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DIGITAL TRANSFORMATION OF RENEWAL ENERGY INDUSTRY AFTER COVID

[1]Bui Anh Tu, [2]Nguyen Duc Duong

[1]PhD., Thuyloi University, buianhtu@tlu.edu.vn
[2]Hanoi University of Natural Resources and Environment

Abstract

Compared to many other industries, energy is perhaps one of the most sensitive sectors to technological shifts in the world. So, at the present time, how is technology making the energy industry "makeover"? The following article will update the latest developments on this topic, by going through some of the impacts of digital transformation in the energy industry. The development of renewable energy sources is considered an inevitable trend in the world today, as it makes an important contribution to limiting greenhouse gas emissions, protecting the environment, as well as reducing dependence on renewable energy sources. fossil fuels. The world is recording many positive signals in the process of restructuring the energy industry, in which the strong development of "green energy" sources is considered a prominent bright spot. In recent years, the energy industry has become a dynamic economic sector, making a very important contribution to promoting socio-economic development, ensuring national defense and security in many localities and countries. According to aggregated data, in 2020 the national energy consumption will increase significantly, the energy consumption structure is shifting towards energyization.

Keywords: digital conversion; sustainable Developmet, Renewal Energy, New Economic Context.

1. INTRODUCTION

Digitization technologies have been adopted quite early in the energy industry, compared to many other industries. Such as SCADA systems, WAMs (wide area measurement systems) in the power sector, or data collection in the oil and gas sector in the 1980s to serve the exploration of oil fields, as well as increase efficiency. mine operating capacity. However, the amazing changes of recent digitization technologies - especially those of sensing, storage, data analysis and information networks, along with the application of automation techniques compatibility has ushered in the digital transformation of the energy industry with results that surpass previous advancements. Energy is the infrastructure, the driving force for the socio-economic development of a country. An adequate and sustainable energy supply is one of the keys to determining economic growth. This means that energy policy is an extension of national policy. In contrast, national policy is the standard by which an energy policy is evaluated and established. Therefore, energy planning needs special attention. Vietnam is one of the developing countries in Southeast Asia with an increasing demand for electricity to serve the industrialization of the country. However, our country's electricity system currently mainly uses fossil fuels such as coal, oil, and gas for electricity generation. The result of this choice is that, in addition to facing a shortage of this fossil energy source due to its gradually depleting reserves, the use of fossil energy is polluting, greatly affecting the environment. environment. Meanwhile,

Vietnam is known as a country with great potential for renewable energy (RE) sources, but currently only exploits and uses a very small percentage because most renewable energy projects are of high cost. low profitability, installation technology is still complicated, so it is not attractive to both users and investors. So far, the number of projects of this size and scale in our country is very small, the proportion of installed capacity of power plants produced from renewable energy in the total installed capacity of the whole system is still very modest.

2. Renewable energy development

Solar energy: Solar energy is often used in the form of solar thermal power plants, solar electric batteries, solar hot water, solar drying equipment, etc. Due to the advancement in technology for manufacturing solar panels, leading to the improvement of efficiency in converting solar heat into electricity and reducing the cost of panels in the past time; As well as the Government of Vietnam's solar power purchase and sale policy (Table 1), a series of solar power plants were established across the country, mainly in the South-Central Coast provinces.

Thus, if in 2018, the installed capacity of solar power in Vietnam only reached 105 MW, in 2019 this number has increased to 5GW and by 2020, the installed capacity has increased to 16.5GW. The boom in investment in solar farms and rooftop solar power has led to a solution to control solar power development by EVN and local authorities. Besides the strong development of solar power projects, other applications of solar energy (solar water heaters) are still in a slow state of development.

Wind energy: According to the World Bank and other energy organizations, Vietnam has great potential for wind energy (NLG) with an estimated 520 GW of installed capacity. Wind energy can be developed into electrical energy in two main areas: onshore wind power and offshore wind power. With large and stable capacity, small land area, and competitive electricity price; Many wind power projects on land and offshore in Vietnam have come into production and/and are in the investment stage.

Thus, the total wind power capacity by 2025 included in the Power Plan VII in June 2020 is 11,800MW, much higher than the initially set target of about 800 MW in 2020 and about 2,000 MW in 2025, and about 6,000 MW in 2030. Calculation results of author Du Van Toan [7] show that Vietnam's sea area has great technical wind energy potential that can reach 637 GW and account for 13,4% of theoretical wind energy. Therefore, a series of large domestic and foreign corporations are implementing and preparing investment projects for onshore and offshore wind power projects in Vietnam.

Biomass energy: With a huge potential for biomass energy, including tens of millions of tons of agricultural by-products (straw, rice straw, rice husks, cereal crops, etc.); tens of millions of tons of domestic waste, tens of millions of tons of livestock waste. The by-products and wastes that are causing environmental pollution need to be treated; but also a renewable energy resource that can be recovered by combustion. According to the 2011 National State of Environment Report, the total volume of domestic solid waste generated nationwide is about 44,400 tons/day. By 2019, this figure is 64,658 tons/day (urban area is 35,624 tons/day and rural area is 28,394 tons/day).

Other forms of energy: Besides the energy sources mentioned above, Vietnam also has potentials for other renewable energy sources but has not been invested in research and exploitation, nor has any preferential policies. first aid. These are forms of energy such as tidal energy, wave energy, geothermal energy, etc. To be deployed into energy supply projects, these forms of energy need to overcome many other policies, technical, technological, and logistical barriers.

3. Mode, digital policy conversion renewable regeneration

In Vietnam, the concept of 'digital transformation' is often understood in the sense of changing from a traditional business model to a digital one by applying new technologies such as big data (Big Data), Internet of Things (IoT).), cloud computing (Cloud) etc… to change the operating method, leadership, working process, company culture. Not only does digital transformation play an important role in businesses, but digital transformation also plays an important role in other areas of society such as government, mass media, medicine, science...

In the national digital transformation program, energy is one of the eight priority areas for implementation. Decision No. 749 dated June 3, 2020 approving the National Digital Transformation Program to 2025 and orientation to 2030 by the Prime Minister defining: “Digital transformation in the energy sector, in which priority is given to focus on the power sector towards maximizing and automating networks for efficient power supply. Connect digital meters to improve speed and billing accuracy, identify network problems faster, help users save energy, and detect losses. Electrical Power". Vietnam has approved a smart grid roadmap to gradually modernize the power grid and apply advanced technologies in grid management. In particular, focus on promoting the development of distributed power sources, small-scale renewable energy sources and the interactive participation of electricity users in the management and adjustment of electrical loads. Vietnam has actively deployed automation technologies to integrate a large number of uncontrollable renewable power sources such as wind power and solar power into the system.

Up to now, the competitive electricity generation and wholesale market in Vietnam has begun to take shape, and power plants have been able to bid competitively in a transparent and fair environment. The process of restructuring the electricity industry (separating between natural monopoly and competitive factors) is being carried out, aiming at the formation of a competitive electricity retail market, providing customers with a choice of Select the power supply unit. Vietnam has issued a roadmap to develop the electricity market at three levels in order to liberalize electricity generation, electricity wholesale and electricity retail, respectively.

Renewable energy development is a major policy of the Party and State, which has been concretized in Resolution No. 55 of the Politburo, the Prime Minister's Decision approving the Renewable Energy Development Strategy and other policies mechanism to encourage the development of renewable energy projects.

Renewable energy development goals in Vietnam's Renewable Energy Development Strategy for the period to 2030 with a vision to 2050, approved by the Prime Minister in Decision No. 2068/QDTTg dated November 25th/ In 2015, the proportion of electricity produced from RE (including large and small hydroelectricity) in the total national electricity production must reach 32% by 2030 and 43% by 2050. In the revised Power Master Plan VII, it is expected that renewable energy sources (including small hydropower, wind power, solar power, and biomass power) will account for 21% of the country's total power capacity by 2030. And in Resolution No. 55-NQ/ The Central Government on February 11, 2020, of the Politburo stipulates that the proportion of RE sources in the total primary energy supply will reach 15-20% in 2030 and 25-30% in 2045, corresponding to the proportion of renewable energy in the total energy supply. The nationally produced electricity is about 30% in 2030 and 40% in 2045.

In order to achieve the above-mentioned RE targets, the Ministry of Industry and Trade has advised and submitted to the Government of Vietnam to issue various incentive mechanisms for different types of renewable energy that are assessed as having great potential as follows:

Table 1: *Summary of incentive mechanisms for renewable electricity development*

Type of renewable energy	**Type of technology**	**Incentive and Effective Mechanism**	**Selling price (excluding VAT)**
Small hydropower (under 30MW)	Power production	Avoidable cost tariff	The avoidable cost tariff is published annually by the Ministry of Industry and Trade
Wind power (for projects put into operation before November 2021)	Project on land	FIT for 20 years	8,5 USCents/kWh
	Offshore project	FIT for 20 years	9,8 USCents/kWh
Biomass	Co-generation of heat-electricity	FIT for 20 years	7,03 USCents/kWh
	Not Co-generation of heat-electricity	FIT for 20 years	8,47 USCents/kWh
Electricity from waste	Burning	FIT for 20 years	10,05 USCents/kWh
	Bury	FIT for 20 years	7,28 USCents/kWh
Solar power	Floating solar power	FIT for 20 years	7,69 USCents/kWh
	Ground solar power	FIT for 20 years	7,09 USCents/kWh
	Rooftop solar power	FIT for 20 years	8,38 USCents/kWh

Source: Report of the National Steering Committee on Electricity Development

In addition to the incentive mechanisms for buying electricity as mentioned above, renewable energy projects in Vietnam can also enjoy other support mechanisms such as incentives for corporate income tax, equipment import tax, incentives on land use, and access to finance...

Table 2: *Other incentive mechanisms for grid-connected renewable power projects.*

No	Financial incentive mechanism	Degree
1	Corporate income tax	Corporate income tax rate: - The first 4 years from the year of taxable income: 0% - Next 9 years: 5% - Next 2 years: 10% - The remaining years: 20%
2	Import Tax	Goods imported as fixed assets, materials and semi-finished products not produced domestically. Investors should check the annual List of goods and products exempt from import tax announced by the Ministry of Planning and Investment.
3	Using land	Preferential land rental according to the regulations of the province
4	Environmental protection fee	0%
5	Investment	The Vietnam Development Bank (VDB) lends up to 70% of the total investment cost at an interest rate equivalent to that of a 5-year Government bond plus 1%/year

Source: Report of the National Steering Committee on Electricity Development

In recent years, with the active participation of the Government, ministries, branches, and

localities, Vietnam's business environment has continuously improved, creating excitement for domestic and foreign investors. expand the scale of production and business activities. In addition, people's material and economic life increases, leading to an increase in electricity demand. However, this is also a huge challenge for Vietnam's electricity industry in the context of

1. The domestic primary energy supply has reached its limit, leading to dependence on imported fuel.

2. Distribution of power sources and uneven load causing great transmission pressure on the North-South 500kV transmission line system.

3. Climate change impacts lead to drought; hydroelectric reservoir lacks water for production.

4. Some Power projects under the revised Power Master Plan VII are behind schedule compared to the requirements set forth…

The above challenges take place in the context that the power system is under a lot of pressure to ensure electricity supply, especially when the operation progress of thermal power sources faces many risks. Creation is considered as one of the important solutions. Politburo also issued Resolution 55 on the orientation of Vietnam's national energy development strategy to 2030, with a vision to 2045. In which, setting targets for renewable energy sources to account for a billion the share of total primary energy supply will reach about 15-20% by 2030; 25 - 30% by 2045.

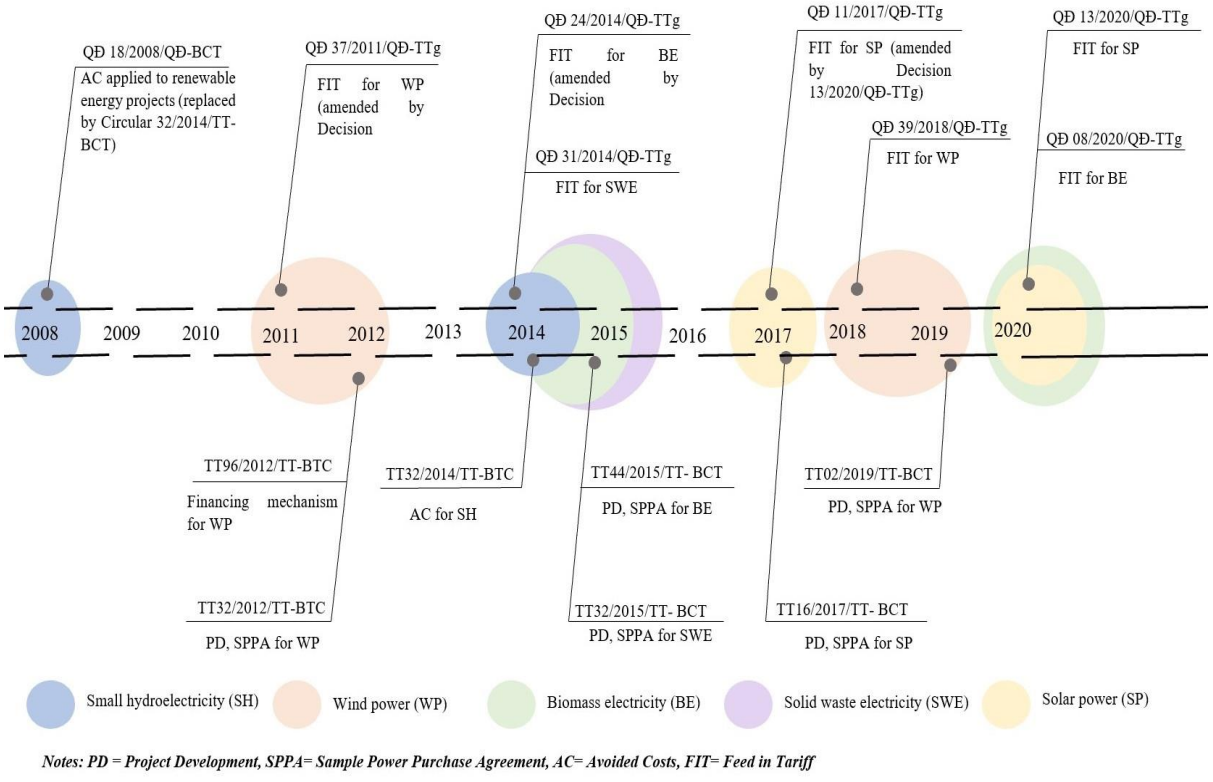

Figure 1: *Current incentive mechanism for renewable energy development [1].*

As of 2018, the total capacity of solar power plants put into operation was only about 86 MW, accounting for 0.18% of the national power capacity structure. However, at that time, when Decision No. 11 took effect, there were many farms solar power projects (PPD) that had been supplemented with the planning.

Specifically, as of April 2018, the total capacity of solar PV plants added to the master plan is about 7,667 MWp, equivalent to about 6,286 MW(ac). However, the grid connection planning of these solar power plant projects is carried out independently without a comprehensive assessment of the relevant grid

responsiveness in the region. Realizing that this may cause risks to the existing transmission grid, in May 2018, PECC2 proactively proposed to the Electricity of Vietnam (EVN) to calculate and prepare a Report "Research and development". rescue and release capacity of solar and wind power plant projects nationwide until 2020" and has been agreed by EVN. PECC2's capacity clearance report has made the following main contents:

(1) Reviewing the list of solar and wind power sources expected to be put into operation in the period up to 2020 which has been supplemented by the Ministry of Industry and Trade and the Prime Minister.

(2) Reviewing the synchronous grid of projects and the list of electricity grids expected to be invested by EVN up to 2020.

(3) Assess the responsiveness of the power grid.

(4) Calculating the amount of solar and wind power that cannot be consumed because the grid has not yet met.

(5) Proposing relevant power grid solutions to put into operation to meet the power transmission needs of solar and wind power plants.

Developing renewable energy sources will mitigate the impacts of climate change (reducing greenhouse gas emissions) and pollutants from burning fossil fuels; at the same time, adding capacity to the power system, contributing to increased economic benefits for localities, businesses and creating jobs for workers. In line with Vietnam's commitments in the 2015 Paris Agreement, the Government of Vietnam has issued decisions on mechanisms to encourage the development of solar power projects in Vietnam (Decision No. 11/2017/QD-TTg). and Decision No. 13/2020/QD-TTg), a mechanism to support the development of wind power projects in Vietnam (Decision No. 37/2011/QD-TTg and Decision No. 39/2018/QD-TTg), mechanism supporting the development of biomass power projects in Vietnam (Decision No. 08/2020/QD-TTg) and a mechanism to support avoided cost tariff for small hydropower plants.

In the Prime Minister's Decision, No. 39/2018/QD-TTg amending and supplementing a few articles of Decision 37/2011/QD-TTg dated June 29, 2011, on the mechanism to support the development of projects. wind power projects in Vietnam. Accordingly, the price of wind power in the mainland is adjusted to 1,927 VND/kWh; offshore wind power is 2,223 VND/kWh... This electricity price is applied to part or the whole plant with commercial operation date before November 1, 2021 and applied for 20 years from the date of operation. Commerce.

The decision of the Prime Minister, No. 13/2020/QD-TTg, dated June 6, 2020. Regarding the mechanism to encourage the development of solar power in Vietnam, clearly states: EVN is responsible for purchasing all solar power output grid connections within 20 years from commercial operation. Rooftop solar power systems are allowed to sell part or all the generated electricity to the Buyer, which is Vietnam Electricity. Electricity of Vietnam or an authorized member unit makes payment for electricity from the rooftop solar power system to the national grid at the prescribed electricity purchase price.

Decision 08/2020/QD-TTg dated March 5, 2020, amending, and supplementing a number of articles of the Prime Minister's Decision No. 24/2014/QD-TTg dated March 24, 2014, on support mechanisms development of biomass power projects in Vietnam. Accordingly, for heat-electricity co-generation projects, the electricity purchase tariff at the delivery point is 1,634 VND/kWh, equivalent to 7.03 US cents/kWh. For projects that are not heat-power cogeneration projects, the electricity purchase tariff at the delivery point is 1,968 VND/kWh, equivalent to 8.47 US cents/kWh, according to the exchange rate calculated at the central exchange rate of Vietnamese Dong. Nam with US Dollar announced by the State Bank of Vietnam on February 21, 2020.

4. Difficulties and obstacles in converting renewable energy quantities

4.1. Mechanism and policy

- The price of electricity from renewable energy sources is currently higher than that of electricity from traditional energy sources (thermal power, large hydroelectricity...). Electricity of Vietnam (EVN) is being assigned by the state to purchase all electricity output from renewable energy power projects at a price set by the state. Thus, EVN is performing the function on behalf of the state, the cost of compensating the price for renewable energy is being combined with the cost of the electricity industry, not yet clearly separated in the electricity bill. When the proportion of RE increases, the price compensating component will increase and greatly affect the cost of electricity industry.

- The RE market needs clear policies and legal procedures to increase investors' interest. The support mechanisms in the past time have not given a long-term orientation: From the beginning of 2021 until now, solar power projects are not allowed to apply the FIT tariff, while the bidding mechanism has not been issued. Similarly, wind power projects after November 1, 2021 also do not have an application mechanism.

- Feed in Tariff (FIT) is applied uniformly throughout the country, leading to the phenomenon of concentration development in areas with great economic potential (high solar power radiation, high average wind speed), the As a result, it is overloading the power grid in some areas or investing in places with low electricity demand, having to carry electricity far away. To overcome this drawback, it is necessary to have policies to encourage development by region and region.

- Lack of standards and regulations of renewable energy projects: Standards and certificates are needed to ensure that equipment manufactured or procured from abroad is consistent with current standards. The issuance of the necessary standards is to ensure that the enterprises operating the plant comply with the applicable laws. The lack of necessary standards also causes confusion and renewable energy producers face unnecessary difficulties.

4.2. Financial

Invest in renewable energy projects with large capital requirements, high risks because capacity and output depend on weather and climate, long payback due to higher investment rates and electricity prices than traditional energy sources. . Therefore, financial institutions and commercial banks are often not ready to lend to investment projects in the RE field.

4.3. Technically

4.3.1. Issues related to the integration of renewable energy sources into the power system (power system)

The production of electricity from renewable energy sources (wind, solar or ocean waves…) these types of sources of electricity generation is not continuous and unstable, so their integration with the power system faces challenges such as:

- Power quality is an important factor in the power system to ensure the stability and high efficiency of the grid system, creating high reliability and low cost.

- The availability of electricity is one of the biggest concerns in integrating RE with power systems: Solar power does not generate electricity at night, and wind power depends on the speed of the wind.

- Overall forecasting: In power systems forecasting is a key topic of energy management system for grid system development planning to ensure stability and high reliability, because since most of the renewable energy technologies depend on weather and environmental factors, it is very difficult to predict the power generation accurately.

- Location of RE sources: Most large-scale RE power plants usually occupy land with a considerable area (solar power accounts for about 1.2ha/1 MWp, wind power accounts for 0.35ha/1MWp.). Choosing a site to build a RE

power plant will entail many factors affecting its integration into the power grid. For example, if the location of the RE plant is far from the power grid, it will affect the cost and efficiency of project operation. The ability of renewable energy sources to generate electricity also depends a lot on the weather and climate at the site where the renewable energy source is built.

- The issue of cost and economic estimation is an important part of the integrated planning of RE sources - the power grid because it must ensure the lowest possible cost ratio. The two main goals of renewable energy project development are economic and environmental. To integrate a large amount of capacity from renewable energy sources, consider installing energy storage devices. However, the storage system has a high cost, and this is really an economic challenge when integrating renewable energy sources - large-scale grid.

4.3.2. Impacts of solar power and wind power on the power system

It can be seen that, with the characteristics of rapid, uncontrolled, and uncontrolled change in power generation capacity (capacity), solar power and wind power will cause significant fluctuations to the power system whenever solar radiation and wind change bias, or stop. If other power sources are not invested to replace at that time, or the existing power sources are not adjusted to increase (or decrease) capacity in time to compensate - offset while EIA and Solar Power are involved. The power system will unbalance the power supply and consumption load. At that time, the voltage and frequency of the power system will slip out of the allowable rated index and the technical protection systems will operate, with serious consequences that can disintegrate the grid and lose power on a large scale.

It is necessary to have another backup power source to mobilize when wind and solar power changes rapidly, or suddenly stops. Thus, to ensure the safe operation of the power system, without voltage and frequency drops, it is necessary to have an available capacity roughly equivalent to the total capacity of participating SP and WP sources.

On the other hand, in order to be able to actively control alternative power sources, or main control SP and WP sources when there is an abnormality, the power system operator needs to have measures, tools, and accurate forecasting capacity. the change of wind speed, the increase and decrease of solar radiation during the day, during the week... even if there is enough backup power.

3. Measures to prevent bad and dangerous impacts on the power system and promote the development of solar and wind power sources

It is necessary to equip the capacity to forecast changes in solar power capacity in the short term, based on the laws of variation and forecast of meteorology, hydrology, weather, and operation characteristics of renewable energy sources at the forecast time in order to actively mobilize other sources to replace and support. According to the recommendation of the EGI International Consultant, it is necessary to build a monitoring and control center for renewable energy sources (at the National Load Dispatch Center and lower-level dispatching centers); retrofit power quality monitoring software; invest in data collection and forecasting systems for renewable energy sources.

The power system needs to be invested in additional backup sources so that in addition to power generation operation, there is also a rotating reserve capacity (hot standby) to quickly mobilize and balance the source - load in the variable times of RE.

The power transmission and distribution industry needs to invest in upgrading the smart grid, on the one hand to increase the ability to absorb and transmit renewable energy sources, and on the other hand, to be able to respond to fluctuations in SP and WP capacity.

The investors of solar power and power plants need to calculate and evaluate the effects of harmonics and have solutions to install harmonic filtering equipment to reduce the impact of bad signals on the plant and power system.

It is necessary for research to apply the installation of storage batteries, charge when the solar power source, the VA exceeds the load demand, and generate electricity when these sources stop operating. Of course, the current prices of the equipment. Energy storage is still high, affecting the economic efficiency of renewable energy sources, but their price trend is decreasing rapidly, and technology is also improving.

An important point is that instead of strongly developing solar farms with a scale of several tens to hundreds of MW, it is necessary to focus on propaganda, promotion and strongly encourage the development of rooftop solar PV in houses, factories, and buildings. commercial house. Rooftop solar PV has many preeminent features: small scale; distributed layout; connection only and low or medium voltage grid (0.4 kV or 22 kV); can mobilize investment socialization...

5. Solutions to improve the efficiency of digital transformation of the renewable energy industry

Faced with the challenges of the pandemic, many new technologies have been developed to cope with difficulties, thereby changing the operation of many industries. This change also has a significant impact on human behavior, from learning and working remotely, to online shopping, virtual reality entertainment experiences...

5G, AI, and cloud computing technologies are gradually becoming familiar in large urban areas, being applied to activities in specific environments such as places with abnormally high - low temperatures, far offshore, areas without power grid… This leads to increasing electricity consumption, causing shortages, affecting energy security.

Meanwhile, the world is moving towards green energy, reducing carbon, and protecting the environment. Therefore, it is necessary to find solutions for efficient energy conversion, achieving the goal of being carbon neutral by 2050.

At the 24th National Conference on Electronics, Communication and Information Technology held in Hanoi on December 18, the speakers shared the trend of energy transition to 2025. Accordingly, a series of awards Technology application methods in the efficient use and management of energy are introduced.

Huawei experts said that from now to 2025, there will be many new energy use trends in the telecommunications sector, including energy digitization, "zero-carbon" telecommunications networks, replacing lead-acid batteries. Lithium batteries, 5G applications in life, diversification of energy sources, self-driving car systems...

Some digital transformation solutions in the energy industry that are being implemented in Vietnam and many countries around the world are to provide on-site power supply for 5G base stations, bank ATMs, schools, and other areas. lack of power grid, replacing traditional generator solution. Energy digitization solutions bring high efficiency in intelligent energy distribution, which can be controlled remotely, saving operating costs.

Around the world, projects applying energy conversion solutions show their practical effectiveness. In Spain, the smart solar approach reduces 3.2 tons of carbon per year. In Pakistan, 81% of business operating costs are cut by eliminating diesel generators.

In addition to technology application solutions in the process of using, green energy and environmental protection goals are also realized by storage devices for energy management, advanced digitization of PV modules to improve processing efficiency. power generation process, real-time IoT application to improve power supply reliability…

The trend of using Lithium batteries in energy storage started in 2011 for telecommunications projects in Pakistan, Paraquay, Netherlands, Latin America, Japan, China... Total global capacity of energy The amount of storage through Lithium batteries reached nearly 3GWh in 2019, saving investment costs and bringing economic benefits to users.

To achieve the goal of digitizing energy, integrated power solutions also need to reduce storage space, provide intelligent temperature control systems, reliable backup power, and ensure network safety.

Flexible power supply solutions need to be replicated from telecommunications to education, environment, aviation, railways, oil and gas, communications, public safety, finance, healthcare... to household activities. family.

With digital transformation in the energy industry, AI artificial intelligence helps to increase computing capacity, proactively filter information, identify and solve problems quickly. The solution uses AI based on big data analysis, to help restore power supply capacity, support making recommendations, and provide accurate investment advice, bringing economic benefits to businesses.

6. Conclusion

Firstly, Renewable energy is a good and sustainable trend, but the unbalanced development due to rapid growth and overheating compared to the national power structure will lead to some inadequacies in terms of techniques, inefficient exploitation, affecting the development of other power sources and the national energy security system. In order for the share of renewable energy sources to reach 25% or more of the total capacity, the size of the economy must be equivalent to that of developed countries with the world's leading industrial base.

Second, attention must be paid to the planning of the structure of renewable energy according to the total electricity diagram of the country in each period based on the objective development needs of the country in the short- and long-term plans, without pressure. Locality and the impact of opportunistic "investors", avoiding group interests, not only develop the power source structure, but also develop synchronously the transmission grid and associated logistics services.

Third, boldly reduce the proportion of coal-fired thermal power plants, do not import outdated equipment for the reason of fire fighting and short-term vision. Priority is given to encouraging the development of gas and wind power to improve efficiency and sustainability. In the development of the power source structure, one should boldly learn from the experiences of other countries, and resolutely not repeat what other countries have experienced and are leaving.

The goal of digital transformation of the energy industry can be divided into two main groups of goals, including: Product/service goals and business goals.

In terms of products and services, energy businesses need to focus on, which is a priority to focus on applications to maximize and automate networks for more efficient and economical electricity supply. Connect digital meters to improve speed and billing accuracy, identify network problems faster, help users save energy, and detect losses. Electrical Power.

According to statistics, energy consumption in transport accounts for 28% and 23% of CO2 emissions from fuel combustion, industry accounts for about 38% and emits 24% of total CO2 emissions, domestic demand. people account for about 48% of the remaining energy consumption and emit 53% of CO2.

Thus, the goal of digital transformation in civil and office buildings has become more urgent than ever to save energy and reduce emissions. Currently, the world's latest research is all about the responsiveness of energy services (e.g. using lighting sensors) and predicting user behavior (e.g. Through algorithms, automatic programming of heating and cooling services) are also options to help ensure energy savings.

In smart cities, solutions have been applied to predict, measure and monitor in real time the energy performance of buildings, allowing consumers, building managers, network operators to and other stakeholders determine where and when maintenance is needed. All these benefits can be realized with limited energy costs, as active controls are expected to

consume only 275TWh by 2040; much less than the 4650TWh could have saved in the same year.

In industry, using digital technology to improve safety and increase output, energy savings can be further achieved through advanced control processes, by incorporating intelligent sensors and data analysis to predict equipment failure. Digital technology also affects the production process of products. Technologies such as industrial robotics and 3D printing are becoming standard practice in certain industrial applications. These technologies can help increase accuracy and reduce industrial waste. Industrial robot deployment is expected to continue to grow rapidly, with the total number of robots increasing from about 1.6 million units at the end of 2015 to 2.6 million by the end of 2019.

For transportation, digital technology is helping to improve energy efficiency and reduce maintenance costs. In aviation, the latest commercial planes are equipped with thousands of sensors, generating almost a terabyte of data per flight on average. Big data analytics will help optimize the flight planning process and make it easier for pilots to make decisions, thereby reducing fuel usage.

Larger ships are also being fitted with more sensors to help crews take measures to optimize routes, while advances in satellite communications allow for enhanced connectivity. so many, so much.

With trucking, where automation and anytime-anywhere connectivity technologies fundamentally change the way people and goods move. The application of technical solutions for vehicle operation and logistics can reduce the energy use of road transport by 20 - 25%. Examples of such solutions include GPS combined with real-time traffic information for route optimization, monitoring during movement and feedback to enhance driving performance; vehicle-to-vehicle connectivity facilitates close convoys, thereby improving fuel efficiency, and sharing data between companies in the supply chain to move more goods with fewer trips than.

Regarding business goals, internal enterprises need digital transformation in management, administration, product statistics... to improve productivity, optimize resource efficiency, save costs and increase efficiency. increase profits from time to time. In which, the group of factors that need to be focused in digital transformation when operating and managing enterprises are: Automation; inheritance and data connectivity; information security and confidentiality.

With the guarantee of socio-economic growth goals, the Government of Vietnam is determined and is giving high priority to efforts to develop the energy industry towards sustainable development, with the goal of maintaining energy security. national quantity and reduce greenhouse gas emissions.

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