Zero Trust Approach Regarding Experts In Energy Systems: Preventing Fake News Influence On Decision Makers

Nuno Soares Domingues[1],[2]

[1] Instituto Politécnico de Lisboa/ Instituto Superior de Engenharia de Lisboa, Rua Conselheiro Emidio Navarro, 1, 1959-007 Lisbon, Portugal

[2]ICNOVA, Universidade NOVA de Lisboa, Universidade Nova de Lisboa, Avenida de Berna 26C, edifício ID, sala 3.20, 1069-061 Lisbon, Portugal

Abstract: *Information is key to decision makers and agents operating in energy markets. Understanding the operation, advantages, different types of systems, the economic indicators, the environmental impacts and the technical aspects involved of the different types of Energy is essential to decide.*
Society is moving in digital media, social networks to influence populations and organizations and seeking the support of the political class to obtain privileges, to introduce changes to the energy sector and to ensure the maintenance of the current rules of distributed generation. The spread of false information about energies has presented itself as a significant obstacle to the growth of these sectors, to misleading focus and to foster bad energy neglecting better ones.
In addition, the legal uncertainty caused by a possible change of rules in the middle of the game, is already negatively impacting the development of the sector, with the risk of further delaying the effective entry into a more environmentally, economically and socially sustainable world market.

Keywords: *Decision Making, Renewable Energy, Economic Sustainability, Environmental Impact, Energy Markets, Distributed Generation, Fake News;*

1. Introduction

Zero Trust is a security strategy based on the philosophy that no person or entity, inside or outside the area, should be given full access to influence systems without validating all the information and whenever it is explicitly necessary. In short, it means the absence of any implicit trust.

In 2010, Forrester Research analyst John Kindervag proposed a solution called "Zero Trust." It was a shift from the strategy of "trust but verify" to "never trust, always verify." In the Zero Trust model, no one is trusted to access a resource until their identity and authorization are verified. This process applies to those who are typically within a private network, such as an employee on a company computer working remotely from home or on their mobile device during a conference on the other side of the world. It also applies to all people or endpoints outside of that network. It doesn't matter if you've accessed the network before or how many times: your identity isn't trusted until it's verified again. The idea is to assume that all machines, users, and servers are unreliable until proven otherwise.

The Zero Trust security strategy can be adapted to the information received by an expert or specialist in a particular area. Assuming that he is not the holder of absolute truth, all his information and conclusions must be supported by evidence or explanatory relationships. Thereby, Zero Trust can be a philosophy sustaining that no person or entity, inside or outside the area of knowledge, should influence decision makers without validating all their information and whenever it is explicitly necessary. In short, it also means the absence of any implicit trust in every saying but the need for explanatory reports and proved studies.

2. How Zero Trust Tailored to Decision-Making Works

The original Zero Trust model can be interpreted as an extremely vigilant security agent: it methodically and constantly verifies your credentials before allowing access to the building where you work, even if it recognizes you, duplicating this process to verify your identity continuously. The Zero Trust model relies on strong authentication and authorization for every device and person before any access or transfer of data takes place on a private network, regardless of whether they are inside or outside that network perimeter. The process also combines analysis, filtering, and logging to verify behavior and continuously observe signs of compromise. If a user or device shows signs of action other than the previous one, they will be observed and monitored as a potential threat.

The adapted Zero Trust model verifies past opinions and their veracity over time to rank the level of trust of the expert or entity. It is a phase that can resemble the level of authorization and permissions of a user in a given system. The validation of credentials in a methodical and constant manner is done by the invitee or interpellate and is based on this level of authorization. Thus, the same assertion by the same expert may have different reliability depending on the place where it is asserted. This is similar to what happens with researchers and their publications: scientific journals and conferences of the specialty have seals and rankings that define the treatment and prior analysis of the information to be made available.

The adapted Zero Trust model weights the bibliographic references and basic studies to verify for diversity, broad studies, and a complete approach to the main and related areas of study. This makes it possible to check if there are combinations between research groups to manipulate information through cross-citations that artificially increase trust. If an investigator shows signs of action other than the previous one, they will be observed and monitored as a possible threat.

This basic change in approach overcomes many common information security threats. The identification of these pseudo-expert "invaders" who take advantage of the weaknesses of the scientific perimeter and then exploit data and studies that are not explicit can pass the moat of the castle and confuse themselves with real experts.

Mutual authentication occurs when two parties authenticate to each other at the same time, such as a user with a login and password, and an application with which they are connecting through a digital certificate. The adaptation to be made for the study in question is that not only does the expert choose where he wants to publish, but he is also chosen by the means of publication. Thus, both are harmed, or both are benefited.

Given the multiplicity and diversity of readers of the studies, the adapted Zero Trust architecture uses a variety of security controls and principles to address common security challenges through preventative techniques.

The main functionalities of the adapted Zero Trust model are:.

- Visibility into studies available in cloud and on-premises environments
- Control of network flows between all assets, improving the availability of studies among interested parties and researchers in the area of knowledge
- Identity verification and ability to grant a virtual reliability score
- Network segmentation as well as application layer segmentation
- Authentication and authorization of both parties
- Granular access policies (access to influence decision-making by reliability tiering)
- Service Insertion
- Security in the information to be transmitted and made available
- Improved decision-making performance
- Motivation for the integration of new researchers
- Mechanism of repulsion of researchers without credibility
- Protects against fake news

- Proactively identify, block, and mitigate targeted threats.

A Zero Trust architecture works seamlessly for users, agents, policymakers, and ordinary citizens, reduces the information uncertainty surface, protects against fake news, and simplifies infrastructure requirements. Different components of the Zero Trust architecture can help ensure the trust of the information network and prevent malicious attacks by fake news.

The media, scientific journals, conference chairs and decision-makers need to ensure that users and agents can safely accept information, without the complexity associated with complex approaches and languages. Information access and security are complex and constantly changing. Changes and deployments through traditional forms of communication and accreditation usually take days (and often involve many components and interlocutors) using valuable resources and with the possibility of spreading fake news for a long time. The proposed adapted Zero Trust security model can reduce architecture complexity and improve information reliability.

With the rise of the cloud, the network perimeter no longer exists in the way it was used. Users and applications can be inside or outside the castle moat. This leads to weaknesses in the perimeter that malicious actors can exploit. Once inside the moat, it is common for lateral movement to go unmonitored, leading criminals to access high-value resources and assets. The same is true of information on social media: it is easier for a pseudo-expert to influence public opinion, the knowledge of decision-makers and the response to legislation. With this, it is possible to change the course of a country according to the intentions of unfriendly-intentioned lobbies or with very strong self-interests

3. The ICNOVA Research Centre

ICNOVA [2] is a new research unit in the field of Communication Sciences in Portugal, resulting from previous R&D units (CECL and CIMJ, pioneers in the area; and CIC.Digital). The current structure comprises four research groups:
- Media and Journalism
- Culture, Mediation and Arts
- Strategic Communication and Decision-Making Processes
- Performance and Cognition

And three laboratories:
- BlackBox
- iNOVA Media Lab
- LEC – Performing Arts Laboratory

ICNOVA focuses on strengthening the link between research and advanced training through partnerships with institutions, universities and international networks, promoting interdisciplinarity and rejuvenating the team through the integration of young researchers in groups and laboratories via scientific employment financed by S&T projects and institutions.

In terms of relations with society, industry and other R&D units, ICNOVA develops collaborative interfaces in academia and with key stakeholders, investing in innovative research, and in interacting with the community through the provision of services and the production of content from public interest.

The Fundação para a Ciência e a Tecnologia (FCT) is the national public agency that supports research in science, technology and innovation in all areas of knowledge. It is a public institute of special regime under responsibility of the Ministry of Science, Technology and Higher Education. The Last FCT Evaluation to the ICNOVA research centre was Excellent, highlighting the information reliability that spreads

4. Case Studies

Fake news around energy is diverse and changes according to the intentions of pressure groups and a country's national strategy. Portugal is in a moment of energy transition aligned with the European Union (EU). The EU has committed itself to a clean energy transition, which will contribute to fulfilling the goals of the Paris Agreement on climate change and provide clean energy to all. To deliver on this commitment, the EU has set

binding climate and energy targets for 2030: reducing greenhouse gas emissions by at least 40%, increasing energy efficiency by at least 32.5%, increasing the share of renewable energy to at least 32% of EU energy use and guaranteeing at least 15% electricity inter-connection levels between neighbouring Member States. To ensure that the EU targets are met, EU legislation requires that each Member State drafts a 10-year National Energy and Climate Plan (NECP), setting out how to reach its national targets, including the binding national target for reducing greenhouse gas emissions that are not covered by the EU Emissions Trading System (ETS). The European Commission has analysed each contribution and defined assessment for Portugal and all Member States.

One of the fake news is that Distributed Generation (DG) is responsible for generating thousands of direct jobs, which would end if cross-subsidization is eliminated. This is not true. Distributed energy (DG) projects yield extraordinary financial results. For example, those of decentralized solar energy are around 40% per year. In addition, it is the owners of small businesses, small farmers, popular houses that have invested in solar energy and not only the big banks, big companies (such as supermarket chains), heavy industries and services. However, there isn't no justification anymore for maintaining the subsidies for the big companies. Simply because they don't need it anymore as solar energy is already super profitable. If these advantages (paid for by all the consumers) are withdrawn, the profit margin will remain well above the market average, enabling the sustainable expansion of solar energy, with not only the maintenance of current jobs, but with the hiring of thousands of others. This is because it will be a sustained, rational economy that does not destroy the competitiveness and structuring gains of the entire electricity sector.

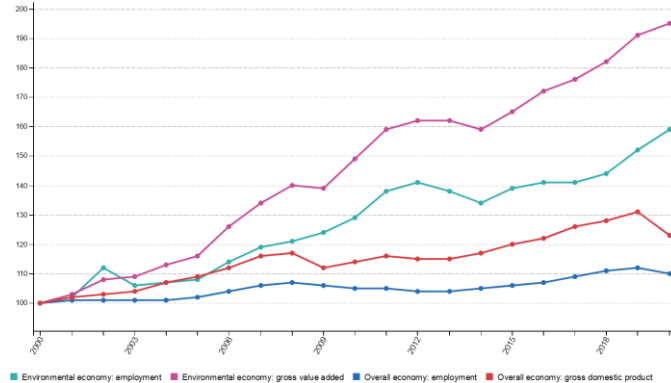Figure 1 [3] illustrates the Employment in the environmental economy

Fig.1- Employment in the environmental economy

According to Eurostat estimates, employment in the EU environmental economy increased from 3.2 million full-time equivalents in 2000 to 5.1 million full-time equivalents in 2020. The environmental economy generated €828 billion output and €341 billion gross value added in 2020. [3]

The environmental goods and services sector, abbreviated as EGSS and also referred to as environmental economy or eco-industries, consists of a heterogeneous set of producers of goods and services aiming at the protection of the environment and the management of natural resources.

Environmental goods and services are products manufactured or services rendered for the main purpose of [4]:
- preventing or minimising pollution, degradation or natural resources depletion;
- repairing damage to air, water, waste, noise, biodiversity and landscapes;
- reducing, eliminating, treating and managing pollution, degradation and natural resource depletion;
- carrying out other activities such as measurement and monitoring, control, research and development, education, training, information and communication related to environmental protection or resource management.

Another fake news is that the expansion of the DG will allow the cleaning of the energy matrix and eliminate environmental impacts. Portugal an EU already has one of the cleanest energy matrices in the world, as can be seen in Figure 2. [5]
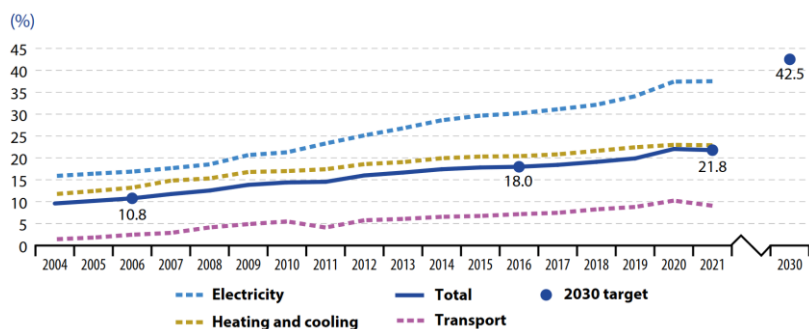
Fig. 2- Share of renewable energy in gross final energy consumption, by sector, EU, 2004–2021

According to Eurostat estimates, in 2022, the EU carbon dioxide (CO_2) emissions from fossil fuel combustion (oil and oil products, natural gas, coal and peat) for energy use in the EU territory reached almost 2.4 Gigatons (Gt), indicating a decrease of 2.8%, compared with the previous year. CO_2 emissions from energy use are a major contributor to global warming and account for around 75% of all man-made greenhouse gas emissions in the EU. The fuel mix, housing standards, economic growth, size of the population, and transport and industrial activities are some factors that influence CO_2 emissions from energy use.

Figure 3 [5] illustrates the Primary energy consumption, by country, 2016 and 2021, in tonnes of oil equivalent per capita

(¹) 2021 population data are estimated and/or provisional.
(²) Break(s) in population data time series between the two years shown.
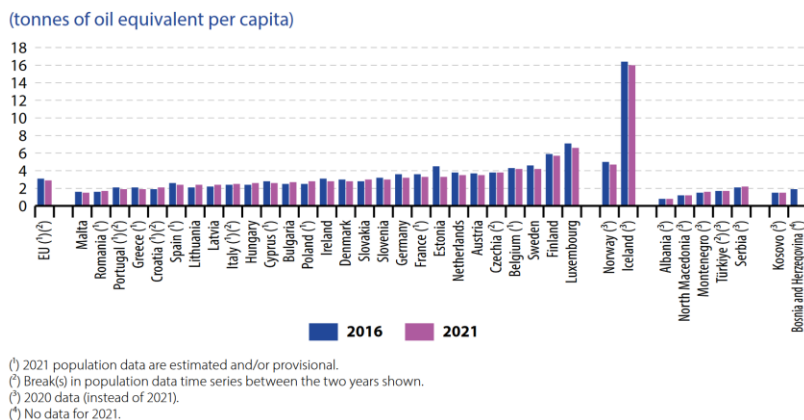(³) 2020 data (instead of 2021).
(⁴) No data for 2021.

Fig 3- Primary energy consumption, by country, 2016 and 2021, in tonnes of oil equivalent per capita

The energy consumption indicator measures a country's total energy needs excluding all non-energy use of energy carriers (such as natural gas used for producing chemicals rather than for combustion). Primary energy consumption represents a country's total energy demand before any energy transformation, excluding energy carriers used for non-energy purposes. In comparison, final energy consumption covers the energy consumed by end users, such as industry, transport, households, services and agriculture.

There is the widespread and almost unanimously accepted fake news that maintains that distributed solar power generation is the cleanest way to produce electricity. This is not true because in their production and disposal at the end of their useful life (25 to 35 years), photovoltaic panels leave a considerable carbon trail. The proper disposal of photovoltaic panels at the end of their useful life needs to be on the agenda of Congress. Inexplicably, GD does not support adequate policies to prevent thousands of panels from being thrown in the trash, with enormous risk to the ecosystem. The potential environmental impacts associated with solar power—land use and habitat loss, water use, and the use of hazardous materials in manufacturing—can vary greatly depending on the technology, which includes two broad categories: photovoltaic (PV) solar cells or concentrating solar thermal plants (CSP). The scale of the system—ranging from small, distributed rooftop PV arrays to large utility-scale PV and CSP projects—also plays a significant role in the level of environmental impact. The PV cell manufacturing process includes a number of hazardous materials, most of which are used to clean and purify the semiconductor surface. These chemicals, similar to those used in the general semiconductor industry, include hydrochloric acid, sulfuric acid, nitric acid, hydrogen fluoride, 1,1,1-trichloroethane, and

acetone. The amount and type of chemicals used depends on the type of cell, the amount of cleaning that is needed, and the size of silicon wafer. While there are no global warming emissions associated with generating electricity from solar energy, there are emissions associated with other stages of the solar life-cycle, including manufacturing, materials transportation, installation, maintenance, and decommissioning and dismantlement. [6-9]

There is a common agreement that DG reduces thermal dispatch (i.e., the need to activate coal, diesel and gas thermoelectric plants), which are more expensive and dirtier. Any country in the world needs to have immediate dispatch generation sources in its energy matrix (i.e., that can be made available on the grid quickly). This strategic reserve is currently provided by hydroelectric, thermoelectric or nuclear power plants. No country in the world accepts to be 100% supplied by renewable and intermittent sources of energy, which depend on uncontrollable factors to generate energy, assuming that the wind always blows, the sun shines every day and enough rain falls to fill the reservoirs of the hydroelectric plants. It is utopian, therefore, to believe that energy systems have continuity of supply and energy security without thermoelectric powerplants to guarantee the generation of energy for a country. Figura 4 [10] shows the Gross available energy in the European Union, 1990-2021, in Petajoule.
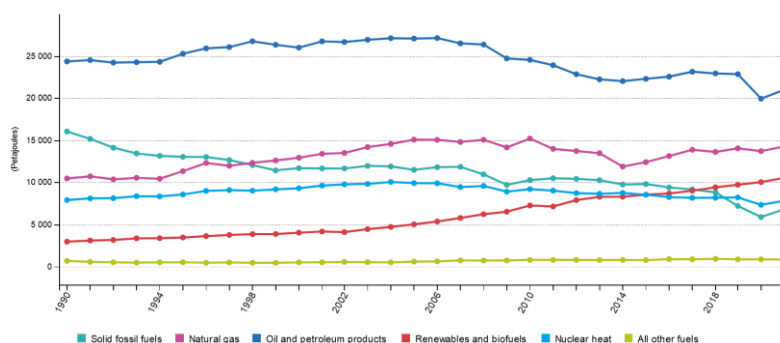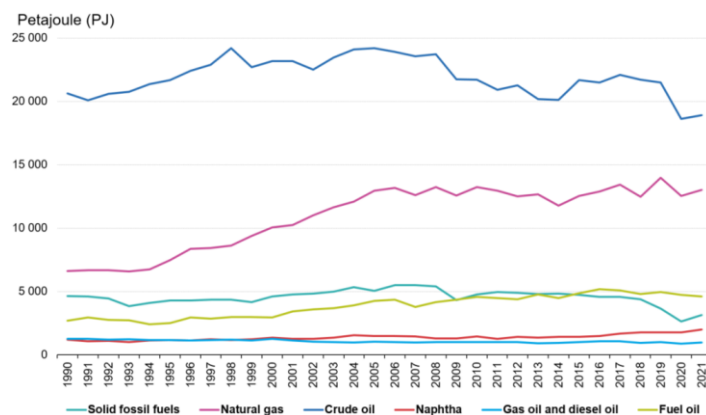

Fig. 4 - Primary energy production by fuel

Over the past decade, the trend in primary energy production was generally negative for solid fossil fuels, oil, natural gas, and nuclear energy. The production of natural gas saw the sharpest decline, followed by solid fossil fuels and oil and petroleum products. The production of renewable energies followed a clear positive trend over the same period, similarly to waste (non-renewable). All these data seem to cope with this fake news but one needs to pay attention to the total energy, meaning energy production and energy imports. Figura 5 [10] shows the Imports and exports of selected energy in the European Union, 1990-2021, in Petajoule.

The decrease in primary energy production in the EU over the past decades resulted in increased imports of primary and secondary energy products. This increase slowed down in 2020 and increased again in 2021. The quantity of imported natural gas almost doubled over the decade, making it the second largest imported energy product. Crude oil again ranked first in terms of quantities imported.

5. Conclusions

The spread of false information about renewable energies, such as solar power, hydropower, biodiesel, biogas and biomethane, has presented itself as a significant obstacle to the growth of these sectors. Understanding the operation, advantages, different types of systems and the technical aspects involved of the different types of Energy is essential to decide.

Fake news has specific characteristics in each sector. In the field of biodiesel, for example, fake news associate's biofuel with problems in diesel engines and equipment.

The proposed Zero Trust model aims to address this drawback and is based on three basic principles: Do not trust any entity by default; Enforce least-privilege access; Implement constant security monitoring.

The modern form of communication is becoming increasingly mobile, accessing cloud applications and services from multiple devices outside the corporate perimeter. In the past, many scientific journals, conference chairs, and media outlets adopted a "check first, trust later" model, which meant that if someone had the correct user credentials, they were admitted as experts whenever they asked for it. This has resulted in an increase in the risk of exposure, dissolving what was once the trusted zone of control and leaving many organizations, people, and governments exposed to fake news. The protection and verification of information is increasingly necessary to prevent decision-making from being made based on fake news. Also, legislative stability is necessary, because if the current rules are changed, we will have the closure of several micro and small companies in a sector that is active and generating jobs even in times of economic crisis.

Many other aspects of distributed micro and mini generation that weigh in its favor could be addressed in this article, however, in order not to extend the subject too much and not make its reading an exhaustive task, we point out only the most controversial topics and arguments that lacked technical foundation.

6. Acknowledgment

7. References

[1] The Definition Of Modern Zero Trust, Forrester Research Inc, https://www.forrester.com/blogs/the-definition-of-modern-zero-trust/ , last access 01st of November of 2023

[2] ICNOVA, NOVA Institute of Communication, https://www.fcsh.unl.pt/en/unidades-investigacao/icnova-en/ , last access 01st of November of 2023

[3] EuroStat, Environmental economy – statistics on employment and growth, updated 7 March 2023, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Environmental_economy_–_statistics_on_employment_and_growth , last access 01st of November of 2023

[4] EuroStat, Glossary:Environmental goods and services sector (EGSS), https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Environmental_goods_and_services_sector_(EGSS) , last access 01st of November of 2023

[5] EuroStat, Sustainable development in the European Union Monitoring report on progress towards the SDGs in an EU context 2023 edition, ISBN 978-92-68-00375-6, doi:10.2785/846970

[6] Environmental Protection Agency (EPA). Renewable Energy at Mining Sites.

[7] National Renewable Energy Laboratory (NREL). 2012. Renewable Electricity Futures Study. Hand, M.M.; Baldwin, S.; DeMeo, E.; Reilly, J.M.; Mai, T.; Arent, D.; Porro, G.; Meshek, M.; Sandor, D. eds. 4 vols. NREL/TP-6A20-52409. Golden, CO: National Renewable Energy Laboratory.

[8] National Renewable Energy Laboratory (NREL). Best Research-Cell Efficiencies.

[9] IPCC, 2011: IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation. Prepared by Working Group III of the Intergovernmental Panel on Climate Change [O. Edenhofer, R. Pichs-Madruga, Y. Sokona, K. Seyboth, P. Matschoss, S. Kadner, T. Zwickel, P. Eickemeier, G. Hansen, S. Schlömer, C. von Stechow (eds)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1075 pp. (Chapter 7 & 9).

[10] EuroStat, Energy statistics - an overview, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_statistics_-_an_overview , last access 01st of November of 2023