Cities of tomorrow

REDISCOVERING ENERGY
One of the leading power utility companies in the world, GDF SUEZ is active across the entire energy value chain, in electricity and natural gas, upstream to downstream. The Group develops its businesses (energy, energy services and environment) around a responsible-growth model to take up the great challenges: responding to energy needs, fighting against climate change and maximizing the use of resources. GDF SUEZ relies on diversified supply sources as well as flexible and highly efficient power generation in order to provide innovative energy solutions to individuals, cities and businesses.
At the start of this new century, more than half of our planet’s population lives in cities. By 2020, as this inexorable urbanization trend continues, there will be an estimated 19 megacities with populations of more than 10 million people, 12 of them in Asia.

Today’s technology capabilities offer us the means and the responsibility to model the cities of tomorrow on criteria other than an infinite availability of energy and resources. We need to think innovatively, and imagine the cityscape as a set of systems that communicate among themselves.

A sustainable city is characterized by its ability to adapt and transform itself over time, by its user-friendly design and high quality of life, by the efficiency of its buildings, its fluid networks, its security, and how space is distributed and shared.

GDF SUEZ strives to bring these characteristics to life, by applying its expertise as far upstream as possible of major urban projects. The foundations that make a sustainable city must be envisioned very early on, even before the design of the systems and spaces begins, so that the necessary technical solutions can be included smoothly and sustainably.

The urban metamorphosis will be profound. GDF SUEZ intends to meet this challenge.

Gérard Mestrallet
Chairman and CEO
Demographic growth, the fight against climate change and the need to conserve resources are all factors that require us to reconsider urban forms. Today’s cities are becoming denser – a density that is in fact more environmentally friendly and energy-efficient.

GDF SUEZ focuses its businesses on the design of major energy projects, urban installations and essential residential solutions: electricity, natural gas, energy services, water and waste services. The Group’s strong involvement in research and innovation means that each design represents an advance in supply security, performance improvement and control of environmental impact.

A preferred partner to developers of new cities and eco-district managers, GDF SUEZ supports its clients along the entire value chain of energy and environmental services. The Group believes that effective and fruitful partnerships are based on careful listening and a shared vision of the issues.

URBAN DESIGN
GDF SUEZ acts increasingly upstream of urban development projects, during the master plan phase. Looking for sustainable solutions and using a cross-functional perspective allows the Group to pool technological capabilities and reduce costs. The first step is to evaluate the context and analyze requirements, in order to then design the channels that structure the space and define the networks. Based on this preliminary phase, all the parameters can be optimized simultaneously by coupling the various flows and connections between systems. The Group’s expertise here is structurally determinant and has high added value.
The “Living Tomorrow” house, sponsored by GDF SUEZ, combines respect for the environment, contemporary architecture, and comfort. Energy-saving building with less than 50 Kw/m2 consumed annually.

COMMITMENT FROM INCEPTION TO OPERATION
To better meet the needs of its clients, the Group recommends a solution-based approach rather than one by profession or activity. This choice allows it to take responsibility, throughout the design, engineering, construction and management phases, for:
- economic and environmental rationalization of the energy mix,
- network rationalization,
- circular economy through reuse of resources.

Each local authority has specific needs and expectations, and GDF SUEZ works with them to construct appropriate financial packages and partnerships. This is a core area of expertise for the Group, for which it is recognized worldwide.

PROJECTS WITHOUT CO2
Producing energy that can be accessed by the maximum number of people, using it more rationally and in amounts that better respect the environment, are goals that have led GDF SUEZ to become involved in pilot projects for new cities and eco-districts with low or even zero-carbon emissions.

A major player in sustainable development, the Group offers effective tools and broad expertise in designing and building clean, smart cities.
## Skills

GDF SUEZ, leader in multi-utilities

### ENERGY

No. 1 independent power producer in the world
No. 1 natural gas transmission and distribution networks

### ENERGY SERVICES

No. 1 supplier to cities and businesses across Europe
A European leader for energy efficiency and environmental solutions through multi-technology services

<table>
<thead>
<tr>
<th>56,100 employees</th>
<th>77,900 employees</th>
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<tbody>
<tr>
<td>Purchase and production of natural gas and electricity</td>
<td>Global expert in the design, installation and operation of energy efficiency and environmental solutions, based on multi-technology services in engineering, installation and energy services</td>
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<td>Sustainable energy management (security of supply)</td>
<td>Energy and environmental streamlining efficiency</td>
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<tr>
<td>Renewable energy production (hydropower, wind, solar, biomass, biogas, waste to energy)</td>
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<td>Natural gas and electricity networks</td>
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<td>Nuclear operator</td>
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<td>Liquefied Natural Gas (LNG) arbitrage</td>
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<td>LNG regasification, natural gas transport and storage</td>
<td>Transport regulation systems</td>
</tr>
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<td>Facility management</td>
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### Dallas, United States
- Electricity supply (40% from renewable energy)
- Covering 100% of the city’s needs

### Izmit, Turkey
- 2,000 km of natural gas distribution network
- 200,000 customers and 80 industrials

### Singapore
- Equity (30%) in Senoke Power, Singapore’s largest power company
- Facilities with a combined capacity of 3,300 MW

### London, United Kingdom
- Build, finance and operate the heating and cooling network for the London 2012 Olympic Games
- Natural gas and biomass boilers for heating
- Cogeneration unit for electricity and heat
- 5,000 metric tons of CO₂ reduction

### Antwerp, Belgium
- Master plan to improve mobility in and around the city of Antwerp
- 465,000 inhabitants
- Area: 20,500 ha

### Barcelona, Spain
- Spain’s first district heating and cooling network
- 360,000 m² of business and commercial space and housing and public facilities
ENVIRONMENT

A world leader in water, sanitation and waste management services

WATER
Consultancy and engineering (studies, master plan, design, project management)
Design, construction and operation of water treatment plants (drinking water, desalination, wastewater treatment, sludge, reuse)
Management of urban drinking water and wastewater infrastructures
Water cycle management for manufacturers

WASTE
Consultancy and engineering (studies, master plan, project management)
Waste collection and urban cleaning
Sorting and recycling
Recovery and recycling of non-hazardous waste products
Remediation and conversion of polluted industrial sites
Complex waste (vehicles, aircrafts, ships...)

65,400 employees

8 research centers in the world
1,200 researchers and experts, including:
800 in energy and services
400 in environment
1,992 patents

PROGRAMS SUPPORTING THE CITY OF TOMORROW BRING TOGETHER PARTNERS FROM ACROSS INDUSTRY, HIGHER EDUCATION AND THE ASSOCIATIVE SECTOR:

- Positive energy buildings
- Renewable energy: solar, biomass, wind energy
- Decentralized electricity production, Combined Heat and Power production (CHP) and energy storage
- Demand side management, energy management (European EU-DEEP program) smart networks and smart metering (DolceVita Zenbox)
- Innovative water and waste treatment (recycling, energy recovery, desalination, positive energy wastewater treatment)
- Sustainable mobility and clean vehicles: Natural Gas Vehicle (NGV), hybrids and Electrical Vehicle (EV)
- The human element, social acceptance of new technologies

Hong Kong, China
- WENT and NENT, amongst the world’s largest and most modern landfill facilities
- Recovery of biogas for use on-site and injection in the gas city network
- A combined capacity of 100 million m³

Amman, Jordan
- Wastewater treatment plant
  - 2.2 million inhabitants
  - Plant is 95% self-sufficient in energy

Cancun, Mexico
- Water and wastewater services for a tourist area
- 225% increase in the number of consumers connected
- Protection of bathing water along the coast
- Preservation of groundwater quality
ENGINEERING
A global approach to energy efficiency for buildings and urban projects
An approach blending technical, economic, financial and social factors
An offer that fosters the development of circular economies

TRANSPORTATION EFFICIENCY
Urban mobility plans and user information and assistance systems
Improved regulation of bus and tram traffic
Reduced environmental footprint through the use of alternative fuels (NGV, electricity, biogas) and better service quality

MULTI-ENERGY SYSTEMS
Natural gas and electricity, renewable energy (solar thermal and photovoltaic, biomass, geothermal)
Recovered energy (methane capture from waste, biogas)
Cost optimization and reduced CO₂ emissions

DRINKING WATER DISTRIBUTION
Improving the comfort of consumers, from decarbonation to monitoring of water’s taste and smell
The city as a coherent set of smart solutions

HEATING AND AIR CONDITIONING NETWORKS
Sharing heat and cold production systems
A central heating system which is more efficient, more effective and less polluting than thousands of individual boilers or furnaces
Valuable space made available in the buildings

NATURAL GAS AND ELECTRICITY DISTRIBUTION
A customized service offer for individuals and companies, planning, financing, installation...
Multi-technique maintenance

“CLEAN” ELECTRICITY AND HEAT
Supply from “clean” production systems: solar panels, solar thermal collectors, wind turbines on buildings, natural gas or electric heat pumps, geothermal, biomass, heat recovery from air extracted from the building
Systems coupling to reduce CO₂ emissions

FACILITIES MANAGEMENT
Building management for heat, air conditioning, security, cleaning, landscaping...
A single contact to manage all services

RECOVERING CALORIES FROM WASTEWATER
Simple, environmentally friendly technology
Recovery of energy for heating in winter and cooling in summer
A heat source in direct proximity to demand, in the heart of the city

REUSING TREATED WASTEWATER
Eliminating solids, ultrafiltration techniques
Protecting the resource by reusing treated water for urban, agricultural or industrial purposes
Possibility of producing drinking water with appropriate treatment
The city as a coherent set of smart solutions

COMMUNICATION NETWORKS
A secured dedicated network for virtual flows (data, voice and image)
Applications in day-to-day city management, for example remote surveillance

WASTE RECOVERY
Methane recovery from household waste, which offers a source of renewable energy for producing heat and electricity
Biogas from fermentation recovered in energy form; this recovery cycle improves economic and environmental performance

REMOTE METERING AND REMOTE MANAGEMENT
Sensors and systems for measuring and transferring data
Continuous usage monitoring, remote malfunction detection and intervention
Limited need for on-site intervention, to reduce carbon

PNEUMATIC WASTE COLLECTION
Selective waste collection terminals at ground level of the buildings
Underground networks for transport to the treatment center
A solution in which waste becomes invisible, eliminating pollution and noise and improving residents’ quality of life
An easy system to implement in new or renovated districts
LIGHTING AND SECURITY NETWORKS FOR PUBLIC AREAS

Lighting fixtures that can include a video surveillance system
Photovoltaic panels on streetlamps to optimize the system
Technical optimization of the light intensity to reduce energy consumption

DRINKING-WATER TREATMENT PLANTS

A systems offer adapted to each situation and type of use
Drawn from rivers, lakes or groundwater
Desalination of seawater using reverse osmosis

Tools for environmental assessment and decision-making

Qualicity
A tool for assessing the overall environmental performance of an agglomeration

Life Cycle Assessment (LCA)
Measurement and analysis of the environmental impacts of a territory, from its design and at each stage of its evolution (AFME: Analysis of the Flow of Materials and Energies)

Prevoir®
A statistical forecasting tool for planning replacement of drinking water pipelines

Avertir®
Technology for acoustic leak detection and GSM data transfer

Scanner®
Technology for corrosion detection in and outside metallic pipes

Sustainable Energy Masterplan methodology
A tool for long-term optimization and planning of multi-energy supply to urban and industrial developments, including end-use efficiency improvement and on-site renewable energy and CHP (Combined Heat and Power production). Targeting optimal economic, energy and environmental performance and reliability.
Customized solutions

All around the globe, the master plans and projects that GDF SUEZ implements with its clients combine technical expertise and tailored solutions adapted to the specific location.

Supporting the development of new cities in the Middle East

- Marafeq, the first multi-utilities services company in Qatar
- GDF SUEZ, No. 1 private developer and operator in the Middle East
- Provides multi-utilities: engineering, district cooling, energy services, electricity and natural gas distribution, water and wastewater treatment and distribution, desalination, waste collection and treatment
- Impacting 400,000 people

Marafeq, the region’s leading multi-utilities company, developed in partnership with Qatari Diar and Barwa, offers master plan design services as well as a synergistic combination of all services in a One-Stop Shop concept. Flexibility, cost-effectiveness and expertise on the local market make Marafeq a key player for long-term partnerships.

Storing energy underground for an eco-district

- Design, construction and operation of a heating and cooling network, provided by an underground long-term energy storage system
- Area: 437,000 m² of office space and apartments
- Energy consumption reduced by 40%, an estimated gain of 2,900 tons of carbon per year
- Management contract (15 years)

In addition to the three power plants situated almost invisibly in the heart of the city, 5 pairs of storage wells are located 120 meters underground to preserve warmth for winter heating, and cold for summer air conditioning. The Group also provides Shell’s new Technology Center Amsterdam with energy via a power plant with 2 pairs of storage wells providing heat and cold for their laboratories.
Optimizing circular economy by recycling sludge

- Sludge treatment from sanitation generated by 610,000 inhabitants (capacity of 300 tons/day)
- Energy recovery during sludge treatment using the safest drying technology on the market
- Dried sludge used as combustible at the park’s power plant which helps reduce coal consumption
- Carbon-neutral cycle

Pooling distribution, management of four networks

- Design, funding, production and management of a heating network
- 1,076 homes and commercial units served by renewable energy
- The eco-district will be fully supplied by renewable energy
- 33-year operating contract

A biomass plant fuelled with wood and fatty acids produces heat. The electricity used by the network is provided by solar panels integrated into the roofs of the buildings. Clean hot water is produced in part by solar thermal collectors or heat pumps.

Creating and operating the first zero-carbon urban network in France

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- The eco-district will be fully supplied by renewable energy
- 33-year operating contract

SUEZ Environnement supplies water services to 17 Chinese municipalities (Chongqing, Qingdao, Sanya, Tanggu, Shanghai, Macao…) for a total of almost 14 million inhabitants, and is also a major player in the waste management sector in Hong Kong and Macao. The Group – a reliable partner for over 30 years – is also expanding into energy and energy services in China.

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- Carbon-neutral cycle

Pooling distribution, management of four networks

- Electricity and drinking water distribution, sanitation (wastewater and rainwater), public lighting services
- Centralized control of four utility networks and pooled customer relations management
- 5 million residents served
- 30-year concession contract

The Group supports the development of the largest city in the Maghreb by meeting its water and energy needs. The city sets the objectives and is in charge of control, while entrusting LYDEC with investments and management, also including awareness initiatives directed towards the public around resource and energy conservation.
Outlook and commitments

The Group actively supports sharing of best practices and participates in international forums and advisory councils devoted to urban development.

SUPPORTING MAYORS OF CHINESE CITIES
Gérard Mestrallet has been advisor to the mayor of Shanghai since 2000, within the framework of the International Business Leaders Advisory Council (IBLAC). This think-tank brings together some thirty business leaders, managers of large international groups, every year.

These meetings are an opportunity to discuss strategic priorities for the city, its specific problems and how to respond to them, and finally, recommendations for resources to be deployed to reach certain specific objectives.

Gérard Mestrallet is also Chairman of the Chongqing Mayor’s International Economic Advisory Council (CMIA), for the world’s largest municipality with a population of more than 32 million.

TAKING PART IN INTERNATIONAL INITIATIVES
World Economic Forum - the SlimCity initiative
GDF SUEZ is a member of the SlimCity steering committee. This structure helps to create links between the private sector and public decision-makers, to identify challenges for cities, share best practices, and discuss possible solutions for the future together.

The United Nations Global Compact
GDF SUEZ participates in the compact and subscribes to its ten principles in the areas of human rights, labor relations, environmental protection and anti-corruption. The Group publishes an annual report on the initiatives taken in this direction, and has endorsed the “Caring for climate” commitments.

The World Business Council for Sustainable Development
The Group is actively involved in several programs, including “Energy Efficiency in Buildings” and “Energy and Climate”, which published the “Powering a Sustainable Future” report. The goal is to propose innovative solutions to help companies reduce the carbon footprint of their business.

GDF SUEZ is also an active member of Comité 21 (French committee for the environment and sustainable development) and of the International Urban Development Association whose members include urban policy decision-makers and businesses.

Gérard Mestrallet, Chairman and CEO of GDF SUEZ, is an advisor to the mayor of Shanghai, within the framework of the IBLAC which meets once a year.
Today and tomorrow...

Today in France, an existing residence consumes some 240 KWh/m$^2$/year. At the end of 2010, a new residence labeled “low energy consumption” will consume 50 KWh/m$^2$/year or even less. Some examples have already been built.

Today in Europe, each person consumes an average of 140 liters of water daily. In urban China a person consumes an average of 220 liters of water per day. Between 2006 and 2010 the Chinese government intends to cut water consumption by 4% each year, mainly through more careful water management measures.

Today, a European produces an average of 550 kg of household waste each year. However, net greenhouse gas emissions from municipal waste management will have decreased from 55 to 10 million tons/year between 1980 and 2020.

(Sources: European Environment Agency, OECD)
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drive
commitment
daring
cohesion