



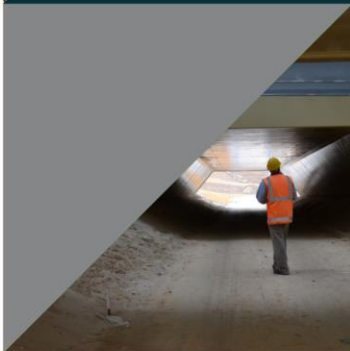
**WARRIP**

WESTERN AUSTRALIAN ROAD RESEARCH  
AND INNOVATION PROGRAM



# Review of Future Pavement Technologies Solar Pavements

INVESTIGATION OF SOLAR  
PAVEMENTS TO PRODUCE  
ENERGY TO POWER ROADSIDE  
FACILITIES



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# SOLAR PAVEMENTS IN WESTERN AUSTRALIA

During March - December 2016 WARRIP investigated the implementation of solar road technologies currently trialled and/or implemented globally. The review included technical benefits and limitations of solar technologies in Western Australia.

## Background

Australia has the highest average solar radiation per square kilometre of any continent. Western Australia's climate is well-suited to embrace solar power generating electricity that could be used to power roadside infrastructure, including adjacent buildings, or sold to the electrical grid as a potential revenue source.

## Approach

- Review of current international and national practice
- Identifying products that have been developed and/or are in use
- Evaluating these technologies, particularly regarding likely application into practice
- Conducting an assessment of the relevance of current practice, products and recent research to Main Roads
- Providing recommendations on further investigate these technologies and what research should be conducted to inform decisions regarding implementation into practice.

## Current Research and Practice

Research and development into the ability of roads and roadside infrastructure to harness solar energy related to pavements include solar collector systems embedded into pavement layers or solar collector panels placed over, or next to, the road.

Novel projects include those that aim to charge moving electric vehicles (EV) and solar-powered EV charging stations. Other solar advances include the incorporation of solar panels into roadside infrastructure, pedestrian paths, highway noise walls and car park canopies.

## Review of Solar Technologies

### Solar roads

Solar Roadways, a project being developed in Idaho, USA aims to integrate light emitting diodes (LEDs), providing lane-marking and thermal control elements. Theoretically, over time, the generation of electricity would cover construction costs.

However, it has not been tested on public roads and thus, its safety and durability are unknown.

### ARTIST IMPRESSION OF SOLAR ROADWAYS



Source: Solar Roadways (2016).

### Solar electric vehicle charging stations

Main Roads has already trialled and implemented electric vehicle (EV) charging stations connected to the traditional electricity grid. However, there is potential for Main Roads to trial solar-powered electric vehicle charging stations in the future.

## SOLAR POWERED EV CHARGING STATIONS



Source: Ecofriend (n.d.).

### Solar collector systems

Research has indicated that solar thermal energy collected by an asphalt pavement may be harvested using a pipe system installed below the asphalt (Bobes-Jesus et al. 2013).

If the heat can be collected with reasonable efficiency and cost, it may be considered an energy source as well as reducing the development of thermal stresses on the pavement.

## SOLAR PAVEMENT HEAT COLLECTOR SYSTEM



Source: Technovelgy (n.d.).

## Conclusions and Recommendations



WA climate is well-suited to solar technologies.



Solar power generating technology is currently immature and expensive.



Deployment of large-scale power generating pavement technology is not recommended.



Main Roads may consider expanding use of solar infrastructure to increase night visibility in rural areas.

## References

Bobes-Jesus, V, Pascual-Munoz, P, Castro-Fresno, D & Rodriguez-Hernandez, J 2013, 'Asphalt solar collectors: a literature review', *Applied Energy*, vol. 102, pp. 62-70.

Ecofriend (n.d.). *Solar-powered charging stations to keep your EV commutes completely zero emission*, webpage, EcoFriend, viewed 15 June 2018, <<https://ecofriend.com/10-solar-powered-charging-stations-ev-commutes-completely-green.html>>.

Solar Roadways 2016, *Solar energy*, webpage, SR, Sandpoint, Idaho, USA, viewed 22 June 2016, <<http://www.solarroadways.com/Home/Specifics>>.

Technovelgy, n.d., *Use roads as solar energy collectors*, webpage, Technovelgy, viewed 15 June 2018, <<http://www.technovelgy.com/ct/Science-Fiction-News.asp?NewsNum=1383>>.