U.S. Support for a Low Carbon Energy Transition

The Foundation for Science and Technology Debate

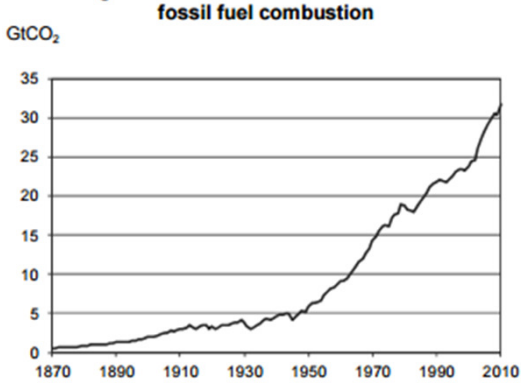
July 8, 2015

My Key Points

- We face a difficult transition
- US Goals for the UNFCCC talks in COP 21
- United States “All of the Above” Energy Strategy
- Strong support for low carbon technologies

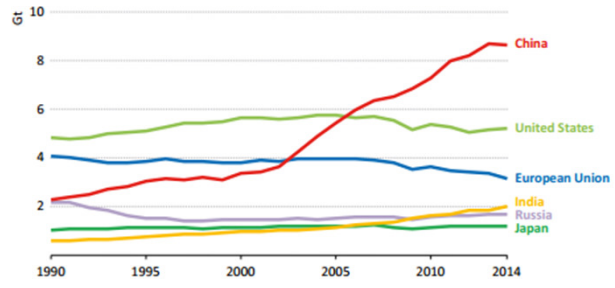
Urgent Need for Action

Figure 3. Trend in CO_2 emissions from fossil fuel combustion



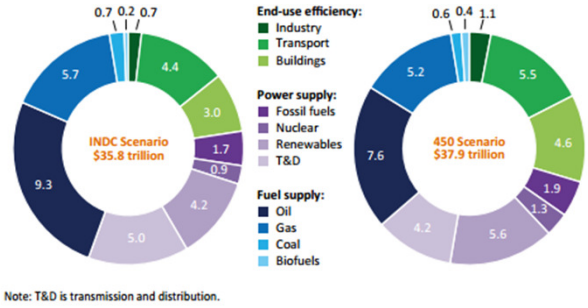
Emission Increases by Region

Figure 1.6 ▷ Energy-related CO_2 emissions by selected region



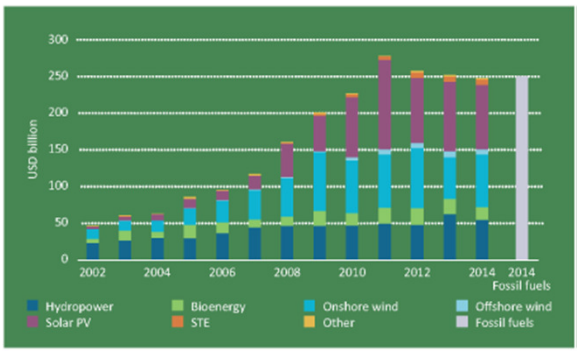
Massive Investments Required

Figure 2.4 ▷ Cumulative global energy sector investments by sector in the INDC and 450 Scenarios, 2015-2030 (trillion dollars, 2013)

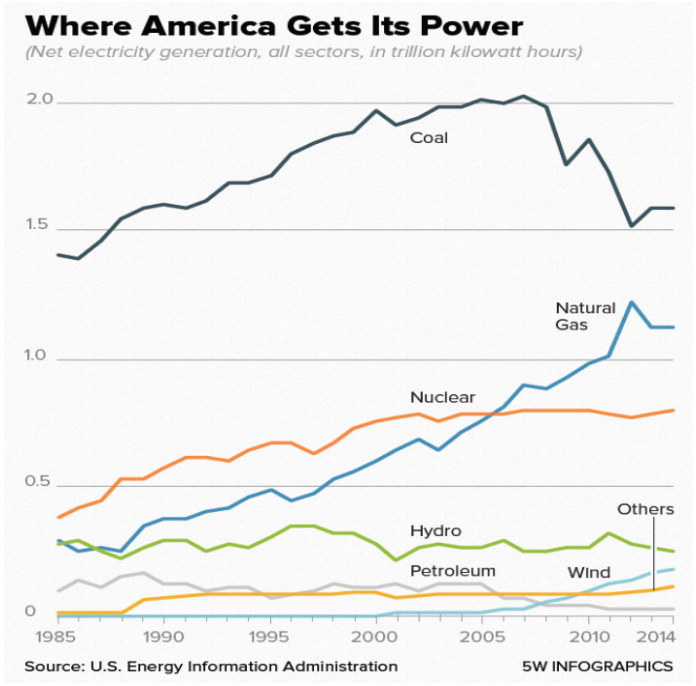


Note: T&D is transmission and distribution.

Now for some good news



Large Investments happening



Making UNFCCC Talks a Success

- President Obama and Secretary Kerry are Strongly Committed to Action
- Domestic Action – the Climate Action Plan
- Committed to ambitious, effective and durable COP 21 agreement
- INDC system is working – Joint Announcement with China, INDCs

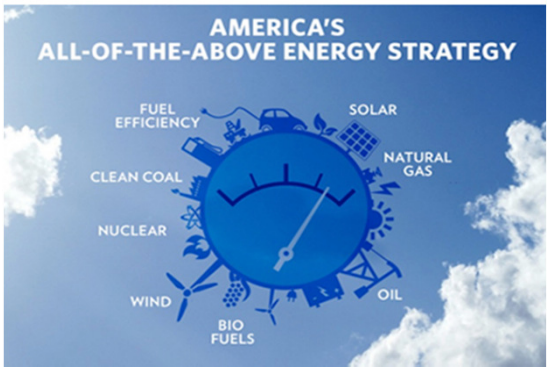
Making the UNFCCC Talks a Success

- Increasing Climate Finance
- COP 21 is a way station, not a final stop
- Key priority of COP 21: send a strong market signal

State Action

- 30 States have Renewable Energy Standards – California 20% by 2010
- State Emissions Trading
- State plans for Smart Grids
- States serve as laboratories for action

"All of the Above" Energy Strategy



Solar - The Sun Shot Initiative

- Goal is to reduce solar costs to cost parity – 6 cents/kWh by 2020
- In partnership with business, universities and national laboratories
- Provide support for soft costs, PV R&D, concentrating solar power, manufacturing R&D (tech to market), and systems integration

Solar- The Sun Shot Initiative

- Successful innovation with industry
- More solar in 18 months than 30 years prior
- 2014- renewables were 14% of electrical power generation – our 2040 target
- 142,000 jobs in the solar industry
- Four years in, over 60% toward our goal
- Reached grid parity in parts of the U.S.
- Bright future worldwide

Department of Energy Wind Program

- Goal – Cost competitive wind energy
- Partner with industry, academics and research institutions
- R&D wind turbines, systems materials and manufacturing
- Wind turbine testing and certification
- Market acceleration and deployment
- Work with environmentalists on impacts

Results of Wind Program

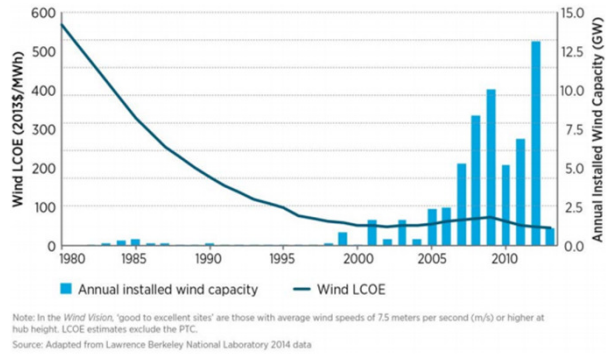


Figure 2-6. Trends of average U.S. wind energy LCOE for good to excellent resource sites and annual U.S. wind power capacity installations
Source: DOE 2015

Wind Program

- Wind Program now investing $100 m annually
- Since 2008 wind production has tripled
- +48,000 wind turbines in 39 states, 65 GW installed capacity, 18 million homes
- Green growth – wind turbine exports from $16 million in 2007 to $500 million in 2013

Off Shore Wind is Emerging

- Tremendous potential – 54 GW by 2030, 42 million homes, $200 b industry, 43,000 jobs
- DoE has invested $227 million since 2011 for off-shore R&D, market acceleration and advanced technology demonstration

CCS is Essential to meet Goals

- Carbon Emission Reduction
- To reduce costs
- Canada' Boundary Dam Project
- UK is a CCS Leader in Europe
- CSLF and international Cooperation

USG Support for CCS Projects

Project	Type	CO2 Sequestered(metric tons/year)	Storage	Sequestration Start
Summit Texas Clean Energy Project (Summit)	IGCC Polygeneration	1,750,000	EOR	2018
Hydrogen Energy California (HECA)	IGCC Polygeneration	2,570,000	EOR	2020
Advanced IGCC with CO2 Capture (Southern Co.)	Power	3,000,000	EOR	2016
Advanced Post-Combustion CO2Capture (Petra Nova)	Power	1,400,000	EOR	2017
FutureGen 2.0 (FGA)	Oxy-combustion	1,000,000	Saline	2018
Steam Methane Reforming With CO2 Capture (APCI)	Industrial	925,000	EOR	2012
CO2Capture From a Biofuel Plant (ADM)	Industrial	900,000	Saline	2015
Petcoke Gasification to Methanol (Leucadia)	Industrial	4,500,000	EOR	2018

Deployment of Smart Grids

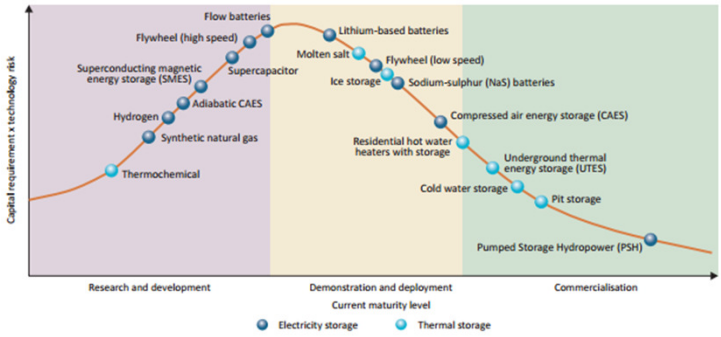
- Huge need for Smart Grids
- Could increase energy efficiency by 9% by 2030
- Department of Energy Smart Grid programs
- Large increase in Smart Metering infrastructure

Energy Storage

- Dept. of Energy Storage Program
- In 2015 180 grid connected storage, 62 MW came on line
- Energy Storage growth will continue rapidly
- California requires 1.3 GW of energy storage by 2022

Maturity of Energy Storage Tech

Figure 3: Maturity of energy storage technologies



Source: Decourt, B. and R. Debarre (2013), "Electricity storage", *Factbook*, Schlumberger Business Consulting Energy Institute, Paris, France and Paksoy, H. (2013), "Thermal Energy Storage Today" presented at the IEA Energy Storage Technology Roadmap Stakeholder Engagement Workshop, Paris, France, 14 February.

Summary

- US is committed to action on Climate Change
- We support many types of low carbon technologies
- Our goal is cost parity