



# Measuring preferences for low-carbon energy technologies in SE England: the case of electricity generation



**E. Fimereli, S. Mourato, P. Pearson**  
**Centre for Environmental Policy**  
**Centre for Energy Policy & Technology (ICEPT)**  
**Imperial College London**



## Background to Survey

- Energy sector responsible for the largest growth in global GHG emissions (IPCC 2001)
- UK targets of reducing CO<sub>2</sub> emissions:
  - 60% by 2050 (Energy White Paper)
  - 26-32% by 2020 (Draft Climate Change Bill)
- Movement to low-carbon energy technologies
  - Renewable energy (20% of total electricity by 2020)
  - Nuclear power under consideration
- Public acceptability and engagement is a complex issue



## Previous Valuation Studies

- Focus on *renewable* energy technologies
- wind power (Ladenbourg 2007; Ek 2005; Alvarez-Farizo 2002)
- biomass & hydropower (Hanley 1999)
- generic technologies (Longo 2008; Bergmann 2006)
- green electricity (Wiser 2007; Borchers 2006)



## Our Survey

- Preferences for electricity generation from:
  - *on-shore wind power*
  - *biomass*
  - *nuclear power*

### Scenario:

*“In view of the environmental challenges caused by climate change, the UK government has recognised that the UK should try to reduce its carbon dioxide (CO<sub>2</sub>) emissions by 2020. One way to work towards this reduction (along with other measures) would be to generate 20% of total electricity from low-carbon energy sources by 2020”*



## Survey Structure

- Knowledge of energy technologies
- Attitudes towards energy and environment
- Choice experiment
- Attitudes towards off-shore wind power
- Socio-economic questions



## Choice Experiment

- Labelled choice experiment
- Status-quo: electricity from current energy mix
  
- *Attributes:*
  - Distance from respondent's home
  - Carbon emissions reduction
  - Local biodiversity impacts
  - Land requirements - fixed attribute
  - Annual electricity bill increase

## Example CE Card

Characteristics	<u>Option 1</u> Electricity from WIND	<u>Option 2</u> Electricity from BIOMASS	<u>Option 3</u> Electricity from NUCLEAR	<u>Option 4</u> Electricity from Current Energy Mix
Distance from Home	6 miles <i>[10km]</i>	0.25 miles <i>[400m]</i>	10 miles <i>[16km]</i>	18 miles <i>[29km]</i>
Local Biodiversity	Less	More	No change	Less
Carbon Emissions for producing 20% of electricity	Reduction by 97%	Reduction by 50%	Reduction by 95%	Reduction by 0%
Total Land for producing 20% of electricity	5,832 ha <i>Or 7,930 football fields</i>	816,000 ha <i>Or 1,190,750 football fields</i>	568 ha <i>Or 772 football fields</i>	1,594 ha <i>Or 2167 football fields</i>
Annual Increase in Electricity Bill	£40	£143	£67	£0

I would choose option [...1....]

# Information

- Description of each technology
- Photos of typical technologies





## Sample

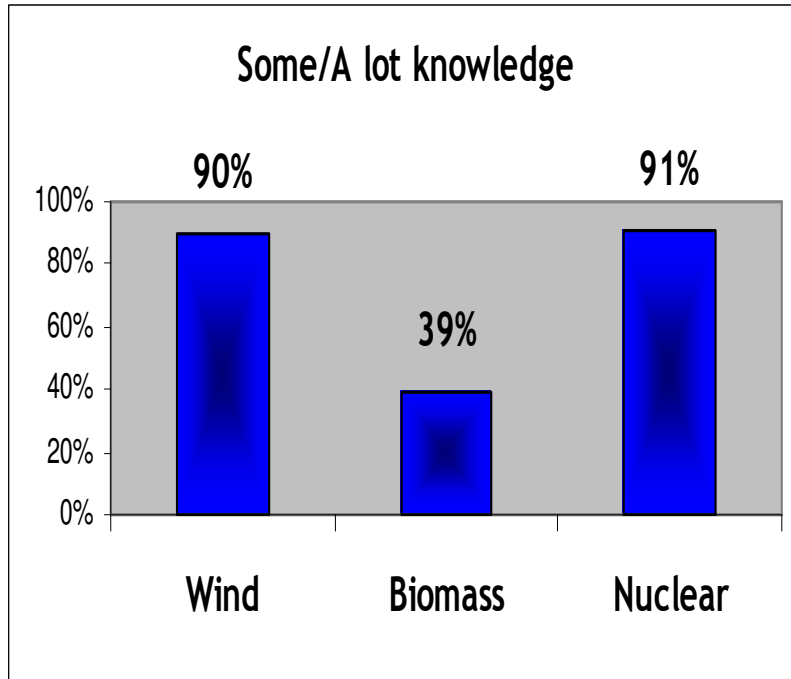
- Cluster sampling - 3 towns in SE England
- Drop off/Mail back
- 1206 surveys in total
- 376 usable responses - 31% response rate

	<i>Sample</i>	<i>SE England<sup>a</sup></i>
Males (%)	45.33%	48.89%
Age (mean)	41.61yrs	46.31yrs
College degree or above & professional qualifications	69.71%	38.2%
Self or full time employed	56.68%	77.90%
Gross annual income (mean)	£37,030	£28,430

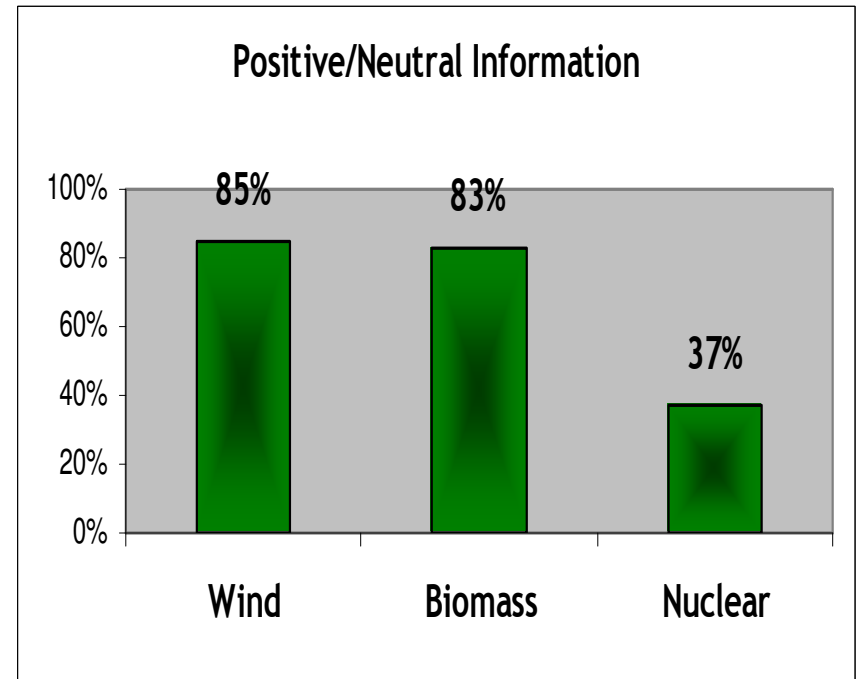
Source: NOMIS/ONS (2006)

# Results (1)

## Knowledge/Information



## Type of information



## Environmental attitudes

‘Invest more in renewables’: 90% agree

‘Invest more in nuclear’: 23% agree, 44% unsure

‘Environmental problems exaggerated’: 18% agree, 21% unsure



## Results (2) - Weighted conditional logit model

### *CE attributes*

- Distance of energy project from home\*\*\* (+)
- Increase in biodiversity\*\* (+)
- Reduction in carbon emissions\*\*\* (+)
- Electricity bill increase\*\*\* (-)

\*\*\* significant at 1% level, \*\* significant at 5% level



## Results (2) - Weighted conditional logit model

### *CE Labels / Technology name*

- Label Wind\*\*\* (+)
- Label Biomass\*\*\* (+)
- Label Nuclear\*\*\* (-)

\*\*\* significant at 1% level



## Results (2) - Weighted conditional logit model

### *Demographics*

- Income (wind)\*\* (+)
- Males (wind)\*\* (-)
- Males (biomass)\* (-)

\*\* significant at 5% level, \* significant at 10% level



## Results (2) - Weighted conditional logit model

### *Knowledge and Experience*

- No knowledge\*\*\* (-)
- Experience with coal/gas power station\*\* (+)

\*\*\* significant at 1% level, \*\* significant at 5% level



## Results (2) - Weighted conditional logit model

### *Attitudes*

- Don't believe in climate change\*\*\* (-)
- Invest in nuclear (wind)\*\*\* (-)
- Invest in nuclear (nuclear)\*\*\* (+)

\*\*\* significant at 1% level



## Results (3) - WTP

### *Implicit prices (95% CI)*

Label Wind	£99.89*** (48.68-151.10)
Label Biomass	£58.47* (-3.37-120.32)
Label Nuclear	£14.49 (-39.76-68.75)
Distance (per mile)	£3.49*** (2.16-4.82)
Increase biodiversity (baseline = reduction)	£22.80** (1.63-43.97)
Emissions reduction (per %)	£1.16*** (0.65-1.67)

\*\*\* significant at 1% level, \*\* significant at 5% level, \* significant at 10% level



## Conclusions

- *Technology and attributes are important*
  - Strong preferences for wind and biomass
  - Nuclear aversion
  - Emissions reductions, biodiversity increase, location
- *Knowledge and experience play significant role*
  - Information provision useful

**Thank you!**