

## Optimal Design of the Power Generation Network in California: Moving towards 100% Renewable Electricity by 2045

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**Abstract :** To fight against climate change, California government issued the Senate Bill No. 100 (SB-100) in 2018 September, which aims at achieving a target of 100% renewable electricity by the end of 2045. A capacity expansion problem is solved in this case study using a binary quadratic programming model. The optimal locations and capacities of the potential renewable power plants (i.e., solar, wind, biomass, geothermal and hydropower), the phase-out schedule of existing fossil-based (nature gas) power plants and the transmission of electricity across the entire network are determined with the minimal total annualized cost measured by net present value (NPV). The results show that the renewable electricity contribution could increase to 85.9% by 2030 and reach 100% by 2035. Fossil-based power plants will be totally phased out around 2035 and solar and wind will finally become the most dominant renewable energy resource in California electricity mix.

**Keywords :** 100% renewable electricity, California, capacity expansion, mixed integer non-linear programming

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