Sustainable Energy Policy and Strategies for Europe

October 28-31, 2014 in Rome, Italy
LUISS University of Rome

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ABSTRACT SUBMISSION DEADLINE **JUNE 1st, 2014**

The Conference Objectives

As Europe strives to overcome the economic crisis, energy stands out both as a conditioning factor and as an opportunity. The energy situation is evolving in Europe as well as in the rest of the world, where new actors, the emerging economies, are taking the leading role. Political developments in several areas of the globe (North Africa and Middle East, the Caspian region, ASEAN countries) are reshaping the geopolitical situation, generating some worries about the security of supply in the EU countries.

The crisis has somewhat released the pressure on energy demand and allowed to reach objectives in the reduction of greenhouse gas emissions that seemed out of reach, but as the European Energy Roadmap to 2050 makes clear the objectives for 2020 and beyond are likely to require a renewed, powerful effort as soon as the economy is back on the track.

Important steps towards the establishment of a really open and competitive energy market in Europe have been achieved, but much remains to be done. Energy technologies (as evidenced in the SET-Plan) have evolved and contributed new solutions, as in the case of non-conventional hydrocarbon resources, but this has happened more as gradual step-by-step improvements than by real breakthroughs. The evolution of these technologies has been influenced by the instruments adopted by governments to promote new sources or new solutions rather than directly by market demand. The use of "market instruments" to steer the energy choices in the direction of sustainability is the subject of animated discussions, based on the analysis of diverse case studies. The hope of obtaining reductions of energy costs by these means has been often frustrated.

Some sectors show difficulties in moving in the right direction (in terms of economy as well as sustainability): the outstanding example is the transport sector, where, apart from the improvement of the efficiency of vehicles, there is little sign of moving from the present paradigm (with private prevailing over public transport, road over track and waterways,) and sporadic attempts are done to reduce the need of displacements (both of people and of goods). Another sector which is meeting institutional rather than technical difficulties is the building sector, especially as concerns distribution of costs and revenues among the different actors.

The first (dual) plenary session of the Conference will be devoted to the European Energy Road Map to 2050, and to the response to environmental challenges.

The next plenary sessions will deal with the specific energy aspects of transportation, and to the efficiency of energy utilisation in buildings. The last two plenary sessions will be devoted to energy geopolitics and emerging countries, and to the regulation of energy markets.

The 14th IAEE Conference will try to discuss all the issues related to European policy and its new perspectives in 8 plenary and 40 concurrent sessions that will be organized by the **AIEE- Italian Association of Energy Economists and IAEE - The International Association for Energy Economics**, in cooperation with the **Guido Carli Free International University for Social Studies - LUISS**, that will host this conference.

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INVESTMENT PLANNING AND OPTIMIZATION OF URBAN AND RURAL HYBRID ENERGY SYSTEMS

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Overview

The key question of planning energy infrastructure for energy supply companies is whether to invest in new plants or maintain and optimize operation of existing power plants, energy grids and to implement also innovative technologies on the demand side. Based on this question, energy supply companies and local/ regional governments have to consider alternative solutions across traditional supply and demand sectors and make plans for the total integrated energy infrastructure (Bakken et al. 2007).

Until now, energy infrastructure e.g. electricity, natural gas and heat grids are planned and operated usually independent from each other. This is not least due to the implementation of unbundling rules in competitive energy markets, where market participant maximizes it individual benefits and profits. Due to this reason the full potential is not necessarily fully exploited of both power plant portfolio and grid energy operation. Therefore synergies as long as they are compatible with the implemented regulations and market rules, are envisaged in this paper.

Methods

This work develops an optimization model to minimize the energy system's total costs. The method uses a steady-state power flow model and optimizes to the cost-minimal investment. It is based on the multi-grid approach and the modelling of energy hubs according to (Schulze 2010; Kienzle 2011; Geidl 2007). Energy hubs are a simplification of an urban or rural area (i.e. it is an abstraction of a spatial area). An energy hub is characterized by a production capacity, energy consumption and storage capacity. Different energy hubs are connected by grids. Mathematically, energy hubs are formulated by a multidimensional linear system. These predefined energy sources are grid conducted energy sources (e.g. electrical, natural gas and heat grid) as well as stationary energy sources (e.g. coal or biomass).

The proposed model is formulated as a mixed-integer linear optimization problem which minimizes investment and operation costs. The existing energy infrastructure as well as different systems of energy hubs are modelled and compared by costs over a period of time (typically 20-40 years into the future). The work does not present an empirical study of a test region but shows the model's functionalities via test cases.

Results and Conclusions

The expected results of the investigated cases shall indicate optimal investment strategies differentiated by technology, energy carrier, supply/demand pattern, and others. It also determines the optimal technology portfolio and optimal investment trajectory as well as the optimal dispatch of existing and new power plants over the predefined planning horizon. Energy prices are used, among others, as sensitivity parameters. E.g. it will be shown that a high dynamic in energy price increases the risk of an investment in production facility and grid infrastructure.

References

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