

# **Analysis of Resource Profile and CO<sub>2</sub> Emissions of the Electricity Generation Sector in Turkey within the Framework of a MARKAL based Bottom-Up National Energy Model**

**İlhan Or and K.Büşra Yilmazer**  
**Department of Industrial Engineering**  
**Boğaziçi University**  
**Bebek 34342, Istanbul, Turkey**

## **Abstract**

This study focuses on the analysis of Turkish energy sector through the MARKAL, a technology detailed bottom-up modeling system, which balances supply and demand of the energy sector. MARKAL minimizes the total discounted energy system cost over the planning horizon by using a comprehensive database that contains detailed characteristics of all primal energy resources, energy carriers, final energy demands, as well as related emissions, technological and economic parameters specific to each technology. In this presentation, a MARKAL based model of the Turkish energy sector will be discussed, while giving special emphasis to the electricity generation sector. For this reason, especially electricity power generation plants are analyzed in order to enrich the technology options of the model. The base scenario, that determines the least-cost combination of technologies and/or resources and satisfies end-use demands by taking into account the environmental and policy restrictions, is generated. After running the base scenario as reference, alternative scenarios for emission reductions are generated by applying carbon taxes or constraining the CO<sub>2</sub> emissions for the purpose of evaluating the impact of emission conscious policies on the energy sector and CO<sub>2</sub> emissions. Moreover, some other alternative scenarios are carried out regarding changes in fuel prices of some energy carriers or capacity and cost constraints of nuclear power and CCS technologies. The results of this study help to evaluate Turkey's energy profile of electricity generation sector and present the best combination of technologies. Also, analyses of these alternative scenarios provide significant benefits to policy makers about carbon mitigation strategies, key technologies for sustainable development and the future investment plans.