

Solar-Powered Smart Community

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Situation

- Dubai was a completely different city 20 years ago than it is now
- Sheikh Mohammed bin Rashid's vision for Dubai has improved and changed the city
- The population in Dubai has increased by 25% from 2008 to 2012 [1]
- Growth means energy usage
- Plans to turn Dubai into a Smart City by Expo 2020



Figure 1: Dubai before and now [2]

Problems

- Population growth has increased the power requirement causing a depletion in natural resources.
- The roads currently being used are made from bitumen and asphalt which not only is harmful to the environment but also to human health.
- Infrastructure integrating technologies will lead to a functioning, effective smart community.

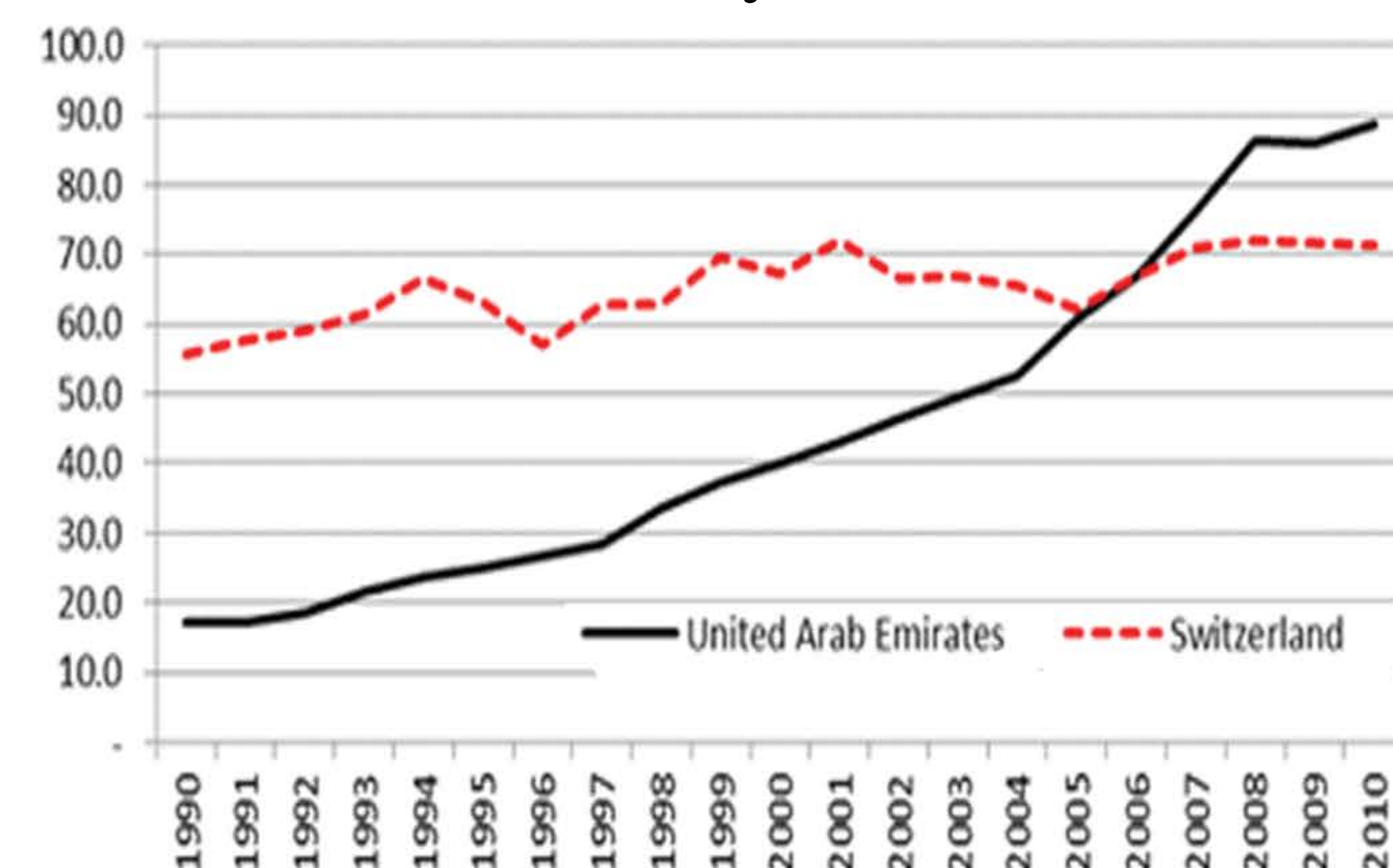


Figure 2: Electricity Generation 1990-2010 (tWh) [3]

Solutions

To build Smart Community in Dubai, in a conditions where there is dust, insufficient wind and hydroelectric generation. Our solution is to build a Smart Community model that will overcome these issues. Therefore our model consists of:

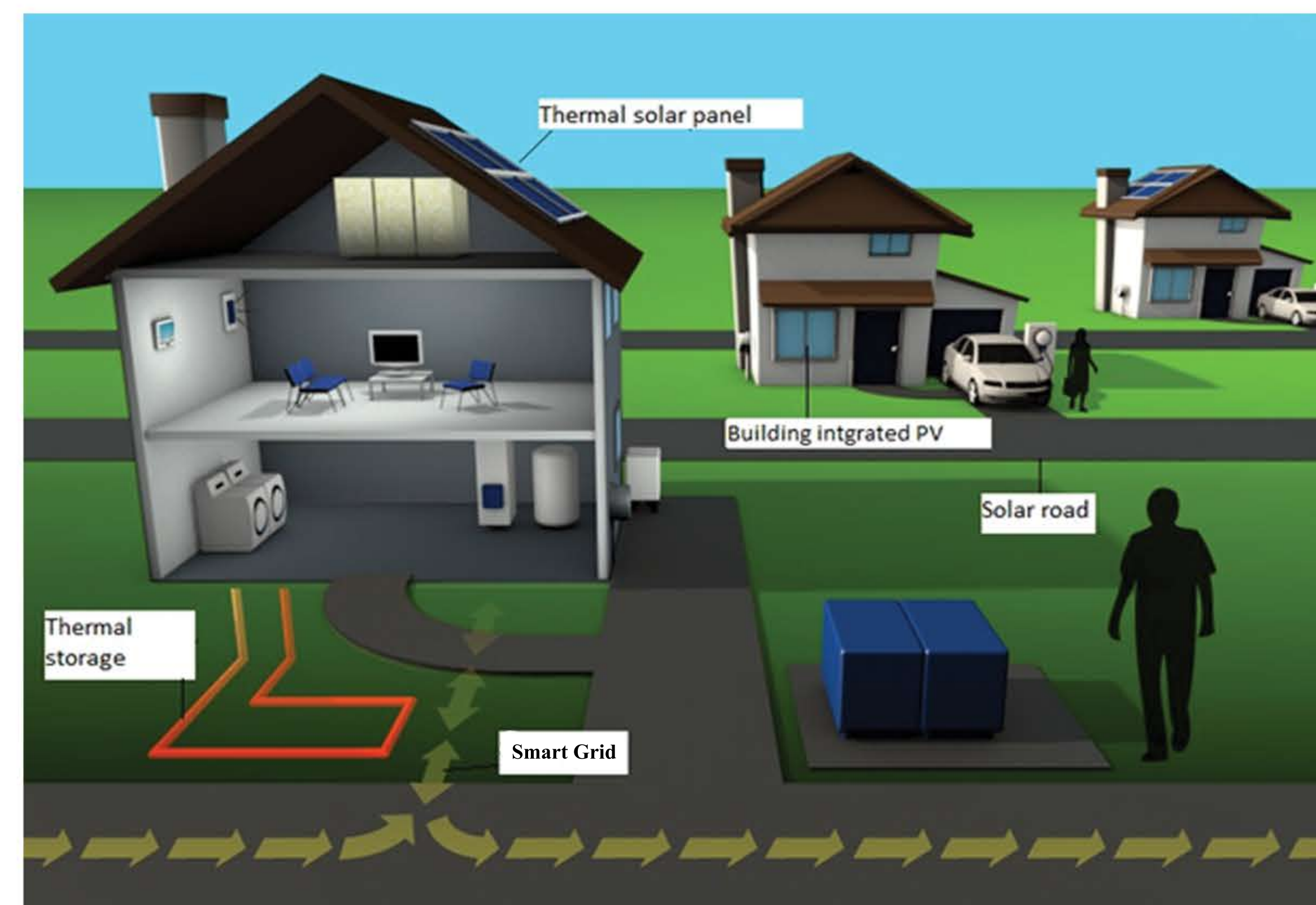


Figure 3: Solar smart system [4]

- Thermal solar panels: not affected by dust, Photo Voltaic (PV) panels are. The thermal solar panel will store the heat energy during day and convert it to electrical energy. Thermal solar panels higher in efficiency than PV panels
- Solar road: Reduce CO2 emissions, generate energy efficiency, solar road provide infrastructure for road sensors to monitor and lighten the road, give flexibility to modify or to change the roads line.
- Building integrated PV: type of building glass replaces windows in houses and provides alternative ways that help generate electricity, UV and IR filter, thermal and acoustic insulation, innovative design, reduces CO2 emission.
- Smart grid: connects and exchanges energy between different technologies and other communities, provides a ready infrastructure for new technology such as smart meters, gives real time measures of consumption, manages and monitors energy in case of faults.

Evaluation

The solutions have certain advantages and disadvantages in each case:

- Solar energy reduces the usage of limited resources such as fossil fuels and natural gases
- Solar roadways will decrease the usage of bitumen (asphalt) and that will lead into a decrease of pollution and harmful substances released
- Smart grids are an efficient way to connect all new technologies and distribute it among all of the community components. Smart grids are used to avoid natural disaster disruptions, so there will be minimal power outages because of the ability of bypassing the outage by reprogramming the circuits

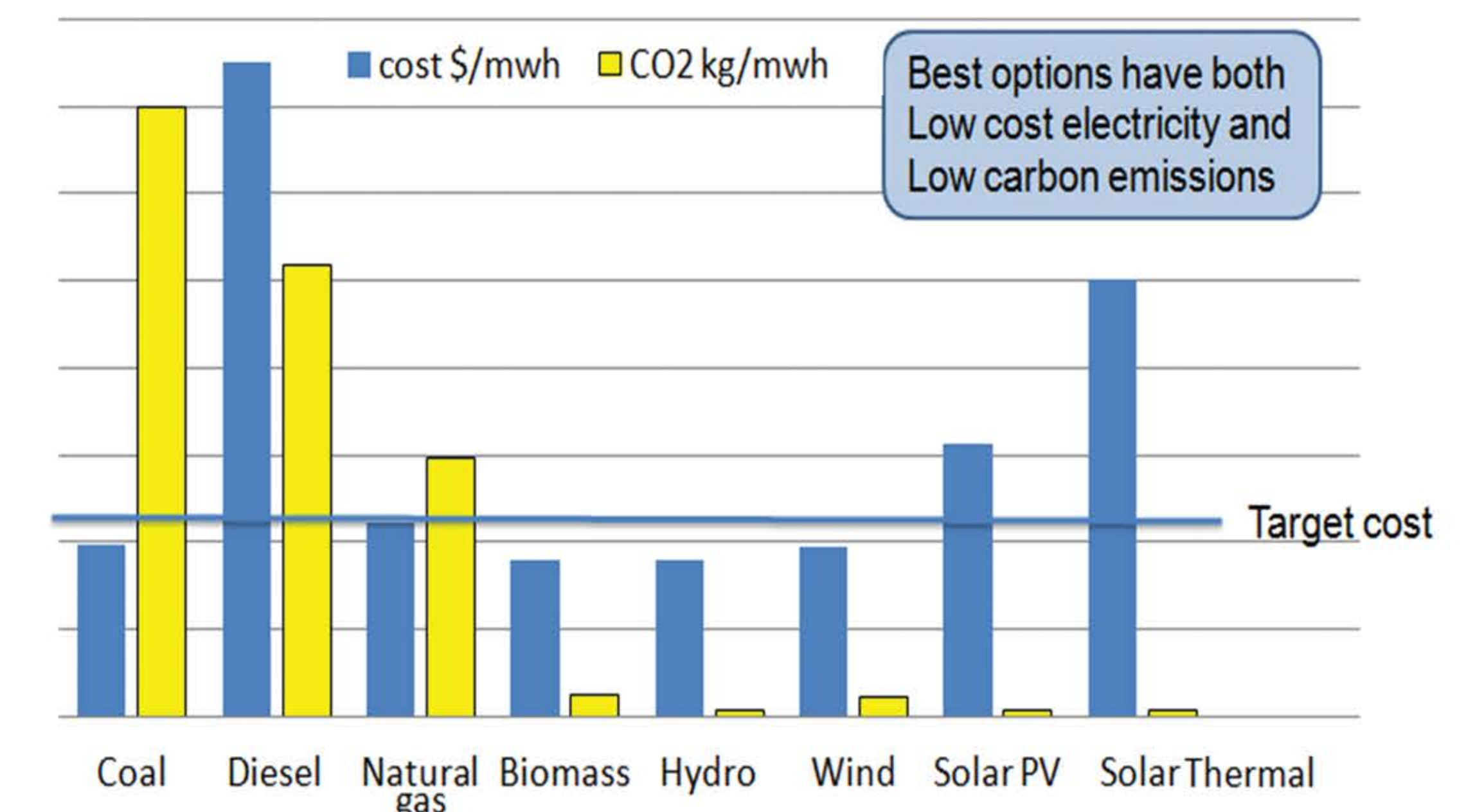


Figure 4: Electricity cost & Carbon Dioxide Emissions [5] per Kilowatt hour

References

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