High-Speed Rail

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Policy Category: Infrastructure

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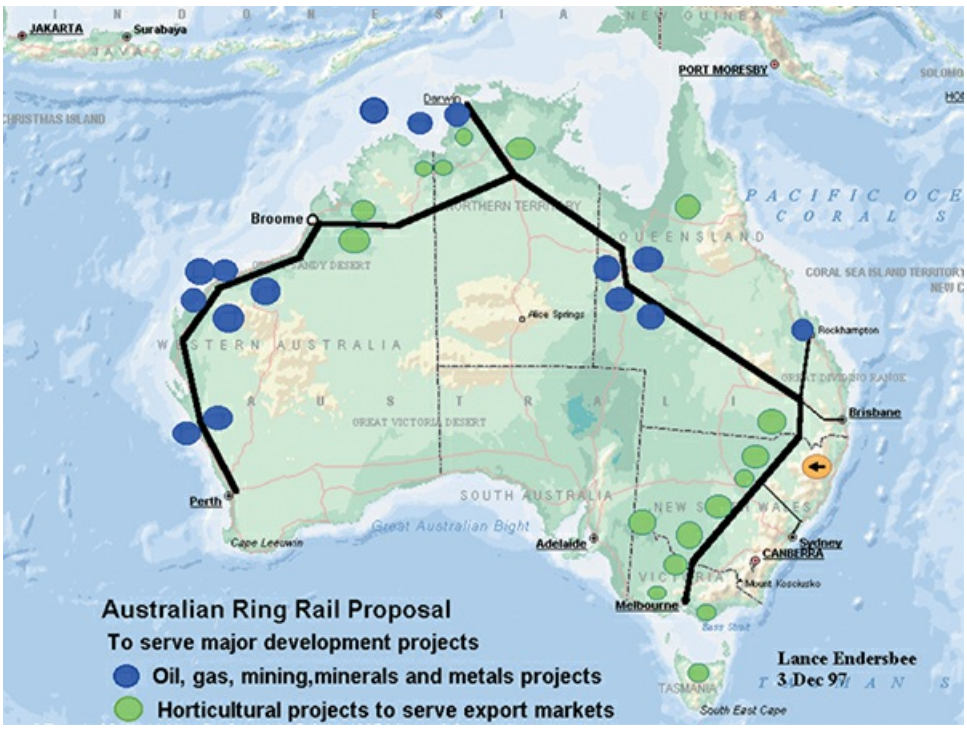
Australian Ring-Rail



Lance Endersbee's 1997 Proposal for an Australian Ring Rail.

Australia’s rail sector must be revolutionised, both for the sake of transport within our country, and also to tie Australia into the rest of the world, in particular into the world’s greatest population centres, at the eastern and south-eastern Asian terminals of the Eurasian Land-Bridge. This revolution will have two axes: Prof. Endersbee’s proposal for a Melbourne-Darwin Asian Express, and a vast upgrading and expansion of Australia’s rail network centring upon the new magnetic levitation (mag-lev) rail technology pioneered in Germany, and which is now being built in China.

Our nation’s rail sector at present is a pathetic shambles, so bad that the 2001 Australian Infrastructure Report Card prepared by the Institution of Engineers, Australia, a very conservative,

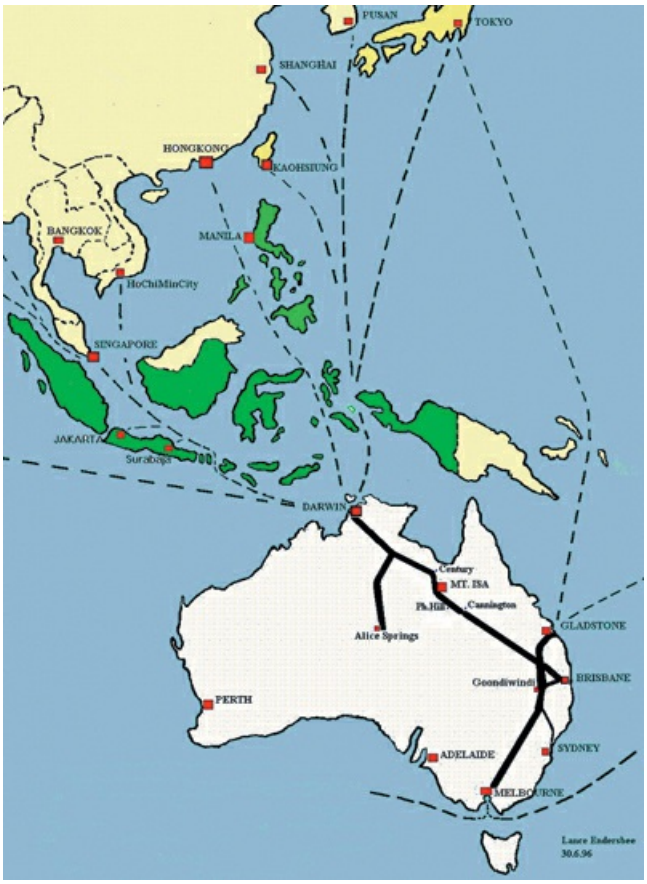
understated body, rates it at D-, with the crucial Melbourne-Sydney-Brisbane rail corridor rating an F, due to “poor track co-ordination, steam age alignments and inadequate signalling and communications systems.”

With the exception of rail lines built expressly to service mineral deposits, most of Australia’s rail system was built at the turn of the 20th Century. The report of the federal Parliament’s Standing Committee on Communications, Transport and Microeconomic Reform, Tracking Australia warned in 1998, “Without urgent and substantial investment in this infrastructure, major sections of the national rail network are likely to become irretrievable within ten years. In this context, the rationale for increased investment in rail infrastructure has to be about averting the potentially enormous costs of diminished or defunct rail services between major cities on the eastern seaboard, including increased road construction and maintenance, and the negative externalities associated with large and growing volumes of road traffic.”

That report was three years ago, and, under privatisation and competition policy with the exception of the beginning construction of the Alice Springs-Darwin railroad, the rail system has not improved significantly since. The “negative externalities” in the report refer to the horrible figure of $15 billion per year lost in road accidents on overcrowded, deteriorating roads along with an estimated $13 billion annual loss due to congestion, which is expected to rise to $30 billion by 2015. Only a tiny fraction of the nation’s passenger traffic moves by rail, and, since 1975, rail’s share of interstate non-bulk freight has declined from 60% to 35%, even as the trucking industry is suffering record rates of bankruptcies and psychological and health problems associated with horrific working hours. Between 1975 and 2001 the Federal Government spent $43 billion on roads and a miniscule $2 billion on rail, even though for medium and long distance, rail is an inherently much more efficient mode of transport. Therefore, we must plan to spend some tens of billions on the industry over the next ten years, both in upgrading existing lines, but in particular in building the Asian Express and a mag-lev grid tying together all of our major population centres.

The Asian Express

The Melbourne to Darwin Asian Express proposal, which Prof. Endersbee later expanded into the Ring Rail to go around the top end of the continent and terminate in Perth, is a beautiful idea, which would transform Australia’s relations to Asia.



Lance Endersbee's 1996 proposal for Asian Express high-speed rail corridor

Australia’s present transport system is a huge constraining factor on the nation’s export capabilities, as Prof. Endersbee explained to the Citizens Party (then Citizens Electoral Council) National Conference on November 23, 1997,

> “Our present system of shipping involves what are still effectively tramp steamers, that go through several ports.... If you have a look at the time tables of all the ships that come to Australia, you find that when a ship comes to Australia, they visit three or four ports in our waters and effectively, most shipping in Australia, circumnavigates the continent. This system would cut right through this, with a total new transport system. It is not just a railway line. It’s a new transport system. Because of the fact that these ships have to call at several ports in Australia, the sort of ships that serve Australia also call at several ports around in the South West Pacific/ East Asia area. So they have a schedule of about six weeks, a turnaround time of about six weeks. So, for shippers shipping from Australia, it usually is a month plus, to get to anywhere in Asia.”

With the Asian Express, however, three trains a day could be running between Melbourne and Darwin, and then, with high-speed ferries, products could be in key Asian ports in another day or two. Said Prof. Endersbee,

> "The distance from Darwin to Singapore is the same distance as the length of the Mediterranean. The sea state is mostly fairly flat. In other words it is calm seas most of the time, so that means we can contemplate fast ferries servicing these areas, and so we can have daily ferry services from Darwin to Java, Darwin to Singapore, and so on."

And these Asian ports are huge: Hong Kong and Singapore are close to tied for the world's largest, while the third largest port in the world is Kaohsiung in Taiwan, with four ports on the north coast of Java which handle as many containers combined as Europe's greatest port, Rotterdam.

The Asian Express should obviously be built immediately. But, explained, Prof. Endersbee,

> "In proposing this project over the past five years, I have been totally opposed by every government in Australia, federal and state.... And nobody is really interested in my analysis of the economies of the project, all the detail I have done in terms of professional work. I have done at least five years solid professional work on this, and prior to that I was working in Southeast Asia, and I have been looking at these economies in Southeast Asia for the last 30 years, and so I had an awful lot of background behind me and what I was proposing was rational and proper for Australia, and, as you can see, the political system was not equal to it."

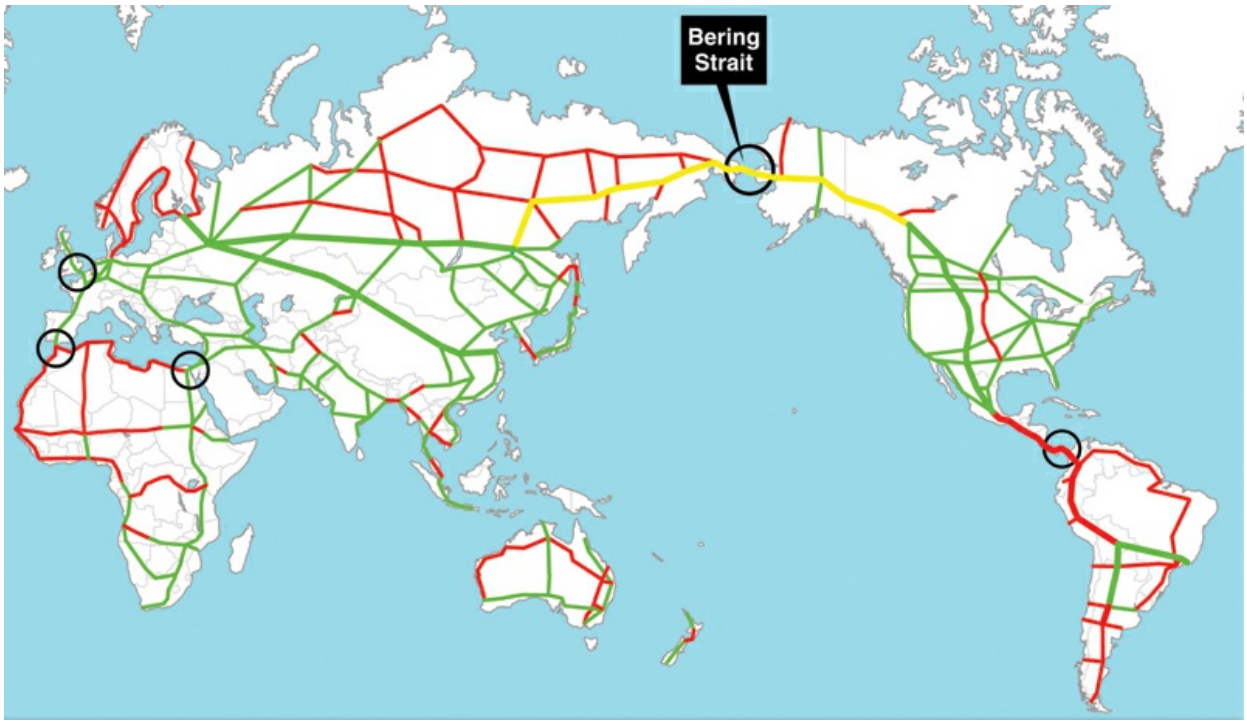
There were several reasons for this: first, it was a national project, and the nation's rail and port systems are all state-based, so no state would sign on to a national project which might "divert" anything away from its own collapsing state rail systems and ports; and second, more importantly, because the federal government has been on a mad privatisation, user-pays binge with the rail system, like everything else.

While refusing to back the revolutionary Asian Express, Prime Minister Howard has lent federal backing, and funds, to a privately- funded $10 billion rail scheme from Melbourne to Darwin, the Australian Transport and Energy Corridor (ATEC), headed up by former Liberal party fundraiser and Howard friend Everell Compton. Aside from the fact that ATEC will mostly run along existing routes, which thus negates the essential point of the Asian Express, its high-speed aspect, and the fact that federal government backing for such a project was effectively let without a tender, under coming depression conditions, the privately-funded ATEC will never be built in the first place.

Development Corridors

Addressing a conference in Germany on May 5, 2001, Lyndon LaRouche sketched a bold vision of the role of maglev centred development corridors in transforming the Eurasian continent, a concept which is equally applicable to our own vast, under-settled and undeveloped country:

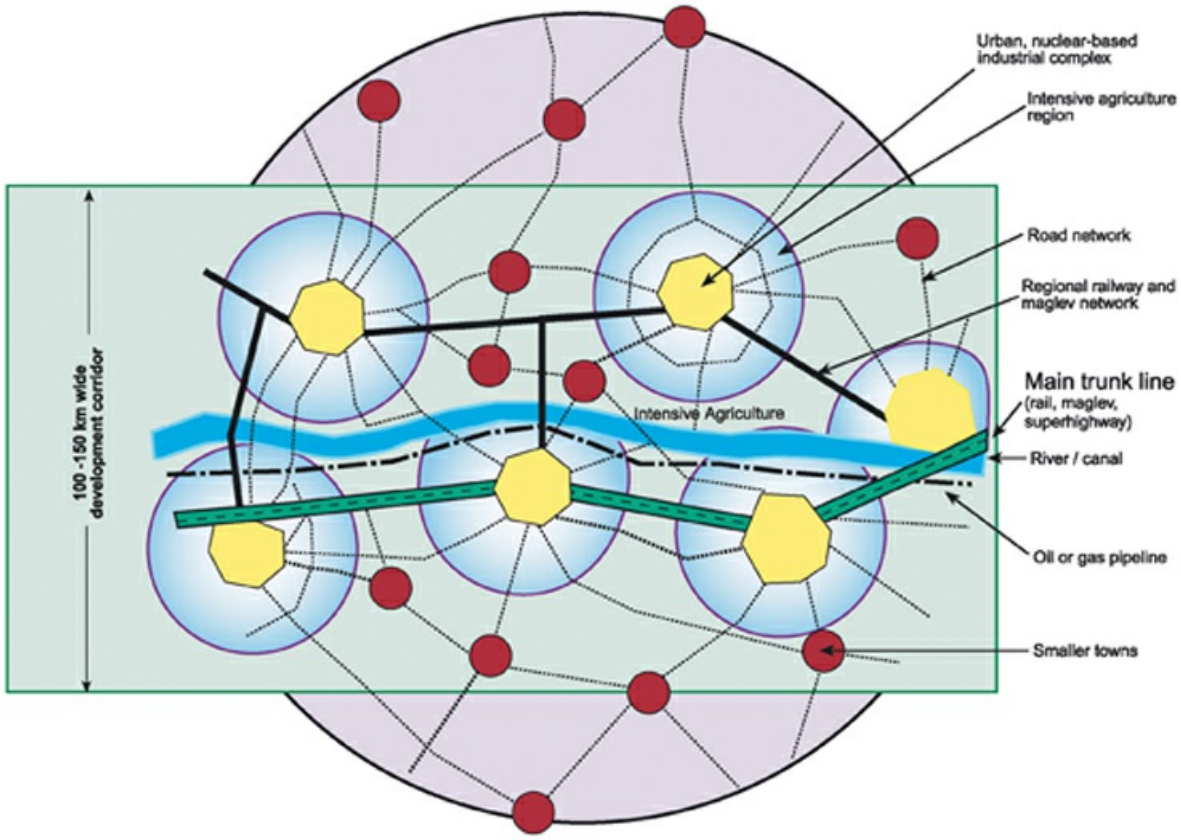
> "This is not railroads, this is not Silk Roads, these are corridors of development, which run a range of, let's say, up to 100 kilometres in width, from the Atlantic to the Pacific, going in various directions. Along these routes, as we did in the United States with the transcontinental railroad, the area on either side of the transportation axis becomes immediately, in and of itself, a sustainable area of economic development. By that means, you can branch out from the main corridors into subsidiary corridors of development and capture the area. If we can make that kind of link, one interesting kind of change occurs immediately....



“Take transportation alone. People who don’t think, think that ocean freight is the cheapest way to move freight. That is not true. The cheapest way is across land, but not by truck; trucks running up and down the highway tell you that the economy is being dismantled. It costs too much, it’s intrinsically bad. Railways are much better. Integrated transport systems, featuring railways, especially magnetic levitation systems, are excellent. Magnetic levitation systems move passengers more rapidly, but those same systems for moving freight, that is really a wonder. That’s where the payoff comes. If you can move freight from Rotterdam to Tokyo at an average rate of 300 kilometers per hour, without much stopping along the way, and if for every 100 km of motion across that route, you are generating the creation of wealth through production as a result of the existence of that corridor, then the cost of moving freight from Rotterdam to Tokyo is less than zero. What ocean freight can do that? Did you ever see a large supercargo ship producing wealth while travelling across the ocean? And at what speed?

“Therefore, we have come to a turning point in technology, where the development of the internal land-mass of the world and the great typical frontier is Central and North Asia. That is the greatest single opportunity before all mankind for development.”

Graphic representation of a 'development corridor'



The railroads of the Eurasian Land-Bridge will not merely be transport systems, but 100 km wide "development corridors", encompassing oil and gas pipelines, communications networks, superhighways, agro-industrial complexes and new cities—precisely the way Prof. Endersbee's Asian Express and Ring Rail proposals should function for Australia.

A Maglev rail system

The maglev era has already begun. On January 23, 2001, China and Germany signed a contract to begin the construction, in Shanghai, of the first magnetic-levitation rail line in the world, which began commercial operations on December 31st, 2002. The implications of this first contract were summed up in an evaluation in Executive Intelligence Review of November 2, 2001:

"This revolutionary new technology is not only suited for passenger travel at velocities of up to 500 km/ hour—for which the German maglev system Transrapid was optimized—but in the future will also allow the creation of fully automated systems of freight transport, with performance parameters which up to now are completely unattainable. Such future freight systems will automatically transport containers from one chosen spot on the network to another, like a computer-controlled industrial conveyor belt. At speeds of up to 250 km/hour, a single maglev container freight transport line could support as much freight daily, as 20 or more parallel conventional railroad lines.

"With the Transrapid, the ancient invention of the wheel is for the first time becoming obsolete. There is no longer mechanical contact between train and track; instead, the train is suspended and propelled forward by electronically steered magnetic fields alone, in a friction-free manner. As a result, magnetic levitation technology allows, in comparison with conventional wheel-track technology, a much greater rate of acceleration, steeper ascents, narrower curves, low noise volume, higher safety because of fully automatic operation, and greatly reduced wear-and-tear on the train and roadway.

"Studies of maglev routes in Europe have shown that not only is the technology quicker than air travel for relatively short routes, but that even for such longer routes, as from Berlin to Moscow or Kiev, maglev is more than competitive. Especially if one keeps in mind the transfer time between airports and city

centers, and the lengthy checking-in and boarding procedures of air travel. At the same time, the Transrapid system has all the normal advantages of passenger railroads: above all, that not only the terminal points of a line, but rather an entire series of cities in between are serviced by the same train, with the unlimited possibility of stopovers for the passengers.

“The Transrapid thereby contributes to the general development of the entire corridor. Whereas for an airplane there is only uninhabited, empty air between takeoff and destination.”

The Chinese roared ahead with their Shanghai-Pudong maglev project. “Commander” Wu Xiangming, the director of construction for the project, organised the construction in a military-engineering style, which allowed the project to be completed in less than two years. The Chinese took only six months to build an entire new factory near Shanghai, which started producing the concrete and steel components of the line in November 2001, to the amazement of German journalists who visited the site. As China extends the line to Beijing, the system’s components would no longer be produced in Germany, but entirely in China, with a view to export to other Asian countries, just as we could establish our own maglev industry in Australia.

The Shanghai-Pudong project has provoked an explosion of interest and large-scale proposals in the Netherlands, Germany, Poland, the U.S. and other countries. In Australia, when examining options for a link from the city of Melbourne to the airport, Victorian former Premier Steve Bracks expressed interest in a maglev line. An express trip would take eight minutes, while a trip with two stops, at Keilor Park and Sunshine, would take only 13 minutes, with speeds hitting 250 km/hour. In 2008, a line linking Frankston-Melbourne CBD-Melbourne Airport-Avalon Airport-Geelong was proposed by ThyssenKrupp Transrapid. In NSW, Transrapid also has a concept for a regional/orbital system to link Sydney, Wollongong and Newcastle.`

For two decades now, Australian federal governments have been dithering and doddering over a Sydney to Canberra or a Sydney-Canberra- Melbourne high-speed link, with one proposal after another being turned down as not cheap enough. But, in retrospect, perhaps all this stonewalling will prove to have been useful, since it prevented Australia from being stuck with a much slower, less effective technology than the maglev. The most insightful recent evaluations of high-speed trains for Australia in the past two decades are found in two reports by former MP Peter Nixon, who in 1995 chaired a working group reporting to the Victorian State Government on rail strategy. His committee’s report, “The High-Speed Train Report” was updated by him in July 2000, in his ‘High-Speed Trains in Australia: Beyond 2000.”

In the latter, he makes a couple of crucial points. First, that “Our country is similar in geographic area to continental United States and mainland China. A large proportion of our relatively small population live in coastal cities separated by significant distances. Almost half of that population live in and around our two largest cities, Sydney and Melbourne, separated by a distance of approximately 900 kilometres. Millions more live in the cities and major regional centres of the east coast corridor, and the aggregation of city and regional Australians along its path, that high-speed trains will be required to effectively serve.”

The benchmark for trains in this corridor, he notes, is an express trip between Sydney and Melbourne in three hours or less, to effectively compete with air travel. Some “wheel on track” technologies could conceivably do this. “However”, Nixon observes, “in a world of rapid technological change, there are indications that conventional ‘wheel on track’ rail systems will in the very near future be succeeded by ‘wheel-less’ trains propelled by the principle of magnetic levitation (maglev). Over the past quarter century, such systems have moved from the development stage to operational readiness. Maglev, with its promise of a quantum increase in operating speeds, remains the ‘new technology’ seeking to challenge the established performance of ‘wheel on track’ systems…. [E]nough international experience has been gained to demand that the proper evaluation of a major east coast high-speed rail network in Australia must include a thorough and objective assessment of the maglev option. At a time of generational change in the rail industry the technology equation remains paramount. The high-speed option selected for Australia will be required to overcome the related tyrannies of distance and time for the next 100 years or more.”

But, even more important than the technical aspects of maglev, is the call with which Nixon ends his

report, which is an implicit call for a great maglev scheme, as part of a broader national purpose of nation-building:

“Nations need to build. Citizens and communities need, and overwhelmingly seek, to be a part of that embrace of a national purpose. The strength of a national high-speed train project lies in the fact that such a project will deliver much more than an alternative transport mode to service existing travel needs. Such a project would provide an important national focus for the development of Australia into the 21st Century. Considerations of national vision and national purpose go to the very heart of our Australian character and psyche.”

Well said. Now, let’s get on with the job!

Australia: Go Vacuum Maglev!

August 30, 2011-Australia has an opportunity to start a global transport revolution in adopting ultra-high-speed maglev evacuated tube transport. Travelling at speeds exceeding 6,000 km/h and cutting the tyranny of distance is possible with current maglev technology with the absence of air resistance in a vacuum. Anyone doubting this will soon look as foolish as Lord Kelvin, President of the British Royal Society who in 1895 said, “heavier than air flying machines are impossible.” Our vast distances between capital cities, the extensive flat terrain of the Nullarbor Plain providing distance to build up to ultra-high speeds and the prospect of an under-sea route to Tasmania, Papua New Guinea and Indonesia, makes Australia the ideal nation to show the rest of the world what is possible.

China has already started testing this technology and Australia must get working immediately or we’ll be left behind. China’s Traction Power State Key Laboratory of Southwest Jiaotong University has successfully developed a prototype model vacuum maglev train that was able to run at between 600 and 1,200 km/h, equal to the speed of a plane, according to Shuai Bin, Vice Dean of the university’s Traffic School. This is just a prototype and longer evacuated tubes will allow more distance to build up speed.

Engineers Professor Emeritus Ernst Frankel and Dr Frank Davidson have proposed a neutrally buoyant vacuum tunnel submerged 45 to 90 metres beneath the Atlantic Ocean surface (avoiding deep ocean pressures) and anchored to the seafloor, through which speeds a magnetically levitated train at up to 6,500 km/h. Travel from Europe to the United States would take about an hour. Professor Frankel is a Professor of Mechanical and Ocean Engineering at MIT and Dr Davidson is known as the father of the English Channel tunnel. “From an engineering point of view there are no serious stumbling blocks,” says Professor Frankel. “We lay pipes and cables across the ocean every day.”

Dr Davidson suggested a route across Lake Ontario built before the trans-Atlantic crossing would alleviate concerns of cost and safety. However, we Australians have an ideal opportunity to get started first and link up Tasmania to the mainland. We could additionally work with the governments of Papua New Guinea and Indonesia to build transport links across the Torres Strait and even the Timor Sea. Since most of the Timor Sea covers the continental shelf, this engineering task is not as complex as it might first seem.

Vacuum maglev transport has so many exciting possibilities and is not just limited to trains. Daryl Oster holds U.S. patent number 5,950,543 for Evacuated Tube Transport (ETT), which specifies small pressurised car-sized capsules. These relatively small capsules would transport cargo or passengers travelling along evacuated tubes “arranged along predetermined routes” via computer control. Physical operation of the system is automated and users would only need to choose and enter a destination. Airlocks at stations would allow transfer without admitting air.

Once a whole network is established, passengers or cargo could travel from and to just about any location in Australia—virtually door-to-door in about an hour or less. Capsules for cargo could be a new revolution as containerisation was in reducing costs of transport. Businesses could interact Australia-wide and in the not too distant future, even worldwide, as if they were in the same city. Cars, trucks and planes would eventually go the way of the horse and buggy.

The ETT system has been adopted by Dr Zhang Yaoping, Director at the Chinese Institute of Evacuated Tube Transportation, Southwest Jiaotong University and more than a dozen licences have been sold in China. The consortium et3.com Inc (ET3 stands for Evacuated Tube Transport Technologies) selling ETT licences claims their system requires only 1/50th of the propulsion energy of that used by trains, cars or planes.

The fuel savings are indeed enormous. In 2010, registered motor vehicles in Australia consumed 31,186 million litres of fuel—this is more than a $40 billion annual fuel cost. Vacuum maglev will cut out nearly all of this cost, since with conventional transport most of the energy derived from the fuel is used to combat air resistance and rolling resistance. There is zero air and rolling resistance speeding through a magnetic field in a vacuum. And not only this, the energy required for acceleration can be recovered by using linear generators to decelerate the capsules or trains.

The time saving potential is enormous. If we Australians were hypothetically paid at the average hourly wage for the time wasted in all modes of transport, this would amount to untold *hundreds of*

billions of dollars annually. Most of this wasted time could be eliminated with vacuum maglev.

Safety systems in vacuum maglev will prove its worth in saved lives. While there's no guarantee of a 100 per cent safe transport system, the automated nature of vacuum maglev takes driver human error out of the equation and since trains and capsules speed through a tube, they are protected from weather and obstacles—accidents on slippery wet roads won't happen in vacuum tubes; intersection and railway crossing accidents will be left in the history books. Road crashes in Australia still cause some 1,400 deaths and 32,500 serious injuries each year. The loss of life and social impacts are devastating and the annual cost to the Australian economy is estimated to be $27 billion. Vacuum maglev will change the slogan from "speed kills" to "speed saves lives".

This protection from weather will also have significant time saving benefits, so say goodbye to airport delays due to fog, snow, ice or volcanic ash. And there will be no sonic boom which prevented the Concorde from flying over populated areas.

The Australian Government must seize the opportunity to develop this technology, which will reap untold *trillions of dollars* in savings and economic spin-offs; it should be funded through national banking credit—the productivity gains demand the investment.
