

## The New Climate Economy

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Jeremy is Programme Director for the New Climate Economy Project, taking a sabbatical from his role as a Director of McKinsey & Co. to lead the project. Previously, he led McKinsey's Sustainability and Resource Productivity Practice. He is also lead author of *Resource Revolution: Meeting the World's Energy, Materials, Food and Water Needs* (McKinsey Global Initiative, 2011).

### **NEWWORLD** CAPITAL GROUP



## THE GLOBAL COMMISSION ON THE ECONOMY AND CLIMATE

New Climate Economy 2014

### Purpose of the Global Commission



- Based on economic decision-maker perspective
- Strategic rather than comprehensive
- Report was published on September 16<sup>th</sup> 2014

### The New Climate Economy Partnership:

### **7** Commissioning Countries

Colombia Ethiopia Indonesia Norway Sweden South Korea United Kingdom

#### **8 Partner Research Institutes**

Climate Policy Initiative (USA) Ethiopian Development and Research Institute Indian Centre for Research on Economic Relations Global Green Growth Institute (South Korea) Overseas Development Institute (UK) Stockholm Environment Institute (Sweden) Tsinghua University (China) World Resources Institute (USA)

#### **Global Commission**

24 global leaders : ex-Presidents and Finance Ministers, major CEOs, heads of the main international economic Organisations

Chaired by former President of Mexico Felipe Calderón **Economic Advisory Panel** 

14 world leading economists, chaired by Professor Lord Nicholas Stern

#### Includes:

Two Nobel prize winners: Daniel Kahneman and Michael Spence

# Major economies across the world need to drive structural change to restore growth



# The world is currently on track to 4+ degrees of global warming



# There are signs that major countries are moving towards 3 degree or better framework



The United States: Has pledged to cut its emissions to 26-28% below 2005 levels by 2025.

**The European Union**: Has already endorsed a binding 40% greenhouse gas emissions reduction target by 2030.

China: Has agreed to cap its output by 2030 or earlier if possible It has also promised to increase its use of energy from zeroemission sources to 20% by 2030.

SOURCE: IWR (2009) and UNFCC (2007) Map created by Hennig B, Sasi Research Group University of Sheffield

### Key drivers of growth and climate performance



HIGH QUALITY, RESILIENT, INCLUSIVE = BETTER GROWTH

### Value of the premature deaths from PM2.5 air pollution



### Sprawl costs the United States over \$400 billion per annum



Source: Litman (2014) for New Climate Economy commissioned by LSE Cities. Note: these denote the potential savings from smart growth policies. See Litman, T., 2014 (forthcoming). *Analysis of Public Policies that Unintentionally Encourage and Subsidize Urban Sprawl* for detail of underlying data sources.

### THE NEW CLIMATE ECONOMY

The Global Commission on the Economy and Climate

Actions with economic benefits could deliver most of the greenhouse gas abatement needed by 2030

### GHG EMISSIONS AND ABATEMENT POTENTIAL FROM SELECTED MAJOR LEVERS: 2030

Gigatonnes of CO<sub>2</sub> equivalents



# INVESTMENT: Infrastructure capital spend is estimated to be marginally higher in a low-carbon scenario

GLOBAL INVESTMENT REQUIREMENTS; 2015 TO 2030, US\$ TRILLION, CONSTANT 2010 DOLLARS

Indicative figures only High rates of uncertainty



Source: OECD (2006, 2012), IEA ETP (2012), modelling by Climate Policy Initiative (CPI) for New Climate Economy, and New Climate Economy analysis.

# Scale-driven cost reduction

## New business models/platforms



3

Deep disruption for incumbents

Recombination waves

## 1 LED lighting costs are coming down much faster than expected – predictably!

ESTIMATES

### Relative projected manufacturing costs for LED packages

Index costs in percent of 2009



Note: The U.S. Department of Energy changed the reporting scheme afterwards over several years, hence a comparison for more recent years is not possible

SOURCE: U.S. Department of Energy (2010, 2011); McKinsey

Chinese production is fueled by global players moving to China for high-end applications, combined with local players scaling up in the low/mid-market

Global players are actively	
expanding local capacity via JVs	

- EEC Established Cree Huizhou Solid State Lighting, being the first international LED company to set up a chip manufacturing facility in China (2010)
- EPISTAR

FOREP

- Partnered with China Electronics Corp. (CEC) to build a joint venture for epi/wafer, chip, light source and lighting product manufacturing (2010)
  - Most of the production will be available in CEC's LCD panels, monitors, TVs and lighting
- Jointly invested with LG Display and AmTRAN, Unity Opto and Wooree Group to set up a LED chip manufacturing plant in Suzhou (2010)

Chinese products capture share in the domestic mid- to low-end market



- ~42% of 2009 revenue are sold in the domestic market
  - LED package 45, panel goods 55%



~72% of 2009 revenue are from the domestic market



~50% of the downstream products are for the domestic market

## China as the entrepreneurial state

#### Efficiency

Im/W



# Results of DEWA's 100 MW solar PV IPP tender set a new cost benchmark

Lead tenderer L	<b>.COE offered</b> JS c/kWh	Assumptions
ACWA Power <sup>1</sup>	5.99	1000
Fotowatio Renewable Ventures <sup>2</sup>	6.13	<ul> <li>~1900 kWh/KWp of</li> </ul>
Masdar <sup>3</sup>	8.24	solar yield in Dubai
First Solar International <sup>4</sup>	8.65	<ul> <li>5% WACC</li> </ul>
SunEdison Solar	8.81	<b>5</b> .98
Hareon Swiss Holding <sup>5</sup>	8.98	cents/kWh requires
EDF Energies Nouvelles	9.16	~\$1/Wp total capex incl.
NRG Energy <sup>6</sup>	11.03	modules + BOS +
Abengoa Solar Ventures	11.76	installation
Huaneng Power International <sup>7</sup>	14.71	0001

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3 factors could help to achieve 5.99 c/kWh

Implications

- Low cost financing
- Tight vendor (module, BOS, EPC)
  - management
- EPC/O&M knowhow in desert environment
- Leading solar companies predict suggest \$0.6/Wp as a stretch target by 2020
- Technology will aid this e.g. efficiency of c-Si currently still only at ~20%. Theoretical maximum > 40% (up to 80%)

Using First Solar panels, 2) In consortium with Saudi Arabian developer Abdul Latif Jameel, 3) In consortium with Corsan Corviam Construction
 In consortium with Corys Environmental Investments, 5) In consortium with China State Construction Engineering, 6) In consortium with Saudi Oger,
 In consortium with Tuas Power
 SOURCE: DEWA; team analysis

# China's investment in renewables will add significant capacity, and continue cost reduction pressure

China is adding more renewables by 2020 than the US and EU combined





2

3 billion?

1 billion

2010

250 million

1R3777

2050

2 A range of smart transport systems have taken off in numerous cities worldwide since 2000



## 2 Smart parking – one example of new business platforms



Establish monetization model(s) across the play and target markets where solution is relevant

# 3 We will see waves of consolidation - e.g. around the project developers, such as that seen in the downstream market

Aquiror	Target	Region	Description of target (Year of acquisition)	<b>Deal value</b> Million €
	Térmika	6	Offers energy related products (2012)	N/a
	<b>iht</b> EnergieService GmbH	_	Engineering services in energy services sector (2012)	N/a
GDF SVez	ADELT MECHANICAL WORKS	۲	Mechanical contractors offering turn-key solutions for B2B and biotech facilities (2012)	N/a
	CHÊNELET	θ	Real Estate company which builds energy efficient, low-income housing (2012)	0.3
	undisclosed	٢	Environment and port study consulting (2013)	N/a
		6	Offers energy related products (2012)	30.1
centrica	Power Plus Communications	•	Broadband provider, enables consumption data delivery in real-time from AMIs to en provider (2012)	4.5
			Providers of energy related products (2012)	89.9
<b>5</b> 1	SE	0	Environmental consulting firm (2012)	N/a
SCEDE		θ	PV Panels manufacturer (2012)	N/a
eon	Bloomenergy	٩	Solid-oxide fuel cell manufacturer (2013)	N/a
	(C) matrix		Energy efficiency consulting, remote building management (2013)	N/a

1 Additional EDF deals expected in Belgium in March 2014

SOURCE: Dealogic, press

#### While Philips moved ahead acquiring several players, its competitor Osram acted slowly and spent energy on its IPO Company Important events LED market shares<sup>1</sup> 2011 Philips offers the first LED light bulb for less than USD 5 (at Home Depot) Philips CEO intends to translate product/cost innovation and higher DHILIDS **Targeted acquisition** volumes into lower prices for LED bulbs of players along the LED value chain (to Further acquisitions, most notably Genlyte, be vertically integrated) a US player, for USD 2.7 billion in 2008 57% 2002 2013 03 04 05 06 08 10 12 07 09 11 16% Comfortable market Slow adjustment of product portfolio with OSRA only three small- to medium-sized position in the traditional lighting market; acquisitions Spin-off from Siemens, restructuring EU announces ban of efforts to prepare IPO (fails in autumn) incandescent bulbs IPO finally takes place; Osram launches LED bulb at EUR 10 (USD 13.1)

1 Share in European LED lighting revenues

SOURCE: Company web sites; annual reports; GBI Research Report; McKinsey

### Incumbents in high-carbon business models are finding themselves in trouble



1 Volume and price effects from average 4.5% demand growth to 2020 (significant differences across countries)

2 Emission allowance allocated for free (~65% of total) valued at 2011 average price (~13.3 EUR/t)

3 Higher carbon price (~ 26 EUR/t in 2020) more than compensates for lower fuel prices (80 USD/bbl oil-linked)

4 Includes effect of increased cross-country interconnection (net effect can not be disentangled meaningfully from the increased RES penetration) and endogenous dynamic effects related to increase RES penetration (thermal plant retirements and lower endogenous additions)

5 Nuclear: 16 GW retirements, 9 GW additions. LCPD: negligible impact due to limited value of plants in 2011 for low efficiency and limits already in place on utilization

SOURCE: McKinsey Power Model, industry vision team analysis

## E.ON is now looking to change the game



P.nn

**Distinct opportunities, mindsets and capabilities** 

The Bank of England is now investigating whether "unburnable carbon" represents a systemic threat to the financial system



Governor of the Bank of England – Mark Carney

"The majority of proven coal, oil and gas reserves may be considered 'unburnable' if global temperature increases are to be limited to 2 degrees Celsius."

"This may lead to stranded carbon"

"In light of these discussions, we will be deepening and widening our enquiry into the topic,"

## 4 Incumbents will fight both innovation and regulation



#### Taxi drivers around the world oppose Uber

- Taxi drivers in major European cities (London, Paris, Madrid, Milan, Berlin) protested against Uber this past summer
- Uber's hometown on San Francisco is threatening legal action against the company



#### US automakers oppose fuel efficiency standards

- US automakers have lobbied against corporate average fuel economy (CAFE) standards for years
- US average fuel economy has seen only slight improvement since the mid-1990s

#### Many industries opposed EU ETS and sought exemptions/exceptions

- EU emissions trading scheme activated opposition from a range of industries
- Chemicals: succeeded in gaining exemption for first 2 phases
- Aluminum: : succeeded in gaining exemption for first 2 phases
- Steel and Cement: Received free carbon allowances for emissions trading
- Airlines: Successfully lobbied against the inclusion of aviation into ETS and UN accord



#### Agriculture opposes New Zealand ETS

- Industry lobbied successfully to remove cost burden of ETS despite emitting ~50% emissions
- ETS now excludes agriculture for first 5 years, with additional concessions to apply after that



#### Industries oppose Japan Kyoto Target plan (2009)

 Nine industry groups via Nippon Keidandren lobby including Nippon Oil, Tokyo Electric Power, Toyota, Mitsubishi and Nippon Steel, lobbied for softer reduction targets

### The next 10 years will be a bumpy, uneven transition period



### Tailwinds

- Technology and business innovation – market tipping points
- Consumer preferences
- Increasing climate change signal



### Headwinds

- Regulatory trench-battles
- Green paradox (i.e. high carbon energy gets cheaper as demand falls off)
- Fossil fuel technological progress

### Global GHG Abatement Cost Curve beyond BAU: 2030



Note: The curve presents an estimate of the maximum potential of technical GHG abatement measures below  $\in$ 80 per tCO<sub>2</sub>e if each lever was pursued aggressively. It is not a forecast of what role different abatement measures and technologies will play.

SOURCE: McKinsey's Global GHG Abatement Cost Curve v3.0; BAU from International Energy Agency World Energy Outlook 2010 and McKinsey analysis

### The marginal abatements benefits curve for 2030



Note: The curve presents an estimate of the maximum potential of technical GHG abatement measures below \$100 per tCO<sub>2</sub>e if each lever was pursued aggressively. It is not a forecast of what role different abatement measures and technologies will play.

Source: New Climate Economy based on 1: Conservative assumptions for monetised co-benefits based on expert input and multiple data sources including Lim et al, West et al, Hamilton et al (forthcoming), Holland et al, Parry et al, World Bank, WRI, Sendzimir et al, Pye-Smith, Costanza et al, Brown and Huntington, Hedenus et al. Co-benefits at the bottom end of the ranges available in published literature. 2: McKinsey's Global GHG Abatement Cost Curve v3.0. For further detail see: New Climate Economy Technical Note, Quantifying the Multiple Benefits from Low-Carbon Actions: A Preliminary Analysis. Available at: 29 http://newclimateeconomy.report.

### Globally, average benefit per tonne of saved emissions could triple if savings associated with co-benefits are included



1 This is the average benefit/tonne of saved emissions across the entire curve, including all levers.

2 These are energy efficiency benefits that are measured as savings in energy costs

3 Health co-benefit from reduced coal related emissions. These play a significant role in developing countries

4 Rural development co-benefit by way of additional rural income

5 Energy security/reduced volatility co-benefit associated with reduced energy usage

6 Air pollution, Avoided accidents and avoided congestion resulting from modal shift in public transport to buses, brt and metro

SOURCE: McKinsey analysis for cost curve estimation, NCE assumptions input for co-benefits levers

# The Global Commission recommends 10 transformative actions

- 1 Integrate climate risk into strategic decisions
- 2 Secure a strong international climate agreement
- 3 End subsidies for the high-carbon economy
- 4 Price carbon to send a clear market signal
- 5 Scale-up low-carbon innovation
- 6 Reduce the cost of capital for low-carbon investment
  - Move toward connected and compact cities
- 8 End deforestation
- 9 Restore degraded lands
- 10
- Phase out unabated coal fast