

Measure: Commercial PV (G2a)

Increase uptake of both large and small commercial PV systems 25% year-on-year totaling installed new capacity of 520 MW and 3.2 MW by 2020 per category, respectively.

COT ARRA RFP Summary:

| | |
|---|--|
| Emission reduction potential by 2020: | 72,528 tCO ₂ e |
| Percentage of goal (2012): | 0.12% |
| Percentage of goal (2020): | 3.2% |
| Total annual average implementation costs per business (small / large): | \$2,012 / \$44,673 over 20-yr life |
| Entity that bears the costs of implementation: | Business or property owner |
| Savings per tCO ₂ e (small / large): | \$59 and \$41 / tCO ₂ e |
| Net annual savings per business (small / large): | \$2,012 / \$ \$10,591 over 20-yr life |
| Entity that realizes the financial return: | Ratepayer |
| Equitability (progressive/regressive, income/revenue neutral, etc): | Only applicable to business that participate |
| Potential unintended consequences: | Minimal |

Background information:

Solar electric systems, or photovoltaic (PV), convert solar radiation into useful forms of energy. Solar resources are most abundant in the southwestern US, therefore making this location the most applicable for large-scale implementation.¹ Decentralized commercial PV in Tucson provides business- and property-owners with clean, renewable energy that helps offset their building's fossil fuel derived energy needs while utilizing the region's most abundant natural resource.

When coupled with energy conservation and energy efficiency, this supply-side solution can lead to important GHG emission reductions, spur local business, and create jobs. The major obstacle to such installations is the large capital investment of PV systems.

The utility, Federal, and State incentives for both large and small commercial are a complicated business. These incentives vary by system size and are fluctuating per year. Moreover, there is a wide spread of system sizes in both categories. The discussion below highlights the current rebates and incentives for the size systems contemplated in this analysis and gives endnotes for further incentive literature.

Description of Measure and Implementation Scenario:

The carbon and economic analysis assumes small commercial installations are, on average, 23.4 kW PV systems producing 39,780 kWh annually and that large commercial installations are 200 kW systems, which produce 304,920 kWh annually.² These sizes are the median sizes of all commercial systems in TEP's service area.³

The implementation scenario to assumes a 25% increase year-on-year from the current totals of reserved and installed systems within TEP's service area.⁴

Has the Measure been implemented elsewhere and with what results?:

Solar energy, and the associated uptake in both residential and commercial markets, has been a topic of national and local energy policy for decades. The more topical discussion is around the future of implementation incentives and energy codes.

According to the International Energy Agency, regionally relevant *Key Actions* for the next ten years include:⁵

- *Provide long-term targets and supporting policies to build confidence for investments in manufacturing capacity and deployment of PV systems.*
- *[Continue to] implement effective and cost-efficient PV incentive schemes that are transitional and decrease over time⁶ so as to foster innovation and technological improvement.*
- *Collaborate across jurisdictions to reform local building codes and standards to facilitate PV implementation and integration.*

Energy/Emission analysis:

| Description | Input | Notes |
|--|------------------|--------------------|
| Expected annual electricity production of a typical commercial PV system (small/large) | 39,780 / 304,920 | kWh |
| Expected annual GHG savings per year (small/large) | 34 / 261 | tCO ₂ e |
| Commercial PV uptake | | |
| Installation increase per year above total current systems | 25% | Current systems: |
| Combined GHG mitigation potential over 10-year life of program | 72,528 | tCO ₂ e |

| Contribution analysis: | | |
|--|-----------|--------------------|
| COT 1990 Citywide GHG emissions (baseline): ⁷ | 5,461,020 | tCO ₂ e |
| MCPA 7% reduction target for COT: | 5,078,749 | |
| 2012 BAU GHG emissions projection: | 7,000,000 | |
| 2020 BAU GHG emissions projection: | 7,343,141 | |
| GHG emissions reduction to meet 7% goal (2012): | 1,921,251 | |
| GHG emissions reduction to meet 7% goal (2020): | 2,264,392 | |
| Residential PV- Increased Uptake | | |
| Contribution of G2a/c Commercial PV in 2020: | 72,528 | tCO ₂ e |
| 2020 Contribution of G2a/c Commercial PV (over 10-yrs): | 3.2 | % |

Economic analysis:

This analysis is completed from the business-owner perspective. For a complete listing of incentives and rebates, please see dsireusa.org.

| Description | Input | Notes |
|---------------------------|--------------------------|--|
| System cost per W | \$6.20 / \$6.74 | Small / large |
| Electricity costs per kWh | \$0.08 sml | Assumed to increase per this |
| Electricity costs per kWh | \$0.08 sml \$0.05 lrg | Assumed to increase per this report's Energy Forecast (see appendix) |

| | | |
|---|-------------------------|---|
| Capital cost of system | \$40K / \$1.35M | Small / large |
| TEP Upfront Incentive (small only) | \$46,800 | \$2/Watt |
| TEP Performance Based Incentive (PBI) | \$0.12 ⁸ | This rate is bid on |
| State rebate (10%- Max \$25K per location and 2 locations per business) | \$14.5K / \$50K | Small / large |
| Federal rebate | \$43.5K / \$404K | 30% of gross amount ⁹ |
| Upfront cost after rebates | \$40.2K / \$893K | Large commercial TEP rebate is paid over time |
| Life of analysis | 20 years | |

Based on the above inputs, the total savings to a small business owner installing a 23.4 kW PV system has a payback period under 12 years, and a large commercial installation has is paid back in under 17 years.

The small system has a savings of over \$42K over the 20-year life of the system, and the large system's savings is over \$211K over the same life. This results in the following **savings** per ton:

- Small commercial **savings** per tCO₂e = **\$59 / tCO₂e**
- Large commercial **savings** per tCO₂e = **\$41 / tCO₂e**

Co-benefits:

Installation of PV systems cushion owners from fossil fuel rate spikes. Moreover, incentivizing accelerated uptake of clean technology can help spur the local economy and small businesses. It also helps in job creation based on the new demand for skilled and knowledgeable electricians. Lastly, this Measure is synergetic with the Climate Wise Measure (E7), and the two, among others, should be considered in concert.

Equitability:

Such systems are only impact those who participate in the program.

Potential unintended consequences:

A potential negative unintended consequence is the increased use of electricity due to the availability of lower cost energy. Another potential negative outcome is that the

retrofit may not be permanent. The current homeowner could decide to go with a “conventional” system at the end of the PV system’s life.

General Note: All references retrieved October through December of 2010 unless otherwise noted.

Endnotes:

¹ http://www.energysavers.gov/your_home/electricity/index.cfm/mytopic=10710

² TEP’s website still shows that the cutoff between small and large commercial is 20 kW. The ACC increased that cutoff to 100 kW February 1, 2010 (<http://tfssolar.com/3135/increased-incentives-help-tucson-businesses-tap-the-sun/>)

³ The median was used in lieu of the mean due to very large systems in each category skewing the numbers.

⁴ Current reserved and installed systems are: large = 33 and small = 13 as of December 31, 2010 as found at arizonagoessolar.org.

⁵ IEA’s *Technology Roadmap: Solar Photovoltaic energy*. Available at: http://www.iea.org/papers/2010/pv_roadmap.pdf

⁶ The IEA’s Roadmap projects parity in energy production pricing between fossil fuels and solar in 2020 for many regions.

⁷ PAG Regional Greenhouse Gas Inventory- 2010

⁸ The current and near-future bidding price for large commercial solar of \$0.12 is information obtained during a December 1, 2010 conference call with Bruce Plenk, the City of Tucson’s Solar Coordinator.

⁹ PV owners will have to pay income taxes on the federal rebate via a 1099 form.