"CLIMATE CHANGE AND A NEW ENERGY BALANCE IN EUROPE: THE ENGINEERING CHALLENGE"

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1. The need to change

- reliance on combustion excessive (cars, factories, energy production)
- development imbalances betw. developed and developing world >> vast differences in level of life & footprint (energy, but also other resources, e.g. minerals, water) >> east catching up now, esp. with crisis
- global problem >> needs global agreement; inhibited by development imbalances
- return on investment unsure >> questionable justification for immediate action
- need to approach problem spherically:
  - restructure energy production: alternative sources (also diffuse), especially renewable[1]
  - improve efficiency of distribution networks, and
  - improve efficiency of energy consumption, e.g. improve efficiency of buildings

2. The need to improve

- basic research >> applied research >> pilot projects >> application
- U.S. model: Federal financing of basic & applied research >> venture capital for pilot & application >> companies absorb new technologies (usually by M&A)
- E.U. finances research but has less venture capital >> need increased maturity of technologies before application possible >> slower.
- context of Lisbon agenda (recast by President van Rompoy) >> need to stimulate innovation if Europe is to maintain its competitiveness (simpler undertaken & developed by developing nations) >> Research needs more support in Europe (E.U. & national level) + dissemination of results

[1] nuclear energy is an alternative form of energy – but not a renewable source of energy

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3. The means to improve

- need for national plans taking into account:
  - competitive advantages of each country
  - maturity of alternative technologies
  - costs & benefits from each (not easy to assess)
  - environmental impacts
  - spin offs, e.g. exportable technological advantage

  Consulting engineers are important here, as advisers to society
- Select most promising sectors at national level & investigate means for advancement, e.g. public investment and/or incentives for private investment.
- Review & adjust above policies periodically

4. Implementation

- need to adjust legal framework for:
  - introduction of technologies, e.g. cost of purchase of energy
  - streamlining of permitting processes
- need to assess costs and returns from each investment, with consideration of:
  - suitable sites for application
  - optimum technologies and combinations thereof
  - preliminary design

Consulting engineers are necessary here.

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