



# The Stern Review

- A “major review” on the economics of climate change – from the point of view of international collective action
- Reporting to the Prime Minister and Chancellor in Autumn 2006
- Speeches and papers on the website:  
[www.sternreview.org.uk](http://www.sternreview.org.uk)

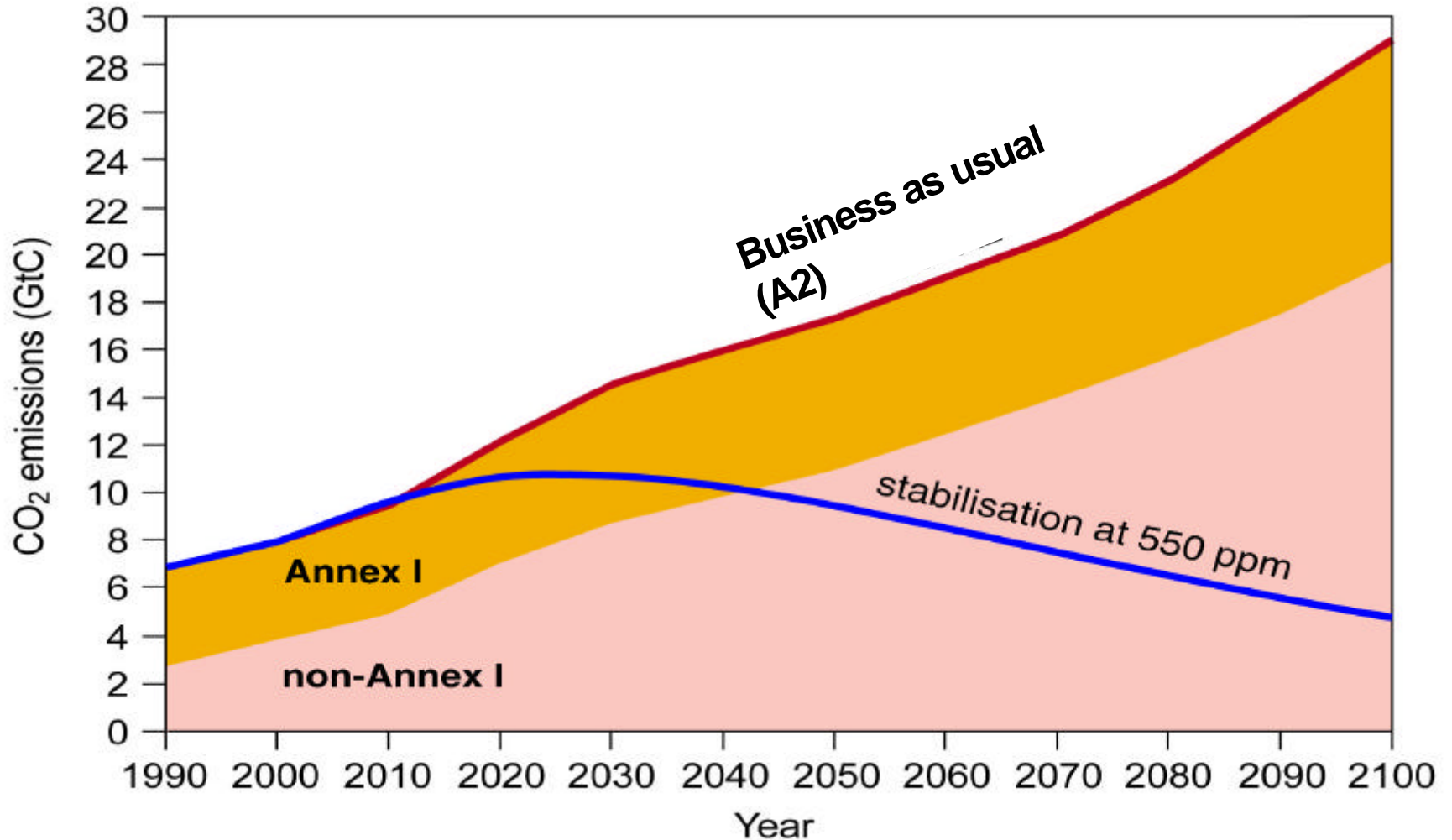
# Current directions

- A serious and urgent issue
- The economics is complex and not a simple cost-benefit analysis: wide range of possibilities, great uncertainties, international collective action
- Countries have to understand better the impact of both climate change and mitigation on growth and development
- We can reduce emissions from their current path at reasonable cost by adopting low-carbon technologies, if we design policy in the right way
- Building international action

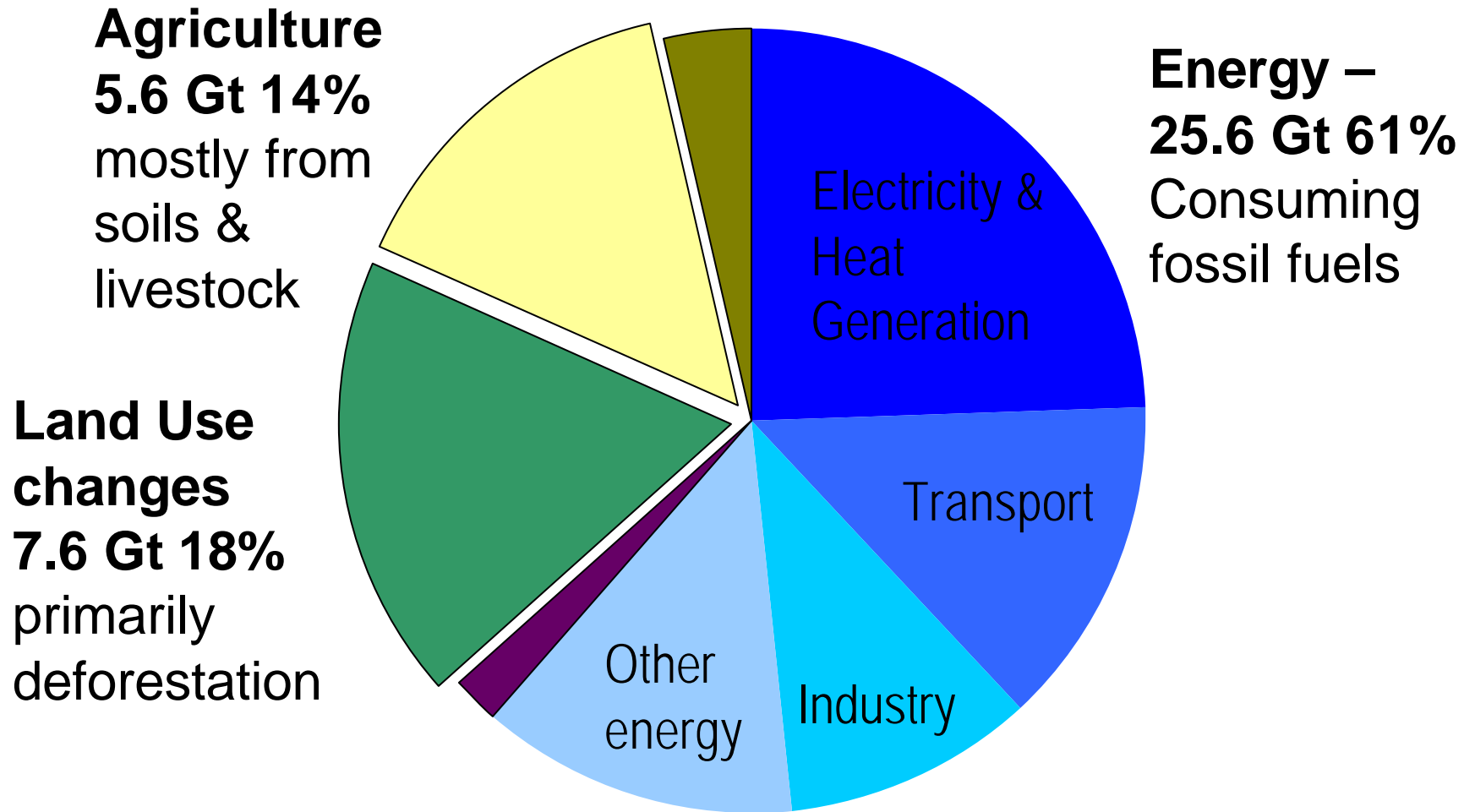
# Focus of today's discussion

- Scale of the challenge and the role of technologies
- Market failures and policy towards innovation
- Specific features of low-carbon markets
- What policy tools are available?

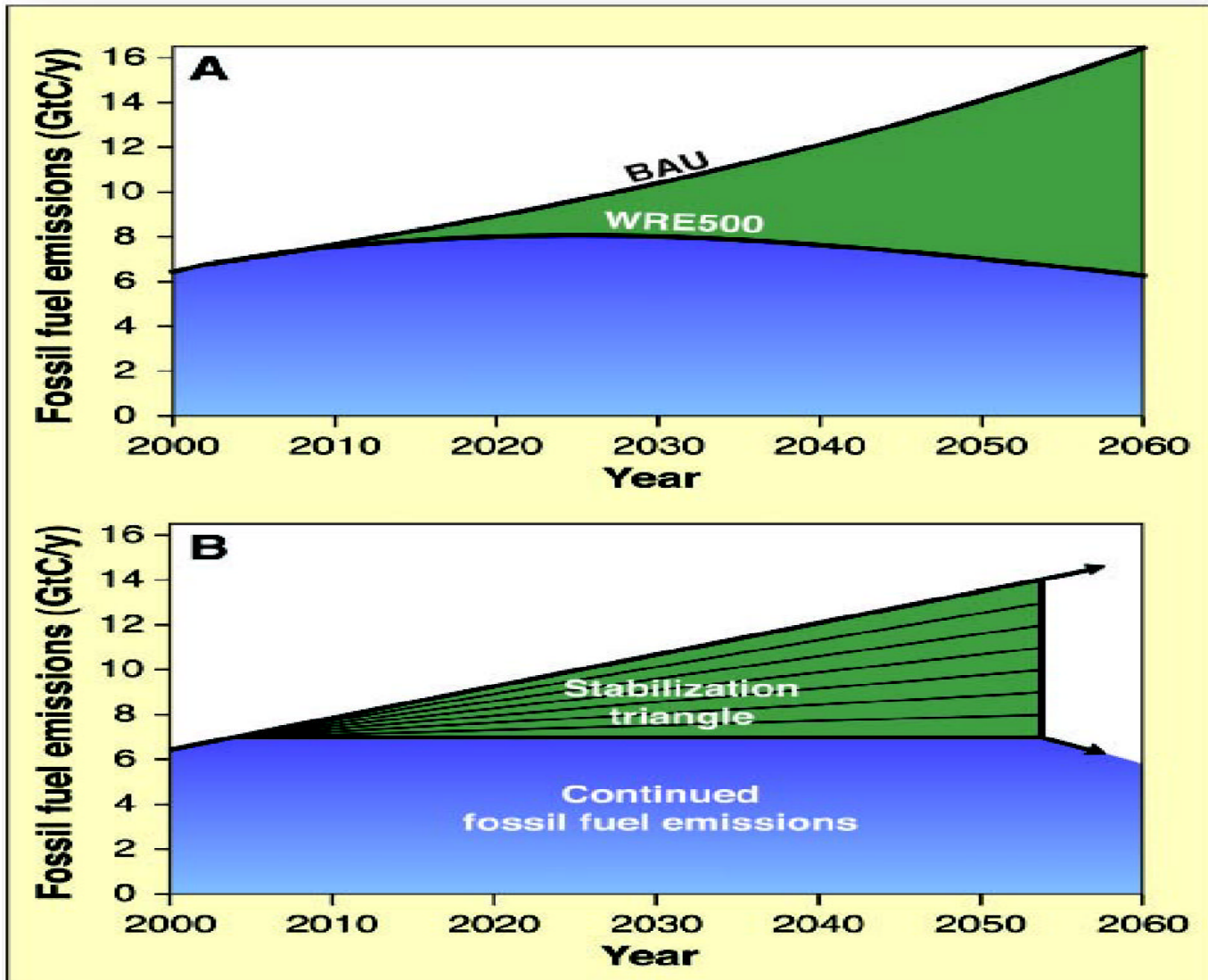
# We are on an unsustainable path



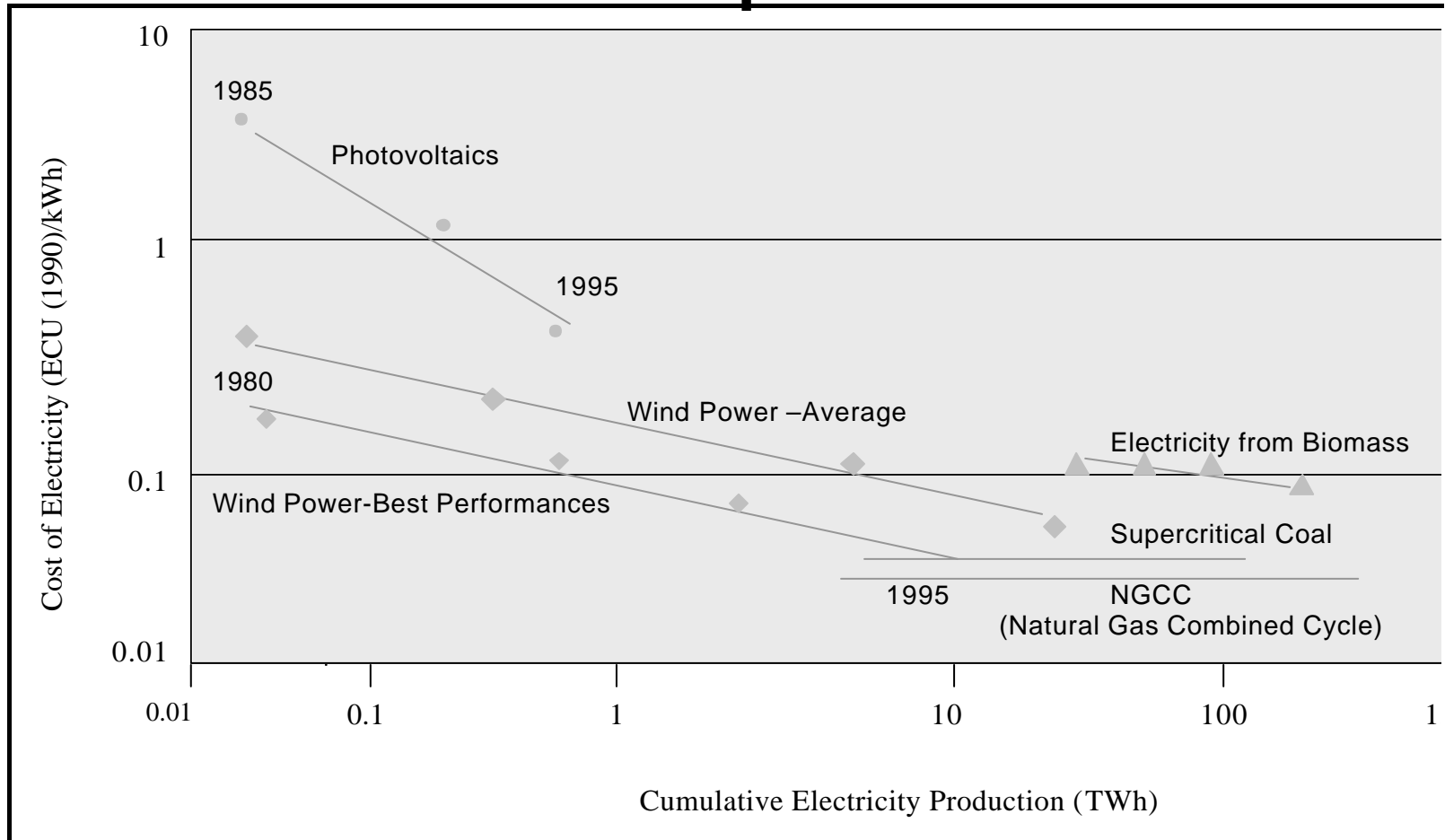
# Action is required across all sectors



# We can make big changes through technology – as shown for example through Socolow's wedges



# Costs are significant – but fall with scale and experience



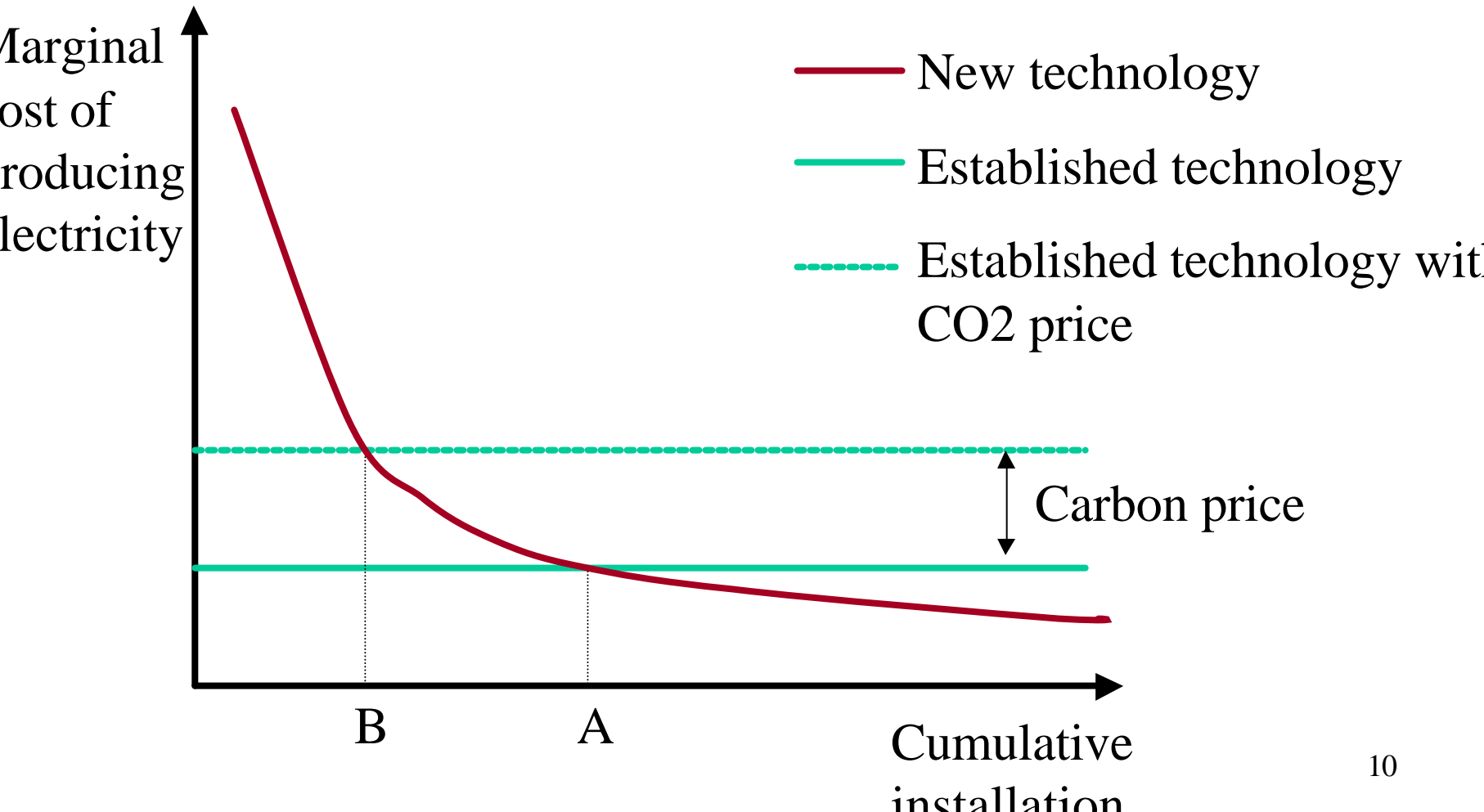
Historic learning curve data for energy technologies

- *Source: McDonald and Schrattenholzer (1999)*

## Two strands to policy

- Correcting the carbon externality through price or quantity instruments. Not our main focus today but issues include
  - Uncertainty
  - Public finance
  - Credibility
- Policies aimed at pulling through lower-carbon technologies

# How the two strands interact



# Why is it not enough just to correct the carbon externality?

- Three key areas of market failure associated with new technologies
  - Externalities
  - Non-competitive markets
  - Capital market failures

# Externalities

- Some of the benefits from innovation spill over into public knowledge
- Innovation creates different types of knowledge:
  - New discoveries – largely R&D driven
  - Learning by watching – knowledge obtained by observing what others are doing
  - Confidence that a technology works
- These cannot be fully captured by the individual firm

# Non-competitive markets

- Impact of product market competition on incentives to undertake R&D.
- Nature of competition in the markets into which potential innovators are selling

# Capital market failures

- Costs of producing a new technology always start very high, but fall as production rises
- Perfect capital markets would take this into account and lend to cover early losses
- But we have
  - Uncertainties
  - Asymmetric information

# What are the distinctive elements of the climate change issue?

- Three specific features of low-carbon markets
  - The urgency of the climate change issue and the cost of not responding
  - Features of the technologies
  - International co-ordination

# Urgency of action on technology

- Urgency of action given
  - Lock-in from long-lived investments
  - Risk of large-scale irreversible impacts
  - Need to be able to respond if there are tough future carbon constraints (“option value”)
- Justifies more active intervention than in some other markets

# Features of the technologies

- Carbon price policies are technology neutral
- But to what extent does innovation policy need to be technology-specific?
  - There are distinct issues with specific technologies:
    - Nuclear waste
    - Land use constraints on biofuels
    - Technical barriers to hydrogen
  - Technologies at different stages of development may need different types of support

# International co-ordination

- How do we balance national and international programmes?
- How do we ensure we are bringing forward a sufficiently diversified portfolio of technologies?
- How do we promote technology transfer to developing countries?

# What are the policy tools available?

- A wide range already used, including
  - Public R&D
  - Creating markets to force technologies to scale up (through regulation / subsidy)
  - Providing risk capital
- How do we create policies which:
  - Are both credible and flexible
  - Are appropriate to technologies at different stages, in different sectors
  - Are consistent with good public finance principles?

# Issues for discussion

- Do you agree that both a carbon price and an innovation policy are necessary elements of an overall strategy?
- Have we correctly identified the market failures associated with the innovation process?
- Do low-carbon technologies justify a more activist approach than in other sectors?
- What is the appropriate mix of policies across different stages of innovation?