ENEDIS
L'ELECTRICITE EN RESEAU

Roadmap for the transformation of network planning methods and the integration of flexibilities

February 2020

Enedis **roadmap for the transformation of network planning methods and the integration of flexibilities** sets forth the progress of Enedis work and shares knowledge on this emerging topic with all the electric network stakeholders.

Many stakeholders expect much from local flexibilities:

- Territories anticipate the development of RE and their value at a local level
- Market players want to supplement their business model (storage, EV charging infrastructures…)
- Network operators see flexibilities as an additional lever to optimize network management from a technical and economic perspective
- National and European institutions (CRE – French Energy Regulation Commission, European Commission, DGEC – French Directorate-General for Energy and Climate…) want to increase market players' visibility.

Enedis is engaged in a major work program to embed local flexibilities in its industrial model while involving its stakeholders. Enedis relies on technical and economic studies, as well as experiments and demonstrators, to test and validate the functionalities to be industrialized. Simultaneously, Enedis has engaged for several years now an educational approach focusing on Smart Grid:

- Publication in 2017 by Enedis and the French Association of Electricity Distributors of the report "Economic assessment of smart grids solutions"
- Contribution by Enedis to the report commissioned by CRE and published in 2017 on flexibility valorization mechanisms for the design and management of distribution public networks
- Publication in October 2019 by Enedis of the document "Flexibilities to enhance the Energy Transition and the performance of the Distribution Network ", which describes flexibilities use cases for the distribution system, their principles, and potential gains.

FLEXIBILITIES: CONTEXT AND ENEDIS APPROACH

DEFINITION

Flexibility is a voluntary increase or decrease of generation or consumption power of one or several sites, at a given time for a given duration, in response to an external signal to provide a service to the energy system.

Enedis refers to **local flexibility** since the effectiveness of flexibility sources to alleviate network constraints depends largely on their location.

A few reminders

The foremost flexibility use is with national market mechanisms, to manage supply-demand balance at any time horizon (ancillary services, balancing market, etc.): this is the legal responsibility of RTE. The use of flexibilities to manage the supply-demand balance has been a reality since the creation of the electric system. **Enedis stands as a facilitator for any player wishing to make the most of flexibilities connected to the public distribution network in any of these mechanisms. More than 40,000 "flexible" sites connected to Enedis network,** with a total capacity of around 1,000 MW, already participate in national balancing mechanisms and in the demand side response market.

For network operators, local flexibilities are an additional lever to technically and economically optimize network operations. Flexibilities compete with "traditional" network management levers as they may provide new solutions with a better cost/efficiency ratio for the community.

Flexibilities: a transformation program for Enedis and its stakeholders

Flexibilities are inherently a lever for network operations: flexibility activation is decided based on detection of a potentially problematic situation for the network. Local flexibilities constitute a **risk transfer from network planning to network operations (real-time or close to real-time).**

On the transmission network, the short-term treatment of congestion through adjustments has been an operational reality for a long time. Now, the development of Smart Grid technologies enables to use flexibilities, to alleviate, inter alia, constraints on the distribution network.

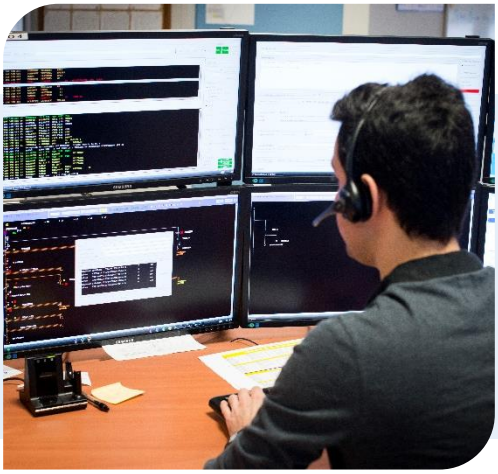
Enedis undertakes a major evolution to embed local flexibilities in its industrial model and is engaged in a comprehensive work program to this end. Embedding flexibility in investment decisions and network operations optimization extends far beyond reconsidering network planning methods and parameters.

These changes impact many business and IT processes, for Enedis as well as for its stakeholders.

To enable this transformation, Enedis:

- **Develops methods to identify and to value flexibility opportunities, then to activate and to control flexibilities**: Enedis makes sure that the economic efficiency of flexibility versus other available levers;
- **Embeds flexibilities and their value in network control,** while continuing to ensure the **safety of persons and property** (in particular, adapt protection systems);
- **Develops a "DSO-TSO" coordination model to integrate flexibilities**, as DSO and TSO may share a flexibility pool;
- **Builds a framework of rules and processes**, in **close cooperation with stakeholders**;
- **Develops methods and tools to manage flexibilities portfolio throughout their life cycle across Enedis activities**: network planning, network control, tendering and contracting, flexibility activation settlement, investment and network connection for new customers, etc.;
- **Performs change management and trains its staff**.

Enedis relies on real-life cases to manage change. Because of the current flexibility maturity and similarly to European DSO, Enedis tests local flexibilities and capitalizes feedbacks. Flexibilities use cases are complex and unequal in value: **Enedis will progressively and as soon as possible implement these different flexibility use cases**.



THE ROADMAP

	2020	2021	After 2021
Evolution of design methods	Evolution of technical and economic parameters Development and industrialization of needed flexibility methods		
Map of flexibility opportunities	Update		
ReFlex S3REnR* project (including a call for tenders)	Experiments preparation Regulatory sandbox implementation ✓ CRE and RTE validation of temporary methods ✓	Connection capacity increase with direct generation curtailments (according to constraints) Market based flex. procurement as an alternative to direct generation curtailments Market-based flex. activations	Regulatory changes and feedback Flexibilities embedded in S3REnR*
"Investment deferral" **"Support for real-time operations"**	1st call for tenders (6 areas)	Activations in case of successful market-based flexibility procurement Feedback on market-based flexibility procurement and real-life activations	Marked-based flex. procurement for identified opportunities Further experiments if needed, depending on feedback
Smart connection offers for MV Producers	Experiments (types 1 and 2)** Regulatory changes ✓ Documentation update (type 1)	Type 1 embedded in the network connection process Documentation update (type 2)	Type 2 embedded in the network connection process
Smart connection offers for MV Consumers	First experiments and feedback Depending on opportunities: experimentation of other configurations, feedback, and embedding	Documentation update (1st smart offers)	1st configurations embedded in the network connection process
LV Flexibilities	Participation in demonstrators		

Legend

- Collective benefits
- Individual benefits
- Depending on previous project milestones
- ✓ External Agreement
- Marked-based flex. procurement

* Regional Renewable Energies Connection Master Plans (S3REnR in French)

** Type 1: guaranteed power
Type 2: max. vol. limitations

Principles of network design

1 Purpose of network design

Network planning aims to establish an **efficient network structure** (HV/MV primary substations, MV/LV substations, power cables, voltage level, etc.) at the **best cost/quality ratio for the community,** i.e. enabling **electricity to be distributed and collected on the whole territory, for all customers and on the long term**. The expected high grid reliability leads to consider any kinds of situations, including extreme and rare events.

The operability of a network requires that design takes into account real-time operations and symmetrically that control room operators are enabled to operate the infrastructure. These two phases, network planning and operations, are therefore closely linked.

Because of its careful sizing of the public distribution network and its efficient network operations, **Enedis now guarantees an average reliability of 99.99%** in France, with optimized costs across all its processes.

2 Fundamentals of methods and tools

The methods and tools for network dimensioning studies are used:

- for **connection studies**: guarantying the whole requested capacity to inject or withdraw at any time;
- for **network planning studies**: diagnosis and assessment of network upgrades opportunities to improve the quality of supply, at the initiative of Enedis;
- or, e.g., in the case of third-party requests to **relocate networks**.

These methods and tools allow to:

- **diagnose the network** and identify potential structural constraints[1];
- choose the **optimal strategy** by comparing several solutions (do nothing, change the network operating scheme, reinforce or restructure the network) that can fully or partially meet the identified constraints;
- **plan the medium- and long-term evolution of the network**, to achieve the best balance between cost and quality over time**.**

Choosing the **optimal strategy** for a given network consists in determining a **cost/quality optimum** from a **collective standpoint** rather than from an individual standpoint: we thus refer to the **collective value** of each solution. To do so, Enedis primary substation studies assesses the different solutions on a **technical and economic basis**: collective benefits (valuation of the reduction in non-quality and technical losses) vs. investment costs and changes in operating costs.

MV network and HV/MV amine the following situations:

- **Network in nominal configuration** ("N" situation, all assets and equipment are available): structural capacity to deliver peak demand during a relatively severe cold wave (ten-year period) and to accommodate all the generation power – these situations being uncorrelated. This is a **deterministic technical and economic comparison of solutions** to guarantee this structural capacity. These studies are carried out following **network connection applications** or during **network planning**.
- **Network in a downgraded situation** ("N-1" situation where exactly one asset or equipment is faulty or unavailable, the MV grid having a potential back-up through a neighboring network) at normal temperature during high consumption seasons.

  Different solutions, including the "do nothing" solution, are inter-compared using technical and economic assessments. This is a **probabilistic approach**: the different possible load states of the network are modelled using a "load duration curve"[2] and the different network incidents are probabilized. These studies are carried out during **network planning**.

LV studies are more standardized due to structural issues (LV networks are tree-structured) and operational implementation issues, keeping the same principles.

The networks are not dimensioned to satisfy the sum of the connection capacities historically requested by each customer: the capacities stemming from the effects of load aggregation (or from lower use of the infrastructure compared to initial demand) are made available to the community. Indeed, the connection of a new consumer or producer will take into account the power requested by the customer, but also its integration into the existing networks. To this end, Enedis models all other existing loads based on what they are (then projects them under planning conditions) and not based on their original connection power. The closest parameter to figure this would be the subscribed power-rather than the connection capacity.

[1] **Constraint**: Voltage or current excursion beyond permissible thresholds. Threshold: maximum and possibly minimum value (voltage, current, etc.) resulting from the regulatory obligations imposed on Enedis for the safety of persons and property.

[2] **Load duration curve**: curve describing the number of hours a given power is exceeded.

3 A few reminders on load modeling

Load (consumption and generation) representation in network planning is part of the data required for network studies, be it for their diagnosis or for decision-making studies.

The load hypotheses used for these studies and their representation by load duration curves are an industrially accepted choice.

- **The infrastructure is built to be operated at all times, not just for consumption or generation peaks. Long-term studies are carried out based on a complete network and on an optimized operating scheme**.

The resilience issue for such technical and economic study only encompasses the loss of a single asset. However, **Enedis must be able to operate the network at less restrictive load levels, under less satisfactory but more frequent network conditions**: e.g. during maintenance operations when assets are unavailable for some duration. Consumption and generation situations considered in development studies implicitly address these situations.

- **Using load duration curves is consistent with the issues examined in network studies**: permanent future features of a network solution at a geographically known location (the location issue no longer arises once the solution is chosen).

A contrario, such hypotheses no longer apply when it comes to flexibility and as such require major adaptations to study the impact of a flexibility service.

Load modeling in network planning aims at representing, over the projected time-frame of the study, "plausible" loads, representative of current and future use of networks in design situations.

These loads do not directly compare with past use:

- Historical data from a given year is only one of an infinite number of possibilities: **the modelled loads used for a study are "projected" in extreme and rare conditions** (weather conditions, etc.) **as well as extended over time** (increase/decrease, deformation, etc.).
- **Representation of the same load differs according to the extent of the study**: the further away from the connection point, the more this potential individual load will "mix" with other neighboring loads through complex and non-constant phenomena of aggregation over time.

Thanks to Linky smart meters, Enedis can now measure consumption and generation of customers below 36 kVA at a higher frequency. Moreover, in the medium term, Enedis will systematically collect load curves of customers above 36kVA. These new and frequent measurements offer opportunities to readjust and recalibrate load models currently used for LV and MV network planning. This is an on-going work that will be carried out over several years.

The ReFlex experimental framework (optimizing investments of Regional Renewable Energies Connection Master Plans) will require, from 2020 onwards in preparation to a subsequent generalization, to continue on-going studies on the effects of aggregation between generation sectors on one hand, and between consumption and generation on the other hand. These studies will enable to determine, in cooperation with stakeholders, the best collective balance between increasing capacities of primary stations and using flexibility for temporary production curtailment.

DEVELOPMENTS IN DESIGN METHODS

Enedis regularly updates its methods and models to take into account changing context (IT developments, changes in uses, etc.).
Today, external changes are important and structuring and require more than the simple and regular updating of models by Enedis.

Flexibility studies require **an approach that radically departs from current research methods and tools** (load curve studies vs. load duration or dimensioning capacity studies). They require detailing **temporal evolution of constraints** on a specific asset, whereas a normative approach is enough to represent this temporal evolution in “classic” studies.

1 Evolution of technical and economic parameters

Regardless of the solutions studied (do nothing, network restructuring, reinforcement, flexibilities contracting), technical and economic assessments to determine the optimal network evolution solutions use the following **structuring parameters**. Those will be first updated early 2020, then on a recurring basis and as needed.

The valuation of **failure** (cost of **Non-Distributed Energy - NDE**, **Non-injected Energy - NIE**) quantifies the cost borne by the community in the event of a network failure leading to a power outage or an inability to produce.

- The value of the NDE depends on the capacity to anticipate the failure (planned works vs. incidents) and its duration. It corresponds to a loss of socio-economic value due to the outage. It is based on surveys and economic analysis, for each segment of customers connected to the public distribution network;
- The value of the NIE is the substitution value, for the community, of the energy that could not be injected into the distribution network. It is therefore homogeneous to the long-term electricity market price, minus the variable cost of generation of curtailed resources (set to zero for the PV and wind energy sectors).

The cost of **technical losses** represents the full cost of technical losses for the networks (including associated energy procurement cost on the energy markets).

The **discount rate** is used to calculate the net present value of technology and economic balance sheets over a long time horizon, to compare several solutions. The updated rate is based on a public reference, adapted to the principle of a societal cost-benefit analysis to reflect collective value creation: its value is estimated at 4.5%, in accordance with *France Stratégie*'s recommendations.

Changes in these economic parameters lead to changes in industrial technical and economic choices. For example, **the choice of cables ("economic cable cross-sections") is optimized to limit technical losses.** A network operated as close as possible to its capacity over long periods generates high technical losses and therefore does not correspond to the technical and economic optimum.

KEY DEADLINES

NDE, NIE, technical losses, economic sections of cables (update of the Reference Technical Documentation): in 2020

2 Fundamentals of flexibility and evolution of study methods

As detailed above, the "classic" network development study is based on reference situations and load duration representation.

A contrario, flexibility studies require a **new approach,** breaking away from **current study methods and tools**: estimating a flexibility requires an explicit representation of its impact over time (to measure the effect of a product shaped and limited in duration, season, etc.) and in space (to take into account its location).

This results in comparing the optimal asset solution (reinforcement / restructuring) and the proposed flexibility solution(s) in order to determine the best solution.

The optimal asset solution and flexibility have different impacts, both in terms of failure and technical losses reduction (flexibility has a marginal effect on losses reduction).

There are two different approaches to assess their value:

- **For smart connection offers, the value is individual and the connection applicant takes the decision.**
- **For flexibilities used to defer investment, the value is collective and Enedis takes the decision to contract a flexibility**, following a two-step process.

In a first step, the optimal asset solution is compared to an ideal flexibility (perfect response, ideal location, zero cost), through technical and economic assessments. **A flexibility opportunity to defer a reinforcement is identified if (and as long as) the reinforcement is "beaten" by the ideal flexibility**, with regard to the evolution observed each year in the area (evolution of loads, disappearance of the flexibility pool).

This method assumes that an **ideal source of flexibility exists,** i.e.:

- with an unlimited volume and duration during each incident,
- a perfect response (total reliability of the flexibility pool),
- an ideal location of flexibility sources for each incident (including the distribution of flexibilities on several nodes for a given incident, i.e. always "on the right side" of the incident to help recovery of the accessible network),
- an ideal start-up delay.

Not every constraint is an opportunity for flexibility. In many cases, constraints require investment because they are related to a topological constraint that flexibility cannot solve, a regulatory obligation, a need for asset renewal, a decision to bury overhead lines, a request for quality improvement, a need to develop new projects... Flexibilities can therefore potentially solve only some of the identified constraints.

The second step is a market-based procurement approach to assess the flexibility pool, in terms of service and price. Enedis will evaluate the players' bids according to the service and price they offer. **The flexibility service will be the best solution only if its collective value (including the residual non-quality and the cost of the service for Enedis) is greater than the reinforcement solution's.**

3 Flexibilities, risk management, and experiment

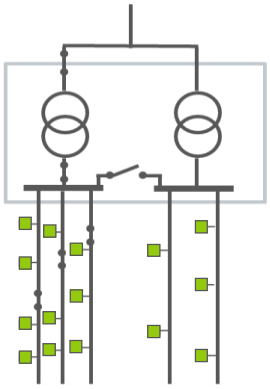
Intrinsically, flexibilities are an operation lever and not a network planning tool.

The efficient control of contracted power modulation generates the collective benefit, yielding to prefer this alternative to a "conventional" means of operations or investment. In other words, it boils down to guaranteeing the consistency of hypotheses at the time of the decision of investment deferral and flexibility contracting, up until real-time operations (control room center, use of mobile power supply restoration units, etc.).

Reliability of a flexibility service is constitutive of the service: it concretizes the risk transfer from traditional levers to the flexibility service. Be it using reinforcement or flexibility, the aim is to ensure compliance with thresholds (voltage, current, etc.) resulting from regulatory obligations (quality of supply), while continuing to guarantee safety for persons and property.

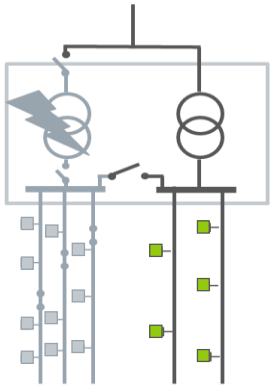
Experiments are necessary to initiate and challenge the processes and to ensure, in real time, the value creation through flexibilities. **This value creation is expected at the time of flexibility contracting then generated in real-time, whereas it is guaranteed by design for a reinforcement**.

IN CASE OF AN INCIDENT, THE USE OF FLEXIBILITIES ALLOWS FASTER SERVICE RESTORATION FOR CUSTOMERS



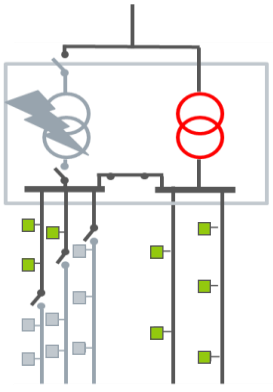
Normal operation

All customers are supplied, through three feeders connected to the left transformer, and two other feeders to the right transformer.



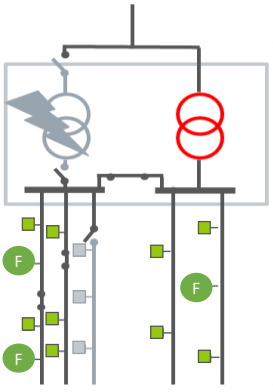
Incident on the left transformer

Power is no longer provided to the customers on the left.
The second transformer continues to supply the customers on the right.



Grid switching

The second transformer continues to supply the customers on the right and **additionally supplies some customers on the left, up to its capacity limits**.

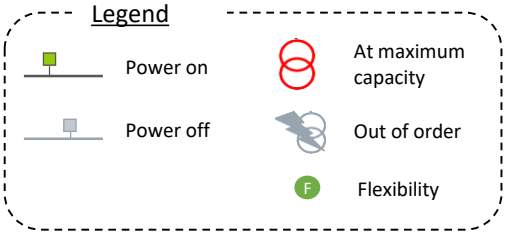


Activation of flexibilities

The flexible sites F reduce their consumption or inject energy into the grid, **which helps accelerate power restoration for more customers**.

From the "Economic assessment of smart grid solutions" 2017 report

Illustration of the possible increase in power restoration via flexibilities - decrease of consumption or increase of generation - in case of an incident on an HV/MV transformer occurring in a two-transformer primary substation.



FOCUS ON FLEXIBILITIES

1 Different frameworks to activate local flexibilities

There are 2 main families of local flexibilities:

A. For an individual benefit, as part of the individual connection

The Smart (or conditional) Connection Offer is **individual**: it is chosen by the customer (consumer or producer) as an alternative to his Reference Connection Offer.

- The benefit of this smart connection offer for the customer is a **reduction in network connection costs and/or delays**.
- In return, the customer agrees to **temporarily limit its consumption or generation, on demand and without compensation** from the distribution system operator.
- The customer **arbitrates between the reduced connection costs / delays and the costs related to the impact of these limitations** on its industrial process.
- The **customer is responsible for taking into account the consequences of these limitations in his contractual commitments** (especially with his Balance Responsible Party).

B. For a collective benefit, in the context of public network development or operations

Flexibilities constitute a new lever to manage operations or to optimize network design, for the benefit of the **community** (e.g. the transformation capacity of a primary substation).

- **Opting for a flexibility service requires that it provides greater value than "traditional" levers used in network operations or planning, over the timeframe concerned by the flexibility service**. The value provided by the flexibility depends on the service offered and on its price.
- **The flexibility offered** (i.e. power modulation on demand by Enedis) **by one or more grid users and selected by Enedis for a collective benefit must be remunerated**.
- **In particular, Enedis shall ensure that the effects of the DSO activations are neutralized within the perimeter of balancing responsible parties and more globally within the entire community of Balance Responsible Parties.**

2 Analysis of the flexibilities main sources of value

Value sources of flexibilities and the priorities to explore and exploit their potential for the distribution system are described in two reports published in 2017: "Economic assessment of smart grid solutions" produced by Enedis and the Association des Distributeurs d'Electricité en France and "Valuation mechanisms for the design and management of distribution public networks" commissioned by the French Energy Regulation Commission (CRE).

The main value potential of local flexibilities is the integration of renewable energy:

- **Investments optimization within Regional Renewable Energies Connection Master Plans (S3REnR) is the 1st source of flexibility for the public distribution network.** To this end, Enedis **ReFlex** project aims at increasing the hosting capacity of HV/MV primary substations. **By 2035, the collective cumulative savings on the public distribution network could reach** €250 million (a **30% cost saving on the considered assets, i.e. the transformation capacity of primary substations).** On the current network, 2.5 GW (equivalent to one year's generation facility connection) of additional capacity could be immediately made available. Market-based flexibility procurement will be the preferred approach to compete with generation curtailment which is technically accessible, controllable, and at a capped and controlled cost.
- **Smart Connection Offers for MV producers have a more modest target** (estimated at around 50 MW of generation capacities / year).

Consumption use cases represent a marginal value and are still at a R&D stage:

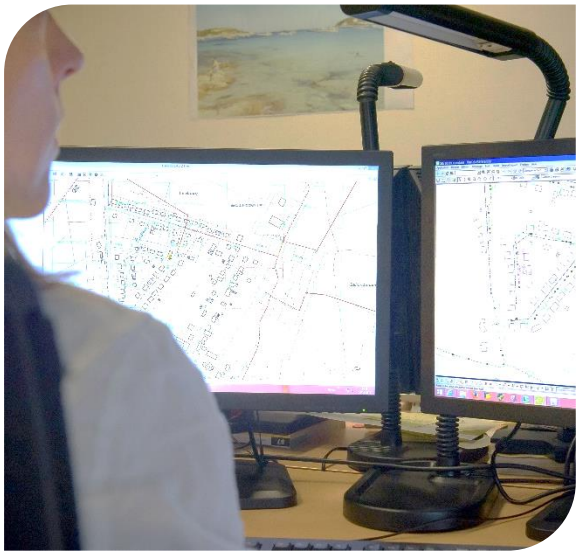
- **Smart Connection for MV consumers could be offered**: target would remain modest and should be supported by provisions that avoid circumventing the principle of customer declaration of connection power.
- **Opportunities to help solve consumption constraints – at the level of primary substations and on the MV network – should remain rare** (low current consumption increase). They imply specific difficulties in terms of identification of operational fragility situations and then of their control in real-time operations. Contrary to the above mentioned Regional Renewable Energies Connection Master Plans framework, they raise the following question: are there potential technically and economically efficient sources of flexibility in these networks where load aggregation is limited? This is one of the challenges to be tackled in the experiments launched by Enedis (request for interest and calls for tender).

Finally, flexibilities to help solve constraints on MV/LV secondary substations have a zero net present value. **Flexibilities for the LV network are still a matter for R&D and demonstrators, with reduced and far-off potential.**

3 Work program priorities

The ReFlex project (integration of flexibilities in the design of Regional Renewable Energies Connection Master Plans) is the priority of Enedis' flexibility program: it is the largest source of value on the distribution network for the community. Experiments are needed, which Enedis wants to initiate as early as 2020 as part of the "regulatory sandbox", with a target to provide feedback by 2022. Following these experiments, a change in regulatory framework will be necessary before this method of sizing primary substations can be permanently integrated into Regional Renewable Energies Connection Master Plans.

The smart connection offers for MV Producers will be industrialized as soon as the regulatory framework is specified[3] **and after adaptation of Enedis' industrial tool (forecasting and real-time operations information systems)**.



[3] A decree should provide a framework for the flexibility volume of renewable energy facilities.

Smart connection offers for MV consumers still need to be tested because of the various possible configurations for activation and contractual conditions. They will be progressively industrialized when technically mature, provided that regulation evolves, while preserving the virtuous and incentive nature of stating power in connection application.

Replacing "traditional" operating levers or deferring investments by contracting flexibility services through calls for tenders is still an experimental approach. Enedis studies flexibilities on the basis of demonstrators, in specific (targeted functionality, etc.) and sometimes simulated (simulation of consumption peaks) scenarios. **Enedis is entering a new phase in 2019-2020 and is addressing the market to procure flexibility services. For the 1st time, Enedis is testing on real life cases a complete process**: identification of opportunities, calls for tender, bid and contract management, integration into the real-time operations process, activation, measurement, validation and settlement, payment if relevant.

The process launched in 2019 is experimental: it may evolve according to feedback. **Enedis and its stakeholders must progress together on the knowledge and the use of flexibilities** to generate sustainable value for the community. The transposition of the Clean Energy Package into French law will set a framework for these flexibility services.

Enedis will capitalize on experiments and make the most of opportunities provided by the developments in the regulatory framework set by public authorities.

Enedis presents below its work program: **Enedis will adapt its entire industrial tool and gradually embed flexibilities in its processes.**

4 Optimization of the Regional Renewable Energies Connection Master Plans primary substation sizing (ReFlex project)

Enedis intends to experiment in two areas the modification of the dimensioning hypothesis of S3REnR primary stations, by increasing hosting capacities and using flexibilities (via the regulatory sandbox). These experiments will enable to validate the implementation of these flexibilities and better characterize their ability to increase the hosting capacities of primary substations for renewable energy sources.

The generalization of these dimensioning methods on the new master plans will be decided on the basis of feedback from the two experimental areas.

KEY DEADLINES

- Preparation of the experiments: 2020
- Application for exemptions to public authorities in the context of the regulatory sandbox: 1st semester of 2020
- Validation of the temporary methods by the French Energy Regulation Commission (CRE) and RTE for balance perimeter corrections on the ReFlex project perimeter: 2nd semester of 2020
- Hosting capacity increase of the identified HV/MV primary substations and first generation curtailments (depending on network constraints): 2021
- Call for tender for flexibility services: 2021
- First activations (depending on network constraints) of market-based flexibilities: 2022
- Depending on feedback and regulatory changes, validation of the S3RENR plan then embedding of flexibilities in the revisions of Regional Renewable Energies Connection Master Plans : 2022 / 2023

5 Flexibilities for investment deferral and/or grid operations

Enedis has carried out an in-depth analysis of 2019 and 2020 investment projects in terms of opportunities for flexibility services: 3 cases of opportunities have been identified. In addition, Enedis has identified 3 other cases not warranting investment, yet of interest for flexibility services in case of an incident on the network.

These 6 cases constitute the target of the request for interest launched in November 2019. The methods used will be capitalized to analyze similar cases. New configurations will require the development of new methods.

As seen above, **the location of a constraint and the location of flexibility sources useful to alleviate that constraint might be different: flexibility opportunities require special methods for identification and valuation**. Therefore feedback from Enedis, as well as from European and American distribution system operators, highlights the value of identifying and communicating on flexibility opportunities, in order to foster the emergence of appropriate proposals.

Enedis analyses the network constraints and will publish the flexibility opportunities (where, when, how much?) it has identified, wherever they can be useful for the network and integrated into its operational processes.

KEY DEADLINES

- 1st experimental market-based procurement for 6 flexibility opportunities: request for interest in November 2019, call for tenders in the first half of 2020
- Update of the flexibility opportunities map: March 2020
- 1st possible activations: from Q4 2020 onwards
- Feedback (including activation in actual situations): 2021 - 2022
- New market-based procurement: from 2022 onwards, depending on feedback and opportunities for flexibility

6 Smart Connection Offers for MV producers

Enedis is finalizing the methods to offer Smart Connections for MV producers. These offers will be included in the Technical Reference Documentation as soon as legislation is complete, *a priori* in 2020.

KEY DEADLINES

- Smart Connection Offers for MV producers with guaranteed power (called “type 1”) embedded in the connection process: 2nd semester of 2020
- Smart Connection Offers for MV producers with a maximum volume of limitations (called “type 2”) embedded in the connection process: 2nd semester of 2021

7 Smart Connection Offers for MV consumers

Smart Connection Offers for MV consumers are less mature than those for MV producers. Enedis needs to continue experimenting these offers on other connection applications (or power increases), in various network configurations and with different types of activation (e.g. at the initiative of the network control centers, local automaton on voltage level, etc.).

This will enable Enedis to specify the different types of possible smart offers for MV consumers, and develop the study methods and the necessary tools.

KEY DEADLINES

- *Depending on feedback and on a generalization framework preserving the virtuous and incentive nature of stating power in connection application*, 1st configurations for Smart Connection Offers for MV consumers embedded in the connection process (curtailment activated by a local automaton) : from the 2nd semester of 2021
- *Depending on opportunities*: other configurations to be tested, then to be industrialized based on feedback.

Enedis, l'électricité en réseau

Enedis is a public-service company managing the electricity-distribution grid.
It develops, operates and modernizes the electricity grid and manages the associated data.
It performs customer connections, 24/7 emergency interventions, meter reading and all technical interventions. Enedis is independent from the energy providers, which are responsible for the sale of electricity and the management of the supply contract.

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