



Figure 3. Effect of changing $Pr_{U TL}^+$ with a free System Cost and $Pr_{U TL}^- = 0.57$ (AED/KWh) on the objective value and the optimum number of panels.

5. Conclusion

An optimization approach has been proposed to equip decision makers with the available and feasible options for switching over to energy efficient photovoltaic system installations that can satisfy the ever-growing demand for electricity. Lingo 15.0 optimization software was utilized in this work to solve the optimization model.

An optimization model has been presented considering monthly average values of the load to be supplied, average output energy from the PV panels based on average peak sun hours for the UAE. Based on actual values of the parameters of this model from the case study, the PV system installation is not recommended unless the land rent cost drops to 30% of its actual cost or the purchased/sold energy prices increases to 1.1 [AED/KWh] from their actual values of 0.57 [AED/KWh]. The impact of this work will target the consumers toward renewable energy source for generating electricity rather than conventional use of burning fossil fuel and its impact on commercial and environmental impact. This work can be used for future study related to case by case implementation in residential properties i.e. implementation of optimized PV system for Villas in UAE.

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References

- Al-Salaymeh, A., Al-Hamamre, Z., Sharaf, F. and Abdelkader, M.R. (2010), "Technical and economical assessment of the utilization of photovoltaic systems in residential buildings: The case of Jordan", *Energy Conversion and Management*, Elsevier Ltd, Vol. 51 No. 8, pp. 1719–1726.
- Bortolini, M., Gamberi, M. and Graziani, A. (2014), "Technical and economic design of photovoltaic and battery energy storage system", *Energy Conversion and Management*, Elsevier Ltd, Vol. 86, pp. 81–92.
- Cucchiella, F., D'Adamo, I. and Lenny Koh, S.C. (2015), "Environmental and economic analysis of building integrated photovoltaic systems in Italian regions", *Journal of Cleaner Production*, Elsevier Ltd, Vol. 98, pp. 241–252.
- Hernandez, J.C., Vidal, P.G. and Almonacid, G. (1998), "IS (1998) 562-565", Vol. 5, pp. 562–565.
- Ren, H., Gao, W. and Ruan, Y. (2009), "Economic optimization and sensitivity analysis of photovoltaic system in residential buildings", *Renewable Energy*, Elsevier Ltd, Vol. 34 No. 3, pp. 883–889.
- Youssef, A., El-Telbany, M. and Zekry, A. (2017), "The role of artificial intelligence in photo-voltaic systems design and control: A review", *Renewable and Sustainable Energy Reviews*, Vol. 78 No. April 2016, pp. 72–79.
- Allaham, H.A. (2016). *Electrical Energy Management using Grid Connected Photovoltaic Optimized System: Application to a Data Centre in UAE* (Thesis). Retrieved from University of Sharjah

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