

## Why invest in emerging technologies?

Most major economies accept the need to rapidly decarbonise energy supply to avoid the risk of dangerous climate change. To do this will require the accelerated deployment of proven clean energy technologies in parallel with the accelerated development of new technologies that are clean, abundant and affordable.

Accelerating clean technology development is about creating the optimal conditions to drive innovation. This requires two fundamental ingredients: abundance to stimulate innovation and competition to drive efficiency. We need to cram a generation of research and development into a decade. We need to fast track technology breakthroughs and the inevitable failures and setback that come with them. We need to make it attractive for investors to back inherently risky R&D projects and companies.

Many of the building blocks for this clean tech revolution are already in place in Australia. Australia has world class universities and research institutes and an abundance of quality clean energy resources. It still lacks dynamic venture capital markets and many of the government incentives needed to foster key stages of technology development and retain clean technology development onshore.

Freeing up investment and stewarding all stages of the development cycle will be fundamental to delivering Australia's formidable promise as a clean energy superpower and a world leading incubator of smart clean technologies.

## Current Policy Settings

The Rudd Government has made a clear commitment to increase the level of renewable energy in Australia by 2020. The Renewable Energy Target (RET) is the major policy mechanism to support the deployment of large scale renewable energy and also supports solar hot water and roof top solar photovoltaic.

While the RET is effective in developing the market for mature renewable technologies, on its own it will not sufficiently accelerate development of clean technologies in the research, development and demonstration stages.

Current State and Federal Government policies supporting emerging technologies are still varied and patchy. Key Commonwealth Government policies supporting cleantech include: The Renewable Energy Demonstration Program, the Geothermal Drilling Program and the Second Generation Biofuels Program, totalling \$500 million, in addition to the \$1.5 billion Solar Flagship program.

## What is an emerging technology?

An emerging technology is one that has moved from the research laboratory into the field and is currently in the early demonstration to full scale demonstration period of development. Ernst and Young<sup>1</sup> found that 49% of Australian cleantech companies are hosted in the energy industry and 48% of these are found to be emerging technologies in the pre-deployment phase.

Examples of clean emerging technologies at the demonstration phase in Australia include wave energy and algae farming, whereas those progressing to deployment phase include solar power towers and geothermal.

## Barriers to optimal investment in emerging technologies

The private level of investment in clean and emerging technologies in Australia is suboptimal; the benefits of developing these technologies exceed the private benefit captured by investors.

Analysis by the University of Sydney<sup>2</sup> has shown three key market failures prevent the socially optimal level of investment in emerging clean energy technologies:

- 1. Private firms are unlikely to capture the full benefit generated by their investment**
- 2. There is an inherent second mover advantage in R&D, if firms prefer to imitate rather than innovate they will delay investment**
- 3. The price of energy does still not reflecting the full cost to society – this makes the traditional energy price is artificially low when compared to the clean energy price, substantially reducing the incentive to invest in alternative clean technologies.**

These factors combined makes Government support a critical element to driving innovation and growth across the clean energy industry.

A recent report by Ernst and Young<sup>3</sup> found the main constraint to investment in cleantech in Australia is the cost of technology when compared with traditional technologies in the host industry. Other constraints include:

- The absence of an Australian market for cleantech
- Lack of patent capital
- Stronger investment attractiveness overseas
- Greater revenue risk with lower energy prices in the absence of a price on carbon
- Low investor awareness of technology risk

<sup>1</sup> Ernst and Young 2010, Navigating the Valley of Death – Exploring mechanisms to finance emerging technologies in Australia

<sup>2</sup> Andrew Wait, 2010 - Investment in clean technologies as a public good: a discussion paper prepared for the Clean Energy Council.

<sup>3</sup> Ernst and Young 2010, Navigating the Valley of Death – Exploring mechanisms to finance emerging technologies in Australia

## What can Government do to support emerging technologies?

There are four key phases clean technologies pass through before a mature technology is brought to market – Research and Invention, Prototype development, Demonstration and Deployment (refer Figure 1). These stages are often referred to as ‘the valley of death’ and can make or break the commercial success of any given technology. Government support is critical during these stages, where capital investment may be too high for a venture capitalist and execution or technology risk may be too high for project finance investors<sup>4</sup>.

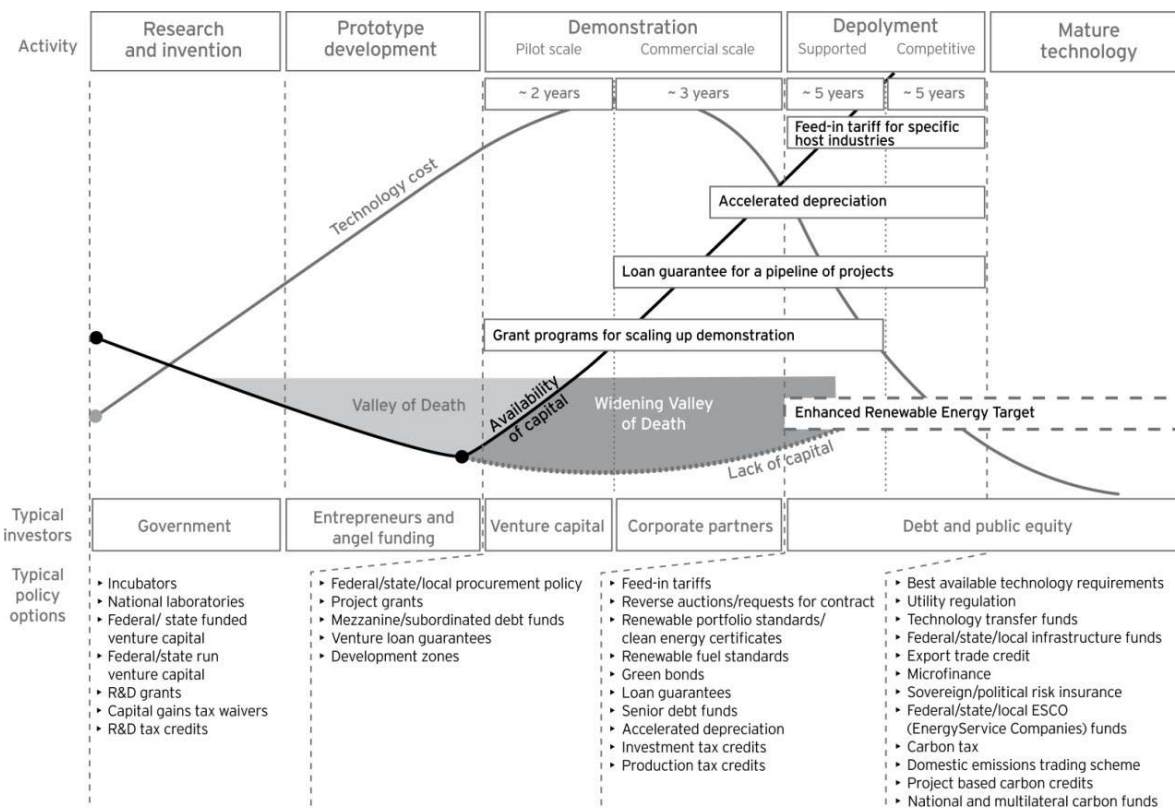


Figure 1 – scope of government action to support emerging cleantech investment. (Ernst and Young – Navigating the Valley of Death, p41.)

To address this inherent market failure Wait<sup>5</sup> found that Governments can:

1. Implement subsidies, grants, tax incentives or other incentive schemes to address the research and development investment externalities.
2. Design policies that encourage firms to innovate and be market leaders rather than imitators, weighting the relevant payoff towards innovation rather than imitation.
3. Deliver policy that ensures the price of carbon-intensive energy incorporates the social cost, making investment in clean technologies more attractive

<sup>4</sup> Ernst and Young, 2010, Navigating the Valley of Death – Exploring mechanisms to finance emerging technologies in Australia

<sup>5</sup> Andrew Wait 2010 - Investment in clean technologies as a public good: a discussion paper prepared for the Clean Energy Council.

## Policies encouraging the development and deployment of clean technologies:

### **Stages 1 & 2: Research and invention, Prototype development**

Renewable Technologies: Wave, biochar, nanotechnologies, solar efficiency technologies,

Policy Response:

#### ***Research and Development Grant Programs***

While also being important at the demonstration and deployment phases of a project, cleantechs and investors have both indicated that Government grants remain critical in the research and invention phase of the project. Cleantechs are heavily reliant upon Governments and angel funding to foster ideas and get them off the drawing board.

#### ***Tax Incentives***

The provision of tax incentives to support research and development is an important way Governments can drive research and development into clean technologies.

While the Federal Government currently operates a research and development tax credit scheme, the scheme could be expanded to provide more coverage for the cleantech sector. The current scheme restricts the availability of depreciation deductions on R&D assets, as an additional incentive the Federal Government could consider removing these restrictions. Increased eligibility for the scheme would also improve its effectiveness.

Facilitating the exploration and prospecting of natural resources like those undertaken in the development of wave and geothermal energy, Governments could grant immediate deductions for exploration-type expenditure incurred. This would be similar to existing exploration concessions that apply to the host industries.

### **Stage 3: Demonstration**

Renewable Technologies: Wave, geothermal, solar power towers, large scale solar

Policy Response:

#### ***Emerging Technologies Loan Guarantee Program***

Government support for early access to debt at commercial scale demonstration and deployment can be critical to gaining support from investors. A loan guarantee program similar to those operating in the USA, China and Japan would help Government take a more aligned role with the private sector and quarantine technology risk.

## **Stage 3 – cont. Renewable Energy Grant and Flagship Programs**

Grant programs for demonstration projects are essential to helping cleantechs navigate the valley of death. The progression of these technologies relies heavily on access to upfront capital.

Programs targeted to address the changing risk profile of the cleantech from pilot scale to full scale demonstration are most effective. Ernst and Young 2010 found this is particularly relevant for the energy sector in the scale up of 0 to 10MW of generation capacity, due to the absence of revenue certainty.

While Government funds have been to date directed to the solar industry through the Solar Flagships Program, there is not at this stage equivalent support program for the wave and geothermal sectors. If Government's priority is to foster innovation across the broader clean energy industry, grant programs that are technology agnostic or spread across a range of sectors may be appropriate given the wealth of renewable resources in Australia.

## **Stage 4: Deployment**

### **Renewable Technologies: Large scale solar thermal, Solar PV, Wind**

#### ***Revenue subsidies***

Addressing the revenue gap that often exists when cleantechs first progress to market is an important step in addressing externalities and encouraging competition, ultimately to drive down costs. In both Europe and the UK, revenue subsidies and regulation was identified as the key factor having the most impact on the growth of a cleantech.

In Australia a feed-in-tariff for emerging technologies coming to market is the preferred mechanism by both cleantechs and investors to attract private investment and industry partners. While feed-in-tariffs in Australia have to date been limited to small scale solar and wind, their application more broadly for technologies reaching commercialisation across the cleantech sector should receive serious consideration.

#### ***Accelerated depreciation***

Allowing host industries to apply accelerated rates of depreciation to clean technologies can assist in their deployment.

Key ways the Federal Government could consider expanding tax incentives to better support clean tech growth in the deployment phase include:

1. Introducing a loading on existing depreciating rates for assets
2. Reducing the write off period for capital allowances by reducing or capping the effective lives of new and retrofitted cleantech assets