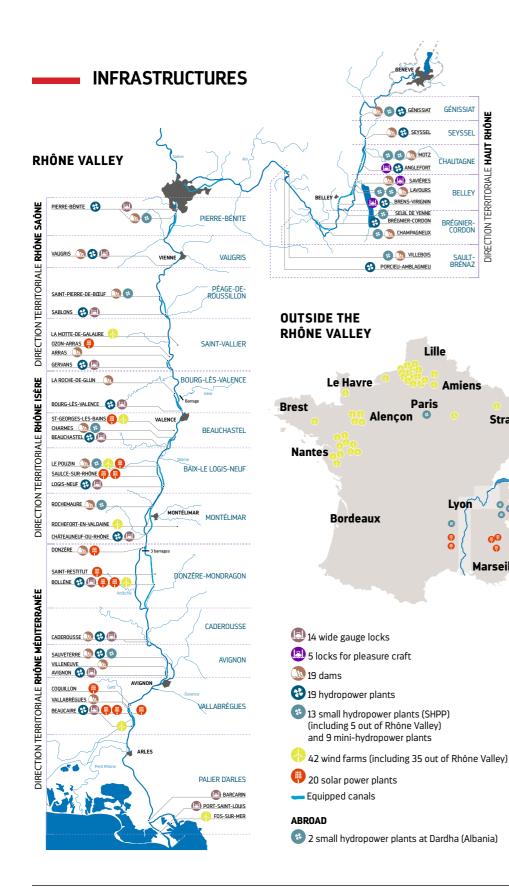




# THE ESSENTIAL



RHÔNE

HAUT I

DIRECTION TERRITORIALE

Strasbourg

Marseille

# **CNR – THE ENERGY OF COLLECTIVE DYNAMISM**

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The French rowing team

NR has developed the Rhône Valley since 1934 and has grown around the Rhône concession in the framework of three missions entrusted to it by the State: electricity production, the development of river navigation and the irrigation of the surrounding agricultural land.

Its knowhow, gained from long experience in harnessing the river for hydroelectricity and enhancing the territories it crosses, forms the basis from which it participates in building tomorrow's energy landscape, at the local scale and in the framework of European and national orientations.

Expert in energy generated from water, it has diversified into wind and solar energy, stepping outside its traditional perimeter to become France's leading producer of 100% renewable electricity. Its DNA inherited from the Rhône Valley not only gives it the technical and financial capacity, but also the operational methods, to forge a more sustainable world based on balanced governance, an integrated industrial model, the logic of redistribution, the spirit of innovation and participatory dynamism.

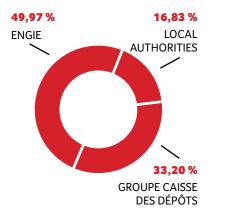
These are all advantages when facing the major societal challenges of our era, and they give CNR a head start in energy transition and in its positioning as a corporate-laboratory of tomorrow's energies.

## A BALANCED MODE OF GOVERNANCE

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**CNR** is a joint stock company in the public interest managed by a Management Board and administered by a Supervisory Board. A mostly publicly owned company – Groupe Caisse des Dépôts and local authorities, ENGIE is CNR's leading private industrial shareholder.

#### DISTRIBUTION OF SHARE CAPITAL



#### THE MANAGEMENT BOARD

Elisabeth Ayrault: Chairwoman and Chief Executive Officer Didier Lhuillier: Joint Managing Director Julien Français: Joint Managing Director

#### THE SUPERVISORY BOARD

This audit body examines the accounts in particular and ensures the good management of CNR.

The Supervisory Board is chaired by Michel Blanc and composed of 18 members:

- 13 shareholders' representatives,
- 2 government representatives,
- and 3 employees' representatives.

Gathered in the Supervisory Board, the energy company ENGIE and the Groupe Caisse des Dépôts provide their specific competences and knowhow alongside local authority shareholders. A fine balance between public and private interests, CNR cultivates a strong industrial identity and is greatly attached to the values of public service.



From left to right: Julien Français, Didier Lhuillier and Elisabeth Ayrault



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Aerial view of Saint-Vallier, the plant-lock of Gervans

S haring-with the redistribution of the wealth generated from the river, balance – with the harmonised use of water resources, – and sustainable development – with the global vision of a company engaged in territorial development – are at the heart of CNR's model and its 9 commitments for energy transition.

**SOCIETAL PARTICIPATION** entails commitment to energy transition and combating climate change. Through its 9 commitments, CNR contributes towards building the energy of tomorrow. It favours social progress through its SER actions.

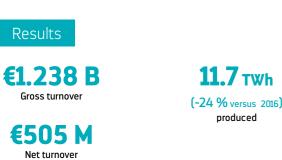
**ECONOMIC EFFICIENCY** entails creating value in order to better share it. CNR ensures the fair remuneration of the State and its shareholders. The value generated by the activity is also redistributed to the territories and the employees. Lastly, it ensures its capacity to invest. **INDUSTRIAL EXCELLENCE** entails knowhow and innovation.

A corporate laboratory for tomorrow's energies, CNR ensures that its production facilities remain efficient, and it ensures the safety of people and property. Furthermore, CNR participates in balancing the national and European electricity grid.

LOCAL ACTION entails assisting the territories to adapt to their challenges. To achieve this, CNR has set ambitious targets: socioeconomic development, sharing water resources and the balance of natural habitats and biodiversity.

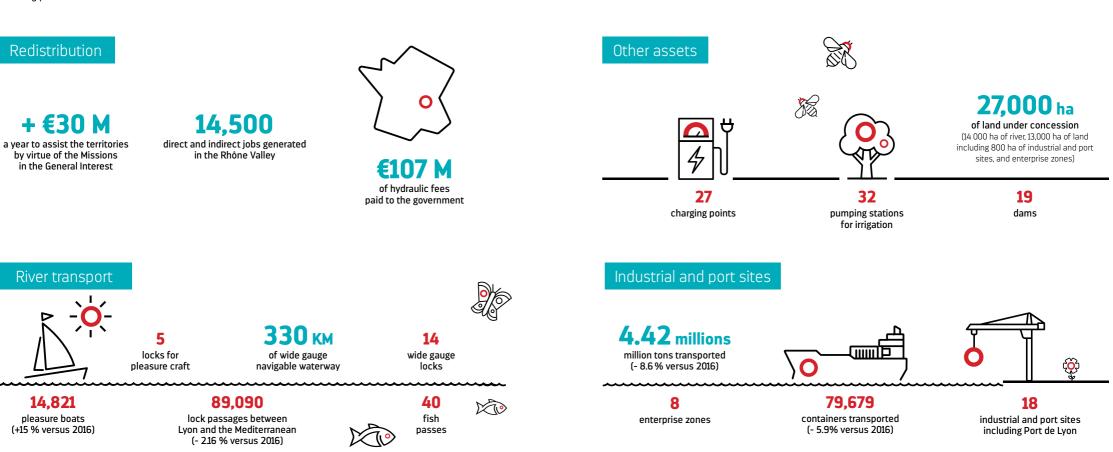
**ENVIRONMENTAL RESPONSIBILITY** entails as always producing electricity generated from natural resources. The historic producer of hydroelectricity on the Rhône, CNR diversifies its sources of production in wind and solar power to develop a 100 % renewable energy mix.

# **KEY FIGURES 2017**





CNR's turnover depends on the evolution of the volume of water available in the Rhône to produce hydroelectricity and the sales price of energy. The meteorological conditions in 2017 were very poor, with heavy rainfall alternating with low water levels. The average discharge of the Rhône was 30% below that of the last twenty years, thus affecting production and turnover.



100% renewable production assets on 30/04/2018

42

wind farms

45

hydropower

plants

3.696 MW

installed capacity

20

solar power

plants

# A PRODUCER OF 100 % RENEWABLE ELECTRICITY

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Thanks to its mix of hydro, wind and solar power, CNR is France's leading producer of 100% renewable electricity and an expert in optimising intermittent energies. It is now present throughout the energy value chain.

#### AN INTEGRATED AND RECOGNISED ACTOR

CNR has a total installed capacity of 3,696 MW and a total production of 11.7 TWh. An acknowledged actor in hydroelectricity, with 25% of French production, CNR has built and operates 20 hydropower plants on the Rhône, to which must be added 25 small and mini hydropower plants. Convinced of the synergy produced between hydro, wind and solar energies, CNR has diversified its exclusively renewable energy mix since the 2000s. In May 2018, CNR has 20 solar power plants and 42 wind farms, of which 35 are outside the Rhône Valley.



**11.7 TWh** equivalent to the output required to satisfy the electricity consumption of 4.8 million people (including heating)



CNR provides **25 %** of French hydroelectricity

production



A wind turbine of the Motte-de-Galaure wind farm

#### AN INTEGRATED AND RECOGNISED ACTOR

Its 80 years of experience on the Rhône have given CNR the expertise to ensure it controls the entire value chain: studies, design, plant operation, selling electricity, prospection and asset development.

This integrated industrial model allows it to control all the competences required to ensure its performance and developments. It provides CNR with unique expertise in managing intermittent energies so it can optimise its electricity sales and make customised offers to other producers. In 2017 CNR sold around 140 GWh in the framework of its aggregation activity.



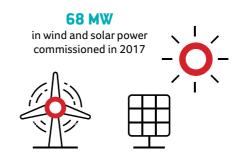
Engine room of the hydropower plant of Génissiat



A plantation at the solar power plant of Saint-Restitut

#### A DRIVING FORCE BEHIND ENERGY TRANSITION

CNR is continuing its developments in and outside the Rhône Valley in view to reaching "zero greenhouse gas emission" and is strengthening its growth in order to meet the challenges determined by French and European policies for renewable energy and combating climate change. The company aims to reach an installed capacity of 4,000 MW in the three renewable energies in France and 300 MW abroad by 2020. Another challenge in France is that of tripling its installed capacity in wind power – i.e. an additional 400 MW – and in solar power, i.e. an additional 100 MW.



#### ECO-SAVING THROUGH SHORT CIRCUITS

Faithful to its model of redistribution, CNR has launched a crowdfunding campaign for the first time for the wind farm of Planèze (Saint-Georgesles-Bains), even before the CRE (Energy Regulation Commission) granted a supplementary tariff to the sales price of the electricity produced. CNR opted for the startup Enerfip to help it. Enerfip is a crowdfunding site specialised in energy transition. Following this initial success which led to the collection of €700,000, CNR will propose this solution of alternative saving for other projects, starting with the wind farms of Oursel-Maison (Oise) and Champ-Bayon (Rhône).

# A PROMOTER OF RIVER NAVIGATION

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O ne of CNR's three historic missions is to develop river transport. It carries out a large number of actions to promote the growth of traffic on the river and improve the service provided to skippers.

#### **COORDINATING A LARGE NETWORK**

CNR groups two main activities regarding navigation. Firstly, it operates industrial and port sites with the construction, management and promotion of port infrastructures on the Rhône: 18 sites form a network with a port every 20 km from Lyon to the Mediterranean. Port de Lyon forms the bridgehead. Secondly there is territorial development, with the development and sale of plots and warehouses intended for industry and logistics services. In all, 880 ha of land accommodate 230 companies operating in logistics and industry (construction, recycling, etc.) and which generate more than 5,500 jobs.

#### 100% GREEN ELECTRICITY CHARGING POINTS ALONG THE RHÔNE

CNR is innovating and has installed two "high power" 1,050 amp charging points on the wharves of Tournon-sur-Rhône. They replace the generating units used to supply electricity (for the washing, airconditioning, catering installations, etc.) to the river cruise liners that stop there. The generating units created noise and olfactory nuisances for the neighbouring population and had a negative impact on the environment. Supplied with 100% green electricity certified by TÜV SÜD, these points, usable throughout the year, reconcile the development of river tourism with sustainable territorial development. Other charging points will be deployed soon on other wharves along the Rhône Valley, and they could also fulfil the needs of commercial navigation.

#### A SUSTAINABLE ALTERNATIVE TO ROAD TRANSPORT

Safe, relatively clean and economic, river transport contributes in particular to reducing heavy goods traffic on the north/south road corridor. CNR's industrial and port sites are multimodal hubs that offer river, rail, river-maritime and road transport giving direct access to the south and the Mediterranean, via the ports of Fos-Marseille and Sète, and to the north via the wide gauge waterway of the Saone. Furthermore, rail links with Northern Europe make this network a strategic corridor that brings the north and south of the continent closer together.



#### 1 PUSH-TOW CONVOY OF 4,400 T = 220 HEAVY TRUCKS

For one ton transported it consumes

4 TIMES LESS FUEL and emits 4 TIMES LESS CO<sub>2</sub>

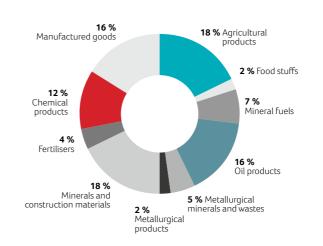
#### REMOTE CONTROLLED NAVIGATION

Since 2012, 24/7, CNR has remotely controlled the 14 wide gauge locks from Lyon to the Mediterranean from its Navigation Management Centre, installed at Châteauneuf-du-Rhône (Drôme). The only system of its kind in France, it satisfies three vital requirements: guaranteeing maximum safety on the river through increased monitoring of the installations (video, VHF, telephone), improving the awareness of users by providing them with full information in real-time on river traffic and by optimising lock passage time.



Aerial view of Port de Lyon Edouard Hérriot

#### TYPES OF GOODS TRANSPORTED ON THE RIVER



#### LYON, A BRIDGEHEAD PORT FOR MARSEILLE

Its traffic and surface area (184 ha) make Port de Lyon the largest port in the Rhône-Saône basin, where it is a leading logistics hub directly linked to the Grand Port Maritime de Marseille. It offers multimodal transport services to its clients: river, river-maritime, rail, road and pipeline. An essential link in the sustainable and economic development of the city of Lyon, it has been committed to an environmental management approach since 2006. It hosts 70 companies, 1,300 jobs and attracts 90% of the container traffic on the Rhône. Every year it handles more than 11 million tons of goods and 500,000 containers, all under the watchful eye of video-monitoring systems.

### SAFETY AND MAINTENANCE, THE CHALLENGE OF PERFORMANCE

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A s the concessionary of the Rhône, CNR makes hydraulic safety an absolute priority in a system subject to rigorous and perfectly controlled procedures. It relies on a quality management system certified ISO 9001.



The "Frédéric Mistral", CNR's hydrographic vessel

#### MONITORING THE RIVER AND THE STRUCTURES

CNR carries out the monitoring of its installations on two fronts: the first involves its dams, dikes, locks, hydropower plants and channels, while the second involves the river bed to predict any hydrological event liable to affect safety and to maintain the flow of the river whatever the discharge. The technical teams monitor the river and the development schemes throughout the year to verify water heights and detect possible traces of deposits and erosion. In addition to this monitoring, CNR deploys a multiplexed transmission network (level, discharge, rainfall, etc.) with more than 220 stations. A fleet of bathymetric boats regularly monitors changes to the river bed. The Frédéric Mistral, a hydrographic vessel brimming with leading edge technology, carries out measurement campaigns using 2 multi-beam echo sounders.

#### MAINTAINING THE RIVER BED AND THE STRUCTURES

CNR regularly carries out preventive actions by dredging and controlling the growth of vegetation, in order to remove obstructions to the river's flow in the case of flooding. This requires an average investment of  $\leq 10$  million a year. To this must be added the maintenance required by the structures and which calls on the knowhow of CNR's multidisciplinary teams that ensure the safety and continuity of navigation as well as optimise production.

A total of almost €78M was invested in 197 maintenance operations during 2017.

#### AN ORGANIC APPROACH TO SEDIMENT MANAGEMENT

CNR wants to achieve greater harmony between harnessing the Rhône to produce hydroelectricity and the life of the plant and animal species that live in it. In partnership with the Services industriels de Genève (SIG) and the Higher School of Landscaping, Engineering and Architecture (HEPIA), it has launched the Bi-O-Rhône project intended to limit the impacts of sediment management on aquatic fauna. The observation of the fish population in the four hydroelectric reservoirs between Lake Geneva and Seyssel dam, before, during and after the sediment removal operations, is due to last 5 years with one campaign per season. It combines non-intrusive echo-sounding and environmental DNA methods, and will lead to better understanding and monitoring of operations to preserve biodiversity.



Renovation of turbine unit 1 at Logis-Neuf

### A CENTRE OF ENGINEERING EXCELLENCE; FROM LOCAL TO INTERNATIONAL ACHIEVEMENTS

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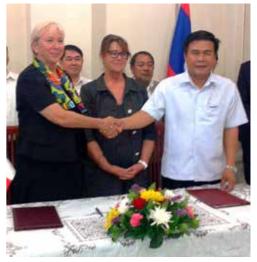
ydraulic and hydrological studies, modelling, developing navigable waterways, river restoration, diagnostics in hydroelectricity, etc. Thanks to its integrated engineering and consulting office – CNR Engineering – and its laboratory – CACOH , CNR's knowhow is now acknowledged in France and in more than 30 countries around the world.

#### CACOH, THE INTEGRATED HYDRAULICS LABORATORY

The Hydraulic Structure Behaviour Analysis Centre (CACOH) works to control risks and optimise the operation of structures. It uses physical scale models to simulate flows, the evolution of river beds and the behaviour of structures, and it couples physical and numerical models. Alone, it covers 40% of CNR's R&D activities. An indispensable decision-making tool, CACOH makes CNR an operator capable of ensuring the highest level of security. It also participates in spreading the reputation of CNR's engineering in France and abroad.



Modelling in progress at CACOH



Signature of a contract with the Laotian government

#### EXPERTISE IN THE SERVICE OF IMPROVING NAVIGABLE WATERWAYS

In 2017, CNR participated with VNF in designing and building the first section of the Seine North Europe Canal in the Team'O+ engineering consortium. It also carried out a feasibility study of doubling the Fontinettes lock in Hauts-de-France. On the international front, CNR developed a partnership in Uganda with UEGCL (Uganda Electricity Generation Company Limited) to provide assistance for the operation and maintenance of its facilities and for training its teams.

#### INCREASINGLY STRONG PRESENCE IN SOUTHEAST ASIA

Present for nearly 20 years alongside local economic actors, CNR Engineering is continuing its actions in Southeast Asia and signed a study contract with Laos in 2017 in view to setting up a centre for monitoring and coordinating hydroelectric facilities on the Mekong and its tributaries. It will be responsible for the concerted management of facilities operated by several companies and for harmonising the different uses made of the water resources.

### AN ACTOR FOR THE GENERAL INTEREST AND A SPONSOR

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A ake the Rhône a powerful vector of economic development, such is the ambition of CNR which carries out its missions in the general interest in five-year plans and acts as a sponsor to the advantage of the territories.

#### SHARED AMBITION

More than just a producer of electricity, CNR acts to develop the territories. To achieve this it takes an original and voluntarist approach with its missions in the general interest that it has deployed since 2004. They embody the strength of CNR's model: that of sharing part of the wealth generated by the river with the territories and taking a long-term view of the Rhône Valley's development. Savières Canal at Chanaz

#### FIVE-YEAR ACTION PLANS

The missions in the general interest are formulated and deployed in the framework of 5-year plans. During the first two plans (2004-2014), CNR carried out on its own or in partnership more than 500 actions amounting to an investment of €286 M.

### The 3<sup>rd</sup> plan (2014-2018) is based on four themes:

- Energy and sustainable mobility (€43 M)
- Water resources and biodiversity (€42 M)
- Economic and tourism development (30 M€)
  River transport (€30 M)

Most of the actions performed are driven by the Rhône Plan, an inter-regional contract for the Rhône-Saone Basin with which CNR is the historic industrial partner and its 2nd largest financial contributor after the State (€134 M for the 3rd Rhône Plan signed in October 2015).

### PARTNERSHIPS LINKED TO THE TERRITORIES

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Among the year's highlights, CNR pursued four structural actions

SUPPORTING THE DEVELOPMENT OF THE WATERWAY, by on-lining the INFORhône internet site to permit more intuitive navigation for the waterway's users. A partnership agreement was signed with Greater Lyon and VNF to develop and manage wharves dedicated to river cruise liners and maintain the boom in river tourism.

#### CONTRIBUTING TO THE ECONOMIC AND TOU-RISTIC DEVELOPMENT OF THE TERRITORIES

by opening an industrial tourism circuit at the dam-hydropower plant of Génissiat to the public, and the signature with the conurbation of Valence Romans of a convention to perform joint actions for the sustainable development of the Rhône Valley based on the river.

#### PRESERVING HABITATS AND SPECIES by pursuing

the programme to restore the Old Rhône through works to fill the oxbows between Donzère and Mondragon with water, in conformity with the master plan formulated with the stakeholders. Part of the Rhône Plan, the purpose of this project is to restore the hydraulic links between the river and its side channels, restore flows, reduce flooding and recreate dynamics favourable for biodiversity.

In 2017, CNR commissioned the 40th fish pass in the Rhône basin at Sauveterre dam. It was the first to be installed in the main channel of the river.

#### ASSISTING AGRO-ECOLOGICAL TRANSITION by

actively collaborating with the Chambers of Agriculture of Auvergne-Rhône-Alpes and ISARA-Lyon\* for R&D in agriculture in view to performing experiments to save water resources and improve their quality.



#### THE WHITE WATER STADIUM OF SAINT-PIERRE-DU-BOEUF, AN EXEMPLARY DEVELOPMENT

Created in 1981 by CNR with the backing of local clubs and the French Canoe-Kavak Federation. the artificial river supplied by the reservoir of the Saint-Pierre-de-Boeuf dam provided the starting point for developing this leisure area. Every year it hosts national and international canoe-kavak competitions. Operated by the inter-local authority of Pilat Rhodanien, this leisure area has developed progressively and now offers a wide range of accommodation and catering facilities, and leisure activities. With around 45,000 visitors a year, this centre has become the second most popular site in Loire in only a few years. It can be reached from the ViaRhôna cycle track and it also has a rapid charging point for electric vehicles.

\* An engineering school specialised in agriculture, agro-foodstuffs, the environment and territorial development



The fish pass on Sauveterre dam

### INNOVATION CONTINUES IN THE SERVICE OF ENERGY TRANSITION

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**CNR** coordinates an ambitious approach to participate in the emergence of the technologies that will forge tomorrow's European energy landscape.

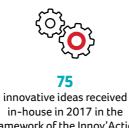
#### PURSUING INVESTMENT IN THE HYDROGEN ENERGY SECTOR

Transforming surplus renewable electricity to produce green hydrogen and injecting it into the gas grid is a wonderful way of storing energy and one on which CNR is working. It is continuing to explore the potentialities of this sector and is participating in the Jupiter 1000 power-togas industrial demonstrator, of which the first stone was laid at Fos-sur-Mer at the end of 2017. Coordinated by GRT Gaz and gathering 7 partners including CNR, this project consists in using electrolysis to convert surplus renewable electricity into hydrogen and then storing it in the gas grid, either directly or after its transformation into methane by injecting  $CO_2$ . CNR will supply the electricity necessary to produce the hydrogen and will control the electrolysis units remotely in order to exploit their considerable flexibility on the energy market.

The port of Marie-Galante

#### SUPPORTING PROMISING INITIATIVES

CNR is supporting start-ups with strong innovative potential. To this end it has signed agreements with the start-up accelerator "Village by CA Centre-Est" which hosts twenty start-ups, and with the Confederation of Small and Medium Sized Enterprises (CGPME) to assist SME's to develop and guide them towards new levers of growth. Its uses its expertise to assist these young companies to structure their markets, and it gains from new ideas for which it can provide the resources for experimentation, as it has been done for electric mobility and green hydrogen.



framework of the Innov'Action approach

#### BEING AT THE HEART OF INNOVATION NETWORKS

CNR develops innovative projects in the framework of cross collaborations with small enterprises, research institutes, local authorities and industrial companies. In 2017, it signed a strategic partnership with the CEA focused on innovative technologies relating to new renewable energy production techniques. The works focus in particular on the energy independence of the island of Marie-Galante and photovoltaic solutions intended for existing structures such as the lines of dikes along the Rhône. The European research programme on this island in the French Antilles is part of the Industrial Demonstrator project for Sustainable Cities (DIVD), for which CNR leads the "energy and mobility" section. The aim is to make Marie-Galante energy independent with 100% renewable energy at a competitive price. CNR and the CEA are collaborating to design and build a smart local electric micro-grid in order to control all the intermittent energy production resources, the electricity storage facilities and flexible demand (for example, charging electric vehicles) while ensuring secure supply.



Refuelling a hydrogen powered vehicle



The port of Dakar on the Senegal River

#### INITIATIVES FOR THE FUTURE OF GREAT RIVERS (IFGR)

Founded in 2014 by CNR and chaired by the economist and academician Erik Orsenna, Initiatives for the Future of Great Rivers (IFGR) was transformed into an association in the general interest in 2017, to continue its mission to give a voice to rivers. A forum of high level international and multidisciplinary dialogue, its members share experiences and good practices relating to river management faced by the challenges of climate change and environmental issues. It raises awareness among decisionmakers and the population of the need to preserve the ecosystems of great rivers and the contribution they can provide to a more sustainable world. In 2017, IFGR explored two themes during its sessions: the place of hydroelectricity in tomorrow's energy models (Itaipu, Paraguay) and the pollution of rivers and its impact on health (in Lyon and Annecy), a session bearing the COP23 label.

# A COMBINATION OF TALENT

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Control room of a hydropower plant

rom operating and maintenance technicians to electricity market traders and electromechanical engineers specialised in strong currents, and to civil engineering technicians, hydraulic and mechanical maintenance engineers, estate managers, meteorologists and sales representatives in port and industrial sites, CNR has a remarkably wide range of trades and specialties that offer its employees a wealth of possibilities for professional careers with lasting trajectories.

Driven by a long-term vision, CNR gives priority to internal mobility and the recruitment of young employees, and it encourages the transmission of knowhow. It deploys a solid training policy and 5% of its workforce is made up of young trainees under work-study contracts.



#### CLOSE TO 57,000 HOURS of training dispensed in 2017



Operation in the machine room of Bourg-Lès-Valence



Nearly 50% of applicants on average are recruited for full-time posts on ending their training contract



the rate of employment of handicapped persons, higher than the national average

# A SOCIAL AND COMMITTED ACTOR

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n the wake of its 9 commitments for energy transition, CNR is implementing a Social and Environmental Responsibility (SER) policy which provides it with the impetus to improve its global performance. SER forms the basis of CNR's industrial model in the general interest according to which all the activities that generate value must act to promote socially fair and economically viable development that respects the environment and which is therefore sustainable. A commitment in keeping with its nature, for people and for the territories.

#### SHARING VALUES

 1,865 children were made aware of the ecological challenges of the Rhône through the initiative "The River in Natural Scale" and cruises reserved for schoolchildren during Sustainable Development Week.

#### ACTING FOR BIODIVERSITY AND THE ENVIRONMENT

- **31** actions performed in the framework of the 2017 European Sustainable Development Week.
- **1 ambitious project** to make the island of Marie-Galante energy independent by 2020 through renewable energy produced locally.



Cruise on the Rhône for schoolchildren



Collection for food banks

#### SUPPORTING SUSTAINABLE MOBILITY

 27 rapid charging points for electric vehicles form an electric corridor along the Rhône Valley, with 1 point installed every 30 km on the secondary road network.

#### ACTING RESPONSIBLY WITH THE COMMUNITY IN MIND

- 14 Food Banks in the Rhône Valley, Somme, Oise, Mayenne and Loire-Atlantique are supported by CNR, (€225,000 over 3 years), in the framework of an agreement that also includes the French Federation of Food Banks.
- **75 % of purchases** are made are made in the territories crossed by the Rhône and 97% are made in France.
- €523,275 of purchases are made in the protected and adapted employment sector (equivalent to work therapy education).





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