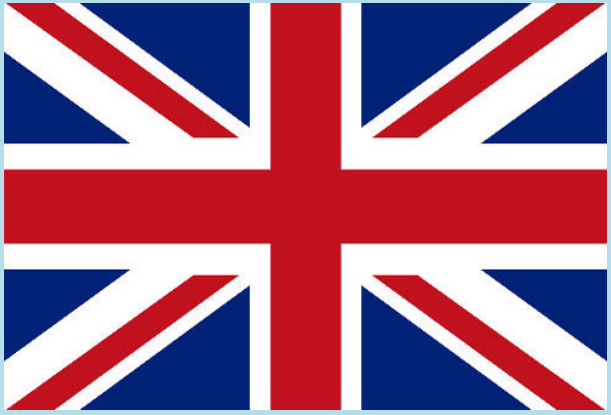


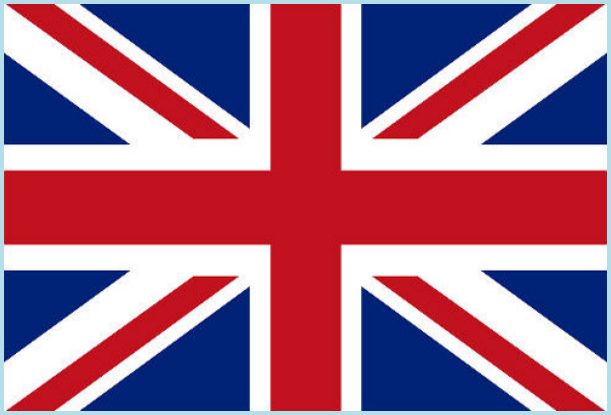
India – UK: Summary of Energy Policy Objectives 2011-2030

2011 Summer School on Efficient Energy Technologies, 4-8 July 2011, Guwahati, India

Tom Demetriades, University of Nottingham
Silvia Alcove, University of Nottingham
P. K. Choudhury, Tezpur University
Thangaraja J, IIT Madras

National Objectives

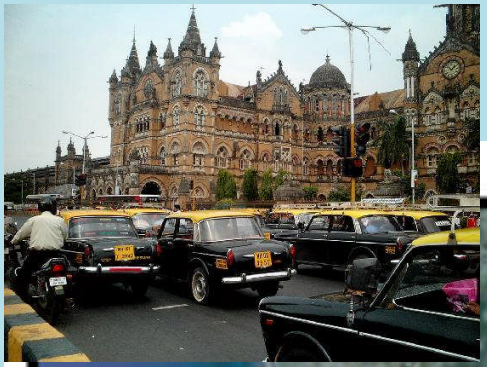
- Make access to electricity more dependable
- Increase capacity, reduced demand = reduce “energy gap”
- Reduce frequency of “blackout” periods

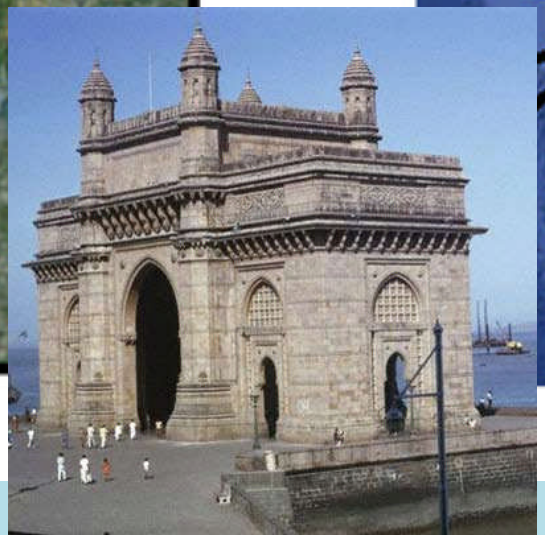


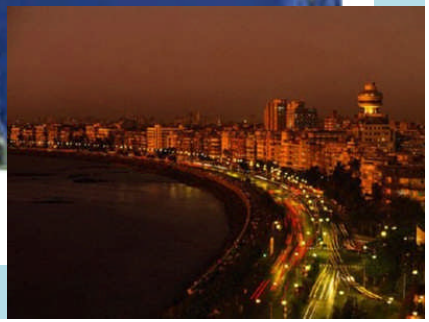
- Increase energy security to avoid the Indian scenario of blackouts in the future
- Reduce carbon emissions
- Reverse trend of increasing costs, remove people from “energy poverty”

Study Zone - India

Mumbai – typical large Indian city with heavy industry. Population = 20’5000’000, a significant proportion (45%) of which is without access to a power supply. Suitable location for CCS.

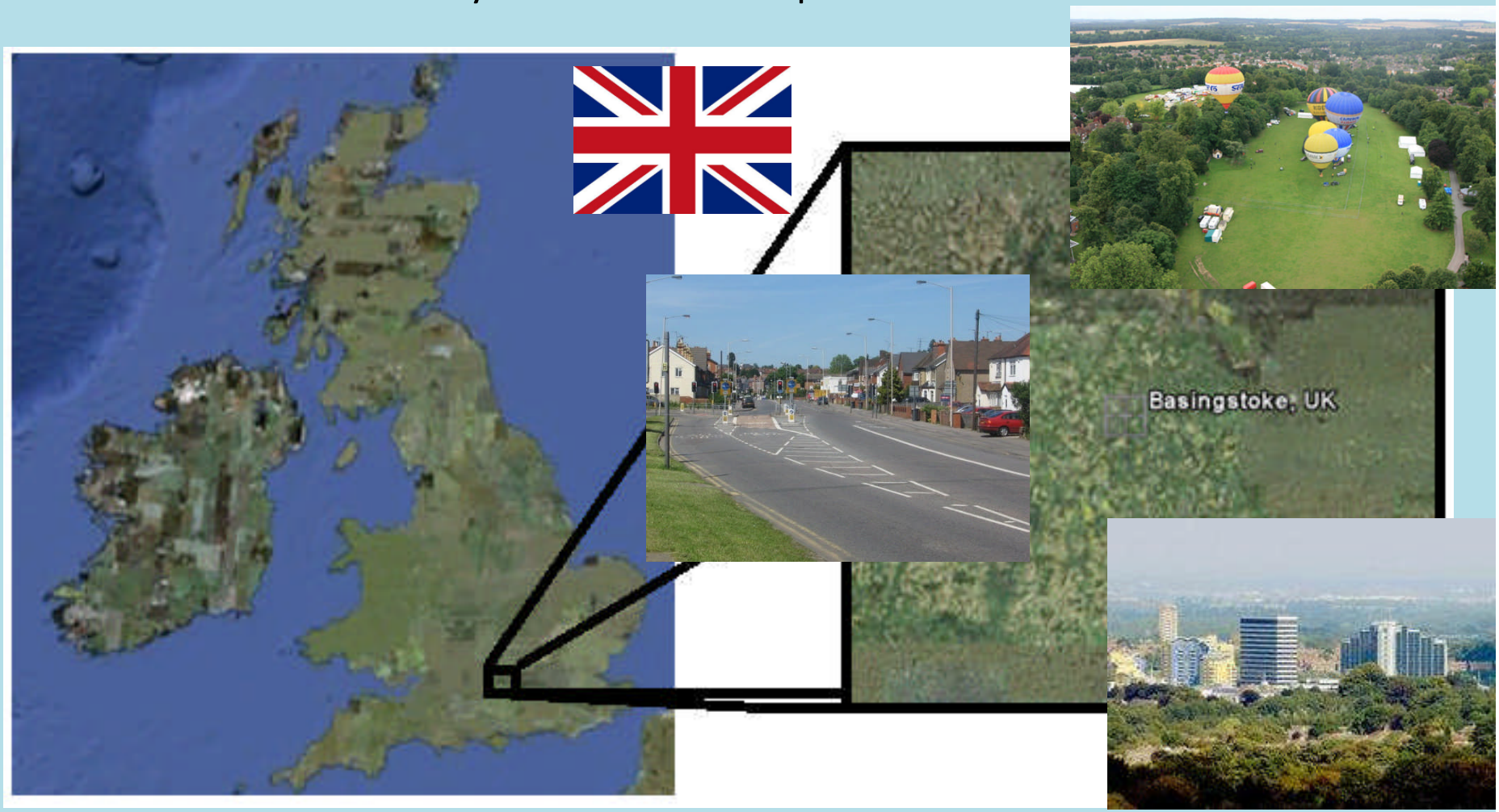






Study Zone - UK

Basingstoke – typical affluent medium-sized UK town, distribution hub for the South with lots of tertiary sector offices. Population = 82’913.



Snapshot of Current Scenario

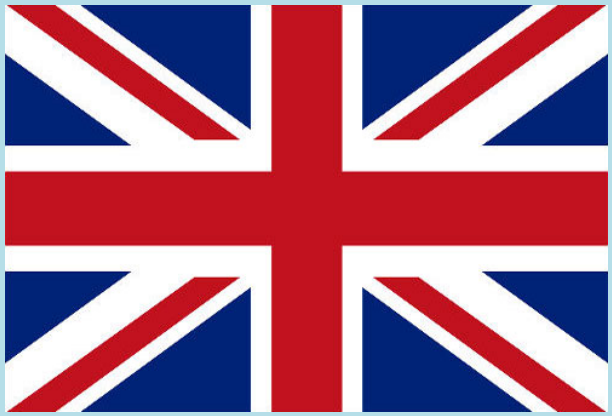
- High percentage of city-dwellers with access to electricity, reducing as you leave the city-centre into suburbs
- Undependable power supply, occasional blackouts – power shortage of 10%: 2008 requirement 120GW, production, 105GW
- High pollution levels

Supply (2006):

- 53%Coal
- 31% Oil
- 6% Hydro
- 8% Gas
- 1% Nuclear
- 1% Other renewable

Snapshot of Current Scenario

- All homes and offices with very dependable power supply
- Electricity is expensive
- High-level inefficiency by end-user, much wastage
- No local power generation, all via national grid from further afield



Supply:
Coal
Natural gas

Trilemma

Environmental impact

Solar
Biomass
Biodiesel

Wind
Hydro

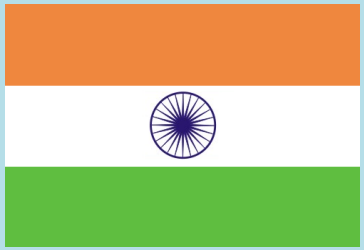
Gas

Nuclear

Cost

Energy security

Coal



Policy Needs - Mumbai

Immediate (July 2011):

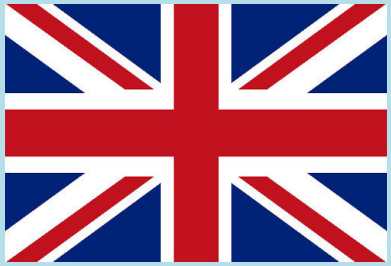
- Proper load management – avoid load shedding and provide stable power supply for industry and dense population
- Scheduled load shedding at times of low demand

Medium Term (2012-2015):

- Renewable energy sources: Biomass (biodiesel), Solar, Offshore Wind, Tidal

Long term (2015-2031):

- Nuclear and Once other problems have been addressed, consider air quality improvements => CCS
- Mumbai is as good a location as any in India to have CCS



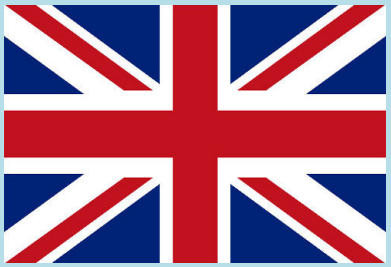
Policy Needs – Basingstoke

Immediate (July 2011):

- Encourage more efficient energy use through information campaign and slogans

Medium Term (before 2015)

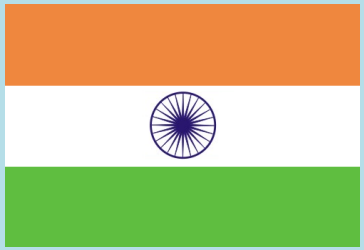
- Set (pre-, and fairly determined) quota for each household and office/factory:
  - Penalties and name + shame for exceeding quota
  - Roll over or bonus for being under
- Tax-breaks for companies which can achieve carbon neutrality



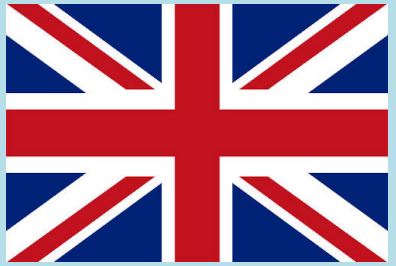
Policy Needs - Basingstoke

Long-term (to 2031):

- High-efficiency components (e.g. refrigerators) to be installed everywhere
- Removal from dependence on fossil fuels
  - Wind
  - Nuclear (in Southampton)
  - Biomass
- Outlaw car journeys for 1 person under 2 miles

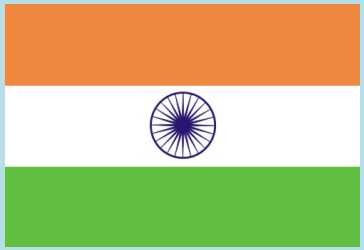


General Policy Needs

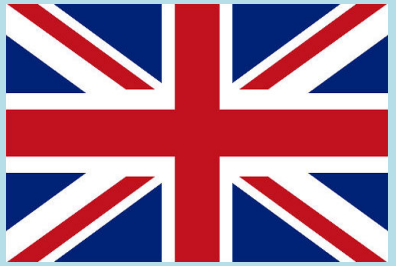


Primary considerations common to India and the UK:

- Focus on long-term increase in generation capacity
- Mandatory energy audit to identify wastage in phases, from energy intensive industries to smaller industries
- Incentives to industries developing or using renewable energy systems self sufficient mode or hybrid mode
- Population Pattern – rural, urban as well as clusters of isolated villages far away from mainstreams. Urban migration in both nations.



General Policy Needs



Secondary considerations common to India and the UK:

- Geographic Features – hills, plains, coastal etc.
- Agricultural, non agricultural ,industrial, residential areas, non industrial areas.
- High energy devices to be scaled down

Biodiesel

Biodiesel emerged as potential alternative to fossil diesel for use in compression ignition engines due to renewable nature

Favorable features:

- Better ignition quality
- Non-toxic
- Biodegradable
- Safe to store and transport
- Lower unburned emissions
- No sulphur or aromatic content
- Requires no major engine modifications
- CO_2 neutral

Shortcomings:

- Poor storage stability
- Lower heat content (11% lower compared to diesel)

Power generator: Standby power
kW: 2250, **Fuel: Biodiesel**

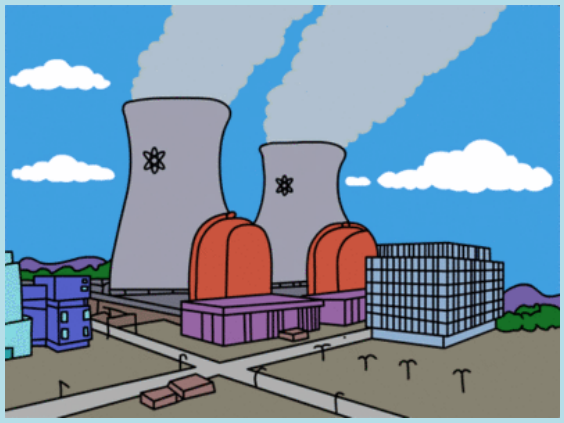
Nuclear

Favourable features

- Low OPEX
- High capacity
- Low emission
- Low noise

Shortcomings

- Radioactive waste
- Public perception
- Build time and cost
- Risk factor
- Uncertainty of uranium source



Wind

Favourable features

- High generation capacity in windy locations e.g. ocean, Basingstoke
- No CO2 emissions, environmentally friendly
- High efficiency – good ROI for builders

Shortcomings

- Unsightly
- High CAPEX
- Intermittent, only useful if wind blows and is below a certain level

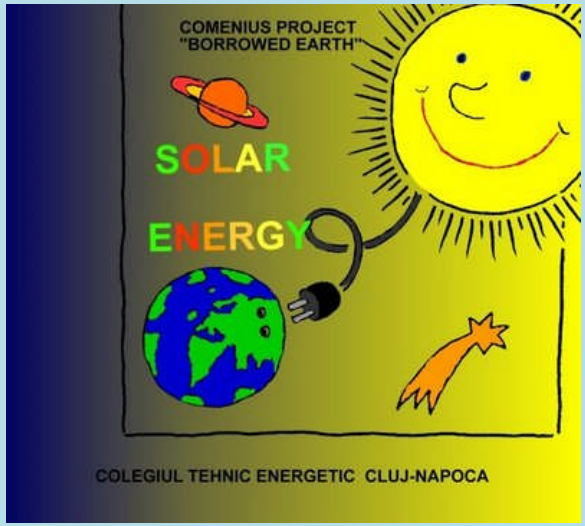
Solar

Favourable features

- Low OPEX
- Convenient
- Low emissions
- Possibility to store energy
- Renewable

Shortcomings

- High CAPEX
- Useless in Basingstoke



Tidal

Favourable features

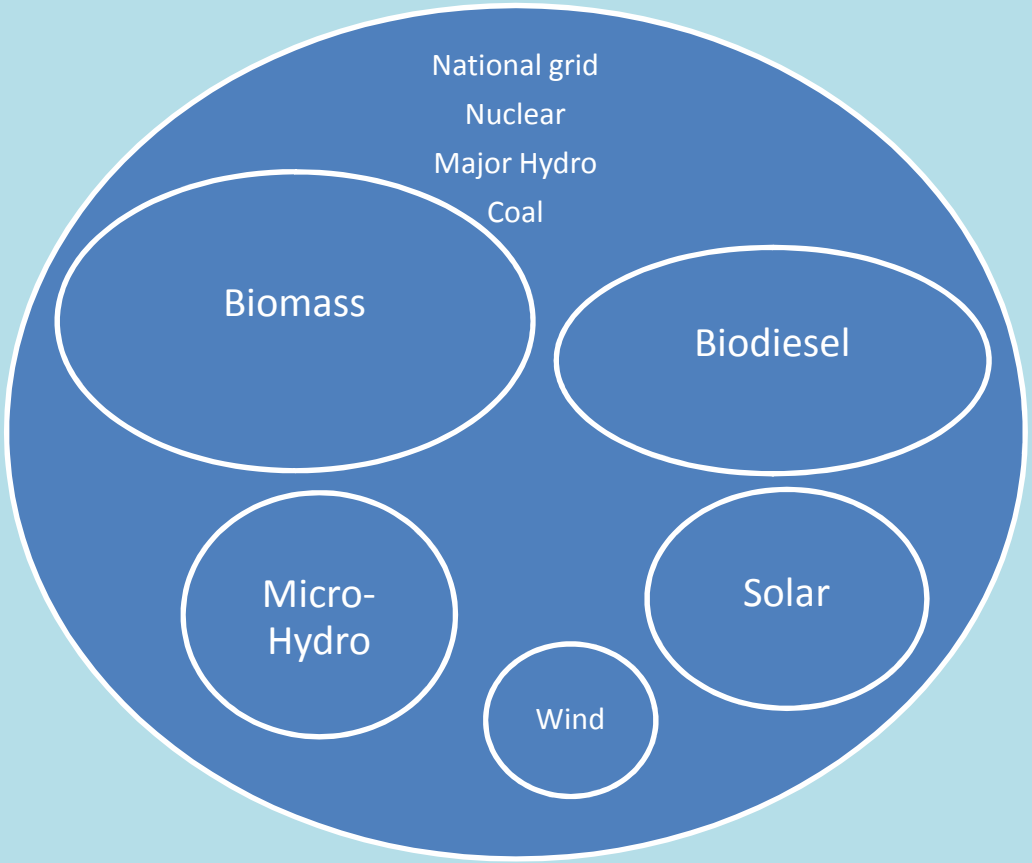
- Renewable
- Quiet
- Environmentally beneficial

Shortcomings

- Expensive
- Unproven technology
- Possibly low capacity
- Could cause ship crash

Implementation: Hybrid network

These solutions will be applicable to both rural and urban areas



Implementation: UK

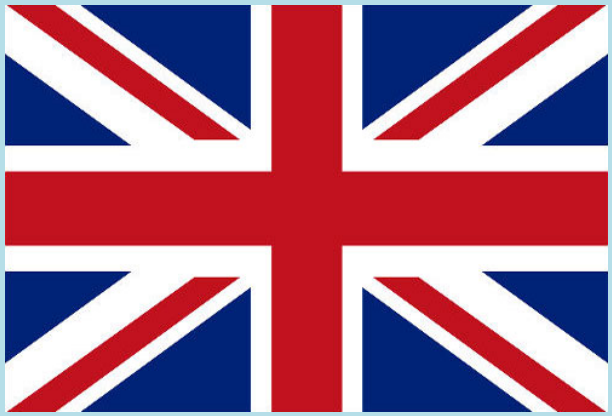
- Laws will be passed making it lucrative to pursue generation methods that can ensure energy stability
- Contracts offered
- Subsidies
- Social dimension: “do what is good for your community”…
- Increased funding to carbon reduction projects e.g. IGCC, CCS

Social and Environmental Benefits

- More households with access to power
- Reduced unemployment
- Carbon neutral strategy
- Community spirit – “all for one and one for all!!”

Social and Environmental Benefits

- Lower energy bills
- Higher energy security for the future
- Lower carbon emissions
- Better quality of life
- Peace of mind



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THANK YOU