

Bouygues Construction, a leading player on the data centre market

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BOUYGUES CONSTRUCTION BEGINS WORK ON ITS SEVENTEENTH DATA CENTRE

Bouygues Construction has begun work on a vast data centre in Pantin, in the north-eastern outskirts of Paris. The first phase of the contract is worth a total of €75 million. When completed, the building, which will provide around 11,000 m² of computer room space, will be one of the largest data centres in France. It is being constructed for Equinix, the world number one in data hosting.

Scheduled for completion during the third quarter of 2012, the first phase of the project will call on the expertise of three of Bouygues Construction's subsidiaries.

Developed by Sodéarif, the property development subsidiary of Bouygues Bâtiment Ile-de-France, in conjunction with RB-Architectes and Critical Building, the new data centre will be built by Brézillon, a subsidiary of Bouygues Bâtiment Ile-de-France, and ETDE, the energy and services division of Bouygues Construction. The largest data centre built by the Group, it will have electric power of roughly 1.5 kW per square metre when it is operating at full capacity. In all, it will have total IT power¹ of 14,400 kW.

The construction of a data centre must meet very stringent criteria. The facility must be located in a flood-free and seismically stable zone and it requires a secure power supply and a reliable telecommunications network. The hygrometry rate (the amount of vapour contained in the air) and temperature of the building, which must remain below 23° C, need to be controlled permanently. The highly sophisticated security systems protecting the critical data housed in the centre include fire detection and extinction, anti-intrusion systems, video surveillance, access control and a biometric recognition system. Data centres are guarded round-the-clock by security personnel, and are among the world's most reliable buildings.

Needs for new data centres are burgeoning because of the expansion of the Internet and the rise of cloud computing (i.e. externalised IT resources). Bouygues Construction has developed a turnkey offer to meet the expectations of this fast growing sector. Thanks to its various subsidiaries, the Group is positioned as a full-service provider on the data centre market, able to provide expertise, according to its customers' wishes, in the definition of needs, finance, design and construction of the site (building and technical installation), operation and maintenance.

With a strong commitment to sustainable construction, the Group employs solutions to reduce the energy consumption of data centres, selecting the most efficient electrical equipment and installing free cooling (i.e. using external air to cool computer rooms). All the techniques employed make it possible to reduce the electricity consumption of a data centre by around 50%.

Since 2007, Bouygues Construction has completed and delivered more than ten data centres in France and the United Kingdom. It has worked for four of the world's five largest hosting services. In particular, the Group handed over two data centres to Interxion, one of the leading European providers of data centre facilities, in 2007 and 2009. Several other projects are either in development or under construction.

¹ *IT power designates power available for the servers, but excludes power intended for the operation of the building (air conditioning, general services, offices).*

The expanding data centre market

Technical characteristics of the market:

A data centre is a hosting facility for electronic data. Often likened to a high-tech safe, it is used to store information and software applications that can sometimes be confidential or critical (see illustration on last page of press kit). This data has to be conserved under conditions of maximum security and must be available at any time. Highly sophisticated security systems are installed, including fire detection and extinction, anti-intrusion systems, video surveillance, access control and biometric recognition systems. Data centres are guarded round-the-clock by security personnel, and are among the world's most reliable buildings. They must be located in flood-free and seismically stable zones and they require a secure and consistent power supply. Standby electric networks and machinery are installed to ensure continuity of operation, even in the event of the breakdown of machinery. In spite of the considerable heat released in the data halls, the building must maintain a maximum temperature of 23° C through the use of air-conditioning and cooling systems. It is also necessary to monitor the hygrometry rate (the amount of vapour contained in the air). Access to a reliable very high bandwidth telecommunications network is also essential. The site must be close to one of several distinct optical fibre networks.

Equipped with servers, routers, switches and air-conditioners, data centres consume electricity very heavily. According to the Invest in France Agency, a 25,000 m² data centre consumes roughly as much energy as a town of 50,000 inhabitants. This explains the importance of all the processes and equipment intended to reduce energy consumption.

Market outlook:

The data centre market is expanding fast. Rapid growth in Internet traffic has made it necessary to store increasing amounts of data on powerful and reliable servers. A further factor of increasing demand for datacom facilities is the rise of "cloud computing", which consists in externalising companies' data and applications on remote interconnected servers that are constantly accessible by way of through Internet networks. According to the consultant International Data Corporation (IDC), worldwide needs for data storage have doubled on average year on year. This explains the need to construct new data halls.

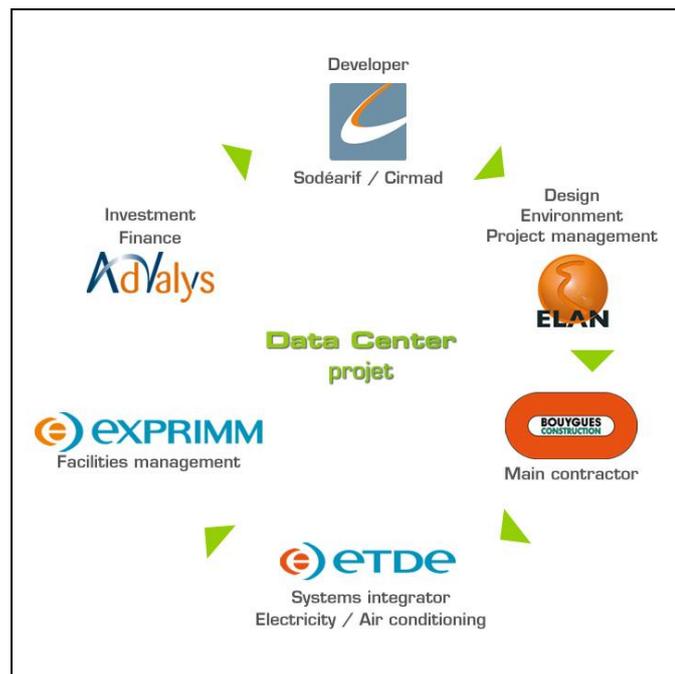
A survey carried out by IDC and the hosting company Interxion forecasts that the datacom hosting market will expand by 23% per year until 2013. The market will have grown from €725 million in 2008 to €2 billion in 2013. The trend is for the construction of "green" data centres, which consume less energy and are more environmentally friendly.

France ranks as world number four for the number of data centres. It has the benefit of high quality electricity and telecommunications networks and an advantageous geographical situation in Europe. Every year, between 10,000 and 50,000 square metres of data centre facilities are built in France.

A turnkey offering

Bouygues Construction is the first construction company to have developed a turnkey offering for data centres, at the initiative of its subsidiaries, ETDE and Brézillon. Group companies are among the market leaders for the construction of data centres en France.

They can operate at various stages of data centre projects: definition of needs, finance, design and construction of the site (building and technical installation), and operating and maintaining the facility during the lifetime of the building.



Presentation of the key players:

AdValys, a subsidiary of Bouygues Construction, specialises in investment and project finance. It provides expertise in the financing of data centre development projects and proposes finance solutions that are appropriate to each venture. AdValys also offers experience in asset management.

Sodéarif a subsidiary of Bouygues Bâtiment Ile-de-France, and **Cirmad**, a subsidiary of Bouygues Entreprises France-Europe, are specialists in property development. They help customers define their projects and then take responsibility for managing the development.

Elan, a subsidiary of Bouygues Bâtiment Ile-de-France, specialises in managing complex projects. It provides engineering and consultancy services to its customers: assistance for project owners and main contractors for projects of all sizes in property, building, and telecoms and networks. It directs the technical design aspects of data centres.

Brézillon, a subsidiary of Bouygues Bâtiment Ile-de-France, operates as a general contractor in the fields of civil engineering and the environment, building and the rehabilitation of housing and public amenities. On data centre projects, the company is responsible for structural works, roads and utilities networks and finishing works (false ceilings, flooring, etc.).

ETDE, the energy and services division of Bouygues Construction, is an integrator of multi-technical solutions and associated services for public- and private-sector customers in the areas of energy, the

service sector, industry, transport, the nuclear sector and telecoms. It possesses an extensive range of skills: network infrastructure; HVAC engineering; facilities management (managing services and performing technical maintenance on buildings); and telecoms networks and services. In data centres, ETDE is responsible for technical packages covering electricity (inverters, LV distribution boards, etc.), low-voltage safety and security systems (access control, fire detection, anti-intrusion systems, etc.) and air-conditioning.

Exprimm is a subsidiary of ETDE specialising in operating and maintaining buildings. As of the design phase of a data centre, it can commit to a performance contract throughout the period of operation of the building. Energy consumption costs are kept under control and the availability of equipment is guaranteed.

A particular focus on environmental issues:

In conjunction with its customers, Bouygues Construction pays particular attention to environmental issues. The Group builds “green” data centres that offer innovative technical solutions intended to reduce the environmental footprint of the buildings. The electrical equipment installed by ETDE (transformers, inverters) offer high levels of efficiency in relation to the energy consumed.

In the Telecitigroup facility in Aubervilliers (see pages 8-9), the technique of free cooling, i.e. cooling the data halls with external air, was used on an industrial scale for the first time in France. When the exterior temperature is below 15° C, operators reduce the use of cold compressors and partially use outside air to cool the data halls. Below 9° C, the compressors are turned off and only outside air is used to cool the centre. Free cooling technology thus makes it possible to reduce the electricity consumption of the data centre, where energy-intensive air-conditioning systems represent an average of 30% of consumption. On the same site, a highly reflective white membrane has been installed on the roof to reflect a large part of the heat from the sun and thus limit the need for cooling inside the building. The various techniques employed make it possible to reduce the building’s electrical consumption by around 50%.

The site also houses an arboretum which reuses warm air from the data halls. This part of the building has been made available to researchers studying the impact of climate change on plant life from all around the world for the French National Institute for Agricultural Research (INRA) and the Société Forestière (Caisse des Dépôts group).

Water processing is another particular point of focus for the Group. The use of tap water is limited by the optimisation of cooling systems. In addition, road surfaces and car parks are surfaced with asphalt that allows the absorption of rainwater and runoff water so that water returns to the water table efficiently.

These measures form part of Bouygues Construction’s sustainable construction policy, which it has developed since 2007. The aim is to incorporate eco-design and environmental issues in the construction of buildings and structures.

Current and completed projects

Bouygues Construction has more than ten data centre projects to its credit, in France and the United Kingdom. Some of these are still at the development stage, while others are under construction or have already been handed over to customers.

1/ Projects in France

Projects at the development stage:

- Data park in Marne-La-Vallée:



Sodéarif is developing a data park at Marne-la-Vallée for Galileo Connect, a British data centre operator. Located in the Paris-Val d'Europe business park, the facility will consist of three 8,000 m² buildings divided in eight private data halls. Energy consumption will be optimised. Among other solutions, the site will use free cooling technology for the data halls. It will have power for IT and cooling of 1.5 kW/m². The necessary permits for the project have been granted. The project is scheduled for handover in 2012.

- Data centre in Sevrans:



In conjunction with Enia Architectes and Critical Building, Sodéarif is currently developing a new data centre project at Sevrans, to the northeast of Paris. The facility, which will consist of 4,800 m² of data halls, will be constructed by Brézillon and ETDE, two subsidiaries of Bouygues Construction. It will be divided into two distinct modules and will have average power density of 1.5 kW/m². The necessary permits were filed in April 2011, making it possible to envisage works starting early in 2012 with delivery in April of the same year.

- Data park near Reims:



Sodéarif and Cirmad Est are planning the construction of a data park in partnership with an economic development agency, Invest In Reims. Located in Bezannes, close to the city of Reims, the development will include several buildings (three in the first phase) in order to be able to offer various options (purchase, rental, colocation, etc.). The park will have average power density of 1.5 kW/m². Developed in conjunction with Reid Brewin Architectes and WSP Flack+Kurtz technical consultants, it will be constructed by Brézillon, Pertuy Construction (a subsidiary of Bouygues Entreprises France-Europe) and ETDE. Requests for the necessary permits have been filed.

Projects under construction:

- Equinix 4 in Pantin: 2011-2012



Data halls: 11,000 m² when completed
 Power density: 1.5 kW/m²
 Architect: Reid Brewin Architectes
 Assistance for project owner: Critical Building
 Bouygues Group companies: Sodéarif, Brézillon, ETDE, Elan

See the press release (page 3 of this press kit) for more information.

- Global Switch 2 in Clichy: 2010-2011



Bouygues Construction is carrying out the extension to the existing site in Clichy, to the north of Paris, for the hosting company, Global Switch. This data centre is scheduled for delivery in the second half 2011.

Data halls: 9,700 m²
 Power density: 1.6 kW/m²
 Duration of works: 23 months
 Customer: Global Switch
 Architect: Reid Brewin Architectes
 Bouygues Group companies: Brézillon, ETDE

Projects handed over:

- TelecitGroup 3 in Aubervilliers: 2009



In Aubervilliers (to the north of Paris), Bouygues Construction built a new-generation data centre for TelecitGroup, one of the world's foremost

data centre operators. The project represented an investment of €48 million. When it opened, it was one the most advanced in Europe in terms of its eco-credentials, with numerous innovative technical solutions employed to reduce its environmental footprint.

Data halls: 3,500 m²

Power density: 1.8 kW/m²

Customer: TelecitGroup

Architect: Zajdela & Ridgway

Bouygues Group companies: Brézillon, ETDE

- Customer confidential, east of Paris: 2008-2009



Brézillon built a data centre for a confidential customer to the east of Paris.

Data halls: 3,000 m²

Power density: 3 kW/m²

Architect: Enia Architectes

Customer: Confidential

Bouygues Group company: Brézillon

- Customer confidential, east of Paris: 2008-2009



Brézillon, a subsidiary of Bouygues Bâtiment Ile-de-France, constructed a second data centre to the east of Paris.

Data halls: 3,000 m²

Power density: 3 kW/m²

Architect: Enia Architectes

Customer: Confidential

Bouygues Group company: Brézillon

- Bouygues Telecom in Montigny-Le-Bretonneux: 2008-2009



Bouygues Construction designed and built a data centre for the operator Bouygues Telecom in Montigny-Le-Bretonneux, southwest of Paris. The new data centre backs up to an existing building.

Data halls: 2,670 m²
 Power density: 3 kW/m²
 Customer: Bouygues Telecom
 Architect : Lepelletier Architecture
 Bouygues Group companies: Brézillon, ETDE, Elan

- La Française des Jeux in Vitrolles: 2008-2009



In Vitrolles, in the south of France, Bouygues Construction completed two split-level buildings on a Design-Build basis for La Française des Jeux, operator of France's national lottery. Each of them contains 520 m² of data halls along with office and supervision spaces.

Data halls: 2 x 520 m²
 Power density: 1 kW/m²
 Customer: La Française des Jeux
 Architect: Archimed
 Bouygues Group companies: Brézillon, GFC Construction

- Interxion 5, north of Paris: 2008-2009



Bouygues Construction designed and built a data centre to the north of Paris for Interxion, one of the European leading data centre service providers. It stands close to another Interxion site constructed by the Group (see below). This facility represents an investment of €57 million for the customer.

Data halls: 4,100 m²
 Power density: 2 kW/m²
 Customer: Interxion
 Architect: Dekonink Kuhn
 Bouygues Group companies: Brézillon , ETDE

- Interxion 3, north of Paris: 2006-2007



Bouygues Construction designed and built this Internet data exchange facility, to the north of Paris. An existing building was refurbished in order to accommodate the data centre, which is occupied by the web hosting company, Interxion.

Data halls: 2,000 m²
Power density: 2.1 kW/m²
Customer: Interxion
Architect: Dekonink Kuhn
Bouygues Group companies: Brézillon, ETDE

2/ Projects in the United Kingdom

ETDE Contracting, a subsidiary of ETDE, has designed and built a number of data centres in the United Kingdom. It has worked for a variety of customers and produced data centres of varying sizes. Among ETDE Contracting's completed projects are two data and operations centres for Airbus, a data centre along with offices for Rutherford Appleton Laboratories (RAL), and a data centre for centralised billing built for Shropshire County Council.

Project under construction:

- Virtus in Enfield: 2011-2012



ETDE is responsible for designing and building a new data centre for the hosting company, Virtus. The first phase of the project (1,000 m²) was completed in March 2011. The second phase has not yet begun, and is scheduled for handover early in 2012.

Data halls: 2,500 m²
Power density: 1.72 kW/m²
Duration of works: 9 months
Customer: Virtus
Architect: Design & Build by ETDE Contracting
Bouygues Group companies: ETDE Contracting

Projects handed over:

- Rutherford Appleton Laboratories: 2009-2010
This data centre in South Oxfordshire was designed for the cloud processing of data from the CERN (the European Council for Nuclear Research), based near Geneva. The customer, Rutherford Appleton Laboratories, specialises in research in areas including materials and structures, light sources, astronomy and particle physics. The building has energy-efficient equipment and free cooling technology.
Data halls: 4,000 m²
Power density: 3 kW/m²
Customer: Rutherford Appleton Laboratories
Architect: Manse U
Bouygues Group company: ETDE Contracting

- Mobile telecoms operator: 2009-10
ETDE Contracting designed and built three data centres on a Design-Build basis for a leading mobile telecoms operator.
Data halls: 300 m²
Power density: 1 kW/m²
Customer: a leading provider of mobile telecom services
Architect: ETDE Contracting
Bouygues Group company: ETDE Contracting

- Shropshire County Council: 2008-09
ETDE Contracting supplied a turnkey data centre to Shropshire County Council in Shrewsbury. The company upgraded and refurbished an existing building to cope with an increased quantity of data handled by the computer room. The facility will accommodate the county's Council Tax billing system.
Data hall: 100 m² (total area: 600m²)
Power density: 1 kW/m²
Customer: Shropshire County Council
Architect: ETDE Contracting
Bouygues Group company: ETDE Contracting

- Airbus: 2007-08, followed by a similar project in 2009-10
In Filton, Bristol, ETDE Contracting converted an existing office building (Design-Build) into a data and operations centre for Airbus. The project required critical services to be replaced while the facility continued to operate normally.
Data halls: 1,500 m²
Power density: 0.3 kW/m²
Customer: Airbus
Architect: ETDE Contracting
Bouygues Group company: ETDE Contracting

Press contacts and Internet link

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Internet link:

Bouygues Construction commercial website specifically dedicated to data centres:
<http://datacenter.bouygues-construction.com/>

Demanding construction standards

An elegant laminated cladding facade discreetly masks the thick reinforced concrete that constitutes the fortified external wall of the data centre. **Security and technical constraints combine to give the building the properties of a civil engineering structure.** The concrete floors in the data halls have to support loads of 1.5 to 2 tonnes per square metre: some of the equipment weighs 30 tonnes. Double waterproofing protects the terrace from any infiltration of water, the mortal enemy of data centres.

7. Keeping it cool

The air-conditioning system is the heaviest consumer of electricity, after the IT systems that are being hosted. The aim is to optimise the use of external air to provide cooling for the data halls, either directly or via a cold water circuit.

6. Power guaranteed

Diesel generators as large as a ship's engine are capable of delivering more than 2,500 kilowatts of power. In the event of the data centre's dual power supply sources failing, they take over within 30 seconds, during which time inverters (located centrally) and their batteries provide power.

5. Double entry

A data centre is a very heavy consumer of power. It is hooked up to two medium-voltage power supplies (20,000 volts). The power is converted into low voltage in a hall equipped with **transformers, circuit breakers and measuring systems** before being carried to the data halls.

1. Bunker mentality

A data centre is protected against both natural catastrophes and intruders. There is high-level security at the entrance, with **controlled access and a biometric recognition** system.

2. Good recovery

Heat recovery systems help to reduce the requirements of the air-conditioning system. **Heat generated by the computers is collected and reused** primarily for local heating and/or hot water networks. This energy saving and recovery solution points the way to interesting ideas in the realm of sustainable development for data centre designers.

3. A very high-speed network

Data centres are built as close as possible to major Internet nodes, and house an infrastructure of multiple standby **routers and switches**. Dozens of kilometres of power and data transmission cables network the data centre.

4. Ultra-pure air

Cooling by air is efficient and economical, but the quality of the air must be utterly perfect to avoid any failure of the equipment. Multiple filters and a stable hygrometry rate are obligatory. **Electronic sensors** perform a continuous control of the atmosphere.

