R&D NESTER

11 NL nov 2017

Subscribe here.

EDITORIAL | HIGHLIGHTS | TECHNICAL INFORMATION | LITERATURE REVIEW | EVENTS | LINKS | QUIZ



EDITORIAL

Dear Reader,

Power networks, digitalization and innovation, continue to be an explosive combination in terms of activity, interest and business opportunities.

This is true across the spectrum of existing and future industry players. Network Owners and Operators can envisage solutions to reduce both capital and operational costs, System Operators can identify additional market opportunities, new value streams and chains can be captured outside the regulated activities, Market Operators can increase their efficiency and extract increased value from their operations, Governments can see their political goals achievable, Customers can have additional solutions to their needs if so desire, just to mention a few.

The work that R&D Nester is doing related to smarter substations and more intelligent network solutions, to big data in energy, to efficient integration of renewables in the network, addresses precisely that trilogy, and you can have a flavor on those developments in the news below.

This combination requires of course a tremendous cooperation in several dimensions. In the geographical dimension, cooperation at national, European and international level. See for example the effort regarding the Single Market Operation mentioned below. In the value-chain dimension, cooperation from R&D activities until field implementation. See below for example the efforts by the European Union ETIP-SNET Platforms where R&D Nester actively participates and by the H2020 Program where R&D Nester is present. The work to do seems extensive, but the benefits even more.

Read more on these and related issues below. Enjoy your reading!

Sincerely,

Nuno de Souza e Silva

Managing Director

HIGHLIGHTS

R&D NESTER PRESENTS 'TRENDS IS THE AUTOMATION AND PROTECTION FOR SMARTER SUBSTATIONS' AT EURODOBLE 2017 COLLOQUIUM



The EuroDoble 2017 colloquium was held in Lisbon from 22 to 25 October.

This event, occurring every year in Europe, is organized by Doble, an American company that manufacturers products and delivers engineering services for the electric power industry.

There were two independent parallel sets of sessions, the so-called ‘tracks': the main one, referring to primary devices, mainly power transformers, asset management and condition monitoring, and the ‘light current' track, devoted to protection, automation and control. Besides the presentations, some tutorials were offered.

The event ended with a technical tour to the Lablec laboratories, at Sacavém: high voltage, smart grids and chemical analysis.

Ricardo Cartaxo, researcher at R&D Nester, presented ‘Trends is the automation and protection for smarter transmission substations', work that described the major investigation lines of the ‘Substation of the Future' project, undertaken by R&D Nester.

Among the issues and concerns that have been addressed in the tutorials and presentations, can be referred the cybersecurity for power systems, the harmonization between IEC 61850 and CIM (common information model), the pollution of the power grid with harmonics caused by wind farms and the lack of physical inertia in the grid when there are much wind power.

More information at: https://events.doble.com/eurodoble/



BIG DATA DEVELOPMENTS CONTINUE WITH R&D NESTER PARTICIPATION IN H2020 BIGDATAOCEAN PROJECT

Following the consortium plan, R&D Nester participated in a new BigDataOcean project meeting. In this two days meeting, the different consortium members presented the current state of work related to ongoing activities, focusing in the work packages that include the implementation of the software architecture to be used in the several deployment steps of the platform and the exploitation strategy to be followed.

This H2020 funded project, which started in January 2017, is now starting to deliver its first results and the Big Data platform created under its scope will have the first version released until the end of 2017. In this first release, users will not only have access to first results of the four considered pilots (including wave energy assessment) but also the possibility to upload their own data and use the platform capabilities in terms of Big Data algorithms, particularly in Knowledge Extraction and Business Intelligence.

R&D Nester main tasks in the project are related to the development of a case study, which aims to use Big Data techniques to assess the potential of wave energy in the Portuguese coast. In this context, R&D Nester, with the support of ENONDAS, already identified multiple public data sources and the first release of the platform will already contain a preliminary study for the Pilot Zone whose concessionaire is ENONDAS. Through the multiple releases of the platform, multiple scenarios will be developed with the pilot aiming to allow the offering of different services related to the wave energy potential in the Portuguese coast, not only focusing in the resource assessment but also in the environment impact and the impact on equipment operation caused by sea conditions.

In this project meeting, R&D Nester presented to other consortium partners the general state of play regarding the case study development, namely the identified data sources, processing patterns to be used by the pilot and requirements for the platform in terms of both processing capabilities and visualization.

Using this project, R&D Nester is increasing its knowledge in Big Data processing features, techniques and challenges, which presents a growing need for utilities in Europe, as the digitalization of power systems and consequently the amount of available/generated data grows significantly.

Follow all project news in http://www.bigdataocean.eu/site/



R&D NESTER REPRESENTED AT EUROPEAN UTILITY WEEK 2017

R&D Nester was present at the European Utility Week 2017, with its own stand at the Portugal Pavilion, held in Amsterdam, from 2 to 5 October.

European Utility Week is the premier business, innovation and information platform connecting the smart utility community, allowing you to meet with experts from utilities, network operators, vendors, consultants, startups and system integrators covering the entire smart system value chain.

Traditionally an event more focused on Distribution and Smart Meters, is increasingly and definitely becoming an all round energy sector meeting, including regional and global developments in Grid optimisation, Renewables, Energy Storage, Smart Metering, Smart Cities, Smart Homes, Energy Services & Efficiency, Energy Trading, Intelligent Buildings, Data Management, Analytics, and IoT, Cyber Secutiry, Smart Gas and Smart Water.

Program includes usually a Conference and an Exhibit. This year included additional collocated events in the Exhibit area: Hub Sessions, with practical industry solutions; Intelligent Buildings Europe; Energy Revolution Europe, focused on renewables and EV; Initiate! Space - a "Web-Summit"style entrepreneurs area; EMART Energy space focused on Markets and Traders.

This event confirmed the presence and convergence of 3 disruptive forces, namely the convergence of solar energy, energy storage and electrical vehicles, that are being the key in part of utilities market reshaping. There is also a significant increase of attention directed to Digitalization and Data Analytics.

R&D Nester's stand received several visitors, and opportunities for joint work in future projects appeared. There was particular interest from players working on solar forecast and on market behavior analysis.

http://www.european-utility-week.com/





R&D NESTER PRESENTS “WRITING PACS SPECIFICATION TOWARDS A FUTURE-PROOF DIGITAL SUBSTATION” IN THE “IEC 61850 EUROPE 2017” INTERNATIONAL CONFERENCE

R&D Nester participated in the international conference "IEC 61850 Europe 2017," which was held in Amsterdam, September from 26th to 28th 2017.

Researcher Bruno Soares, from the project ‘Smart Substation Testing and Implementation', presented a proposal for a new Protection, Automation and Control Systems (PACS) functional specification methodology using the features that IEC 61850 international standard provides on its current edition (edition 2.0) and also providing ideas for new possible features to be applied in future editions of the standard.

This approach allows a substantial improvement in the specification of the secondary systems of electrical substations. This methodology is based in the creation of specification libraries that can be updated easily. By instantiating from the library, it is possible to create entire PACS specification with a considerable effort reduction compared to conventional substation specification. The methodology also considers the simultaneous existence of digital (target of the presented method) and conventional substations, future specification changes and the configuration, maintenance and substitution processes. Therefore, the methodology was a product of a holistic and future-proofed vision of the life cycle of secondary systems installed in the substations.

The methodology may also be applied to the specification of equipment to be installed outside of the substations, for instance, Distributed Generation or electrical grid controllers, in significant evolution in the current energy sector digitization framework.

This conference, which included an exhibition, a network forum and a workshop, is addressed to experts in the application of the international standard IEC 61850 that aims the interoperability between elements of the control and protection system of substations. This standard was intensively applied in the ‘Substation of the Future' project and its results are being exhaustively assessed in the ‘Smart Substation Testing and Implementation' project of R&D Nester for practical use and implementation by network operators.





R&D NESTER WINS THE ARCWIND PROJECT (INTERREG ATLANTIC AREA)

R&D Nester is one of the Consortium members of the project ARCWIND, funded by Interreg Atlantic Area, which will start by the end of the year 2017. The project has a duration of three years and the consortium is composed of different entities both from the academic and industry from five different European countries, namely Portugal, Spain, France, United Kingdom and Ireland.

This project aims to contribute to the use of floating off-shore wind energy for used in deep water and more exposed sites in the Atlantic Area by assessing the wind energy potential based on atmospheric models and remote sensed data and its integration into the electricity grid.

Throughout the project different case studies of offshore wind farms will be considered taking into account the evaluation of energy potential, costs assessment, logistics and maintenance planning operations.

R&D Nester contribution is focused in simulations related to the connection of the developed case studies to the electric grid, considering the impact of these new connections.



R&D NESTER MAKES 2 PRESENTATIONS AT THE ETIP-SNET MEETING IN LISBON, SEPT. 28-29

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).

The meeting in Lisbon was dedicated to a Workshop of the Western Region, which includes France, Ireland, Portugal, Spain and the UK.

R&D Nester, which is involved in 3 Working Groups within ETIP-SNET, made two presentations related to the topics addressed in Working Group 1, focusing on the business and technology trends contributing to the overall energy system optimization at affordable costs, and Working Group 4, addressing 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 meeting had the participation of several European entities such as REE, EDP-D, EDF R&D, ENTSO-E, EERA, Engie, Eirgrid, Tecnalia and many others.

For more information see https://www.etip-snet.eu/.

R&D NESTER PRESENTS WORK ON CAPACITY IN ELECTRIC NETWORKS AT ICE/IEEE ITMC 2017

R&D Nester participated in the 23rd ICE/IEEE ITMC Conference which main focus was on "Engineering, Technology and Innovation Management Beyond 2020: New challenges, New Approaches".

The conference, which this year was in Madeira Island, is organized by the IEEE Technology and Engineering Management Society and R&D Nester had the opportunity to present a scientific paper related to calculation of the grid capacity for reception of new energy sources.

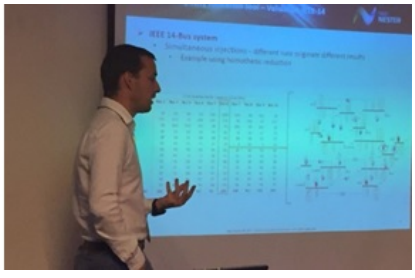
The conference has gathered multiple experts in the information and communications technology and intelligent systems and electric grids, from different sectors including universities, research centres, industry and national and international authorities.

Three plenary sessions have taken place, focusing in the importance of cybersecurity and interoperability in modern systems and also the vision for the future of engineering and technology, presented by representatives of different institutions who were at the conference, such as the European Commission, represented by the EC Commissionaire for Research and Innovation, Carlos Moedas.

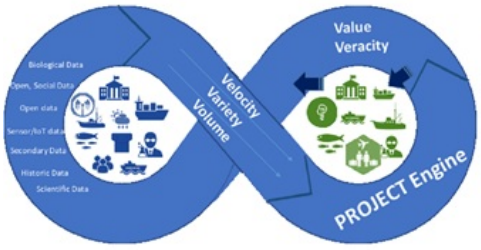
Several other authorities like the President of the Regional Government of Madeira and other representatives from the European Commission were also present at the event.

The work developed by R&D Nester, under the framework of the project "Power Systems Simulation" was presented in a technical session related to new trends in power systems. R&D Nester presented a methodology/tool to calculate the capacity of power grids to absorb new energy sources. The tool, designed for grid planning purposes, allows to obtain optimal solutions to maximize the capacity of a power grid to absorb new energy sources in different grid nodes without jeopardizing the operational security of that grid.





R&D NESTER ADDRESSES BIG-DATA FOR ENERGY IN A SCIENTIFIC PAPER IN A IEEE CONFERENCE RELATED TO H2020 PROJECT “BIGDATAOCEAN”



BIG DATA OCEAN

R&D Nester published and presented a scientific paper in the ICE/IEEE ITMC (International Conference on Engineering, Technology and Innovation) related to the subject-matter under development in the project in which it participates as a member of the consortium "BigDataOcean", a project funded by the European Comission program H2020.

In the presented paper, R&D Nester explained its view of the necessary characteristics of Big Data techniques for applications in power systems focusing in the applicability of these techniques for ocean wave forecasting. The paper also contains a general description of the pilot under development in the project context.

In parallel with this Conference, Nuno Amaro represented R&D Nester in the consortium meeting of this Project. The two days meeting allowed the different consortium members to present the current state of work related to the different project activities.

The main function of R&D Nester in this project is the development of a pilot/case study whose goal is to use Big Data techniques to improve the evaluation of energy potential of waves and in this context a presentation was made to the remaining consortium partners, illustrating the pilot services and characteristics designed until now.

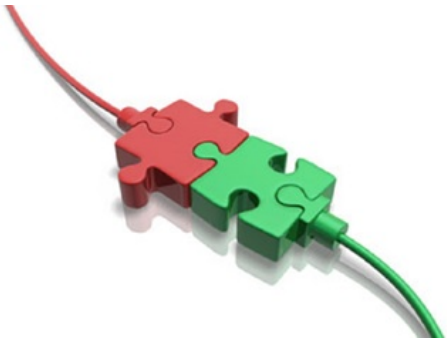
THE MINISTER OF SCIENCE, TECHNOLOGY, INNOVATION AND TELECOMMUNICATIONS OF BRAZIL VISITED R&D NESTER

A Brazilian delegation was received in R&D Nester facilities, led by the Minister of Science, Technology, Innovation and Telecommunications of Brazil, Gilberto Kassab.

The visit started with a presentation by Nuno Souza e Silva, Managing Director of R&D Nester, followed by a visit to R&D Nester laboratory, describing the current energy challenges being addressed and the work being done.



R&D NESTER INVOLVED IN DIGITALIZATION AND STANDARDIZATION OF ELECTRICAL NETWORK AT EUROPEAN LEVEL (AdHoc Group on IEC61850)



Multiple communication protocols currently exist in the area of electric system substation automation, which are often not compatible with each other.

The IEC61850 Standard for the design of electrical substation automation addresses many crucial aspects of Transmission System Operator (TSO) communications, data modeling and engineering in order to reach seamless interoperability of different vendors' subsystems within the TSO system management architecture.

Ricardo Cartaxo, researcher at the R&D Nester, is the representative of REN in the working group of ENTSO-E for the study of the IEC 61850 communication standard, which main purpose is to achieve interoperability between devices from different manufacturers, in a substation protection, automation and protection (PAC) system.

The prime goal of this group is to contribute to the use and improvement of this standard, by clarifying ambiguities and identifying gaps, bringing the view of the European TSOs to the IEC 61850 international community. This group is in close contact with the IEC working group in charge of the issuing of the standard, the WG10 of the Technical Committee 57, aiming to incorporate the ENTSO-E requirements in future editions of the standard.

Currently, the group main task is the creation of an IEC 61850 profile for all ENTSO-E members and the establishment of a standardized engineering process for the PAC system.

This profile will be the superset of the functions and signals defined by all the ENTSO-E members, eliminating duplicates, that is, signals that have different names, but with the same meaning. To do this job, a tool has been developed, the Interoperability System Tool (IST), so each one of the members can insert its own functions and signals for the construction of the profile.

The first step, just finished, was the 'distance protection exercise', which consisted in the introduction and compilation of the sub-functions and signals related to this protection function. In this development, Ricardo had the support of André dos Santos, the responsible in REN for the design and specification of PAC systems.

Next step will be the listing of all PAC functions for the introduction of the respective sub-functions. Finally, a gap analysis towards IEC 61850, to determine which new data models shall be added to the standard to cover all TSOs needs.

NEW H2020 ENERGY WORK PROGRAMME OFFICIALLY LAUNCHED ON OCTOBER 27

The European Commission has announced how it will spend €30 billion of the EU research and innovation funding programme Horizon 2020 during 2018-2020, including €2.7 billion to kick-start a European Innovation Council.

According to the press release , 2018-2020 Work Programme will focus efforts on fewer topics with bigger budgets, directly supporting the Commission's political priorities:

•A low-carbon, climate resilient future: €3.3 billion

•Circular Economy: €1 billion

•Digitising and transforming European industry and services: €1.7 billion

•Security Union: €1 billion

•Migration: €200 million

€2.2 billion will be earmarked for clean energy projects in four interrelated areas: renewables, energy efficient buildings, electro-mobility and storage solutions, including €200 million to support the development and production in Europe of the next generation of electric batteries.

About Past and Ongoing H2020 participation, see also:

•Horizon 2020 country participation [updated: October 2017] http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=country-profiles

Includes research-related data and recent success stories on projects relating to each country.

•H2020 Projects & Results [updated: October 2017]

http://ec.europa.eu/research/participants/portal/desktop/en/projectresults/index.html

Includes statistics on H2020 proposals, success rates, funded projects and participants.

R&D Nester is currently active in several H2020 projects and is looking forward towards further collaboration.

TIME SYNCHRONIZATION IN SUBSTATIONS

Time synchronization is a main issue in the project of PAC (protection, automation and control) systems of substations, because all devices must have the same time reference.

In the past, this was relevant only for time tagging of substations events; to perform a post mortem analysis of a power grid incident, it is a crux to know the correct time and sequence of all events.

For this purpose, an accuracy of a millisecond was enough. This was achieved using clocks receiving a long wave radio signal from a station located in Mainflingen, using the DCF 77 time code.

The advent of the GPS changed this. Central clocks in substations began to be synchronized by a local GPS receiver, sending the time to all substation devices, using a PPS (pulse per second), dedicated protocols (e.g. IRIG-B) or over data communication protocols, such as Lonworks.

The first edition of the IEC 61850 communication standard was published in 2004, prescribing the use of SNTP (simple network time protocol) to synchronize the devices at station level (control and protection units), having a millisecond accuracy.

This accuracy, however, is not enough for the line differential protection, which use a dedicated time synchronization system based, for instance using IRIG-B, which has an accuracy of a microsecond.

Nowadays, time synchronization is gaining an even high importance. The introduction of the process bus pushes the time synchronization system to a microsecond accuracy. Moreover, the protection algorithms now depend on the correct time stamp of the sampled values frames published by the merging units.

So, the SNTP, that is adequate to time-tag the signals that are generated at bay level, is of no use for the process level, since its accuracy is only at the order of a millisecond. IRIG-B has the required accuracy, but it requires a dedicated infrastructure.

Therefore, the trend is the Precision Time Protocol (PTP) or IEEE 1588, which first edition was published in 2002, with a revision in 2008. This protocol ensures the desired accuracy and uses the already existing communication network of the substation.

The PTP enables an easy redundancy, since it incorporates the BMCA (best master clock algorithm) that choses the best time source. Therefore, in a substation, two master clocks can be placed to run in parallel.

THE NEW MIBEL INTRADAY MARKET HYBRID OPERATION MODEL

The realization of the internal market for electricity in the European Union aims at reaping maximum benefits for society from cross-border competition and providing the right signals and incentives to drive the necessary investments to decarbonize the energy system1.

The single coupling of the several European spots markets is being accomplished under the European Commission regulation (EU) 2015/1222 of 24 July 2015, establishing a guideline on capacity allocation and congestion management (CACM regulation)2. It came into force on August 14, 2015.

The European wholesale electricity market is organized in two time frames: the day-ahead market, setting electricity prices and volumes on a daily basis for the 24 hours of the next day; and the intraday market, opening trading sessions after the day-ahead market and closer to the time of physical power delivery.

The intraday market allows market agents to adjust their committed schedules between the day-ahead market and real-time operation by means of selling or buying electricity bids. According to the CACM regulation, the single intraday market coupling means the continuous process where collected orders are matched and cross-zonal capacity is allocated simultaneously for different bidding zones in the intraday market. Towards the realization of the single European intraday market, the market operators EPEX, GME, Nord Pool and OMIE (the spot market operator of the MIBEL - Iberian Electricity Market), together with the Transmission System Operators (TSOs) from 12 countries, started the cross-border intraday market project. Hence, the MIBEL intraday market operation model of 6 intraday sessions has to be adapted to the realization of cross-border intraday continuous trading.

The selected operation model for the new MIBEL intraday market is hybrid, currently combining the established 6 intraday sessions model and the European model of continuous trading. The main change in the intraday sessions model relates to the cross-border bids between Spain and France (ES-FR): while, previously, the ES-FR trading was done in two sessions, with the implementation of the European continuous trading model, the negotiation with France and the remaining Europe is only possible in continuous trading.

In the hybrid model, from the market period immediately after the gate closure of a given intraday session to the beginning of the delivery horizon of the next intraday session, the continuous trading at each market period negotiate the delivery horizon starting at the beginning of the following second period until 1 hour before physical delivery. Parallel intraday sessions and continuous market trading address different periods of power delivery. For example, consider the 5th intraday session, starting at the 8th hour of the day (CET time zone) and corresponding to the beginning of the 9th market period. The trading in this session addresses the physical delivery between the 11th and the 24th hour of the day. However, the continuous market, at the 9th market period, is negotiating energy to be consumed between the 10th and 11th hour of the day.

In summary, the new MIBEL intraday hybrid operation model promotes the realization of the internal market for electricity by interlacing the established intraday sessions with continuous trading, thus presenting agents additional opportunities to balance their positions until 1 hour before real-time operation.

https://ec.europa.eu/energy/sites/ener/files/documents/1_en_act_part1_v9.pdf

https://electricity.network-codes.eu/network_codes/cacm/

LITERATURE REVIEW

OMICRON Magazine for the power industry "IEEE Transactions on Industrial Informatics" - Issue 2, 2017

R&D Nester published an article in the OMICRON Magazine entitled "Characterization of Substation Process Bus Network delays".

This article was wrote in the scope of R&D Nester Project "Smart Substation Testing and Implementation".



EASE-EERA Energy Storage Technology Development Roadmap 2017 Update

The European Association for Storage of Energy (EASE) and the Joint Programme on Energy Storage (JP ES) under the European Energy Research Alliance (EERA) presented the EASE-EERA Energy Storage Technology Development Roadmap (2017 Update).

The roadmap provides a comprehensive overview of the energy storage technologies being developed in Europe today and identifies the RD&D needs in the coming decades. On this basis, the roadmap provides recommendations for R&D policies and regulatory changes needed to support the development and large-scale deployment of energy storage technologies. The aim is to inform policymakers for research, innovation, and demonstration in the energy storage sector in order to further strengthen Europe's research and industrial competitiveness in the energy storage industry.



http://ease-storage.eu/category/publications/technical-documents/

EVENTS

28 -30 Nov 2017
VIENNA, AUSTRIA
EUROPEAN POWER STRATEGY AND SYSTEMS SUMMIT

30 Nov 2017
EUCI WEBINAR - THE BLOCKCHAIN TECHNOLOGY REVOLUTION

7 Dec 2017
LISBOA, PORTUGAL
O FUTURO DO SECTOR EÓLICO

30 -1 Jan /Feb 2018
AMSTERDAM, THE NETHERLANDS
5TH ANNUAL NEXTGEN SCADA EUROPE CONFERENCE

13 -15 Feb 2018
MARRAKESH, MOROCCO
PHOTOVOLTAICA 2018

15 Feb 2018
BRUSSELS, BELGIUM
UPDATING THE EUROPEAN STRATEGY ON ENERGY EFFICIENCY: MAKING BETTER USE OF ENERGY RESOURCES

11 -13 Apr 2018
LISBON, PORTUGAL
GREEN BUSINESS WEEK

26 -31 Aug 2018
PARIS, FRANCE
47TH CIGRE SESSION 2018

3 -5 Sep 2018
PORTO, PORTUGAL
INESC TEC - COURSE "ADVANCED DATA ANALYTICS FOR ENERGY SYSTEMS"

6 -8 Nov 2018
VIENNA, AUSTRIA
EUROPEAN UTILITY WEEK

LINKS

Some useful links:
ON RESEARCH, DEVELOPMENT AND INNOVATION

Portugal:

- Portugal 2020
- Programa Operacional Competitividade e Internacionalização (COMPETE 2020)
- Agência Nacional de Inovação
- COTEC Portugal

Europe:

- Energy Research Center of the Netherlands (ECN)
- European Energy Research Alliance (EERA)
- Horizon 2020
- Nordic Energy Research
- JRC Publications - Joint Research Centre - Smart Electricity and Interoperability
- ETIP SNET - European Technology and Innovation Platform Smart Networks for Energy Transition

Rest of the World:

- American Energy Innovation Council (AEIC)
- China Electric Power Research Institute (CEPRI)
- Electric power research institute (EPRI)

OTHER ORGANIZATIONS

Portugal:

- Laboratório Nacional de Energia e Geologia (LNEG)
- Polo de Competitividade e Tecnologia da Energia (EnergyIn)
- Associação de Energias Renováveis (APREN)

Europe:

- European Network of Transmission System Operators for Electricity (ENTSO-E)
- The European Wind Energy Association (EWEA)
- World Wind Energy Association (WWEA)

Rest of the World:

- CIGRE - International Council on Large Electric Systems

QUIZ

This quiz is about time synchronization, an issue with an increasing importance in protection and substation PAC (protection, automation and control system).

1) IEEE 1588 (ALSO KNOWN AS PRECISION TIME PROTOCOL – PTP) IS A HIGH ACCURACY TIME SYNCHRONIZATION STANDARD THAT RUNS OVER ETHERNET DATA NETWORKS AND ITS CURRENT VERSION IS THE VERSION 2. WHAT WAS THE YEAR THAT ITS FIRST VERSION (VERSION 1) WAS APPROVED?

- a) 2000
- b) 2002
- c) 2004
- d) 2008

2) IN 2008, INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC) HAS ADOPTED THE VERSION 2 OF IEEE 1588 (IEEE1588 V2). WHAT IS THE LABEL OF THIS PTP STANDARD UNDER IEC?

- a) IEC 61850 Ed. 2
- b) IEC 61588 Ed. 2
- c) IEC 60870 Ed. 2
- d) IEC 81346 Ed. 2

3) TAI STANDS FOR INTERNATIONAL ATOMIC TIME AND IS A TIME SCALE THAT PROVIDES THE EXACT SPEED AT WHICH OUR CLOCKS TICK. HOW MANY ATOMIC CLOCKS ARE PART OF TAI CLOCK SYSTEM WORLDWIDE?

- a) 2 atomic clocks
- b) About 50 atomic clocks
- c) About 100 atomic clocks
- d) About 400 atomic clocks

5) WHEN WAS “LEAP SECONDS” VALUE UPDATED (ADDED ONE SECOND) LAST TIME?

- a) 25th December 2015
- b) 31st December 2016
- c) 1st January 2017
- d) 10th July 2016

6) THE EPOCH IS THE ORIGIN OF THE TIMESCALE. WHAT IS THE PTP EPOCH?

- a) January 1st 1960 00:00:00 TAI
- b) January 1st 1970 00:00:00 TAI
- c) January 1st 1980 00:00:00 TAI
- d) January 1st 2000 00:00:00 TAI

7) WHICH OF THE FOLLOWING IS AN IEEE 1588 V2 PROFILE THAT IS SUITABLE TO BE APPLIED FOR SUBSTATION AUTOMATION?

- a) IEEE 1588-2008 Default Profile
- b) G.8275.2 Telecom profile
- c) Power IEEE C37.238
- d) SMPTE 2059-2 profile

8) IEEE 1588 CONSIDERS SEVERAL CLOCK TYPES. WHICH OF THE FOLLOWING CANNOT BE USED (EXCEPT FOR TIME DOMAIN SEPARATION) IF POWER IEEE C37.238 PROFILE IS ADOPTED?

- a) Slave-only clock

4) UNIVERSAL TIME (UT1) IS A TIME SCALE DIRECTLY RELATED TO EARTH'S ROTATION AND SO IT CONSIDERS THE SLOWING ROTATION OF EARTH. TAI IS CONSTANTLY COMPARED TO UT1 AND BEFORE THE DIFFERENCE BETWEEN THEM REACHES 0.9 SECONDS, A "LEAP SECOND" IS ADDED TO UTC (UNIVERSAL TIME COORDINATED). THIS IS DONE SINCE 1972. WHAT IS THE CURRENT VALUE FOR "LEAP SECONDS"?

- a) 12 seconds
- b) 20 seconds
- c) 27 seconds
- d) 31 seconds

- b) Grandmaster clock
- c) Transparent clock
- d) Boundary clock

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

Answers of the 10th edition Quiz

1) What is the power capacity of new renewable power plants projects foreseen to be installed in Portugal during 2017?

Answer: b) 750 MW

2) In 31st December 2016 the installed capacity of wind power was which percentage of the total installed capacity in Portugal?

Answer: a) 25 %

3) In the year 2016, what was the percentage of the Portuguese power demand that was fulfilled using renewable energy sources?

Answer: b) 57 %

4) Whats is the sector responsible for the highest greenhouse emissions in Portugal?

Answer: a) Transports

5) How many interconnections does the Portuguese Transmission Network have with Spain?

Answer: b) 8

6) What was the average interruption time (per year) in the Portuguese transmission system in the last 5 years?

Answer: a) Less than 30 seconds

R&D Nester - © 2014. All rights reserved

Tel.: +351 21 001 13 00

Email: info@rdnester.com

If you want to unsubscribe this newsletter, click here.