MANIFESTO

for ***low carbon energy***

setec
Engineers & Citizens

Introduction

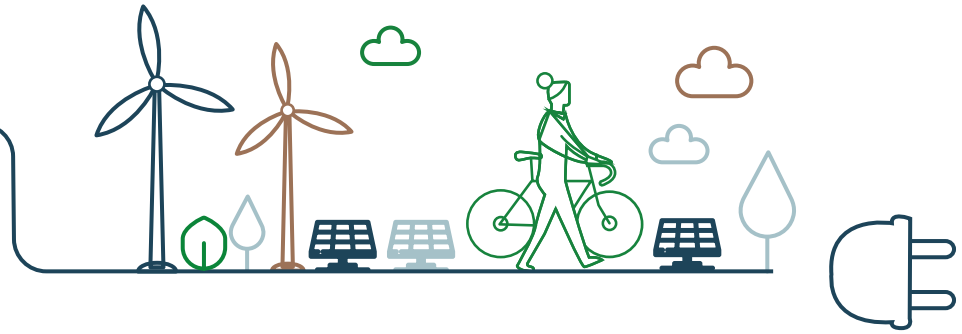
For decades, we have been familiar with an energy system characterised by partly «invisible» production, based largely on fossil fuels. In the public mind, this has created a form of ignorance, even denial, about the economic, social and environmental consequences of largescale, long-term extraction of fossil fuels.

However, as we pointed out at the beginning of this manifesto, it is no longer possible to continue in this way. The fight against climate change and the preservation of our biodiversity are unavoidable. To meet these challenges, we need to move towards energy sobriety and efficiency, but also accelerate the construction and deployment of renewable and low-carbon energy facilities.

Of course, with this change in production methods, our energy system, which is already undergoing a transformation, will become visible to everyone, just like the wind turbines that are part of everyday life in our regions. But is this really a problem? As some landscape architects say, «we have to be prepared to look behind the scenes of our lifestyles», especially when they illustrate our sovereignty and are vectors of competitiveness, that they enable the development of new professions and that they improve our purchasing power.

So we, the engineering companies, believe that we have a key role to play in this new relationship with energy, brought about by the emergence of low-carbon energy production facilities. In particular, this manifesto recalls the commitments made by Europe and France to reduce energy consumption and develop renewable energies, and highlights the need to build appropriate and consistent strategies, together with our partners, to serve the public. We will be adapting this approach wherever we operate, depending on the energy resources available locally.

Our ambition is to place engineering at the service of local and regional authorities to meet the challenges of decarbonising energy, particularly for industry. To complete and consolidate the range of viable solutions, our engineers are developing expertise in new energy solutions such as hydrogen and its renewable and nuclear production, the flexibility of the electricity system, and the deployment of fixed and floating offshore wind farms.



These solutions are designed to meet the challenges of decarbonising both the energy system and related local activities, in particular industry and transport.

They can only be successfully implemented for the benefit of all regions if all stakeholders are involved and take action.

Convinced that engineering is in a position to offer the expertise and pragmatism required for this transformation, the men and women of **setec** are firmly committed to this challenge that our world must face today.

Enjoy your read!

Michel Kahan,
President **setec** group

A climate emergency that requires a coordinated, expert and pragmatic engineering solution

Access to energy is a fundamental prerequisite for meeting all human needs (food, housing, healthcare, transport, etc.).

Fossil fuel combustion alone accounts for 41% of global greenhouse gas emissions. The International Energy Agency (IEA) estimates that these emissions remain on an «unsustainable growth trajectory», fuelling climate disturbance and reaching a new record in 2023.

At the same time, the Conferences of the Parties (COP) continue to take place, with participating countries systematically reaffirming the objective of the Paris Agreement: to maintain the increase in global average temperature below 2°C compared to pre-industrial levels and to continue efforts within a 1.5°C limit. They went even further, stating that it was «alarming and extremely worrying that human activities have caused warming of around 1.1°C to date».

Europe and France have legislated on the targets to be achieved by 2030 and 2050. The French National Low Carbon Strategy (Stratégie Nationale Bas Carbone) and the French Multiannual Energy Programme (Programmation Pluriannuelle de l'Energie - PPE) set out trajectories for achieving carbon neutrality by 2050 and reducing France's carbon footprint. The latest version of the PPE sets the target of reducing end use energy consumption in mainland France by 7.6% in 2023 and 16.5% in 2028, compared with the 2012 reference year.

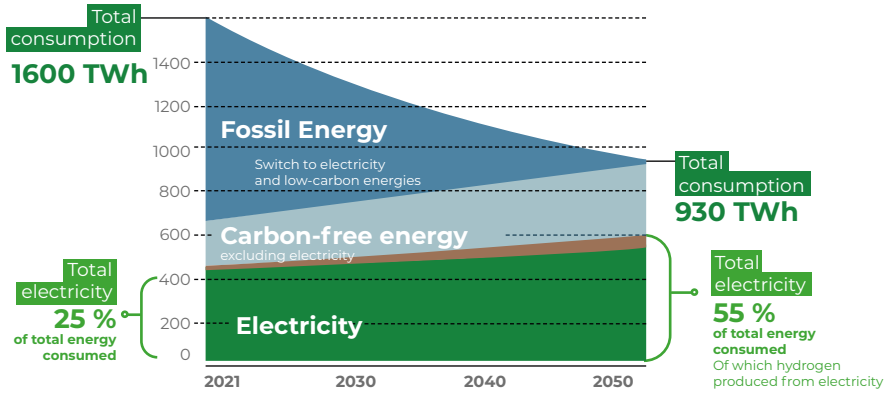
A particular effort is being made to reduce our energy consumption and to replace fossil fuels with renewable energies. The objectives covered by this legislative framework are:

- Improving security of supply
- Improving energy efficiency
- Saving energy and reducing consumption of fossil fuels in particular
- Developing the use of Renewable and Recoverable Energies (RE)
- Balanced development of energy networks, storage and conversion to encourage local energy production, smart networks and self-generation
- Preserving the purchasing power of consumers and the competitiveness of energy prices

The report «Assessment Forecast 2023-2035», published in 2023 by the French Transmission System Operator (RTE), sets out a scenario for achieving carbon neutrality by 2050. The aim is to combine control of energy consumption (-40% by 2050), driven by sobriety and energy efficiency, with the transfer of uses (massive electrification and development of low-carbon energies, including low-carbon hydrogen).

Final energy consumption forecast (in TWh)

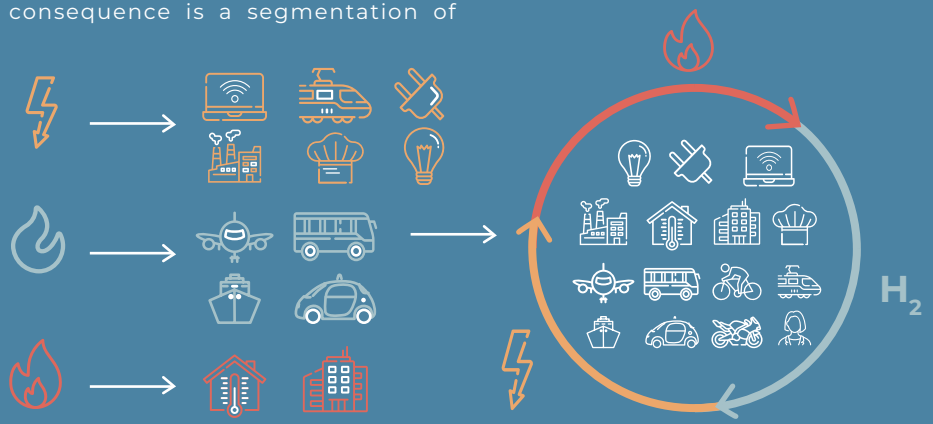
Source: Low-carbon strategy of the French Ministry for Ecological Transition (2020)



Regardless of the scenario chosen, the transformation of our energy systems will invariably take place over both a short and a long timeframe : the diversification of production sources, the transformation of networks, the evolution of uses and the optimisation of systems will take several decades to materialise.

We are convinced, once again, that it is urgent to act. In line with our long-term vision and our environmental and social commitments, we intend to play our full part in bringing about the structural changes in our energy system.

Until recently considered linear, energy value chains (producer => operator => consumer) are evolving towards new, interconnected, more sustainable and more flexible solutions. These new energy patterns appear to be inextricably linked to the regions that support them. The consequence is a segmentation of energy production and consumption (electricity, fuels, heat, etc.) and the emergence of a logic of interdependence between energy systems, in which the region plays an integrating role. This can be represented schematically as follows:



This transformation must be supported in a pragmatic way:

- Using the existing situation as a starting point for developing alternative scenarios to meet current and future needs, while keeping in line with national and European policies.
- By considering that engineering provides practical solutions to support the changes required to transform our energy systems

Already, through the nature of its activities, the **setec** group is close to the needs of local and regional authorities and the changes they are undergoing. With its technical expertise across a range of areas identified as key to decarbonising our energy systems, the **setec** group is able to respond to these challenges in a practical and cross-disciplinary way. Today, and without limiting the list, **setec** has a wide range of expertise in the field of energy, including :

- The deployment of renewable energies
- Nuclear construction
- Waste energy recovery
- Transport infrastructures (networks)
- CO^2 capture and processing

setec is a leading multi-disciplinary engineering company in the field of low-carbon energy, offering solutions tailored to each region to help fight climate change and tackle the energy crisis.

Our approach is based on:

- An integrated energy systems engineering offer, capable of informing decisions and raising awareness among project developers at different levels.
- Mobilising expertise and sharing knowledge and know-how to raise awareness and persuade people to take action.
- Innovation work contributing to new decarbonisation solutions.
- Providing global assistance by coordinating and leading stakeholders at local level.

Our approach to decarbonising our energy systems

INTELLIGENTLY INTEGRATE THESE SOLUTIONS ACCORDING TO RESOURCES AND NEEDS

BE MODERATE AND OPTIMISE

- Reduce energy consumtion
- Recover waste energy

LOW-CARBON PRODUCTION

- Develop renewable energies
- Deploy innovative solutions in the nuclear sector

DECARBONISING ENERGY USE

- Substitute fossil energies for certain uses
- Deploying hydrogen technologies

Support the transition of energy systems to meet increasingly interdependent needs

After more than a century of centralised activities around energy sources (thermal energy or nuclear energy), the last two decades have seen a shift towards more local activities, due in particular to the deployment of renewable energies.

Since 2010, the law has given local authorities extensive powers in the energy field. Local authorities (Cities, EPCIs, Departments, Regions, etc.) set their own energy transition targets. They take into account the energy resources available within their boundaries, the uses to be met and the existing or necessary transport and distribution infrastructures.

From analysing production to usage

These policies are based on detailed diagnoses and analyses of the energy needs of all components within a local economy (industry, services, agriculture, collective and individual mobility, urban and/or rural housing, etc.), and for all forms of energy (electricity, green gas including hydrogen, heat).

Adapting local energy systems to these needs (e.g. electrification of industrial processes, low-carbon mobility, deployment of heating networks, etc.) should lead local authorities to implement solutions based primarily on the region's own energy resources (solar, wind, hydro, geothermal, bio-resources, waste energy, etc.). This approach contributes to two national objectives: guaranteeing the maximum possible energy independence and controlling the competitiveness of energy prices.

Additionally, the territories include in their vision the capacity to import and export energy with neighbouring territories, by setting up intermediate transport and storage infrastructures which are themselves connected to national and trans-European infrastructures.

To meet these challenges, **setec** proposes a feasible approach at regional level

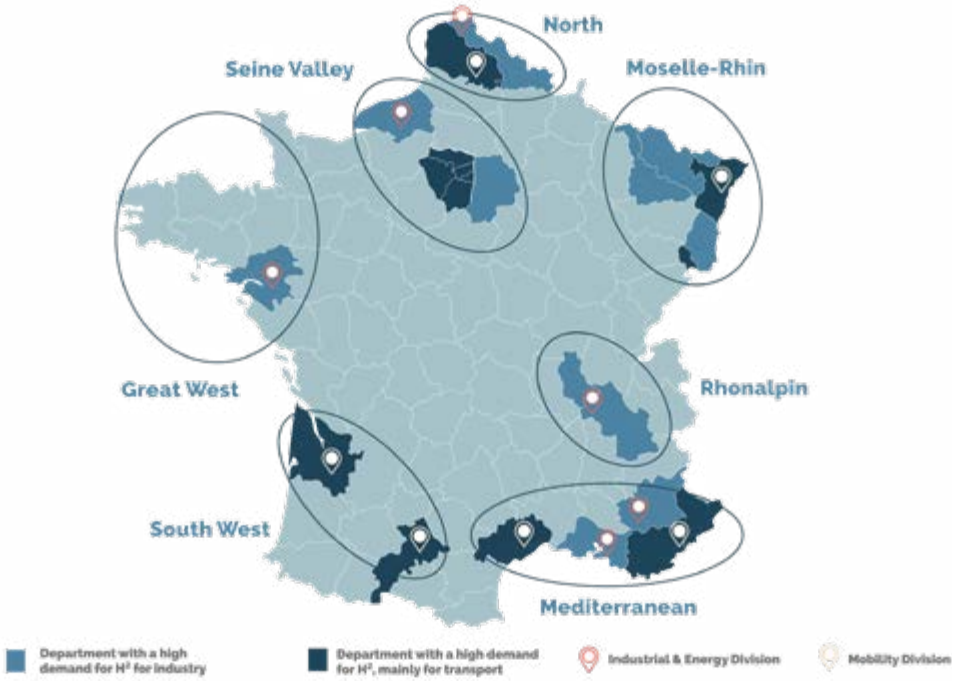
Working with groups representing local authorities and industry, **setec** is committed to building integrated solutions at a regional level to meet increasingly interdependent and comprehensive needs.

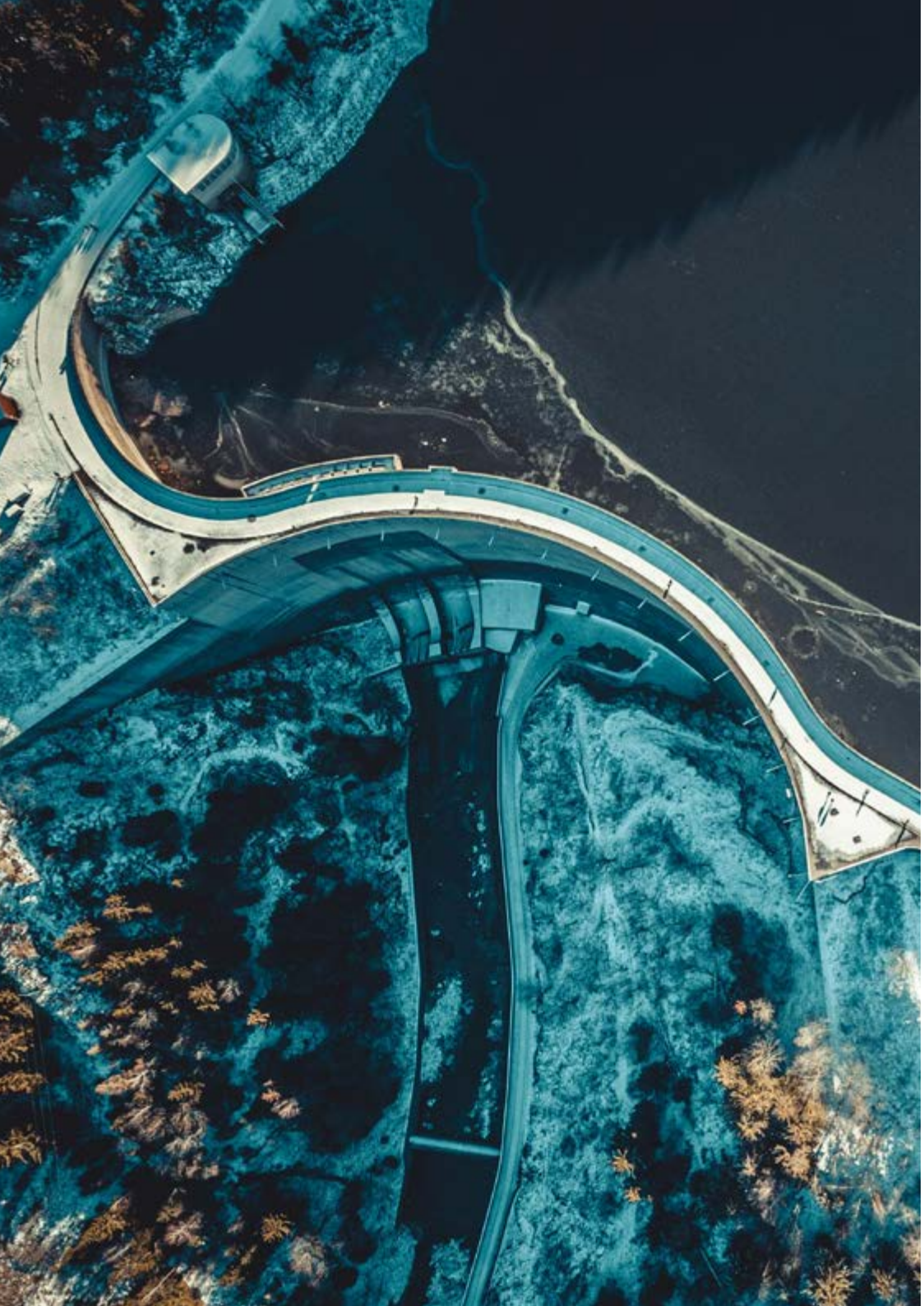
This growing complexity is encouraging energy systems to evolve locally, on the scale of defined territories, ranging from an industrial or port activity zone to a metropolitan or regional area.

One example of this approach is hydrogen, a new energy carrier that needs to interface with existing energy systems. The France Hydrogène association has identified areas where hydrogen projects are emerging (see map below).

But thinking locally should not be limited to issues relating to internal flows, and means that boundary conditions need to be factored into the analysis.

A territory's energy transition also requires a long-term approach. Energy solutions demand costly and time-consuming investment. The relevance and sizing of each new facility must therefore be assessed on the basis of the needs to be met in the short and medium term, but also projected into a long-term perspective and stability strategy.





Build appropriate and comprehensive strategies, including the development of new collective energy infrastructures

By demonstrating an ambition to «build locally by thinking globally», **setec** has taken a stand to meet the challenges facing local and regional authorities in terms of the future of energy. Our approach is based on the methodological guide «The Energy Master Plan- Combining the energy combination regional planning and urban development» («Le Schéma Directeur des Énergies - Conjuguer mix énergétique, planification territoriale et urbanisme») published by ADEME and GRDF in January 2020. ADEME defines these strategic documents for territories and recommends an appropriate methodology for establishing Energy Master Plans (Schémas Directeurs de l'Energie - SDE).

The SDE is a means of promoting crossfunctionality in the definition and management of actions to optimise the regional energy model, with a double objective:

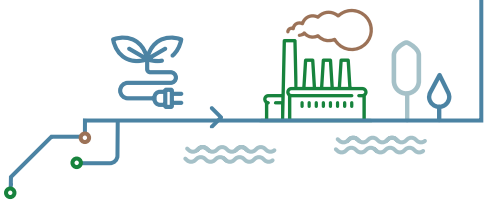
- **Moving away from a silo-type approach** to energy, particularly between different energy networks and sectors
- **Incorporating energy into sector** policies that are often developed independently of one another, particularly in industry, urban planning, development and mobility.

SDE initiatives are designed to translate **energy transition objectives into network and urban planning.**

The SDE, as defined by ADEME, «is interested in an area's energy system, the different vectors of energy consumption, the balance between demand and supply, and the supply chains and networks (energy mix) at a local level with a long-term projection. It looks at the potential for reducing requirements, and anticipates future technological developments. All end uses are taken into account, whether industrial, collective or for public use».

Optimising mutually beneficial contributions from regions and industries

The development of a strategy generally begins with a major scenario-building phase. Scenarios for changes in energy systems must necessarily take into account the interests of the local population (political vision and acceptance of the impact of the different sectors),as well as industrial strategies (site installations or closures, decarbonisation strategy, circular economy), in order to build **a genuine partnership project that optimises the benefits for the region and industry.** The establishment of such public/private partnerships contributes to the effort to reindustrialise regions by providing industrial companies with a guarantee that their requirements will be met.



setec assists local authorities in defining and implementing new community energy infrastructures

In practical terms, we work with local stakeholders in their quest for a low-carbon energy mix and a balance between local control of energy (municipalities, citizens, etc.) and supporting emerging, developing and industrial energy strategies. **Coordinated, performant networks** are a key condition for the development of renewable energies: capacity to accommodate local production, linking production, consumption and storage, managing usage and load reduction.

The challenges are proportional to the opportunities, making it possible to combine economic development and energy transition, and to define a regional strategy for energy networks and production.

The contribution of local authorities and regions to decarbonisation is aimed at achieving economic and energy efficiency, followed by research into local and renewable energy sources (solar, wind, hydro, geothermal, biomass, heat recovery, etc.).

Implementing these solutions involves defining, planning and investing in the infrastructure needed to manage such energy by means of storage, transport and distribution to industry and users.

setec offers local authorities the ability to tackle each of these issues individually, but also to integrate them into a more global approach that is more sustainable over time.

Using digital tools for energy planning and optimising uses and exchanges

To assist with energy supervision of territories, it is necessary to include controls within the energy systems that enable changes in relevant indicators to be monitored (consumption by type of energy and by operator, management of flows and stocks controlled in the public sectors of networks, the carbon footprint of energies, changes in energy prices, etc.).

As regards climate and energy, a number of local stakeholders have committed to designing and testing an innovative system for monitoring, evaluating and managing a Territorial Climate, Air and Energy Plan (PCAET), and thereby contributing to the process of developing the reference method and tool kit at national level, under the guidance of the French government.

This was made possible by the development of a detailed monitoring and evaluation reference framework for the PCAET, the development of a prototype digital platform for the residential building sector and the preparation of a roadmap for the deployment of the complete digital solution.

Coordinating territorial solutions to the problems of industrial low-carbon development

Our involvement with industry and local authorities enables us to deploy a number of energy low-carbon initiatives:

- Committed to energy efficiency, we offer solutions for reducing consumption and improving energy efficiency.
- We have been asked to develop ways of harnessing unavoidable energy and transforming excess electricity production into hydrogen for off-grid use or seasonal storage.
- We are involved in low-carbon energy production projects, supporting the development of renewable energies in local areas (photovoltaic and thermodynamic solar power, onshore and offshore wind power, hydroelectric power, geothermal energy).
- Committed to the subject of bioresources and their potential for energy conversion, we integrate the analysis and implementation of renewable energy potential into our solutions.

We are also participating in the French nuclear industry's efforts to develop cleaner, safer 3rd generation (EPR 2) and 4th generation (SMR, AMR) reactor technologies.

But beyond these different experiences, we are convinced that the subject of reducing the carbon footprint of industrial processes, given the proportional weight of emissions from this sector and the local complexity of the issues, requires a carefully thought-out and specific solution, on a suitable geographical scale.

While most industries, starting with the highest CO2 emitters, have already drawn up their roadmaps for decarbonising their activities, the operational implementation of these strategies has to fit into existing ecosystems, which are sometimes restrictive (land and logistics capacity) and sometimes facilitative(mutualisation or circular economy), but almost always interdependent.

Local and regional authorities have a

key role to play during this phase of change, by continually adapting the environment in which these industries are developing their activities.

Energy and material transport infrastructure (for all modes of transport), the development ofresources such as waste heat, bio- or e-fuels, and the use of hydrogen for mobility are all areas that often involve several stakeholders and a number of shared local responsibilities (local authorities, operators, infrastructure managers, developers, etc.).

In this respect, we work alongside industrial platforms that bring together a wide range of activities, including refining, agro-industrial processing, plastics processing and logistics.

Structured around larger territories (such as the Seine corridor between Paris and Le Havre), these areas are the focus of numerous projects designed to improve industrial synergies between local stakeholders, many of which are themselves well established.

For a specific operator in Normandy, the aim is to identify the most effective technical, economic and contractual means of developing a project to recover waste energy and mutualise energy use across the industrial zone.

As an example, we proceed by:

- Identifying and characterising sources of waste heat - site audits, analysis of operating data, etc.
- Identification and characterisation of needs in the region and surrounding communities - GIS study, discussions with potential consumers.
- The development of several scenarios for developing identified resources - accompanied by a technical and economic preliminary evaluation.
- A detailed technical and economic study of 4 scenarios (2 industrial network scenarios and 2 urban network scenarios)
- Analysis of possible management methods and contractual schemes

The diversity of our activities and the projects on which we work, as well as the variety of our partnerships, make it natural for our teams to adopt a comprehensive or multi-partner approach.

The specific challenge of reducing the carbon footprint of industry means that we need to combine our expertise and develop partnerships with major stakeholders in the world of consultancy, innovation and science, so that we can think ahead and provide scientifically solid technological and operational solutions that will benefit the entire ecosystem.

Combining nuclear power and hydrogen, to decarbonise our production and increase the flexibility of our electricity system

setec, a recognised partner to leading nuclear industrial companies

Based on a wealth of experience and know-how acquired in industrial and infrastructure projects, **setec** has progressively offered expertise to the nuclear industry. From civil engineering to mechanical engineering, ventilation, nuclear safety, radiation protection, material and technological risk management, environmental hazards (earthquakes, explosions, floods, tornadoes, etc.) and fire risk assessment, **setec**'s skills are highly complementary.

Today, by capitalising on this multidisciplinary experience, **setec** is able to work on complex engineering projects and assist clients with requalification phases, new construction, studies of new models, dismantling projects and radioactive waste storage or disposal.

Hydrogen, the solution for both decarbonising and enhancing the flexibility of energy systems

The development of low-carbon hydrogen is one of the solutions being put forward to achieve carbon neutrality. In recent years, ambitious European and national strategies for the development of hydrogen have emerged, and in September 2020 the public authorities defined a hydrogen strategy in line with the France Recovery Plan.

In the «Energy Futures 2050» study published by RTE, the production of low-carbon hydrogen is included in certain scenarios that currently dominate our energy future. **But the production of hydrogen, essentially through water electrolysis, is a major source of electricity consumption at a time when the electricity system will be under increasing strain,** both in terms of accessible power and flexibility requirements. This energy will have to be produced directly by dedicated renewable energies or by future generations of nuclear technologies (EPR 2, Small Modular Reactor SMR, Advanced Modular Reactor AMR) in a bi- or tri-generation mode (electricity, heat, hydrogen).

Renewable hydrogen and low-carbon hydrogen

By developing the potential of the current nuclear fleet and adding the EPR 2 reactors and smaller 4th generation reactors, France is creating the means to produce almost its entire hydrogen needs domestically in order to maintain a level of **energy independence** that has been the key feature of French energy policies since the middle of the last century.

An innovative nuclear-hydrogen solution for next-generation reactors

setec is working with nuclear partners to explore the potential for bi- or tri-generation in future EPR 2 reactors. The inclusion of a steam plant on a cooling ground circuit could supply local heating networks, and a high temperature electrolyser could produce hydrogen on a massive scale, mainly for use by major industrial consumers.

The 4th generation of nuclear reactors is another major focus for **setec**'s teams. The modularity and size of these future power plants mean that they will be decentralised energy production tools capable of meeting local needs (electricity, heat, hydrogen).

A partner in the NUWARD™ SMR project, **setec** is also involved in the design work for 4th generation AMR reactors, whose specifications include the capacity for electricity and hydrogen cogeneration. More recently, **setec** has been supporting a number of start-ups emerging from the government's «France 2030» programme and the «Innovative Nuclear Reactors» call for proposals.

These start-ups offer breakthrough technologies for today's reactors. OTRERA Nuclear Energy, announced on the 24th of May, 2023 as a CEA spin-off and winner of the «Innovative Nuclear Reactors» call for projects on the 27th of November, is proposing a sodium-cooled fast neutron reactor capable of high-efficiency cogeneration (110 MWe, 185 MWth). Otrera Nuclear Energy's ambition is to commission a production reactor in 2032.

A diversified range of setec services

Providing expertise, assistance, consultancy and project management services, **setec** offers support to nuclear industry stakeholders in the following areas:

- **Bringing a clear view of the market that is essential for sizing and managing facilities,** through its global approach to the development of energy systems and the establishment of energy master plans on a regional level.
- Assisting constructors and operators in preparing and performing **functional analyses and preparing regulatory dossiers** concerning the integrated facility.
- **Designing and managing the implementation** of integrated plant packages: in addition to the works already assigned to **setec** on the nuclear island, the Group is positioning itself on the steam power plant and the hydrogen production unit, as well as on all auxiliary sub-systems required to guarantee the environmental protection and safety of such innovative installations.
- Designing, sizing and managing the construction of **infrastructures that interface with the local environment** (storage, transport and distribution of energy from the plant to local applications)

Putting innovation and a pragmatic approach to engineering at the service of offshore wind power development

While the first French offshore wind farms are supplying their electrons to the network with an effective capacity factor, the ambitions of France (45GW by 2050) and Europe (300GW by 2050) highlight a number of challenges that **setec** intends to meet.

Evaluating and minimising environmental impacts

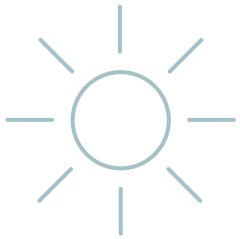
Environmental issues are paramount in offshore wind farm projects, as can be seen from the regulations and the requirements of the tender specifications:
limiting environmental impact both at sea and on land, eco-design, carbon footprint of the project, recyclability of components, life cycle of the infrastructure, sobriety, etc. All measures must be taken to reduce the environmental impact of the project. **Historically present in this field, setec has acquired recognised expertise thanks to its experience in the marine environment.**

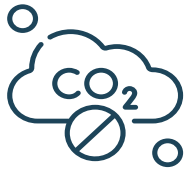
The challenges are such that we need to constantly improve our general understanding of the environment and of species, to identify the effects of wind power and to **continue to improve environmental monitoring. But we also need to look at research and innovation to find solutions that will allow us to build and operate wind farms with less impact** (substitution of certain rare resources, new materials for blades, cables and anchoring systems, etc.).

Technical and construction challenges for both land-based and floating offshore wind turbines

The need to speed up projects is pushing industry stakeholders to design structures and assemblies that are compatible with depths never before reached: it was generally accepted that beyond 50 metres, fixed foundations (monopiles, jackets, gravity foundations) were no longer competitive with floating solutions. But it now seems possible to go beyond these limits thanks to new installation and lifting methods, such as those being used in Scotland.

For floating wind turbines, the efforts of both developers and **setec** are focused on the design of floating structures to combine resistance, sobriety, performance and realism. There are a large number of floating concepts (semi-submersible, spar, barge or TLP) and many innovations of various degrees of sophistication (active ballast systems, synthetic anchor lines, etc.). While the challenge of technical feasibility appears to be in the process of being met, that of reducing costs and mass production remains ahead of us.





Infrastructure availability and industrial tools, the key to deployment

The infrastructure for assembling, transporting and maintaining wind turbines (port facilities, industrial tools, vessel fleets and personnel, etc.) is a key factor in the success of largescale deployment of floating wind turbines: port logistics could therefore be the main challenge for large-scale deployment, and to achieve this, the assembly and storage of floats should, in the near future, be carried out within coastal infrastructure located close to the projects, given the challenges associated with their land use and on-site transport.

As logistical and industrial bases for projects, the ports will have to **build and adapt their infrastructure** (heavylift quays, platforms) and have significant land capacity to meet the requirements of storage, maintenance, launching and integration of wind turbines on floats.

As far as connections are concerned, the increasing distance between the wind farms and the expected rise in power delivered will force the network operator to adapt methods of collecting and purchasing electricity on land (floating direct current substations, higher-power floating dynamic cables, etc.) **and therefore to innovate and adapt the infrastructure.**

Assisting regions and territories so that their projects are acceptable

In the environmental context, the issue of acceptability and integration of projects into regional and local communities remains central in France today, with no project escaping this rule. This approach conditions, if not their success, at least the social acceptability of the projects. The construction of an offshore wind farm is the result of a long process of consultation and dialogue with all local stakeholders (elected representatives, administrations, local associations, fishing communities, local residents, etc.), which is inseparable from the operational aspects of the project.

setec offshore wind is built on a foundation of high value-added expertise designed to meet the engineering challenges of offshore wind energy.

The group, which has already made a name for itself thanks to its renowned expertise in the marine environment, has set up an entity that federates **setec**'s skills in offshore wind energy and offers a wide range of services to project owners, developers, public authorities, energy companies, manufacturers, port managers, etc. This service offering meets three objectives:

- **To advise and accompany project developers**, based on our expertise
- **Develop, orientate and secure offshore wind energy technologies, both land-based and floating**, by meeting performance and economic efficiency requirements
- **Propose solutions for the construction**, consolidation and optimisation of offshore wind farm facilities and their future exploitation

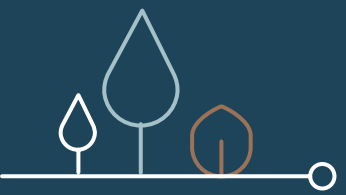
Providing expertise, assistance, consultancy and project management, **setec offshore wind** brings together many of the group's activities to provide the right solutions for all stakeholders in the industry.

THE 07 COMMIT-MENTS

of SETEC

for a low-carbon energy

1. Providing a global territorial vision **of the entire non-fossil energy cycle**, from production to use
2. Designing and planning **low-carbon, energy efficient projects** with the aim of decarbonising energy sources
3. Recommend and develop **mutually beneficial solutions** for decarbonising energy, linking industry and local communities
4. Integrating **safety, security and public acceptability** into our offers
5. Acting and innovating for **economically and environmentally efficient energy systems**
6. Developing tools and indicators for **operational assessment** of project impacts
7. **Supporting** stakeholders and **optimising the performance** of their projects over the long term




ENGINEERS
&
CITIZENS