

The economic viability of home solar cells as a future energy source

Conflicting advice is often published regarding climate change, particularly about the replacement value of energy sources and their related costs of production, both directly and indirectly (Bunker, 2018, p.138). However, one issue is patently clear and obvious: solar energy is available to use and with minimal concern for the production of polluting gas emissions (Aggarwal and Aggarwal, 2014, pp 1-3).

In the domestic setting, this energy source can be obtained by installing solar panelling and/or a battery system to store surplus energy produced that is immediately required. Furthermore, excess production may also be returned to the main electricity grid, and the dwelling is credited with the value of this transfer (Clean Energy Council, 2019).

In reviewing the economic viability of replacing any functional item, domestic or otherwise, common sense issues should be considered. About the home installation of solar cells as a replacement energy source for existing electrical or gas energy usage, the issues to be considered would essentially be:

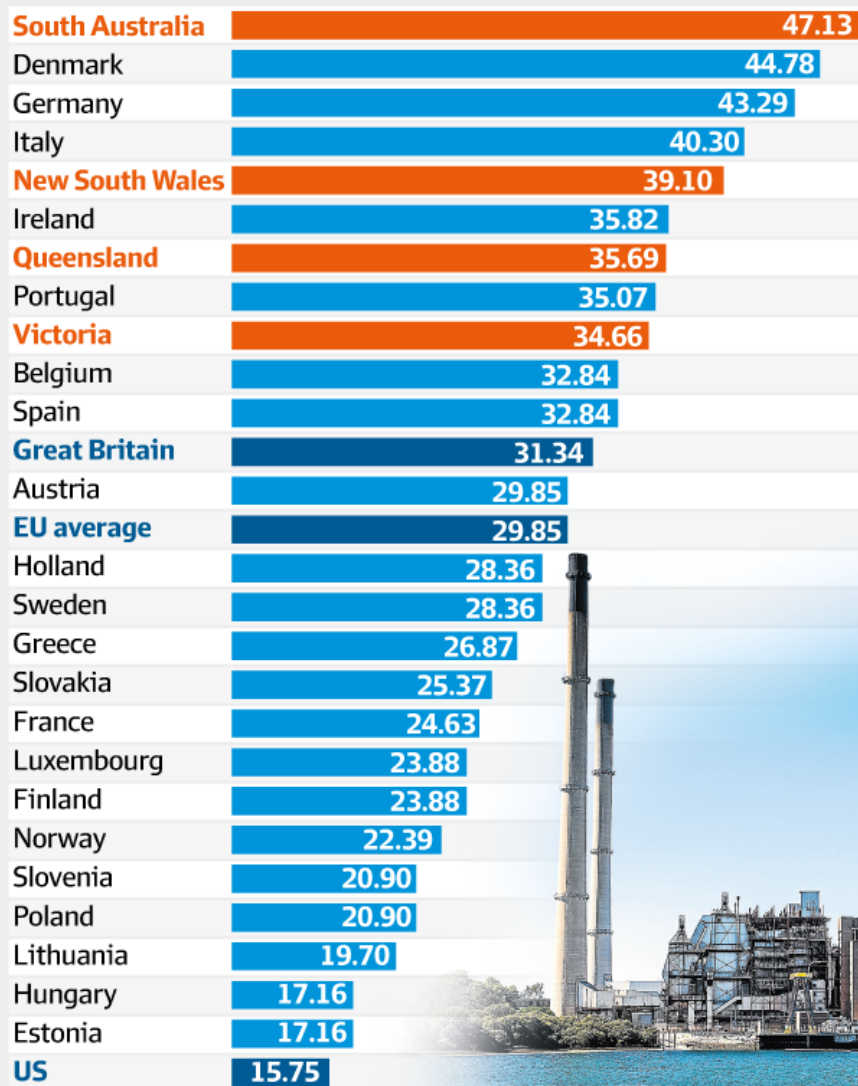
1. A knowledge of the current costs of the energy source presently used.
2. Advantages (or otherwise) of using solar cells to replace that energy source.
3. The costs of replacing all or part of an existing energy source.
4. What decision will be made as a result of these considerations?

1. Costs of current energy source

In most domestic dwellings, the energy source is via the electricity grid. Most homes are built with this connection already in place. All it takes to start using it is for a homeowner to establish an account with an electricity distributor and commence paying established rates (tariffs) which vary dependent on periods of use.

In 2017, the Financial Review suggested that: "Australian Households pay the highest power prices in the world". Consideration of this information should give impetus to considering what we are now paying for with a less expensive alternative.

Retail electricity prices of NEM states, including taxes, compared to selected countries (¢ per kWh)



SOURCE: MARKINTELL, US ENERGY INFORMATION ADMINISTRATION

Figure 1. Electric Shock! Retrieved from Financial Review: August 5 2017. Australian households pay the highest power prices in the world. Retrieved 29 September 2020 from <https://www.afr.com/politics/australian-households-pay-highest-power-prices-in-world-20170804-gxp58a>

This cost, for Queensland in particular, as estimated by the Australian Energy Market Commission (2018), is projected to produce an annual electricity bill of \$1295 for a typical residential customer for the years 2019-2020.

Part of this cost, however, would be due to externalities that the public may not be well aware of. These are well described by Biegler (2009) in his reference to “environmental and social costs that don’t appear in the market price of a product such as electricity”.

This emphasises the cost of greenhouse gas emissions (GHGs) and pollutants as a

component of electricity production. It is worth noting here the comparisons of these costs concerning other potential energy sources such as solar cell acquisition (Sims, R.E.H et al.2003, p.7)

External costs of some electricity generation technologies

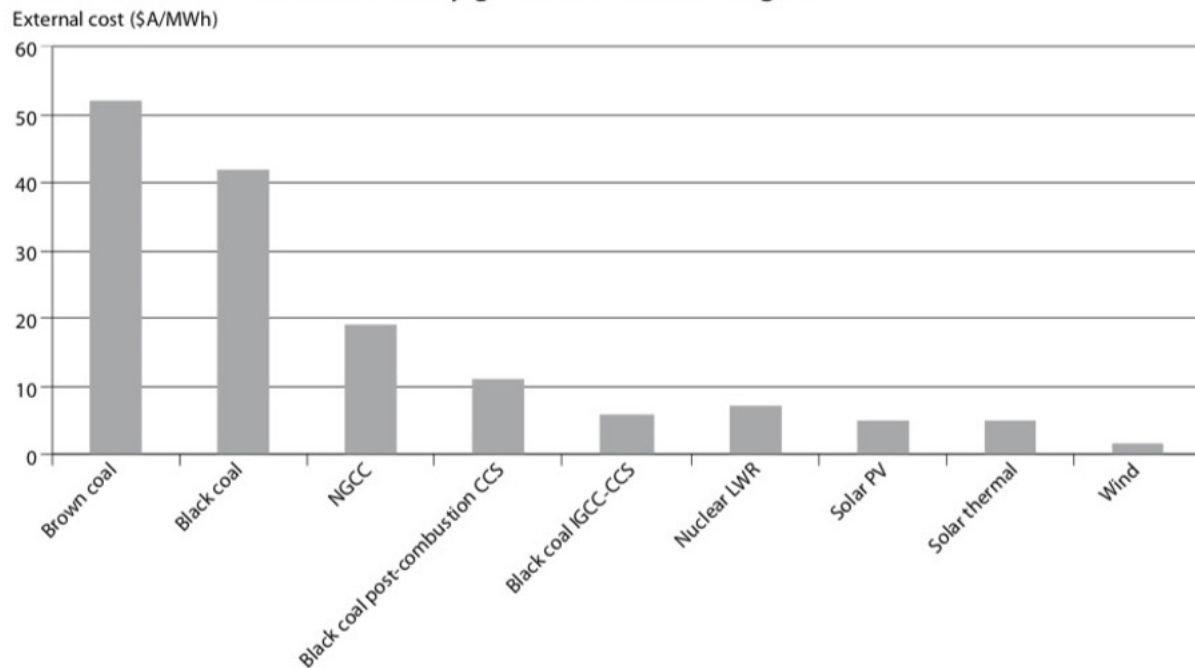


Figure 2. Comparison of external costs attributed to electricity generation technologies, viewed 24 June 2022, <Biegler, T., 2009. The hidden costs of electricity: externalities of power generation in Australia>

“The bars in the chart above represent the external costs of electricity generation, but the present wholesale price of electricity in Australia gives a context for the monetary valuations of these external costs”. (Biegler, 2009)

2. Advantages of using solar cells as a replacement energy source

- i. They offer clean, renewable energy producing no pollution by way of greenhouse gas emissions - as opposed to the pollution produced by organisations using oil and gas for electricity generation. Even so, there is a downside, albeit minimal, to the possible environmental impacts realised from

production and installation processes relating to the use of solar energy technologies (Tsoutsos, T. Et al., 2005, p. 291)

- ii. Batteries may store excess energy produced during the daytime for night-time use. The extra cost of this has to be factored into the cost of energy source replacement.
- iii. Reduction in electricity costs. A solar technology alternative can come close to eliminating existing costs and production of credit for returning excess energy generation to the electrical grid. Many homeowners with solar cells already realise credits on their current electricity bills (Clean Energy Council, 2018).
- iv. Reduced initial cost of solar hardware by government subsidies. The Clean Energy Council (2018) describes these subsidies' details thoroughly.
- v. Increased value of the dwelling. Solar-cell installations are viewed as an additional benefit to comfortable and economical living, like ceiling and wall installation. These benefits appeal to a dwelling with these features more attractive as a purchasing option. (Fares, R. 2015, p 3)

3. Cost of replacing all or part of an existing energy source

Based on the average household's energy usage estimated by the Australian Energy Market Commission (2018), a home with a 6kW solar-powered system could be saving the bulk of its present electricity bill. One Australian commercial outlet, "TheQuoteCompany" (2019), suggests as much as an 80% reduction in household energy costs after solar power installation. With many other solar retail organisations, the initial installation cost is approximately \$6000 after receipt of government subsidies. From this writer's experience, power bills are reduced significantly and drop by as much as \$300 a quarter, representing a \$1200 saving each year on earlier electricity charges. These figures indicate a considerable saving. However, the Department of Environment and Energy of the Australian Government offers several cautions in their Guide to Installing Solar for Households. These cautions are channelled through the Clean Energy Council (2018) and should be well-considered when choosing both installation required and the installer's ability and integrity.

4. Decision to be made on economic viability

It is clear that installing solar cell technology to augment, if not replace, an existing direct connection to the electrical grid is entirely viable financially.

Apart from the relatively short “break-even” cost of installation and use versus an existing connection drawing power from the electricity grid, there are other advantages to be gained, albeit most of a seemingly altruistic nature:

Summary

Solar energy is renewable, inexhaustible and emits no greenhouse gas emissions or other polluting products from existing non-renewable energy sources.

In particular, for those residential dwellings that are situated in more remote areas where connection to an electrical power grid is prohibitive and where other energy sources such as diesel and/or petrol-driven generation create polluting gases, solar cell technology provides an ideal alternative energy source in financial terms alone (Pittock, 2011. p 320)

References

Aggarwal, J. and Aggarwal, M.L. 2014. Harnessing Solar Energy for Every Home: Energy Saving Applications, Proceedings of the National Conference on Advances in Materials Science for Energy Applications, Dehadrun, India, pp 1-3.

Biegler, T. 2011. Australian Academy of Technology & Engineering: Hidden Costs of Electricity in Australia. ATSE. Parkville, Victoria 3052.

Bunker, B. 2018. The Mythology of Global Warming. Moonshine Cove Publishing, LLC. Abbeville, South Carolina, USA.

n.a. 2018. Australian Energy Market Commission. Residential electricity price trends 2018: S E Qld fact pack. Retrieved 29 September 2019 from <https://www.aemc.gov.au/sites/default/files/2018-12/S%20E%20QLD%20fact%20pack.pdf>

n.a. 2019. TheQuoteCompany. 2019. Solarmarket. Retrieved 29 September 2019 from <https://www.solarmarket.com.au>

n.a. 2018. Clean Energy Council. Guides: Buying Solar. Retrieved 29 September 2019 from: <https://www.cleanenergycouncil.org.au/consumers/buying-solar/guides>

Fares, R. 2015. Scientific American: Rooftop Solar Increases a Home's Selling Price, weblog, viewed 29 September 2019. <<https://blogs.scientificamerican.com/plugged-in/rooftop-solar-increases-a-home-s-selling-price/> >

Pittock, B. (2011). "Co-benefits of large-scale renewables in remote Australia: energy futures and climate change." *Rangeland Journal* 33(4): 315-325

Potter, B. and Tillett, A. 2017. Financial Review: Australian households pay the highest power prices in the world. Retrieved 29 September 2019 from <https://www.afr.com/politics/australian-households-pay-highest-power-prices-in-world-20170804-gxp58a>.

Sims, R. E. H., Rogner, H-H., Gregory, K. 2003. 'Carbon emission and mitigation cost comparisons between fossil fuel, nuclear and renewable energy resources for electricity generation, *Energy Policy*, Volume 31, Issue 13, October 2003, pp 1315 – 1326.

Tsoutsos, T., Frantzeskaki, N, Gekas, V. 2005. Environmental impacts from solar energy technologies. *Energy Policy*, Volume 33, Issue 3, February 2005, pp 289-296.