infrastructure of the Portuguese Transmission Grid, which will allow evaluating its performance in a comparative way.

In this new architecture, supported by the IEC 61850 communication standard, the so-called "process bus" was considered, that is, there are IEDs (intelligent electronic devices) close to the primary equipment (circuit breakers, disconnectors and instrument transformers), placed in the switching station switchyard.
For this purpose, cubicles suitable for outdoor installation were selected, where the following process IEDs gave been placed:

- CBC, Circuit Breaker Controllers: is the interface to the CB, for positions, signals and commands, also performing the synchronism check function and bay unit of the circuit breaker failure protection function.
- IUDS, Intelligent Units for Disconnector Switch: is the interface to the disconnector switches, for positions and commands.
- Merging units: convert currents and voltages from instrument transformers into sampled values that are then transmitted over the communication network.





The bay level IEDs (distance protection function) and the station level IEDs (differential bus protection function, local human-machine interface - HMI - and gateway to the remote SCADA) have been placed in the control building.



For security reasons, the platform will not issue commands to the power system. In evaluating the performance of the platform, the event lists generated by the local HMI and gateway will be used.

In addition to the new (fully digital) architecture, a 'hardwired' solution was also implemented for the 103/104 bay, which consists of two redundant units that implement all protection, automation and control functions, however without a process bus.

The objective is to use this architecture in refurbishments of the PAC system, in which the primary equipment as well as the copper cables, which connect it to the PAC system, are kept.

The monitoring of the platform can, largely, be carried out remotely, by the project team, at the facilities of R&D Nester, in Sacavém, through the established remote access.




Among the advantages of the developed architecture, it can be mentioned the simplification of the installation of the PAC system in the substations (replacement of copper cables by optical fibre), the possibility of combined use of devices from various manufacturers (interoperability) and the existence of redundancy also for the control functions (not only for protection functions).

This project will allow to test and validate the developed architecture, thus contributing to the digitalization of the power grid and the creation of a more efficient system.

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# The latest updates on H2020 European Project INTERRFACE

See the latest updates on European Project INTERRFACE ("TSO-DSO-Consumer INTERFACE aRchitecture to provide innovative grid services for an efficient power system") in which R&D Nester is participating.

Key components of the 'Interoperable Pan-European Grid Services Architecture' (IEGSA) were identified and include: the Flexibility Register, the TSO/DSO coordination platform, the Single Interface to Market and the Settlement Unit.

**1st Plenary Meeting of INTERRFACE Project**

The first plenary meeting of INTERRFACE took place in Budapest, Hungary on 5-6 February. During the two-day event all 9 Work Package leaders and many more task leaders presented their progress and had constructive discussions on the next

steps planned for the second year of the project.



More than 70 representatives of 42 consortium partners were present which raised a perfect momentum to further elaborate the design and services of the core of this project, the Interoperable Pan-European Grid Services Architecture (IEGSA). This will be the common platform between TSOs, DSOs and prosumers and its design will be based on the findings of Work Package 2(SOTA Analysis and End-user Requirements) and 3 (Services and Market design) and on the requirements extracted by the demonstrators of this project (http://www.interrface.eu/public-deliverables).

The plenary meeting was hosted by one of our Hungarian partners, Budapest University of Technology and Economics.

**Recent publications**

Two peer-reviewed articles were published recently related to results of INTERRFACE Work Package 2:

- Survey Analysis on Existing Tools and Services for Grid and Market Stakeholders and Requirements to Improve TSO/DSO Coordination

  Article produced by R&D Nester Team.
  [link: https://ieeexplore.ieee.org/abstract/document/8984489]
  M. Al-Saadi, R. Pestana, R. Pastor, G. Glória, A. Egorov, F. Reis, T. Simão (IEEE Xplore, 2020 February)

- Flexibility markets: Q&A with project pioneers

  [link: https://www.sciencedirect.com/science/article/abs/pii/S0957178720300126?dgcid=author]
  T. Schittekatte, L. Meeus (Utilities Policy, 2020 April)

**New collaboration with Horizon project, CoordiNET**

The INTERRFACE and CoordiNET [link: https://coordinet-project.eu/] projects both answered to the call LC-SC3-ES-5-2018-2020, titled "TSO-DSO-Consumer: Large-scale demonstrations of innovative grid services through demand response, storage and small-scale generation". The projects agreed to jointly produce a common position paper on the topics covered throughout the course of the projects.

## R&D Nester contributes to the creation of new grid

# planning and operation tools in the Interpreter project

R&D NESTER is contributing to the creation of new grid planning and operation tools, in the scope of the INTERPRETER project, financed by the H2020 programme. This project aims at developing a modular platform that allows including multiple tools for grid operation and planning. In the project scope, and to demonstrate the capabilities of the developed platform, 10 different tools are currently under development, to be later on provided to system operators. Some of these tools are only applicable to distribution systems, while others are applicable also to transmission systems, which is the case of the tools developed by R&D NESTER.

Results already obtained include the design of the platform architecture to be implemented and the definition of the functionalities of the different tools, through the creation of use cases. R&D NESTER is responsible for the development of two tools, which can be used in grid planning processes:

- Nodal Capacity calculation - optimization of the process of nodal capacity calculation in a network, aimed at received new generation units. The tool will follow a stochastic approach, as an example in contingency analysis, contrasting with the commonly used N-1 criterion.
- Optimal size and siting of energy storage units for congestion management - this tool uses an optimization algorithm to calculate optimal size and siting of energy storage units considering congestion management situations. Its solutions allow to have a direct comparison between costs for these storage solutions and grid expansion measures.

The set of tools developed in the project includes, as examples, solutions for phase balancing and detection of non-technical losses (applicable to low voltage networks). The tools developed by R&D NESTER will be tested with models of low, medium and high voltage grids, ensuring a transversal usage in power systems.

The project INTERPRETER started in October 2019 and has t duration of 36 months. The project activities are developed in a consortium, which besides R&D NESTER has 8 partners from Spain, Belgium, Greece, Denmark and France, including 2 DSO's from Belgium and Spain.

More information about the project can be checked at https://www.interpreter-h2020.eu/

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# R&D Nester selected to be represented in 4 working groups of ETIP-SNET



The European Technology & Innovation Platforms (ETIPs) have been created by the European Commission in the framework of the new Integrated Roadmap Strategic Energy Technology Plan (SET Plan) by bringing together a multitude of stakeholders and experts from the energy sector.

The ETIP Smart Networks for Energy Transition (SNET) role is to guide Research, Development & Innovation (RD&I) to support Europe's energy transition, and results from the merging of the previous initiatives EEGI (European Electricity Grid Initiative), Grid+ and Grid+Storage, and the SmartGrids ETP (European Technology Platform).

More specifically, its mission is to:

- Set-out a vision for RD&I for Smart Networks for Energy Transition and engage stakeholders in this vision.
- Prepare and update the Strategic Research and Innovation Roadmap.
- Report on the implementation of RD&I activities at European, national/regional and industrial levels.
- Provide input to the SET Plan action 4, which addresses the technical challenges raised by the transformation of the energy system.
- Identify innovation barriers, notably related to regulation and financing.
- Develop enhanced knowledge-sharing mechanisms that help bring RD&I results to deployment.
- Prepare consolidated stakeholder views on Research and Innovation to European Energy Policy initiatives.

Many European organizations submitted their applications to have their members present in the 5 Working Groups that were created within the ETIP-SNET organization. R&D Nester was selected to be represented in 4 Groups of ETIP-SNET, based on the CVs of the staff and the organization.

**WORKING GROUP 1**
**Reliable, economic and efficient smart grid system**

Nuno Souza e Silva was nominated, and approved by ETIP-SNET, to collaborate with Working Group 1 - Reliable, economic and efficient smart grid system

This Working Group addresses business and technology trends contributing to the overall energy system optimization at affordable investment and operation costs. It will focus on system aspects, addressing the main functionalities, quality and efficiency of the electricity system as such and consider the benefits of its integration with the other energy vectors. The flexibility options investigated in WG1 are: new transmission and distribution technologies (power electronics for instance), setting up interfaces with storage, demand response, flexible generation and synergies with other energy networks (i.e. how to couple the electricity networks with the gas and heat networks). WG1 also follows Set Plan Action 4 related to grid smartening in the sense of grid observability and controllability (i.e. tools for managing the variability and uncertainty of operational conditions at several timescales), increased grid hosting capacity and economic efficiency of the system through the use of ICT.

**WORKING GROUP 2**
**Storage technologies and sector interfaces**

Ricardo Pastor was the researcher nominated, and approved by ETIP-SNET, to represent R&D Nester in this working group.

Working Group 2 addresses the technological and market developments related to energy storage solutions to ensure the required level of flexibility for the transmission and distribution of electricity. It will consider all the different energy storage options, including power-to-power, power-to-gas, hydro and marine storage, CAES, thermal mass of buildings, hot water storage, etc., and their direct or indirect interface and interaction to the power networks. WG2 covers the entire value chain of all energy storage options, starting from the development and demonstration of new materials, technologies and solutions, and addressing their integration into the overall energy system, the evaluation of their impact on flexibility and the related costs/ benefits.

**WORKING GROUP 4**
**Digitisation of the electricity system and Customer participation**

Ricardo Cartaxo was the researcher nominated, and approved by ETIP-SNET, to represent R&D Nester in this working group.

Working Group 4 addresses the use and impact of the Information and Communication Technologies as a pervasive tool along the entire value chain of the power generation, transportation and use. The communication layer is one of the pillars of the smart energy system, enabling system observability, monitoring, control and protection, specifically enabling a radical change in the relation between the final user and the energy system. New digital tools (i.e. from smart meters to social networks) linked to the Internet of Things will aim to favour Customer participation in all stages of the development and expansion of the energy system thanks to the analysis of big data generated. The widespread use of digital technologies however needs to be accompanied by suitable measures for data and information protection from malicious intrusions and attacks (cybersecurity) and from uncontrolled use of customers data (data privacy).

In order to address all these topics, inside the group, three task forces were created:

- Task Force 1: Digital Technologies and reference architectures and standards;
- Task Force 2: Digital Energy Disruptive Use Cases;
- Task Force 3: Digital Cyber-security recommendations.

R&D Nester is monitoring all task forces and participating on Task Force 3, which is particularly relevant in the context of the current R&D Nester activities.

Among the members of this Working Group, there are participants from all over the world and from the most relevant stakeholders: TSOs, consumers (electricity retail companies), DSOs, ICT Technology providers, Renewable Energy resources, research and academia and telecommunication service providers.

By participating in WG4, R&D Nester improves its visibility not only in power systems domain, but also on communications network field, taking advantage of the networking and knowledge sharing opportunity provided.

It is also allowing R&D Nester understanding the roadmap for European RD&I concerning power systems digitalization and contributing for this roadmap to go in the best direction, holistically anticipating the future needs of all stakeholders.

**WORKING GROUP 5**
**Innovation implementation in the business environment**

Nuno Pinho da Silva and Nuno Souza e Silva were the researchers nominated, and approved by ETIP-SNET, to represent R&D Nester in this working group.

Working Group 5 (WG5) focuses on how the R&D of Europe (national or European) in the Energy area can be utilised in support of innovative activities that will positively transform the business environment in Europe. It adopts a helicopter view of the activities carried out in the projects within the perimeter of the ETIP about the energy transition in order to:

- Build homogeneity in the qualitative and quantitative analysis of projects, work done and lessons learned
- Create a common platform for analysing the progress made with technologies, systems and solutions through-out the EU and facilitate their scalability and replicability;
- Build a methodology to judge system needs in the energy transition capable of identifying tangible needs for building on progress made and give feedback to the other WGs for populating their R&I needs in the years ahead;
- Identify the barriers which may slow down business model deployment;
- Search for innovative solutions that will maximize the benefits of the innovation process that EU achieves through R&I activities in the area of Energy.

WG5 includes members from manufacturers, producers, gas and electricity transmission and distribution network operators, retailers, consultants, innovation platforms, research centres and universities.

By partaking in WG5, R&D Nester benefits from an international networking and knowledge sharing environment with holistic awareness of the European RD&I outputs in the Energy area, deployment barriers and Energy systems needs to anticipate its clients' needs and timely develop innovative solutions well-tuned to the new energy paradigm.

More details can be found in http://www.etip-snet.eu/

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# R&D Nester comes closer to Academia and IST




R&D Nester researcher Ricardo Cartaxo was invited by the Instituto Superior Técnico to give a lecture on the IEC 61850 communication standard, under the scope of the subject of Power Systems Protection and Automation, taught in the Electrotechnical and Computer Engineering course.

For about an hour and a half, Ricardo Cartaxo mentioned the motivations for the development of this standard (the main one being the interoperability between devices from different manufacturers) and its main characteristics, emphasizing that it is constantly evolving.

IEC 61850 is widely used in the protection and automation systems of distribution and transmission electrical substations.

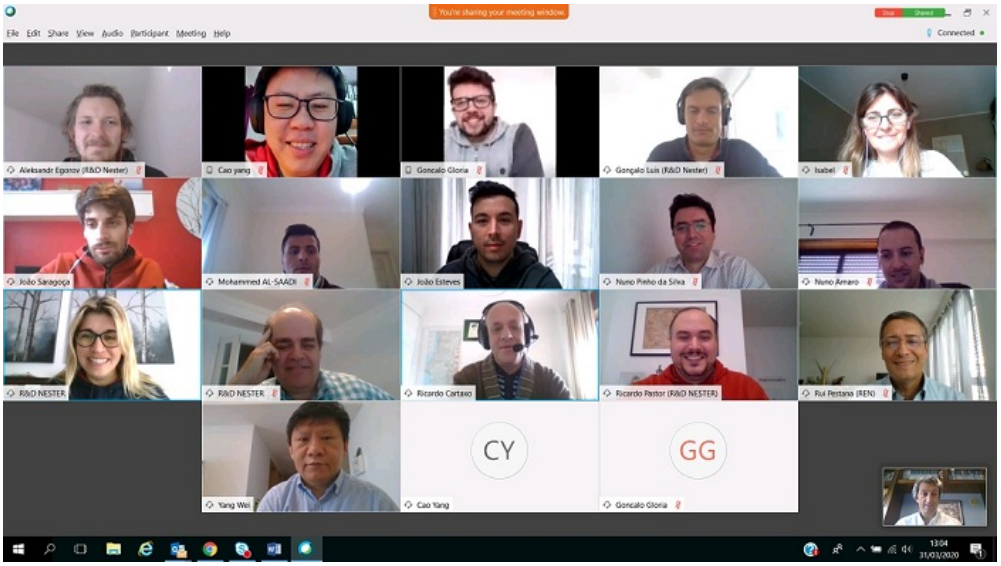
The following day, the students visited the R&D Nester laboratory, where they learned about some projects developed there, related to the matters taught in the aforementioned course subject.

In addition, researcher Nuno Amaro presented a simulation in the RTPSS (real time power system simulator), related to the project 'ProtMPLS', which aims to verify the suitability of IP-MPLS communication networks as a support for the operation of line differential protections.

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# R&D Nester: working remotely but still creating a Smart Energy Future!

In this new reality of experiencing a worldwide pandemic, R&D Nester Team continued to develop the projects in which it is involved, never ceasing functions. Each member of the Team stayed at home, in telework mode, and all the necessary interactions between the Team were guaranteed through web meetings. R&D Nester Team proved that even from a distance it managed to maintain its synergy with focus on "creating a Smart Energy Future".

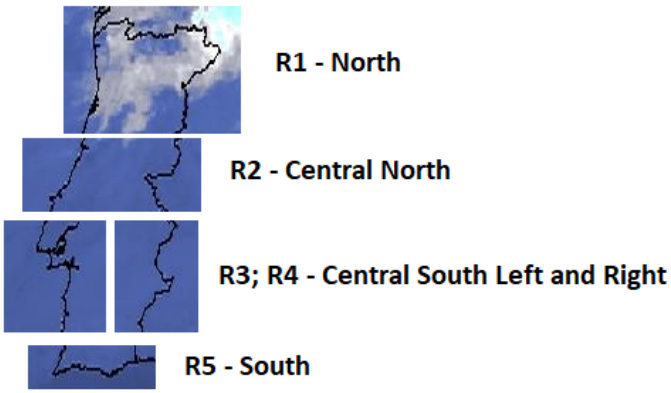



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TECHNICAL INFORMATION

# Using satellite images to forecast solar power

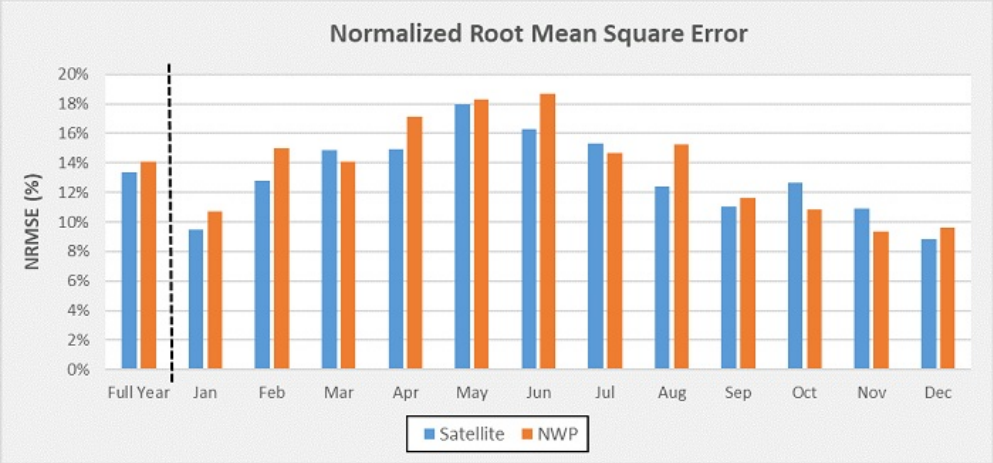
R&D NESTER during 2019 developed a preliminary study regarding forecast based on satellite pictures. This methodology uses the theoretical solar radiation of clear sky and computes a cloud index (CI) that indicates the number of clouds in the sky. The Portuguese mainland is divided in five regions, as follow:




The calculation of the cloud index is made using a clear sky library, built using satellite pictures and solar PV aggregation metering data from the region under study. This library defines the probability density distribution that characterizes the clear sky for each hour. Thus, the cloud index is calculated by comparing the probability density distribution of the new picture with the clear sky library.

A case study was developed using one Photovoltaic Solar Power Plant for the year of 2018, comparing the normalized root mean square error of the satellite methodology and the numeric weather prediction (NWP) model. These preliminary results are showing that methodologies using satellite pictures have a significant potential and should be studied in detail.

R&D Nester is going to continuing developing and researching on this subject in order to perform the best possible forecast.




# Long Term Energy Scenarios Creation – vision for 2050

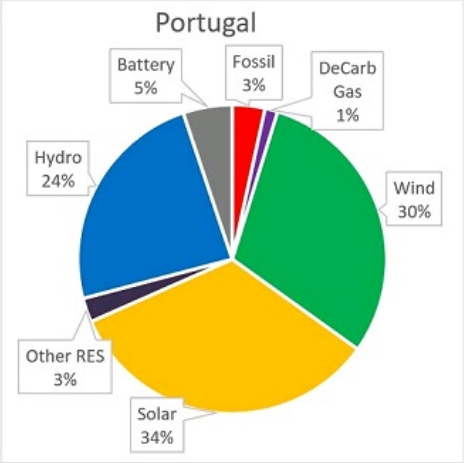
R&D NESTER is involved in the development of long-term energy scenarios (up to 2050) at Pan-European and national level. These scenarios, created in the scope of H2020 Project FlexPlan, aim at having a future glance of different possible solutions to achieve a complete decarbonization of the European power system in 2050.

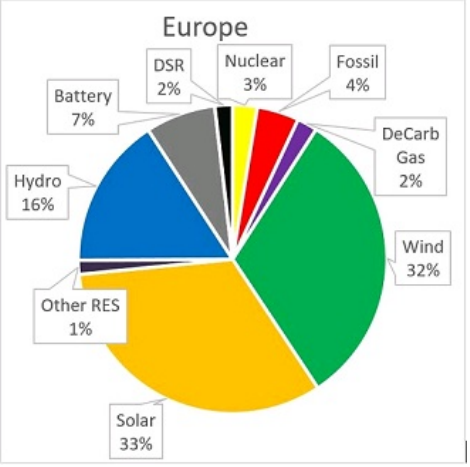
Using a methodology developed for FlexPlan, three different scenarios were created, having as basis the TYNDP2020 scenarios recently released by ENTSO-E [1]. These use different approaches to reach the European climate targets for 2050. Complementing the ENTSOS vision provided in TYNDP2020, and as a way to validate target numbers for 2050, official European Commission (EC) and different Member States (MS) documents were also considered in a screening study. These include the long-term strategy of the EC for a carbon neutral economy: "A Clean Planet for All" [2] and MS documents as the last issues of the National Energy and Climate Plans (NECP) and the long term plans for carbon neutrality, which are already available for some countries like Portugal [3]-[4]. As these scenarios were based on TYNDP2020 visions, the same names were used and, in summary, they present the following features:

- National trends: this scenario is focused on the national and European climate targets, stated in the current versions of the NECPs, presenting the most conservative approach of the three scenarios. Nonetheless, it aims at a reduction of GHG of at least 80 % by 2050 (when compared to 1990).
- Distributed Energy: this scenario aims at reaching carbon neutrality by 2050 and also answering the 1.5°C of average temperature increase by the end of the century, stated in the Paris Agreement. In this scenario, these targets are reached through the large-scale deployment of distributed energy solutions, with a high focus on consumer/prosumer based solutions.
- Global Ambition: similarly to Distributed Energy, this scenario reaches carbon neutrality by 2050 and the 1.5°C target.

However, the approach to reach these targets is more focused on centralized solutions, derived cost reduction due to the economies of scale (e.g. in offshore wind).

Using the aforementioned data sources, the methodology developed in FlexPlan allows creating energy scenarios for 2050 ensuring possible visions for the power system landscape. As a result of this methodology, national and European level forecasts for the European power systems are created. As an example of these results, the following two graphs demonstrate a possible vision for the total installed capacity in Portugal and Europe, using the Distributed Energy scenario. The depicted results do not represent binding solutions. Instead, these are possible solutions, which allow reaching the climate targets set by the different MS and the EC. In the scope of the FlexPlan project, these scenarios will be used to demonstrate the capabilities of a grid-planning tool and to provide possible solutions (regarding power grids) to reach these targets. Indicated fossil fuels installed capacities correspond to decarbonized solutions.




References:

[1] - ENTSO-E, TYNDP2020 Scenarios Report, 2019, available at https://www.entsos-tyndp2020-scenarios.eu/

[2] - European Commission, A Clean Planet For All, 2018, available at: https://ec.europa.eu/clima/policies/strategies/2050_en

[3] - Portuguese Environment Agency, Plano Nacional Energia e Clima, 2019, available at https://apambiente.pt/_zdata/Alteracoes_Climaticas/Mitigacao/PNEC/PNEC%20PT_Template%20Final%202019%2030122019.pdf

[4] - Portuguese Environment Agency, RNC2050 - Roteiro para a Neutralidade Carbónica, 2019, available at: https://descarbonizar2050.pt/

LITERATURE REVIEW

## "Underground Sun Storage"

Check another ETIP-SNET Energy Story and learn about "Underground Sun Storage", a pilot project using power to gas technology, which enables the conversion of electricity to hydrogen, which is then stored in the natural gas network.

Link to open publication

ETIP SNET

EUROPEAN TECHNOLOGY AND INNOVATION PLATFORM

SMART NETWORKS FOR ENERGY TRANSITION



# ENERGY STORY:

## Storing sunshine

The Underground Sun Storage project uses renewable hydrogen to integrate wind and solar energy

PLAN. INNOVATE. ENGAGE.

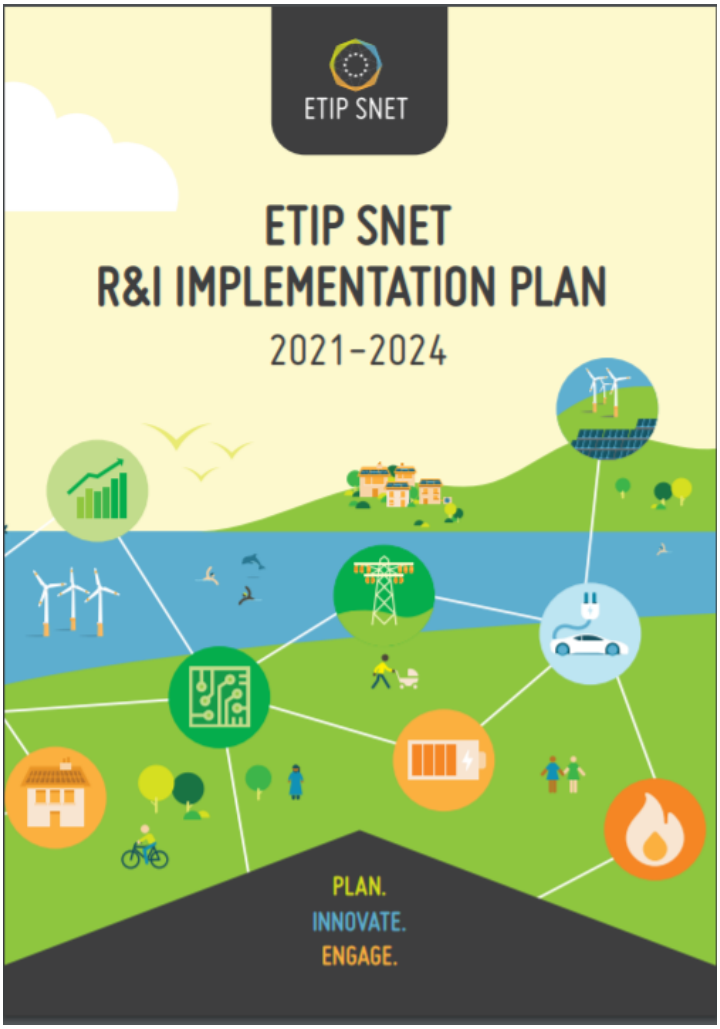
# ETIP-SNET R&I Implementation Plan 2021-24

In May, the Research and Innovation Implementation Plan 2021-2024 was published, with the participation of R&D Nester, among several European partners. R&D Nester participates in 4 of the 5 Working Groups of ETIP-SNET.

This document follows the document ETIP-SNET Vision 2050, which defines a set of objectives to be achieved in 2050, and the document ETIP-SNET R&I Roadmap 2020-2030, which describes the path to achieve these objectives.

This Implementation Plan describes the activities necessary to follow the route identified in the Roadmap, identifying 24 topics in the 6 Research Areas previously defined, namely, "Consumer, Prosumer and Citizen Energy Community", "System Economics", "Digitalization", "Planning-Holistic Architectures and Assets", "Flexibility Enablers and System Flexibility" and "System Operation". The 24 topics detail themes within these 6 Areas.

Link to open publication




## EVENTS

**8 -10 Jul 2020**
SETUBAL, PORTUGAL
IEEE CPE - POWERENG 2020

**20 -25 Aug 2020**
PARIS, FRANCE
48TH CIGRE SESSION 2020

**7 -11 Sep 2020**
LISBON, PORTUGAL
37TH EU PVSEC - PHOTOVOLTAIC SOLAR ENERGY CONFERENCE AND EXHIBITION

**16 -18 Sep 2020**
STOCKHOLM, SWEDEN
17TH INTERNATIONAL CONFERENCE ON THE EUROPEAN ENERGY MARKET

**22 -23 Sep 2020**
BERLIN, GERMANY
CIRED BERLIN 2020 WORKSHOP - HOW TO IMPLEMENT FLEXIBILITY IN THE DISTRIBUTION SYSTEM?

**5 -10 Oct 2020**
BEIRUT, LEBANON
WORLD ENERGY WEEK - WORLD ENERGY COUNCIL

**12 -15 Oct 2020**
LISBON, PORTUGAL
RENEW 2020 - 4TH INTERNATIONAL CONFERENCE ON RENEWABLE ENERGIES OFFSHORE

**24 -27 Oct 2020**
SAINT PETERSBURG, RUSSIA
25TH WORLD ENERGY CONGRESS - WORLD ENERGY COUNCIL

**25 -28 Oct 2020**
THE HAGUE, THE NETHERLANDS
IEEE-PES-ISGT-EUROPE 2020 - INNOVATIVE SMART GRID TECHNOLOGIES CONFERENCE

**24 -27 Nov 2020**
VIENNA, AUSTRIA
3RD SEERC CONFERENCE 2020 - CIGRE SOUTH EAST EUROPEAN REGIONAL COUNCIL - SEERC COOPERATION - SUSTAINABILITY - FUTURE

## LINKS

ON RESEARCH, DEVELOPMENT AND INNOVATION

- Associação de Energias Renováveis (APREN)
- Associação Portuguesa da Economia da Energia (APE)
- Portugal Energia
- DGGE - Direção-Geral de Energia e Geologia
- Portal de Ciência e Tecnologia | Fundação para a Ciência e a Tecnologia (FCT)
- The European Commission's Priorities
- European Energy Research Alliance (EERA)
- The European Wind Energy Association (EWEA)
- ERSE - Entidade Reguladora dos Serviços Energéticos
- Direção-Geral de Estatísticas da Educação e Ciência (DGEEC)
- A European Green Deal | European Commission
- Joint Research Centre - Smart Electricity and Interoperability
- European Climate, Infrastructure and Environment Executive Agency (CINEA | ex-INEA)

OTHER ENTITIES

- EUASP - The European Union Agency for the Space Programme
- Research and Innovation | European Commission
- Eurostat - Science, Technology and Innovation
- GEIDCO - Global Energy Interconnection Development and Cooperation Organization
- ESA - The European Space Agency
- EU-GCC Clean Energy Technology Network
- International Electrotechnical Commission (IEC)
- International Energy Agency (IEA)
- World Intellectual Property Organization (WIPO)

## QUIZ

1) IN THE 2030 CLIMATE AND ENERGY FRAMEWORK, THE EUROPEAN COMMISSION ESTABLISHED A TARGET OF 32% OF CONSUMPTION SUPPLIED BY RENEWABLE SOURCES. PORTUGAL ESTABLISHED ONE OF THE MOST AMBITIOUS PLANS AMONG THE DIFFERENT MEMBER STATES TO ANSWER TO THE OVERALL EU PLAN. WHAT IS THE TARGET FOR PORTUGAL (PERCENTAGE OF CONSUMPTION SUPPLIED BY RENEWABLE ENERGY IN 2030)?

- a) 35 %
- b) 40 %
- c) 43 %
- d) 47 %

2) THE PLAN TO REACH A CARBO-NEUTRAL ECONOMY BY 2050 IN EU ESTABLISH A TARGET TO LIMIT THE GLOBAL TEMPERATURE INCREASE OF:

- a) 1ºC
- b) 1.5ºC
- c) 2ºC
- d) 2.5ºC

3) TO REACH THE CARBON-NEUTRAL STRATEGY OF LAST QUESTION, THE EUROPEAN COMMISSION ESTABLISHED INTERIM TARGETS TO MONITOR THE PROGRESS OF ESTATE MEMBERS. THE 2030 TARGETS, ESTABLISHED IN THE 2030 CLIMATE AND ENERGY FRAMEWORK, AIM AT REDUCE EMISSIONS BY A PERCENTAGE OF (COMPARED TO 1990):

- a) 40%
- b) 50%
- c) 55%
- d) 60%

4) AT THE END OF 2018, THE EUROPEAN COMMISSION PUBLISHED AN AMBITIOUS PLAN TO ACHIEVE A CARBON-NEUTRAL ECONOMY BY 2050. WHAT IS THE NAME OF THIS PLAN?

- a) European Green Deal
- b) A Clean Planet for All
- c) Paris Agreement
- d) EU climate-neutral law

5) THE PROJECT WINDFLOAT ATLANTIC IS ONE OF THE FIRST FLOATING WIND FARMS TO BE CONNECTED TO THE POWER GRID IN EUROPE AND THE FIRST COMMERCIAL LEVEL PROJECT TO BE CONNECTED TO THE PORTUGUESE POWER SYSTEM. WHAT IS THE PLANNED INSTALLED CAPACITY FOR WINDFLOAT ATLANTIC AT THIS CURRENT PRE-COMMERCIAL LEVEL?

- a) 8.3 MW
- b) 15 MW
- c) 25 MW
- d) 100 MW

6) PORTUGAL IS COMMITTED TO THE TRANSITION TO A GREEN ENERGY SYSTEM. IN FACT, THE TWO ONLY EXISTING COAL THERMAL PLANTS (SINES AND PEGO) ARE SCHEDULED TO BE DECOMMISSIONED IN THE NEXT YEARS. WHAT ARE THE DEADLINES ESTABLISHED BY THE PORTUGUESE AUTHORITIES FOR THE DECOMMISSIONING OF BOTH POWER PLANTS?

- a) Both will shut down in 2020
- b) Sines will shut down in 2020 and Pego in 2021
- c) Sines will shut down in 2023 and Pego in 2021
- d) Both till shutdown in 2025

Correct answers will be provided to you soon.
If you have problems answering this quiz, click here to answer this via browser.

1. Answer: d) 47 %
2. Answer: b) 1.5ºC
3. Answer: a) 40%
4. Answer: b) A Clean Planet for All
5. Answer: c) 25 MW
6. Answer: c) Sines will shut down in 2023 and Pego in 2021

EDITORIAL
HIGHLIGHTS
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QUIZ - This specific Quiz deals with concepts related to substations. The definitions have been taken from www.electropedia.org

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