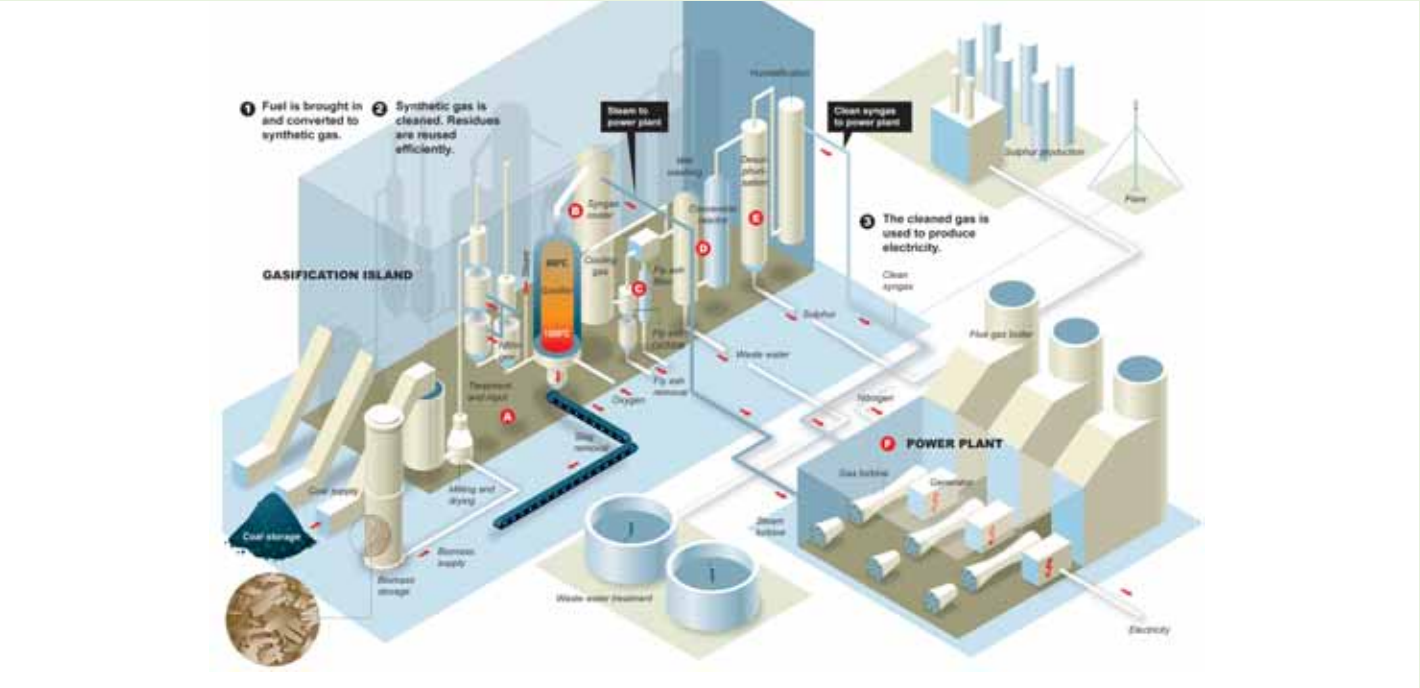


Electricity generation with gasification technology

The future Nuon Magnum power plant will be based on coal gasification technology. During this process, coal is first converted into a combustible gas: the so-called synthesis gas or syngas for short. This gas is then cleaned and the sulphur removed to reach a level of purity comparable with natural gas. The syngas is then suitable for use in a Steam and Gas turbine, where it is converted into electricity. The combination of coal gasification followed by the generation of electricity is called IGCC (STEG or KV-STEG in Dutch).



Explanation of the production process

- A. Coal is delivered to the facility from the harbour. There it is ground and dried to produce pulverised coal. This pulverised coal is then mixed with the pre-ground biomass. The pulverised coal is stored under nitrogen and this coal-nitrogen mixture is pressurised and then transported to the gasifier.
- B. In the gasifier, oxygen is added to the coal, and the mixture is converted to coal gas under pressure and at high temperature. The non-combustible part of the coal (molten ash) solidifies and is removed as slag. The coal gas consists primarily of carbon monoxide and hydrogen and at this stage still contains various pollutants. These pollutants are removed step by step. The non-flammable parts of the coal are removed from the gasifier primarily in the form of slag. The coal gas is combustible and poisonous. The gas is then cooled in the syngas cooler. The heat that is released is converted into steam.
- C. Then in two steps the fly ash - fine particles that also contain non-combustible materials from the coal - is removed from the gas.

- D. Then the gas is washed with water. This removes the soluble compounds, such as chlorides and fluoride, extracting them from the gas. The water used is then cleaned in the waste water treatment plant and subsequently reused.
- E. During the subsequent sulphur removal process, the toxic H₂S (hydrogen sulphide) is extracted from the coal gas. Over 99% of the sulphur from the coal is bound in this manner and converted into pure sulphur. This is reused in the chemical industry. A very small part of the sulphur goes into the air via the flue gas burner as SO₂.
- F. The purified coal gas is thinned with nitrogen in the saturator and saturated with water vapour so as to achieve low NO_x emissions; it then goes to the gas turbine. Here the coal gas is burned, turning the gas turbine. The hot flue gases from the gas turbine are cooled in the flue gas chamber. The heat released is used to create steam, which drives the steam turbine. The ultimate electricity production takes place in the generator, driven by the steam and gas turbines in tandem.

About Nuon

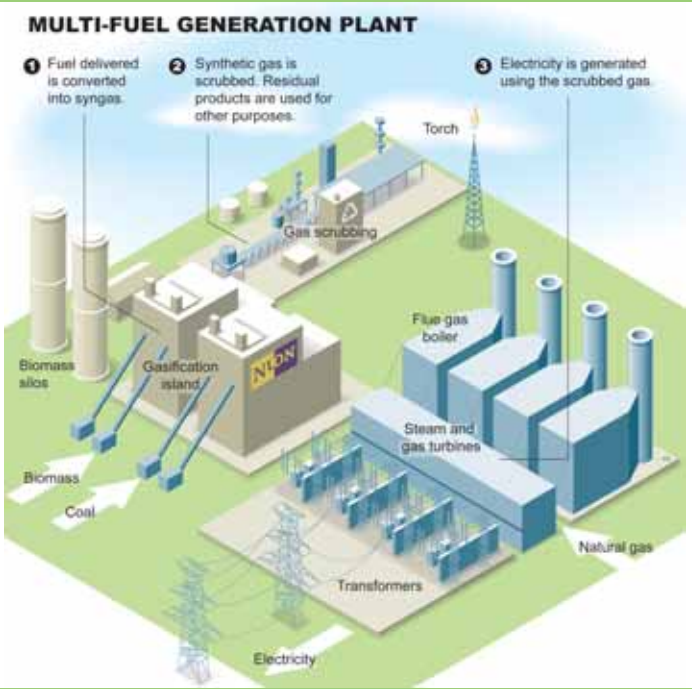
Nuon is a leading energy company with customers in the Netherlands, Belgium and Germany for the purchase of electricity, gas, heat and supplemental services. Nuon is active in the production, trade, transport and delivery of (sustainable) energy. Nuon strives for balanced growth for all interested parties, namely its shareholders, employees, customers, the environment and society. The net turnover in 2005 was EUR 5 billion. At the end of 2005 Nuon had 9,665 employees. Nuon's largest shareholders are the provinces of Gelderland, Noord-Holland and Friesland and the municipality of Amsterdam.

Nuon's total production capacity

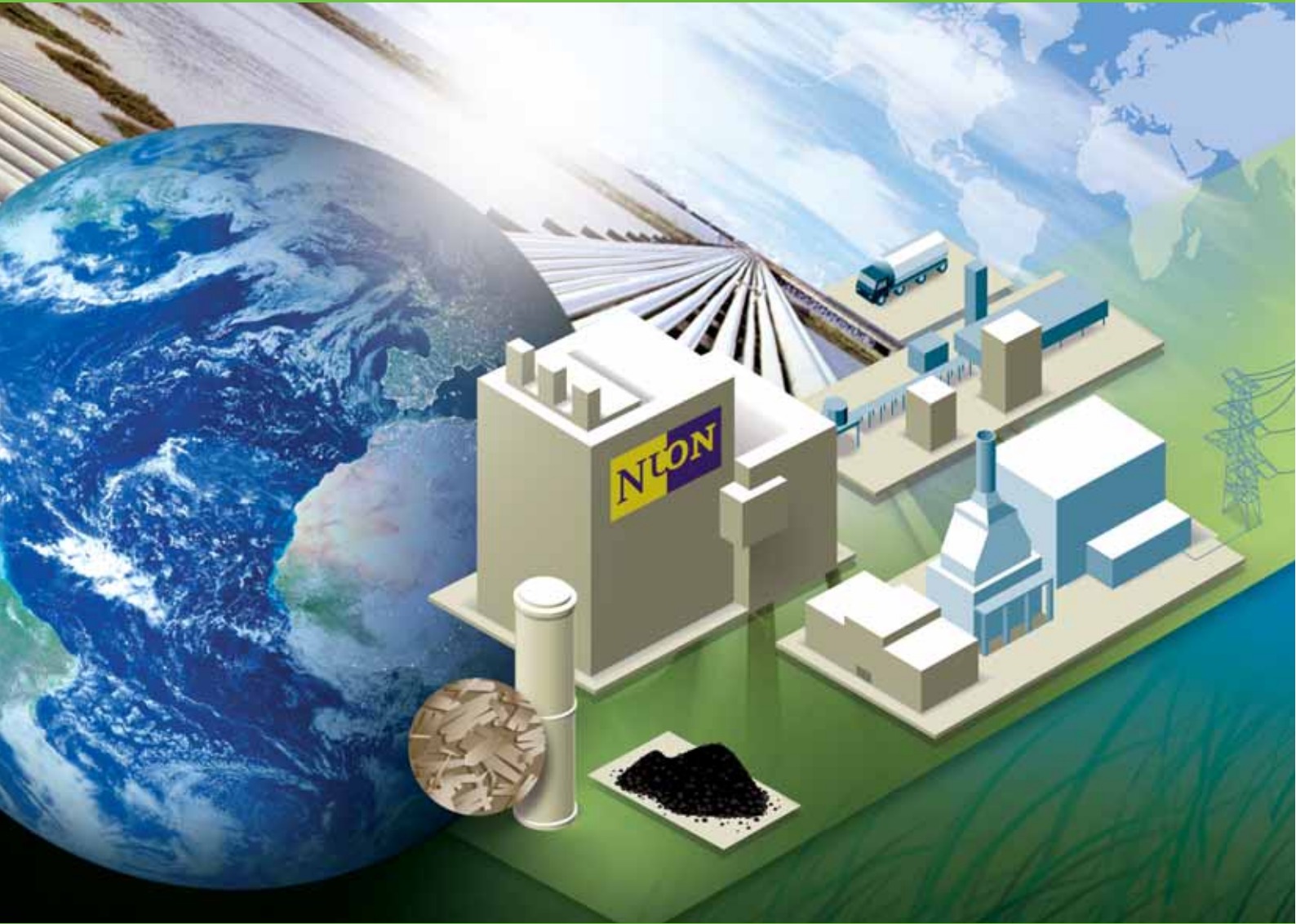
In 2006, Nuon has about 3,500 MW of conventional production capacity in the Netherlands as well as sustainable production capacity (sun, wind, water and biomass) of 459 MW. Nuon also produces district heating for Utrecht, Nieuwegein and Amsterdam Zuid-Oost and supplies electricity to industry. The Netherlands as a whole has approximately 22,000 MW of electrical production capacity, divided among power plants, Heat Power Link and sustainable production capacity.

The future power plant

This is an infographic of the Nuon Magnum generation facility. The definite design of the power plant will be modified to fit in with the environment in wich it will be located.



Nuon Magnum IGCC Power Plant



This brochure is a publication of Nuon Energy Sourcing. Go to www.nuon.com/magnum for more information about the Magnum IGCC.

0506 1060

Investing in the future

Without a doubt, the 21st century will be a period of revolution in the area of energy. There is

a dramatic increase in demand worldwide; many generation facilities are obsolete and the sup-

ply of fossil fuels is declining. Investing in electricity production is a necessity. In developing a

new generation plant, Nuon is living up to its social responsibility and investing in the future.

Nuon Magnum IGCC Power Plant

Nuon is developing a new power plant that is expected to be put into operation in 2011. The new generation facility will be able to generate electricity from coal, gas and biomass and over time will replace old gas and coal-fired generation plants. The new generation plant can generate approximately 1200 megawatts of electricity, enough to provide electricity for 2 million households. The estimated investment in the new IGCC generation plant will be 1 billion euros. In mid-2006, Nuon will decide where in the Netherlands the new generation plant will be located.

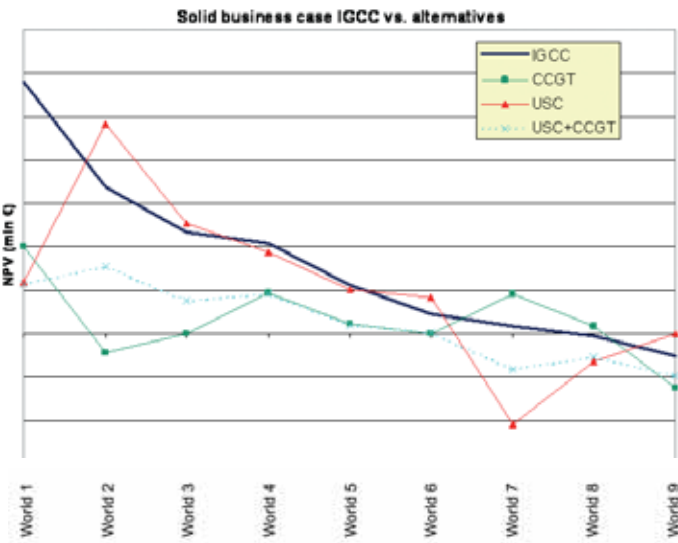
Nuon Magnum is a concept that combines sustainability and production capacity. It offers the possibility to flexibly utilise a broad range of fuels. Emissions will be considerably lower because this power plant produces fewer harmful substances. It will also be possible to trap CO2 with a relatively low loss of profit. That places less of a burden on the environment and offers economic advantages.

The concept is based on a multi-fuel power plant based on gasification technology, Integrated Gasification Combined Cycle or IGCC. This is the name for the technique by which fuels are gasified into synthetic gas and converted to electricity using a steam and gas turbine. Gasification is one of the cleanest and most flexible ways to generate electricity from solid or liquid fuels. Integrating this with combined cycle technology (steam and gas turbine; STAG) results in high yields.

Nuon has experience with the coal gasification technology in combination with the generation of electricity in a steam and gas turbine. Nuon is the first company to apply this technology in the Willem-Alexander Generation plant in Buggenum in the province of Limburg. Based in part on this experience, Nuon has amassed extensive design and operational knowledge in the domain of coal gasification technology and low calorie gas-fired dual-fuel gas turbines.

Nuon chooses gasification technology

Nuon has based its selection of coal gasification technology for the future Nuon Magnum plant on an analysis of possible future scenarios. Nuon asked itself what the electricity production sector will look like in 20 years. Based on the possible answers, Nuon has compared a number of possible world scenarios, such as the possibility that the world will be producing environmentally friendly energy using a great deal of sustainable generation (sun, biomass, wind), trapping and storing CO2 and deploying a great deal of combined heat and electricity generation. Or a scenario in which there are low fuel prices (there is considerable gas export from Russia and considerable supplies of LNG flood the European market). Or a world in which coal prices are extremely high (for example due to enormous economic growth in China, resulting in a dramatic increase in the demand for coal).



The nine world energy scenarios and the applicability of technologies for large-scale generation. This clearly demonstrates that IGCC has a role in every possible scenario

- USC (Ultra Super Critical Boiler) Referred to in Dutch as conventional coal boiler generation (conventionele kolenketel), the successor of the existing coal-fired generation plants that utilises greater pressure and higher temperature, resulting in a higher yield
- CCGT (Combined Cycle Gas Turbine) Referred to in Dutch as Steam and Gas turbine (Stoom en Gas turbine or STEG)
- USC+CCGT (a combination of a USC and a CCGT)
- IGCC (Integrated Gasification in Combined Cycle) The Dutch term for this is KV-STEG

Technology, electricity generation through gasification

Dutch electricity production is largely based on coal and natural gas. Natural gas is a clean fuel, which means that emissions from a natural gas-fired generation plant are low and this type of generation leaves no residues. Moreover, burning natural gas produces less CO2 than when coal is burned.

However, coal is considerably cheaper and available in much larger quantities, which is why coal is used on a broad scale to generate electricity. Natural gas-fired units are used to cover peaks in demand precisely because the amount of electricity generated can be regulated quickly, increased or decreased as the situation requires.

In order to be able to guarantee power supplies over the longer term and so as not to be dependent on just one fuel, utilising coal for electricity generation will still be necessary, at least for part of the electricity required. In order to be able to satisfy ever more stringent environmental requirements, more and more (increasingly) expensive facilities must be installed. This is adequate motivation for looking for alternative technologies for generating electricity from coal without the disadvantages of conventional coal-fired generation plants.

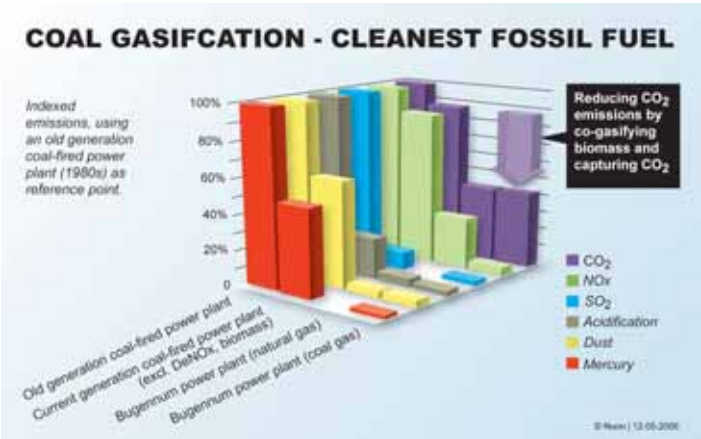
* Nuon recognises the requisite role of nuclear energy in the European – and thus the Dutch – power supply. But for the provision of renewable energy, Nuon has selected other methods.

Clean coal

The technology of coal gasification (IGCC concept) results in better environmental performance than that of conventional coal-fired power plants. Nuon aims to achieve an output of 47% using IGCC technology. Scarcely any residues, such as SO2, dust particles, NOx and heavy metals are released when generating electricity by means of gasification. As some of the coal can be replaced by biomass, the power plant emits less CO2.

Coal gasification does produce CO2 emissions, which contributes to the greenhouse effect. CO2 is a greenhouse gas. When part of this fossil fuel is replaced by biomass, the emissions of CO2 can be considerably reduced. Gasifying biomass also releases CO2, but this is offset by the fact that the production of new biomass uses CO2 from the atmosphere. Thus it is part of the natural cycle.

Currently it is still unclear what types of biomass are most suitable for sustainable electricity generation. The biomass market is developing rapidly and includes a number of (possible) solid, liquid and gas fuels. The IGCC concept offers the advantage that it can process a broad spectrum of the types of biomass available.



Project approach

The project for building Nuon Magnum is based on a combination of methods from the electricity and petrochemical sectors. It is based on best practices gleaned from collaboration with reputable project partners.

Before construction starts on Nuon Magnum, we will work out more details regarding the investment decision. We will conduct this phase in accordance with the so-called 18- month program.



As the diagram illustrates, during that 18- month program we will work on five different areas of attention. These are Project Management, the Business Model, Commercial Terms, Engineering and Communication & Mobilisation.

In January of 2006, Nuon began a license procedure for the generation plant to be constructed at three locations, Eemshaven in Groningen, Maasvlakte/Europoort near Rotterdam and Sloehaven near Vlissingen. The definitive choice of location is expected to be made in mid-2006, based on a study of the possibilities and a cost-benefit analysis. Nuon is collaborating with engineering company ABB Lummus Global to develop the technology for the generation plant. Nuon will make the definitive investment decision in mid-2007. The generation plant is expected to be up and running in 2011.