Module 2:

Decentralized Energy Production

First Part: Cogeneration

Scientific Director: Stefano Campanari

Description

The diffused electric and thermal energy production by small size generators, powered by fossil or renewable sources, is an overturning of the technological and cultural paradigm that has led the energetic system growth, historically based on the electric generation centralization.

Today, the use of medium or small generation systems, especially cogeneration (combined heat and electric energy production) is aimed to a more rational use of energy and also to the possibility of reducing the CO_2 emissions in the atmosphere. A large scale diffusion of these systems, in the industrial field and also in new branches of the tertiary sector and the residential one, is conditioned by the performance of the new paradigm of the “embedded generation”. The distributed generation, structurally integrated in the built environment, creates a new kind of energy interdependence between plant and building; due to this fact, the rules for project and renovation are being updated, following the European Directive on energy saving in buildings.

This constitutes a system variation, and so the problems to be faced are large and complicate. They cover several aspects: technological (new generators, their connection to the system, their regulation, their integration in the built environment), concerning regulation, economic, financing, organization and also cultural.

In this module the technological aspects connected to cogeneration and micro cogeneration diffusion are thoroughly analysed. The aim is to give an exhaustive frame of the progress report in the energy sector, but also of the problems connected to the development of the distributed generation. During the module space will be given also to the geothermal generation and thermovalorization. Finally, the module deals with the analysis of the possible development and the problems of technologies that use hydrogen, a possible clean energy vector of the future. The module addresses to technicians (who deal with project and verification) but also to planners.

Programme

- Hydrogen: properties, technologies and perspectives
- Industrial cogeneration

- Small scale cogeneration and micro cogeneration (civil and tertiary)
- Fuel cells, gas microturbines, i.c. engines, ORC engines
- Tri-generation
- Tariffs and regulation issues
- Electrical aspects of the distributed generation
- Thermovalorization of waste
- Geothermics

Second Part: renewable sources

Scientific Director: Mario Gamberale

Description

Renewable sources represent one of the main options to reduce the impact of the energy sector on the environment, especially after the decision of the European Council to accelerate the penetration of the renewable sources, with the aim to reach by 2020 the 20% quota of the energy needs.

The second part of module B deals with this subject, giving an overall idea about the legislation level both in Italy and Europe. It introduces the general principles on which the energy production from renewable sources is based on, and it also goes through technologies for energy production, beginning from the six renewable sources that the European Directive 77/CE/2001 recognizes: solar, wind, tidal-power, hydraulic, geothermic and biomass.

Programme

- International renewable sources (FER) frame
- FER incentives
- Investments analysis and costs-profits analysis
- Hydro electric (mini hydro)
- Biomass chain
- Wind: micro, mini and large size
- Solar thermal and thermodynamic
- Photovoltaic technology and incentives
- Tidal-power plants