ASI PhD Scholar

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My project will assess the benefit of using a liquid metal as a heat transfer fluid (HTF) in 'heliostat' concentrating solar thermal power stations, from a system perspective.

During my undergraduate degree in Renewable Energy Engineering I became really interested in high temperature solar thermal technologies. Their centralised nature, dispatchability and ability to achieve economies of scale led me to believe that these technologies could play a significant role in replacing conventional generation technologies. I started working part-time for NEP Solar, helping to design and install solar thermal parabolic trough collectors and improve collector manufacturing techniques. I went on to work for the Centre for Energy and Environmental Markets, and focused on the integration challenges of solar energy technologies in the Australian National Electricity Market. This gave me a more in depth understanding of the integration issues that renewable technologies will have to work through and the market structure that they will become incorporated into. This knowledge further strengthened my belief that dispatchable solar thermal technologies will play a key role in achieving high levels of renewable penetration, particularly in the context of the Australian electricity market.

These experiences got me interested in finding ways to increase the efficiency and reduce the levelised costs of high temperature concentrating solar thermal (CST), as well as ways to increase the dispatchability of CST technologies to help with their integration into existing electricity systems.

My best shot at specialising in this area – either as an industry professional or a researcher - was to go overseas. The ASI PhD scholarship gave me an opportunity to stay here and conduct my research in partnership with an Australian company, Vast Solar. They are one of the few companies specialising in developing high temperature CST technology in Australia. This is great for me because it gives me access to their test facility, allows me to have input into the development of a solar thermal power station and gives me the opportunity to learn about the challenges faced by the CST industry.

My project will assess the benefit of using a liquid metal as a heat transfer fluid (HTF) in 'heliostat' concentrating solar thermal power stations, from a system perspective. Currently, two of the major hurdles for CST are delivering high quality steam to a turbine and the integration of cost effective thermal storage. High performance HTFs are a key to solving both of these challenges.

My research will address the shortcomings of other HTFs currently in use, such as low thermal conductivities and associated heat transfer coefficients, costs, high freezing points, corrosiveness and complexity of multi-stage processes. Vast Solar are interested in the potential efficiency increases and advanced storage capabilities that are believed to be achievable using a liquid metal HTF and, as a result, are committed to supporting this research and implementing the recommended technologies into their projects. This project will not only contribute to the body-of-knowledge in the solar thermal field, it will also assist industry to realise large scale CST in Australia.