The Green Entrepreneurial State
from fixing markets to co-creating and shaping

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International Energy Agency estimates that an additional USD 1.1 trillion in low-carbon investments is needed every year on average until 2050, in the energy sector alone, to keep global temperature rise below 2 degrees Celsius.

This implies current investment in GREEN ENERGY is only 20% of what it should be!

• Breakthrough Energy Coalition
• Mission Innovation & Clean Energy Ministerial
Global energy finance

Biggest challenge: what is State’s role?

Set ‘level’ playing field then *get out of the way*

De-risk (and ‘facilitate’) private sector

Solve market and system ‘failures’

Something … more interesting?
"Governments have always been lousy at picking winners... As the revolution rages, governments should stick to the basics: better schools for a skilled workforce, clear rules and a level playing field for enterprises of all kinds... Leave the rest to the revolutionaries."

(‘The Third Industrial Revolution’, The Economist, April 21, 2012).
Coordination failures e.g. pro-cyclical investment

Public goods e.g. knowledge, clean air

Negative externalities e.g. pollution

Information failures e.g. SME finance

Imperfect competition e.g. monopolies

Only fixing market failures?
Shaping and Co-Creating Markets
Market failure policies don’t explain **General Purpose Technologies**

- ‘mass production’ system
- aviation technologies
- space technologies
- IT
- internet
- nuclear power
- nanotechnology
- green technology
Missions and risk-taking along entire innovation chain

1. research
2. concept/invention
3. early stage technology Development
4. Product development
5. production/marketing

Source frequently funds this technological stage
Source occasionally funds this technological stage

Patent
Invention: functional prototype
Business Validation
Innovation new firm or program
Viable business

- NSF, NIH, DARPA
- Corporate research
- Angel investors, corporations, technology labs, SBIR, NASA
- VC, SBIR, InQtel, NIH, ARPA-E
- Corporate venture funds, equity, commercial debt

Source: adapted from Auerswald/Branscomb, 2003
We measure success by how many risks we have been willing to take (with inevitable failures) and whether the successes actually matter.

Cheryl Martin, ex-Director ARPA-E
Private and Public (SBIR) Venture Capital

*Source: Block and Keller, 2012*
What makes the iPhone so ‘smart’?

Source: Mazzucato (2013), p. 109, Fig. 13
Total NIH spending, 1936-2011 in 2011 dollars=$792 billion

NIH budget for 2012=$30.9 billion

Source: http://officeofbudget.od.nih.gov/approp_hist.html
Creating missions not fixing markets

NASA’s mission is to “Drive advances in science, technology, aeronautics, and space exploration to enhance knowledge, education, innovation, economic vitality, and stewardship of Earth.” NASA 2014 Strategic Plan

“Creating breakthrough technologies for national security is the mission of the Defense Advanced Research Projects Agency (DARPA).”

“The ARPA-E mission is to catalyze the development of transformational, high-impact energy technologies.”

“NIH’s mission is to seek fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to enhance health, lengthen life, and reduce illness and disability.”

“The mission of the KfW Group is to support change and encourage forward-looking ideas – in Germany, Europe and throughout the world.”
Technology risk in clean tech

(venture capital will ride the wave, who will kick/push?)

- Wind farms
- Utility-scale solar
- ‘First-gen’ biofuel refineries
- Fabs for solar cells using established technologies

- First commercial plants for unproven solar cell technologies
- Advanced biofuel refineries
- Offshore wind farms
- Carbon sequestration

- Wind and solar components of proven technologies
- Internal combustion engines
- Insulation / building material
- Energy efficiency services

- Energy efficiency software
- Lighting
- Electric drive trains
- Fuel cells / power storage
- Wind and solar components of unproven technologies

Source: Ghosh and Nanda, 2011
Global renewable energy (RE) finance

Heterogeneous actors in RE

Green tech public & private investments (2011)

- Development Finance Institutions: $123.0 bn
- Project developers (including public utilities): $102.0 bn
- Corporate actors: $66.0 bn
- Households: $33.0 bn
- Commercial Financial Institutions: $21.0 bn
- Government (budgets): $12.0 bn
- Private Equity, Venture Capital and Infrastructure funds: $1.0 bn
- Institutional Investors: $0.4 bn

Source: Climate Finance Initiative


**Tilting the playing field via Demand**

Source: Carlota Perez, “Why IT and the green economy are the real answer to the financial crisis”, Green Alliance 2012
A key element to get an energy breakthrough is more basic research. And that requires the government to take the lead. Only when that research is pointing towards a product then we can expect the private sector to kick in.
The elephant in the room: Financialisation

Fortune 500 companies have spent $2.3 trillion on buybacks from 2003-2012 (54% of their earnings), with another 37% on dividends.

(William Lazonick, HBR 2014)
Think Again!

private sector

vs.

public sector
The Entrepreneurial State: debunking private vs. public sector myths (2013) Anthem Press: M. Mazzucato


Financing renewable energy: who is financing what and why it matters (2017), Technological Forecasting and Social Change, M. Mazzucato and G. Semieniuk


