

1 – CONTEXT: THE EDF GROUP

The EDF Group, founded in 1946, is one of the world energy leaders from the electricity production to trading and to the grid management. Present in more than thirty countries all over the world and leader of the electricity market in both France and the United-Kingdom.

One of the main EDF functions is to supply to its 40,9 million clients all over the world a safe electricity supply at lower cost. To fulfil our mission, EDF designs, builds and operates a large range of production power plants [nuclear, thermal, and renewable – hydraulic, wind and solar-] and different grids to meet the demand. The national grid is made of about 370 main substations connected to a 105.000 km grid of 400-kV and 225-kV lines and cross-borders interconnections and cables. France is connected to the neighbouring countries through the UCTE.

Major actor of the energy transition, the EDF Group is an integrated energy company, present on all the business-lines: production, transmission, distribution, trading, energy sale and utilities.

Leader of the low-carbon electricity generation all over the world, the Group developed a diversified production mix based on nuclear, hydraulic energy, renewable energies and on thermal energy.



€ 139.7Bn

Sales



179,550

Employees throughout the world



40.9M

Customers worldwide⁽¹⁾

EDF, first producer worldwide of zero direct CO₂ emission electricity (434 TWh)

93% decarbonised ⁽⁴⁾ generation thanks to nuclear (78%) & renewables (15%)



467.6 TWh

Electricity generated by the EDF Group⁽²⁾



€ 706M

Research and development budget



93%

Production free from CO₂ emissions⁽³⁾

Renewable energy leader

Installed renewable capacity of 47GW gross worldwide at end-2023, with a target of 100GW gross in 2030

- (1) 34.3 million clients for electricity and 6.6 million clients for gaz. Consolidated scope. Count in delivery points
- (2) Production of fully consolidated entities
- (3) Direct emissions excluding the life cycle analysis of generating plants and fuel

- (4) Direct carbon emissions related to generation, excluding life cycle assessment of generation means & fuels

2023 figures extract from www.edf.fr/groupe-edf

EDF CI2T (formelly known as EDF CIST-INGEUM) is the **EDF Thermal and Transmission Engineering Center** providing design and engineering services dedicated to the EDF electricity transmission systems all over the world. The Centre delivers a technical support to the grid owners and is frequently involved to solve complex technical problems related to design, operation and to the maintenance of the electric grids.

EDF CI2T has expert teams in all the business-lines associated to the electricity transmission and to the telecommunication systems.

In addition to support the activities of the EDF Group, the CI2T provides consultancy services all over the world in the below fields:

- Design, construction and commissioning of both high and very high voltage substations, of transmission lines, of underground and undersea cables,
- Achievement of surveys for the grid development, solve complex technical problems and facilitate the operational improvements,
- Development and upgrading of the load dispatching centres.

2 – EDF CI2T: INTERNATIONAL CONSULTANCY ACTIVITIES

OUR ADDED VALUE

Our internal capacity allows EDF to design, specify, build and commission facilities, thus delivering an added value to our clients and this thanks to the issue of drawings and of technical specifications guaranteeing a maximum reliability and lower development, operation and maintenance costs. Our great experience in the project management guarantees the quick and efficient implementation of projects.

OUR EXPERIENCE

The EDF CI2T clients benefit since many decades from the EDF experience as grid planner, designer, builder and operator. Therefore, we can deliver our operator clients the advantages of our great experience. We remain at the forefront of the latest technological progresses in all the electricity transmission aspects indeed the quick evolution of the SCADA / EMS and DMS systems and the integration of the renewable energies.

OUR ROLE

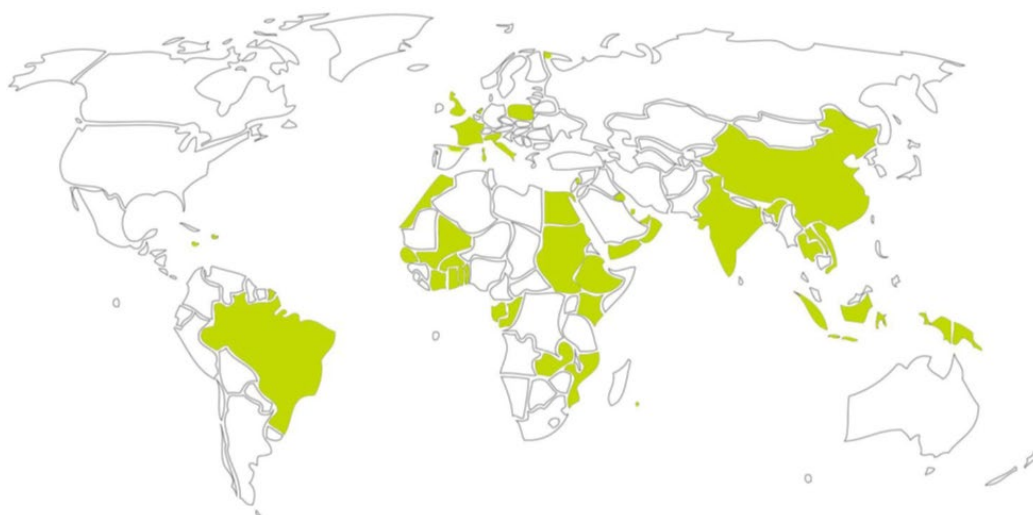
EDF CI2T often commits as consulting engineer in the important transmission and production projects. The main activities associated to this role are:

- The feasibility studies,
- The preparation of technical specifications and of call for tender documents,
- The support to the client to elect the companies in the call for tender stage,
- The review of the comprehensive drawings and of the programmes subjected by the companies,
- The monitoring of the works, the quality assurance and the contract management,
- The participation in the plant and site acceptances,
- the commissioning of the facilities.

OUR MAIN CLIENTS

Our clients are electricity producers and distributors, government institutions, major project promoters and developers. We are familiar with the working conditions associated to the major international financial institutions such as the World Bank.

THE WORLD EDF CI2T SCOPE:



SOCIAL AND ENVIRONMENTAL RESPONSIBILITY

Secure the electricity supply, allow a fair access to energy and contribute to the sustainable development of the territories are the EDF missions. In this energy transition context, we therefore defined a strategy called 2030 COURSE leading the Corporate ambition: Be efficient and responsible energy Company, champion of low carbon growth. This strategy is structured around 3 main priorities: Increase the proximity with our clients, Double the production of renewable energies and Triplicate the business part achieved abroad by 2030.

3 – EDF CI2T: MAIN EXPERTISE SECTORS

THE SUBSTATIONS

EDF CI2T is expert in design, construction and commissioning of all types of both high and very high voltage substations, in a large range of operational configurations. The types of substations are inner and outer metal cladding substations and modular units.

All our experts are perfectly familiar and experienced with all the most recent industrial and technological developments in their respective fields. Our knowledge and our solid position in the world market, allows us to propose our clients exact and updated information respect to the availability and to the cost of the tailor-made solutions to meet their specific needs.

Our expertise extends to the control design and to the communication networks (optical fiber, OPGW, PLC, micro-waves, pilot cables, etc.) and allow them to be remote monitored, controlled and operated transmission systems in the supply centres of the control system.

THE OVERHEAD LINES

EDF CI2T has a great experience all over the world in design and in the specifications of all types of VHV and HV overhead lines from simple circuit lines international interconnections with strategic importance.

EDF takes a particular care to design and specify compliant with the rules of the art overhead lines, compliant with the latest international standards, to provide the best solutions and to guarantee the optimal efficiency for the lifespan of the assets.

THE CABLES

Because of environmental and space restrictions, the electricity companies are each time more searching for underground/undersea transmission cable facilities instead of more traditional aboveground lines.

EDF CI2T is now committed in many strategic projects involving high and very high voltage underground and undersea cables dedicated to the EDF transmission grids and to other companies in the world.

THE LOAD DISPATCHING CENTRES

The load dispatching centres play an essential part to get an efficient operation of the transmission systems and of the distribution grids. These last years, the usual role of the operation changes so as to integrate the energy trading after the deregulation, the creation of energy pools and the implementation of international interconnection projects. The energy trading functions are monitored and controlled by the SCADA / EMS systems.

EDF CI2T is at the forefront of the latest SCADA / EMS and DMS technological progresses. During the writing down of the technical specifications, we take a particular care to the design of both systems and architectures, make sure all the objectives are considered, indeed: accounting, scalability, high performance, flexibility, openness to other platforms, versatility of the interfaces, cyber security and control security.

STUDIES OF THE GRIDS AND MASTER PLAN

The grid owners shall regularly review their transmission master plans, first of all because of the load increase then because of the connection of the new power plant.

The move to smart electric grids considering the integration of new technologies, among which the renewable energies, leads to revolutionise the traditional operating mode designs of the existing grids. Moreover, the important increase in the countries trying to improve the safety of their transmission grids initiating interconnections with the neighbouring countries in this field.

EDF CI2T can provide all the services allowing to achieve all the types of the concerned studies, among which the flow studies, the short-circuit studies, the stability analyses, the adaptation of the defence programmes, the review of the grid codes and of the interconnection codes, etc. Our experts have a significant experience respect to software programmes recognised at the international level for the study of the operational grids.

EDF CI2T is one of the rare consultancy engineering groups which developed know-how in the field of probabilistic studies forming a new way to carry out grid studies with the energy production in the quickly changing world. With the growing penetration of the renewable energies and the reliability and availability issues, it is only using probabilistic tools an in-depth grid study could be achieved. This is one of our value proposals dedicated to our international clients.

TRANSMISSION OF THE RENEWABLE ENERGIES

With the preoccupations related to the sustainable evolution, the integration of the renewable energies in the electricity grids became important in the world electricity sector. EDF CI2T, to meet this need implemented a section responsible for the integration of the renewable energies on the existing grid, while guaranteeing the system reliability and stability.

EDF CI2T, in collaboration with the EDF R&D developed a proposal including four types of studies; these studies are particularly well adapted to the isolated grids located on the islands.

The insertion study of the renewable energies requires new methods different from the ones used for the grid and EDF CI2T gets the answer – the probabilistic approach. This allows a decrease in the uncertainty related to the intermittent electricity production (inherent to the type of a great number of renewable technologies) and to maximise the value of the system renewable potential.

The mentioned approach in four stages consists in:

- the study of the site development potential - identification of the wind, solar, biomass or hydroelectric energy potential of a site,
- the impact study – study of the integration impact of the renewable energies on the existing grid,
- the resolution proposals of problems – the identification of the possible opportunities to integrate more renewable energies,
- the studies on the action plan – the creation of an action plan to improve the integration.

DEVELOPMENT OF THE SMART GRIDS

EDF, one of the first world actors of the energy sector is pioneer in the development and in the implementation of technologies and projects supporting the progress of the smart grids. The development of new technologies is advantageous for the client, the supplier and the company in general, thanks to consumption decreases, a best management of the assets, the improvement of the grid performances and a lower impact on the environment.

The EDF expertise in this field is developed by its R&D division leading to several Smart Grid demonstration projects.

MAINTENANCE AND REPAIR OF EDF Ltd. TRANSMISSION EQUIPMENT

EDF owns about 500 (nuclear, thermal and hydroelectric) power plants as well as their outgoing transmission equipment, including: substations, lines and cables using a voltage range from 42 kV to 500 kV.

EDF CI2T is responsible for maintenance activities of the equipment and for the following operational support activities associated to the transmission equipment:

- Development and repair of the substations and of the associated lines and cables, of the drawing up of technical specifications dedicated to monitor the works,
- Drawing up of the maintenance policy and outsourcing of the maintenance services,
- Data transmission between the EDF power plants and the EDF "Production and market optimisation Centre".

STORAGE OF THE ENERGY

Produce a low-CO2 emission electricity and develop the renewable energies is the challenge EDF daily meets. Know to store this energy to distribute it when necessary, this is the challenge of the next years. To do so, EDF leader of the energy transition, launches the electric storage plan: The objective is to develop 10 GW of new storage means all over the world by 2035 in addition to the more than 5 GW already operated by the Group.

MANAGEMENT OF THE EDF Ltd/TRANSMISSION SYSTEM OPERATOR INTERFACE

EDF CI2T manages the interface between the EDF Ltd fleet and the independent French Transmission System Operator (TSO) for everything related to transmission. Activities range from the negotiation of the production agreements to the organisation of the connection to the grid respect to the new production power plants.

The specific responsibilities include:

- Negotiation and management of the auxiliary services between EDF and the TSO
EDF defines the daily production programmes which are then negotiated and agreed with the TSO. Sometimes, when the programme requires some modifications to preserve the balance between production and consumption (primary reserve, etc.), these services are paid by the TSO.
- Negotiation with the TSO to connect new EDF power plants to the French transmission system:
When EDF builds a new power plant, EDF CI2T carries out flow and dynamics studies to determine the optimal location of the new power plant. A technical and financial proposal request to connect the power plant to the grid is then sent to the TSO. EDF CI2T assesses the proposal at the technical and financial levels and is responsible for managing the negotiations with TSO.