The energy challenge adopting clean tech - how quickly can the World change?

Prof Ray Wills

Director and Partner Duda&Wills

Chief Adviser Sustainable Energy Association of Australia

Adjunct Professor The University of Western Australia







Adoption of technology

- The natural turnover and retirement of appliances, buildings and vehicles can bring about a modest penetration of sustainable energy in the next ten years.
- However, adoption of new technology is often not just 'natural'
- The transition to sustainable energy, like many new technology shifts, will be more rapid with changes favoured by:
 - policy measures and regulation;
 - consumer sentiment;
 - pricing advantage.



Technology adoption rates – US

Will electric cars be dishwashers or VCRs?



NY Times

Technology adoption rates - vehicles



Technology adoption rates - vehicles



Technology adoption - manufacturers



Zoepf 2011

Technology adoption rates

- Can historic deployment rates be used to describe future technologies? Expect some similarities just faster!
- Small-scale deployment for approximately five years
 exponential growth and an inflection point ten or more years after first application
- Is there an opportunity for disruptive technology entry?
- Beginnings of disruptive innovation may be in market innovations,
 - Vehicle ownership model (eg Better Place) could rapidly change the how and what is purchased
 - Roof top solar companies may own the panels on your roof

Technology adoption rates

LIFX: The Light Bulb Reinvented

by Phil Bosua



www.kickstarter.com

Technology adoption rates

- Marked decrease in developmental lag
- Innovation/development of new products
- Supply side capabilities
- Market competition
- Growing consumer expectations
- Higher level of communication between consumers - blogspace
- Fleet/building/operations managers and CFOs
- Regulation
- Energy security

Renewable energy growth

Figure 2.9 Changes in percent shares of RE technologies in power generation, 1990-2009



Data IEA

Global renewables 2013?



Data UNEP

Latest Capacity Announcements vs. Actual Figure 1a



Total Identified Capacity Declines Due to Commissioning, Cancelations, and Fewer Postponements



Source: Ventyx – Velocity Suite 2012 data – 1/13/2012

Global electricity ...

IEA Energy Statistics

Statistics on the Web: http://www.iea.org/stats/index.asp



© OECD/IEA 2011

For more detailed data, please consult our on-line data service at http://data.iea.org.

Trends in car prices and CO2 2002-2010



How clean are Europe's cars?

Global electricity growth - Europe

Australian renewables 2011...

- The transformation of Australia's energy mix has begun in 2011 new electricity generation construction 25% solar, 31% gas and 33% wind.
- Coal-fired power currently 75% of Australia's total generation - in 2011 only 14% of new investment was coal.
- This is still behind the average world-wide investment in renewable energy – China's economy 8 times larger than Australia, investment in renewables over 20 times larger!

Australian electricity consumption 2012...

Changes in electricity generation and emissions

Eastern states electricity generation and emissions intensity

Solar on Australian homes

Technology energy use

Annual Electricity Energy Consumption (in kWh)

Global electricity growth

www.seaaus.com.au

The Sustainable Energy Association of Australia thanks all SEA members for their support including our sponsoring members acknowledged below:

Platinum Members NISSAN Jackson McDonald HYUNDAI **First Class Legal Service Corporate Members** Careers BGC ALL- ENERGY Australia OLLGAR **BrightGeneration** bhpbilliton **Education and Training** ronius **Curtin University** DUDA&WILLS HORT70 **Business Government Sustainability** HYPERION SHIFTING THE LIMITS POWER ENERGY Infinite energy NEXTPOWER **RioTinto** LGF LANDFILL GAS & POWER screentech perthenergy (2) SUNPOWER westernpower W **WorleyParsons** THE UNIVERSITY OF Swan Energy WESTERN AUSTRALIA resources & energy Wesfarmers

Probono legal advice provided by Jackson McDonald Lawyers

understand energy global de g Prime Minister 🤕 🖬 principled develop and moperate honesty experiencepotential -Western Australia Western Australia ing greenhouse regulation reputation trusted_{recycle} respect^{Wills} markets briefing construction Construction ct resources 0 Duda ar Estakeholder nad te Government productivity ly commerci ederal Government Parliament *+*Premier JOVERnment Premier e-based advocacy consult rofessional opportunity obligations pport respected B. prepare f attain rategica build pattain ground alignment comenetwork bureaucracy ion represent H. B. Constituents vrelationships and the second se eputable facts 2 2 3 echevidence 8 4 cLocal Government 💐 dership valued urgent minimise investment environment Australia

understand energy global accessapproval Prime Minister consultation initiate science principled reformoperate honesty quality experience potential education effective mining safety specialist finance lobby facilitate education effective mining safety specialist finance lobby facilitate effective mining safety specialist finance lobby facilitate effective mining safety finance lobby facilitate finance lobby facilitate effective mining specialist finance lobby facilitate finance lobby facilitate finance lobby facilitate effective specialist finance lobby facilitate finance lobby facilitate finance lobby facilitate effective finance lobby facilitate finance lobby finance lobby facilitate finance lobby finance lob facilitate D trusted 9 important 9 detail critical usines briefing gconstruction monitorprotect resources a' competitive ar Estakeholder <u>ustainabilit</u> State Government F productivity comply commercia Federal Government Parliament engage engage contract Correct ministerial positive Government Premier evidence-based advocacy consult educate professional opportunity obligations measure support respected 5. SUCCESS analytics strategic parley negotiate navigate bureaucracy Outcomenetwork navigate bureaucracy preparation represent 2.80 constituents hospitality relationships reputable facts D. 2 cleantechevidence 2 4 electric Local Government leadershipvalued urgent minimise investment environment Australia

understand accessapprovals Prime Minister 📿 🧧 consultation initiate develop an, reformoperate.honesty experiencepotential –Western Australia effective mining renewables safety specialist finance lobby facilitate safety specialist finance lobby specialist finance lobby specialist finance lobby specialist facilitate specialist finance lobby financ education detail critical monitorprotect resources ustainabilit Rest State Government - proc comply commercia Federal Government Parlia engage positive Government ministerial positive evidence-based advocacy cor educate professional opportunity of procurement measure support respected in support analytics strategica parley negotiate business networks navigate bureau Outcomenetwork hospitality relationships réputable facts DE cleantech evidence electric Local Government 💐

DUDA&WILLS Business Government Sustainability