



# Reducing the cost of clean energy through integrated energy planning and policy

## Low Carbon Model Towns

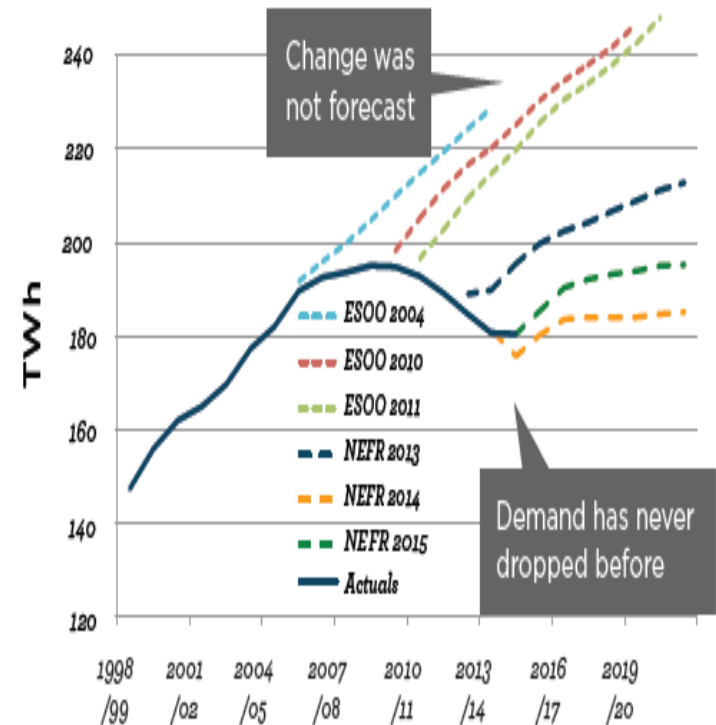
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Louise Vickery, Energy Efficiency Renewable Energy, IEA  
Low Carbon Model Town Symposium, September 2017

- Three Pillars of Modernisation
  - Engagement with emerging economies
  - Clean Energy Hub
  - Broaden Energy Security – Oil, Electricity, Gas
- Energy Efficiency in Emerging Economies
  - Practical policy support based on where countries are at
  - Developing networks of policy makers through Training Weeks – Paris, Singapore, Georgia
  - Indonesia, South Africa, Brazil, China, India, Mexico
- Ministry of Energy and Mineral Resources invites IEA practical support for integrated approach to meet growing demand while reducing carbon.



- Growing evidence many countries and projects have over-estimated energy demand growth
- Underestimated the impact of energy efficiency and distributed renewables
- Overinvestment or sub-optimal investment in energy infrastructure
- Lack of analysis of a communities' ability to pay for energy services – energy economy
- A more holistic and sequenced approach could be applied to national, sectoral, and local energy planning and policymaking to lower the cost.

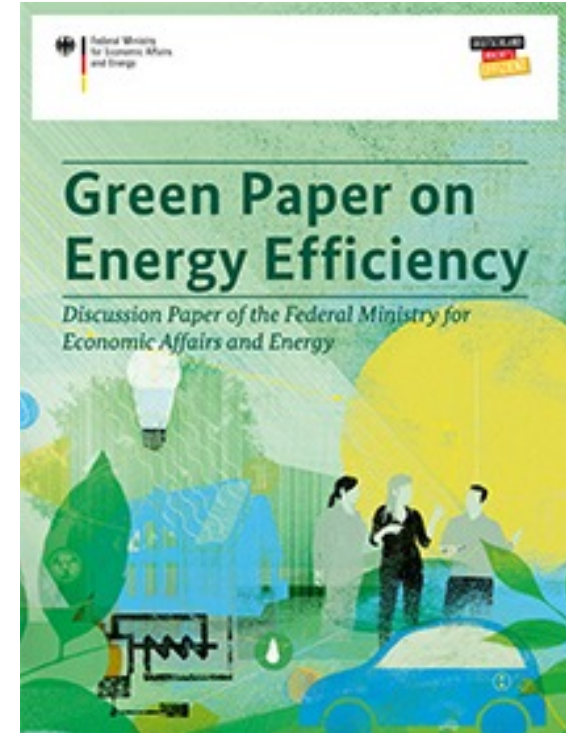


ESOO: Electricity Statement of Opportunities; NEFR: National Electricity Forecasting Report

1. Take an “Energy Efficiency First” approach, look to where demand can be reduced cost effectively
  - Understand current energy demand and future trends, the services required and customer’s ability to pay
2. Look at local clean energy resources to meet energy demand with tailored geo-spatial approaches.
3. Least-cost mix of energy efficiency, local renewables, central generation and grid

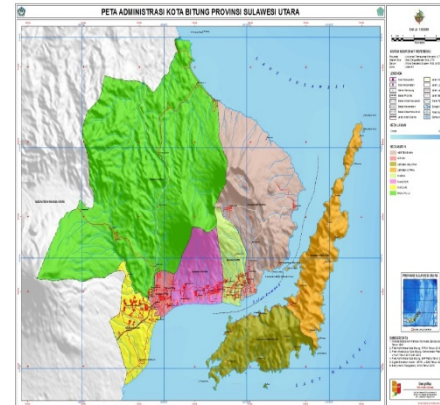


Inform and develop policy to stimulate investment in **least cost low carbon energy services.**



# Low Carbon Economic Developments

- Low Carbon Developments :
  - APEC's Low Carbon Model Towns
  - C40 Cities Climate Leadership Group
  - ICLEI Cities for Climate Protection
- Low carbon developments could be a model for how to weigh up what is most affordable for local area planning.
- Develop processes, tools and policy that can be implemented on local, provincial and national level.



- Comprehensive and informative approach – links to practical examples ✓
  - Further examples and on web ?

South Pole Carbon - February 2015

Page 13

## Final List of Regrouped LCMs

- Peer to peer exchange ✓
- Feasibility studies high quality ✓
- How to weigh up what is most cost effective approach for my town ?
- How to provide practical information
- To move forward.

LCMT Sectors	Sub Sector	Type / Technology of LCM	Specific LCM
Energy	Energy Generation	Off-grid Geothermal Energy Generation	• 1. Utilization of Geothermal Energy (Geothermal Power Plant)
		On- & off-grid Solar Energy Generation	• 2. Use of on and off-grid Photo Voltaic (PV) panels on buildings
		Off-grid Waste-to-Energy Generation	• 3. Methane capture and anaerobic digestion (AD) system for Solid Waste and Wastewater
		Biomass Thermal Energy Generation	• 4. Thermal energy generation from agricultural waste
	Industry	EE in Equipment and Appliances, Building Design and Industry Processes and Product Use (IPPU)	• 5. Comprehensive EE Program for the Industry Buildings, Appliances and IPPU
Commercial Residential	EE in Equipment and Appliances & Building Design		• 6. Comprehensive EE Program for the Residential and Commercial Buildings and Appliances
	Transport	Shift and avoid	• 7. Bus Rapid Transit (BRT) • 8. Non-Motorized Transport (NMT) and Transit-Oriented-Development (TOD)
AFOLU	Land Use and Urban Greening	• 9. Urban Forestry and Urban Greening	
Waste	Solid Waste, Wastewater	Solid Waste Management	• 10. Integrated Solid Waste Management System and 3R strategies

- **Tools** to better map and understand demand and supply
  - Costs and Performance of renewables and energy efficiency
  - Weigh up what is the most cost effective pathway to low carbon energy

To inform

- **Low carbon energy services** that match income and growth of the community
- **Green Climate Finance**
  
- **Collaborative Open Approach** (local national international) peer to peer learning

# Some Examples if we have time

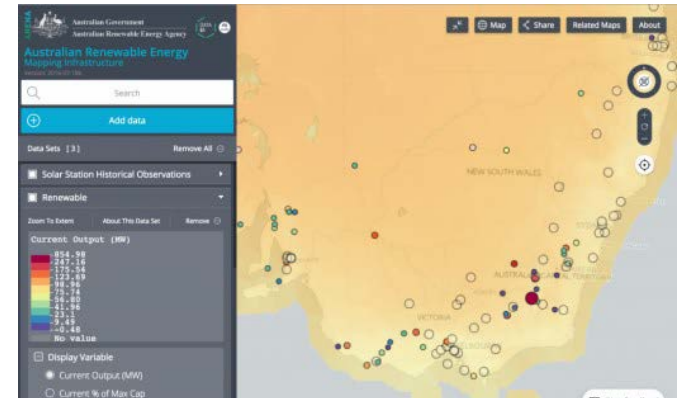
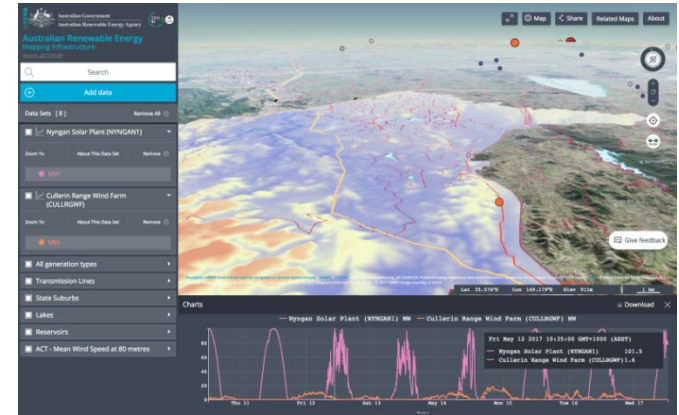
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# Australian Renewable Energy Mapping Infrastructure



- Accessible online map - 650 layers of information about:
  - Energy resources – solar, wind, marine, biomass, geothermal
  - Grid & Substation Infrastructure - Constraints and Capacity
  - Generation performance – real time
  - Environmental information, land tenure types, topography
  - Demographics and Household Energy Demand
  - In future - ARENA projects – LCOE and performance
  - In future - Heat maps of large energy users energy demand
- Supported by ARENA funding and available at: [www.nationalmap.gov.au/renewables](http://www.nationalmap.gov.au/renewables)
- Part of Australian Government national policy commitment to Open Data – as source of business and policy innovation



London-based BBOXX delivers energy systems to remote off-grid African locations.

- The system is designed not to provide a certain quantity of energy, but to deliver the required services.
- The package includes super-efficient lights, TV, radio and phone chargers supplied by a solar panel with battery storage.
- The system is charged on a monthly service fee basis through mobile phone.

Similar service models are also emerging in established energy markets.

- Start-ups in North America, Australia and Europe are selling households and businesses, a greater sense of control over their energy costs and carbon, through solar, storage and smart energy management systems.
- Other technology companies are piloting the delivery of smart, clean, reliable, energy services for urban developments in places like Lyon in France, Japan and Korea.



Solar and battery  
replace burnt down  
sub-station  
as cost effective.  
Now more reliable  
then some fringe of grid  
in Western Australia

9/13/2017

Blackout parties: how solar and storage made WA farmers the most popular in town | Guardian Sustainable Business | The Guardian



## Blackout parties: how solar and storage made WA farmers the most popular in town

Once considered an eco-warrior's pipe dream, renewable energy is rapidly gaining ground in the traditional mining state of Western Australia

**Max Opray**

Monday 15 May 2017 00:19 BST

**A**long the remote southern coastline of Western Australia, the locals have cottoned on to a new, surefire way to keep their beer cold.

The energy grid around Esperance and Ravensthorpe is unreliable at the best of times, but after a bushfire took out the poles and wires around these far-flung outback towns last year, the power company asked residents if they might be interested in trying out a more economically and



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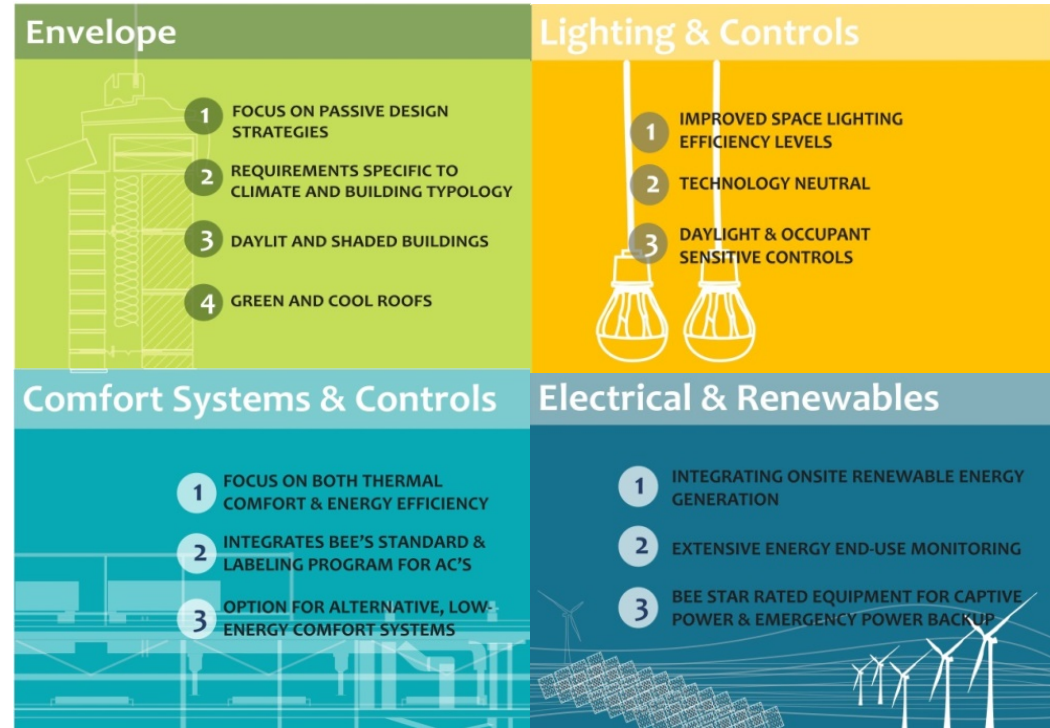
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# India's Energy Conservation Building Code includes renewables



- Unprecedented construction boom in India
- Demand expected to increase 8% annually
- Passive design, energy efficiency & renewables
- Applies to buildings using +100kW
- 3 performance levels encourage progress
- Adoption integral for widespread use
- Responsive to provincial government incentives and requirements to install rooftop solar.
- Flexible - Provincial governments decide how to implement depending local RE resources

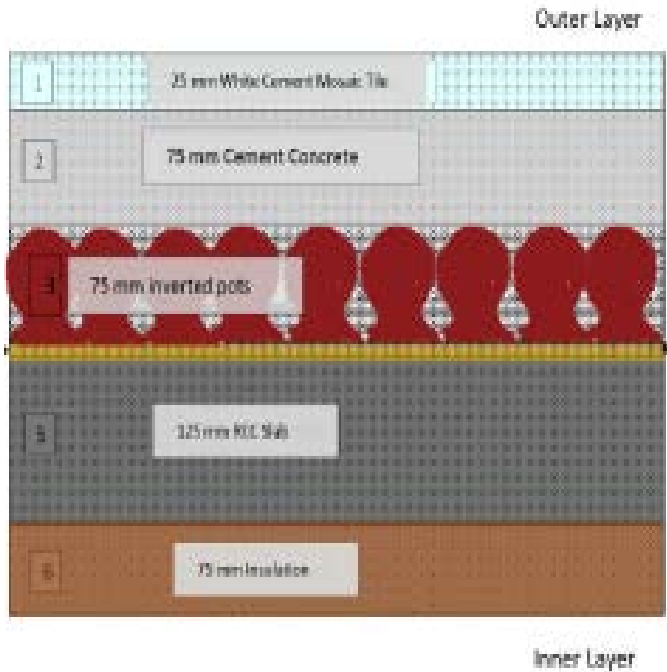




Horizontal and vertical shading



Staircase provides buffer to sun



Six-layer roof prevents heat penetration

Inverted clay garden pots

Integrated renewable generation



# New York's Reforming the Energy Vision (REV)

- Hurricane Sandy greatly damaged New York's energy infrastructure in 2012
- Already aging infrastructure and recurring blackouts
- Governor Cuomo's overhaul of the NY energy system



- Comprehensive plan incorporating efficiency measures and renewable energy
- Policy measures include financial incentives, innovation R&D, technical guidance from ESCOs



# Brooklyn-Queens Demand Management



- Brooklyn Queens Demand Management aimed to **defer a \$1.2 billion substation** upgrade.
- Instead ConEdison is investing **\$200 million in alternatives** to meet the addition 69 MW of demand in 2018
- Policy takes into consideration both EE & RE
  - 52 MW of demand reductions
  - 17 MW of DER investments by late 2018
  - Free LED lights in lower income neighborhoods
  - Rebates for residential smart-metering
  - Incentives for thermal energy storage & CHP systems
  - Demand response auction to provide compensation

## Qualifying Neighborhoods in Brooklyn & Queens Program





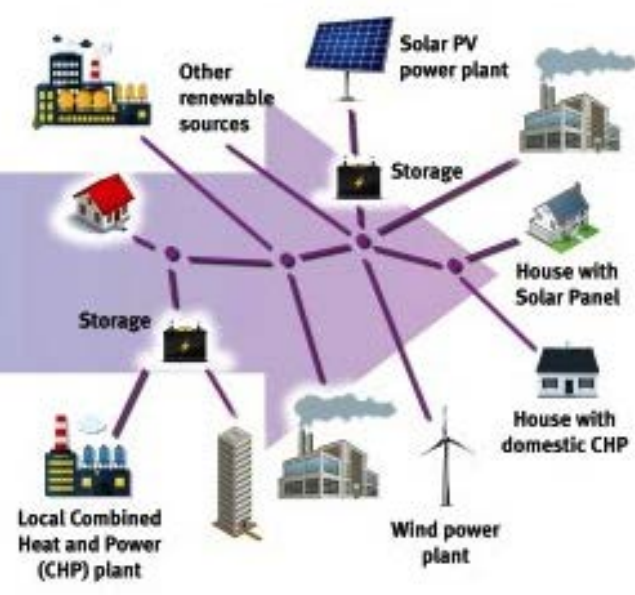
# New York's Reforming the Energy Vision (REV)

- Targets for 2030 include
  - 50% powered by renewables
  - 23% buildings energy savings
  - 40% less GHG emissions
- Qualitative goals
  - Consumer efficiency education
  - Resilient energy infrastructure
  - Clean energy innovation
  - Reduce generation costs

## Yesterday's Energy Model Centralized Power



## Tomorrow's Energy Model Cleaner, Local Power



- Solar + storage microgrid project at public housing division, Marcus Garvey Apartments, recently finished construction in June 2017
- First use of storage at multifamily building in NYC
- Powers 32 buildings, 625 units
- 400kW PV array
- 1.2 megawatt-hour battery
- 400 kW fuel cell system



# PG&E's Plan to replace nuclear with EERE

- California mandates 50% of power generation must come from renewable energy by 2030
- PG&E to close Diablo Canyon, the last nuclear plant in California
- Leaving a 4,000 gWh hole, worth 6% of the state's total electricity mix
- PG&E intends on replacing 50% of capacity through energy efficiency procurement, the other 50% will be replaced with flexible sources of generation and DERs

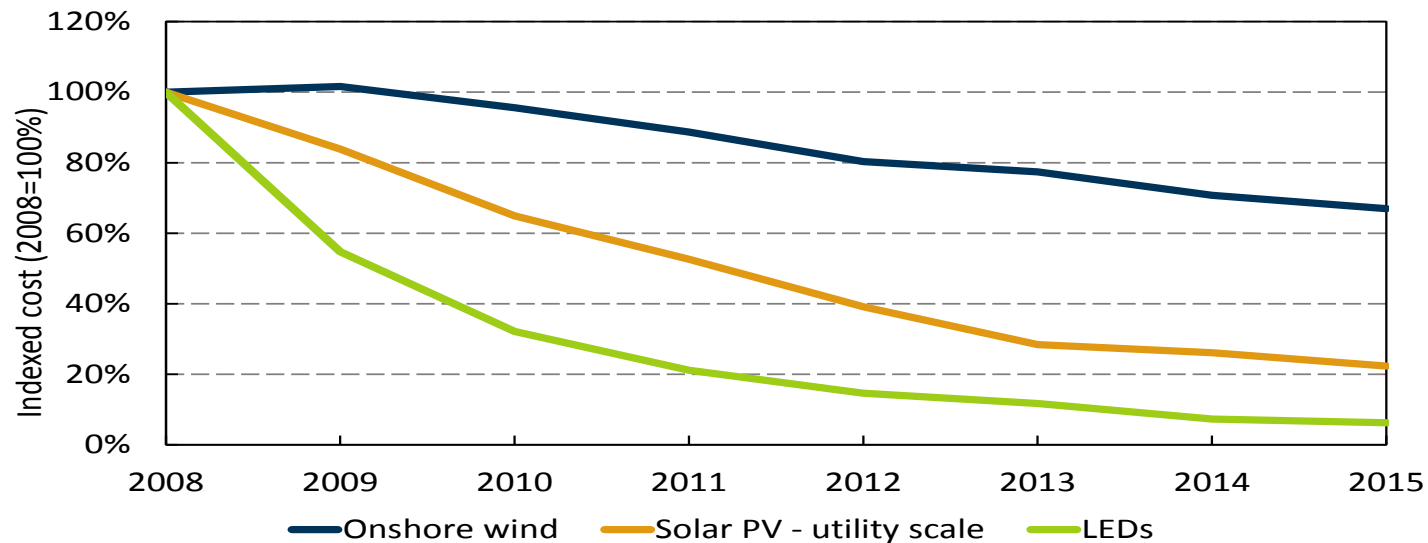




[www.iea.org](http://www.iea.org)



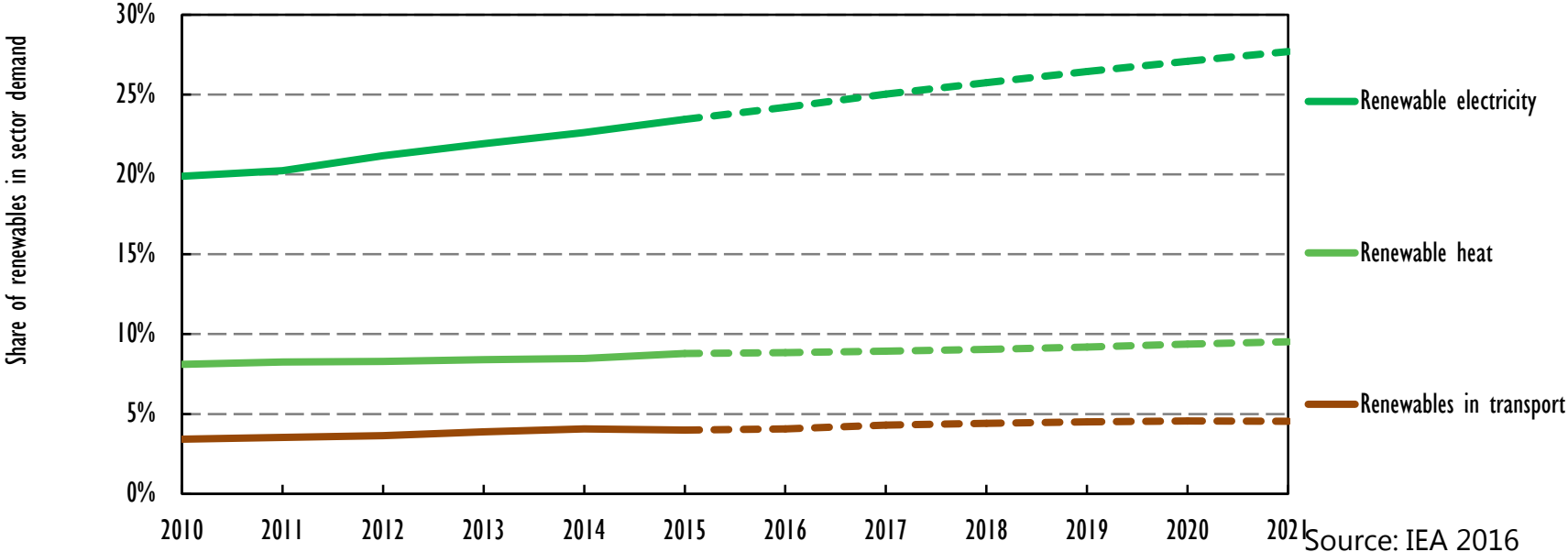
# Policies and scale are reducing clean energy costs in key technologies:



Source: IEA 2016

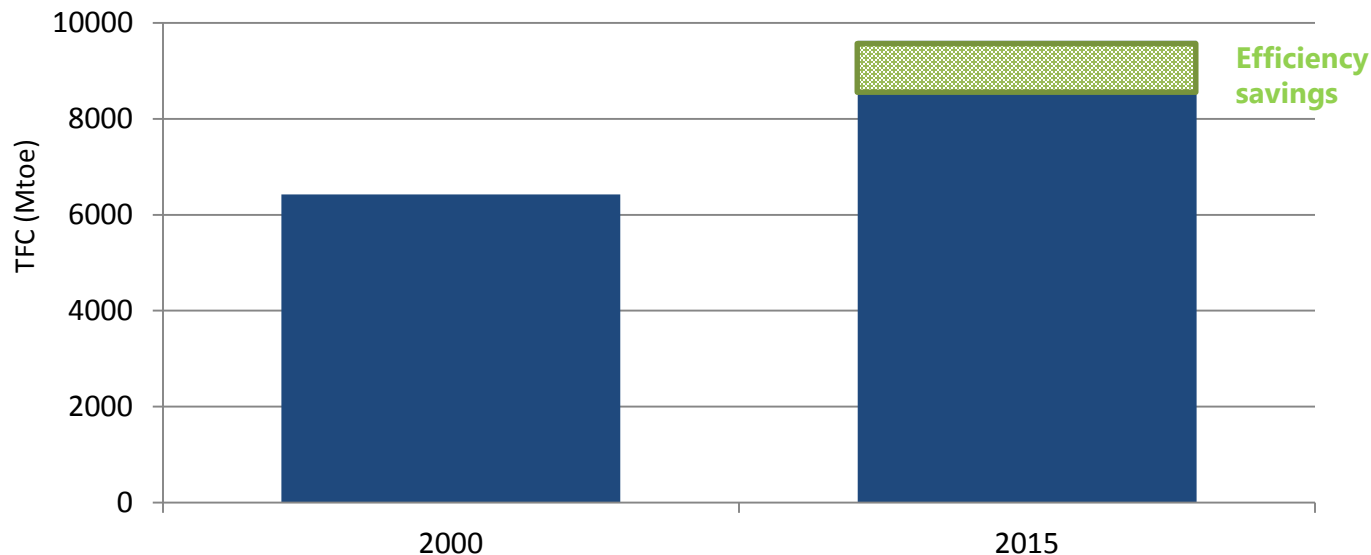
# The share of renewable electricity is growing

The share of renewable electricity is growing - 20% to 28% of global electricity from 2010-21 , 8% to 12% for renewable heat and 3.5% – 4.5% of road transport



Note : Renewables in road transport and heat do not factor in renewable electricity. The IEA’s Renewable Energy Market Report and World Energy Outlook, 2017 will factor in the impact of renewable electricity in heat and transport; however renewable electricity is not expected to significantly impact on the proportions of energy coming from renewables for heat and road transport, until post 2021.

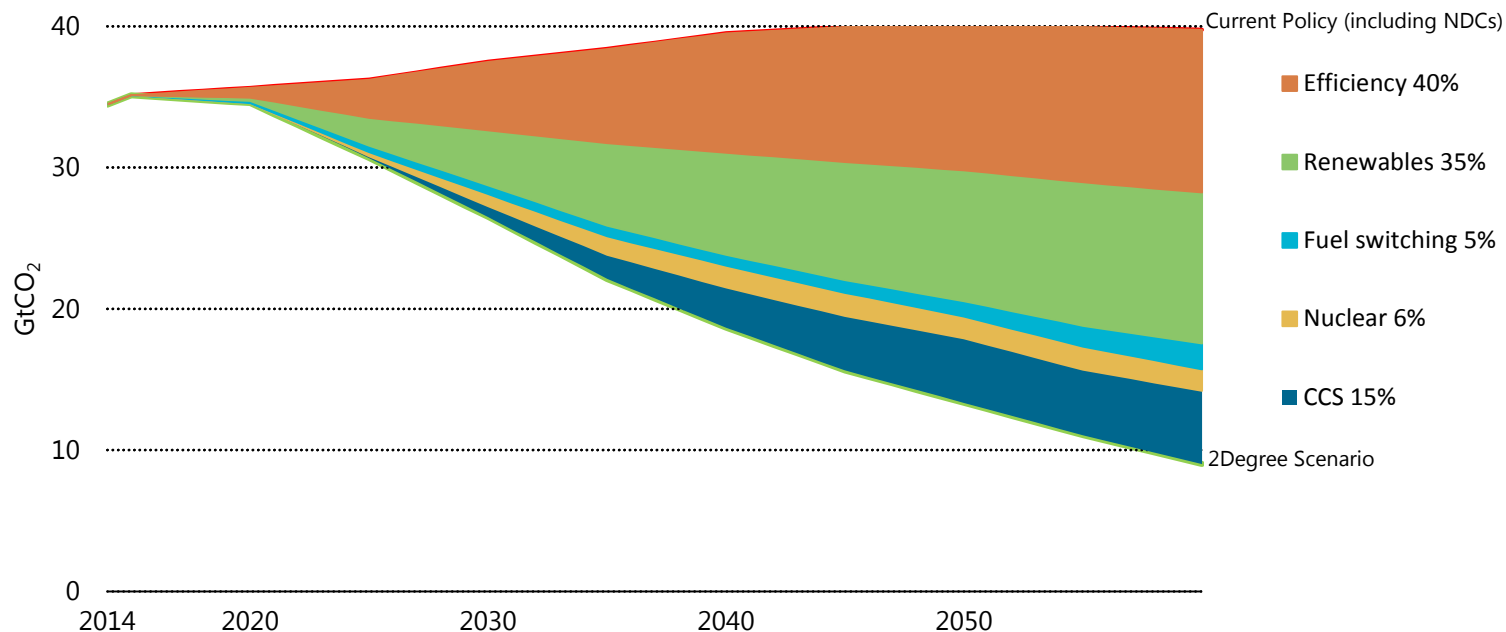
## Global final energy consumption and savings from energy efficiency



**Without efficiency gains, global energy demand would have been 12% higher in 2015, equivalent to adding another European Union to the world's energy system.**

# Efficiency and Renewables are key to future energy systems

The IEA projects that energy efficiency and renewables will contribute 75% of the reductions in emissions needed over and above current announced policy to reach 450ppm or 2 degrees scenario



**“Reduction efforts are needed on both supply and end use sides; focusing on only one does not deliver 2 degrees”** Energy Technology Perspectives 2017