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**Severn Power Ltd**  
**800MW CCGT Power Station,**  
**Newport, South Wales**

Environmental Statement  
Non-technical summary

May 2006

# Introduction



**S**evern Power Ltd is proposing to build an 800Megawatt (MW) power station near Newport in South Wales that will feed into the UK National Grid, helping to safeguard electricity supplies in a region where demand is increasing. The proposed Combined Cycle Gas Turbine (CCGT) power station will be built on the site of the demolished Uskmouth A coal-fired power station and next to the existing Uskmouth power plant (B) on the banks of the River Usk. This location has been used for power generation for 50 years.

This document summarises the Environmental Statement that has been submitted to the Department of Trade and Industry for consent under Section 36 of the Electricity Act. It explains, in non-technical terms, the environmental assessment that has been carried out on the proposed power station and describes the mitigation measures that will be taken to reduce the impact of the project on the surrounding environment.

The gas feeder pipeline and the existing electricity substation, that are located adjacent to the power station are outside the scope of this study and subject to a separate planning application.

Further details of the project can be obtained from Severn Power Ltd. Full copies of the Environmental Statement report will be available at the Planning Office, local libraries and the power station (Uskmouth B).

Location map

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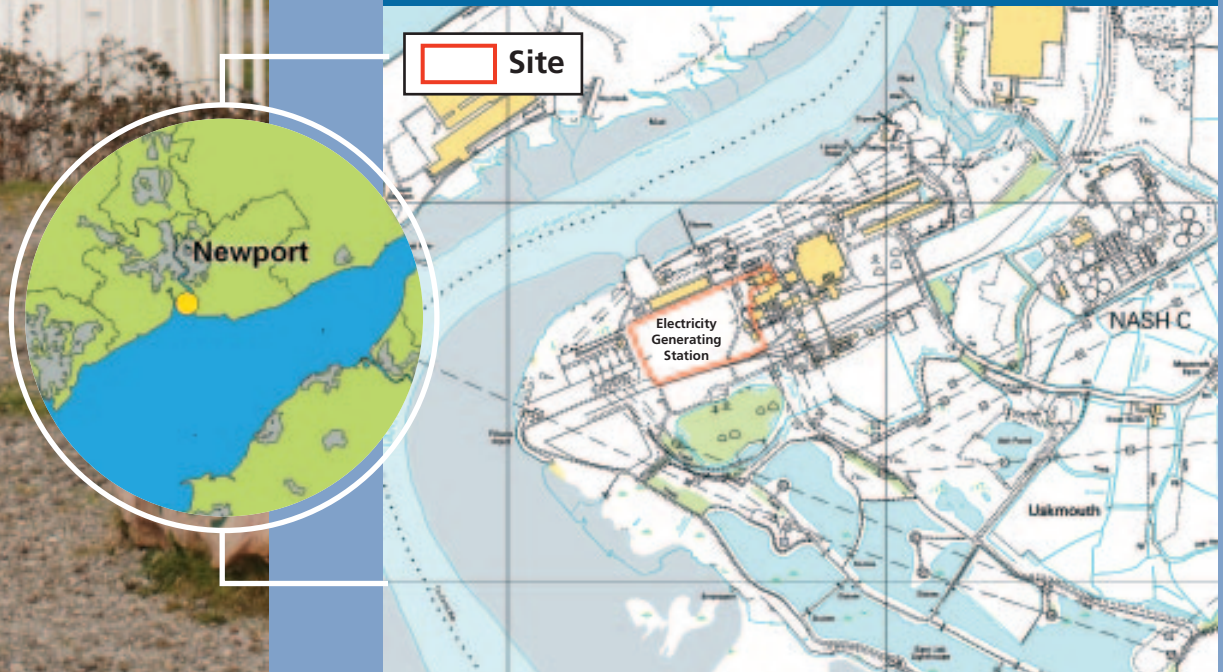


Figure 1: Proposed site



**T**he proposed site for the 800MW CCGT power station is shown in Figure 1. The site lies adjacent to the existing Uskmouth (B) power station, which will continue to operate.

The connection for gas supplies for the new power station will be provided by Wales and West Utilities and delivered to the site via a new buried pipeline that will link into the existing gas distribution network.

Electricity produced by the power station will be fed into the National Grid substation on the Uskmouth site via a short underground cable, then onto the National Grid.

## Why has this type of power station been selected?

The proposed 800MW CCGT power station will provide flexible and efficient power production to help meet local and national demand for electricity. The flexibility offered by a CCGT plant will allow the plant to meet daily and seasonal fluctuations in electricity demand. This flexibility in output is in sharp contrast to the existing coal-fired Uskmouth (B) that was designed to supply a continuous baseload of electricity to the National Grid.

The UK Government acknowledges that gas-fired energy generation will be a leading technology for the future<sup>1</sup>, helping to meet the nation's need for electricity as supplies from older nuclear power stations decline due to

decommissioning. In parallel, environmental legislation is forcing the closure of less efficient coal-fired plants that produce higher levels of pollutants, such as carbon and sulphur dioxide, than the relatively clean CCGT plants. There will be a need to replace electricity generation shortfall in all regions. According to the DTI, around 30% of the existing capacity will need to be replaced over the next 20 years. Whilst the Government is considering new nuclear build, such plants have a long lead-time. The Government is also continuing to encourage renewable generation but the technologies available are unable to fill the growing energy gap on their own.

## Is there a do nothing option in this region?

There is already a local generation shortfall, making the region a net importer of energy, and without the new CCGT power station this position will worsen for existing and new consumers. To meet growing energy demand, energy supplies are imported from other areas of the UK, which increases the costs to consumers, as delivery results in lost energy and thus has a negative impact on the local economy. Without increased investment in the region, there is a risk that the system security would not be maintained as the existing Uskmouth (B) power plant reaches the end of its operational life. The CCGT power station will help address the generation shortfall, reducing losses incurred in moving power longer distances to meet local demand and improving security of supply within the region. It will also help address the falling reserve capacity in the UK generally.

Gas burners in the home



<sup>1</sup> Our Energy Challenge – Securing Clean, Affordable Energy for the Longer Term. DTI 2006.

# Project overview and rationale

## What are the alternatives to CCGT power generation?

The environmental assessment considered a range of fuel options for a power station at this location.

### Biomass power generation

Supplying biomass fuel (such as woodchips) to a plant of this size would present logistical problems and would not be economically viable. Large volumes of biomass would need to be brought to the plant along already congested rail lines or increase traffic on the local roads. Delivery by barge along this tidal section of the Usk would present a technical challenge and may be considered environmentally unacceptable in an area of special scientific interest. Biomass on a large scale would also require significant investment in storage and handling facilities, which would make the plant uneconomic when combined with the high price of the fuel.

It may be possible to construct a smaller plant using biomass fuels and this option may be further considered in

the future. At the present time, there are a number of reviews of energy policy and environmental legislation that make investment in power plants of this nature risky. These regulatory risks should reduce over time making such investments more likely.

### Diesel or coal

A diesel or coal-fired plant has relatively high atmospheric emissions and generally provides baseload, which is a less flexible way of generating electricity than a modern gas plant. Consequently, using either fuel would limit the operation of the plant to fit within the stringent environmental regime, as well as producing higher priced electricity. Uskmouth (B) already provides baseload electricity and Severn Power Ltd will complement that output with its ability to follow demand.

### Nuclear

Building a nuclear power plant would take many years and could not address the UK's need for short-term secure power supplies. The size of the local population and limited access to cooling water supplies (a requirement of nuclear power plants) also rule out this type of plant at this location.

### Renewable

Renewable energy from locally derived wind or wave power would not be able to meet the projected demand for this part of the country. The nature of the local environment also makes these technologies less suitable than more conventional types of generation.

### Waste

An energy-from-waste power station could have potential at this location and be economic in the long term. However, this type of technology is relatively new and untested for the required output, though it may be suitable as a smaller plant to complement existing facilities. The delivery of waste to the site presents similar logistical problems to those of biomass. As noted above, it may be possible to address these issues in the longer term, but a CCGT ensures the needs of local demand are met under current economic conditions.

## Are there alternative sites available?

The proposed location was selected after an extensive search for brownfield sites in the region with good connections to the National Grid.

## How does a CCGT power station work?

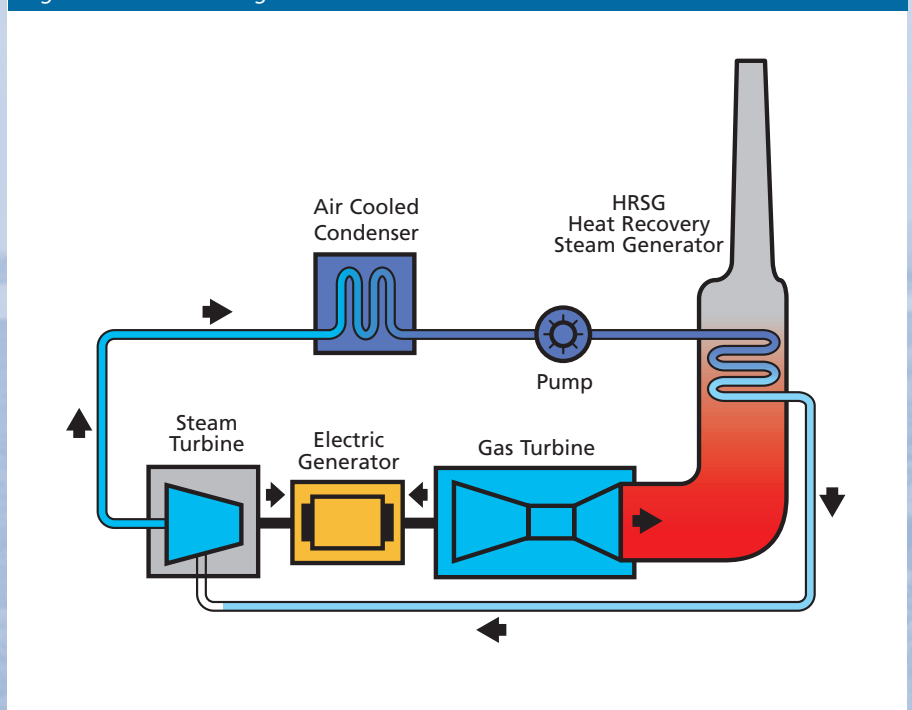
A CCGT power station is currently the most efficient form of large power generation with an efficiency of over 55%. This compares to coal-fired power stations, which have an efficiency of around 32%.

Figure 2 shows a schematic diagram of a CCGT power station, of a similar design to Severn Power Ltd's proposal. Power is produced in two phases that are designed to maximise operational efficiency and minimise emissions.

### Stage 1 – Gas turbine

At the start of the power generation process, gas is burnt to power gas turbines that rotate at high speed. This rotation is used to drive an AC electric generator (alternating current) that produces electricity supply, which is then fed into the National Grid.

Figure 2: Schematic diagram of a CCGT Power Station



## Stage 2 – Heat Recovery Steam Generators (HRSG)

In the second phase, heat contained in the gas turbine exhaust is fed back into the process via a closed-loop water system (similar in principle to the way in which a car's water system captures engine heat which can then be used by the vehicle's heater). The hot gases produced as a result of combustion in the turbines are captured by a heat recovery steam generator (HRSG), which produces steam that powers a steam turbine capturing greater efficiency from the process. This turbine is also linked to an electric generator, producing additional power supplies.

This design feature gives rise to the term 'combined cycle' as this secondary heat capture process, coupled with the use of efficient gas turbines in Phase 1, results in thermal efficiencies of over 55%. The proposed CCGT plant will use proven technology and take full consideration of environmental impacts especially noise, safety, emissions and visual appearance.

## When will the plant be built?

Severn Power Ltd will start construction once all necessary consents have been given and a contractor appointed. This is anticipated to be in early 2007. The CCGT is scheduled to be operational in October 2009.

Construction is expected to last 30 months, followed by a four-month commissioning and testing period. During the early part of commissioning, there will be intermittent firing of the gas turbines. During this short testing period, it is possible that emissions of oxides of nitrogen will be temporarily higher than those during normal plant operation. However, such testing is necessary to ensure safe and efficient operation of the plant in the long-term.

Site construction hours will be limited to daylight hours as follows:

Monday-Friday	07:00 to 19:00 hours
Saturday	07:00 to 13:00 hours

No work will take place on Sundays or Bank Holidays. If work needs to be undertaken outside normal working hours, prior written approval will be sought from the Newport City Borough Council.

## Who will build the power plant?

The CCGT power station will be constructed under an EPC contract (that covers Engineering, Procurement and Construction). Severn Power Ltd has appointed an owner's engineer, whose job it will be to oversee the construction and ensure the contractor will adopt the environmental working practices of Severn Power Ltd. Severn Power's contractor's will be required to undertake any mitigation actions included in the Environmental Statement. There will be regular audits of the contractors' performance to check adherence to health, safety and environmental practices. The contractors will also be encouraged to select a plant design that uses proven technology and proven procedures for construction and commissioning.

The construction will involve three main phases:

- Site preparation;
- Foundation construction; and
- Building construction.

Site preparation involves levelling of the ground and associated earthworks, and excavations for the foundations. The movement of existing pulverised fly-ash (PFA) to a new site location, where it will be landscaped and seeded with grass, is subject to a separate planning application, which will be undertaken prior to the preparation work commencing.

The foundation construction is expected to require the installation of piles that will support the larger items of equipment such as the HRSG system, gas and steam turbines and generator foundations.

Once the foundations are in place, the construction of the buildings will commence. During this phase, the equipment that makes up the CCGT will be installed.

## What controls will there be to ensure the plant operates properly?

Severn Power Ltd will carry out continuous monitoring of the air and water discharges from the power station to comply with the requirements of its IPPC (Integrated Pollution, Prevention and Control) authorisation. It will also operate in line with the requirements in its Electricity Generation Licence and with the technical codes that cover the UK electricity network, such as the Grid Code and Balancing and Settlement Code.

The monitoring equipment, covering emissions, discharges, operational parameters, etc., will be integral to the power station data control system (DCS) and signals and alarms will be fed directly to the control-room. The operational staff will be trained to ensure compliance with regulatory limits and will store data records for a minimum of 10 years. This data will be retrievable on demand. In addition, Severn Power's Environmental Management System (EMS) will be an integral part of the site's overall management system. These systems combined with manual checks will ensure that all aspects of the plant, from management policies to process controls, are operated as intended and that any faults and incidents are detected, corrected and recorded.

The EMS places particular importance on reducing risks to the environment. It integrates EMS responsibilities within line management and commits personnel to environmental awareness and competence, as well as encouraging continuous improvement.

# Environmental considerations

Photomontage of CCGT from East Usk lighthouse, Newport Wetlands National Nature Reserve



## What kind of noise will the power station produce?

During operation, the main sources of noise will come from air inlets, power block, the exhaust stacks, HRSGs, air-cooled condenser and transformers. These will be designed to have minimal noise impact on the locality.

The plant design will adopt best available techniques (BAT) that incorporate noise reduction measures in all appropriate elements of the power station.

Noise will arise during the short-term construction period, but operating times will be limited. Operation of the power plant is predicted to give rise to no more than slight adverse impacts at Newport Uskmouth Sailing Club, and in and around Nash village.

## What kind of pollution or hazardous materials will the plant produce?

### Liquid waste

It is not technically feasible to prevent some liquid effluent. However, by adopting principles of using best available technology in the design, the volume and impact of any effluents from the water treatment system that cannot be recycled are minimised.

The mains water supply has to be treated to utmost purity before it can be used in the steam cycle. The plant that undertakes the water treatment produces small quantities of aqueous effluent. These contain trace quantities of cadmium and mercury that are present in the sulphuric acid and caustic soda used in resin generation, but no other potentially toxic materials.

Highly efficient CCGT power plants of the kind proposed produce only small quantities of waste products. The use of gas to fuel the plant means that no solid waste is created that could be discharged during the water treatment process.

The use of air-cooled condensers and closed-loop water circulation systems means that there is no need for large volumes of cooling water or cooling towers and the environmental impacts associated with cooling water systems. Furthermore, the design means that there will be no visible plume from a cooling tower or abstraction from, or discharges to watercourses.

### Solid waste

Once the power plant is operational, there may be very small and intermittent solid wastes involving: the disposal of materials from the intake filters for the gas turbines that need to be replaced annually; removal of used ion exchange resins (usually every five years); removal

of sludge and oil from oil/water separators; used chemical containers; and general office waste.

Most of these wastes would be returned to the original supplier or removed by an appropriate licensed contractor for safe disposal.

### Emissions to the atmosphere

The majority of emissions from the power plant enter the atmosphere via the main 65m stacks. This flue gas contains carbon dioxide, carbon monoxide, oxides of nitrogen and traces of particulates associated with the combustion of natural gas. Volatile organic compounds are also emitted during the firing of the gas turbines. The height of the stack will ensure that the flue gas temperature and the emissions will have no significant effect on the local area.

Emissions of carbon dioxide (CO<sub>2</sub>) from a CCGT power station are about half those from an existing fossil fuel plant per unit of electricity produced. In addition, sulphur dioxide emissions are reduced to negligible levels. However, the power plant will have to hold or buy permits for CO<sub>2</sub> emissions and will be closely regulated by the Environment Agency.

The Environmental Statement concludes that the power station emissions will have no significant impact on human health and negligible impact on climate change.



### **Will the power station produce electromagnetic effects?**

The electrical connection to the National Grid will be via a buried cable and so there are no additional sources of EMF (electro-magnetic field) generated by the power station and no new pylons or overhead lines.

### **Will there be any lighting effects from the site?**

The power station will comply with the requirements of the Civil Aviation Authority and the Harbour Authority to ensure safety during operation of the power station. Some low level lighting will be installed to ensure safe movement of operations and security personnel around the plant at night.

### **What effect will there be on the existing ground conditions?**

Site-based investigations and desk-based studies have been carried out to analyse the existing environmental setting and physical conditions on the site. The purpose of this extensive work is to assess how the development might affect the topography, geology, soils,

hydrology, hydrogeology, drainage, flooding, climate change, seismicity, subsidence, ground movement and meteorology.

The site lies at the confluence of the River Usk and Severn Estuary. It occupies low-lying salt-marsh levels that have been reclaimed from the sea over many hundreds of years. The site has an area of 83ha and contains Uskmouth (B) and related facilities. The proposed site will sit within the Uskmouth site, with the CCGT power station covering around 6ha.

When the old Uskmouth A was demolished, the basement void was filled with rubble and PFA produced by Uskmouth B. This PFA will be removed from the development site to an adjoining area as a landscaped grassed mound covering a 6ha area. This activity is subject to a separate planning application.

Overall, soil analysis shows that the PFA is inert and does not constitute a hazard to human and environmental health but it is possible that isolated hydrocarbon 'hotspots' may occur. Any 'hotspots' identified during the works will be removed by a licensed contractor to a suitable disposal site.

### ***Surface water and hydrogeology***

Surface water will be directed to the Uskmouth drainage system that is connected to the foul sewer. Surface water draining from the site is subject to monitoring as part of the discharge authorisation permit that specifies permitted concentrations. There are no designated groundwater Source Protection Zones in the local area and no groundwater abstractions within 1km of the site. Downward infiltration of any contaminants from made ground is limited by low permeability alluvial clays beneath the site.

### ***Flooding and climate change***

There have been no major tidal flood events at this site for 60 years. However, the flood risk assessment recommends that the power station has a minimum floor level of 9.25m above Ordnance Datum to allow for wave action and to allow for environmental change.

### ***Earthquake risk***

The Environmental Statement concludes that significant seismic events are unlikely at this site.

# Environmental considerations

## ***Subsidence and ground movement***

The site lies outside of the South Wales coal mining area, so subsidence is not an issue and ground conditions are unlikely to present construction problems.

## **How will the development affect the local ecology?**

Members of the Institute of Ecology and Environmental Management (IEEM) carried out an ecological assessment of the proposed development. This examined the baseline conditions at the site and subsequent evaluation of habitats and species for the whole area.

The report concludes that the residual impacts of the development with regard to local wildlife are of slight positive to

no significance. The adoption of best practice principles, such as the compilation of an Environmental Management Plan, during construction and operation will mitigate the major proportion of ecological impacts.

Full details of the ecological assessment for all species are given in the main report.

## **Will there be any other environmental impacts on the site during construction, operation and decommissioning?**

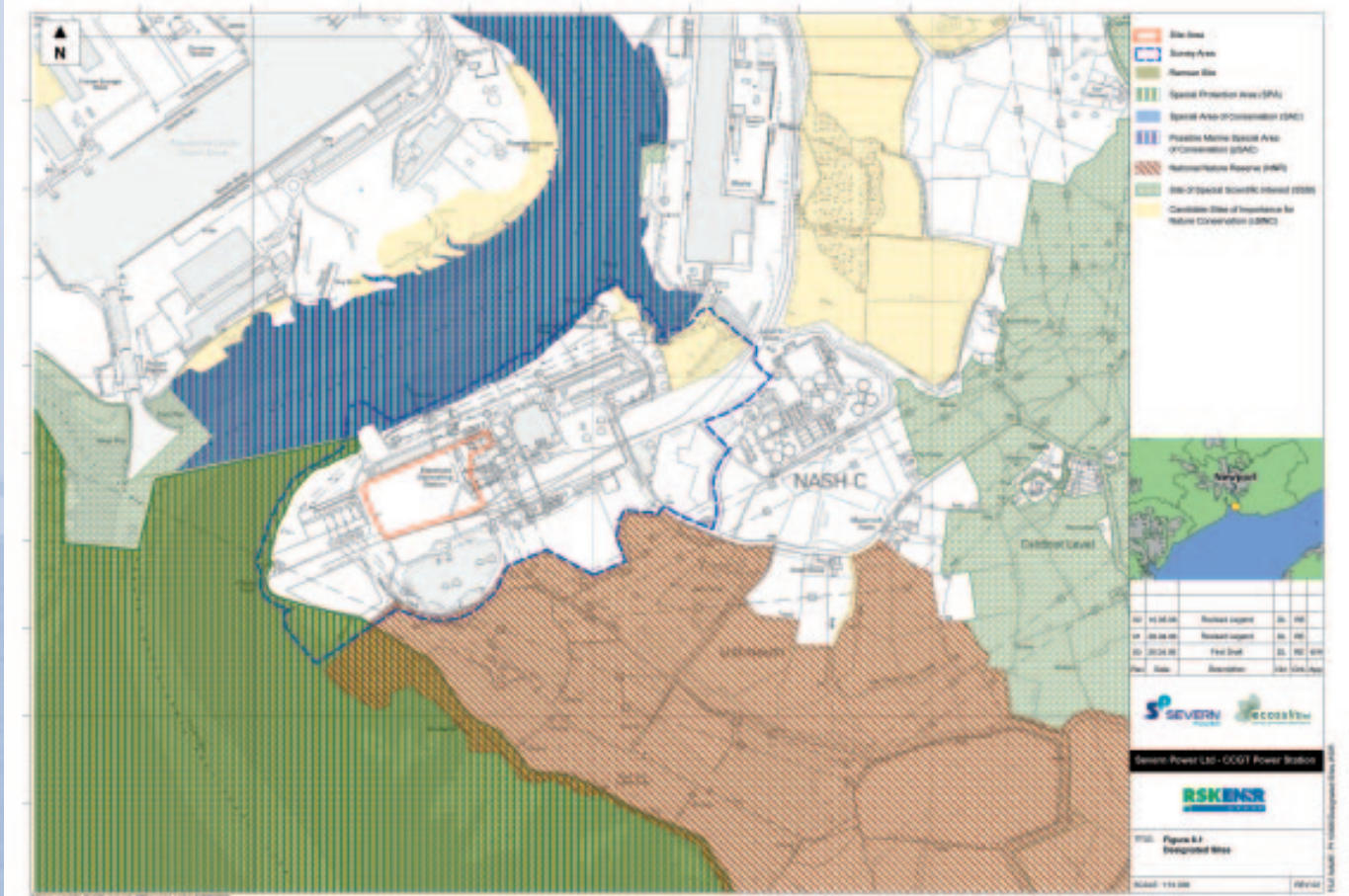
The expected movement of soil around the site during construction has been modelled so that mitigation measures can be developed. A Pollution Prevention Plan and an Emergency Response Plan will be used to manage

any incidents and these specify mitigation measures. Similar plans will be prepared for the operational period and later when the station is decommissioned and demolished.

Dust emissions associated with the construction work will be temporary, limited and restricted to working hours. The effects of this will be minimal.

The Environmental Statement concludes that the timely adoption of mitigation measures will ensure that any impacts on the physical environment caused by the CCGT power station will not be significant.

### *Designated sites*



## What are the social and economic effects going to be?

The plant will generate sufficient power to ensure surrounding industries can run at full capacity and hence safeguard jobs. During the construction phase, around 400 people will work on the project and, in the medium to long-term, 40 high value jobs will be created. The proposed development would produce significant socio-economic benefits through the creation of new jobs, the reuse of a brownfield site and associated boost to the local economy for the life of the plant.

The development will cause some localised community disruption and nuisance issues during construction and operation. However, these effects are considered to be minor and short term. Severn Power will work to minimise disruption wherever possible.

## What will the power station look like?

Figure 3 is a photomontage that illustrates the visual appearance of the power station. The proposed development is located in an area considered by Newport City Borough Council to have low landscape value. Locating a new power station in the

vicinity of other industry limits the impact on the landscape. Nevertheless, mitigation in the form of landscape enhancement from the new grassed mound will go some way to reduce this impact.

There will be no new pylons or overhead lines associated with the CCGT power station.

The Environmental Statement contains a range of photomontages showing the appearance of the CCGT power station from a wide variety of viewpoints.

Figure 3: Photomontage of CCGT from Lowlands/West Nash Farm



## What will be the effect of the power station on local transport and traffic?

Transport and traffic studies indicate that road traffic generated by the construction programme would not affect existing and future traffic-related air quality or noise. Control measures will be put in place to minimise potential air quality and noise impacts. The 30-month construction phase will give rise to additional traffic movements and a travel plan will be agreed with the local highways department prior to work starting.

This construction traffic may have significant impact at times but

arrangements will be made to minimise this impact on other road users. Heavy goods vehicles will follow routes agreed with the local council.

During operation of the power station, there will be a negligible increase in traffic.

## Will there be any cumulative effect of this development?

An assessment of cumulative effect was undertaken, as part of the environmental assessment, to determine if the power station may have an effect when considering in combination with other planned or existing developments.

This assessment is to some extent limited due to the lack of detailed information on other potential developments.

However, the study identified and examined the possible cumulative effect of other locally significant projects and considered the following projects worthy of more detailed investigation:

- The natural gas feeder pipeline;
- The Llanwern Regeneration Strategy (LRS);
- The relocation of the PFA mound on the site; and
- The change in land use associated with the Gwent Levels (National Nature Reserve centre).

# Environmental considerations

The Environmental Statement concludes that in the event that all these developments occur in the current proposed timescale for the power station, there is potential for both positive and negative effects.

Traffic-related air and noise emissions associated with the power station development and LRS are not regarded as significant.

The cumulative effects on traffic flows of the LRS and gas pipeline developments, during the power station construction phase, are regarded as slight to adverse.

Other developments are considered to have limited potential for cumulative effects on traffic flows.

Positive effects for the region with the power station include providing employment for new residents at the Llanwern regeneration site together with the ecological and visual benefits of the mound of PFA.

The Environmental Assessment concludes that none of these developments will result in significant negative cumulative effects.

## Who is responsible for ongoing environmental management?

Severn Power Ltd has ultimate responsibility for the successful environmental performance of this project and will make it a contractual requirement that the contractors follow the detailed Project Environmental Management Plan (PEMP) that is the key mechanism for environmental management during the project design and construction phases.

There will also be additional plans in support of the PEMP. These will be agreed with the appropriate authorities and cover a range a wide range of subjects such as integrated pollution prevention, water and wastewater management through to the emergency response plan.

A comprehensive training programme will be implemented to ensure specific personnel are properly trained in their environmental duties and emergency response actions.

The construction activities will be closely monitored for environmental performance and compliance. Weekly environmental inspections and monthly environmental audits will also be undertaken.



## Summary

Severn Power Ltd intends to conduct its activities in such a way that the impact of all aspects of this development is kept to a minimum. To achieve this, the project has been specifically designed to limit environmental impacts during construction and future operation. Severn Power is also pleased to report that the proposed CCGT power station will have a positive effect on the local economy, creating 400 jobs during a two-year construction period with 40 permanent jobs at the plant and a further 45 jobs associated with companies supplying services.

