



**New technologies and services to support a grid with
100% renewables**

Wind Europe September 26 - Hamburg



France – Building up to more renewables

- Electrical heating = Thermo-sensitive country

-1° C in winter = + 2 400 MW

→ Various European interconnections that need to be enhanced

- High potential of renewable (onshore & offshore wind, PV, hydro, marine, biomass...)

→ **But lags behind in terms of installed capacity**

- Production areas vs Consumption areas

→ **Adjustment of the national grid must be done as renewables develop**

- Various tools in place in addition to reserve system

→ Adjustment mechanism with growing impact

In 2017 → Average 340 MW with a peak at 1 898 MW Representing
27 GWh vs 16 GWh in 2016

→ Capacity mechanism

2015 ADEME report → 100% renewable electricity system by 2050

Offshore & Onshore wind as 1st supplier of energy



Renewables participation to all balancing mechanisms

- Priority to voluntary and price-driven mechanisms over regulatory / mandatory mechanisms
 - Adjustment = No mandatory and centrally controlled adjustment
 - But voluntary and decentralized**
 - Market tools adaptation to allow renewables for participation
 - European wide service system homogenisation = **MARI & PICASSO project**
 - High potential for wind services to the grid
 - Existing wind turbines underuse vs capability (e.g. regulation of reactive)
 - Regulation homogenisation to use wind turbines at design potential
 - Real-time reactive power regulation completed with variable maximum active power injection
- All barriers for the participation of renewables to balancing mechanisms must be removed even if marginal participation at this stage and marginal remuneration potential**

Technological integration tools development and implementation

- Fast & Safe Service system data to assess actual delivery of services
- Integration of remote control
- Robust forecast tool



Development of storage services

- Development of flexible and various power production associated to market products
 - Inter-seasonal, intraweek and intraday storage products
 - Grid-To-Vehicle & Vehicle-To-Grid storage products
 - Hydrogen storage for public transportation and railways
 - Fast response by wind and storage
 - Dynamic pricing for storage
- Balancing adjustment at two levels
 - Areas balancing adjustment → **Reduced by storage integration**
 - Producer balancing adjustment with storage and smart tools
- New tools development for new products integration
 - Smart Grid for the producer
 - Aggregation of different power solution = **Wind + Solar + Storage**

High potential of storage integration to wind production to support grid

- Stable and long-term business case development required
- **At Production side and / or Consumption side**