Design of Optimal Energy Supply Chain Network of Hybrid Renewable Energy System in Saudi Arabia Using Graphical Information System (GIS)

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The climate change caused by the increased level of atmospheric greenhouse gas has transferred a recent global research trend to a decentralized generation/distribution/storage of carbon-free renewable energy. Recently, The usefulness for Graphical Information System (GIS) has been emerged as for their potential for contributing geospatial analysis, however, a broad integration of GIS and energy system models is lacking so far. This study presents an optimal design of supply chain network of hybrid renewable energy system in Saudi Arabia using mixed integer linear programming (MILP), where GIS is applied to analyze geographical information and achieve suitability for constructing renewable plants of each area. MILP model is formulated for achieving optimal energy supply chain network using candidate renewable sites derived from GIS, where it considers energy demand satisfaction and energy transportation cost between sites. Finally, case studies on various demand and supply scenarios are conducted and computational result are compared with sensitivity analysis.