Illustration : Joséphine Herbelin

SMART GRIDS, THE BACKBONE OF SUSTAINABLE RECOVERY

think SMARTGRIDS

FRENCH SOLUTIONS FOR SMARTGRIDS

STATEMENT OF CONVICTION

This plan was written by the members of Think Smartgrids, association created in 2015, with the aim of bringing together the Smart Grids stakeholders in France and promoting their international know-how. The association's vocation, through its actions, is to contribute to job creation in France, and to develop the competitiveness of the sector. The need for a massive green recovery plan is the subject of a widely shared consensus. The European Green Deal or recent French government announcements clearly establish the ecological dimension of the recovery. Think Smartgrids wanted to make its contribution towards the recovery through the energy transition, illustrating the importance of investment in smart grids.

This document demonstrates the central role of Smart Grids in the energy transition, as well as the immediate impact of their development on boosting the economy, in the context of the development of lasting energy infrastructure.

After several years of experimenting with Smart Grids, the maturity of digital technologies combined with advances in energy technologies have created the conditions for widescale deployment of smart grids, independently of all actions related to the health crisis. Meeting the imperative of carbon neutrality by 2050 in developing Smart Grids involves the participation and the short, medium, and long-term stimulation of several industrial sectors:

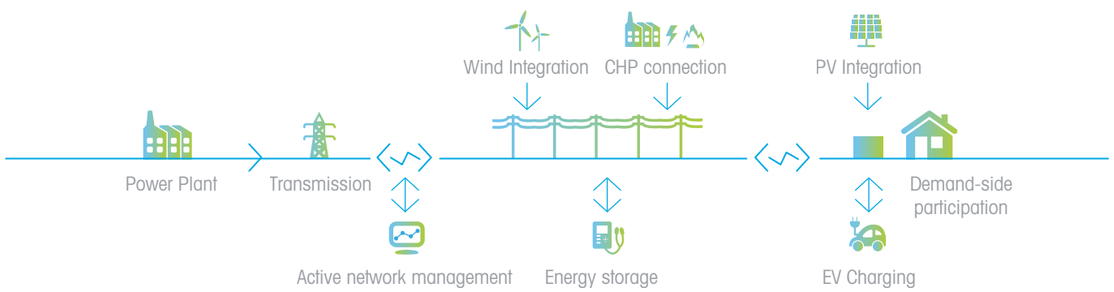
- The building sector, which will play a key role in the renovation and sobriety of buildings (insulation, positive energy building, active building management).
- The automotive sector, which is supported in its recovery by the automotive plan, needs EV charging stations, which are known to be important in achieving carbon-free mobility.
- Manufacturers of electrical equipment and other sectors.
- Digital Service Companies which will take this opportunity to implement technology for climate purposes.
- The start-ups and innovation clusters that will find a field of application for their new value propositions.

And, of course, the electrical sector, which will have the opportunity here to play its pivotal role vis-à-vis other energy systems (heat, cold, decarbonated gas, hydrogen, biofuels).

The Think Smartgrids recovery plan provides the opportunity for all these sectors to create tens of thousands of jobs throughout the French mainland and overseas territories within a year.

France, a pioneer in the fight against global warming since the Paris agreement, is already among the world leaders in decarbonized electrical systems, from production to energy networks and services. The dynamic that France will inspire by implementing Think Smartgrids recommendations and projects is also likely to provide significant prospects for international development among French businesses, from start-ups to major operators and equipment manufacturers, energy companies and digital service companies.

Accelerated investment in Smart Grids, a prerequisite for a successful green recovery, requires that transmission costs - the future "TURPE 6" in France (regulated user tariff) - takes this new trajectory into account for the development of smart grids. It is also essential to fund structuring projects appropriately to avoid adding to the end customer's bill.



THE THINK SMARTGRIDS RECOVERY PLAN IS BASED ON 14 RECOMMENDATIONS:

THE NEED FOR A GREEN RECOVERY PLAN

R1. A green recovery plan with a Smart Grids component is essential
R2. The effectiveness of the Green Recovery Plan depends on several conditions

SMART GRID DEVELOPMENTS THAT FACILITATE THE ENERGY TRANSITION

R3. Accelerate the deployment of charging infrastructures for electric vehicles
R4. Act on the decarbonisation of buildings through Smart Grids and digitalisation
R5. Improve the flexibility of industrial consumption
R6. Standardize communications to develop residential demand control
R7. Create the necessary energy data architecture to develop services for Prosumers
R8. Develop the energy transition, energy resilience and industrial performance of territories through the combination of Real-Time Telecoms - Smart Grids
R9. Deploy storage for networks and renewable energy (RE)
R10. Develop multi-network distribution coupling (electricity, heat, cold, H_2, e-fuels)

LEVERS FOR REGULATION AND CHANGE

R11. Change regulations to free up energy: change bundle
R12. Change behaviour for a sustainable society
R13. Organize the increase in skills to support the development of Smart Grids
R14. Accelerate the energy transition by extending French Smart Grid leadership to the international market

RTE's intelligent electrical substation in Blocaux

ABOUT THINK SMARTGRIDS

Think Smartgrids federates and represents the French Smart Grid ecosystem, with around a hundred members, from start-ups to major groups, research laboratories, universities, professional associations, and competitive clusters.

The activities of its members cover the entire Smart Grids value chain: electronic engineering, utilities, automation, equipment and information systems, business models, training, and regulation. The association, chaired by Marianne Laigneau, President of the Enedis Management Board, aims to federate and develop the Smart Grids sector in France, to be the voice of its members among key stakeholders and to develop international collaboration on behalf of its members. The Energy Regulation Commission, the Enterprise Directorate and the Directorate General for Energy and Climate have observer status.

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THE IMPORTANCE OF A GREEN RECOVERY POST-HEALTH CRISIS

THE NEED FOR A MASSIVE RECOVERY PLAN IS THE SUBJECT OF A WIDELY SHARED CONSENSUS

The health crisis linked to Covid-19 has plunged France, Europe, and most of the world into a deep recession. There is a widely shared consensus on the need for a massive recovery plan.

Many voices are calling for the recovery to focus on ecology and energy transition. There are several reasons for this:

- Tools and political commitment exist; at the European level with the "Green deal" presented in December 2019, in France with the National Low Carbon Strategy (SNBC), set out in the Multiannual Energy Program (MEP), which are themselves "taken into account by public decision-makers at both national and local levels", all converging towards an ambitious objective of carbon neutrality in 2050; or again in Germany, with the "Power Grid Action Plan"[1].
- For many, the health crisis underlines the urgency of the fight against global warming, whose medium to long-term consequences could be much more serious than the health crisis of 2020. At the same time, the economic consequences of this health crisis are a direct threat to the funding of actions in favour of the fight against global warming[2].
- Finally, any useful and sustainable recovery plan will have to be oriented towards an industrial project anchored in the territories, to enable local reindustrialisation for priority sectors and increase French competitiveness.

Achieving the objectives of the energy transition necessarily relies on innovative networks, the backbone of this transition, enabling the rise of alternative carbon-free energies in the energy mix and changes in consumer lifestyles and uses.

This is why Think Smartgrids, an association dedicated to developing and promoting the French smart grid sector, wanted to make its contribution to a revival through the energy transition, by showing how it can, and must, reserve a central place for investment in smart grids.

First and foremost, the regulations provide for it. The energy code specifically states that in order to achieve the objectives of France's energy policy, "the State, in coherence with local and regional authorities and their interest groups and by mobilising businesses, associations and citizens, ensure, in particular, that [...] means of transport are provided and energy storage adapted to needs"[3]. The other means provided for by the code are also closely linked to the networks, whether it is a question of controlling demand and promoting energy efficiency, through flexibility tools, by for example, increasing the share of renewable energies via close control of their connection, the development of self-consumption and storage solutions, or supporting energy research, including transport.

This reassuring framework makes it possible to effectively "signpost" the investment. Secondly, there are existing projects: it is the very purpose of this contribution to show specific examples of these projects. Backed by French and European companies of all sizes, from start-ups to large groups, at different levels of maturity or in the research and development phase, all are concrete. The smart grid industry provides immediate investment opportunities, in projects for medium and long-term development.

Finally, the territorial coverage of energy networks and the variety of stakeholders in the Smart Grids sector enable investment in this sector to feed the entire social, economic, and territorial fabric. In the same spirit, we will see that the diversity of projects provides opportunities for short, medium, or long-term investments, and thus for stimulus investments to be part of a sustainable trajectory.

1. On 14 August 2018, Germany's Minister of Economic Affairs and Energy stated: "For a successful energy transition, we need modern and well-built grids as much as we need more renewable energies".
2. See the May 2020 Report of the International Energy Agendas on global investment, fearing a reduction of nearly $400 billion in investment in the transition to clean energy.
3. Energy Code, Article L 100-2

SUSTAINABLE RECOVERY FOR A NEW, LOW-CARBON ECONOMY INVOLVES MULTIPLE APPROACHES TO BE IMPLEMENTED IN A MULTI-MATURITY TRACTORY (SHORT, MEDIUM, AND LONG TERM)

The sustainable recovery must make it possible to reinforce four pillars of the energy and digital transition:

1. **The development and integration of renewable energies.** The Pluriannual Energy Program (PPE), adopted by decree of 21 April 2020, plans to double the capacity for electricity production from renewable sources by 2028, with the aim of achieving carbon-neutrality by 2050. This production, which is intermittent and distributed by nature, will have to be absorbed by the networks safely and sustainably.
2. **Smart electrification of energy uses, including the development of electric mobility and smart charging.** The PPE sets a target of more than 5 million electric or rechargeable hybrid vehicles by 2028 and plans to have 500,000 public charging points by that same date. The automotive recovery plan, presented Tuesday 26 May 2020 by the French President, confirms this ambition and de facto reinforces the role of the stakeholders in the Smart Grids sector already involved in creating the best conditions for the development of large-scale electric mobility in France.
   The other energy uses: self-consumption, storage, downstream device control (IOT) and development of the services provided by the communicating meter are also intended to develop the flexibility of the system and reduce the costs for households and businesses in the long term. This approach highlights the new Prosumer, who wants to reduce their energy bill and contribute to the management of their consumption, or self-production.
3. **Improved energy efficiency.** The PPE foresees a reduction in final energy consumption of -16.5% by 2028 compared to 2012 and the development of 6.5 GW electrical shedding capacity.
4. **A multi-energy convergence** benefiting from the possible synergies between electricity, heat, cold, natural gas, and hydrogen.

These four approaches, essential for the fight against global warming, are conducive to positive externalities: securing the energy supply, increasing the resilience of the economy, reducing air pollution related health costs and net local job creation (+400,000 jobs in France by 2028, source PPE). They are supported by intense digitalisation of networks, developing technical and financial gains while increasing the resilience of these networks.

It should also be noted that the number of jobs created by the global electricity system is currently estimated at 300,000, including 100,000 for electricity transmission and distribution networks (EDEC study on the electricity sector, June 2020).

Stimulus plans must guarantee the effectiveness of their support over different timelines:

- **Short-term timeline to allow for immediate recovery of the economy** (including developments in the digital sector) and to catch up for delays in the 1st half of 2020 related to the lockdown and the necessary implementation of sanitary measures: postponement of infrastructure maintenance activities (network, production, charging stations), connection of renewable installations and charging stations to the power grid, falling sales of electric vehicles, financial difficulties of certain stakeholders linked to the economic downturn, etc. In particular, the postponement of maintenance activities on some production resources during the lockdown period, underlines the need for Smart Grids solutions such as observability and tracking capabilities or storage and shedding devices, to cope with any potential risks to supply.
- **Medium-term timeline to enable the acceleration of these four pillars** in a context in which the need for financial support for energy transition solutions could be higher than initially expected without a change of framework (lower price of fossil fuels, surplus of CO_2 quotas, etc.).
- **Long-term timeline where carbon neutrality is achieved**, to give visibility to economic stakeholders on a target market framework ensuring non-discrimination and transparency of benefits for the consumer.

THE EFFECTIVENESS OF THESE GREEN STIMULUS MEASURES IS RELIANT ON SEVERAL CONDITIONS

EUROPE IS NOT ALONE AS A PIONEER IN THE FIGHT AGAINST GLOBAL WARMING

There is no point in investing massively in the energy transition and the fight against global warming if other countries are not also pursuing these efforts. This hurdle could be removed if France and its European partners manage to set an example, by engaging their citizens to act and by making the necessary decisions as part of their low-carbon commitments. Smart Grids are already helping to integrate renewable energy into the grid and can contribute to greater flexibility and energy efficiency.

However, France and Europe must also help other countries to implement their own energy transition policies through active, green economic diplomacy, initiated at the 2015 COP 21 in Paris. To achieve this, international cooperation will have to be strengthened, both on an institutional level (Ministry, Energy Regulatory Commission, ADEME) and on a company level. Comprehensive solutions can be proposed internationally, by French companies, supported by diplomacy, ranging from RE production to its integration in the networks, but also from transmission network studies to the installation of electric vehicle charging stations.

USE STIMULUS PACKAGES TO LAUNCH PROJECTS THAT ARE ESSENTIAL FOR DECARBONISATION, BUT NOT IMMEDIATELY PROFITABLE AND THEREFORE GENERALLY DIFFICULT TO FINANCE

The green recovery also involves the eco-renovation of housing and tertiary buildings. It contributes majorly to the country's new low-carbon strategy and provides a tremendous opportunity for the sustainable creation of jobs in France, in many sectors and throughout the country: construction, HVAC engineering and Smart Grids. In existing housing, renovation can produce the dual effect of sobriety and decarbonisation, by relying on targeted operations to improve insulation and the implementation of technologies to control usage. Other actions can be taken to combat fuel poverty such as the widespread use of efficient means of heat production and cooling such as reversible heat pumps or the use of biomass. These actions also contribute to the fight against fuel poverty.

Housing is becoming a field of intervention for Smart Grids: with the new carbon-free thermal uses, the development of photovoltaics and residential electricity storage, the acceleration of electric mobility and smart charging, houses and buildings have an ever increasing need for intelligence.

Housing uses Smart Grids to optimise the management of uses and the load curve at the scale of individual or collective housing. The convergence of IOT, supervision and BIM/CIM data exchange technologies between the network and the home, in compliance with the applicable rules of confidentiality, provide new development opportunities.

WE NEED TO INVEST IN INNOVATION, FUNDAMENTAL AND APPLIED RESEARCH

In this framework, innovation is key, both for the green transition and for economic competitiveness.This innovation is multi-faceted:

- **Technological**, to develop breakthrough products and services that will have a low environmental impact on their life cycle and consolidate French or European strengths in global economic competition. For example, the Linky smart meter, Smart Grids technologies, flexibility management services, batteries, and hydrogen production resources.
- **Organisational**, to encourage administrations and companies to consider environmental issues in their strategy and operations and to meet the needs of a changing world through the continuous training of teams. For example, some stakeholders have embarked on programmes to renew their existing fleets of internal combustion vehicles with electric vehicles.
- **Regulatory**, to support the two previous approaches by changing market rules to facilitate the inclusion of innovations or by promoting the development of a competitive and green French offer. For example: the new frequency regulation mechanisms and the smart connection offer.

Support for technological innovation must be based on a comprehensive view of the development cycle:

- **Fundamental research**: to identify potentially differentiating core technologies.
- **Applied research**: to find an integrated solution and produce first models.
- **Demonstration and pilot installations**: to confirm the applicability of the solutions in real conditions.

To this end, public research laboratories and institutions have a major role to play and their capacities need to be strengthened.

The energy transition and the challenge of innovation concerns all economic stakeholders - large groups, public institutions, SMBs and a fortiori start-ups, due to the specific nature of their development model.

STAKEHOLDERS AND DECISION-MAKERS MUST BE TRAINED

The implementation of the proposed transition and its success depend on the adapted capacities of the active forces within private and public organizations. In this perspective, initial and continuing training is a formidable tool. It must be transversal in terms of the issues addressed, placing the challenges of the ecological and digital transition at the centre, but above all it must be aimed at all professions and not be limited to the obvious training of engineers and scientists. For the integration of the green transition, it is equally important to train future political decision-makers, future business leaders, economists, members of administrations, operational stakeholders in the transition, etc. This training should facilitate the emergence of the innovations listed above in particular. Universities and schools have a major role to play in this respect and this is concomitant with their actions in research.

BEHAVIOUR NEEDS TO CHANGE

The general public has a major role to play in the green transition, whether through their daily actions or their consumption choices. Most French people affirm a sensitivity to environmental issues. However, there may be a certain defeatism that comes with the feeling of having a limited impact. As a result, the involvement of the public represents both an opportunity and a risk of disengagement. In addition to changing people's vision of their abilities, it is also necessary to bring about a change in behaviour by the involvement of everyone, through a certain form of energy sobriety. This mobilization must be applied to all the contexts and instances of people's lives. Changing energy behaviour is a national cause.

This question of behavioural change can be found in Smart Grids, particularly when it comes to technologies linked to flexible consumption such as postponing heating or smart charging.

The Education and awareness policy on the green transition can be initiated on European, national, and local levels. The ADEME, as well as territorial actors, local authorities, and associations, among others, working closely with the French populations, are the major players in this field. Businesses also have a considerable capacity to communicate with the public. They can highlight the environmental attributes of their own products and implement actions related to their core business, for example during an intervention at an individual's home.

MOBILIZATION OF THE TERRITORIES, AT THE HEART OF ENERGY AND DIGITAL TRANSITION PROJECTS

The deployment of Smart Grids solutions on a large scale requires strong territorial mobilization. The French Smart Grids sector has passed a milestone thanks to the development of three major programmes driven by the territories: FLEXGRID (Provence-Alpes-Côte d'Azur), Smile (Brittany and Pays de la Loire) and YOU & GRID (Lille Metropole and Hauts-de-France). These three projects were approved through the French government's call for expressions of interest launched in 2015.

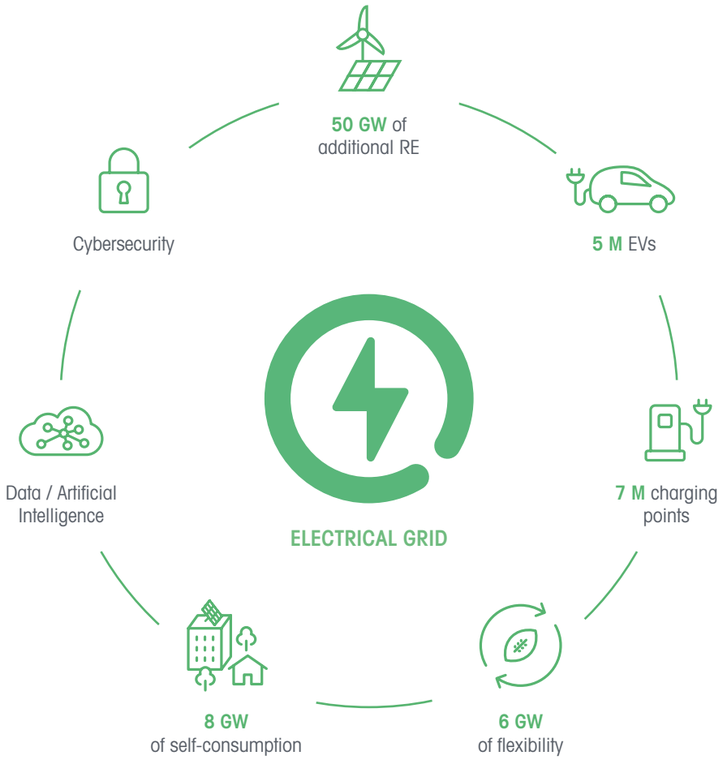
Their implementation was initiated in 2016, thanks to €50 million made available through AIP portals and €80 million from the tariff for use of the public electricity network in France ("TURPE"). Thanks to a great effort of cohesion, initiative and collaboration between the industry and the territories, over 120 projects are being deployed in all the use cases (industry and infrastructure, mobility, smart city, and data, RE and storage). Numerous successful European funding projects have helped to support these initiatives.

These showcases of the French industrialisation of Smart Grids are examples for other local authorities, both in terms of solutions and the ways in which public and private contractors and citizens are supported and involved.

It would be useful to organise feedback for local and regional authorities so that other Regions can benefit from their experience to speed up implementation by providing concrete, learning and operational support from the field.

SMART GRIDS, BACKBONE OF SUSTAINABLE RECOVERY

ENERGY NETWORKS AT THE HEART OF THE ENERGY TRANSITION



By becoming increasingly smart and digital, electricity grid infrastructures have a key role to play, enabling the massive integration of distributed and intermittent renewable energy sources, supporting the development of electric vehicles, multi-energy grids, smart buildings, and smart cities.
Thanks to micro-grids, Smart Grids also allow quality access to energy in isolated areas.

The power grid is becoming increasingly decentralized and complex, requiring better understanding, monitoring and control, as well as the development of tools for forecasting electricity production and consumption. From smart meters and sensors to smart substations and virtual power plants, smart grids rely on digital solutions to become more flexible, scalable, and efficient.

The development of smart meters, solutions for controlling consumption and self-consumption, has also led to the emergence of the "Prosumer": the consumer can now actively participate in improving the flexibility of the network and contribute to the management and economic optimisation of the energy system.

Finally, for local authorities, smart grids are an opportunity to develop new models around sustainable mobility, micro-grids, energy storage and energy communities, thus helping to balance the costs of the energy transition. The analysis of smart grid data is a powerful lever to support local policies, better target investments and empower territories in their local energy management.

SMART GRIDS' CONTRIBUTIONS TO A GREEN RECOVERY

Smart Grids are contributing to the energy transition today by integrating all intermittent renewable energies and strengthening it for tomorrow, through continuous adaptation of the network and increase of its capacities: digitalization and advances in storage make the network more resilient and enable it to respond to the challenge of the development of electric mobility.

The International Energy Agency (IEA), in its most recent report published in June 2020, clearly states the value of considering the development of networks in the framework for recovery plans:
"Grid-related measures could boost employment and deliver many long-term advantages in terms of sustainability and resilience. Efficient networks are the foundation of robust and secure power systems, and there is scope for action to reduce high-cost disruptions, improve the integration of variable renewables, and enable demand-side response and cross-border trade."

The benefits of deploying Smart Grids across the entire national community are estimated at €400M/year[1].

Smart Grid on Glénan island

INTEGRATION OF RENEWABLE ENERGIES ON THE NETWORKS

In the Multiannual Energy Programme (MEP), the French government has set ambitious objectives in terms of inclusion of RE, and it raises new issues for networks. A significant share of RE generation is intermittent and decentralized. Power grids will have to, on the one hand be increasingly flexible and, on the other hand, function bidirectionally by ensuring the collection of all decentralised production, while guaranteeing safety, stability, reliability, equal access and quality of supply and service[2].

Smart Grids facilitate the integration of REs while meeting the fundamental objectives assigned to the networks. Smart Grids help to:

- **Reduce the cost and time to connect REs**, for optimized network costs for all users.Optimization of connection can be achieved through smart connection offers which can reduce connection costs by up to 60%[3]. Offers have been tested since 2017 as part of the Smart Grid Vendée demonstrator and their scaling up to industrial scope is planned in the SMILE project (Smart Ideas to Link Energies).
- **Maximize the injection of RE into the networks**, thanks to more dynamic and in-depth management of the network, beyond the more conservative fixed limits that are applied when information on the state of the networks is not available[4].
- **Manage the electrical system in a reactive manner**, in the context of distributed and unpredictable energies, by developing observability, steering and flexibility. Controlling production can avoid up to 30% of reinforcement costs on low voltage (LV) networks[5].
- **To recover waste heat**, in particular by implementing synergies between the different energy networks (most notably electricity, heat, cold, gas).

1. Sustainable Recovery – IEA June 2020
2. Ademe study, Adeef, RTE, Enedis 2017
3. Press release on the launch of the smart connection offers: https://www.enedis.fr/sites/default/files/field/documents/DP_ORI.PDF
4. The Ten-Year Development Plan for the RTE network is available here: https://www.concerte.fr/system/files/concertation/SDDR_AppelAContributions_vfin_0.pdf
5 This approximation was estimated as part of the SMAP demonstrator: https://www.enedis.fr/smap

EXAMPLE OF OPPORTUNITIES: OFF-SHORE WIND POWER, AN ENERGY WITH JOB PROSPECTS

Offshore wind energy is gradually becoming a fully-fledged sector in the development of new renewable energies. The EPP foresees an acceleration of its development with an installed capacity of 9 GW within 10 years. Connecting off-shore sites raises the major challenges of industrial reliability and cost reduction, which are indispensable for the sustainable competitiveness of the off-shore sector.

The Smart Grids sector has developed innovative solutions for electrical equipment adapted to the constraints of volume, weight, and difficult conditions at sea. The increase in the power of machines has necessitated the creation of higher voltage equipment. The advent of floating wind turbines and the remoteness of the coastline increase the challenges. The Lisore project (EDF, RTE, Centrale Nantes, Siemens, France Energies Marines, Chantiers de l'Atlantique...) aims to develop a lighter floating platform for energy evacuation substations. The Omdyn project aims to develop a high-voltage dynamic immersed cable adapted to the movement of floating equipment, with EDF, RTE, IFREMER, Total, DCNS, Bureau Veritas, University of Nantes...

Several thousands of jobs will be created through this new sector, from the construction of blades to the connection of wind turbines.

DEVELOPMENT OF ELECTRIC MOBILITY AND SMART CHARGING

Transport accounts for one third of energy consumption and greenhouse gas emissions in France, making mobility a major factor in the energy transition. The EPP sets a target of 1.2 million electric (electric and plug-in hybrids) personal cars in circulation by 2023 and over 100,000 public charging points. These are directly connected to the electricity grid, so their impact must be anticipated.

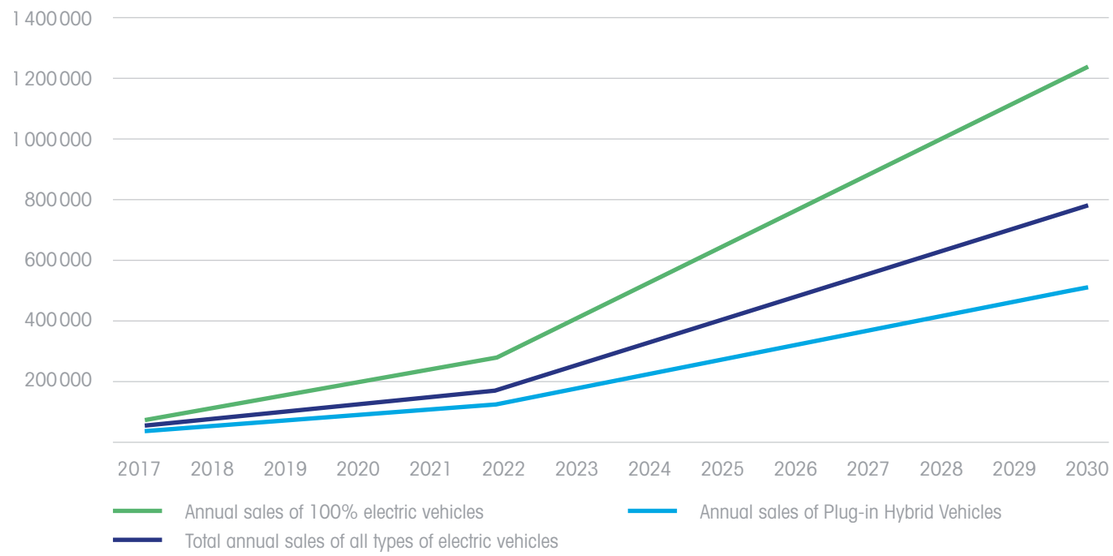
Smart Grids allow for the integration of charging points into the networks, at optimal cost for the community, by providing innovative connections that consider the consumption profiles of these uses. This optimisation can generate up to 30% savings on electric bus depot connection costs for example. In addition, controlling EV charging stations through Smart grids helps to:

- **Reduce the impact and cost of charging on the network**. Important savings generated for the community and consumers. Enedis believes that controlling EV charging along with a peak / off-peak hour warning signal [1] could help to reduce the costs of the introduction of EVs on the low-voltage (LV) networks from nearly EUR 1 billion to about 600 million euros.
- **Synchronize EV charging with local RE generation**. Thus, a EV charging administrator could guarantee that their electricity product is both green and local.
- **Use the EV battery to promote self-consumption**. Vehicles are used as storage devices as part of a collective self-consumption operation. The energy accumulated during use of electric vehicles is returned at peak demand times (vehicle-to-building or V2B).
- **Provide services to networks in exchange for income through vehicle charging/discharging** (vehicle-to-Grid or V2G). The benefits of managing EV charging for customers can be significant. RTE considers that "full electricity" costs about €400 per year for conventional use of an electric vehicle. EV charging management can generate savings of around €60 to €170 per year for simple management and up to around €250 for dynamic management [2]. New generation terminals are already V2G-ready with the ISO 15118 standard, but EVs remain rare. At this stage, V2G in France is limited to a small number of innovative, albeit high-quality projects (e.g. GridMotion), but in other European countries, such as the Netherlands, Denmark and Great Britain, the achievements are more significant.

The aVEnir project, for example, which is led by a large consortium of industry manufacturers and academics, and supported by ADEME, aims to validate business models for smart charging in order to launch commercial offers. Smart charging commercial offers are present and effective in France.

1. The signal consists in shifting the recharge by 3 hours compared to the conventional peak/off-peak signal
2. Challenges in the development of electromobility for the power system - RTE

FORECASTED DEVELOPMENT OF SALES OF ELECTRIC AND PLUG-IN HYBRID VEHICLES IN FRANCE THROUGH 2030 (SOURCE PFA, CALCULATION UFE) [1]



EXAMPLE OF PERSPECTIVES: THE CITY OF SAINT-ETIENNE

As part of its commitment to the energy transition, the municipality of Saint-Etienne launched the installation of charging stations for vehicles in the most urbanized towns of its territory: Saint-Etienne, Saint-Chamond, Firminy, Andrézieux-Bouthéon, Rive de Gier, Le Chambon Feugerolles and Saint-Priest en Jarez. Enedis was fully involved in the development of the installation master plan for the first 100 terminals and the guidelines for the installation of 25% of additional "upon request" terminals. This approach enabled the identification of the most suitable locations for these terminals according to uses and network capacity, to reduce delays and respond as best as possible to the needs of the community and its users.

1. http://www.avere-france.org/Uploads/Documents/1551115637d13d0bfa6661350cbf21f906b7e1035c-UFE.pdf

SMART ELECTRIFICATION OF ENERGY USES

Smart Grids provide innovative tools for **the implementation of new consumer services and help to develop uses**. In particular Smart Grids help to:

- **Control energy consumption in the residential sector** through communicating meters and home automation equipment that allows devices downstream of the meter to be controlled so that they consume at the most advantageous times, with equivalent comfort. This generates savings for customers while reducing constraints on the networks, and more broadly on the electrical system. As such, the EV charging station, the heating system and hot water tank are devices whose operation can be programmed through control tools by integrating tariff instructions from meter readings. Buildings integrating these functionalities are "Smart Grid Ready" and can be used to control energy consumption and save up to 40% in energy costs for an increase of just 2.5% in investment costs [1].

- **Transform buildings in the tertiary sector** (public institutions, offices, shops, etc.), into sources of flexibility and cost reduction for the network, due to their ability to be controlled for very distinct uses. Over time, they should be able to meet the needs of their occupants by integrating new carbon-free uses such as self-consumption or electric charging stations.

- **Enable the end customer to better understand their energy consumption and to become a "prosumer"**. Interfaces have been developed for this purpose to provide consumption monitoring. In addition, by 2021, Enedis will have completed the deployment of Linky and 35 million households will be equipped with Linky communicating meters.

- **To broaden the offers of redevelopment bodies**. Based on consumption and production data, suppliers can present innovative services to consumers, when they agree to make their data available. This may include assistance in controlling energy, energy performance diagnostics, etc.

- **To encourage the decentralisation of energy production and self-consumption**. Ever more consumers wish to prioritise local distribution networks, including for energy production. There are currently over 60,000 private self-consumers who have most often chosen to install solar panels on the roof of their building. There are also thirty or so collaborative self-consumption operations enabling a group of producers and consumers to exchange energy locally.

EXAMPLE OF PERSPECTIVES: VIRTUAL POWER LINES, STORAGE AND DEVELOPMENT OF THE RTE NETWORK, SOLUTION UNDER DEPLOYMENT

RTE has launched the RINGO project which aims to create "**virtual power lines**" using **stationary batteries, with the aim of managing congestion due to peaks in RE production and to delay or avoid the need to build new power lines**. Three sites will be equipped with commissioning in 2021.

E**lectricity storage is one of the possible responses to the need for flexibility**. Storage will make it possible to **provide many services** such as system services, network congestion management, regulation of production, optimisation of self-consumption operations, continuity of supply in the event of a power outage, etc. The development of electricity storage is dynamic in France where there are currently over 250 MW of projects compared to less than ten last year. In addition, in February 2020, RTE selected nearly 400 MW of new capacities which are greener, flexible, and useful for security of supply for the period 2021-2028.

1. https://www.cote-azur-ecobiz.fr/upload/docs/application/pdf/2018-09/evaluation_batiments_Smart_Grids_ready_2018-09-21_15-39-7_201.pdf

SOLUTIONS WORKING FOR THE TERRITORIES

Smart Grids are at the heart of all territories, in every home, in every public infrastructure, in every development zone... and are an important **lever for their economic, environmental, and societal development**. They enable:

- **Development of "smart" and connected territories in line with the demands of the population**, by facilitating projects for the integration of RE, the decentralisation of production, the development of electric mobility and the control over energy consumption. They provide local decision-makers with new opportunities to develop innovative business models for better control of their public infrastructures.

- **Stimulation of the economic base, investment in technology and local innovation**, leading to improved services for residents, greater agility, and a more attractive territory.

- **Enhancement of the data** collected through smart metering, to **enable local authorities to be better informed, to better manage their activities, to better define their public energy policies**, transport, urban renovation and development and to **make better investment decisions**.

Ouessant, island winner of the Brittany Region's call for projects "Local Energy Loop"

EXAMPLE OF PERSPECTIVES: THE MANAGEMENT OF NON-INTERCONNECTED ZONES (NIZ)

The term NIZ refers to territories which are not connected to the continental network, or only to a limited extent: in particular, Corsica, the French overseas territories, the Ponant islands and Saint Pierre and Miquelon.
Thus, for Corsica and the French overseas territories, with an energy demand of around 10 TWh in 2019, specific multiannual energy schedules have been adopted with ambitious targets that make energy technologies central to the development of a sustainable energy future. Smart Grids: energy autonomy in 2030 for overseas territories, with over 50% of RE in 2023.

In this perspective, we can list the existing technologies:

- 490 MW of hydropower, 480MW of PV.
- Wind farms with storage and Energy Management System, in service or already validated: 75MW of wind power and about 30MWh of batteries, 2/3 of which are in service.
- PV power plants with storage and Energy Management System, in service or already validated: 220 MW of PV power with more than 150MWh batteries, about half of which are in service.
- Storage systems on the network and piloted by EDF SEI: 50MW validated by the French Energy Regulatory Commission (CRE), half of which for fast reserve.
- Actions in favour of EV management, essential in the NIZs:
  - An EDF SEI network signal, available in open data, to indicate the best times for charging EVs.
  - Commercial offers of photovoltaic EV charging stations with smart control.
  - The NIZs are a formidable open-air laboratory for France and an example to follow for all countries with inhabited islands.

SMART GRIDS AS A LEVER FOR MORE EFFICIENT NETWORK COLLABORATION

Smart Grid technologies provide innovative opportunities for collaboration between the electricity, gas, heating, and telecommunications networks. This coming together of networks is a means of gradually ensuring a greater degree of flexibility and greater resilience of energy systems.

Through **Power-to-Gas**, which consists of **transforming excess renewable electricity into hydrogen** through electrolysis, Smart Grids will enable the coupling of different networks to ensure an economically optimal energy supply and maximum use of renewable production resources. The implementation of equipment capable of arbitrating between electricity and gas (e.g. hybrid boilers, micro-cogeneration) also allows for collaboration between the electricity and gas networks for greater flexibility in the energy system.

The heating networks have also adopted a Smart Grid approach, in particular as it **strengthens their economic competitiveness**, by integrating thermal storage, and by modelling and piloting these networks. Grenoble's Compagnie de chauffage has for example integrated, on the ZAC-Flaubert industrial zone, storage solutions with phase-change materials and smart control for optimal use of resources based on demand and sunlight forecasts [1]. In France, 56% of heat is produced from renewable or reclaimed sources. This rate was only 26% in 2005.

NETWORK DIGITALISATION: IMPERATIVE FOR THE SUCCESS OF THE ENERGY TRANSITION

The structural evolution of Smart Grids is characterized by a reasoning of decentralization, by increasing digitalization of the infrastructure and business tools, and by the necessity to control the energy cycle to safeguard suppliers, operators, and users. Therefore, **the coupling between energy distribution networks and telecom networks is an opportunity** that allows us to:

- **Maintain efficient and resilient networks despite temporary unavailability** of power or telecom links.
- **Ensure better protection of the energy system and its telecom components against cyber-attacks**, which can cause major or even catastrophic breakdowns.
- **Ensure the secure exchange of data** (systems, individuals, suppliers, users...) and the traceability of the use of this data between the Smart Grids components and the various stakeholders in the energy value chain. Transparency and traceability are essential conditions for effective management of energy resources and protecting know-how.

Thus, Smart Grids must be perceived as part of **an ecosystem by relying on a trustworthy digital space** in which telecom operators and technologies play a key role. For example, 5G, could guarantee massive access to several million terminals from which data could be collected, enabling the measurement and traceability of energy exchanges between Prosumers (at the same time producers & consumers). 5G would also facilitate local edge processing on the different regulation/feedback loop scales.

EXAMPLE OF PERSPECTIVES: POWER TO GAS, A SOLUTION BEING TESTED

Launched in 2014, the GRHYD[2] project in the Urban Community of Dunkirk includes an industrial scale Hythane® fuel project supplying a CNG bus station with a hydrogen-natural gas mix as well as a project for the injection of hydrogen into a natural gas distribution network in a new neighbourhood of about 100 homes. The project aims for a first stage of blending up to 6% hydrogen and then up to 20%. In November 2018, the 6% level was established. In March 2019, the switch to 10% was effective. However, in 2020, in accordance with the ministerial order issued by the General Directorate for Risk Prevention, the injection of hydrogen into the natural gas network in the Petit Village neighbourhood of Cappelle La Grande was terminated.

Jupiter 1000[3], located in Fos-sur-Mer (southern France), aims to set up an innovative 1 MWe hydrogen production facility, a CO_2 capture unit on the chimneys of a neighbouring industrial plant and a methanation unit to convert the hydrogen produced and the recycled CO_2 into synthetic methane. In addition, an injection/mixing station will enable the gas to be injected into the gas transport network. The electricity consumed comes from wind turbines near the Grand Port Maritime de Marseille. The first gas injections were made in February 2020[4].

1. http://www.cea-tech.fr/cea-tech/Pages/cr_2018/Grenoble-test-reseau-chaleur-reseaux-et-stockage-thermique.aspx
2. http://grhyd.fr/presentation/
3. https://www.jupiter1000.eu/projet
4. http://www.grtgaz.com/medias/communiques-de-presse/detail-actus/article/jupiter-1000.html

Datacenter

THE SMART GRIDS INDUSTRY IN FRANCE

A SECTOR COMPOSED OF A VARIETY OF STAKEHOLDERS WHO MAKE UP THE RICHNESS OF THIS ECOSYSTEM

The Smart Grids industry is made up of diverse stakeholders with expertise in each link of the value chain:

- Distribution and transport network operators
- Energy suppliers
- Research and academic institutions
- Industrial and equipment manufacturers
- Redevelopment bodies
- Telecom operators
- Digital Service Companies

In addition, the richness of the sector comes from the **diversity of the types of structures** involved, with major international manufacturers alongside many small businesses (SMBs, start-ups).

The sector therefore has a local approach, tackling issues specific to each region, and a more **global** approach, exporting French expertise.

Finally, the Smart Grids sector in France is **organised and developed within the Think Smartgrids**, association which aims to:

- Federate French stakeholders in the industry
- Promote Smart Grids expertise
- Carry the voice of industry stakeholders to the key stakeholders

Think Smartgrids now federates a hundred or so active members including 17 large groups, 49 SMBs, 12 start-ups, 11 educational and research institutions and two leading professional associations in the sector. The association is internationally recognized and is a member of the Global Smart Grids Federation. Its members represent France within the international Smart Grid Action network (ISGAN). The members of the association participate in the work of France's "New Energy Systems" Strategic Committee.

A SECTOR THAT REPRESENTS AN INCUBATOR FOR JOBS IN FRANCE

In France, the Smart Grids sector represents **more than 20,000 direct jobs and is growing rapidly with 2000 new jobs per year**. This dynamic sector generates major investments and the completion of projects (e.g. the Linky d'Enedis project represents between 5000 and 10,000 additional jobs[1]) promoting the development of **local skills and expertise**. It should also be noted that the number of jobs created by the global electricity system is currently estimated at 300,000, including 100,000 for the electricity transmission and distribution networks.

A MARKET WITH STRONG POTENTIAL FOR DEVELOPMENT

The Smart Grids market is developing dynamically in France and abroad. In France, it represents **approximately 2 billion euros and 7.5 billion euros if we include the international projects of French stakeholders**[1]. This international development of the sector should increase in the coming years with a **global Smart Grids market already reaching 75 to 100 billion euros in 2020**.

To continue this sustained development, investments are significant with **130 million euros per year in R&D** and more than **200 million euros for industrial projects such as Smile, FlexGrid and You & Grid**. Beyond these examples, the French Energy Regulatory Commission (CRE) has identified more than 120 Smart Grids projects in France.

France is thus the **3rd European country in terms of R&D investment and demonstrator projects** behind Germany and the UK for a total European investment of **around €5 billion**[2].

FRANCE'S CONTRIBUTION TO INDUSTRIAL DYNAMICS

The sector contributes to the emergence of **French industry champions on the various links of the value chain and contributes to France's industrial dynamics**.

As a result, **manufacturers** (suppliers of equipment, solutions and services), rely on their experience acquired notably on French projects, which are highly visible internationally, to **develop their range of products** for international clients. For example, French network operators RTE (via RTE International) and Enedis (via EDF International Networks) are also exporting their skills by **supporting foreign stakeholders in their Smart Grids projects**. The aim is to train other network operators in the knowledge needed to implement innovations produced by their suppliers' sector. Numerous **start-ups, SMBs, equipment manufacturers and service companies** benefit from the influence of the French sector and deploy their know-how on international projects.

1. ADEME, IN NUMERI. 2018. Marchés et emplois dans le domaine des énergies renouvelables (Markets and jobs in the renewable energies sector), Situation 2014- 2016. 136 pages
2. Gangale F., Vasiljevska J., Covrig F., Mengolini A., Fulli G., Smart Grid projects outlook 2017: facts, figures and trends in Europe, EUR 28614 EN, doi:10.2760/701587

FUNDING OF RECOMMENDED ACTIONS

This Think Smartgrids recovery plan is based on 14 recommendations and around 30 initiatives and projects of varying weight and duration. Most of these initiatives and projects could be launched very quickly, thus contributing to the economic recovery and forming the sustainable backbone of the energy transition. This file aims to demonstrate this.

Some of these initiatives and projects fall within the natural scope of covering investments in electricity networks, and it would therefore be normal to finance them via the contribution of the consumer customer, through the transmission tariff.

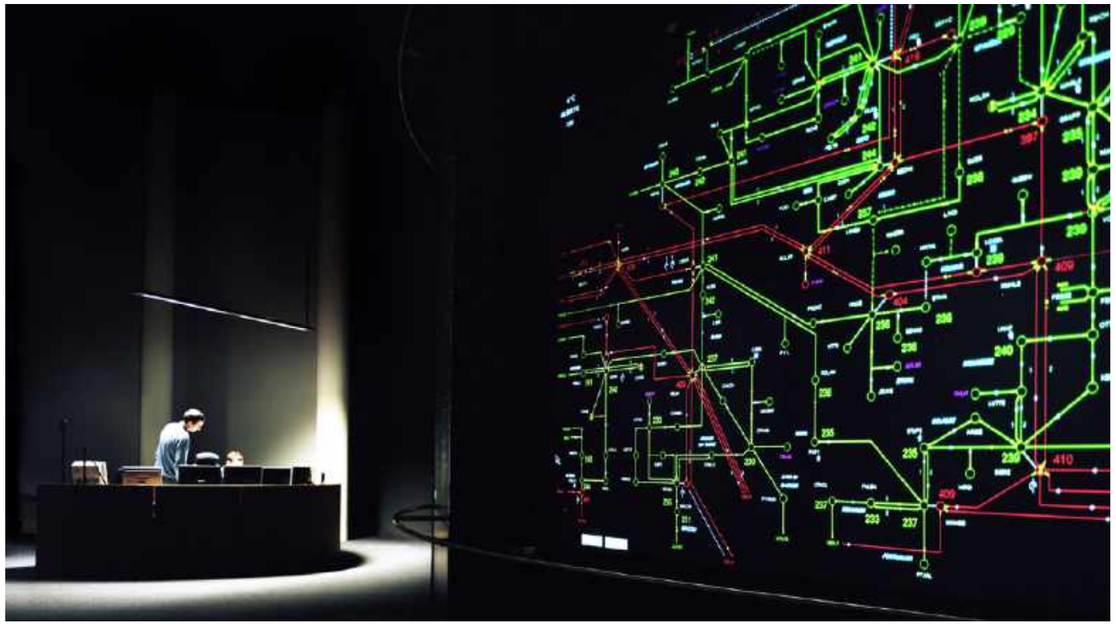
However, for other initiatives and structuring projects such as:

- Reinforcing the network for the accelerated provision of public or collective infrastructures allowing for EV charging.
- Development of industrial, tertiary, or residential flexibility.
- Multi-energy convergence.
- Or the accelerated reception and management of renewable energy generation assets.

Other funding sources need to be mobilized, on European, French, or regional levels. This will allow us to:

- Move towards high quality use of public stimulus opportunities.
- Moderate or erase the immediate impact on the customer's bill, as a health and economic crisis is a factor of instability.
- Choose the most appropriate financing vector depending on the types of initiatives and their economic suitability with the power system terminals, as well as their externalities.

A dialogue must be initiated rapidly on this financing aspect, depending on the batch of initiatives and projects selected by the public authorities.



Villers les Nancy's local dispatching room

THE FOURTEEN RECOMMENDATIONS OF THE THINK SMARTGRIDS RECOVERY PLAN

Here are the fourteen recommendations drawn up by members of Think Smartgrids who federate Smart Grid stakeholders in France and are committed to promoting their know-how internationally.

THE NEED FOR A GREEN RECOVERY PLAN

SMART GRID DEVELOPMENTS THAT FACILITATE THE ENERGY TRANSITION

LEVERS FOR REGULATION AND CHANGE

KEY

The following indicators illustrate the intensity of the short-term economic impact of the proposed measures, expressed in terms of jobs, and thus their contribution to economic recovery.

Medium


Significant
> 1 000 ETP


Very strong
> 10 000 ETP

R1. A GREEN RECOVERY PLAN WITH A SMART GRIDS COMPONENT IS ESSENTIAL

A green recovery plan is indispensable and must cover at least the following 4 points:

1. The development and integration of **renewable energies**.
2. **Smart electrification of energy uses**, including **electric mobility**.
3. Improvement in **energy efficiency**.
4. **Multi-energy convergence.**

Think Smartgrids recommends that the Green Recovery Plan include a specific component on smart grid and storage solutions, which are essential for the large-scale development of these 4 major pillars of the energy transition.

R2. THE EFFECTIVENESS OF THE GREEN RECOVERY PLAN DEPENDS ON SEVERAL CONDITIONS

The effectiveness and success of the Green Recovery Plan are conditioned by the following elements:

- **Its inclusion in an international dimension**, notably taking France and its partners as examples in support of other countries in the implementation of their own energy transition policies.
- **A perspective of possible local reindustrialization**, in particular regarding future technologies, or critical activities.
- **The exemplarity of public stakeholders** (state, local authorities), **public service companies or any company** over which the State has some form of control or regulation.
- **Appropriate mobilisation of the remuneration tools** (tariff for use of the public electricity network) of network stakeholders to finance the necessary developments.
- **Consideration of innovation** in its various facets (technological, regulatory, or organizational).
- **Training of stakeholders**, in particular for the "in demand" professions of the energy transition.
- **An educational dimension for the consumer** who, through their habits, is at the heart of the energy transition.
- **Prioritizing and focusing investment** on promising areas should avoid diluting the impact of the action.

R3. ACCELERATE THE DEPLOYMENT OF CHARGING INFRASTRUCTURES FOR ELECTRIC VEHICLES

The plan to revive the automotive industry presented by the President of the Republic on 28 May includes several measures to speed up the sale of electric vehicles. 100,000 charging stations accessible to the public, a decisive factor when choosing to buy an electric vehicle, must therefore be made available to users by the end of 2021.

FOR PUBLICLY ACCESSIBLE TERMINALS

France currently has approximately 30,000 terminals, accessible to the public. It is now necessary to increase the current number of terminals by 200%, when previously the increase was only 15% per year. With the increase in sales of electric and hybrid vehicles exceeding 100% per year, it is crucial to massively deploy an efficient charging network.

Working in the field, and with the territories, the distribution network operator (GRD) proposes the necessary actions, within the framework of ad hoc consultations, backed by the internal transport guidelines (French law of December 2019), to determine the best way to integrate EV charging stations into the existing network. Public service companies, the distribution network operators (GRD) support local authorities in the development of their high performance EV charging station master plan.

COLLABORATIVE RESIDENTIAL CHARGING STATIONS

The installation of an EV charging station in residential buildings remains a long and complex process, despite successive legislative provisions. The costs incurred by the user and/or condominium also remain as a major obstacle.

PROPOSED ACTION

Implementation of a financing mechanism to boost the installation of EV terminals in shared residences, by authorising the installation of a shared infrastructure from the first request of one of the co-owners. This type of solution, installed and operated by the Network Manager or private developer (as preferred by the co-owner committee), balances out the costs to users and considerably reduces the time required to install a terminal. As such, co-owners avoid the need to be considered individually, in a waiting list, with potentially excessive costs depending on the layout and size of the carpark.

Think Smartgrids supports this initiative, which gives vehicle buyers and condominiums the freedom to choose their charging solution, benefiting from a fair financing scheme.

The recovery plan calls for the "Banque des territoires" to develop a financial product to anticipate the assumption of responsibility by the condominium when the first request for a charging installation is made, and to cover the distributor's part of the work. Other innovative financing methods could be implemented to complement this type of proposal.

VEHICLE CHARGING CORRIDORS

The existing operational infrastructures could form the backbone of a future network of EV charging Corridors. Manufacturers and installers, as well as the actual operators, will also be key to the quality of service provided by these infrastructures.

Renault Zoe and charging stations

R4. ACT ON THE DECARBONISATION OF BUILDINGS THROUGH SMART GRIDS AND DIGITALISATION

Buildings represent 30% of CO_2 emissions in France. Conditions are right today to greatly accelerate the decarbonisation of residential and tertiary buildings. The new RE2020 regulation will set the framework and incentives; technical solutions are increasingly mature; primary energies, beginning with decarbonised electricity, will provide leverage. Smart Grids will play a key role in supporting the integration of new thermal uses into the network and managing them efficiently.

As an essential component of the green recovery, the eco-renovation of buildings will make a major contribution to the country's new low-carbon strategy and will provide a tremendous opportunity for the sustainable creation of jobs in France, throughout the country and in many industries: construction, HVAC engineering and Smart Grids. It is a major source of savings for the end customer and contributes to the fight against fuel poverty.

In existing housing, renovation can produce the dual effect of sobriety and decarbonisation, by relying on targeted operations to improve insulation and through the generalisation of efficient means of heat production and cooling such as reversible heat pumps or the use of biomass.

Housing is becoming a scope of intervention for Smart Grids: with new decarbonated thermal uses, the development of photovoltaics and residential electricity storage, the acceleration of electric mobility and smart charging, homes need to be increasingly smart. They interact with the Smart Grids through the optimization of management of uses and the load curve on an individual or collective housing scale. The convergence of IOT, supervision and BIM/CIM data exchange technologies between the network and the home opens new development opportunities.

Through their ability to be controlled for quite distinct uses, buildings in the tertiary sector (public institutions, offices, shops, etc.), are sources of network flexibility, but also sources of significant energy savings. In the long-term they should be able to meet the needs of their occupants by integrating new decarbonated uses such as self-consumption or EV charging stations.

Digitalisation buildings

PROPOSED ACTIONS

- **Develop energy performance contracts as a tool for investing in eco-renovation**: a clear and rapidly operational measure adapted to the recovery plan, it provides a solution for financing the heaviest work (switching a heating system to decarbonated solutions – PAC (powdered activated carbon) and biomass, insulation of interior and exterior walls) which are profitable but are currently hampered by a significant cash outflow for the customer. Savings on fuel bills would provide concrete, short-term support for condominiums, housing associations and local authorities. The system would leave a portion of the energy savings to the project owner for the duration of the contract. The lending structure/organisation would be reimbursed by the energy savings made and verified (hence the involvement of suppliers for invoicing, and of Distribution network operators as a trusted third party to confirm the electricity savings through the use of Linky and Gazpar meters).
- **Supporting the development of smart management of the optimization of thermal uses within the dwelling**. In new and renovated housing, heat pumps (PAC) are expected to play a key role in the development of carbon neutrality. Associated with new uses such as electric vehicles and production sources integrated into the housing, they present opportunities to optimize the load curve and the energy bill using surplus production or through energy storage. The action combines several levers:
  - To make the installation of digital devices for controlling and actively managing individual energy consumption and collective self-consumption measures eligible for CITE and Ma Prime Rénov'.
  - Raise the awareness of public authorities on the importance of a strategy to influence international standards relating to digital downstream meter control solutions and their application in France, which would involving the various stakeholders (energy suppliers, redevelopment bodies, network operators).
  - Train energy installers on high-performance hybrid PAC solutions, on how to adjust and manage them, and on their integration into local control systems. These measures will enable the optimal use of the tariff signals conveyed by 35 million Linky meters and the 500,000 Ibis boxes deployed by 2022. The full potential of these systems can be exploited: the Linky digital contacts, which can be used to optimally control specific downstream uses, such as heat pumps or EV charging.
- The proposed action plan aims to support a renovation trajectory of 7 million homes in Low Energy Buildings quality by 2030 and the conversion of ¾ of existing homes currently heated by fossil fuels to a decarbonated solution (PAC and biomass).

To achieve this, it is recommended to install a smart housing control solution, including for homes in self-consumption, connected to the meters, on 50% of the dwellings impacted by these transformations. It should be noted that the main heat pump manufacturers produce a large proportion (+50%) of the added value in France (2018 sales: €3bn). Japanese stakeholders produce a large quantity of their products in Europe (Daikin, Mitsubishi). The presence of these groups in regions is supported through the Origine France Garantie label.

Controlling the electricity consumption of buildings can also provide various services for the optimization of the electrical system, in particular as backups for frequency adjustment, as a means of shedding and as a guarantee of capacity. RTE has estimated that the net value in 2030 generated by controlling consumption could amount to 82M/year for residential contexts and €176M/year for industry and the large tertiary sector, both sectors with roughly similar contributions.

The French companies that could benefit from such a recommendation are the builders, installers and maintainers of decarbonated thermal systems (hot and cold), the providers of solutions and control services in individual and collective housing interacting with Smart Grids infrastructures (smart meters, boxes, EV charging stations, aggregators) and of course all construction companies.

High-voltage line

R5. ACTING ON THE DECARBONISATION OF BUILDINGS THROUGH SMARTGRIDS AND DIGITALISATION

Shedding can be a flexible option for network operators to manage imbalance between supply and demand for electricity, at any given time. The potential for flexibility from industrial sites is currently the main source of flexibility on the market. This market is generally the most interesting to focus on as it allows large volume shedding towards the network by activating this device on a few sites.

However, the benefits linked to the remuneration of shedding by the network operator in relation to the costs entailed by stoppage of the production line are difficult to evaluate. The investments required and the activation costs, which can vary greatly from one industrial site to another, make decision-making complex.

To facilitate this trade-off and improve the flexibility offer in industrial consumption, **the implementation of a major energy audit plan** would make it possible to identify target industrial sites, to integrate the influences behind consumer decision-making for participation in flexibility and to ensure the required level of equipment to facilitate process management and the possible postponement of consumption.

Furthermore, it is essential to have visibility on market depth and value to enable decision making. The introduction of an **official annual report on the activation of flexibilities**, specifying the nature of the relevant industrial families, would be an effective tool to provide visibility on the volumes actually activated in relation to the existing potential, and the average value associated with these flexibility activations. Finally, this report could provide estimates of potential incorporated in the network operators' multi-year projections, with visibility at 3, 5 and 10 years. The costs required to automate the management of flexibilities require a ROI that generally comes up against the uncertainty on future needs for this type of adjustment.

R6. STANDARDIZE COMMUNICATIONS TO DEVELOP RESIDENTIAL DEMAND CONTROL

Energy management and usage optimisation systems are still not very widespread in France in the residential sector and still have great potential in the tertiary sector. These systems can generate significant energy savings, while improving comfort for occupants.

In addition, France's metering system base has grown significantly: 25 million Linky meters have been deployed, 35 million will have been deployed by early 2022, and 500,000 Ibis boxes are also being deployed for the business market. All these metering systems are equipped with an interface for downstream communication (ICT). These deployments provide a new opportunity to enhance the efficiency of the management systems by providing simplified access to tariff information.

In a residential context, significant energy savings of at least 5 to 10% can be achieved quickly, thanks to these active equipment control and management devices. This makes it possible to increase the disposable income, comfort, and safety of people in a situation of energy insecurity:

- 25 million dwellings in energy class C or less.
- 6 million of the poorest households spend 15% of their income on energy (housing and transport).

In tertiary and industrial contexts, optimizing usage and interaction with users can also generate significant savings, around 30 to 50%, and makes it possible to mobilise the last profitable sources of energy savings needed to achieve low-energy labels.

STANDARDIZATION OF DOWNSTREAM METER CONTROL MODES

The solutions currently available on the market are not very widespread, mainly due to a lack of standardisation. We therefore propose to encourage stakeholders **to standardise downstream meter control modes (energy suppliers, redevelopment bodies), in particular the use of Linky digital contacts**, to boost the downstream meter equipment market (energy operators, optimizers, etc).

This will enable the end consumer to offload or automatically delay certain uses (heating, washing machine, EV charging, etc.), without compromising on comfort, while reducing energy demand and consumption. And this would be sustainable because it is automated. It will also be a catalyst for the integration of decarbonated heating solutions such as heat pumps, the installation of renewable energy solutions, the development of electric vehicles, etc.

COMMUNICATION ON THE BENEFITS OF ENERGY MANAGEMENT SYSTEMS INTERFACED WITH METERS

Launching communication actions for customers, decision-makers, redevelopment bodies, to present and promote the available solutions.

Linky meters

R7. CREATE THE NECESSARY ENERGY DATA ARCHITECTURE TO DEVELOP SERVICES FOR PROSUMERS

Communicating meters installed in French households provide a large amount of data on energy consumption. Reading this data can already allow consumers to better understand and sometimes reduce their consumption. The processing of these data, be it aggregated or individual on which the consumer will have consent, represents a value source for innovative companies, and potentially interesting services for Prosumers.

Through a more detailed knowledge of their consumption profile, households can choose pricing offers that are best suited to their needs. The data also facilitates demand management and consequently the integration of variable renewable energies in the networks. They thus represent an asset for the energy transition. The universe of energy data is opening new horizons for smart network stakeholders and Prosumers.

To develop the potential of energy data to support the energy transition and create new services, the association proposes to:

- Reinforce the trust of users and secure their rights to privacy.
- Facilitate the flow of data between stakeholders.
- To help to create value from this data.

A SOVEREIGN CLOUD TO BUILD TRUST

First, to strengthen consumer trust, the Think Smartgrids association recommends developing sovereign European clouds such as Gaia-X, which will support consumer data sharing. This data will make it possible to better quantify and develop energy efficiency operations such as energy performance contracts. These contracts, based on a dynamic optimization of costs to meet user needs, will give purchasing power back to prosumers and guaranteed budget margins to local authorities.

HARMONISATION OF DATA AND SIMPLIFICATION OF RULES TO FACILITATE DATA FLOW

The association recommends working on automating the provision of consumer metering data flows through the maintenance of a register of consents by distribution network operators (GRD), to develop a market for services for these users.

EXPANSION OF EXISTING EXPERIMENTS

Finally, thanks to the feedback from existing projects in local authorities (in particular that of Lyon - Smart Lyon) and with the provision by the distribution network operators (GRD) of a personalised API, allowing an authenticated user to retrieve their data in the form of a flow to integrate it into the system of their choice, hosted by themself or by a third party service provider. The API will be progressively homogenised between GRDF, Enedis and their European peers via the European association EDSO. This scheme is designed ab-initio, and is replicable for professionals in the sector, especially for technical management of buildings. We will also be able to capitalize on the SMILE/PRIDE project, which implements a territorial energy data platform for the regions of Brittany and Pays de la Loire and makes recommendations on energy data governance.

R8. DEVELOP THE ENERGY TRANSITION, ENERGY RESILIENCE AND INDUSTRIAL PERFORMANCE OF TERRITORIES THROUGH THE COMBINATION OF REAL-TIME TELECOMS - SMART GRIDS

In addition to their contribution to the energy transition, decentralised Smart Grids are a tool for the performance and resilience of territories, strengthening the electricity production and distribution system in the event of incident (crisis, including future crises resulting from climate change) or major events.

Notably, local micro-grids, managed with prosumers within a network allowing for decentralized operation, represent the local dimension of energy resilience, from which telecommunications services can benefit.

Coupled with the exchange of multi-service telecom and energy supervision data, they require decentralised collection and processing infrastructures at the periphery of the networks and the flexibility to reconfigure their topologies (*edge computing*).

PROPOSED ACTIONS

1. **Promote experiments involving telecommunications operators,** particularly via the regulatory sandbox system set up by the Energy-Climate law, to successfully engineer infrastructures, which are highly interconnected to allow real-time exchange. These experiments will include solutions based on minimal service local micro-grids (Telecom and Energy network architectures, connected objects), resilient in case of problems in centralized energy production, and their implementation based on a cost-benefit analysis including their carbon footprint.

2. **Implementing an alliance at European level "5G-Smart Grids" to specify and experiment innovative communication services for Smart Grids,** based on the 5G-ACIA (Industry 4.0) model, and to be a driving force for the "Energy" working group within "Gaia-X", the European sovereign cloud project (see https:// www.data-infrastructure.eu/GAIAX/Navigation/EN/Home/ home.html).

R9. DEPLOY STORAGE FOR NETWORKS AND RENEWABLE ENERGIES (RE)

The deployment of battery storage systems in mainland France is in its infancy as it is not yet competitive. This recommendation aims to anticipate its development in mainland France to, over time, reduce the cost of integrating RE and to position French stakeholders on a rapidly emerging global storage market.

Concurrently with mainland France, this recommendation aims to accelerate the deployment of storage in Non-Interconnected Zones where its implementation may already be economically relevant. Thus, within these NIZs, accelerating the energy transition in microgrids with actions in favour of the development of RE production projects would make them formidable technological showcases and would contribute to exporting French know-how internationally.

CASE FOR MAINLAND FRANCE

Battery-based energy storage systems saw their costs significantly reduced to reach, by 2018, a CAPEX of approximately $380/kWh and $450/kWh for 4 hours and 2 hours of storage[1] respectively, with trends towards $150/kWh by 2030[2]. In mainland France, energy storage is developing for frequency adjustment and capacity mechanisms, unrelated to renewables: a few MW operational to date and about 350MW planned.

PROPOSED ACTIONS

For mainland France, tenders for the provision of combined services, storage ROCs and investment by network operators are required. The recommendations are aimed at the deployment of storage systems that can meet the various needs in a combined manner, rather than independently: frequency adjustment, capacity, support for infrastructures, market arbitration, use of local flexibility, optimisation of RE management. These storage systems would be owned by the stakeholders in the competitive sector but also regulated.

This would consist of joint calls for tenders by RTE and ENEDIS: for storage systems optimally positioned on the network, guaranteed to be able to participate in the frequency and capacity adjustment markets, and which can be associated with wind or photovoltaic power plants that have recently been awarded a contract or are under construction in order to benefit from savings on grid connection. French Energy Regulatory Commission calls for tenders for wind or photovoltaic power with storage would make it possible to smooth fluctuations and cap renewable generation with the authorisation to participate in the frequency and capacity adjustment markets.

The target should be 50 MW / 100 MWh per year for each call for tenders. The return on investment will be as follows: Trade-off on energy markets, revenues on capacity and adjustment markets, and savings on RE connection (reduction of peak power injected…).

The additional public investment highlighted by this recommendation only relates to the additional costs of around €3.75M for 50 MW / 100 MWh spread over the period of operation (around 10% of the installation cost for mainland France). Thus, the public investment curve, taking into account the cumulative annual cost of the installations, would be €0.375M in the first year, €0.75M in the second year, and so on to reach €3.75M in nominal mode after 10 years.

French companies that could benefit from such a recommendation are on the one hand energy operators (Total, Akuo, Albioma, Neoen,…) and on the other hand storage system suppliers (Schneider, Socomec, Entech, Forsesee, Saft, Blue Solutions,…).

FOR NIZS

In Non Interconnected Areas (NIZs), characterized by small networks resulting in lower intrinsic robustness and high production costs, storage, especially electrochemical storage, is one of the important building blocks of TE (Transactive Energy) scenarios with extremely ambitious objectives, aiming for energy autonomy by 2030 (and by 2050 for Corsica). Indeed, storage is one of the interesting flexibility levers to promote the integration of RE in electrical systems and can be economically relevant as of today.

In the case of NIZs, centralised control of storage facilities by the grid operator (e.g. for frequency adjustment or load transfer) is a more relevant solution for effective management of the variability of RE generation within small networks and in the absence of interconnections and a market, and in comparison to decentralised management, for example associating renewable generation and storage.

1. Fu, Ran, Timothy Remo, and Robert Margolis. 2018. 2018 U.S. Utility-Scale Photovoltaics-Plus-Energy Storage System Costs Benchmark. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A20-71714.
2. VARTIAINEN ET AL. Impact of weighted average cost of capital, capital expenditure, and other parameters on future utility scale PV levelised cost of electricity

On the other hand, there are micro-networks within these NIZs: certain islands in the Ponant, Saint-Pierre-et-Miquelon, inland municipalities in French Guiana, etc. for which production costs and operating fragilities are exacerbated compared to larger territories. Currently, the electrical production of these small electrical systems (whose power consumption varies between tens of kW and tens of MW depending on the electrical system concerned) is almost exclusively provided by thermal power plants. The transactive energy objectives of these micro networks are nevertheless very ambitious, with a 100% RE production mix targeted for 2030. In addition to energy efficiency actions, this transactive energy plan requires the combined implementation of several actions:

- Deployment of renewable energy production facilities.
- Installation of storage and control systems by the grid operator allowing the integration of RE production while guaranteeing the quality of supply and grid stability.

While several microgrids are already largely engaged in the energy transition (Sein Island, Ouessant Island, Saint-Georges de l'Oyapock, Maripasoula), the development of RE installations remains globally rather slow (although benefiting from a tax compensation). This development deficit can be explained by the lack of visibility of these projects and the difficulties in carrying them out in areas that are generally difficult to access. Acceleration of the development of these projects will enable the network operator to deploy associated storage and control devices more quickly.

PROPOSED ACTIONS

Opening of new CRE (French Energy Regulatory Commission) portals specifically for storage and launch of calls for tenders by the State for RE production projects in microgrids.

It would consist of:

- Subject to the achievement of a significant volume, launch of a new competitive CRE portal (excluding micro-grids) to enable new projects to emerge, taking advantage of the fall in technology costs and the new impetus given by the Multiannual Energy Programmes currently being finalised. This mechanism will allow all projects meeting the system operator's specifications to compete, whatever their technology (li-ion batteries, STEP, hydrogen, etc.), including weekly or seasonal storage projects.
- Launch of calls for tenders by the State for RE production projects (wind, PV, biomass, etc.) in microgrids to accelerate the energy transition of these systems. These projects will be integrated into the microgrids through the parallel deployment of an Energy Management System (EMS) and a storage system centralized by the grid operator.

These actions will be based on a strengthened partnership with storage stakeholders and RE producers to facilitate the Energy Transition in these territories. The innovative solutions deployed in the microgrids can be adapted to be implemented on a larger scale in the medium/long term.

It is expected that these actions in NIZs, will lead to spin-offs for French industry, in particular for energy operators and storage system suppliers.

Enedis battery storage warehouse

R10. DEVELOP MULTI-NETWORK DISTRIBUTION COUPLING (ELECTRICITY, HEAT, COLD, H2, E-FUELS)

France's strategy to achieve carbon neutrality by 2050 is based on 2 key components: converting final use energy to decarbonated sources, which will make a major contribution to the 2nd component: halving global energy consumption.

The interaction between electricity and other decarbonated energy carriers can facilitate the acceleration of the decarbonisation of uses and benefit the power system itself. This interaction must also be appreciated for its role in the balance of the power system, both in its ability to provide flexibility in the electrical load curve and in the possibility of injecting the electricity that will be produced from these other decarbonated energy carriers (XtoPower).

Decarbonisation of uses through the transformation of decarbonated electricity into other energy carriers (H2, heat, cold, e-fuels) is of immediate interest for this decade (2020-2030). Power-to-X production technologies are mature enough to replace the use of liquid or gaseous fossil fuels by carbon-free electricity, in addition to direct electrification:

- Battery-powered electric vehicles for light and heavy land mobility.
- Heat pumps for thermal use in buildings (summer and winter comfort).
- Auxiliary heat pumps on district heating and cooling networks.

Technologies for producing electrolytic non-carbonated hydrogen, as a substitute for steam reforming of methane gas and petroleum products (or coal) have reached the industrial stage. Costs are still too high but tending to decline with a levelling off in industrialized volumes (100 MW minimum). Electrolytic hydrogen can bring a significant environmental gain in the decarbonisation of new uses:

- Use of hydrogen in industrial processes.
- Use of hydrogen alone or synthetic fuels made from hydrogen for heavy and long-distance mobility (airplanes, ships, trains, ...), as a substitute for petroleum products and fossil methane gas (e-fuels).

Power-to-X is a no-regrets option: regardless of the decarbonated energy carrier used (electricity, heat, hydrogen, e-fuel), the uses associated with these carriers will expand in coherence with their technical and economic maturity and acceptability. However, an economic compromise must be found with the setting of a single, non-volatile floor price for CO_2.

Indeed, the various uses of Power-to-X can bring additional benefits to the electrical system and Smart Grids by introducing new forms of flexibility: use of surplus RE production, elimination of heat pump and thermo-fridge pump use due to the possibility of storing heat or cold in the networks. It is therefore necessary to develop Smart Grids solutions to mobilize these flexibilities and to develop energy optimizations integrating this new dimension.

Regarding the interest for the generation of electricity from decarbonated energy carriers (XtoPower) for the electricity system, it is technically possible, but the timeline is too distant to be of economic interest. The potential appears beyond 2040 and depends on other factors such as changes in the overall electricity mix, a drastic reduction in the production costs of biomethane and technologies such as fuel cells or hydrogen turbines.

PROPOSED ACTIONS

- Action 1: Electrolytic hydrogen. **Accelerate the national calls for projects that will make it possible to mass-market and localise technological developments in the production of electrolytic hydrogen in areas where electricity is decarbonised**, along the lines of what Germany has implemented. Public procurement should also make it possible to speed up experiments in hydrogen-based heavy mobility (trains, ships, buses, etc). Projects will have to integrate a Smart Grids component: PowerToX installations must be designed to be controllable and tested on the value they provide in terms of flexibility to the electrical system and the network.

- Action 2: Heat and cold. **Accelerate calls for projects to increase the coupling between Smart Grids and urban heat, cold and temperate networks through high-capacity heat pumps and thermo-frigo pumps, as well as integration in electrical RE and thermal storage**. The projects will aim, on the one hand, to optimise the overall economy and the CO_2 balance for the community and, on the other hand, to evaluate the benefits for the dimensioning of electrical and urban networks through the smart control of these inter-vector converters.

- Action 3: Territorial PowerTo strategies. **Encourage local authorities to draw up scenarios for the implementation of differentiated PowerToX strategies**, within the scope of energy and climate policies (PCAET, SRADDET), by facilitating the cross-communication of energy data (electricity, methane gas, heating network, fuel distribution) with other databases (building, INSEE, weather, etc.), through standardisation.

R11. CHANGE REGULATIONS TO FREE UP ENERGY

SUGGESTED EVOLUTION: ADAPTING ENERGY TAXATION TO SUPPORT THE TRANSFER OF USES

- Pro-climate economic and fiscal framework. Define a trajectory for the development of taxes (TICPE) applied to fossil energies to guarantee economic profitability of projects involving the conversion of uses to new decarbonated vectors and to support a European floor pricing strategy and increasing price per tonne of CO_2.
- Promote investment in networks to meet industrial and energy transition challenges.

TURPE 6[1], which is due to come into force on 1 August 2021, should encourage investment in networks. This increase in the role of networks to meet the challenges of the energy transition is one of the keys to its success. Strategic planning of investments would contribute to this objective with an optimization of network investments while allowing Smart Grid manufacturers to gain visibility and competitiveness, especially in export.

Wind turbines

TRANSPOSE THE EUROPEAN "MARKET DESIGN" DIRECTIVE QUICKLY AND AMBITIOUSLY

The EU Directive 2019/944 of 5 June 2019 is part of the third climate-energy package and concerns common rules for the internal electricity market. It aims to make consumers more active on the energy markets, by informing them (access to smart meters, price comparison tools, dynamic price contracts) and through their role (consolidation of the principle of free choice). It also promotes flexibility solutions, such as energy storage, Article 2 provides a definition that includes electricity storage (paragraph 59). It provides incentives for the use of flexibility in distribution networks (Article 32) and the integration of electromobility into the electricity grid (Article 33).

Finally, the Directive (Article 59.1 l) entrusts the regulatory authorities with the task of assessing the performance of transmission system operators and distribution network operators with regard to the development of a smart grid that promotes energy efficiency and the integration of energy from renewable sources, and proposes a limited number of indicators for monitoring the deployment of Smart Grids solutions to adapt networks to the constraints of the energy transition and energy efficiency.

The French Energy Regulatory Commission should quickly take a position on these indicators to enable France to impose its standards.

The transposition of this text is therefore likely to support and promote the implementation of the recommendations of Think Smartgrids included in this document.

Law 2019-1147 of 8 November 2019 has already empowered the French government to legislate the provisions of this directive that fall within the scope of the law, for a period of twelve months.

Think Smartgrids therefore recommends a swift and ambitious transposition of EU Directive 2019/944.

IMPROVE THE CONTROLLABILITY OF THE DEMAND FOR PROMOTING ACTIVE MANAGEMENT TECHNOLOGIES

The smart building represents a factor of optimization of the electrical system as a vector of flexibility through the controllability of demand via active management equipment in particular.

Behind this term lies the optimised management of a building's energy production and consumption with the help of measurement, regulation and control systems aimed at demand management. Many jobs can thus be intelligently managed: local production of renewable energy, lighting, motors in industrial processes, etc. This equipment therefore allows for better integration of new uses such as electric recharging.

However, in thermal building regulations and in new environmental building regulations, these technologies are barely developed.

The driving forces behind calculations for thermal regulation must put more focus on active energy management technologies.

In the residential context, financial aid and incentive systems must also evolve to make the installation of active energy monitoring and management systems eligible for the CITE (tax reductions) and MaPrimeRénov' (currently limited to thermal renovation work), in order to liberate Energy Demand Management potentials.

EXPAND THE PERIMETER OF THE REGULATORY SANDBOX TO INCLUDE DATA

The Energy-Climate Act of 8 November 2019 introduces a "sandbox" mechanism in the energy sector by granting exemptions "to the conditions of access to and use of networks and installations for the experimental deployment of innovative technologies or services for energy transition and smart grids and infrastructures". However, some experimental projects may find a definite interest in exploiting the data at a finer mesh. E.g.: Data by delivery point to enable local authorities to measure the number of renovation projects and their level of performance. Article 61 of the law of November 8, 2019 must evolve to broaden the regulatory sandbox to include energy data.

DEVELOPING SMART CONNECTION OF FACILITIES TO ACHIEVE THE FRENCH TARGETS FOR THE PROPORTION OF RENEWABLE ENERGIES IN ELECTRICITY PRODUCTION

Alternative connection offers (ORA) make it possible to reduce the time and cost of connecting renewable energy production sites in exchange for the producer's ability to "step back" from the grid on a one-off basis. This captures the flexibility and intelligence of the network, allowing it to be more resilient. It would be advisable to systematically involve them in the presentation of reference connection offers to promote the development of small projects that would not necessarily have seen the light of day without an alternative connection solution. The order issued in application of Article D. 342-23 of the Energy Code on alternative connection offers should provide for the latter to be addressed to the reference offer in order to encourage the study of all flexibilities and thus offer visibility to the project owner on the opportunities available to them.

1. New tariff for use of the public electricity network in France

R12. CHANGE BEHAVIOUR FOR A SUSTAINABLE SOCIETY

The fight against global warming includes a focus on sobriety (consuming less energy and resources) and a focus on reducing emissions (decarbonisation - the road to carbon neutrality). Only a radical change in the behaviour of all consumers and economic stakeholders will make it possible to achieve carbon neutrality. The recent health crisis has demonstrated that changing lifestyles and work patterns, the virtual cessation of transport and industrial activities could have a significant immediate effect on CO_2 emissions, demand for energy and its decarbonisation.

So far, however, this subject has not really been considered by political authorities. No ambitious plan has been drawn up to change behaviour. Only companies, under the pressure from their shareholders and some leaders committed to the climate cause, have established quantified trajectories for reducing their ecological and energy footprints.

It is now necessary to establish behavioural change as a local, national, European, and global cause and to translate it into strong actions that produce rapid results. And as recommended by the High Council for Climate (HCC), the Economic, Social and Environmental Council (EESC), and many other public and private actors, this must be a fair transition (reducing vulnerabilities and strengthening resilience capacities).

Changing behaviour is not easy. Without the establishment of a priority cause at each level, the exemplary nature of decision-makers and public policy makers, the commitment of well-known personalities, and concrete actions whose results can be measured and communicated, there is no way to change behaviour. The establishment and expression of a priority at all political and decision-making levels, with a few key orientations whose results can be measured by indicators that are easy to understand and accessible everywhere and by everyone: how many MW of installed RE capacity per quarter, number of public buildings thermally renovated, number of EV charging stations installed, etc.

These are the actions that we are proposing.

COMMUNICATION, EDUCATION AND AWARENESS-RAISING ACTIVITIES

A vast communication programme, starting in schools, to generate active involvement of the populations in this change, by sharing and explaining it. The aim is to change school curricula to include the notion of energy sobriety starting at secondary school level, by emphasizing the behaviours that encourage low consumption and promote efficient actions (purchase of an EV, use of public transport, etc). Explaining the role of power grids, the backbone of the Energy Transition, should be part of the program.

Site visits can be organized (network operators, equipment manufacturers, test sites in the territories).

Explain to consumers how they can participate in energy sobriety and encourage them with campaigns highlighting the advantages of the Linky meter as a tool for monitoring consumption, communicate on the consumption of a "virtuous" household and the energy efficiency actions implemented by consumers.

STRUCTURAL ACTIONS

- **The eco-renovation and upgrading of all buildings by 2040** and of all public buildings by 2030 and communication of the impacts that this generates (Sobriety and Decarbonisation - S + D).
- **Multiplication of solar roofs and hot water systems** in all new buildings or those undergoing major renovation, combined with a transformation of the commercial offer (S).
- **Multiplication of renewable heat** (heat pumps and biomass) in all new and renovated single-family homes (S + D).
- **A sharp reduction in transport emissions** (halving by 2030) (D).
- **Acceleration of energy intensity reductions** (from 1.5% / year to 4-5%) through binding measures (S&D).
- **Accelerated development of infrastructures supporting this sobriety and the reduction of energy intensity** (5G telecom networks, Smart Grids, EV charging stations, use of batteries in V2X logic, hydrogen, etc.), with a "100% deployed" objective by 2040 (aiming for neutrality by 2050) (S&D).

APPROPRIATE FUNDING

- **A carbon tax floor of €50/t starting in 2021**, and an even more ambitious objective. Obviously, this measure would need to be implemented on a broad international level, so as not to undermine the competitiveness of our industries (D).
- **The allocation of all environmental and energy taxes to environmental projects.**
- Accelerating the transition to a decarbonised economy implies that "**by 2025, any support for innovation should integrate the move away from a carbon-based model**" (D).

Research must be funded in areas of innovation with an environmental and ecological interest.

INVOLVING CITIZENS AND LOCAL STAKEHOLDERS IN PROJECTS IN THE FIELD

- **Self-consumption projects** through the local development of renewable energy production (RE) on public buildings for example (D).
- Involving citizens through **support platforms in the territories** to encourage the emergence of smart city projects (S).
- **Successful deployment of electric mobility and its role in the energy transition with Smart charging** / V2G requires the involvement of citizens, SMBs, etc (D).
- Support awareness-raising operations aimed at decision-makers (in particular public decision-makers): it remains important to have examples, or to set up virtuous regulatory constraints on public action.

RELATED ACTIONS

- The establishment of a **recycling industry - second life** of batteries (cars, scooters, bicycles, and others) (D).
- **Various circular economy measures** (to be specified later) (D).

It is necessary to strike hard to make a mark and quickly because this is urgent.

Electric Ebusway in Nantes

R13. ORGANIZE THE INCREASE IN SKILLS TO SUPPORT THE DEVELOPMENT OF SMART GRIDS

Today, the French electrical industry as a whole represents 600,000 jobs, including 400,000 jobs related to installation, integration and maintenance activities and 200,000 jobs dedicated to the upstream activities of the industry, including 60,000 high added value jobs and 100,000 jobs in electrical networks. These 600,000 jobs represent 23 job families, in the fields of electrical systems, construction, industry, city infrastructures and mobility... in demand areas with an expected annual growth of 5 to 10% [1]. In these professions we can already see a scarcity of profiles, and an incompatibility between existing training and the skills required.

Therefore training is a key issue to ensure the combination of a triptych of energy, digital and societal skills. The aim is to respond to the evolution of existing professions and the needs of new professions linked to the development of Smart Grids.

To meet this challenge, we propose the implementation of 3 actions dedicated to training in the industry:

- Action 1: Identify new activities and their impact on skills and professions (induced by the deployment and use of Smart Grids) to **build a shared repository of training courses on the targeted professions**, from vocational training to engineering degrees, in continuing and initial training. In view of the dynamics of the sector, the repository will have to be monitored to follow the evolution of needs.
- Action 2: **Develop digital content in training courses dedicated to the energy professions**, building on the ongoing work carried out in the framework of the EDEC: organise more cross-functionality between the OPCO (2I - Inter-industry, ATLAS and Construction) and facilitate bridges between initial training courses. For example:
  - Support the creation of an experimental digital module to complement initial or continuing training; this experiment could be carried out in Brittany and Provence-Alpes-Côte d'Azur, two regions involved in the work carried out by the EDEC and the CSF Nouveaux Systèmes Electriques.
  - To support the creation of modules for SMBs (in continuing or initial training) dedicated to cyber-security, in connection with European programmes and including the Digital Innovation Hub.
- Action 3: **Facilitate reconversions towards Smart Grids professions** by organising bridging training courses for shrinking professions. Network operators have the know-how and proven practices to activate this measure on the operational modalities of training. The modalities for linking supply and demand have yet to be developed (for example, the creation of a platform between sectors) as do the financial support mechanisms.

Enedis truck in front of wind turbines

1. EDEC study on the electrical sector, June 2020, (UFE, Gimelec, SERCE, FFIE, Think smartgrids, IGNES, Industries Méditerrannée)

R14. ACCELERATE THE ENERGY TRANSITION BY EXTENDING FRENCH SMART GRID LEADERSHIP TO THE INTERNATIONAL MARKET

When the Paris Agreement was signed in 2015, France showed that it could be a leader at the international level to drive very concrete actions in terms of energy transition and the fight against global warming. COP 21, which gave birth to these ideas and this agreement, is still unanimously welcomed throughout the world.

Also, the French Smart Grids industry, representing over a hundred stakeholders in France, with recognized expertise and an exceptional know-how on the international Smart Grids market estimated at 75 to 100 billion €, wishes to benefit from this lever to develop the international influence of its companies.

Indeed, France's ambition is to be a leader in the fight against climate change, but it must also be a force for proposal and support for the governments and stakeholders of other countries, by proposing experienced innovative and sustainable solutions in the field, capable of delivering on climate commitments.

To respond to this challenge, two actions are proposed.

ACTION 1: PURSUE AND AMPLIFY GREEN ECONOMY DIPLOMACY

It is proposed that the subject of the energy transition, NDCs (National Determined Contributions – countries' commitments to the fight against climate change), be systematically included in the agenda of all bilateral meetings with France - represented by the President of the Republic, the Prime Minister, or the Minister of the ecological and solidarity transition –), and that French expertise be promoted to achieve the objectives of each country.

Smart Grids are one of the solutions to the problem of global warming, and French companies in the sector have developed numerous technologies that contribute to it, from EV charging to self-consumption, storage, RE integration and flexibility solutions. The key messages will be proposed to the authorities according to the delegations and their points of interest.

In the event of a visit to France by an international delegation, these same energy transition topics, highlighting French Smart Grids solutions, should also be proposed on the agenda of the meeting along with visits to Smart Grids sites, in Paris or in the regions.

Bilateral relations between the Ministries of Energy/ the green transition could be developed and amplified, to create more visibility for French companies in the sector. For example, the French Ministry could recommend that another country implement Smart Grids roadmaps. These Smart Grids roadmaps or any other action for evaluating the level of a country's energy transition could then be implemented by research institutes or French academics, for example, to see the emergence of concrete projects to reduce emissions of greenhouse gases, supported by companies from the Smart Grids industry.

ACTION 2: CREATE THE FUTURE EUROPEAN UNICORNS OF THE ENERGY TRANSITION

France can rely on a network of promising start-ups and SMBs in the field of energy transition, in particular in AI for networks, the micro grid, EMS (Energy Management Systems), modelling and smart charging. Just like the Battery Alliance, by demonstrating this model for SMBs and start-ups, the proposal is to bring out the unicorns of tomorrow in contributing to the creation of European consortia of start-ups, and SMBs in order to activate the smart grids lever of the energy transition.

The aim is to finance a system of meetings for these start-ups, and to help them grow together in European incubators already existing in France, Germany, and other countries. Depending on their maturity, the consortia will then be able to benefit from existing European schemes such as the European Innovation process, which allows companies to benefit from equity capital from the European Union.

This provision enables start-ups in the energy transition to be supported, to create jobs and to respond to the challenges posed by the evolution of the Energy sector; from individual and collective electric mobility, with its search for business models, to connections for new renewable energies, not forgetting micro grids for isolated sites, or the processing of energy data.

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