

Kick-off Meeting, Torquay, 11-12/10/2004

**MICROCHEAP: The Integration of Micro-CHP and
Renewable Energy Systems**

CONTRIBUTION OF NTUA

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Laboratory of Steam Boilers and Thermal Plants

The Laboratory has been working for the last 20 years on the following subjects:

- Combustion process in conventional and non-conventional steam boiler furnaces and heat transfer phenomena on the exchange surfaces of steam boilers
- Formation of pollutants and technologies for their reduction
- Computational simulation of heat transfer processes, combustion phenomena and the formation of pollutants
- Energy savings from Thermal Power Plants
- Process simulation and development of advanced cycles for power generation.
- Development of new technologies and combustion systems such as solid fossil fuels and biomass combustion in a Fluidised Bed, Fuel Cells, hydrogen technologies, carbon capture and sequestration technologies
- Testing and checking of efficiency and exhaust gas quality of heating systems
- The Laboratory is since 1996 a Notified Body for the certification of boilers

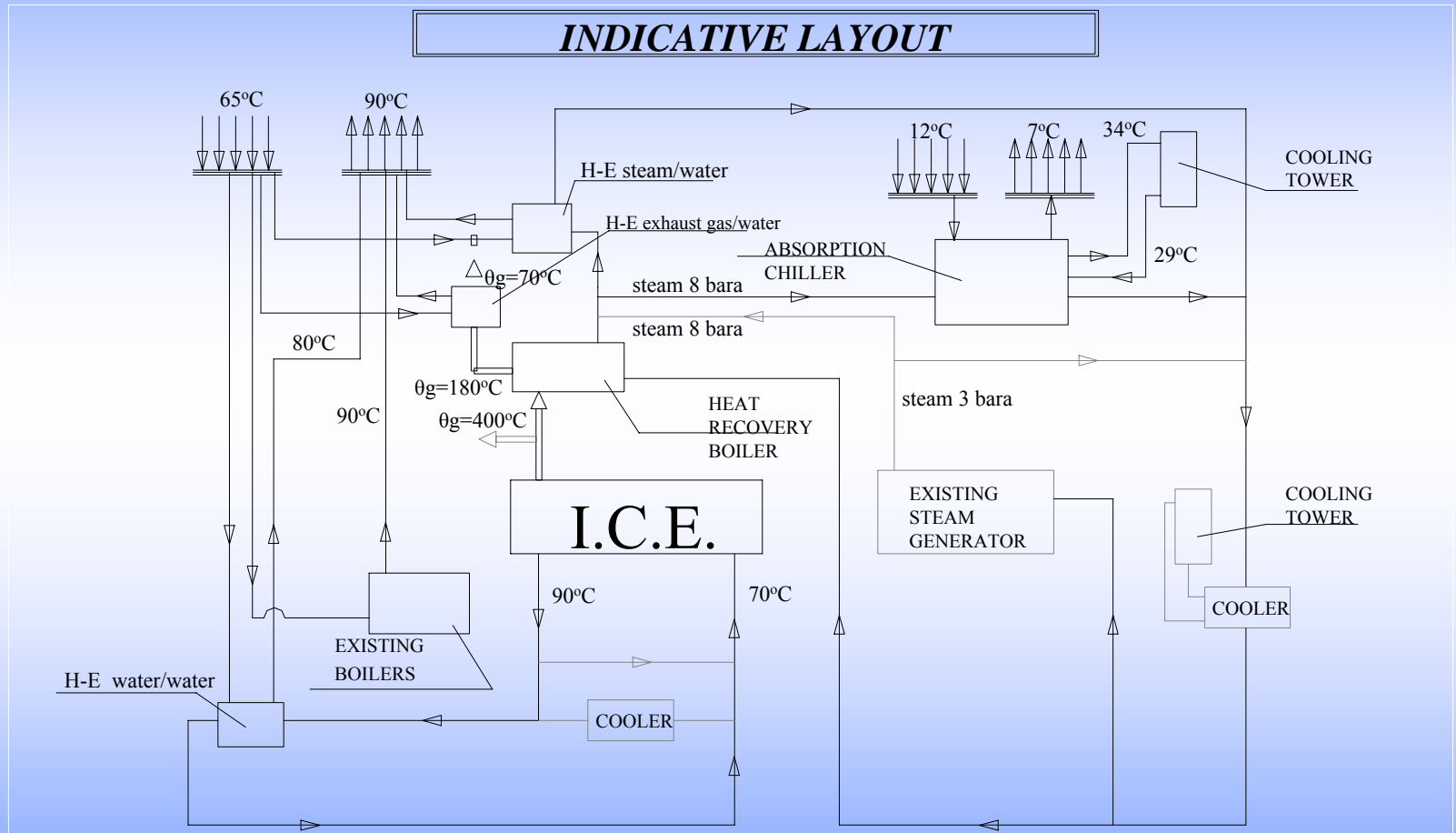


Existing Infrastructure – Facilities of NTUA/LSB

- **Test field of central-heating boilers.** The facility is suitable for testing central heating boilers fed with solid, liquid or gas fuel with a maximum nominal heat output up to 400 kW. The scope of the boiler test is to provide EC type examination Certificate as well as to provide the certificate of conformity. The control-laboratory operates according to the European norms EN 45001, EN 45011.
- **Thermal power station with nominal power 2.5 MW_{th} for electricity and heat generation.** The power plant is being used for educational purposes as well as for the assessment of various types of additives into light oil (Diesel) and heavy oil (Mazut), aiming at the improvement of the combustion process which has a direct effect on emissions reduction.
- **Unit of measurements.** The laboratory has the necessary equipment to support all its activities: the certification of central heating boilers, the assessment of various types of combustion improvements and the control of combustion systems. A modern measurement unit is also used for analyzing the formation of combustion gases, including:
 - ↓ Gas analyzers [O₂, CO₂, CO, SO₂, N₂O, C_xH_y, NO, NO₂ and NO_x]
 - ↓ Apparatus for soot level measurement
 - ↓ Apparatus for flue gas acid dew point measurement
 - ↓ Apparatus for gravimetric determination of dust load.
- **Cogeneration Plant (1600 kW_e).** The Plant covers electricity, cooling and heating needs of NTUA



Cogeneration Plant - NTUA/LSB



Research Projects of NTUA/LSB

NTUA/LSB has participated in a large number of research projects partially funded by the E.U. and national organisations, in co-operation with other Universities and companies:

➤ JOULE I, II, III, Thermie Action A, Thermie Action B, TMR, INCO, LIFE, FP5, FP6, ECSC, ALTENER, PEPPER, General Secretariat of Research and Development, EPER, MEM, National Programmes Financed by the Ministry of Development, INDUSTRIAL PROJECTS, Studies for Power Public Corporation (PPC), Boiler efficiency measurement tests, Hot water heating boilers design, Oil fuel combustion additives tests, Cooperation with the Hellenic Standardisation Organisation (ELOT), Cooperation with the Hellenic Register of Shipping S.A. and the TUV of Hellas (RW TUV) S.A., Cooperation with Hellenic and foreign industries, Cooperation with Public Services, Third Party Services

➤ Some recent projects :

- The Cooled Gas Turbine – A Demonstration of Innovative Gas Turbine Technology (EI/1105/98)
- Combined Cycle Power Plant with Integrated Low Temperature Heat (LOTHECO) (Project No: NNE5-1999-20053)
- Research and Development of high efficiency components for an intercooled, recuperated CHP gas turbine for Combined Heat and Efficient Power (CHEP) (Project No: NNE5-1999-20085)
- Sustainable Development of Croatian Capacity in CHP Sector (LIFE 00/TCY/CRO/084)
- Innovative In Situ CO₂ Capture Technology for Solid Fuel Gasification (ISCC) (SES6-CT-2003-502743)
- Upgrading of High Moisture Low-Rank Coal to Hydrogen and Methane (C₂H) (RFC-CR-03009)
- ENCAP and CASTOR FP6 Integrated Projects
- HYSOCIETY Accompanying Measures Project (Project No: NNE5-2001-641)
- BIOCELLUS project dealing with SOFC with allothermal gasification of biomass



NTUA/LSB - NETWORKS

Network of Laboratories (Labnet)

“Improvement of the Methodology of Efficiency Measurement for Domestic Boilers – Dir. 92/42.”

MEMBERS: Danish Gas Center, ARGB, BBRI, Caradon Heating Limited, CTIF, CERUG, CETIAT, DGP, DVGW, EMPA, GASTEC NV, GASUNIE, Hepworth Heating Ltd, NTUA, Repsol Butano, Swedish National Testing and Research Institute, TNO, LT-Ulg. VTT, Italgas.

EQEM Thematic Network

“Comparative emission measurements of air polluting compounds to improve E(nvironmental)-Quality.”

MEMBERS: TUV Austria, VITO (ISSeP), Dk-TEKNIK, JRC-EI-ERLAP, VTT, INERIS, UMEG, NTUA, FORBAIRT, CISE, KEMA, Kjelforening – NORSK ENERGI, ISQ, INERCO, IVL Swedish Env. Research, EMPA, AEA Technology.



CONTRIBUTION TO THE PROJECT

- **WP2: Elaboration of the current state of the art and market size**
 - ↙ Study of market trends within Southern Europe and projected future market scenarios. Compilation of a comparative price list of technologies competitive to renewable micro-CHP (month 12)
- **WP3: Mapping of current research activities and centers of excellence**
 - ↙ Aid in survey of research activities in Southern European universities and research institutes (month 12)

