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EDITORIAL



Dear Reader,

Welcome to our first number of 2015!

Following two articles we have started in the previous edition, we bring you again some views at European level on the topic R&D on electricity networks and its regulatory framework, and on how some countries are addressing the issue, and further information on dynamic tariffs.

On our technical information section, we address issues such as Analytics, Big Data and Internet of Things as applied to electrical systems. These are all topics currently under intense debate in the energy field.

Our traditional section on Legislation provides you with the latest updates on key legal and regulatory pieces of information. Particularly relevant is the publication of Decree-Law 153/2014 creating the legal regimens for auto-consumption and for selling energy to the public network from small producing units based on renewable sources.

As in the previous edition, this section is also enriched with some interesting links and curiosities. We call your attention to the R&D Investment Scoreboard, where it is highlighted that more than 2/3 of the total investment is performed by German, UK and French companies, although with a decrease in volume by the later ones.

We maintain our section "Quiz" which was very popular in the first edition, with a quite interesting set of answers as you can see in the results presented. Test your knowledge again with a set of questions this time more tuned to our protection, automation and control experts!

You will find more on this and other topics in the notes below. We hope that you find the minutes spent with us both relevant and rewarding.

Sincerely,

Nuno de Souza e Silva
General Manager



HIGHLIGHTS



R&D Nester receives appreciation of "Outstanding Presentation" in IEEE conference



R&D Nester published and presented his first scientific paper, under the project "Multiattribute Energy Storage Planning" led by Miguel Moreira da Silva.

The research paper is entitled "Planning Energy Storage in Transmission Networks", has been accepted for presentation at the prestigious IEEE conference on Green Energy and Systems (IGESC), hosted by the University of California.

Miguel Moreira da Silva stated at the conference, the "benefits of dispersed energy storage facilities (i.e. batteries), to support the system operation, as well as REN's network development, in order to meet current and future technical and regulatory challenges.

As a result of this presentation, R&D Nester research team, for energy storage area, received from the Steering Committee of the conference, the appreciation of "Outstanding Presentation".

R&D Nester meets with Director of Smart Grid Research Center at UCLA

In providing the research paper in Energy Storage in the United States, Miguel Moreira da Silva (R&D Nester Project Leader) went to the University of California, Los Angeles (UCLA) to meet with the Director of Smart Grid Energy Research Center (smartgrid.ucla.edu), Prof. Rajit Gadh. At that meeting, Miguel Moreira da Silva presented R&D Nester, as well as the research areas of the center of R&D resulting from the partnership between REN and the China Electric Power Research Institute.

The R&D Nester Project Leader referred that "the Director of the UCLA proved to be very impressed by the ambition of R&D Nester, as well as the bet of REN and State Grid research in intelligent and sustainable energy systems. Indeed, it was open to evaluate opportunities to R&D partnership in order to materialize the mission of R&D Nester to establish an international network of innovation applied to the energy transport networks."

Regulatory framework for R&D (Part II)

In the previous number we have presented some background on the regulatory rationale behind R&D as well as some statistics related to some European countries. In this issue we will address the following:

- Global picture for R&D
- Project THOR: Five principles for a solution

Global picture for R&D

Based on a survey by the Battelle Institute in 2010 the R&D annual spending by country may be seen in the following picture. The top ten countries represent 80% of the total R&D investment around the world¹.

According to A.Sterlacchini a decline of R&D investment in the fields of energy and electricity and a significant reduction in R&D investments in the grids have occurred. The amount of R&D allocated in Europe is similar in 2012-2014 whose global share will from 26% in 2009 to less than 21.7% in 2014 while Asia rises from 38% in 2013 up to 39% in 2014 (source: Batelle).

Another interesting trend is that companies are continuously decentralizing their R&D by building new R&D facilities in offshore locations. The reasons may be twofold: (i) transfer technology from the home country or (ii) increase their stock of knowledge. In either case the benefits stands from reducing time to market or allows companies to be close to the markets where the results from R&D can be exploited. Moreover electric utilities do not carry long-term research projects which are primarily focused on fundamental research technologies² as used to be the case some decades ago.

When looking for the research priorities China puts more primacy in development rather than in fundamental research when compared with Europe and United States.

In Europe an improvement of transnational collaboration in RD&D is also encouraged through initiatives like the SET-Plan. France, United Kingdom, Germany, and Italy represent for more than 62% of both public and corporate RD&D.

When looking for 2020 and beyond the trend for R&D funding is illustrated in the next figure. At the current growth rates China will surpass EU by 2019 and US by 2022 in what concerns the R&D spending.

Project THOR: Five principles for a solution

In the electricity sector R&D and innovation have potential long-term economic benefits³ and there is a growing awareness about the need to foster R&D and innovation by extending the regulation of electricity markets. As mentioned in the previous newsletter the Europe 2020 Strategy has identified three priorities (Smart, sustainable and inclusive growth) and recognized Innovation as a key driver for the European economy. In that sense one essential target proposed by Lisbon Strategy⁴ was to reach before 2020 a level of R&D investment that should represent 3% of Europe's GDP.

Bearing in mind the third energy package⁵ where tasks explicitly TSO with RD&D necessary for pursuing and stimulating innovation activities there is a need to develop a rationale for TSO involvement in R&D activities. In order to deliver that rationale ENTSO-E solicited an external study (THOR) which provided three plausible scenarios bearing in mind the current regulatory framework:

- **Status quo** i.e. a continuation of the current R&D activities of TSOs. The end result may be amid others: "...Progress is made on grid innovation at European level, but the deployment is generally slow and not homogeneous over the whole continent...". **Integration of RES** "...deployed inefficiently requiring higher cost in terms of infrastructures and balancing...".
- **Manufacturers' holdup** corresponds to a scenario of reliance on private non-grid R&D initiatives where large equipment manufacturers undertake the R&D activities for electricity networks. The result may be a set of "... complete 'turn-key' systems, internally incompatible and with proprietary standards and information protocols...", i.e., **not adapted to TSOs needs**, nor cost-efficient.
- **Critical impetus** where "...policy makers have identified the urgency and the leverage that an effective R&D creates on system development and deployment... In this scenario efforts are concentrated on the core projects. The expected result is that "...The grid technology is developed, tested and deployed in a systematic and equitable manner in all member states. National R&D activities continue as before an important and complement the joint work in focusing on country specific solutions..."

In order to tackle with this the THOR study proposes solutions based on some key principles⁶ for the funding solution of R&D for TSOs.

- **Effectiveness:** when considering transmission system research, working with the grid operators is the most effective approach in terms of deployment and fit to specification
- **Transparency:** all R&D activities jointly performed that follow the ENTSO-E R&D Plan is fully transparent with strong stakeholder involvement
- **Efficiency:** The joint research to be done should be deployed in order to assure value for money.

A short and medium term action plan was proposed that start from the possibility to allocate an annual amount for research and development activities to be carried out in projects at European level that are guaranteed to have a financing eligibility. This proposal advocates that in the short there is no need for changing the current regulatory framework to support R&D activities. In the medium term the creation of a regulatory push for effective R&D activities is proposed together with an effective exploration of the

synergies with other sectors (e.g. ICT, gas).

Meanwhile TSOs and National Regulator Authorities (NRA) should work towards agreeing in a common framework to incorporate R&D expenses in the tariff structure. This means that from one side acknowledge the fact that current national legislations, where compliant with the Directive 2009/72/EC, generally are satisfactory to implement effective financing schemes for R&D activities and from the other the need for a clear set of criteria to define what to finance in terms of R&D activities to be pursued by TSOs should be considered a priority by the NRAs.

Some examples in Europe: In France, a part of the regulated grid tariff is dedicated to support R&D. In United Kingdom, National Grid has up to 0.7% of regulated transmission turnover. In Denmark the framework for R&D projects and funding is regulated by a specific act. In Italy, an incentive regulation mechanism for smart grid demonstration grids exists.

¹ U.S., China, Japan and Europe represent about 78% of 2014's total investment in R&D [source Batelle's survey]

² A. Sterlacchini, "Energy R&D in Private and State-owned Utilities: An Analysis of the Major World Electric Companies"

³ Albeit these benefits are difficult to quantify what stands from A.Sterlacchini study is that "drop of research expenditures is not associated with better outcomes in terms of profitability"

⁴ http://www.europarl.europa.eu/summits/lis1_en.htm#

⁵ Regulation (EC) 714/2009, art 8.3.a

⁶ More details and the full set of principles and rationale can be found in the THOR study



TECHNICAL INFORMATION



Analytics applications in electricity supply systems

In the face of a changing business environment, utilities are exploiting data to improve their business models. Analytics is the process of extracting information from heterogeneous data within a timeframe that respects business constraints and promotes business opportunities.

There are two analytic subsets often used in the industry: descriptive analytics that gauge current performance and predictive analytics that point to problem prevention. Here are given examples of how utilities are using analytics, namely, to enhance asset management and develop demand side management methodologies.

System and environmental data is being used to support risk-based methodologies. In the UK and Japan, transmission system operators (TSO) are developing risk-based approaches for asset replacement and investment planning [1,2], while in Portugal, risk-based methodologies have been applied to overhead line management [3,4]. In the US, analytics is being used by AEP for deploying preventive maintenance [5] and by Edison in the New York grid management [6].

Customers' data is being exploited for supporting demand response. In Gotland, the Swedish Vattenfall, through its subsidiary GEAB, has a pilot project addressing transactive energy services [7], while in the US, Austin Energy and the CPAU are studying analytics applications to reduce peak load [5]. In Spain, REE (the Spanish TSO) is spearheading the PERFILA project [8], a collaborative effort aiming at improving the load profiling capability.

These successful applications have taught some valuable lessons: keep in mind the sector's constraints, such as privacy, criticality and existing proprietary software, deploy prototypes to evaluate potential return and account for the utility's specific business environment.

¹ A. Johnson et al., "A framework for asset replacement and investment planning in power distribution networks", Cigré Session 45, Paris, 2014

² Y. Ogama et al., "Asset management methodology for optimization of long term replacement place of age facilities", Cigré Session 45, Paris, 2014

³ N. Pinho da Silva et al., "Predictive modelling of overhead lines reliability and lifetime", Cigré Session 45, Paris, 2014

⁴ N. Pinho da Silva et al., "Risk based maintenance and lifetime management of overheadlines", Cigré Belgium, Brussels, 2014

⁵ <http://www.utilitydive.com/news/how-4-utilities-are-using-big-data/293968/>

⁶ C. Rubin et al., "Machine Learning for the New York City Power Grid", IEEE TPAMI 34(2), 2012

⁷ Vattenfall's R&D Magazine, N 3, October 2012

⁸ <http://www.ree.es/en/press-office/press-release/2013/09/perfila-project-spearheaded-red-electrica-will-allow-more>

IEC released two white papers on Internet of Things and Smart City

In November 2014, IEC released its fifth white paper titled Internet of Things: Wireless Sensor Networks and its sixth white paper titled Orchestrating infrastructure for sustainable Smart Cities.

The Internet of Things White Paper discusses the use and evolution of Wireless Sensor Networks (WSN) within the wider context of the Internet of Things. It provides a review of WSN applications, while also focusing the attention on infrastructure technologies, applications and standards featured in WSN designs.

The Smart City White Paper explains what it needs to move cities to greater smartness; the what, who and how of smart city development. It calls for a wide collaboration between many stakeholders, including other international standardization bodies to ultimately lead to integrated, cost-efficient, and sustainable solutions.

The development of IEC White Paper is led by IEC MSB (Market Strategy Board). MSB is a relatively new board of IEC. It comprises 15 members of top-level technology officers from industry and IEC Officers. Dr. SHU Yinbiao, the General Manager of SGCC and one of the vice-president of IEC, is the current Convener of MSB. The function of MSB is to identify technological trends and market needs for IEC by establishing Special Working Groups, led by an MSB member, to investigate certain subjects in depth.

The white papers can be found and freely downloaded via the following link:

<http://www.iec.ch/whitepaper/internetofthings/>

Researchers set world record in solar energy efficiency

UNSW's solar researchers have converted over 40% of the sunlight hitting a solar system into electricity, the highest efficiency ever reported.

The world-beating efficiency was achieved in outdoor tests in Sydney, before being independently confirmed by the National Renewable Energy Laboratory (NREL) at their outdoor test facility in the United States.

"This is the highest efficiency ever reported for sunlight conversion into electricity," UNSW Scientia Professor and Director of the Australian Centre for Advanced Photovoltaics (ACAP) Professor Martin Green said.

"We used commercial solar cells, but in a new way, so these efficiency improvements are readily accessible to the solar industry," added Dr Mark Keevers, the UNSW solar scientist who managed the project.

The 40% efficiency milestone is the latest in a long line of achievements by UNSW solar researchers spanning four decades. These include the first photovoltaic system to convert sunlight to electricity with over 20% efficiency in 1989, with the new result doubling this performance.

Source:

<http://newsroom.unsw.edu.au/news/science-technology/unsw-researchers-set-world-record-solar-energy-efficiency>

<http://www.sciencedaily.com/releases/2014/12/141207091648.htm>

Dynamic tariffs Part 2

In the previous edition of this Newsletter, we presented the concept of dynamic tariffs in electricity, its motivations, some different types of implementation and some related regulatory issues. In this second part of the essay we will address additional details and implementation cases.

Dynamic pricing for retail electric utility service has received attention since the late 1970s. Since then, numerous pilot programs have been conducted, as well as more limited permanent deployments.

The concept of dynamic pricing by retail electric utilities has been in existence for more than three decades. The concept has been widely studied, tested and, on a relatively limited basis, implemented by the electric utility industry. Initial efforts to develop dynamic pricing programs began in the late 1970s and early 1980s in response to the dramatic increases in oil prices and rising electric rates.

In those years, the first wave of electricity pricing experiments was carried out under the auspices of the U.S. Department of Energy and its predecessor agency, the Federal Energy Administration.

United States Federal and State initiatives to deregulate electricity in the late 1990s, along with the Western energy crisis of the early 2000s stimulated a second phase of widespread interest in dynamic pricing. Then in the late 2000s, promotion of the Smart Grid and maturation of wholesale power markets in certain regions stimulated another wave of interest that is continuing today.

Following are examples in the USA:

In California

- PG&E has enrolled 80,000 customers on CPP (critical peak pricing)
- SDG&E is offering PTR (peak-time rebate) on an opt-out basis to 2 million customers
- SCE is offering PTR on an opt-in basis and more than 2 million customers have signed on

In Illinois

- Both the investor-owned utilities, ComEd and Ameren, have enrolled about 25,000 customers on RTP (real-time pricing) in Illinois
- A new state law calls for opt-in PTR to be offered statewide.

In Spain, an example was the Hourly demand tariff. This tariff type defines seven tariff periods, depending on demand, being Period 1 regarded as the critical period. This period differs from others by presenting prices (energy and power) considerably higher. The days that belong to Period 1 are indicated by the operator of the transmission system and usually correspond to days of greater shortage of supply. This period lasts for thirteen hours, set between 8h and 0h, and can occur 23 times, on weekdays during the Dry Period.

Electricite de France (EdF) began offering its CPP rate (called the "Tempo Tarif") to residential customers across France in 1996. There was an experimental stage between 1989 and 1992, a tariff launch during 1993-1995, and a generalisation after 1995. It was then offered to commercial customers with a minimum capacity of 9kW as well.

Other examples include the German "Intelliekon" project, which started in 2008, and the Norwegian, real-time pricing (RTP) offered by certain electricity retailers.

Although dynamic pricing is tested and implemented for several decades now, simulations and experiments have greatly abstracted away from all the price transmission mechanisms between the network and the retailers and have focused solely on the final retail price that consumers face. The great majority of pilots and implementations are in the U.S.A. However, besides trial and pilot experiences, also large scale deployments have been done. A further split occurs between residential experiences and commercial and industrial (C&I) experiences. All these particular situations present different results.

It can be concluded that customers do respond to dynamic pricing, to a larger or smaller extent, depending on several context characteristics. In particular, low income customers also do respond to Dynamic Pricing. Additionally, the intensity of customer's response to dynamic pricing varies with the price incentive.

In the majority of cases, weather conditions (e.g., temperature or humidity) are used as the key driver for triggering critical events.

In terms of implementation parameters, the great majority of cases surveyed declared critical days between 10 and 22 days per year, and the number of hours per peak event is mostly frequently 4 hours. E-mail, telephone or SMS are the most common forms of notification of customers of an upcoming dynamic pricing event.

It was verified that customer response survives the novelty phase and persists over time.

In terms of results, the implementation results do show a clear reduction of the peak profile of the utilities, and do show a customer bill reductions for the majority of customers. In most cases, reduction between 10% and 20% during the peak periods were observed.

Although in most studies load shifting or reduction were almost always present when customers are exposed to dynamic tariffs, it is never discussed whether dynamic tariff is applied only to the energy component of the final tariff, only to the network / grid tariff of the final tariff, or a mix.

It is also worth mentioning that metering technology is rapidly changing, creating the opportunity to provide time-varying rates for the mass market.

A critical issue is always the ratio between costs (equipment, software, systems, people) and benefits associated with implementation of such a system. Therefore, pilots for fine-tuning key parameters to the particular application case shall be run beforehand.



LEGISLATION

Portaria n.º 212-A/2014, de 14 de Outubro
Establish several criteria regarding the allocation of political costs within the electric tariffs.
[Read Document](#)

Decreto-Lei n.º 153/2014, de 20 de Outubro
Approves the legal framework for the electric self consume legal regime.
[Read Document](#)

Portaria n.º 278-B/2014 - Diário da República n.º 250/2014, 1º Suplemento, Série I de 2014-12-29
establish the percentage related to the electricity social tariffs.
[Read Document](#)

Despacho (DGEG) n.º 8/2014
Update of the cogeneration reference tariff. (4th quarter 2014)
[Read Document](#)

Portaria n.º 263/2014, de 16 de Dezembro.
Management of the QREN incentives reimbursements.
[Read Document](#)

Decreto-Lei n.º 172/2014, de 14 de Novembro
Several updates regarding the electricity social tariffs legal regime.
[Read Document](#)

Portaria n.º 278-C/2014 - Diário da República n.º 250/2014, 1º Suplemento, Série I de 2014-12-29
establish the proceedings for the assignment of the electricity social tariffs.
[Read Document](#)

CURIOSITIES

HIGH LEVEL CONFERENCE ON EU ENERGY POLICY AND COMPETITIVENESS, 17 NOVEMBER, BRUSSELS

"There is no energy security without a fully functional and completed Internal Energy Market. The European Council recognised the urgency of achieving a fully functioning and connected internal energy market. The Italian Presidency is rightly insisting on the necessity of a completed internal energy market. As a major energy market with half a billion consumers, an integrated and transparent internal energy market will be the backbone of the Energy Union."

[Read the full speech of Commissioner Miguel Arias Cañete](#)
[Watch the entire conference](#)

HIGH LEVEL CONFERENCE ON BUILDING A EURO MEDITERRANEAN ENERGY BRIDGE, 18 NOVEMBER, ROME

"Secure, sustainable and affordable energy is also a key priority for the Southern and Eastern Mediterranean countries. Energy cooperation is a key priority for the Euro-Mediterranean Partnership. The EU and the countries of the Southern and Eastern Mediterranean now have a unique opportunity to work together towards developing new sources of energy, new gas and electricity networks, integrating our markets, and cutting demand through improved energy efficiency."

[Read the full speech of Vice-President Maroš Šefčovič](#)

EU INVESTS €647 MILLION IN KEY ENERGY INFRASTRUCTURE, 29 OCTOBER 2014

On 29 October, Member States agreed to allocate €647 million to support key priority infrastructure projects. The bulk of the support goes to gas projects in the Baltic region as well as in Central Eastern and South Eastern Europe. Funding will come from an EU programme called the Connecting Europe Facility (CEF). The supported projects will increase Europe's energy security and help end the isolation of Member States from EU-wide energy networks. They will also contribute to the completion of a European energy market and the integration of renewables to the electricity grid.

[Read the full press release](#)
[Read the MEMO](#)

LITERATURE REVIEW

Kids Energy corner...thinking about our future Engineers!

<http://www.eia.gov/kids/>

<http://www.energykids.eu/>

<http://ses.jrc.ec.europa.eu/kids-corner>

<http://www.fplsafetyworld.com/> (Under 11 years old)

<http://learn-energy.managenergy.net/education/kidscorner/en/u11/u11.htm> (Over 11 years old)

R&D and Innovation Information

EU companies must boost R&D investment to stay globally competitive

Carlos Moedas, Commissioner for Research, Science and Innovation said: "Despite the harsh economic climate, EU companies continue to invest in R&D. That is good news, but more is needed to keep up with our competitors. With public resources limited, attracting private R&D investment is even more essential. Horizon 2020 is already engaging more businesses than ever before, but now we're ready to step up our game. The EUR 315 billion investment plan presented by the Commission and European Investment Bank will help to raise more private investment for riskier projects, benefiting R&D across Europe."

Source: European Commission - Press release, Brussels, 04 December 2014

Key findings of the 2014 EU Industrial R&D Investment Scoreboard⁷

- The world top 2500 R&D investors continued to increase their investment in R&D (4.9%) well above the growth of net sales (2.7%).

- Volkswagen leads the global ranking for the second consecutive years, showing again a remarkable increase of R&D (23.4%, up to €11.7bn). Second continues to be Samsung, showing also an impressive R&D increase of 25.4% followed by Microsoft (US).

- EU companies in the automobile sector, accounting for one quarter of the total EU's R&D, continued to increase significantly their R&D (6.2%).
- The poor R&D performance of EU companies in high-tech sectors such as Pharmaceuticals (0.9%) and Technology Hardware and equipment (-5.4%) weighed down the total R&D increase of the EU sample. The overall amount invested in R&D by EU companies in high-tech sectors represent 40% of the amount invested by their US counterparts and the gap between the two company sample is increasing with time.

⁷ The EU Industrial R&D Investment Scoreboard is published annually by the European Commission (DG Research and Innovation and DG Joint Research Centre).

Trends

For EU based companies, 97% of the total R&D investment is by companies based in 10 countries. The overall performance is largely driven by companies based in three countries: Germany, France and the UK, which account for more than two thirds of the total. In Germany and the UK, companies' investment continued to grow (5.9% and 5.2% respectively) above the average while French companies saw a decrease in R&D investment (-3.4%).

The full text of the Scoreboard report, the press release and memo can be consulted at:

<http://iri.jrc.ec.europa.eu/scoreboard14.html>

Main findings of the survey, can be found on:

<http://iri.jrc.ec.europa.eu/survey14.html>

The Commissioner presentation is available at:

<http://ec.europa.eu/avservices/video/player.cfm?ref=1096096>



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19-20 FEBRUARY
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NICE

[6TH ANNUAL EUROPEAN
SMART GRIDS SUMMIT
2015](#)

17-18 MARCH
2015

SYDNEY, AUSTRALIA

[SEAPAC 2015: SOUTH
EAST ASIA PROTECTION
AND AUTOMATION
CONFERENCE](#)

10-12 MARCH
2014

DENMARK

[EWEA OFFSHORE 2015](#)

27-28 MAY
2014

SWEDEN

[LUND SYMPOSIUM](#)

01-05 JUNE
2014

SOCHI - RUSSIAN
FEDERATION

[THE INTERNATIONAL
SCIENTIFIC AND
TECHNICAL CONFERENCE](#)



LINKS



- [American Energy Innovation Council](#)
- [Associação de Energias Renováveis \(APREN\)](#)
- [China Electric Power Research Institute \(CEPRI\)](#)
- [Electric power research institute \(EPRI\)](#)
- [Energy Research Center of the Netherlands \(ECN\)](#)
- [European Energy Research Alliance \(EERA\)](#)
- [European Network of Transmission System Operators for Electricity \(ENTSO-E\)](#)
- [The European Wind Energy Association \(EWEA\)](#)
- [Horizon 2020](#)
- [Laboratório Nacional de Energia e Geologia \(LNEG\)](#)
- [Nordic Energy Research](#)
- [EnergyIn](#)
- [Redes Energéticas Nacionais \(REN\)](#)
- [State Grid Corporation of China \(SGCC\)](#)
- [World Wind Energy Association \(WWEA\)](#)

FUNDING Opportunities

Funding for the R&D and Innovation and business competitiveness (*useful links*)

National funds

Portugal 2020 - See [here](#) the most recent information about calendar calls and other important information.

Our highlight goes to the new portuguese user-friendly app service available - [Balcão 2020](#) - is the access point to the operational programmes financed by FEEL (European Structural Funds and investment) for all entities wishing to apply for funding for their projects. This is where you will find information about funding available for the period 2014-2020 and everything you should know about the submission of his application and the follow-up of your project in its various phases.

National support Entities: [FCT](#) and [ANI](#) (ex-ADI)

Legislation: Management of repayments of the QREN incentives systems - see the [Portaria n.º 263/2014, de 16 de Dezembro](#).

European funds

New usefully site available [Access to EU finance](#)



QUIZ



1) USUALLY, A SUBSTATION IS DIVIDED INTO:

- ☐ A) Pays
- ☐ B) Bays
- ☐ C) Days
- ☐ D) Jays

3) IN A SUBSTATION, WE CAN FIND:

- ☐ A) A primary system only
- ☐ B) A secondary system only
- ☐ C) Both primary and secondary systems
- ☐ D) A tertiary system

5) PAC STANDS FOR:

- ☐ A) Protection, automation and control
- ☐ B) Protective automated command
- ☐ C) Perimeter access control
- ☐ D) Parameter alert center

7) WHICH OF THE FOLLOWING IS A COMMUNICATION SERVICE DEFINED BY THE IEC 61850?

- ☐ A) SWAN
- ☐ B) CRANE
- ☐ C) GOOSE
- ☐ D) DUCK

9) YOU ARE READING A DOCUMENT ABOUT ENGINEERING PROCESS DEFINED BY THE IEC 61850 AND SEE THE ABBREVIATION SCL. WHAT DOES IT MEAN?

- ☐ A) System control language
- ☐ B) System configuration layout
- ☐ C) Substation centralized design
- ☐ D) Substation configuration language

2) WHICH FROM THE FOLLOWING EXISTS IN A SUBSTATION?

- ☐ A) Backyard
- ☐ B) Steelyard
- ☐ C) Brickyard
- ☐ D) Switchyard

4) IED IS AN ABBREVIATION FOR:

- ☐ A) Intelligent exploding device
- ☐ B) Infrared emitting diode
- ☐ C) Intelligent electronic device
- ☐ D) Internal electric drive

6) WHAT IS THE IEC 61850?

- ☐ A) A communication protocol
- ☐ B) A standard defining communication networks and systems for power utility automation
- ☐ C) A set of rules for CO2 emission reduction
- ☐ D) A standard that defines the limits of noise produced by substation devices

8) WHICH OF THE FOLLOWING IS A FUNDAMENTAL CONCEPT OF THE IEC 61850?

- ☐ A) Logical Node
- ☐ B) Physical Node
- ☐ C) Connectional Node
- ☐ D) Functional Node

10) HOW MANY PAGES THE FIRST EDITION OF THE IEC 61850 APPROXIMATELY HAD?

- ☐ A) 250
- ☐ B) 500
- ☐ C) 1000
- ☐ D) 2000

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

send

Answers of the 2nd edition Quiz

1) What percentage of sunlight can the best silicon solar cells convert into electricity?

Answer: D 25 per cent - 83% voters

3) What is clean coal?

Answer: D All of the above - 17% voters

5) What is the theoretical power of a single five metre high wave equivalent to?

Answer: C 1000 MW per kilometre of coastline - 33% voters

7) What pest could potentially help us produce biofuels?

Answer: B Termites - 100% voters

2) Which of the following renewable energy sources are able to provide baseload power?

Correct: C Geothermal - 83% voters

4) Which of the following statements about wind energy is false?

Answer: D Wind turbines reach maximum power output at wind speeds of 25 metres per second - 100% voters

6) What is not a major constrain preventing the widespread use of hydrogen as a replacement for fossil fuels?

Answer: D it cannot be used in private cars - 16% voters

8) What type of dwelling is designed to harness its energy from natural factors like sunlight and body heat?

Answer: C Passive house - 50% voters



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