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Sungrid Limited – Summary of PV LCA Analysis by Andrew D. Moore

Life Cycle Assessment is “the compiling and evaluation of the inputs and outputs and the potential environmental impacts of a product system during its lifetime.” This study looks at the LCA results of a 1kWp monocrystalline PV system being manufactured overseas (Germany & China) then shipped to Australia and installed. It includes all the energy and materials inputs/outputs of the manufacturing and packaging processes of PV panels, inverters, racking, and BOS components. It also includes the transportation energy inputs to ship the equipment to Perth and then distribute to each capital region of Australia prior to installation.

Results:

Total Global Warming Potential	2078 kg CO ₂ -e
Primary Energy Demand	31873MJ
Water Consumed in manufacture	18000L
Water Saved over life of system	342900L
CO ₂ -e saved per year (Perth)	1572kg CO ₂ -e
GHG payback period (Perth)	1.32 years (2.11 years if all components made in China)
GHG payback period (Australia)	1.6 years
Lifetime CO ₂ -e mitigation (30 yrs)	45.1 t CO ₂ -e
GHG emissions per kWh (PV)	43 g CO ₂ -e
GHG emissions per kWh (Grid)	980 g CO ₂ -e
Energy payback time (Perth)	1.7 years
Energy Return Factor (Perth)	17.5

- The initial manufacture of the PV modules contributed 85% of the environmental impact.
- The majority (71%) of the Global Warming Potential (GWP) associated with the production of a PV module is related to the production of the solar cells. (Frame = 14%, Glass = 10%).
- The majority (79%) of the GWP associated with solar cell production is the production of wafers.
- The majority (53%) of the GWP associated with wafer production is the generation of electricity consumed in the process. (Silicon manufacture = 36%).
- For all locations in Australia, electricity produced by a PV system emits significantly less greenhouse gas emissions than electricity provided from the grid.

Reference:

Moore, Andrew D., *Life Cycle Assessment of a 1kWp Photovoltaic System Installed in Australia*, Murdoch University, April 2009.