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# TECHNOLOGY TEAM

**MISSION**: To find out the differences between the different solar technologies. Which is better?

**PROBLEM**: There are a number of different solar technologies, using different materials, manufacturing processes and designs. How can we find out which one performs best?

**SOLUTION**: Many companies have provided identical solar array set ups (size, position) with different solar technologies so we can compare them directly.

***Figure 1: Calyxo CdTe thin film array***

***Figure 2: Trina Monocrystalline array***

**Key Terms:**

**Monocrystalline** ("one crystal") silicon is made by creating a single giant crystal of silicon then slicing off thin pieces to use in the solar panel. The silicon must be pure and cooled at exactly the right rate or else a single crystal will not form.

**Polycrystalline** ("many crystal") silicon (sometimes called multicrystalline) is made by fusing many small silicon crystals together and slicing thin wafers off for use in the solar panel. At each of the joints between the crystals electric energy can be lost, but polycrystalline silicon is less costly to produce.

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**ACTIVITY: Investigating Efficiency**

Fill out the table below from information on the signs associated with each of these solar power systems. Use the map to find your way to the correct locations.

| Array | Company | Type | System Size (kW) | Array Area ($m^2$) | Efficiency (%) | Annual Electricity Generation (MWh) |
|---|---|---|---|---|---|---|
| 21 | Evergreen | polycrystalline silicon | | | | |
| 13 | Trina | monocrystalline silicon | | | | |
| 17 | Sanyo | hybrid silicon | | | | |
| 8 | Kaneka | amorphous silicon | | | | |
| 9 | Solco Choice | CIGS thin-film | | | | |
| 7 | First Solar | CdTe thin-film | | | | |

As you read the signs, jot down any notes about cost, material production, effect of temperature, etc. that you think might affect the usefulness of the different technologies (especially in Alice Springs).

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Based on your data, which technology is most efficient? Which is the least efficient?

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What did you find out about cost or temperature effects? Is there a reason to use the less efficient technologies in general? What about in Alice Springs specifically?

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Solar array efficiency and electricity generation estimates on these signs are often based on ideal conditions and laboratory tests – not the real world. That's why this large testing facility was built – to see what works best for Alice Springs and our typical climate and weather conditions. You can see real time data about how much power is *actually* being generated at any given time by going onto the Desert Knowledge Solar Centre website. These data are also available on the touch screens at the Interpretive Centre (check the map).

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**ACTIVITY – REAL TIME DATA:**

Fill out the data sheet below from data gathered on the touchscreens (or website). Go to the interactive map and select the same systems you just looked at to fill out the chart below.

| Array | Company | Type | Current Output (kW) | Powering # Houses | Normalized Output (kW/kW peak) |
|---|---|---|---|---|---|
| 21 | Evergreen | polycrystalline silicon | | | |
| 13 | Trina | monocrystalline silicon | | | |
| 17 | Sanyo | hybrid silicon | | | |
| 8 | Kaneka | amorphous silicon | | | |
| 9 | Solco Choice | CIGS thin-film | | | |
| 7 | First Solar | CdTe thin-film | | | |

**"Normalised Output"** is a term that refers to the amount of power generated in relation to the size of the PV system. Using the normalised output means you can compare the efficiency of PV systems even if they are different sizes.

Are any of the solar arrays producing as much power as indicated by the signs? If not, what might be affecting them?

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Can you tell which type of material is more efficient based on this limited data? Explain your answer.

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