


ITU-CITET Regional Training Workshop on ICT and Climate Change Mitigation and Adaptation in Arab Region  
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## Session 8: Best Practices on Sustainable Energy / Electricity Generation in various countries

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### Session Objectives

- To understand how energy is generated and consumed.
- To understand energy generation mixes and why they are important to GHG emissions.
- To identify best practices from various countries and why they reduce energy consumption and GHG emissions.

### Session Objectives

- To look at energy and its use in the generation of electricity.
- Power generation is a major contributor to GHG emissions.
- To identify best practises in electricity generation in various countries.
- To determine how we can move towards a lower carbon electricity generation mix for a country.


### Warm-up Exercise with Flip Chart/Power Point (2 minutes)

Which renewable energy technologies are you familiar with?


- Your Answers
- 1)
- 2)
- 3)

• How do these generate electricity?

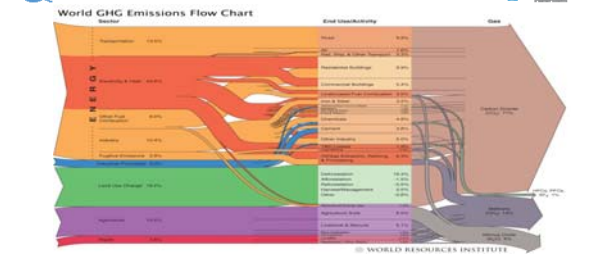
• How do these save GHG emissions?




**To start:**  
**What is Energy and Electricity and where does it come from?**



### Energy: where it come from and where it goes




Source: www.wri.org



### Mitigation actions necessary

- Decarbonizing electricity generation is a key component of cost effective mitigation strategies in achieving low stabilization levels (430–530 ppm CO<sub>2</sub>e). Decarbonization will happen more rapidly in electricity generation than in other sectors.
- Mitigation scenarios reaching around 450 ppm CO<sub>2</sub>e concentrations by 2100 require large-scale global changes in the energy supply sector.
- GHG emissions from energy supply projected to decline by 90% or more below 2010 levels between 2040 and 2070.

[www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc\\_wg3\\_ar5\\_summary-for-policymakers.pdf](http://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_summary-for-policymakers.pdf)



### How could we achieve a 90% reduction in GHG emissions?

- Increase share of Nuclear energy - a mature low-GHG emission source of baseload power. However, share of global electricity generation has been declining (since 1993) and a variety of barriers and risks exist.
- Replace coal-fired power plants with modern, highly efficient natural gas combined-cycle power plants or combined heat and power plants.
- Use CO<sub>2</sub> capture and storage (CCS) technologies to reduce lifecycle GHG emissions of fossil fuel power plants.
- Combining bioenergy with CCS (BECCS) offers the prospect of energy supply with large-scale net negative emissions which plays an important role in many low-stabilization scenarios, while it entails challenges and risks.

[www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc\\_wg3\\_ar5\\_summary-for-policymakers.pdf](http://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_summary-for-policymakers.pdf)

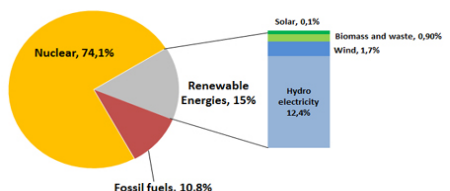
### Types of Generating Technology

<b>Fossil Fuels</b> <ul style="list-style-type: none"> <li>Coal</li> <li>Oil</li> <li>Gas</li> </ul>	<b>Renewables</b> <ul style="list-style-type: none"> <li>Solar PV</li> <li>Solar Thermal</li> <li>Wind</li> <li>Tidal</li> <li>Geothermal</li> <li>Hydroelectric</li> <li>Micro-Hydro</li> <li>Biomass</li> </ul>
<b>Non-renewables</b> <ul style="list-style-type: none"> <li>Nuclear (but very low carbon)</li> </ul>	

### Next:

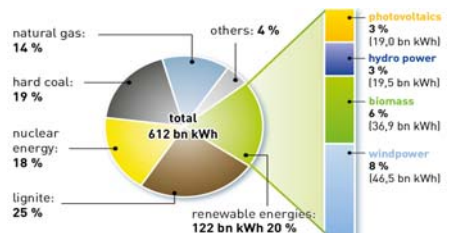
*Some cases studies of best practises*

### Case Study: France's Electricity Mix

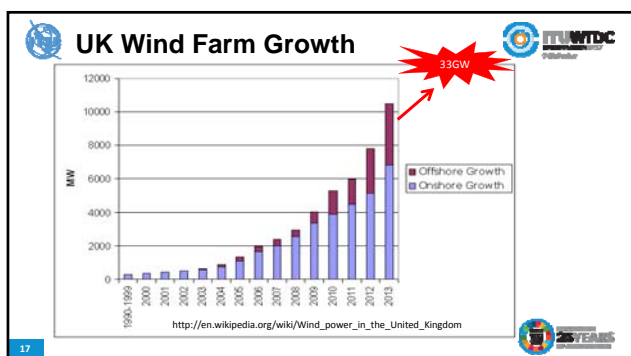
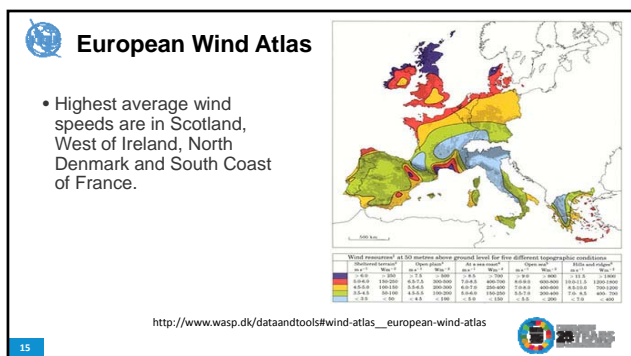
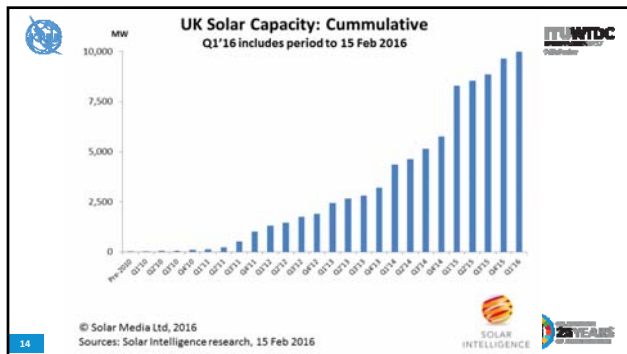
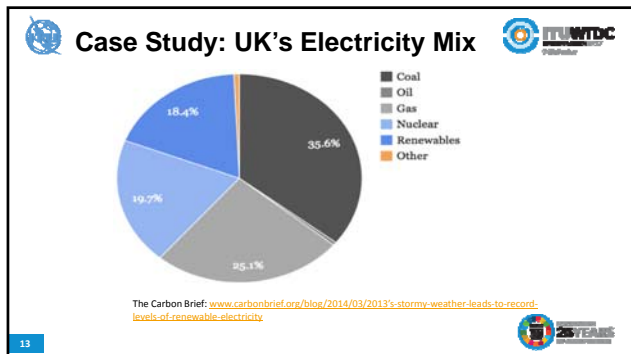


[www.electrical-efficiency.com/2012/08/european-electricity-come-from/](http://www.electrical-efficiency.com/2012/08/european-electricity-come-from/)

### Case Study: Germany's Electricity Mix



[www.renewables-in-germany.de](http://www.renewables-in-germany.de)



### But where does the biomass come from...?

...and will it help solve climate change?

<https://www.carbonbrief.org/investigation-does-the-uks-biomass-burning-help-solve-climate-change>

### Next: EU case study – is it best practice?

### Case Study: Energy trends in EU to 2030

Baseline 2009: Gross Power Generation by source in TWh

Year	RES	Oil	Gas	Solids	Nuclear
2005	11.5	21.2	30.0	30.5	28.0
2010	19.2	23.9	26.9	28.0	24.5
2020	26.0	22.8	24.9	24.5	25.9
2030	32.1	18.7	22.2	25.9	25.9

[http://ec.europa.eu/energy/observatory/trends\\_2030/doc/trends\\_to\\_2030\\_update\\_2014.pdf](http://ec.europa.eu/energy/observatory/trends_2030/doc/trends_to_2030_update_2014.pdf)

### Case Study: EU Energy Policy

- DG Energy has mandate (based on Lisbon Treaty) to create a **fully integrated competitive European energy market**.
- In January 2014, EU agreed:
  - 40% emissions reduction target by 2030 compared to 1990 levels,
  - 27% renewable energy target,
  - most ambitious of any region in the world, expected to create 70,000 full-time jobs and cut €33bn in fossil fuel imports.
- How is DG Energy achieving this?

### EU principles of a low carbon economy

- Cut of at least 20% in emissions from all primary energy sources by 2020, while pushing for international agreement aimed at achieving 30% cut by all developed nations by 2020.
- Cut of up to 95% in carbon emissions from primary energy sources by 2050.
- Minimum target of 10% for use of biofuels by 2020.
- Minimum 10% electricity interconnection target for all member states by 2020.
- Energy supply and generation activities of energy companies to be 'unbundled' from their distribution networks.
- Improve energy relations with EU's neighbours, including Russia.
- Development of European Strategic Energy Technology Plan:
  - to develop renewable energy, energy conservation, low-energy buildings, 4<sup>th</sup> generation nuclear reactor, clean coal and carbon capture.
- Develop an Africa-Europe Energy partnership:
  - to help Africa 'leap-frog' to low-carbon technologies and to help develop the continent as a sustainable energy supplier.

### Summary

- Best practises in electricity generation are available from all continents.
- A change to a country's electricity mix (some of which must be enabled by ICT) can have a substantial effect on its GHG emissions.
- Regulatory mechanisms must be brought into play to encourage this to happen effectively/quickly.



## Links to ITU Academy ICT&CC TP modules



Foundation Module 1 Introduction to ICT & Climate Change  
 Foundation Module 5 Applying Green ICT Strategies  
 Advanced Module 5.2 GHG Reductions in the Power Sector  
 Advanced Module 5.3 Decarbonising Transport



## References for further reading



- National Energy Yearbooks providing figures for energy and electricity consumption.
- Digest of UK Energy Statistics [www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukess](http://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukess)
- Real time information on energy consumption, e.g. <http://www2.nationalgrid.com/uk/Industry-Information/Electricity-transmission-operational-data/Data-Explorer/>
- Examples of National electricity generation mixes (renewables and non-renewables), e.g. [www.unendlich-viel-energie.de/media-library/charts-and-data/germanys-power-mix-in-2013](http://www.unendlich-viel-energie.de/media-library/charts-and-data/germanys-power-mix-in-2013)
- IEA: RE technologies Hydropower, wind power [www.iea.org/media/training/presentations/latinamerica2014/5B\\_Renewables\\_Technology\\_Wind\\_Hydro.pdf](http://www.iea.org/media/training/presentations/latinamerica2014/5B_Renewables_Technology_Wind_Hydro.pdf)
- UK Climate Change Act (2008).
- Energy for a Changing World (EU Energy Policy): [www.managenergy.net/resources/881#VICkju87A0](http://www.managenergy.net/resources/881#VICkju87A0)

