# Optimization-based analysis of a complex energy superstructure

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In this paper, a new optimization-based framework for design and operation of the renewable energy resources (RES)-based energy system is presented. We first generate RES-based energy superstructure which includes different sources (wind, solar, biomass) and various energy converser technologies along with different energy demands (electricity, hydrogen, fuels). We then develop a network optimization model mixed-integer linear programming (MILP) for the analysis of energy supply system. In this model, we include various constraints such as demand satisfy, energy flow conservation, limited capacity of technologies to minimize the total annual cost. We finally conduct different scenarios of future demand portfolio in transportation sector. We illustrate the applicability of the suggested model by applying to the problem of design of multi-energy supply problem in Jeju Island, Korea. In addition, we analyze the economic feasibility and the sensitivity of the key parameters on the total annual cost, such as unit price of biomass and efficiency or capital cost of related technologies.