INSTITUTE OF ENERGY

AWARDS AND HONORS

FIRST-CLASS LABOR MEDAL
2005

THIRD-CLASS INDEPENDENCE MEDAL
2010

SECOND-CLASS INDEPENDENCE MEDAL
2020

VIETNAM SCIENCE AND TECHNOLOGY INNOVATION AWARD
(VIFOTEC 2003)

VIETNAM SCIENCE AND TECHNOLOGY INNOVATION AWARD
(VIFOTEC 2013)

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MESSAGE FROM DIRECTOR GENERAL

"Through a long journey of more than 60 years of development, carrying on the mission of making a great and effective contribution to the sustainable development of the energy industry, taking the lead in strategy and policy formulation, planning, scientific and technological research, providing high-quality and prestigious consulting services in the fields of energy, electricity and environmental protection, the Institute of Energy has made strong development steps to become Vietnam's leading consulting organization for the Government and the Ministry of Industry and Trade.

Thousands of strategic study, planning and engineering projects, scientific and technological tasks bearing the Institute of Energy imprint have been developed across Vietnam, contributing to the success of our brand positioning and establishing a good recognition to a wide network of domestic and international partners and clients.

Entering the third decade of the 21st century, Institute of Energy is at a critical juncture in its evolution. As a result of the effects of climate change and the trend toward a global energy transition, Vietnam's electric power, energy sectors in general and Institute of Energy in particular are confronting new challenges, which also present new potential for breakthrough development. Principly, power and energy system development plans elaborated by Institute of Energy will shape the future of these industries commensurate to the potential and available resources, with the goal of diversifying power sources, providing stable and reliable electricity, meeting the needs of socioeconomic development, and ensuring national security and defense. To reduce greenhouse gas emissions and adapt to climate change, one of the Institute of Energy's main objectives in the upcoming period is to keep researching and developing new and renewable energy sources, particularly offshore wind power and green hydrogen. In addition, digitalization in the energy sector is expected to promote the development of power and energy systems toward enhanced connectivity, smart and efficient operation in order to achieve the "dual" goal of ensuring energy security and sustainable development - the overarching goal in the national energy development strategy. It is a privilege for Institute of Energy to support Vietnam's joint efforts to realize the commitments made at the 26th United Nations Climate Change Conference (COP26) of achieving Net Zero target by 2050, controlling greenhouse gas emissions, and transitioning from fossil fuels to clean energy.

Honor the past, look to the future. With the excellent reputation affirmed during the past decades, Institute of Energy will make unremitting efforts and dedication to maintain its position and stature, worthy of being the first choice of the partners, clients and for the sustainable development of Vietnam's energy and electric power sectors."

DIRECTOR GENERAL

Dr. Sc. TRAN KY PHUC

HISTORIC JOURNEY

1960

INSTITUTE OF GENERAL DESIGN
(Ministry of Industry)

1967

INSTITUTE OF POWER DESIGN RESEARCH
(Department of Electricity)

1969

INSTITUTE OF POWER PLANNING AND DESIGN
(Ministry of Power and Coal)

1979

INSTITUTE OF ELECTRIC POWER ENGINEERING SCIENCE RESEARCH
(Ministry of Power and Coal)

1981

INSTITUTE OF POWER PLANNING AND ECONOMICS
(Ministry of Electricity)

1984

INSTITUTE OF ENERGY AND ELECTRIFICATION
(concurrently the Office of the Government's Energy Division)

1989

INSTITUTE OF ENERGY *(Ministry of Energy)* on the basis of merging the Institute of Energy and Electrification and the Institute of Electric Power Engineering Science Research.

1995

INSTITUTE OF ENERGY
(Vietnam Electricity Corporation - now Vietnam Electricity)

2006 - PRESENT

Institute of Energy is one of the pioneering organizations to adopt the financial autonomy and self-responsibility mechanism of a public science and technology organization.

2010

INSTITUTE OF ENERGY
(Ministry of Industry and Trade)

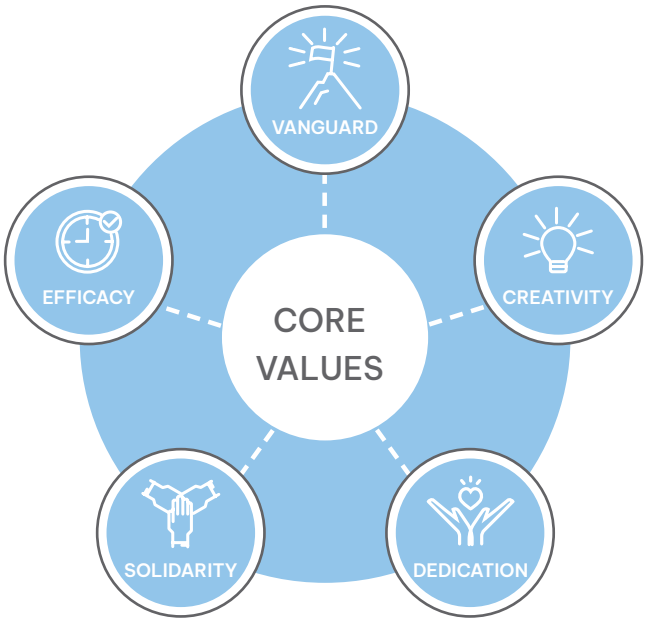
MISSION - VISION - CORE VALUES

MISSION

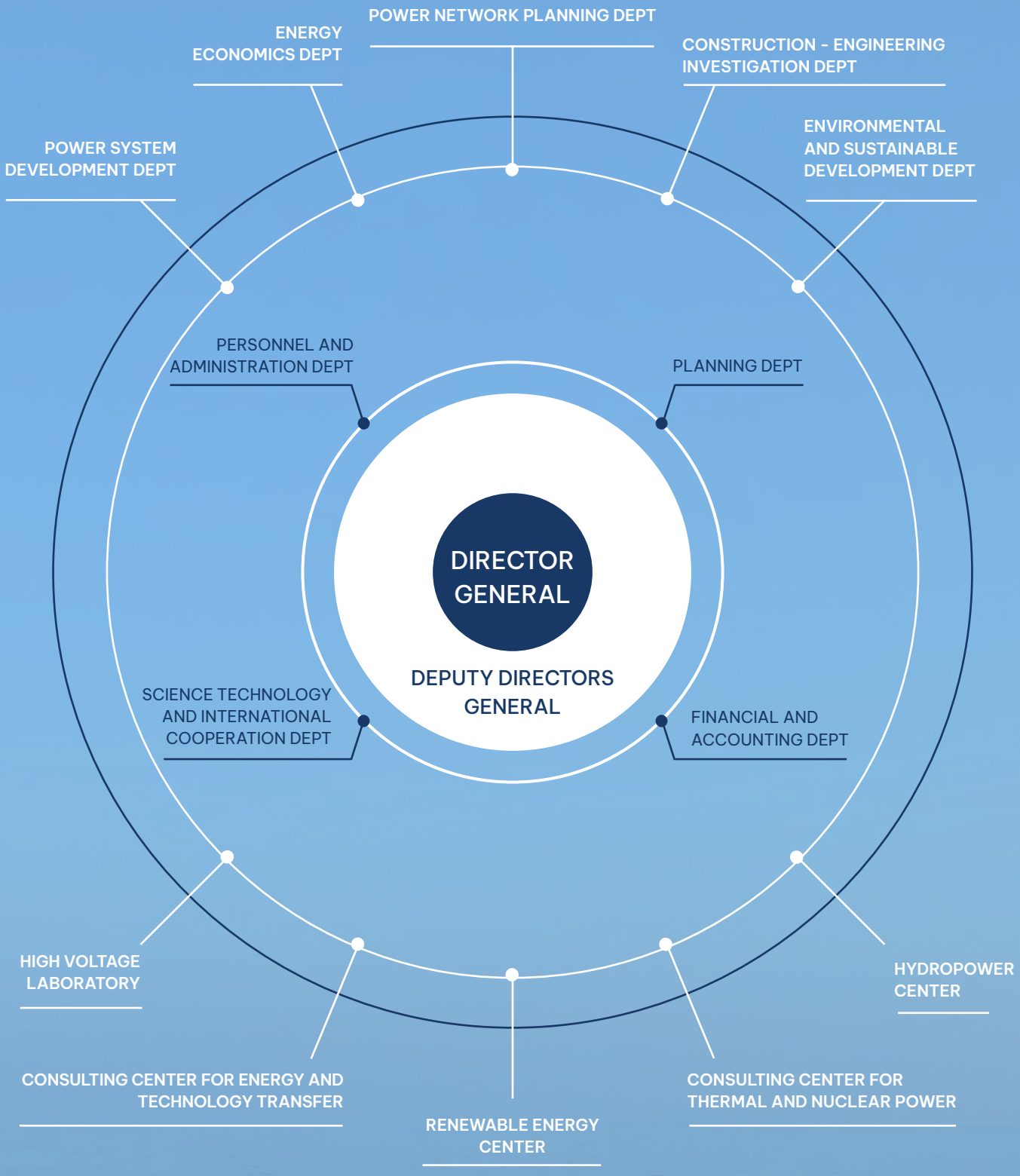
Making effective contributions to sustainable energy development; Leading in strategy and policy formulation, planning, scientific & technological research; Providing high-quality and prestigious consulting services in the fields of energy, power, and environmental protection.

VISION

Being the Asia's leading prestigious science, technology and consulting organization in the fields of energy and electric power.



ORGANIZATIONAL STRUCTURE



ACTIVITIES AND IMPRINTS

01 RESEARCH ON ENERGY AND POWER DEVELOPMENT STRATEGIES, POLICIES AND PLANNING

SCIENCE RESEARCH, TECHNOLOGY DEVELOPMENT AND DEPLOYMENT **02**

03 SCIENCE, TECHNOLOGY, CONSULTING SERVICES AND TRAINING

01 / RESEARCH ON ENERGY AND POWER DEVELOPMENT STRATEGIES, POLICIES AND PLANNING

Research on energy and power development strategies, policies and planning is the core activity that serves as the cornerstone for establishing and expanding the brand of the Institude of Energy (IE). IE is the sole organization in Vietnam to elaborate national power development plans and national energy plans that are in line with each development period of the country. These are significant projects that orient the medium- and long-term development of Vietnam's power and energy sectors in order to ensure national energy security and towards the goals of sustainable development, e.g. adaptation to climate change and achievement of Net Zero goal by 2050.

Session on reporting to the Government on the National Power Development Plan for the period 2021-2030, with the vision to 2050 (PDP VIII) on April 15, 2022

NATIONAL POWER DEVELOPMENT PLANS

2020

National Power Development Plan for the period 2021-2030, with the vision to 2050 (PDP VIII)

2016

The revised National Power Development Plan for the period 2011-2020, with the vision to 2030 (revised PDP VII)

2011

National Power Development Plan for the period 2011-2020, with the vision to 2030 (PDP VII)

2006

National Power Development Plan for the period 2006-2015, with the vision to 2025 (PDP VI)

2001

Vietnam Power Development Plan for the period 2001-2010, perspective up to 2020 (PDP V)

1995

Vietnam Power Development Master Plan for the period 1996-2000, perspective up to 2010 (Master Plan phase IV)

1992

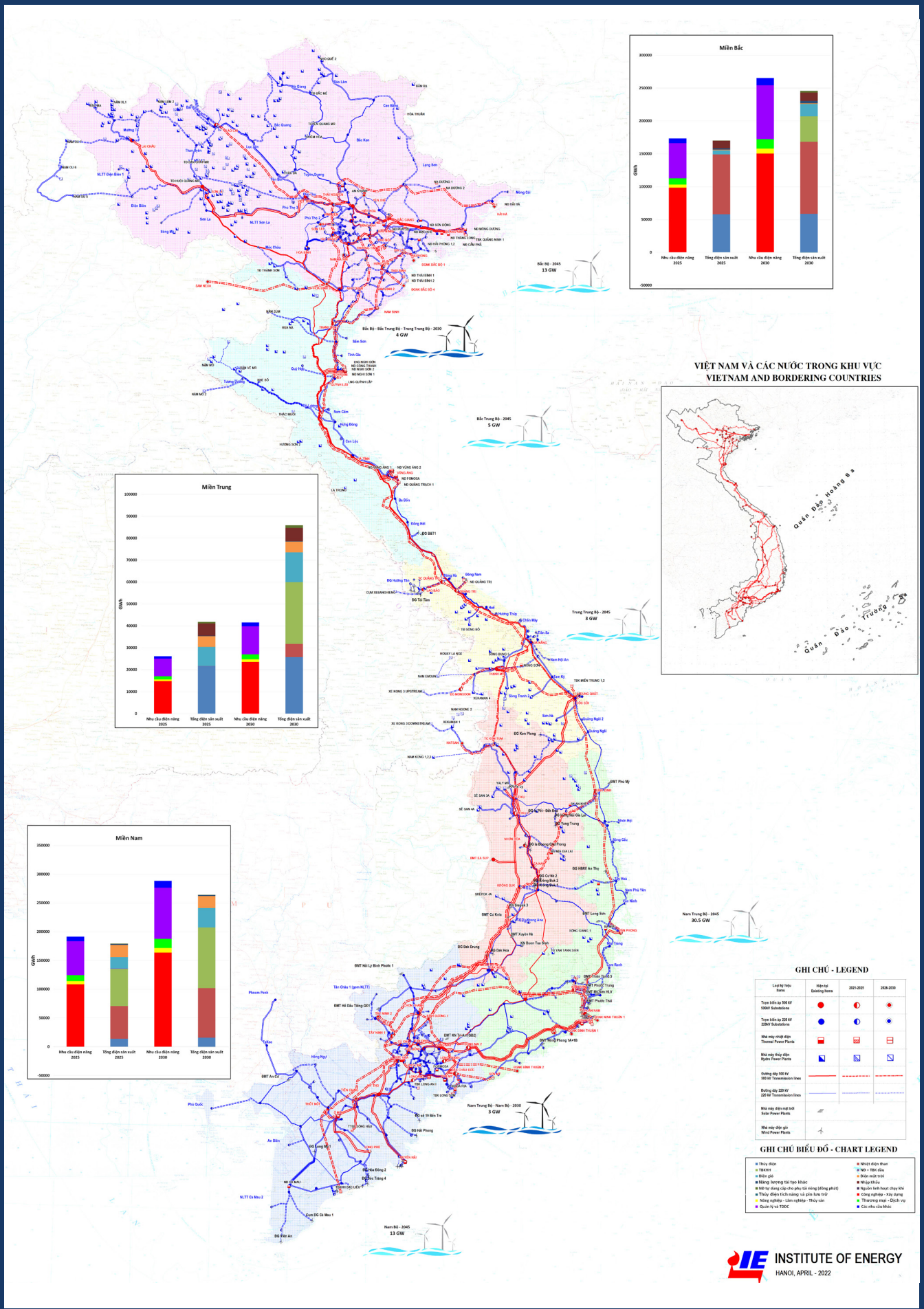
Vietnam Power Development Master Plan for the period 1992-1995, perspective up to 2000 (revised Master Plan III)

1991

Vietnam Power Development Master Plan for the period 1991-2000 (Master Plan III)

Before 1991

Vietnam Power Development Master Plan phase 1 and phase 2



Map of Vietnam Power Development Plan for the period 2021-2030, with the vision to 2050 (PDP VIII)

Institute of Energy is Vietnam's leading organization in researching and calculating the balance of national power supply and demand, connecting the power grid, exchanging, exporting and importing electricity with neighboring countries. Thanks to the application of well-known dynamic planning and power system calculation software such as BALMOREL, PLEXOS, PDPAT, PSS/E, etc. to the calculation of power sources and grid planning, IE has proposed and implemented priority programs and projects on connecting power sources and power grids in 7 provinces in the Cambodia-Laos-Vietnam Development Triangle Area (2004), researching the potential of cooperation in the energy field between Vietnam and China (2005), building a plan to connect the Vietnam - Laos - Cambodia power grid by 2015 with the vision to 2025 (2010) and many works to connect the backbone lines of the 500kV North - Central - South of the power grid to ensure optimal operation of the power system in Vietnam.

Vietnam Electricity Development Strategy up to 2025, with the vision to 2035 (2016); Development Strategy of National Power Transmission Corporation up to 2025, with the vision to 2040 (2017); Orientation to implement Development Strategy of Ho Chi Minh City Power Corporation for the period 2021-2025, orientation to 2030, with the vision to 2045 (2021),... are significant projects with bold imprints of IE in the fields of strategic research and development policy for the Ministry of Industry and Trade and power enterprises.

In addition, IE has participated in formulating development plans for the power supply network in provincial planning, power development planning for key economic regions, industrial parks, and economic zones, particularly in researching and providing advice on mechanisms and policies for the rural, mountainous, and island power supply programs in different phases.

ENERGY DEVELOPMENT PLANS

- 2022 — Roadmap for offshore wind power development in Vietnam
- 2020 — National Energy Development Plan for the period 2021-2030, with the vision to 2050
- 2018 — National Biomass Development Plan for the period up to 2025, with the vision to 2035
- 2018 — National Solar Energy Development Plan for the period up to 2025, with the vision to 2035
- 2018 — National Renewable Energy Development Plan for the period up to 2025, with the vision to 2035
- 2016 — National Energy Development Plan for the period 2016-2025, with an outlook to 2035
- 2010 — Vietnam Nuclear Power Development Plan for the period up to 2030

The Institute of Energy has applied the following calculation, analysis and forecasting tools in research, formulation energy development planning and strategies in Vietnam:

ENERGY SYSTEM ANALYSIS TOOLS

TIMES
(The Integrated MARKAL-EFOM System)

MARKAL
(Market Allocation)

LEAP
(The Long Range Energy Alternative Planning system)

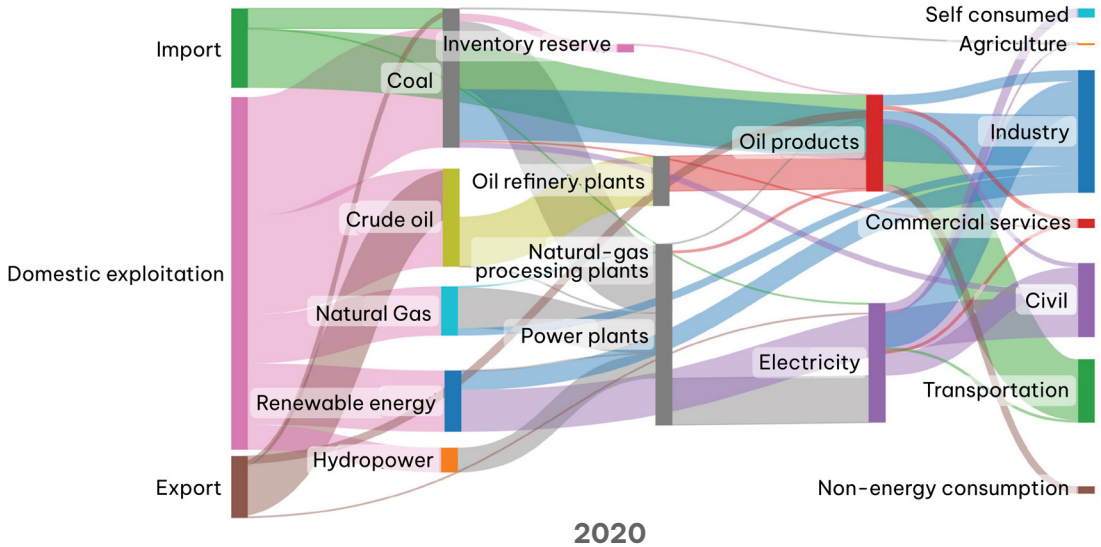
Vietnam Calculator 2050

ENERGY DEMAND FORECASTING TOOL

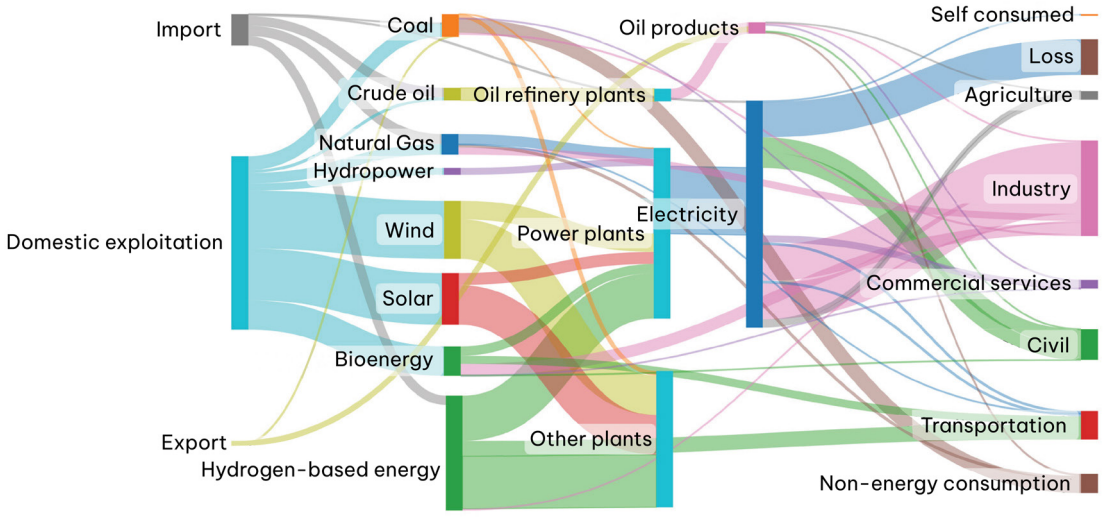
Simple-E
(Simple Econometrics)

ASSESSMENT TOOL FOR ENERGY EFFICIENCY SOLUTIONS

IE-E2MACC
(Institute of Energy – Energy Efficiency Marginal Abatement Cost Curves)



2020



2050

Energy flow charts for Vietnam in 2020 and 2050

02 / SCIENCE RESEARCH, TECHNOLOGY DEVELOPMENT AND DEPLOYMENT (RD&D)

One of the IE's core activities in electrical power and energy sector is scientific-technological activities and innovation, which cover science research, technology development & deployment, standardization, metrology, quality and intellectual property activities. Pursuing international good practices, science research, technology development and deployment and innovation play a vital role in motivating Institute of Energy's competitiveness and efficiency of its other core business.

National level RD&D projects
9+

Ministeral and corporate levels RD&D projects
126+

Science and Technology Awards
3+

NATIONAL LEVEL SCIENCE RESEARCH, TECHNOLOGY DEVELOPMENT AND DEPLOYMENT PROJECTS

1
Vietnam energy development strategy for the period up to 2020.

2
Overview of Vietnam's energy industry and national energy policy

3
Research on lightning and lightning protection measures for electrical works.

4
Determining the scientific, economic and legal basis for the connection, exchange and import - export of energy with countries in the region.

5
Renovating and modernizing the energy equipment technology (under the Science and Technology Research Program KH 09 "Developing strategies and policies for sustainable energy development").

6
Research on developing a system to assess and monitor the security of Vietnam's power system.

7
Research on developing a tool to assess the reliability of the power source system and the transmission grid in Vietnam.

8
Research on the combustion technology of mixing domestic anthracite coal with imported bituminous coal to improve the utilization efficiency of fuel at coal-fired thermal power plants in Vietnam (In cooperation with Vietnam Union of Science and Technology Associations).

9
Research and test combustion of coal with additives to increase efficiency and reduce pollutant emissions for coal-fired thermal power plants.

POWER SYSTEM RESEARCH

Institute of Energy is the leading organization in research, analysis, calculation and simulation of the power system and electricity market and application of scientific and technical advances to the power system development (research on electricity load curve, electricity demand forecast using artificial neutral network, matters in optimal operation of power plants, power storage, power transmission and distribution smart grid). IE has also studied and evaluated the reliability of large power systems using Monte-Carlo simulation method with the application of genetic algorithms and artificial intelligence, calculated and determined the electricity tariff of various types of traditional power generation technologies in Vietnam. IE is at the forefront of research on high-voltage electrical engineering and high-electromagnetic effects with dozens of research topics, serving the assurance of safe, efficient and highly reliable operation of the Vietnamese power system. Typical national scientific and technological research programs and topics such as lightning research and lightning protection measures for electrical and civil works, research and assessment on the current distribution of electromagnetic fields of high voltage lines 220kV and above and of radio frequency broadcasting stations from 100kHz to 1GHz and its effects on public health, of which, survey and assessment on electromagnetic fields of high voltage lines 220kV and above is the component led by the Institute of Energy.

KEY LABORATORY FOR HIGH VOLTAGE TECHNIQUES

Impulse current test system for up to

100kA

Test laboratory building

OVER 5,000m²

AC voltage test system and environmental chamber up to

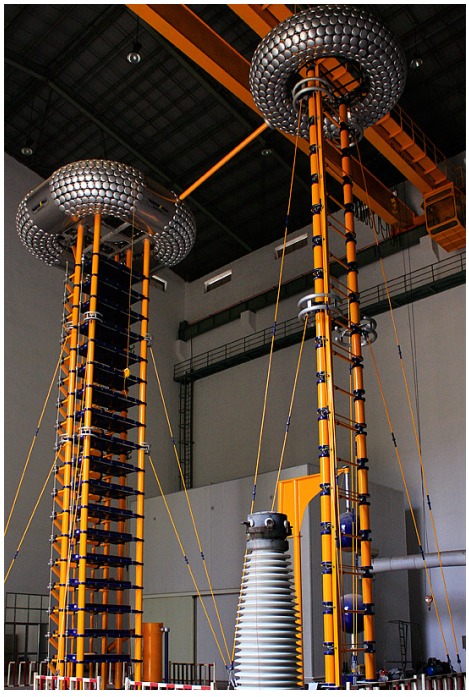
1,200kV

Impulse voltage test system up to

3,600kV

Test system for on-site substations up to

450kV



HYDROPOWER RESEARCH

Institute of Energy has worked on numerous research projects pertaining to the design of discontinuous injectors for spillways, calculating the capacity of hydropower reservoirs to withstand extreme floods, creating a downstream flooding map using Mike Flood software to simulate dam failure, and calculating excess flood in accordance with QCVN 04-05 to suggest solutions to ensure safety and lessen downstream flooding; research into the factors that contribute to downstream erosion and recommendations for calculation methods that are appropriate for the design, management, and operation of hydropower works; determination of non-erosion velocity with consideration of dynamic circuit for rock materials and reinforced concrete downstream of spillway dam, rough design in hydraulic experiments, and development of norms - unit price for hydraulic model testing of hydropower projects... The IE's theoretical studies and model experiments on flood drainage, flood discharge, downstream inundation, and the safety of hydropower and irrigation works have resulted in suitable solutions that assist management agencies and plant's owners in safely managing, exploiting, and operating hydropower works across the country.

RESEARCH ON THERMAL POWER AND NUCLEAR POWER

Thermal power plants have accounted for a large proportion of Vietnam's power system in the last two decades. The strong development of coal-fired thermal power source has been opportunities for the Institute of Energy to carry out scientific researches on the application of restoration, upgrade and improvement of thermomechanical, control - automation systems and equipment, the application of ultra super-critical (USC) and advanced ultra-supercritical (A-USC) coal-fired thermal power technology, advanced combined cycle gas turbine technology using liquefied natural gas (LNG) for new plants. The project "Research, design and application of UD-type pulverized coal-fired nozzles for boilers of Ninh Binh Thermal Power Plant" under the State-level scientific and technological research program KH 09 implemented by IE won the First prize of Vietnam Fund for Supporting Technological Creations (VIFOTEC) in 2003. After that, IE has continued implementing many national research topics related to combustion technology when mixing domestic anthracite coal with imported bituminous coal, testing coal burning with additives to increase efficiency and reduce pollutant emissions for thermal power plants. In addition, IE also studies to identify greenhouse gas control measures in the field of coal-fired thermal power and recommends a roadmap for application and methodology research on the Bilateral Offset Credit Mechanism (BOCM) regarding the efficiency of coal-fired thermal power plants in Vietnam. With regards to nuclear power, IE has carried out numbers of studies for site selections of nuclear power plant projects, nuclear power reactor technologies suitable for Vietnam as well as studies and calculates the evolution of serverse accidents and heat transfer at the bottom of the VVER-1000 nuclear reactor's vessel.

RESEARCH ON ENERGY ECONOMICS, ELECTRICITY MARKET

The Institute of Energy conducts energy economics research and analysis through economic application, the demand-supply balance of energy-intensive fuel in the economy; the competitiveness of energy production and utilization technologies; the role of energy policies, energy efficiency, and energy saving; as well as the structure and operation of energy markets, energy information systems, and energy statistics. IE has implemented a number of remarkable tasks as follows:

1. **Build a method to determine the retail electricity tariff and submit it to the competent authorities for promulgation as a basis for economic and financial analysis and draw up a loan scheme for expansion hydropower plant projects (EVN, 2022)**

2. **Research to build an average retail electricity tariff framework for the 2021-2025 period (EVN, 2021)**

3. **Research on information technology infrastructure to serve the operation of Vietnam wholesale electricity market (VWEM) (EVN, 2017)**

4. **Research and develop tools to evaluate and rank energy efficiency measures in sub-industries (Ministry of Industry and Trade, 2018)**

In the trend of energy transition, the Institute of Energy continues to carry out researches on analyzing the motivations that influence enterprises and consumers to supply, produce, transport and use of energy sources: energy market structures, regulation of energy activities as well as the environmental and social impacts of the energy efficiency programs.

RESEARCH ON SUSTAINABLE ENERGY DEVELOPMENT

The energy transition towards sustainable growth poses many issues to be studies for the Vietnam's energy system. The Institute of Energy has carried out many scientific research and international cooperation projects on the sustainable energy development, the socio-economic impact of energy development, emission mitigation, pricing of pollutants, carbon pricing, carbon footprint tracking, developing a roadmap for applying low-carbon and high-efficiency technologies in the power and energy industries to reduce greenhouse gas emissions. Notable projects include:

Assess the potential to reduce greenhouse gas emissions from energy activities in Vietnam, thereby recommending solutions to reduce emissions on the basis of building a marginal cost curve using modeling method for Vietnam's energy system by 2030, (Ministry of Industry and Trade, 2013)

Review, assess and recommend a roadmap for green growth in the thermal power sector up to 2030, with the vision to 2040 (Ministry of Industry and Trade, 2019)

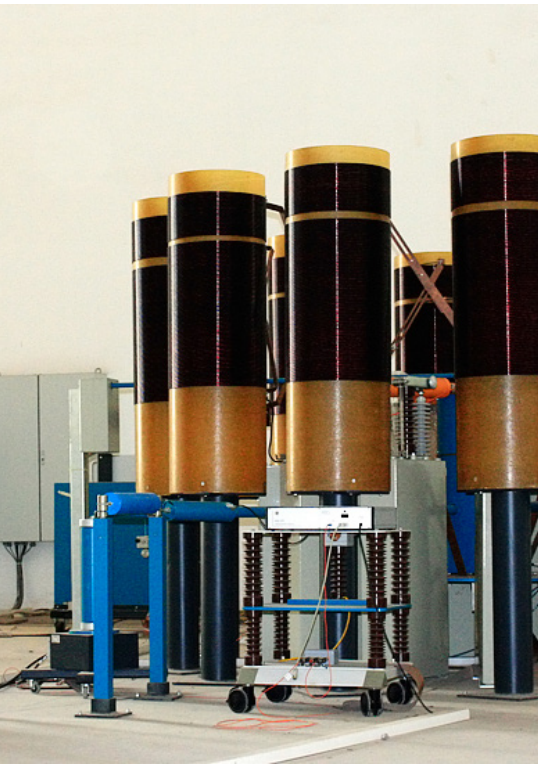
National inventory of greenhouse gas emissions in the energy sector; Building, analyzing and modeling the macroeconomic and socio-economic impacts of power planning in the context of Vietnam's commitments to respond to climate change (UNDP, 2020)

03 / SCIENCE, TECHNOLOGY, CONSULTING SERVICES AND TRAINING

Annually, over 200 projects on science, technology, consulting services and training have been implemented by IE, solidifying its position as a leading consultant in Vietnam's energy and power sectors while also steadily expanding into regional and international markets.

Institute of Energy is grateful to have intensive experience in providing construction investment consultancy services as well as comprehensive solutions for energy and electricity projects, thanks to our highly skilled experts in the fields of power system, energy economics, thermal and nuclear power, hydropower, renewable energy, construction engineering, automation, information technology, and other related fields.

POWER SYSTEM AND EQUIPMENT



The impulse current generator for tests on section of arresters according to IEC 60099-4

- *Charging voltage: up to 100kV*
- *Current Impulse: up to 100kA*

Research on the need for flexible internal combustion engine (ICE) power plants and their applications in Vietnam's future power system

Installation of the lightning monitoring and warning system for the national power transmission grid

Installation of the dynamic line rating (DLR) system for the transmission grid under the scope of the National Power Transmission Corporation.

Institute of Energy is Vietnam's leading organization in researching and applying cutting-edge high-tech, advanced and high echnologies to power system development. Several power studies implemented by IE include:

Research on the operation of Battery energy storage system (BESS) in Vietnam's power system

Research on the impact of the sudden gas supply shutdown to the Central Gas-fired Power Complex on the operation of the plants and the safety of the power system

Research on the impact of virtual power plants on the operation of the power system

Research on determining the power transmission price and methods to manage and prevent congestion in terms of power market linkage

Effect of electricity tariff adjustment on load components in power demand forecast

Research on the capacity transmission capability of the Central Gas-fired Thermal Power Complex utilizing the Ca Voi Xanh gas in terms of power system stability

IE is among the top consulting providers in the field of high-voltage electrical engineering and electrical equipment commissioning test for projects involving the integration of cutting-edge science and technology into Vietnam's power system operation. Some typical commissioning test projects include the commissioning test of AC high voltage test and partial discharge measurement at Xekaman Xanxay Hydropower Plant (Lao PDR), the testing of 220kV GIS gas-insulated substation at Ban Chat Hydropower Plant and the testing of 110kV underground power cable line for the Cat Linh - Ha Dong railway project, and so on. In particular, the type test with lightning and switching impulse items for the first 500kV 3-phase power transformer manufactured in Vietnam and for the largest capacity 500kV 3-phase/467MVA power transformer manufactured in Vietnam provided by IE has contributed greatly to the development of the domestic electromechanical industry. In the field of standard and quality control, IE provides conformity assessment and certification services for power transmission grid equipment such as transformers, insulators, power cables... In addition, IE also provides training courses and internship programs for students majoring in Electrical Engineering at universities and technical staff of electrical power utilities in the field of high voltage engineering and testing.

POWER TRANSMISSION LINES AND SUBSTATIONS DESIGNING

Institute of Energy affirms its leading brand and position in expediting engineering design of power grid projects i.e. transmission lines and substations up to a voltage of 500kV. Over the last two decades, IE has completed consulting works from preparation of Pre Feasibility Study (Pre-FS), Feasibility Study (FS) to Technical Design, Construction Drawing Design, Bidding Documents, and Total Cost Estimates,... for hundreds of works, transmission grid projects with voltages from 110kV, 220kV to 500kV in Vietnam and other countries in the region. Outstanding works and projects that IE have been completed and successfully energised include the 500kV Quang Trach - Doc Soi transmission line; 500kV switchyard of Quang Trach Power Center, 500kV West Hanoi - Thuong Tin transmission line; 500kV West Hanoi substation; Upgrading 500kV Nho Quan substation capacity and a series of 220kV transmission line and substation projects, and so on. These projects all contribute to enhancing the transmission capacity of the 110kV, 220kV & 500kV power grids of the national and regional power system.

In addition, IE is investing in in-depth research on technological solutions and designing transmission works for offshore wind power, flexible alternating current transmission systems (FACTS), high voltage direct current (HVDC), consulting for inter-regional transmission projects and participating in training - transfer of in-depth research and calculations in the field of power transmission.

THERMAL POWER

Institute of Energy has participated in consulting services for the development of coal-fired power plants from the initial stage of site selection study to investment preparation and project construction and conmissioning phase. Hai Phong 1&2 Thermal Power Plants (TPPs) (4x300MW), Hai Duong BOT TPP (2x600MW), Van Phong 1 BOT TPP (2x600MW), Quang Trach 1 TPP (2x600MW), Vung Ang 1 TPP (2x600MW), Thang Long TPP (2x300MW), Mao Khe TPP (2x220MW)... are some of works bearing the imprint of the IE.

1

Consulting on planning and sitting the location of projects with total installed capacity: over 15 GW

2

Formulation of Feasibility Study Report and Basic Design: over 10 GW

3

Formulation of Technical Design Report: over 5 GW

4

Research on upgrading and renovating boiler systems, exhaust gas and wastewater treatment systems: over 5 GW

5

Project management and supervision of construction: over 3.6 GW

6

Report/ design appraisal: over 10 GW

Regarding to gas and liquefied petroleum gas (LNG) thermal power, the Institute of Energy has participated in consulting services for gas-fired thermal power projects and pioneered in consulting the development of LNG thermal power plants nationwide such as 3,200MW Bac Lieu LNG, Hai Lang LNG Power Center (Quang Tri), Central 1 and 2 gas-fired power plants, Nhon Trach 3 and 4 LNG, Quang Ninh LNG, etc.

Consulting on selecting and planning the site location, investment proposal: in many locations nationwide such as Quang Ninh, Hai Phong, Nam Dinh, Ninh Thuan, Binh Thuan, Ba Ria - Vung Tau, Long An , Bac Lieu,...

Formulation of Pre-FS, FS, Basic Design: over 6GW

Report/ design appraisal: over 5 GW

NUCLEAR POWER

Institute of Energy has developed a study on Orientation for planning nuclear power development in Vietnam for the period up to 2030, of which 8 potential sites were planned across the country. IE is also the consultant formulating Pre-FS report for constructing the first nuclear power plant in Vietnam and deeply involved in preparation FS report for Ninh Thuan 1 and 2 (NPP) (approx. 2x1,000MW each).

HYDROPOWER

Institute of Energy has carried out many research projects on hydraulic model experiments for hydropower projects of class II or above with aiming to verify the works' design and propose optimal solutions for project construction and operation. Most of hydraulic model testing works for major hydropower projects in Vietnam and Lao PDR are implemented by IE, including hydropower plants: Son La (2,400MW), Lai Chau (1,200MW), Tuyen Quang (342MW), Ban Ve (320MW), Ba Ha River (220MW), Huoi Quang (520MW), Ban Chat (220MW), Hoa Binh (2,400MW), SeSan 3 (260MW), Xekaman 1 (322MW), Xekaman 3 (250MW) ...

Small and medium hydropower planning in provinces and river basins is a strength of IE, including projects in Gia Lai, Dak Lak, Dak Nong, Kon Tum, Ha Giang, Dien Bien, Lai Chau,... These results provide a vital foundation for municipalities to solicit investment, make effective management and exploitation of hydropower resources and promote local socio-economic development.

Son La Hydropower Plant

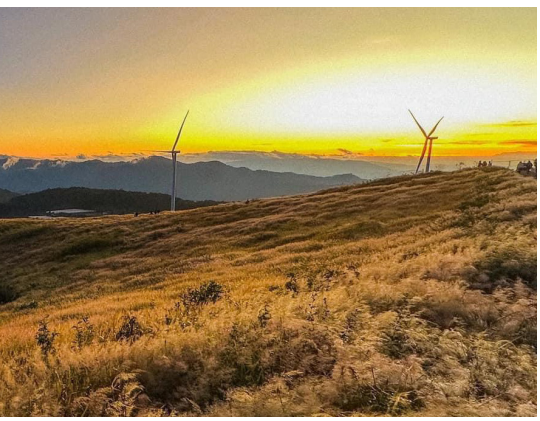
RENEWABLE ENERGY

Institute of Energy is a renowned consultant in renewable energy projects in Vietnam. On-site energy supply works for remote, mountainous, and island areas, particularly the improved stove models, biogas works, rooftop solar power systems, etc. studied by IE have been deployed, contributing to enhance people's life.

In recent years, solar power has developed strongly in Vietnam. Many works across the country bear the imprint of IE, typically solar PV power plants such as Hoa Hoi (Phu Yen) (256MW), Le Thuy (Quang Binh) (270MW), Ky Son (Ha Tinh) (250MW), GAIA (100, 2MWp), Thien Tan 1.2 (100MWp), Thien Tan 1.3 (50MWp), Thien Tan 1.4 (100MWp), Singenergy Ninh Thuan, Binh Dinh Solar Power Park...

IE has started to research and cooperate in developing wind power in Vietnam very early. Onshore wind power plants such as Hoa Binh 1 and 2 (50MW), Cau Dat (68MW), Lac Hoa 2 (130MW), Hoa Dong 2 (72MW), Kosy Bac Lieu (40MW), Tra Vinh V1-2, Dong Hai 1 (50MW)... are all developed by the Institute of Energy. Concerning offshore wind power, IE provides consulting services to build a development roadmap for Vietnam, advise on the project implementation process, develop technical regulations and electricity tariff framework, research on combination with green hydrogen production, as well as gradually master the design of offshore wind power projects. At the same time, IE also researches and recommends the most efficient power transmission solutions. Several remarkable works consist of Tra Vinh Coast (2,000MW), Macquarie (3,000MW), La Gan (3,500MW), Ninh Thuan 1&2 (5,000MW), Hai Phong (3,900MW), Thai Binh (3,000MW)...

In the field of biomass and waste-to-energy (WTE), the Institute of Energy has carried out strategic research, developed mechanisms and policies for biomass energy development, and made plans for biomass power development over the periods. An Khe 95MW, Phu Yen KCP 60MW, An Giang 50MW, Yen Binh 50MW, PIR 1 (Quang Binh) 50MW, Phu Hoa 50MW, Chau Lang (An Giang) 50MW, Tuyen Quang Sugar Cane 25MW; Soc Son 2MW, Thai Binh, Hau Giang, Xuan Son, Thai Nguyen, Bac Ninh, Cu Chi Waste Power Plants are typical works in this field of IE.



ENERGY ECONOMICS

Institute of Energy provides in-depth consulting services on energy pricing, assessment of economic and financial feasibility for energy projects; energy information systems, energy statistics and energy demand management. IE has carried out research on electricity tariff for a number of wind power projects in Lao PDR, consulted on formulating methods and contents to calculate investment effectiveness in distribution projects with voltage up to 110kV, prepared annual statistical reports on energy efficiency, developed strategies for equitization and restructuring of Power Generation Corporations (GENCOs), analyzed macroeconomic benefits - costs for efficient use of energy,...

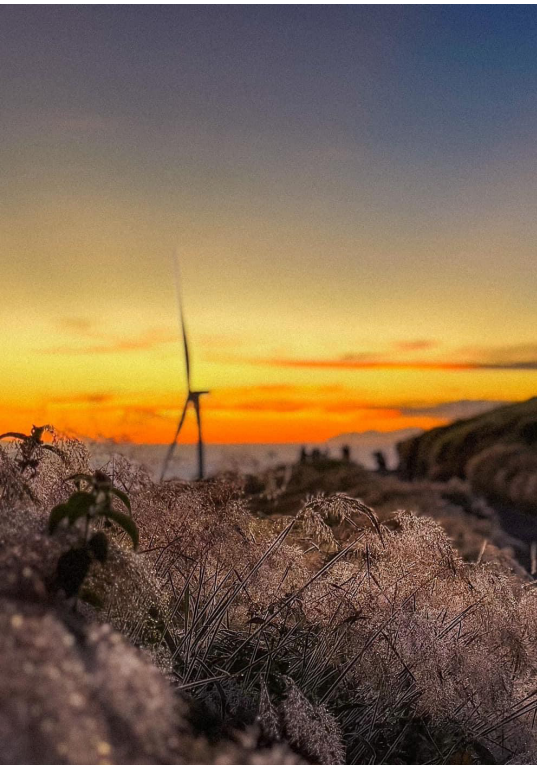
IE is the leading consulting organization in estimating optimal operational costs and delivering solutions that maximize the profit of each plant in the power system when the power source structure includes a significant proportion of renewable energy and is closely linked to the transmission grid.

ENGINEERING INVESTIGATION - CONSTRUCTION

Institute of Energy is the construction supervision consultant for the first large-scale coal-fired power plants in Vietnam such as Hai Phong 1 and 2 TPPs; participates in geological assessment, earthquake and tsunami hazard assessment for the construction site of Ninh Thuan 1 and 2 NPPs; supervises and investigates topography and geology for the proposed NPP sites in Quang Ngai and Binh Dinh; supervises the investigation work for 500kV transmission lines such as Quang Trach - Doc Soi 500kV transmission line, West Hanoi - Thuong Tin 500kV transmission line, ... and supervises the construction of 220kV transmission lines.

IE is also a pioneer in researching foundation solutions for offshore wind poles and coordinating in training for courses applying calculation and design software for offshore wind power plants in Vietnam.

ENVIRONMENT



In the field of environment, Institute of Energy has extensive experience in conducting strategic environmental assessments (SEA), environmental impact assessments (EIA), consulting on environmental and social impact assessments (ESIA) according to regulations of international financial organizations, and consulting on climate change and procedures for applying for environmental permits.

Strategic Environmental Assessment (SEA): IE has carried out many strategic environmental assessment reports for important plans such as the National Power Development Plans, National Energy Development Plans, National Renewable Energy Development Plan, National Biomass Power Development Plan, and so on. Of which, the SEA of Power Development Plan VII was recognized extremely effective and chosen as the typical Asian report at the International Environmental Assessment Conference held by IAIA in Porto (Portugal) in 2012.

Environmental Impact Assessment (EIA): Institute of Energy has conducted dozens of EIA reports for important power source projects (coal, gas, LNG, and NPPs in Vietnam) such as Hai Phong 1 and 2 TPPs, Mao Khe TPP, Hai Duong BOT, Nam Dinh 1 BOT, Van Phong 1 BOT, Central 1 and 2 TPP, Ninh Thuan 1 and 2 NPPs, etc.

Consulting on environmental and social assessment according to regulations of international financial organizations such as Environmental Management Plan (ESMP), Resettlement Planning (RP), Livelihood Restoration Plan (LRP), ethnic minority development plan (EMDP), social assessment (SA), Due Delegation (DD), environmental and social impact assessment (ESIA), Environmental, Health, and Social Impact Assessment (EHSIA), environmental monitoring of small hydropower projects, and assessments and analyzes related to gender, labors, etc.

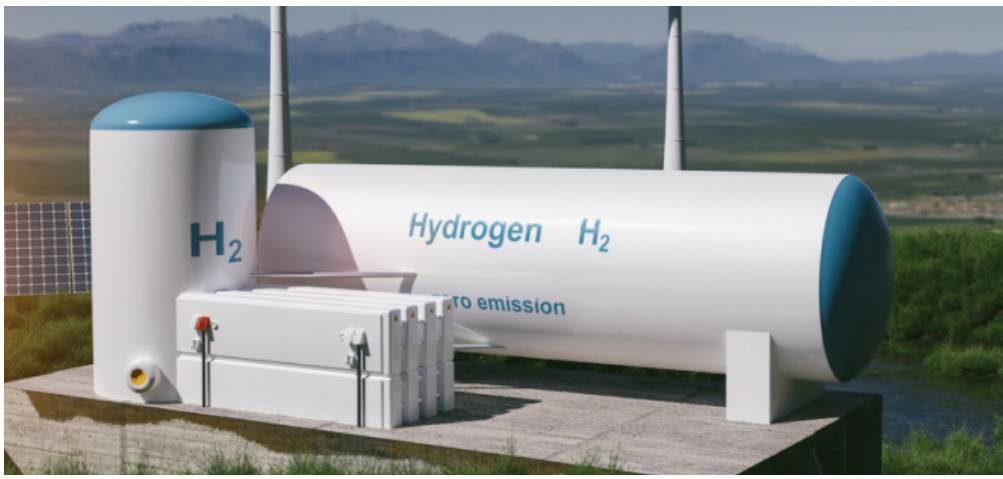
Consulting on the implementation of procedures in obtaining permits for the environment, water resources, and consulting on environmental, social, and safety monitoring in all phases of energy projects with typical projects such as Hai Duong BOT TPP, Van Phong 1 BOT TPP...

Consulting on climate change: IE has completed numerous tasks and projects on planning to mitigate greenhouse gas emissions, proposing solutions and roadmap to mitigate greenhouse gas emissions for the energy and electricity sectors, inventorizing greenhouse gas emissions; monitoring, reporting, and verification (MRV) at facilities and the energy sector to meet emission cutting targets, determine the carbon footprint of Vietnam's key export products, and carbon labeling. IE also cooperates with international organizations to study emission reduction for coal-fired power plants (BOCM) in Vietnam.

INSTITUTE OF ENERGY AND OUTSTANDING TRENDS

The development of renewable energy sources is currently an inevitable trend to shift to green energy sources, towards sustainable development. It is also a crucial task of the Institute of Energy to research, make advice and contribute to orient the development of the energy and power sectors and gradually realize Vietnam's commitments at COP26.

As one of the first consultants in Vietnam implementing consultancy services on renewable energy projects, Institute of Energy has actively taken initiative in researching and applying achievements of the Industrial Revolution 4.0, scientific and technological advances into energy and power activities, contributing to accelerate the energy transition in Vietnam.



WIND POWER

Vietnam's wind power market has enormous growth potential. With the goal of meeting electricity demand, ensuring energy security, diversifying power sources and providing stable and reliable electricity as well as meeting the needs of socio-economic development and national security and defense, the Institute of Energy is one of the pioneers in building a breakthrough development strategy and roadmap for offshore wind power in Vietnam. IE aims to master new technologies in the power grid infrastructure system (high-voltage submarine cable technology, super-high-voltage direct current (HVDC) power system) and improvements in wind turbine technology to apply for offshore wind power projects in Vietnam.

ENERGY TRANSITION IN THE FIELD OF POWER SOURCES

BIOMASS ENERGY

Institute of Energy is continually looking for proactive solutions to promote the further development of biomass energy sources in order to reduce waste to the environment, contribute to ensuring energy security, and reduce dependence on fossil fuels. With the priority of using biomass energy for electricity production, biogas and biomass pellets are used directly as fuel, the Institute promotes the implementation of researches to help increase the rate of using agricultural - forestry waste products as well as waste treatment for energy purposes by 2030 in Vietnam. In addition, the integration of renewable energy in general and biomass energy in particular into the grid for the purpose of grid balance or energy storage to create many bioenergy applications, from base load operation to power supply during peak periods in order to maintain a reliable and guaranteed power supply using renewable energy, and to minimize adverse impacts on the environment, are also key research topics of IE.

CO-FIRING IN COAL -FIRED POWER PLANTS

To reduce coal consumption in coal-fired power plants, the alternative solutions include conversion to combined cycle gas turbine systems, WTE units, battery energy storage system (BESS), using biomass fuel, etc. to boost flexibility. Co-firing coal technology utilizing agro-forestry by-products and solid waste help positively enhance energy security, improve air quality, reduce greenhouse gas emissions and solid waste disposal while increasing the proportion of renewable energy in the energy mix. Institute of Energy's experts have successfully applied and tested combustion technology with additives at Hai Phong TPP with pulverized coal-fired technology, reducing coal consumption by more than 2%, and decreasing pollutant emissions by a minimum of 5%. IE is planning for research on combustioning green ammonia in coal-fired power plants with the rate from 20% increasing gradually to 100%, and at the same time, proposing roadmaps, mechanisms, and policies to apply this technology on a large scale.

With abundant biomass energy reserves, renovating coal-fired power plants for co-firing with biomass, in parallel with establishing a biomass supply chain, is a smart step toward unlocking these potential sources in Vietnam. Currently, biomass collection and supply systems, biomass fuel quality, combustioning technology, and the influence of fuel mixing on boiler performance and operation are the main research issues of IE.

GAS AND LNG THERMAL POWER

With the orientation towards 2050, most gas-fired power plants will switch to completely using green hydrogen fuel, Institute of Energy has implemented research, development, training, and technology transfer of natural gas combustion (including LNG) mixing with hydrogen fuel, developed and proposed mechanisms and policies to apply this technology. IE also advises on fuel conversion, upgrading, and renovating gas-fired power plants that are moving toward the energy transition.

NUCLEAR POWER

Many countries now acknowledge nuclear power as a source of clean electricity that can eventually replace fossil fuels while also helping to reduce greenhouse gas emissions and adapt to climate change. In Vietnam, nuclear power can be considered as essential baseload power source in the future. Nuclear power technology of post generation of III+ reactors, SMR reactors with unit capacity less than 300MW, and especially fourth-generation, can fundamentally solve economic, technological, and nuclear safety problems.

IE continues utilizing well-trained human resources and existing infrastructure to conduct research on development trends and the application of new nuclear power technology, getting prepared for necessary conditions in the event that Vietnam restarts nuclear power development program, from which it can advise, propose and plan for the development of this energy in Vietnam.

FLEXIBLE POWER SOURCES

Institute of Energy is working on methods to increase the flexibility of Vietnam's power system to fulfill the aim of maintaining sufficient power supply meeting load growth while also assuring power system stability with a high proportion of renewable energy sources. For this aspect, flexible power sources can resolve the problem of high-share of renewable energy sources in the power generation system. In the long term, Vietnam needs to build a flexible power generation source (e.g. ICE) to meet the requirements for a power system based on renewable energy sources, maitaining stability and reliability and optimizing the power system operation. Therefore, IE is meant to provide consulting services, in-depth research on the need and ability to effectively integrate flexible power sources in the power system; proposes mechanisms to develop flexible power generation sources to ensure the economic feasibility of the projects.

ENERGY STORAGE SYSTEM (ESS)

Battery energy storage system (BESS) is one of the energy storage technology solutions to create a flexible power source for the national power system in the future to solve the limitations when developing renewable energy sources and accelerate the energy transition in Vietnam. IE is a pioneer in conducting many researches related to this technology, such as research on the applications of BESS in power transmission systems (regulating frequency, voltage, reducing oscillations, reducing losses, preventing overload, delaying power grid upgrade, etc.), research on the necessity and operation of battery energy storage in the power transmission system, research on the ability to convert Ninh Binh TPP into a BESS.

Along with BESS, pumped-storage hydropower is also an optimal energy storage solution to provide flexibility and stability for the national power system. To keep ahead of the development trend of pumped-storage hydropower in Vietnam, the Institute of Energy has conducted research on developing pumped-storage hydropower power works such as Bac Ai (1,200MW) and Phuoc Hoa (1,200MW) and conducted studies for investment proposal for a number of potential pumped-storage hydropower projects such as Kosy - Di Linh (1,200MW), Hoa Binh - Ba To (1,200MW), Dien Bien 1, 2, 3 (3,200 MW) pumped-storage hydropower complex...

HYDROGEN ENERGY

Institute of Energy is a pioneer in researching and consulting to build mechanisms and policies on a roadmap for green hydrogen development in Vietnam. Currently, IE is conducting research to propose a preliminary roadmap for the development of the PtX industry, proposing a roadmap for developing the hydrogen economy in Vietnam, study the medium and long-term strategy for the chemical industry, and petroleum industry of Vietnam to effectively participate in green hydrogen market as well as the market for hydrogen-derivative products; preparation of a report on site selection, Pre-FS study of green hydrogen plant projects in the Southeast and Southwest regions. IE provides consulting services on green hydrogen market demand, research on the development of green hydrogen production technology, and green hydrogen production projects nationwide.

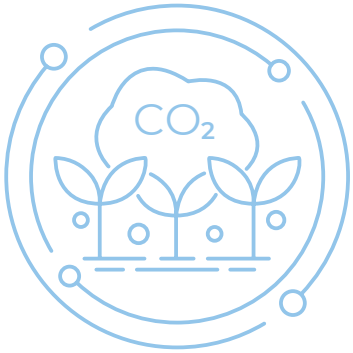
DIGITALIZATION

Digitalization is one of the focuses of development orientation and global competitiveness by applying Artificial Intelligence (AI), Internet of Things (IoT), Big Data, Cloud Computing, blockchain... Grasping such trend, the Institute of Energy has taken initiative in researching and cooperating in digitalization consulting services for power plants, power grids, and substations. The project of formulating Feasibility Study Report and digitalization technology solutions for Hai Phong 1 and 2 TPPs is a typical work of IE in this field.

SMART GRID

Research and application of Smart Grid is an important solution to improve the reliability of power supply, enhance the energy efficiency, optimize the power system operation, facilitate the development of renewable energy sources and small distributed power sources to reduce CO_2 emissions. This will promote changes in the way of using electricity, of which, first of all, improving the load curve and encouraging the development of industries using energy-saving equipment, thereby contributing to environmental protection, ensuring national energy security and sustainable development. Institute of Energy is proud to contribute to the development of this technology development roadmap in Vietnam.

TRANSITION IN ENERGY CONSUMPTION AND UTILISATION



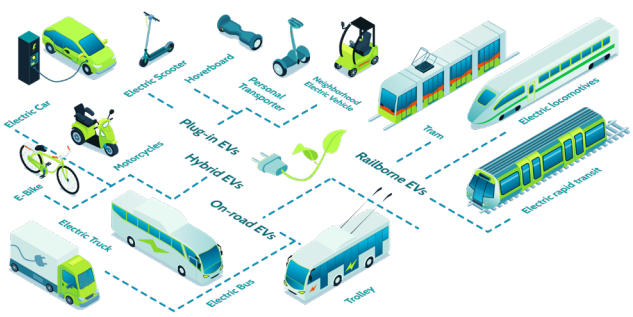
CARBON CAPTURE, UTILISATION AND STORAGE

Carbon capture, utilisation and storage (CCUS) is a potential technology to cut down CO_2 emissions from thermal power plants, as part of many countries' roadmap to net zero emissions in the world and is also an important medium and long-term solution for Vietnam's goal of reducing greenhouse gas emissions and neutralizing carbon. Currently, this new technology is still being researched, tested and assessed specifically for each type of CO_2 storage.

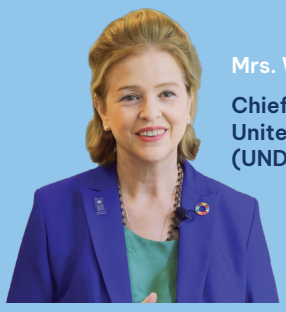
The Institute of Energy is one of the first consultants in Vietnam to conduct research on determining the potential carbon capture and storage (CCS), and the prospect of applying CCS technology in Vietnam. Currently, we are planning to conduct in-depth studies on the ability of CCUS according to market demand as well as developing standards, regulations and provisions on this technology in conformity with Vietnam's conditions to orient the completion of the carbon market, carbon tax to attract investment resources in this field, and at the same time, to open up new prospects for the sustainable operation of coal-fired power plants.

ELECTRIC AND FUEL CELL VEHICLES

IE participates in in-depth research and provides consulting services in the field of electric vehicles and fuel cells such as participating in the national training on electric transport; researching and preparing reports to assess opportunities of developing the electric charging station market for the transportation industry in general and corporations and businesses in Vietnam, typically assessing opportunities for developing the electric charging station market of Petrolimex for the period up to 2030, with the vision to 2045.



INSTITUTE OF ENERGY IN PARTNERS' THOUGHTS



Mrs. Wiesen,

Chief Resident Representative of the United Nations Development Program (UNDP) in Vietnam

"UNDP congratulates the Institute of Energy for its significant contributions to the development of Vietnam's energy sector. UNDP has collaborated with Institute of Energy on a number of leading important studies, including international policies and practices of Vietnam on waste treatment from solar and wind power development; Potential for green hydrogen production and use in Vietnam; Model of macroeconomic and socio-economic impacts of the power development plan in the context of the Nationally Determined Contribution (NDC) and the energy development plan for the period up to 2050. The effective cooperation relationship between the two parties is based on the deep expertise and long-term experience in building energy strategy and policy of Institute of Energy combined with UNDP's international experience and neutrality of those supports. UNDP wishes to conduct further deep cooperation with Institute of Energy in the fields of energy planning, energy transition, and conversion of coal-fired power plants."

Mr. Dang Trung Kien,

Chairman of the Board of Directors of Truong Thanh Energy and Real Estate Joint Stock Company

"Since 2018, as a consultant, Institute of Energy has actively supported TTVN Group to successfully complete a number of solar power projects and wind power projects. During the course of cooperation, TTVN Group and its partners highly appreciate the dedication and professionalism with the passionate and enthusiastic working spirit of Institute of Energy leaders and employees. Institute of Energy brand has been affirmed as the leading organization in the field of: energy, electricity. Institute of Energy's products and services are highly appreciated by many local authorities and MOITs for its quality, in line with the national electricity development orientation. TTVN Group appreciates the good relationship between the two parties and looks forward to further cooperation to successfully deploy more clean energy-based products, contributing to sustainable energy development in Vietnam."

Mr. Sebastian Hald Buhl ,

Country Director, Ørsted Group in Vietnam

"Ørsted Group has cooperated with Institute of Energy since 2020 for the preparation of the Pre-F/S of Ørsted's portfolio of offshore wind power projects in Vietnam. During the cooperation, Ørsted was very impressed with the professionalism, dedication, and high commitment of Institute of Energy's staff. Ørsted is also analyzing the possibilities of cooperation using other relevant consulting services of Institute of Energy to boost the development and execution of offshore wind power projects in Vietnam, leveraging the Institute's experience and professional expertise."

Mr. Nguyen Trung Kien,

Director of Commercial Development and Partners, General Electric Vietnam

"As a research body that initiates energy strategies and leads the country's energy transition, the Institute of Energy has been working with us on key renewable energy projects and develop guidelines of the relevant policies. GE looks forward to a long-term partnership with Institute of Energy to help provide affordable, reliable power sources that contributes to national energy security and efficiency."

Mr. Philipp Munzinger,

Director of GIZ Energy Support Program in Vietnam

"The GIZ Energy Support Program has been working with Institute of Energy since 2009. With Institute of Energy's support, important studies and policy recommendations have been submitted to the Ministry of Industry and Trade for consideration. GIZ has benefited from its close cooperation with Institute of Energy as the country's leading professional consulting body, mainly focused on technical discussions and exchanges on renewable energy promotion and energy efficiency in Vietnam. GIZ looks forward to continuing to work with Institute of Energy to develop visions, strategies and policy recommendations for a sustainable energy transition in Vietnam."

PARTNER NETWORK

SEVERAL KEY DOMESTIC PARTNERS

Vietnam Electricity (EVN)

Vietnam Oil and Gas Group (PVN)

Vietnam National Coal And Mineral Industries Holding Corporation Limited (VINACOMIN)

Vietnam National Petroleum Group

EVN

PETROVIETNAM

VINACOMIN

PETROLIMEX

PETROVIETNAM PV GAS

PETROVIETNAM POWER

EVNNLDC
TRUNG TÂM ĐIỀU ĐỘ HỆ THỐNG ĐIỆN QUỐC GIA

EVNNPT

EVNNPC

EVNCPC

EVNSPC

EVNHANOI

EVNHCMC

EVNGENCO1

EVNGENCO2

EVNGENCO3

EVNPECC1

EVNPECC2

EVNPECC3

EVNPECC4

EVNNPT
BAN QUẢN LÝ DỰ ÁN CÁC CÔNG TRÌNH ĐIỆN MIỀN BẮC

EVNNPT
BAN QUẢN LÝ DỰ ÁN CÁC CÔNG TRÌNH ĐIỆN MIỀN TRUNG

EVNNPT
BAN QUẢN LÝ DỰ ÁN CÁC CÔNG TRÌNH ĐIỆN MIỀN NAM

EVNNPT
BAN QUẢN LÝ DỰ ÁN TRUYỀN TẢI ĐIỆN

Viet Phuong Group

T&T Group

Trung Nam Group

Ha Do Group

Bitexco Group

Truong Thanh Vietnam Group

Vietracimex Trade Construction Corporation (now WTO)

Viet Phuong

T&T GROUP

TRUNGNAM Group

HADO GROUP

BITEXCO GROUP

TTVN
ĐỒNG HÀNH CÙNG PHÁT TRIỂN

VIETRACIMEX

SEVERAL MAJOR INTERNATIONAL PARTNERS

ENTERPRISE

- **Japan**
  - Tokyo Electric Power Services Co., Ltd (TEPCO)
  - Toshiba Energy
  - IHI Corporation
  - Marubeni Corporation
  - Electric Power Development Company (EPDC)
  - JAPC
  - Erex Co., Ltd
- **China**
  - China Power Engineering Consulting Group Co., Ltd (CPECC)
  - Southwest Electric Power Design Institute (SWEPDI)
  - Envision Energy
- **Korea**
  - KEPCO E&C
  - Doosan Heavy Industries
  - Samsung
  - Hanwha Energy Corporation (HEC)
  - Korea Gas Corporation (KOGAS)
  - Korea Southern Power Co., Ltd (KOSPO)
  - Korea Electronics Technology Institute (KETI)
  - Doosan Enerbility
  - Taekwang Power Holdings
- **Thailand**
  - Super Energy Corporation
- **Ivory Coast**
  - Ivorian Electricity Company (CIE)
- **USA**
  - Exxon Mobil Corporation
  - AES Holdings BV
  - GE
  - Apple
  - Millennium Energy
- **Russia**
  - Rosatom
  - Novatek
- **Germany**
  - Siemens AG
- **France**
  - Total Gas & Power
  - EDF
- **Saudi Arabic**
  - ACWA Power
- **Norway**
  - Equinor
- **Denmark**
  - Ørsted Corporation
  - CIP/COP
  - Vestas
- **Finland**
  - Wärtsilä Corporation

INTERNATIONAL ORGANIZATIONS

- World Bank
- Japan International Cooperation Agency (JICA)
- ASEAN Energy Center
- Institute of Energy Economics of Japan (IEEJ)
- GIZ Energy Support Progamme
- New Energy and Industrial Technology Development Organization (NEDO)
- The Council of Renewable Energy of the Mekong Region Countries
- Asia Pacific Energy Research Center (APERC)
- Asian Development Bank (ADB)
- United Nations Development Program (UNDP)
- International Atomic Energy Organization (IAEA)
- Global Wind Energy Council (GWEC)

EMBASSY

- USA
- Denmark
- England
- France
- Korea
- Japan
- ...

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