

Comparative energy technology costs

Fact sheet, December 2017

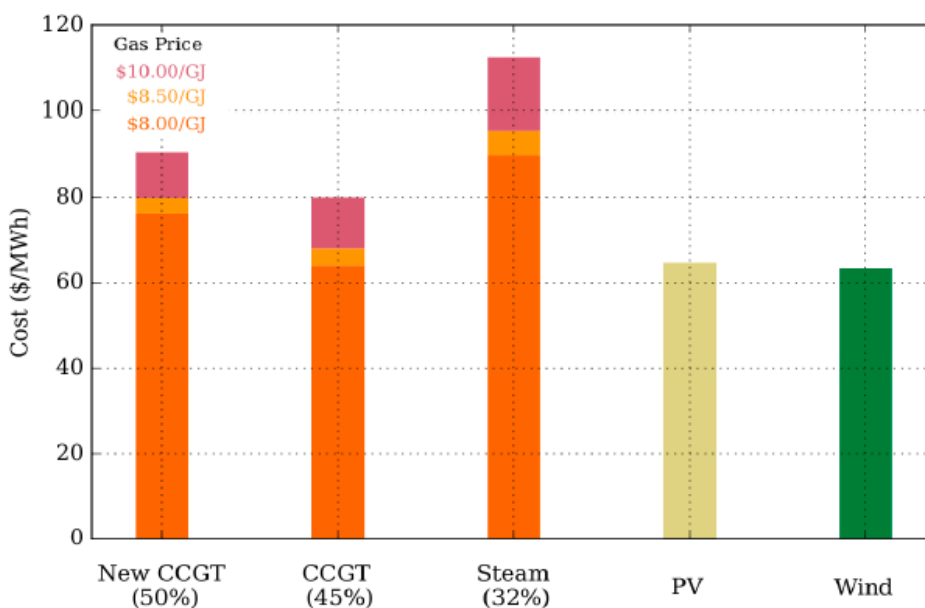
Key points

- Electricity from new wind and solar plants is now cheaper than from existing gas plants.
- Electricity from wind is cheaper than coal or gas, even with additional “firming” costs that ensure its availability 24/7.
- Solar thermal is cheaper than gas peaking plants for flexible dispatchable generation.

1. Electricity from new build wind and solar is cheaper than from existing gas plants

Providing electricity from wind and utility scale solar PV is already lower cost, even including capital costs, than from existing gas plants. The University of Melbourne analysis in Figure 1 shows that the cost of electricity from wind and solar, which includes the cost of capital, is lower than the costs of CCGT and Steam (thermal gas turbine) power plants that are already built and operating.

Figure 1: Comparison of costs (LCOE) of providing bulk energy with gas and renewable technologies



In Figure 1, New CCGT (combined cycle gas turbines), PV (solar photovoltaic) and wind all include the capital costs of building the plants. CCGT and Steam (thermal gas turbines) represent the cost of electricity from existing plants that are already built and operating.

Source: McConnell and Forcey (2017) *A short lived gas shortfall*

2. Electricity from wind is cheaper than coal or gas even with additional “firming” costs to ensure its availability 24/7

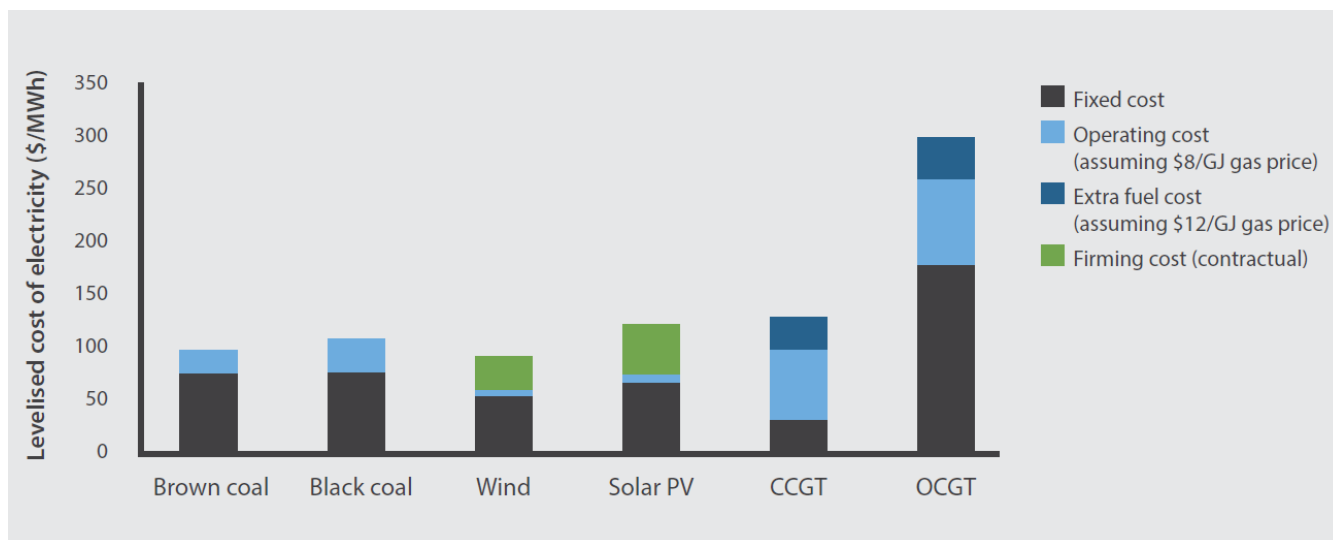
Firming capacity is the additional energy required to ensure that electricity is available when needed. For example, because wind power fluctuates with the amount of wind available, *firming capacity* can be provided by dispatchable sources to guarantee energy can be available at any given time. These dispatchable sources include solar thermal with energy storage, batteries, hydro or gas peaking plants.

The recent report by Australia’s Chief Scientist Dr Alan Finkel AO¹ noted that wind is cheaper than coal and gas plants, and utility scale solar is cheaper than gas, even with the additional cost of being supported by dispatchable firming capacity that removes variability (see Figure 2 below). The report refers to AGL analysis that only considered gas peaking as potential firming power. It does not consider solar thermal with storage or any other dispatchable source of generation.

AGL recently outlined its estimates for the cost of different fuels. AGL considers that a new wind farm supported by gas peaking generation (through the ‘firming cost’) to now be cheaper than new CCGT at a \$8/GJ price. A new solar farm supported by gas peaking generation would also be cheaper than new CCGT at a gas price of \$12/GJ.²

— Finkel (2017) (see Figure 2 below)

Figure 2: Implied cost of new generation



Source: Finkel (2017) *Independent review into the future security of the national electricity market* (based on AGL analysis)

¹ Finkel (2017) *Independent review into the future security of the national electricity market*

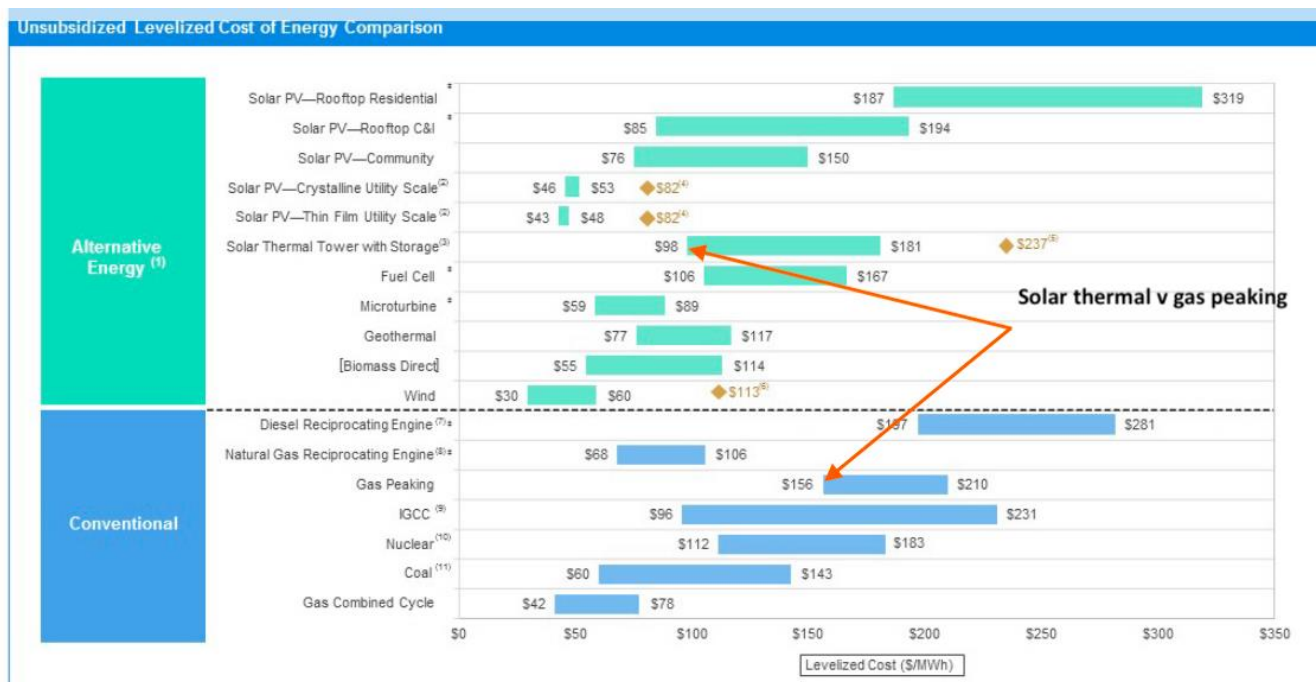
3. Solar thermal is cheaper than gas peaking for flexible dispatchable generation

As noted above, the Finkel/AGL analysis only considers OCGT (gas peaking) for firming power. It does not consider solar thermal with storage or any other dispatchable source of generation.

However solar thermal with energy storage provides similar – and in many ways superior – flexible dispatchable generation, and is now considerably lower cost than gas peaking plants.

In the 2017 Lazard’s Levelised Cost of Electricity (LCOE) comparisons, solar thermal with energy storage is as low as US\$98 per MWh (globally) compared to gas peaking from US\$156 per MWh (Figure 3 below).

Figure 3: Unsubsidised Levelised Cost of Energy Comparison



Source: Lazard (2017)