[*DEMAND RESPONSE PROGRAM DESIGN: ENVIRONMENTAL AND ECONOMIC PERSPECTIVES*]

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Overview

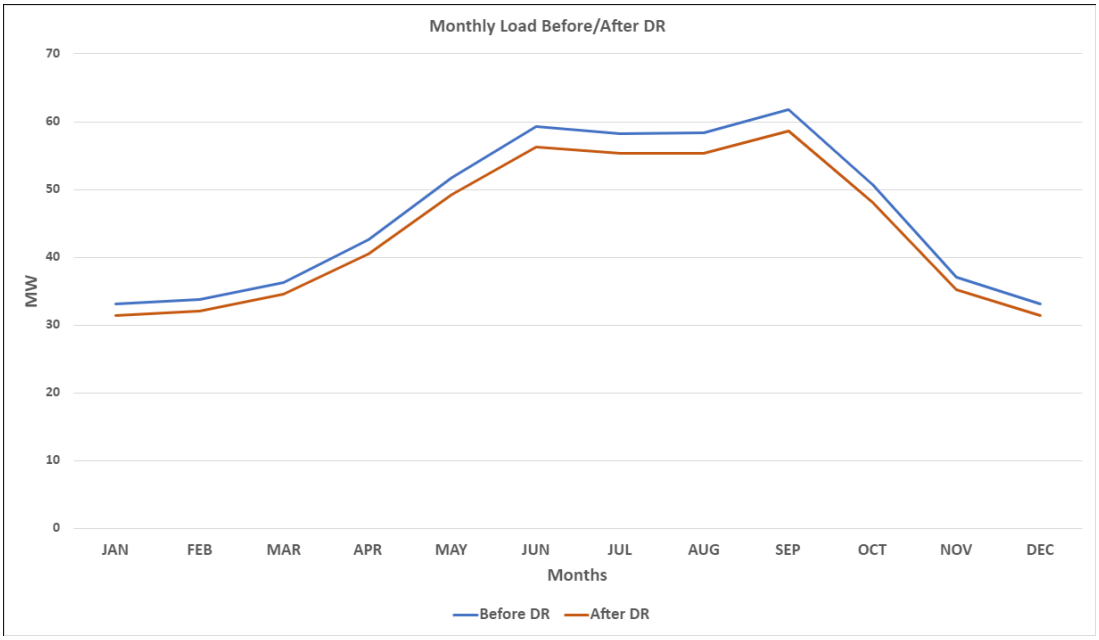
The increased use of energy leads to an increase in energy-related emissions. It is important to maintain Emissions from electricity generating units are under control by regulating the carbon footprint. Demand response (DR) refers to the modification of the consumption pattern on the part of the end consumer in a variety of ways and techniques. DR software has been developed to increase electrical system reliability by reducing peak hour loads. DR can provide economic efficiency and environmental benefits. This paper reviews the network in Saudi Arabia from generation to consumption and studies the economic and environmental effects of peak load before and after the application of a demand response program.

Methods

Designing a demand response program from an environmental and economic perspective, and using tools to reach the results.

Load data:

The loads will be used in Saudi Arabia for 2018, which was Approved by the annual report of the Water and Electricity Regulatory Authority[1]. The data was Extracted from the graph for download through the program (getdata Graph Digitizer) and The maximum value for each month was taken to work out the worst and highest load value ineach month, which will reduce the value of each month's peak loads by 5% Figure1 shows the peak consumption curve for each month of the year before and after the DR.



1- Environmental perspective:

The environmental perspective section contains data on environmental carbon emissions dioxide before and after application of the demand response, and contains miscellaneous environmental data showing the environmental impact of electrical energy consumption before and after the demand response program, as well as comparing emissions before and after.

2- Economic perspective:

The section contains cost-benefit analysis of generation, transmission and distribution of electricity based on the value of the load, by applying the laws of cost-benefit analysis. The construction and operational value of the stations is included in the calculation.

Results

The results shown in the table1 are a summary of what was provided economically and environmentally through the tools and equations that were used in each perspective.

parameter	amount
Energy Saving(kwh)	20868336
Peak Demand Saving (MW)	28.56
Metric tons Co2 Reduced	9036
Cost Saving (SAR)	4257140.544
Barrels of Oil Saving	28608

Conclusions

At the conclusion of the project, find that the demand response is economically and environmentally feasible, especially in the consumption network in which it grows like the Kingdom of Saudi Arabia. The demand response is environmentally feasible by reducing 28.56 MW and saving 9036 Metric tons of CO2. The demand response is economically successful by reducing the total cost by 4257140.544 SAR and saving 28608 barrels of oil. The difficulty and challenge were in collecting accurate data on the network and the load.Through the results of the study, it was found that the demand response is feasible, but it faces several challenges and incentives to implement them exceed the challenges. In the future work of the project, we will work on implementing all demand response programs on network in the Kingdom of Saudi Arabia and determining the most appropriate program of demand response programs to be implemented.

References

[1] ECRA Statistical Booklet 2018, Electricity & Cogeneration Regulatory Authority, Available: https://ecra.gov.sa/