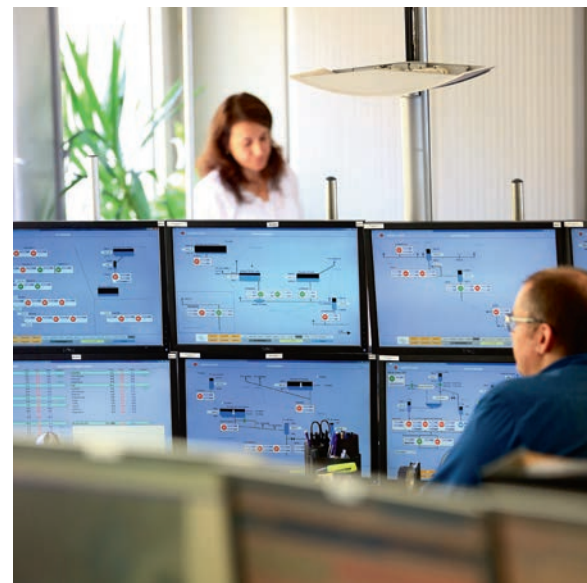




## SELL YOUR INTERMITTENT ENERGIES WITH CNR

Producer of hydroelectricity since 1934, with more than 3,000 MW of installed capacity on the Rhone, we organised our activities immediately after the electricity market was opened in 2001, to manage our energy efficiently and sell it in France and Europe. Thus we have built a platform unique in France that brings together 3 operational skills that act in synergy: meteorological forecasting and the optimisation of production, which work in close relation with the hydropower plants to place the energy produced as profitably as possible; the remote control of our 19 hydropower plants on the Rhone to control production reactively and precisely; and a front office that sells the energy produced on the wholesale market of electricity. This organisation provides flexibility and reactivity for managing fluctuations of variances due to forecast deviations. Fully integrated, it can easily adapt to the many changes that occur in the market and regulations.

Since 2007, when CNR decided to invest in the development of wind and solar power, it has developed within the COCPIT a new activity to forecast these meteorological energies to anticipate their future management on the wholesale electricity market. The expertise gained from the strategy deployed in 2008 has allowed CNR to position itself in 2016 as an aggregator of RES on behalf of CN'AIR, its subsidiary in charge of RES development, and for third parties, thanks to changes in the system providing support for these sectors.



## What is CNR?

CNR is France's leading producer of 100% renewable electricity (water, wind, sun) and the operator of the multipurpose concession to manage and develop the Rhone from the Swiss border to the Mediterranean Sea. Its missions comprise hydroelectricity production, the deployment of navigation and port sites, and supplying irrigation for agricultural use. A fully integrated company at the forefront of technologies devoted to energy that it constantly improves by pursuing a policy of active innovation, CNR offers its services to manage and sell intermittent energies, and its expertise to external clients in France and thirty other countries. In the service of energy transition, it works on smart grids and energy storage, and it develops sustainable electric mobility.

A joint stock company in the public interest, CNR is unique due to its industrial model based on sharing the value created locally with the stakeholders. Drawn up with the latter, its Missions in the General Interest, carried out for over 10 years, have strengthened this close link with the territories. CNR is a mostly publicly owned company (local authorities, Caisse de Dépôts) while the ENGIE Group is its largest private shareholder.



2 rue André Bonin  
69316 LYON CEDEX 04 - FRANCE  
Tél. : +33 (0) 472 00 69 69

***cnr.tm.fr***

*Energy is our future, so save it!*

## COCPIT THE INTERMITTENT PRODUCTION OPTIMISATION AND TELECONTROL CENTRE



GRAPHISTAR 11/2016 - Photos credits Camille Moineau, CNR photographie







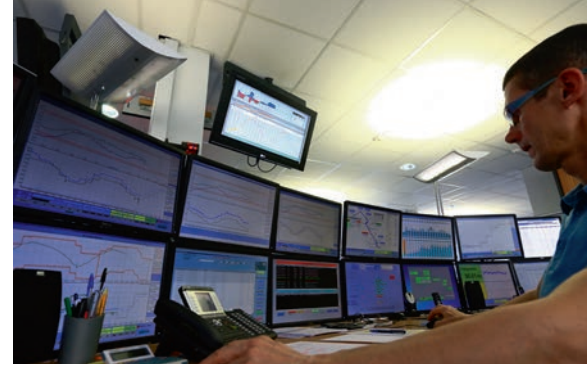
## The front office Access to the market

Our traders sell energy at the best price thanks to the presence of CNR in most European countries for bilateral transactions and for those made on local electricity exchanges. CNR secures its turnover by reducing market risks, in particular through long-term sales for a large share of its production. It is also a highly efficient trader of short-term, SPOT (day-ahead) and intra-day sales by acting with all its European counterparts to minimise losses due to forecast deviations.



## Telecontrol

Our telecontrol operators guarantee hydraulic safety in association with the plant operators, and validate and then implement the production programme of our 19 hydropower plants. They adjust the output and thus the production of the plants in real-time to reduce variances with forecasts. Having a single operations centre for 500 km of the Rhone ensures perfect coordination between the plants and fast adaptation to hazards. The operators of the COCPIT are also in constant contact with the operators on site to optimise maintenance actions and know the availability of the installations.



# A FULLY INTEGRATED ENVIRONMENT TO OPTIMISE THE ENERGY MANAGEMENT

## Middle office

CNR has developed solid expertise in risk management and established a policy that covers the 4 main risks confronting it: credit risk, risk linked to production hazards, market risk linked to fluctuating prices, operational risk. A specific information system called "Front to Back" is used to implement this policy, since it intersects with COCPIT's market activities. The Middle Office implements the risk policy on a daily basis, by monitoring all the transactions made by the Front Office, and constantly adapts the risk policy as a function of regulatory changes and market evolutions.

## Back office

It works day-by-day to secure the sales and the invoicing process. It confirms transactions with counterparts, controls them to prevent any errors, manages pro-forma invoicing, and reports CNR's activities on the markets.



### CNR PERFORMS:

- . 15,000 transactions including 2,300 for the purchase or sale of cross-border transit capacity
- . in 6 different countries
- . with 70 counterparts
- . for 32 TWh

## Operational support

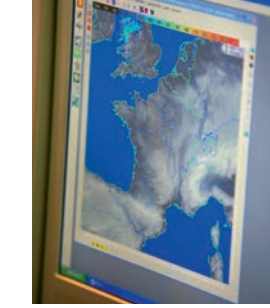
This team provides the interface between COCPIT's operational personnel and the IT department, which develops and continuously improves the forty software applications used by the COCPIT. Its global vision of these professions allows it to quickly transform their needs into software specifications to obtain optimal reactivity to changes in market rules, electricity grids and profit from opportunities to develop new products and services linked to electricity sales. Furthermore, it maintains COCPIT's information systems in operational condition.

## A REACTIVE AND EFFICIENT ORGANISATION

## The ancillary services and services to electricity grids

Thanks to its production units, CNR contributes through the ancillary services to balancing electricity production and consumption on the grid (maintaining frequency and voltage). This expertise and the COCPIT ensure that CNR is fully operational in managing these services in different markets for its own interests and those of its clients.

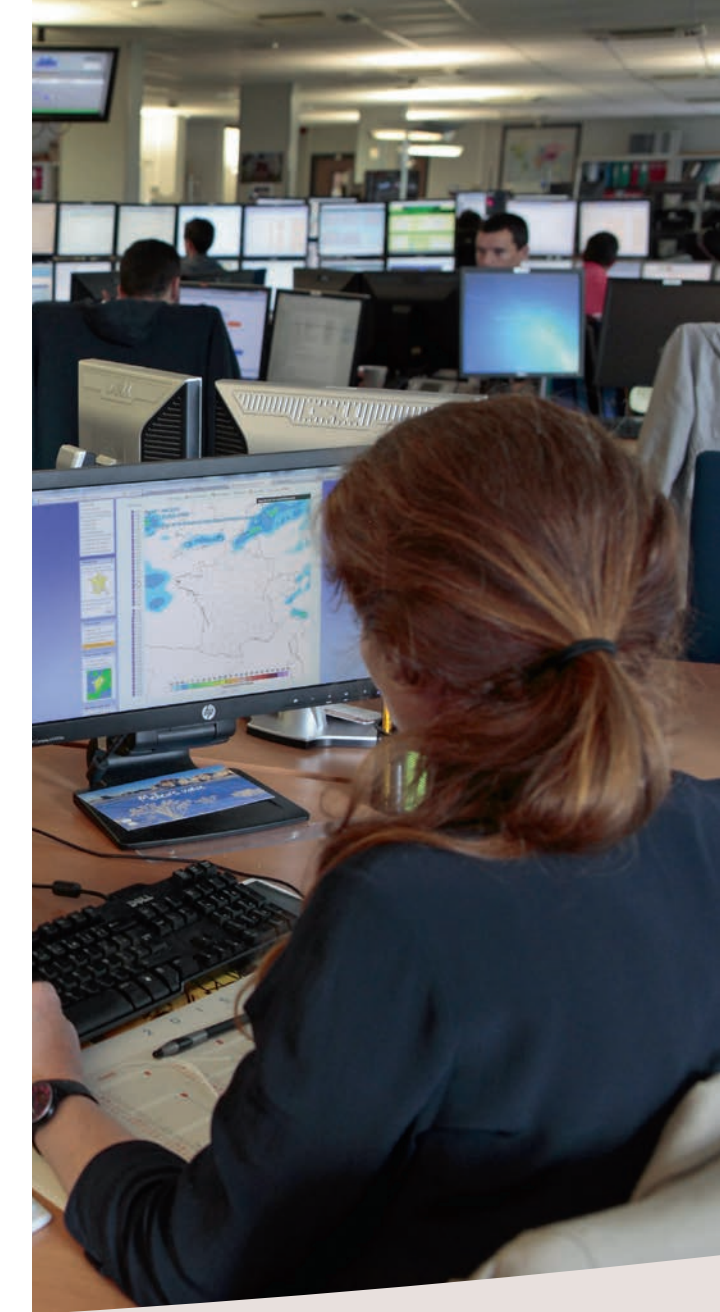
Furthermore, CNR's participation in the national consultative authorities that define the rules for electricity grids and markets gives it a considerable advantage with the different services provided to the grid (reserves, capacity mechanism, adjustment, curtailment, etc.), while preserving the specific characteristics of the random nature of its production.



## Forecasting / Optimisation

Composed of meteorologists, hydrologists and hydraulics engineers, our team of forecasters relies on specific tools developed in-house to analyse the meteorological models of the major national centres (Météo France, European Centre, NOAA, UKMO, etc.) and then forecast the resources available to produce electricity: river discharges, wind and sunshine. A large remote measurement data transmission network allows CNR to update and manage its forecasts several times a day in real-time, by comparing the forecasts with field data.

Our optimisers determine the production programmes as a function of water inflow forecasts, the constraints of production installations, and by anticipating market prices. CNR is therefore capable of adjusting its production on the Rhone to produce more during peak hours when the demand is higher, thereby allowing to sell its production at the best price. In addition, this adjustment makes it possible to place more renewable production on the peak demand, thereby reducing recourse to coal and oil-fired power plants to satisfy the demand and thus improve the global carbon emission balance of the electricity mix.



## Balancing responsible entity

As a balancing responsible entity for RTE since the electricity market was opened up in 2001, CNR is under contract with the French Réseau de Transport de l'Electricité (French Transit System Operator) and is responsible for maintaining the balance between the energy produced and that supplied to clients or sold on the market, for both itself and the partners in its perimeter (ENGIE, GEG, and RES producers).

The mitigation of production or consumption imbalances between partners within the perimeter permits reducing income losses due to these variances, thus the gain is shared. The experience gained from the complex management of this perimeter has made CNR a major actor that RTE takes into account during discussions on changing French and European rules in the sector.

