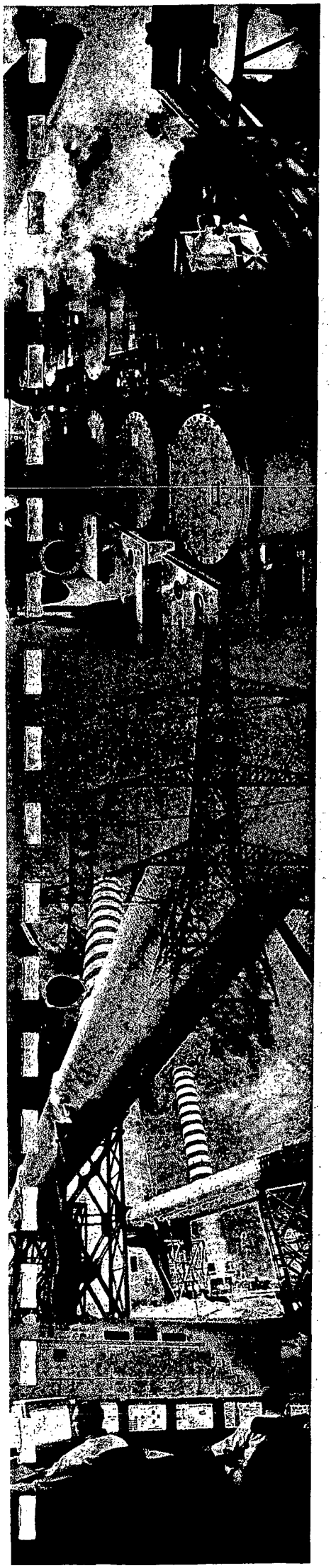

ELECTRICITY AUTHORITY OF CYPRUS

VASILIKOS POWER STATION PHASE IV

ENVIRONMENTAL IMPACT ASSESSMENT

JUNE 2005

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1. NON-TECHNICAL SUMMARY

The Electricity Authority of Cyprus (EAC) proposes to construct and operate a further two combined cycle gas turbine (CCGT) units on land at Vasilikos Power Station. The proposed CCGT units will provide electricity to the local grid in the most efficient, reliable and environmentally acceptable manner currently commercially possible providing EAC with the flexibility to meet the growing energy demands of the island. The CCGT units represent Phase IV of the development of Vasilikos Power Station.

Phase I of the development comprises 2 x 120 MW (minimum) conventional heavy fuel oil (HFO) fired units (Units 1 and 2) and included construction of infrastructure and common equipment taking account of future developments. A black start gas turbine generator set, 38 MW (nominal), was also installed under Phase I. This set is also used for peak lopping duties.

Phase II (Unit 3) of Vasilikos involves the installation of a further 1 x 120 MW (minimum) conventional HFO fired unit and will also include seawater scrubbing flue gas desulphurization (FGD). Completion of Phase II is scheduled for July 2005.

Phase III (Unit 4) comprises a single CCGT unit of up to 220 MWe output. Construction on Phase III is scheduled to commence in July 2006.

The two units planned for Phase IV are assumed to be CCGT units of similar size to Phase III ie each with an electrical output of up to 220 MWe. However improvements in gas turbine technology between now and the construction of Phase IV may improve the efficiency leading to a slightly higher output but this will not cause additional environmental impacts.

The site

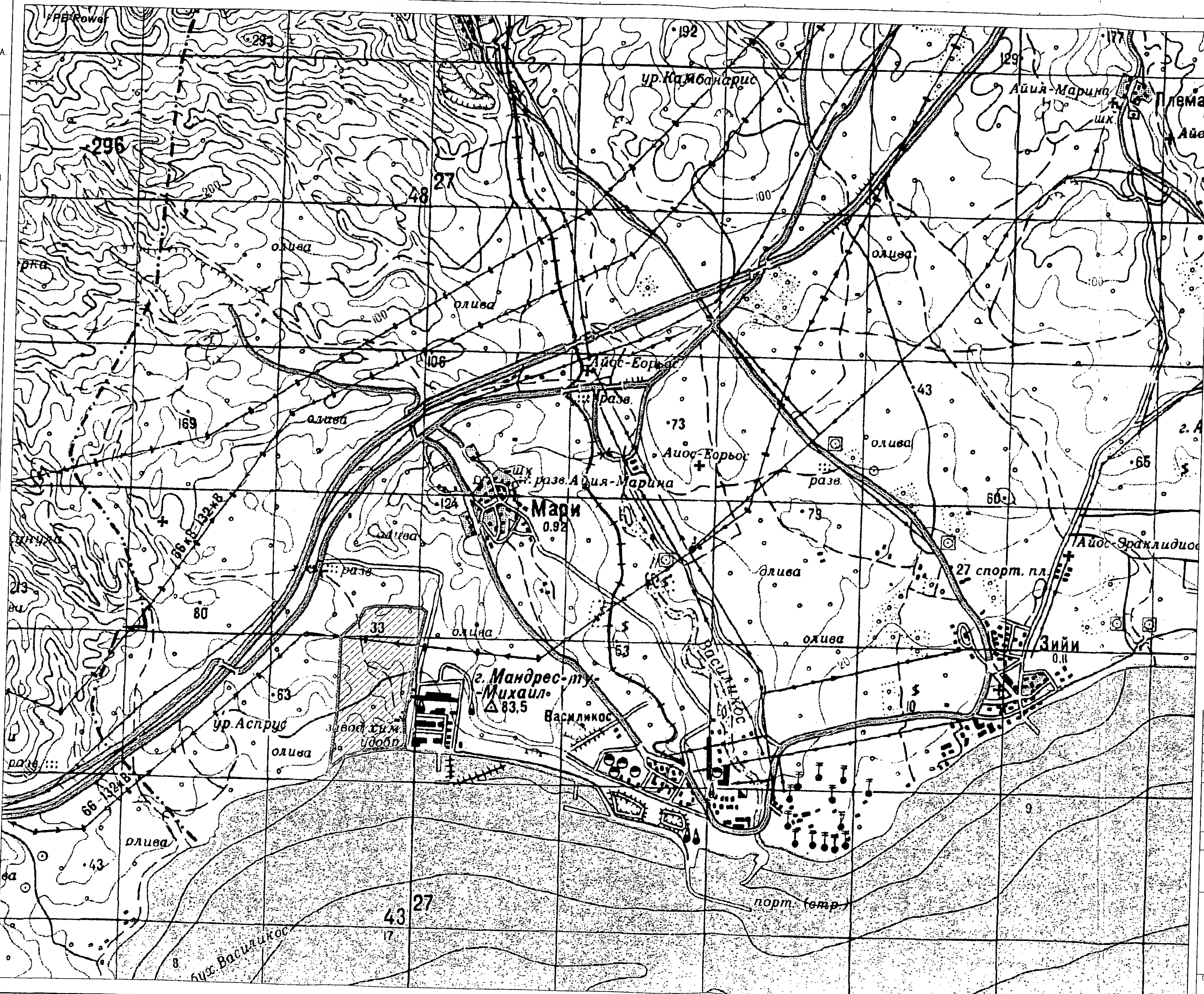
The proposed site of the CCGT plant is situated at the Vasilikos Power Station. Figure 1.1 shows the location of the site.

The nearest housing lies approximately 1.7 km to the northeast at Mari. Limassol lies 25 km to the west. The site is on the south coast of Cyprus on land currently comprising the existing units of Vasilikos Power Station.

The proposed development

Each CCGT unit will be made up of a two gas turbine generating units each capable of producing up to 75 MWe of electricity and a steam turbine generating unit, capable of producing up to 100 MWe depending on the level of supplementary firing required which is in turn a function of the size of gas turbines selected. The total electrical output of the proposed plant will therefore be up to 220 MWe.

VASILIKOS POWER STATION



Rev.	Date	Description	Drn	Chkd	Appr

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ELECTRICITY AUTHORITY OF CYPRUS

VASILIKOS POWER STATION - PHASE IV

PB Power

Title

SITE LOCATION

Drawn	Checked	Approved	Date
PDO	RW	EA	26/5/05

Scale	Autocad File	DRG. No.	Rev.
1:25000			

Document No. 61649/PBPN/005 Rev A1

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Ultimately the primary fuel for the gas turbine will be natural gas. The supply of natural gas to the site will be via a connection to the proposed LNG facility adjacent to the site. Prior to gas being available the primary fuel of the plant will be low sulphur distillate fuel oil, once gas is available distillate fuel oil will only be used as the emergency fuel. The period of operation on distillate fuel oil prior to the availability of natural gas is expected to be of the order of 6 months.

Distillate oil will be stored on site and will be brought to site by the existing fuel oil delivery system. The distillate fuel oil is also a low sulphur fuel, containing a maximum of 0.1 per cent sulphur. This compares well to the heavy fuel oil used on site, which has a typical sulphur content of 1.0 per cent.

The plant will operate continuously throughout the year and will be designed to have a minimum net operational life of 30 years.

The Ministry of Labour and Social Insurance will approve all environmental controls at the plant and all emissions must be within limits set in the licence to operate the plant.

During natural gas firing emissions of oxides of nitrogen (NO_x) will be controlled by the use of Dry Low NO_x Burners. The flue gases from each gas turbine will be discharged via a dedicated 75 m stack. A 25 m blast stack will also be provided for each gas turbine. During distillate fuel oil firing the emissions of NO_x will be controlled by water injection. The control of NO_x emissions is in accordance with the Best Available Techniques (BAT) requirements of the Large Combustion Plant Draft BAT Reference (BRef) Note.

Water will be treated in a water treatment plant for use as make up water for the heat recovery steam generator (HRSG) to compensate for boiler blowdown, water injection for NO_x abatement during distillate fuel oil firing and periodically for gas turbine compressor washing. Therefore on a day to day basis the main requirement for treated water will be for HRSG make up.

The construction phase is due to commence in July 2006, with a target date for take over in approximately 2009.

Air quality

Dust may be generated during several activities associated with the construction works, for example during site clearance, excavations and earth moving operations. It is very unlikely during most weather conditions and using the proposed dust mitigation measures that dust generated at the site will cause nuisance at residential properties in the area.

During the operation of the CCGT plant the principal atmospheric emissions of concern will be the oxides of nitrogen (NO_x). When operating on natural gas emission levels of NO_x will be maintained below 50 mg/Nm^3 (24.4 ppm) at ISO conditions. When operating on distillate fuel oil emission levels of NO_x will be maintained below 120 mg/Nm^3 at ISO conditions. This is in accordance with the Large Combustion Plant Directive (2001/80/EC) and BAT requirements for such plant. The sulphur content of natural gas is negligible. The sulphur content of distillate fuel oil is limited to 0.1 per cent by Directive 1999/32/EC from 2008, however the actual content may be lower.

EAC have two continuous monitoring stations to monitor ambient pollutant levels in the Vasilikos area. EAC have no plans to instigate further monitoring as the existing monitors will monitor ambient air quality before and during construction and through at least the first year of operation of Phase IV.

The atmospheric dispersion of the emissions of NO_x and SO_2 from the CCGT plant has been modelled and the ground level concentrations calculated and compared to the relevant standards whilst considering baseline levels due to Phases I, II and III of Vasilikos Power Station.

The modelling exercise has shown that the emissions from the proposed plant will not impact significantly on local air quality. The further monitoring undertaken by EAC will confirm this.

Water quality

The discharge of any effluents during construction, including site drainage, will be the responsibility of the Contractor who will reach agreement with the relevant Ministry with regard to the detailed methods of disposal. Standard good working practices should ensure that any impacts due to the water discharging from the site would be insignificant.

During operation water required for boiler water make-up, injection to control NO_x during oil firing and periodic gas turbine compressor cleaning will be taken from the existing water supply to the site while water required for the cooling system will be abstracted from the sea in accordance with current cooling arrangements.

On a day-to-day basis, the effluent produced by the CCGT plant will comprise a small increase in the effluent from the existing water treatment plant serving the overall Power Station. This effluent will be discharged in accordance with existing arrangements.

Any areas of the site that are likely to be contaminated with oil will drain to oil interceptor(s) to limit the oil in water content to below 10 ppm. This surface water, with surface waters from non-contaminated areas, will drain to the existing surface water system. Sewage will be discharged to the local sewerage system.

The arrangements for water usage and aqueous discharge are in accordance with the BAT requirements for Large Combustion Plant.

Noise

Environmental noise levels have been predicted for a further two proposed 170-220 MW natural gas fired CCGT unit at Vasilikos Power Station in Cyprus, using computer modelling techniques.

The proposed development is part of an ongoing expansion of the power plant which is being developed in phases, with each phase comprising one or more power generation units.

An assumption has been made for Phase IV that noise control treatment will be introduced on all significant noise sources due to the proximity of residential and tourist areas, although it should be noted that the nearest of these (Governor's Beach) is approximately 1.5 km from the proposed site.

In accordance with the BAT requirements for Large Combustion Plant the following noise control treatments will be included in the design of the plant:

- Gas turbines, steam turbines and generators housed in acoustic enclosures;
- Low noise fans at enclosure ventilation;
- Cladding on steam turbine support structure;
- High level stack silencers; and
- Boiler feed pumps housed in enclosures.

An assessment of the noise impact of Phase IV has been completed in accordance with procedures outlined in BS 4142:1997 "Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas".

The residential locations chosen for the evaluation have been agreed with the Competent Authority and are the same as those used for the Environmental Impact Assessments for Phases I, II and III. Measurements have been taken of current background noise levels (with Phase I in operation) during the most sensitive night-time period in addition to the daytime and evening periods.

Recommended Phase IV plant noise limits are given, based on achieving the overall plant environmental noise limits specified in the original Environmental impact Assessment for the plant.

The level of noise control assumed on this project is extensive and has been based on achieving these limits.

Visual impact

The site is situated at the existing Vasilikos Power Station on the south coast of Cyprus. The area immediately surrounding the power station can therefore be considered to be an existing industrial area.

The proposed CCGT plant is considered to be made up of three elements; the boilers, at a maximum of 20 m high, the blast stacks at 25 m high and the main 75 m stacks. Each CCGT unit will comprise two gas turbines, two boilers and four stacks. The CCGT plant will have a modern appearance with a clean outline and a simple bold structure and will be viewed in the context of the existing power station buildings.

Traffic and infrastructure

Vehicular access to the proposed site is good with access being via the Limassol/Nicosia road.

The large construction work force could result in a maximum of 120 vehicles travelling to the site during peak times. Measures will be taken to minimize the number of traffic movements such as use of minibuses to transport the workforce.

In addition to staff transport movements, construction will include civil works traffic, mechanical works traffic and heavy and abnormal loads. Approximately 10 light vehicles per day and 20 heavy commercial vehicles per day on average would be expected to visit the site. Approximately ten

abnormal loads are expected over the construction period. The timing and routing of these loads will be agreed with the relevant authorities.

Socio economics

A peak construction work force of 600 is expected, a substantial proportion of which, it is hoped, will be recruited from the local area.

The operational workforce of the CCGT plant will comprise skilled staff, it is envisaged that a good number of these will be from the local community.

Ecology

The site is in an existing industrial area with no ecological value.

Cultural heritage

The site has no archaeological value.