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With its notoriously chilly winters, Canberra isn"t the sort of place you associate with high temperatures. But tucked away on the city"s Australian National University (ANU) campus, a group of researchers are turning up the heat on solar thermal technology.

Concentrating solar thermal (CST) power uses mirrors to focus a lot of sunlight onto a solar receiver lined with tubes of fluid. The concentrated solar energy heats up the fluid, which is used to generate electricity via a steam turbine or similar process.

CST is great because it comes with built-in storage - the hot fluid can be stored in tanks, letting us generate power 24/7 and improve the reliability of the energy supply as more renewables are added.

Most modern CST systems use molten salt as the all-important heat transfer fluid. Salts have a high thermal capacity, meaning they absorb a lot of solar energy and can store heat for a long time with quite a small amount of material.

The hotter the salt gets, the more efficiently electricity can be generated. However, the nitrate salts used in current CST plants decompose once they hit 600?C, placing a hard limit on their maximum efficiency.

"Sodium is a liquid between about 100?C and 900?C," explains Senior Research Fellow Joe Coventry. "One of the really nice things about it is that it"s a metal, so it has very high conductivity. That means it can absorb energy really well, which allows us to make the actual solar receiver smaller."

Sodium"s relatively low 100?C freezing point means it"s a lot easier to pump around than salts, making it the perfect fluid for modular CST plants that link multiple small solar towers together.

The Solar Thermal Group is looking at ways to boost the performance of sodium receivers by pushing up temperatures, overcoming some limitations of the materials and improving the technology"s integration with energy storage.

The group"s industry partner Vast Solar has already demonstrated a sodium receiver design at their Jemalong Solar Station Pilot, adding to Australia"s reputation as an international leader in this field.

Instead of flat banks of tubes, a bladed receiver uses tube banks set on an angle like window louvres. The angled blades mean solar radiation is distributed over a larger area, while the gaps between the blades capture light, trap hot air and cut heat losses. Jets of air can also be used to control heat loss from the outside of the receiver.

"The aim of this project is to combine the bladed concept and active airflow features to achieve up to a 50% reduction in losses from the receivers," explains Senior Lecturer John Pye. "That would be enough to bring the cost of electricity from these things down by a significant amount."

The experimental modules have gone through multiple tests in water and wind tunnels to simulate the effects of airflow on heat. The team are using the data from these tests to build computational models that can simulate a large-scale receiver.