

Wind Energy Growth: Technology in Context

Andreas M. Lippert
Manager: Alternative Energy Technologies
GE Global Research
Nov 2009



imagination at work

New energy technology growth

What it takes:

Big domestic marketplace

Scalable, competitive **supply chain**

Best **technologies**

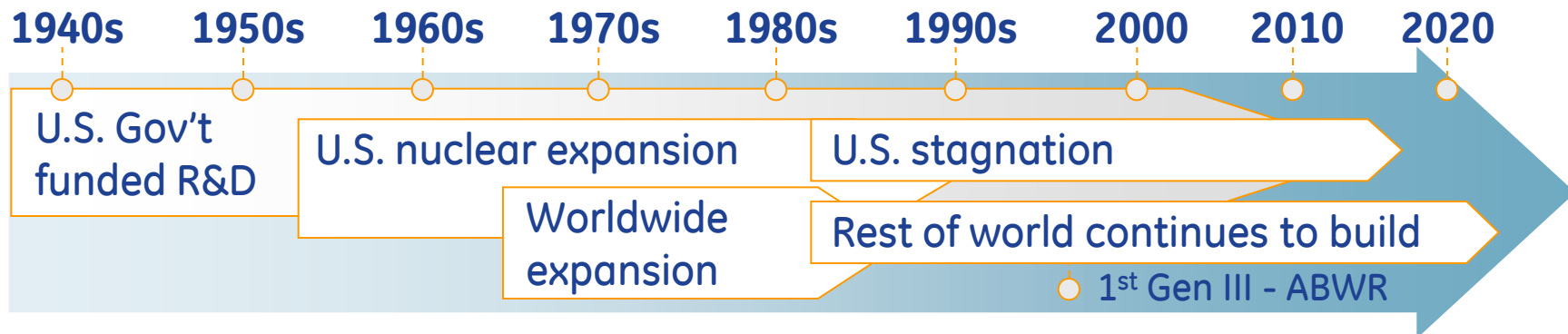
Strong **intellectual property** protection

Free trade and competition

.... Only if we create a large domestic marketplace

The promise of big
markets creates
technology leadership

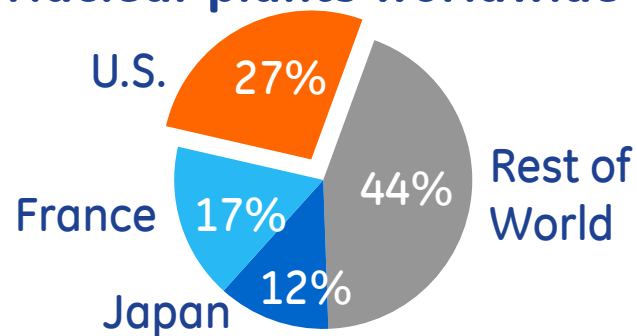
Nuclear industry born from U.S. government R&D



Today:

- 370 GW of nuclear generation worldwide
- 436 reactors in 31 countries
- 104 reactors in U.S.

Nuclear plants worldwide



U.S. government investment has created the technology used for majority of nuclear plants worldwide

Heavy duty gas turbine – byproduct of defense spend

U.S. government funding jet engine during WWII



Leading to ...

1941

First U.S. jet engine built

1940s

Development of land based technology ... beginning of commercial application for energy generation

1949

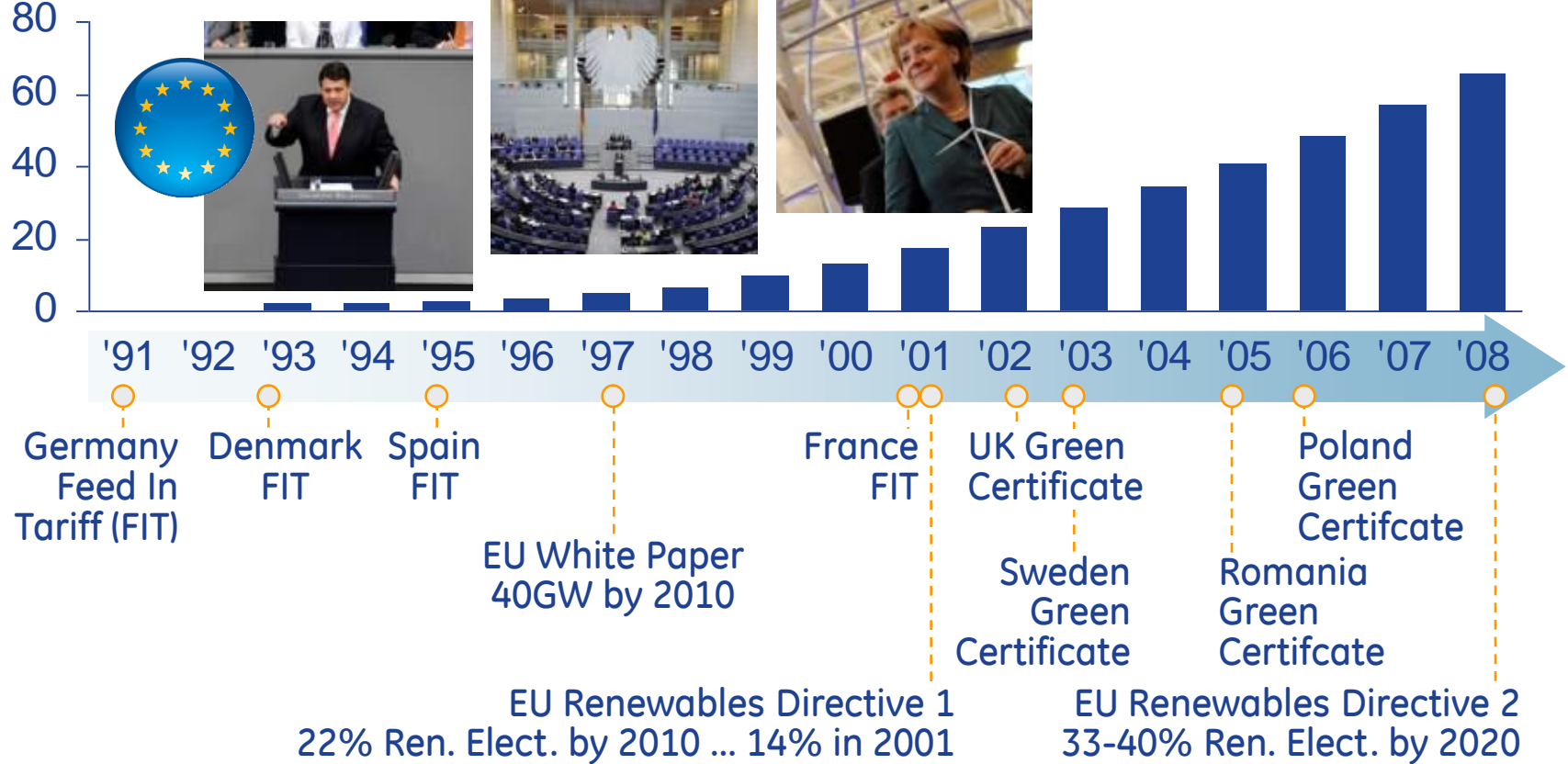
First gas turbine connected to U.S. grid

2009

- Gas turbine technology generates 20% of all U.S. electrical power
- ~600 GW of combined-cycle generation operating worldwide

Consistent Europe policy created wind industry

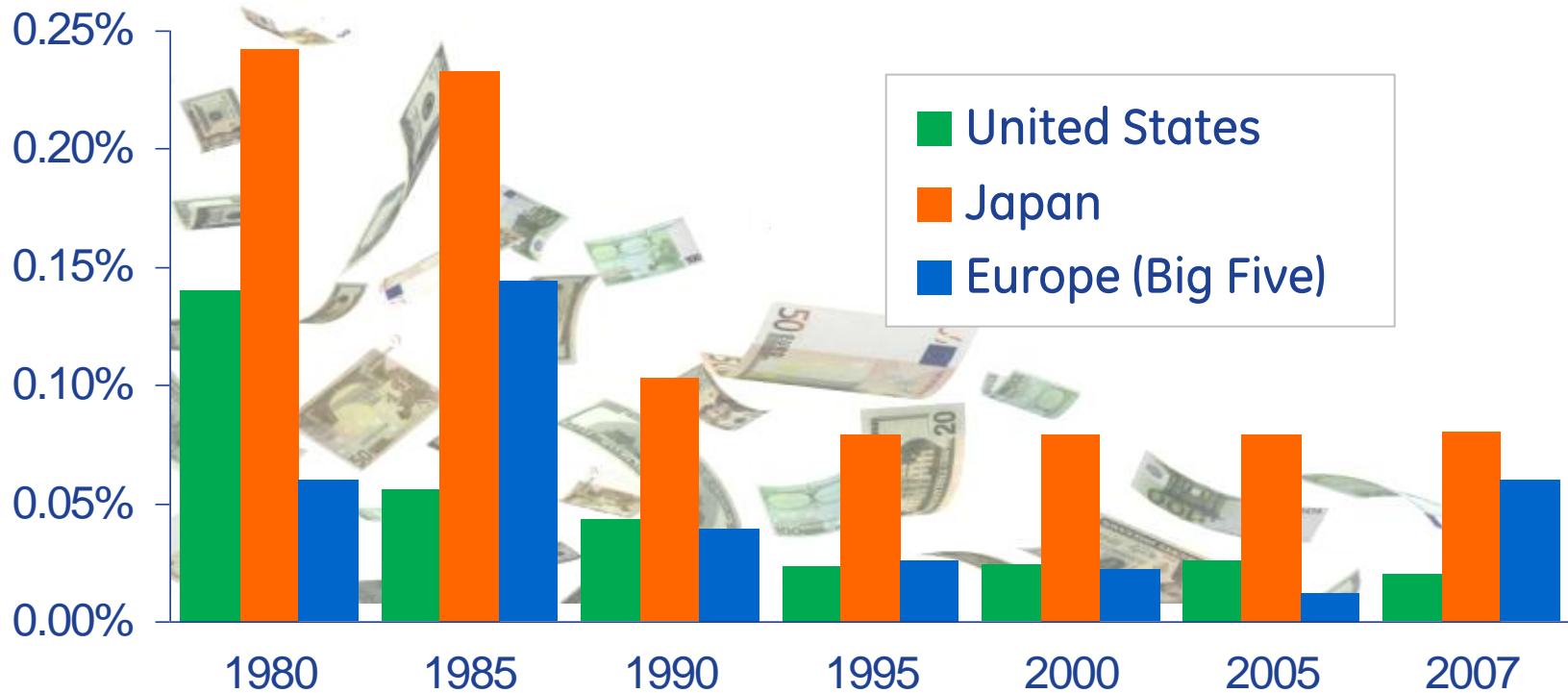
Cumulative GW



The cleaner energy leadership race

Is public energy R&D spending enough?

Government funded energy R&D by country (as % of GDP)



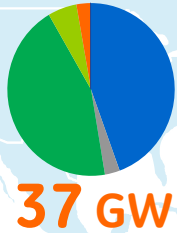
Source: International Energy Agency, R&D budgets, 2009

**Japan investing ~3X more than U.S.
in energy R&D (as % of GDP)**

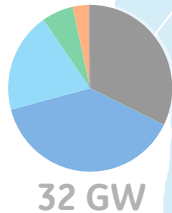
Domestic agendas drive leadership

Forecasted power gen industry orders:
2009-2012

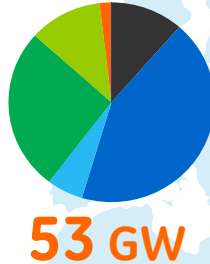
North America



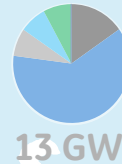
Latin America



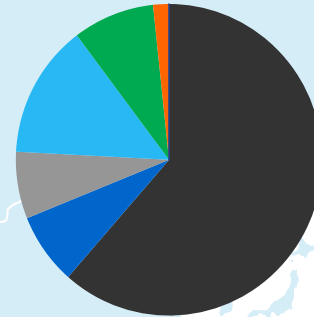
West Europe



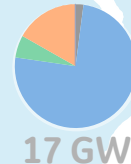
East Europe



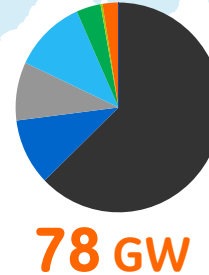
China



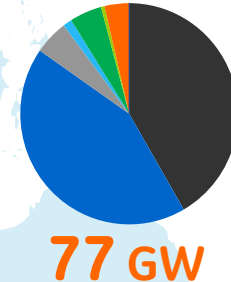
MidEast



India



Asia



3-year global orders (GW)

■ Coal	208	■ Wind	57
■ CCGT/SCGT	127	■ Solar	9
■ Nuclear	25	■ Other	13
■ Hydro	44		
TOTAL		483	

Future technology and market leadership

EU Wind Energy Roadmap

GE has participated actively in TPWind, and supports the EWEA Wind Technology Roadmap

- Concrete, transparent plan
- Public-private partnership
- Concerted process with stakeholders



Strong EU government support is crucial;
EU SET-Plan provides exemplary funding vision

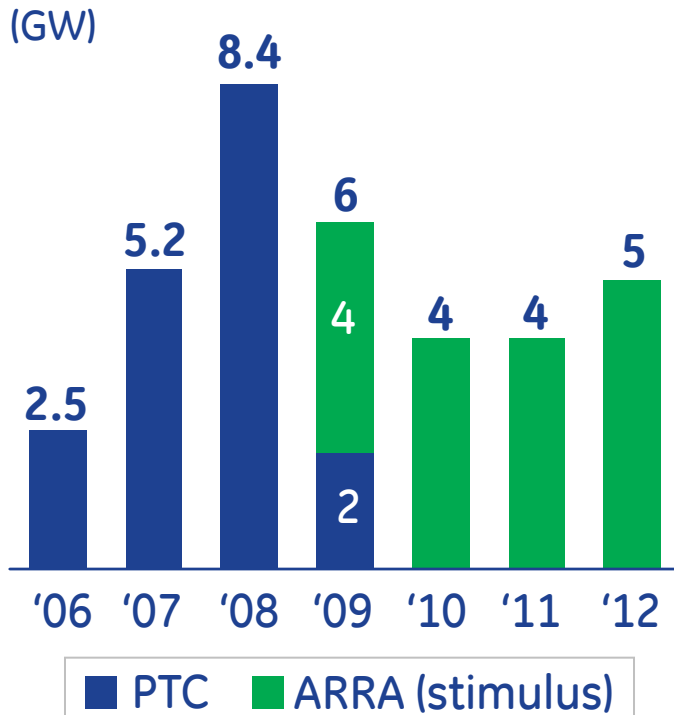
Not just about turbine technology but infrastructure

Difference on 10-20MW turbine by 2020

- aggressive timeframe but accept this as a vision to grow technology development all around

U.S. wind industry

U.S. wind installs



Source: GE + AWEA analysis

Key points

U.S. at ~5% renewable electricity now

- 2.7% Wind (end of '09 est.)
- 1.7% Biomass
- 0.5% Geothermal
- 0.1% Solar

2012 target in H.R. 2454 drives zero renewable installs

- Waxman/Markey
> 6% by 2012 ... 4.5% net after efficiency

12% by 2012 RES target maintains 2008 production and job levels

Proposed RES targets require ZERO new renewables

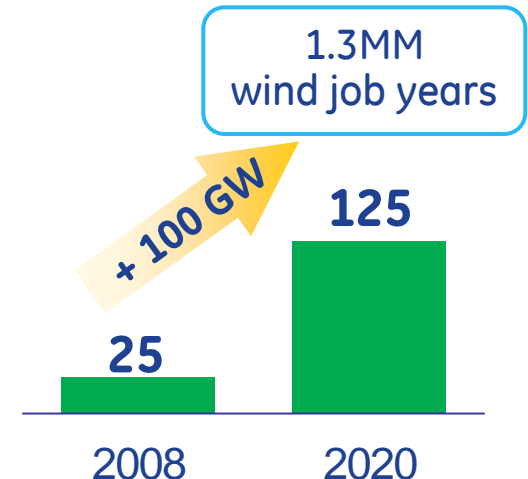
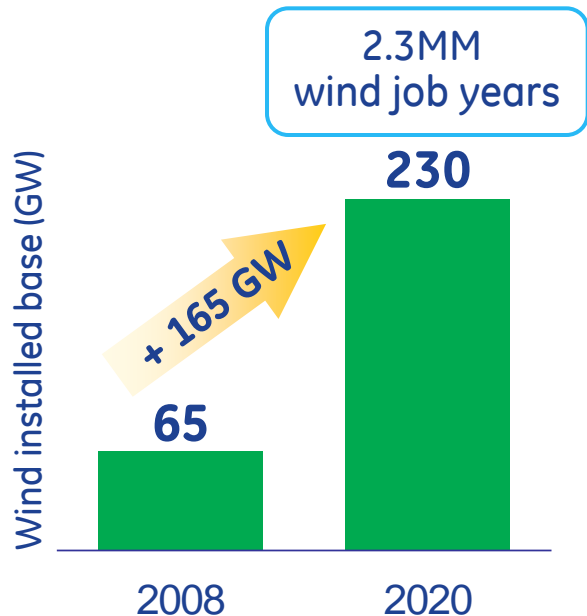
Global wind outlook



EU Renewable Energy Directive

National Energy Administration/NDRC*
"State New Energy Revitalization Plan"
*Proposed increase to 100 GW target

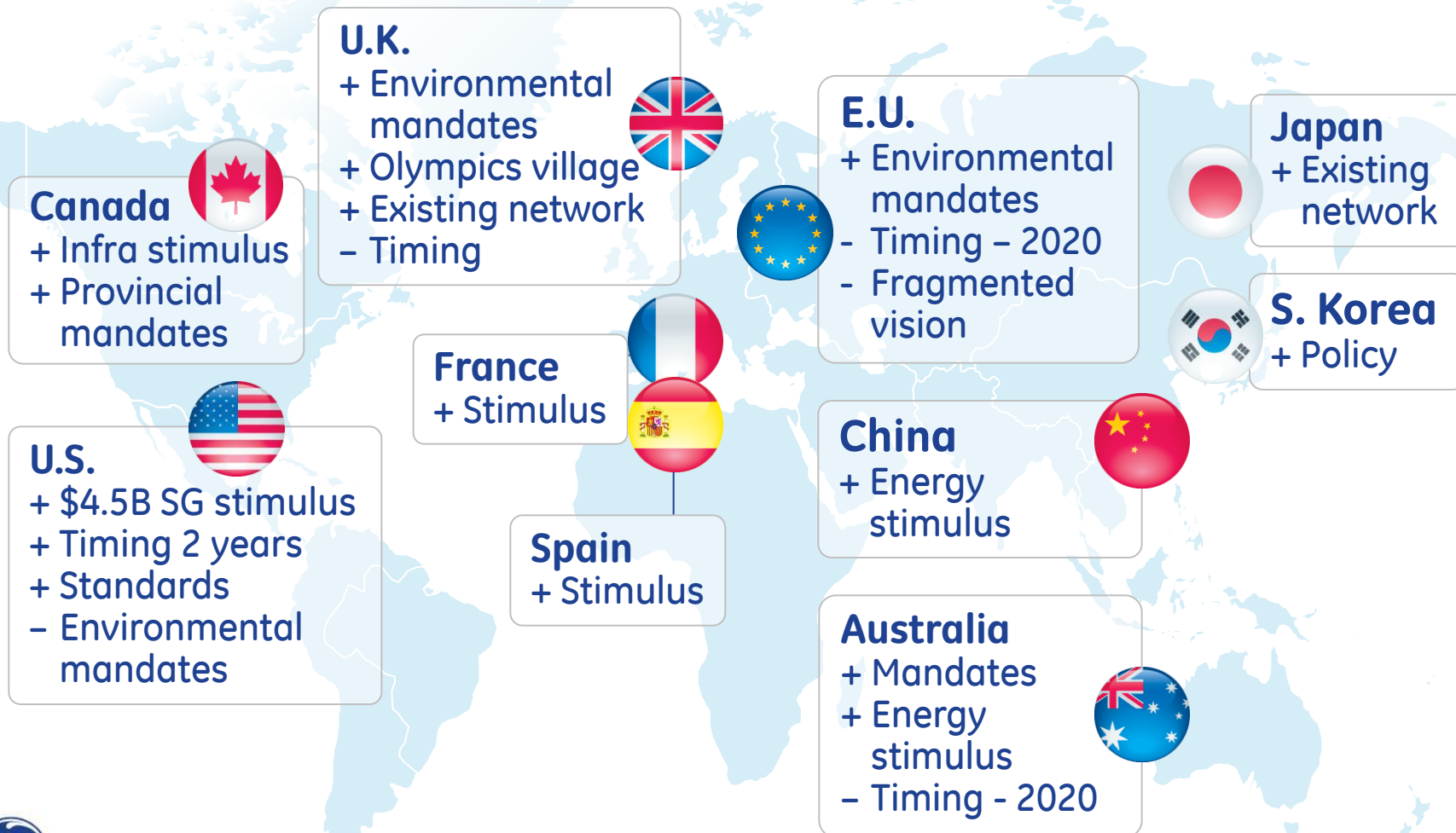
American Clean Energy & Security Act



75% of wind industry outside U.S.

Global Smart Grid landscape

Implementation easier with reliable distribution systems



Exploring Energy Storage – 1 example

AA-CAES

Herausforderungen und Chancen der adiabaten Druckluftspeichertechnik als Ausgleichsinstrument im Netzverbund

40. Kraftwerkstechnisches
Kolloquium 2008

15. Oktober 2008, Congress Center Dresden

Roland Marquardt,
Forschung & Entwicklung - Neue Technologien,
RWE Power AG



Free trade and competition

Cooperate globally to restore growth

Challenge

- More and more countries slipping into protectionism, particularly where they believe clean energy jobs are at stake

Solution

- Take offensive to eliminate trade barriers
 - Governments should move rapidly to roll back existing barriers and open markets ... start with a WTO environmental goods and services agreement
 - Governments should challenge each other for violations of WTO rules



Promote innovation

Challenge

- Some countries proposing compulsory licensing of green technologies

Solution – Innovation

- Essential to addressing climate change at lower cost
- Drives competitiveness and green jobs
- Results primarily from private R&D
- Requires return on investment
- Based on intellectual property protection



Maintain financing

Challenge

- Deployment of new and cleaner technologies requires financing

Solution

- Special climate change funds under United Nations Framework Convention should be:
 - Available for all low carbon technologies
 - Open to private sector proposals
 - Extended to all developing countries
- Carbon credit procedures should be streamlined
- Export credit agencies can also contribute
 - Open in key countries, where now closed



Summary

Cleaner, smarter energy – including wind - is a global, growing and competitive market

To succeed, requires:

- Big domestic marketplace supported by consistent policies & government investment
- Scalable, competitive supply chain
- Best technologies
- Strong intellectual property protection
- Free trade and competition



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