Hybrid Payback

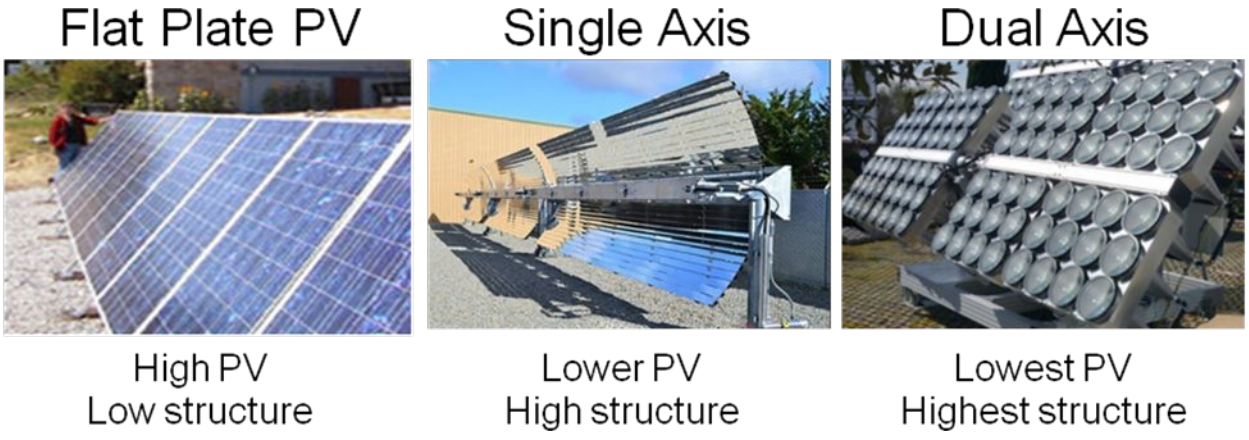
What is the payback for a hybrid solar system? To understand payback of a hybrid, you first have to understand its costs. Below various commercial hybrid systems have been arranged by axes of tracking. On the left is flat plate PV that has no tracking at all. Next is Cogenra's single axis tracking collector and on the right is Solergy's dual axis tracking.

Costs of products are based on its Bill of Materials (BOM). The more materials in a product the more it costs. This isn't true for light products like iPhones, CDs and lipstick, but it's true for most products weighing a pound (Kg) or more. For most heavy products like solar panels, the price is proportional to the BOM cost. For commodity products, the price is typically twice the BOM cost.

The question is can hybrid systems fulfill their promise: they get twice the energy savings but can they do it at the same cost as flat plate PV panels. Since durability requires that most of the materials in a solar panel are glass or metals, the BOM costs determine its price.

In flat plate PV panels, BOM costs are the cost of the PV cells plus the panel's "structure". The structure includes the glass plate on which the cells are bonded, the metal frame around each panel and the supports that hold the panel tilted at the right angle. For flat plate PV, the cost of the PV cells is relatively high but the structure cost is low.

Dual axis hybrid panels have the lowest PV cost since the only PV used is at the focal point of the mirrors, less than 1% of the PV used in flat plate PV panels. While the PV cost is lowest, the structure cost is highest. The mirrors of the hybrid must be moved in two axes to track the sun. in dual axis tracking, the structure must be stiff and the motion precise to be sure the concentrated sunlight lands on its absorbers.

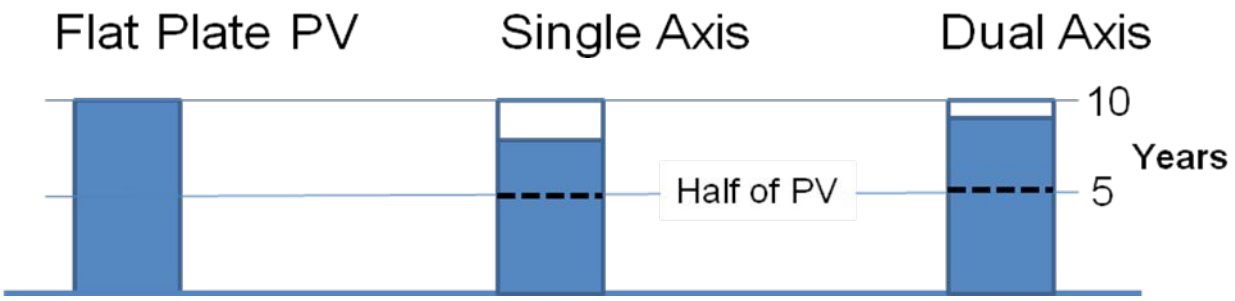


Between zero axis (flat plate PV) and dual axis is single axis. In a single axis hybrid like Cogenra's, solar energy is concentrated into a long thin line and focused on a long thin

absorber. Typically only 5% to 10% of the PV cells used in flat plate are needed in the absorber, making a low PV cost. While fewer expensive PV cells are used, tracking requirements aren't as high and the structure cost can be much less than in a dual axis system.

What about the payback? If a hybrid cost the same as flat plate PV and got twice its savings, its payback would be half – five years instead of 10 years. We found that Flat Plate PV has a best case 10 year payback. The promise of a hybrid is to have a better payback than 10 years.

Below are estimates of the 3 hybrid designs: Flat Plate PV, Single Axis Hybrid and Dual Axis Hybrid. The dual axis system has twice the savings as Flat Plate PV, but its extensive structure makes the BOM cost much more. The result is a push: the payback of a dual axis hybrid is better, but not much better, than a conventional panel.



In a single axis hybrid, the savings are the same when heat and electricity are included. The annual savings are twice that of Flat Plate PV. But its BOM costs are also higher. Its payback is better than a dual axis hybrid though it does not meet the 5 year payback hybrid promise. Still, single axis hybrids are a sweet spot between flat plate PV and dual axis hybrids.