#### Promoting Energy Efficiency in Passenger Transport Planning - Rail Lana Assaf, Senior Associate – Environment

2016 Australian Summer Study on Energy Productivity



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# Drivers for minimising energy demand in transport projects

- The need to minimise contributions to climate change in construction and operation
- Whole of life cost savings and environmental benefits
- Rising cost of electricity and the need to maintain low cost to the customer for passenger transport services



#### **Energy savings incorporated into Procurement**

- Tender briefs should identify minimum requirements for energy performance e.g optimal daylight penetration and natural ventilation
- Whole of Life Costing techniques to be applied where possible to identify energy usage and costs of assets.



#### **Sydney Trains - Carbon Calculator**

A train line can move 50,000 people an hour. Compare this with a freeway lane which can move 2500 people an hour.

What does it take to move 1000 people?

1 train (eight carriages)



15 buses

#### 

Anywhere from 250 to 1000 cars

This would then require 1.37 hectares of parking space in the Sydney Central Business District.

Source: <u>http://www.sydneytrains.info/about/environment/</u> 2016 Australian Summer Study on Energy Productivity



## **Key mitigation opportunities**

- Mobilisation Material purchase and transport
- Construction Minimise site operations
- Contractual requirements Monitoring targets
- Operation Reduced electricity usage, energy monitoring, purchasing offsets, sourcing green power, staff education programs



#### Energy savings incorporated through Design Guideline Specifications

- HVAC: Natural Ventilation, Tunnel Ventilation, Solar Shading, Chilled Beams, Platform Screen Doors (proposed for Sydney Metro)
- Energy Efficient Equipment: Power transmission, energy efficient transformers, energy efficient vertical transport (ramps/variable speed escalators). High efficiency fans and pumps, receptivity to regenerative braking
- Renewable Energy Supply

## **Bayswater Power Station, Hunter Region, NSW**



Source: http://www.abc.net.au/news/2015-07-23/bayswater-power-station.jpg/6641472



#### **Capital Solar Demonstration Plant, Bungendore, NSW**





Spurce: http://www.serree.org.au/storage/capital-east.JPG

## **Capital Solar Demo Introduction of Sheep**

#### Capital East solar farm update

#### Mixing solar farming with traditional farming

The project team is working on connecting the Capital East solar farm with Infigen's Operations Control Centre in Sydney. This enables real time monitoring of the solar farm. Power from the solar farm is being sold directly to Australia's National Electricity Market.

The solar farm has teamed up with a local farmer who regularly brings a dozen of his sheep to the paddock to graze under the solar panels as a means to control pasture growth. The panels were installed just high enough for the animals to roam freely. According to the site team, the sheep stick to grass and are not interested in munching on the cables.

The next stage of the project is the connection of batteries into the solar farm. This will enable Infigen to test the capabilities of this exciting technology.



Local farmer unloads sheep to graze at the solar farm

Source: http://www.infigenenergy.com/media/docs/CREP-Newsletter---January-2014-a18c258c-1705-45fb-8403-09daca7d1c3e-3.PDF



#### Woodlawn Wind Farm, Bungendore, NSW





Source: http://runwiththewind.com.au/home/

## Design

- Avoid steep track gradients
- Flood Impact Assessments to avoid Track Washaway
- Lighter, streamlined rollingstock
- Ability for regenerative braking
- Energy efficient fittings in rollingstock, stations and maintenance facilities
- Increased use of PVs in stations and interchanges

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#### **Flooded Train Stations**

#### Lewisham - October 2014



#### **Bardwell Park - April 2015**



Source: http://www.smh.com.au/nsw/sydney-weather-rains-ease-but-commuters-face-difficult-journey-homeon-wednesday-20150422-1mqtvu.html



#### Stormageddon: Dungog awash with devastation - April 2015



Source: http://www.dailytelegraph.com.au/news/stormageddon-dungog-awash-with-pain-anddevastation/story-fni0fiyv-1227313604268



## Epping to Chatswood Rail Link - Lessons Learnt

# \$2.3 billion black hole

Too expensive, too steep ... now too noisy

#### Linton Besser Transport Reporter

THE long-delayed \$2.3 billion Epping to Chatswood Rail Line has been hit by another critical problem: noise levels in the carriages so deafening that transport chiefs fear commuters will not want to use the service.

The problem surfaced when the first train was run through the 12.5-kilometre tunnel about six months ago but has still not been solved, despite an intended February opening.

The Herald has been told that noise levels during the 15-minute journey hit 90 decibels, the equivalent of a Boeing 737 coming in to land. WorkCover guidelines say that

workCover guidelines say that hearing damage begins when people are exposed to more than "an eight-hour noise level equivalent of 85dB".

Soon after the noise problem appeared, the State Government commissioned acoustic engineering specialists to "conduct detailed investigations". A RailCorp spokesman, Paul Rea, said they had identified "potential ways the issue could be addressed". The measures include "rolling

stock options, installation of additional noise absorption panels, further grinding of rails and installation of rail vibration dampers", Mr Rea said. But RaikCorp and the Transport

But Raik-Orp and the transport Infrastructure Development Corporation, the Government body that built the tunnel, refused to release the results of noise tests and revealed last night they have yet to find a solution. The problem is exacerbated because the tunnel is far too steep



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## **ECRL Lessons Learnt**

- In December 2007 it was announced that Tangara trains would not be running on the line due to the tunnel's steep gradient.
- Plans for a bridge over Lane Cove River were abandoned, due to the potential impact on Lane Cove National Park
- The Tangaras, L, R & S set trains were not ideally suited to that steep gradient.
- Outer Suburban Car Trains (OSCARs) were utilised, which met passenger comfort levels



## **Transit Oriented Developments (TODs)**

- A transit-oriented development (TOD) is a mixed-use residential and commercial area designed to maximise access to public transport and incorporates features to encourage transit ridership.
- A TOD neighborhood typically has a centre with a station or stop surrounded by relatively high-density development with progressively lower-density development spreading outward form the centre.
- TODs are generally located within a radius of 400m-800m from a stop as this is considered to be an appropriate scale for pedestrians.



#### **Chatswood Transport Interchange – Design and Actual**



Source: http://www.metrochatswood.com.au/pages/shopping-centre/a-sense-of-space.php



## Sydney Metro – Northwest, CBD and Southwest





#### **Urban Growth – Sydenham to Bankstown Urban Renewal Corridor**



Source:http://www.planning.nsw.gov.au/Plans-for-Your-Area/Priority-Growth-Areas-and-Precincts/Sydenham-to-Bankstown-Urban-Renewal-Corridor/Map



#### **Transport for London – Active Transport**





## **Funding and Delivery - PPPs**

- Public private partnerships (PPPs) need to evolve to reflect current market conditions
- Infrastructure NSW's recommendations include the use of special purpose delivery entities
- The government's capacity to fund new infrastructure is limited to the difference between revenue (primarily taxation) and recurrent expenditure on government services



### **CBD and South East Light Rail**





Source: http://www.sydneylightrail.transport.nsw.gov.au/

### **Parramatta Light Rail**





http://www.aeol.com.au/databases/news/15/12/nswgov\_parramatta\_light\_rail\_network.html

#### **Badgerys Creek Airport – High-speed Rail Proposal**



Source:http://www.railpage.com.au/news/s/badgerys-creek-airport-on-the-fast-track-highspeed-rail-linebeing-considered



## Maglev exiting Pudong Airport, Shanghai



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Source: https://en.wikipedia.org/wiki/Shanghai\_Maglev\_Train

## **Bullet Train at Mount Fuji - Japan**



