


## CNPC Headquarters

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Primary energy need :

### 346.5 kWhpe/m<sup>2</sup>.

(Calculation method : )

**ENERGY CONSUMPTION**

*Economical building* *Building*

< 50	A
51 à 90	B
91 à 150	C
151 à 230	D
231 à 330	E
331 à 450	F
> 450	G


*Energy-intensive building*

**Building Type** : High office tower > 28m  
**Construction Year** : 2004  
**Delivery year** : 2012  
**Address 1 - street** : 100000 ,  
**Climate zone** : [Cwa] Mild, dry winter, hot and wet summer.


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**Net Floor Area** : 200 838 m<sup>2</sup> Autre type de surface nette  
**Construction/refurbishment cost** : 2 147 483 647 ¥  
**Cost/m2** : 10692.62 ¥/ m<sup>2</sup>

**Certifications :**




**Proposed by :**



### General information

China National Petroleum Corporation Headquarters (CNPCH) is located in Dongcheng District, Beijing, which is opposite to Dongzhimen traffic hub. Connected by four "L" type buildings, the CNPCH is a large multi-functional complex building including spaces of office work, production command, conferences, catering, cultural and sports activities and parking. The construction land of CNPCH covers an area of 22519.884 square meters while the total construction area is 200838 square meters which is consisted of an above-ground floor area of 144,959 square meters and an underground area of 55879 square meters. Specifically, CNPCH is 90 meters tall with 22 floors above the ground and 4 floors underground. It accommodates 3,500 staff for average. CNPCH achieves GREEN BUILDING LABEL 3 STARS, HEALTHY BUILDING LABEL 3 STARS, LEED-GOLD etc..

CNPCH adheres to the concept of green, healthy and people-orientated which is also adopted in its energy production. It adopts new technology, new material, smart management system etc. to increase the energy efficiency in order to build an environmental friendly, healthy and productive office building.

## Data reliability

3rd part certified

## Stakeholders

### Stakeholders

Function : Facility manager

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<http://www.cnpc.com.cn/cnpc/index.shtml>

PetroChina Sunshine Property Management Co., Ltd. Beijing Branch is the property management company of China Petroleum Building. Through the operation and operation, the company has created a high level of operation and management of China Petroleum Build

Function : Facility manager

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<http://www.cnpc.com.cn/cnpc/index.shtml>

### Contracting method

Other methods

### Owner approach of sustainability

The CNPCH takes "high-tech, energy saving, environmental friendly, smart, comfortable and healthy" as the construction goals, uses "adapt measures locally & solve problem practically" and "apply advanced technology, integrate system and pursuit overall optimization" as the guidance of design principle, and adheres to the people-oriented concept based on green and healthy concept by integrating 118 kinds of technology to realize a healthy building with "environmental-friendly" and "resource-conserving" performance.

### If you had to do it again?

The satisfaction of the owner is investigated regularly, and the rate is above 96%.

## Energy

### Energy consumption

Primary energy need : 346,50 kWhpe/m<sup>2</sup>.

Primary energy need for standard building : 419,10 kWhpe/m<sup>2</sup>.

Calculation method :

Breakdown for energy consumption :

Air-conditioning energy consumption 32%

Lighting and sockets energy consumption 28%

Dynamic energy consumption 10%

Data center energy consumption 26%

Other energy consumption 4%

### Envelope performance

Envelope U-Value : 1,20 W.m<sup>-2</sup>.K<sup>-1</sup>

More information :

Double silver Low-E coated hollow glass is used in the building envelope. Beside, double layer breathing-type curtain wall with intelligent sunshading louvers inside is adopted which makes the gross heat transfer coefficient K to be around 1.1 W/ .k.

Air Tightness Value : 3,00

### Real final energy consumption

Real final energy consumption/m<sup>2</sup> : 105,00 kWh/m<sup>2</sup>.

Year of the real energy consumption : 2 016

## Renewables & systems

### Systems

Heating system :

- Urban network

Hot water system :

- Urban network

Cooling system :

- VAV Syst. (Variable Air Volume system)

Ventilation system :

- Double flow

Renewable systems :

- No renewable energy systems

Solutions enhancing nature free gains :

1. Based on regional features and the project requirements, the complex should distribute dispersedly along the north-south strip land. In this case, L shape building is adopted in order to minimize single building volume, increase interface with nature,

### Smart Building

BMS :

The Intelligent system uses technologies of digitalization, network and integration. It adopts Niagara integrated monitoring platform based on the Internet of Things framework and the Web service technology to comprehensively integrate systems such as building automation system, security automation, fire-fighting automation, communications automation, office automation etc.. This enables centralized monitoring, controlling and management of all sub-systems and forms linkage control between all systems and intersystem which monitors the real time operational condition of most devices in the building (such as indoor temperature, humidity, PM2.5 etc.), sets incident alarm before the potential risk happens. There are nearly 100,000 monitoring spots inside the whole building, showing that intelligence is everywhere. The Building is featured with a full set of intelligent system with perfect functions, cutting-edge technologies, high-level intelligence, highly integrated systems, well operational maintenance and management. These factors ensure a healthy, safe and comfortable environment.

The building uses Skyspark intelligent energy management system which is the most applicable system by considering China's national conditions. It is based on the comprehensive energy management of users, making full use of modern Internet of Things technology, artificial intelligence technology, analysis of data mining technology, modern statistical techniques, logistics optimization techniques and other means. This can perceive, analyze, integrate and optimize all aspects of the user's full supply chain of energy consumption to integrate the display, administration and optimization functions in one.

Users' opinion on the Smart Building functions : The satisfaction of the owner is investigated regularly, and the satisfaction rate is above 96%.

## Environment

### Urban environment

1. 500 meters away of the west of the CNPCH is a demonstration park (Nanguan Park) with urban ecology, water scenery and low-carbon technology theme park; Powerhouse Fitness Club (in Oriental Ginza); a public swimming pool in the upper courtyard of NAGA, all of which can be seen as supplement to the building's recreational and sports facilities.

2. Within 200 meters west of the building, there is a community park which contains a variety of fitness equipment and a short fitness trail. It is open to the public for free and can also be used as supplement to the building's recreational and sports facilities.

3. Within 200 meters west of the building, there is a three large bus stations, namely, Dongzhimen north, Dongzhimen and Dongzhimen hub, a total of 36 bus lines

### Land plot area

Land plot area : 22 519,00 m<sup>2</sup>

### Green space

Green space : 4 561,00

### Parking spaces

There are 1200 parking spaces in the building, 1130 of which are underground, -2, -3, -4, and 70 on the ground, with 0.4 parking spaces per person. In the late stage, 268 parking spaces in the basement of the building were reconstructed with three-dimensional parking spaces, which effectively alleviated the difficulty of

parking

## Products

### Product

Air quality on-line monitor

CNPC Sunshine Property Management Co., Ltd. Beijing Branch

No 9 Dongzhimen North Street, Dongcheng District, Beijing

<http://www.cnpc.com.cn/cnpc/index.shtml>

Product category :

In the main space and representative part of each office, this monitor is equipped to collect real time data of indoor air temperature, relative humidity, CO2 concentration, TVOC Concentration, PM2.5. The monitor also can store the data for analysis. Besides, this monitor is connected with the air handling units to initiate its operation when the air quality is low.

"Feel safe as we know what the air quality is"



## Costs

### Energy bill

Forecasted energy bill/year : 35 487 000,00 ¥

Real energy cost/m2 : 176.69

Real energy cost/Work station : 10139.14

## Building Environmental Quality

### Building Environmental Quality

- indoor air quality and health
- acoustics
- water management
- energy efficiency
- integration in the land
- mobility
- products and materials

## Health and comfort

### Water management

Consumption from water network : 137 960,00 m<sup>3</sup>

Consumption of grey water : 27 000,00 m<sup>3</sup>

Consumption of harvested rainwater : 5 375,00 m<sup>3</sup>

Water Self Sufficiency Index : 0.19

Water Consumption/m2 : 0.69

Water Consumption/Work station : 39.42

1. Direct drinking water system: the purified water has passed the detection of the Beijing CDC, water quality has met the drinking water quality standards for the national urban construction industry, and can be drink directly. Each layer of the system has set up instant heating boilers which provides pure water and boiled water for 24 hours. The boilers can instantly be used when turned on. When it is turned off, water is cyclating in the closed system with sterilization and filtration. The system system has avoided the problems of hot and cold water mixing up and repeated heating caused by traditional float valve boilers, and avoided the secondary pollution of ordinary bottled drinking water machine.

2. Domestic water system: domestic water of the building comes from the tap water of the city, and domestic hot water comes from for the municipal thermal systems (waste heat of power plants). The system heats up the tap water to about 55 degrees through the semi-volumetric heat exchanger to support water usage in toilet wash basin, shower room, hairdressing room and the kitchen. The terminal hot water and cold water is mixed up for using. when the terminal is not used, the hot water will be cycled in the branch pipe of the terminal to maintain the temperature for domestic use.

3. Non-traditional water use: the building has established reclaimed water recovery system to collect the cleaning, washing, shower and other waste water, the reclaimed water is used for rinsing the sanitary ware and irrigation of green area, etc. Later we have expanded the amount of rainwater storage, part of the rainwater is used for irrigation, the remaining part is introduced into the reclaimed water system for replenishment.
4. Condensate water, with the advantage of low temperature and being clean, has been generated by air conditioning units and used as an auxiliary cold source for replenishing the cooling tower, and thus saving the water consumed due to evaporation.

## Indoor Air quality

Indoor CO2 test value mg/m3 425

Indoor formaldehyde test value mg/m3 0.019

Indoor TVOC test value mg/m3 0.027

Indoor PM2.5 test value mg/m3 4.07

1. Passive purification: the central air conditioning system is equipped with multi-functional air purifier: the air conditioning system adopts multi-functional air purification device to purify the indoor air which gradually pumps out the indoor air and uses return air and fresh air circulation system. In addition, UV sterilization, activated carbon absorber, and two high-voltage electrostatic dust extraction are utilized to ensure the indoor air quality which is above the national quality standards level.
2. Active purification: the use of air ionization technology can quickly kill bacteria and viruses, decompose the chemical pollutants and rapidly eliminate the odor, increase the concentration of positive and negative ions in the air, eliminate static interference, and achieve active purification goal.
3. Air quality on-line monitoring: set up air quality monitors that cover five parameters (temperature, humidity, CO2 concentration, TVOC concentration and PM2.5 concentration) in the important space of the building and representative parts of each offices; real-time and on-line monitoring of air quality, record and store the data, use real-time monitoring data to control the operation of air conditioning unit

## Comfort

**Health & comfort :** January indoor average temperature: 23.5, indoor average humidity: 38.3

July indoor average temperature : 24.3 indoor average humidity: 45.3

1. To ensure that the food and beverage are healthy, we make sure that the source of raw materials procured is green; in terms of pesticide residues and bacterial content, the raw materials are detected qualified before cooking to ensure employees' catering safety.
2. The north and south wings on the second floor of the CNPCH have set up Chinese Oil Exhibition Halls respectively, to showcase the ancient, modern and contemporary history of petroleum development in China.
3. The ornaments and decorations inside the building are the works of oil worker artists, photographers, painters and calligraphers on the oil fields. These works fully reflect the vigorous development of the production and life of the oil workers and the development of the oil industry.
4. An Oil Bookstore is set up on the second floor of the Building to sale books written people in the field of petroleum and are free to read.

**Acoustic comfort :** Screen external noise (70-80db). The CNPCH uses double layer curtain wall which has good effect of sound proofing. For most room inside the building, noise can be controlled under 40db, complying with national standards. We apply technologies such as isolation, sound insulation, sound absorption and damping to isolate operation noises generated by indoor device installation and from special function rooms such as machine rooms, auditoriums, banquet halls, entertainment and activity venues. Through forbidding or centralized isolated sound proof measures, noise from indoor non-fixed devices is avoided.

## Carbon

### GHG emissions

**Building lifetime :** 50,00

