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THE FUTURE OF THE ELECTRICITY DISTRIBUTION NETWORK AND TARIFF POLICY

The French Case

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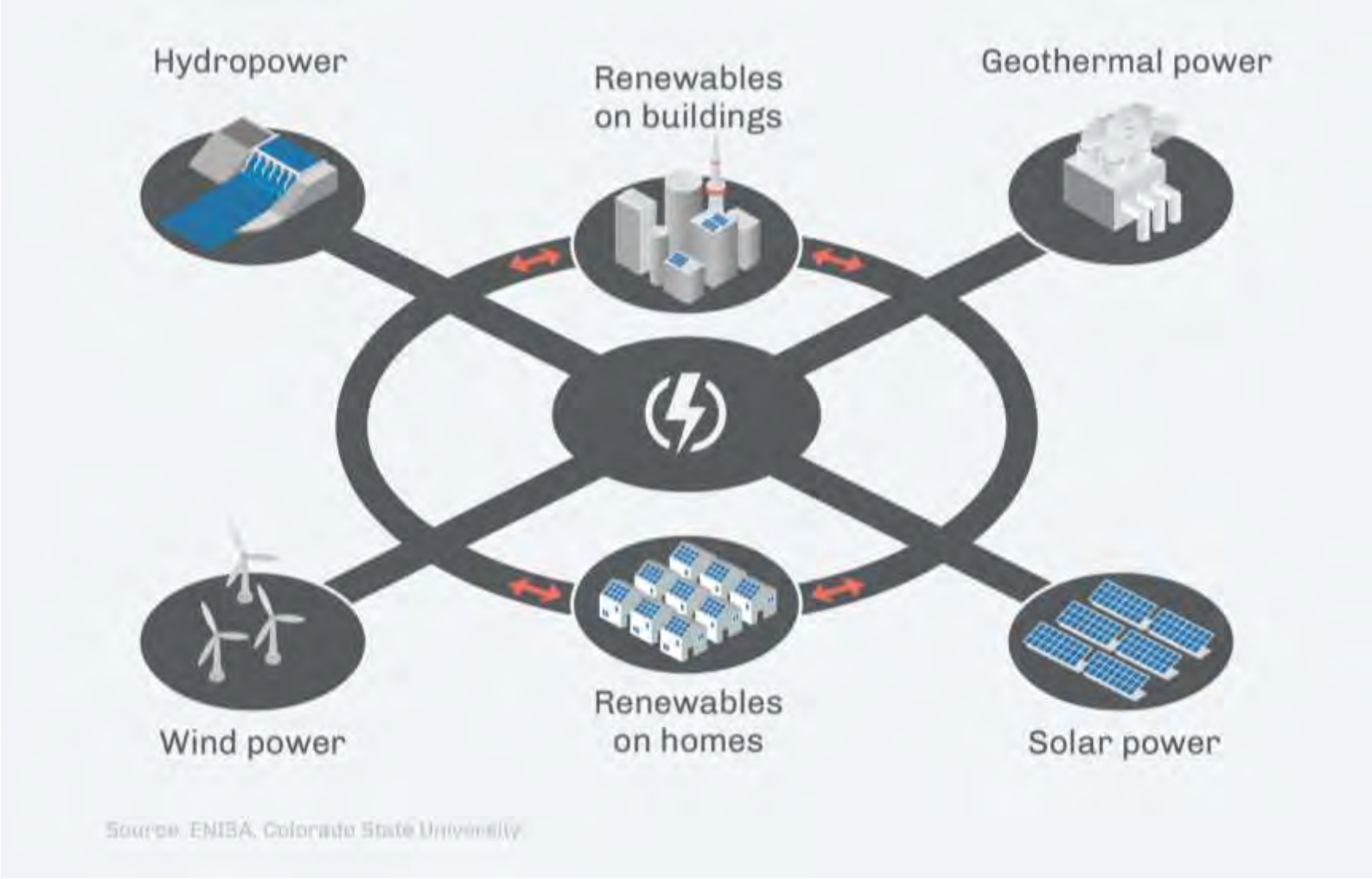
A quick history of electricity distribution in France

- **Before WW2**, the number of French municipalities with electricity went from 7,000 in 1919 to 36,500 in 1938, with a system of public service concessions
- **In 1946**, electric companies were nationalized and EDF was created, integrating production, distribution and transmission
- **In the early 2000s,** the opening-up of electricity markets and the creation of ENEDIS (formerly ERdF), a functionally independent management service for the distribution network
- The distribution of electricity is a **public service** and the DSO's core functions have the characteristics of a **natural monopoly** that falls under the responsibility of local authorities. The duties of ENEDIS include:
  - Maintaining the electricity network's performance and quality.
  - Guaranteeing to all customers non-discriminatory access to the public distribution network, as well as the confidentiality of commercially sensitive information in its possession.
  - Respecting a code of conduct mainly based on equality of treatment, objectivity and transparency. The respect of this code is verified by the *Commission de régulation de l'énergie* (CRE), the French regulatory authority for energy.

The drivers behind the emergence of a new world

- Political and societal concerns: a strong appetence for energy autonomy has emerged and self generation is seen as a means to bypass centralized networks.
- The trend comes from Germany and its “Energiewende” (so-called municipalization of energy generation and distribution).
- The French Law for the Energy Transition of Aug. 2015 and the European Directive Project of Dec. 2016 (Winter Package) both promote self-generation and the concept of the Local Energy Community, potentially competing public DSOs on sections of the network.
- Other drivers are technical:
  - The cost of RE (mainly solar PV) has decreased.
  - Local storage seems attainable thanks to the improvement of batteries.
  - The EV begins to spread out.
  - The digitalization penetrates the energy sector, potentially allowing demand response and providing the system with flexibility (smart grids).

In the new world, power flows in all directions, providing the DSO with a new role

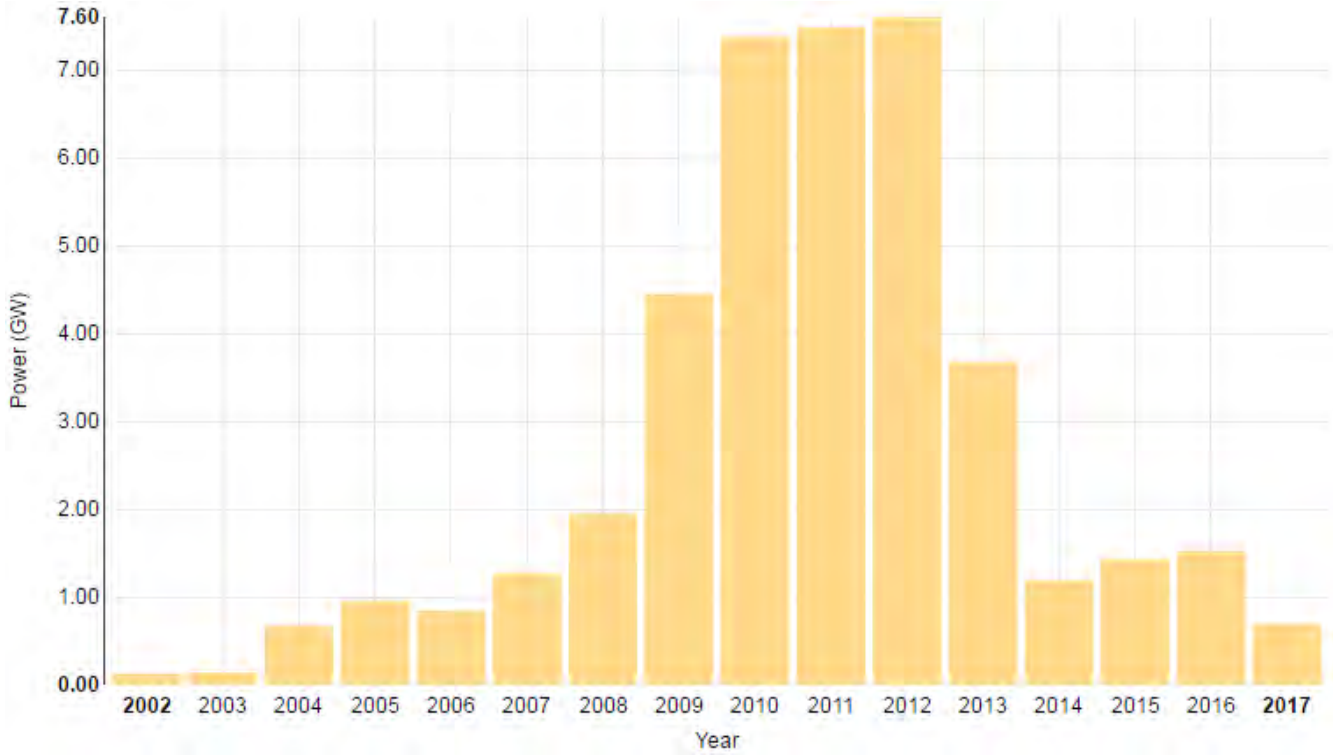


The future of DSOs

- A Working Group has been set up at France Stratégie to reconsider the future of DSOs in more or less the long term (2035), allowing the possibility of disruptive solutions to emerge.
- A series of hearings have been conducted and the main subjects of concern are:
  - Technical: future costs of REs and storage means, vision of R&D centers
  - The digitalization of the sector, the vision of technology developers (i.e. Schneider Electric or Alstom), the possible role of TelCos and GAFAs
  - Consumer issues and the vision of solutions providers
  - Possible regulatory measures for this new world
  - Coordination with the TSO
  - New relationships with the local authorities
- A method of prospective analysis will be used to assess the reaction of current players.
- The report, including recommendations for public policy, is to be issued in the fall.

Initial findings on renewables

- The cost of PV cells sharply decreased between 2010 and 2013 and continues to decline slowly, and it is now a minor part of residential installations.
- Large wind or PV farms have lower costs than PVs on roofs (economies of scale against economies of series): centralized generation still has a future.
- The new world will come, but perhaps not as fast as we may think. **This gives us a bit time to prepare for the future, at least in Western Europe.**



Capacities of solar PVs installed in Germany 2002-2017

Initial findings on storage and EVs

- Costs of local storage technologies (mainly batteries) are decreasing but are still too expensive for general purpose uses. Costs may reach an asymptote (Moore's Law doesn't apply to electrochemistry).
- Batteries may only be profitable for multiple usages (e.g. network and power transfer).
- In countries like France, storage between summer and winter has to be centralized. The German model (*Energiewende*) prefers network extension.
- VehicleToGrid: conflict of usage is an issue. The cost of a battery cycle must be low.
- Charging stations: power is more important than the energy itself.

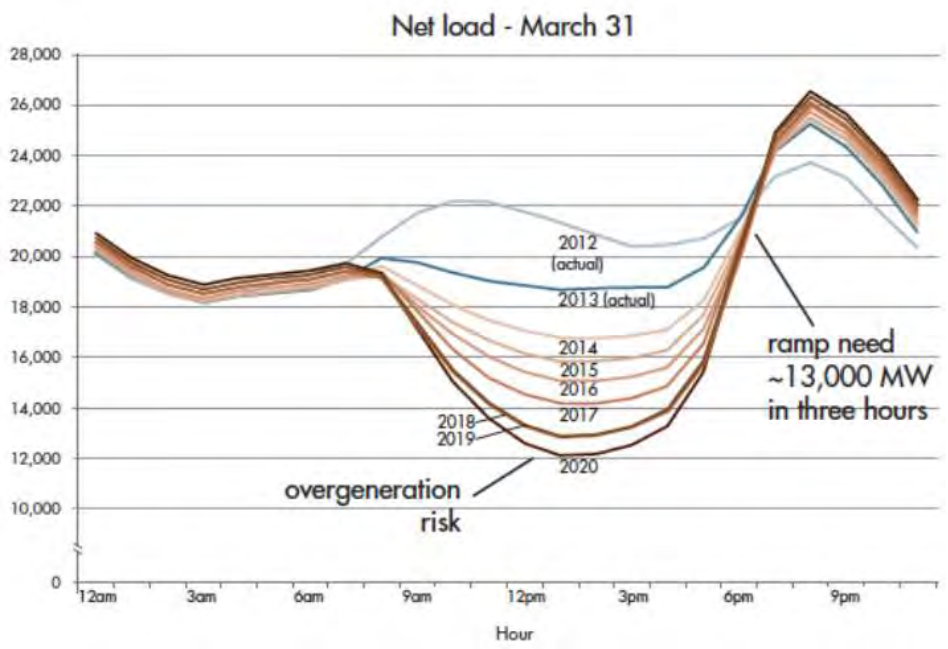
Initial findings on digitalization of the power sector

- Digital technologies are more promising in the short run and may be disruptive in that they make demand flexible and force it to adapt to intermittent production:
  - Data consumption access
  - Modularity of network access services
  - Easy EV charging solutions for existing buildings
  - Production sharing for consolidated management of buildings
- But they face cyber security problems (see recent attacks in Ukraine).
- In France, consumers are not really ready to become “prosumers”. A recent poll (Synopia) shows that their preferences for power are that it is:

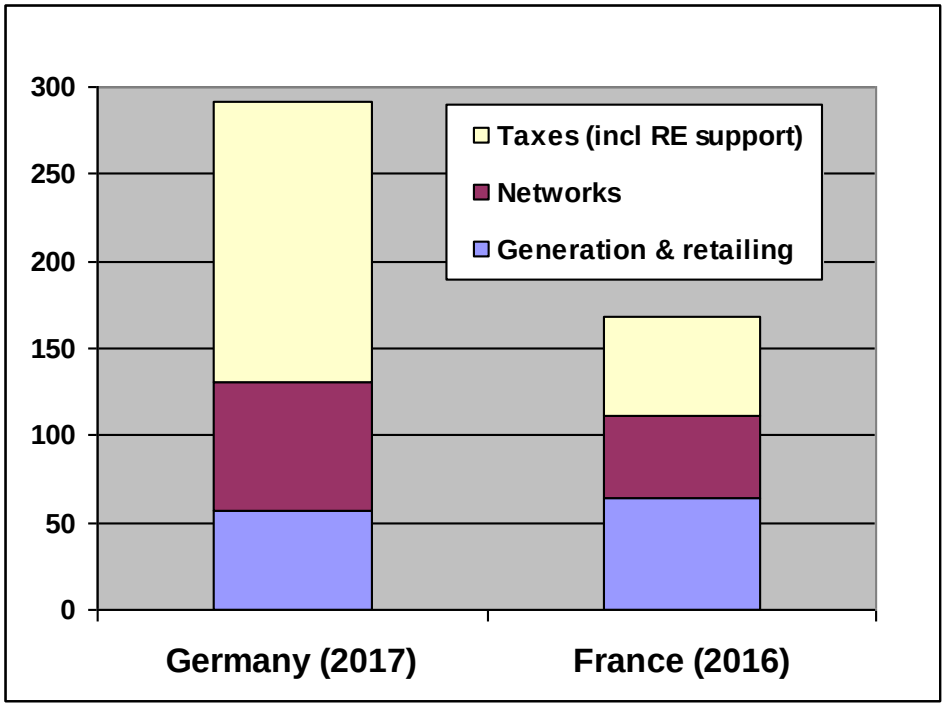
  70%: without interruption
  64%: affordable
  57%: renewable in origin
  36%: locally generated

Initial findings on self-generation

- Self-generation is generally profitable because it takes advantage of favorable regulations (tariff levels and structure, subsidies, taxes, etc.).
- To avoid free riders and tax evaders, the network has to be remunerated for the services it provides (security of supply, power quality, etc.) at all levels (residential customers, neighbourhoods, micro-grids, cities, regions, etc.).
- These signals must include the cost of generation (market cannibalization of REs).



The Californian duck curve



The network tariff

- The tariff paid by network users is regulated by public authorities and in France is known as **TURPE** (Tarif d'Utilisation des Réseaux Publics d'Électricité)
- Determining and applying the tariff depends on 4 basic principles:
  1. **A Uniform Tariff for the entire national territory:** the price is the same throughout the whole country, in accordance with the notion of territorial solidarity (***péréquation***).
  2. **The "postage stamp" principle**: the price does not take into account the distance covered by the energy between where it is produced and where it is consumed (individual solidarity).
  3. **Dual Tariff:** a function of the capacity subscribed and the energy withdrawn.
  4. **Seasonal metering:** some versions of the tariff vary rates according to seasons, days of the week and/or hours of the day.
- The TURPE (TSO + DSO) scores for 1/3rd of the regulated tariff for households (€55/MWh out of €160/MWh).
- For distribution, fixed+capacity components account for 20% and energy for 80%.

The evolution of the tariff is mandatory

- Market and regulation should adapt to ensure a fair return on investment for DSOs: since the costs are mainly fixed costs (CAPEX), the tariff, historically based on the kWh, must evolve to be based on power (€/kW).
- Furthermore, the current tariff, especially in Germany, hinders the transfer of uses to electricity (EV, Heat Pumps), while it is the main vector to decarbonize the economy.
- All services must be remunerated at the right level and coherent price signals sent or received by all actors (final consumers, aggregators, markets, TSO, producers, flexibility providers, storage managers, etc.) in order to avoid redundant investments or non-rational behaviour.
- Ways to remunerate the DSO for data management and attached services must be thought up.
- In France, in the medium or long run, the uniform tariff (*péréquation*) will hardly survive and may be a drag to innovation. New ways to manage the solidarity between territories will have to be devised.