

# Energy Security in Energy Systems Modelling

## Dublin Energy Lab GREP Seminar

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- Background
- Why Energy Security as a research topic?
- Activities to date
- Modelling methods
- Preliminary outputs
- Next steps

- National University of Ireland, Galway
  - B.Eng. in Mechanical Engineering
- Project Engineer - Consultancy
- University of Strathclyde, Glasgow
  - M.Sc. in Energy Systems & The Environment
- Renewable Power Generation
  - Project Engineer, Autoproduction
- Hydraulics & Maritime Research Centre
  - Research Engineer, CFD Modelling
- National University of Ireland, Galway
  - M.A. in Economic & Environmental Modelling
- University College Cork (Oct '11)
  - Energy Policy & Modelling Group



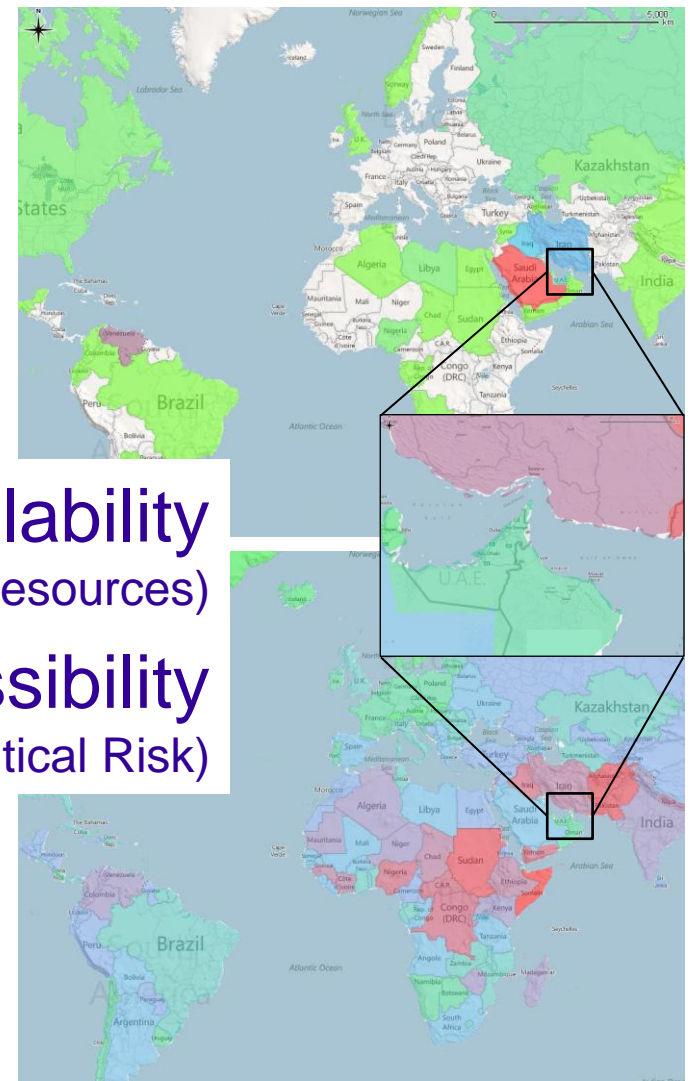
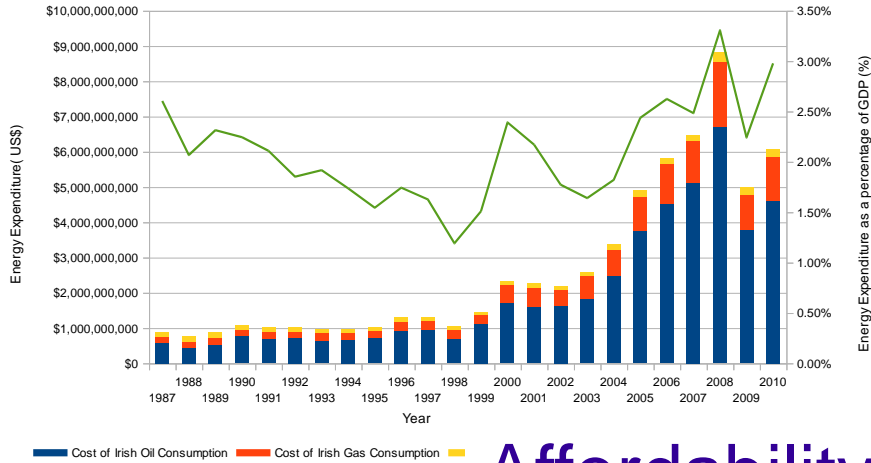
# Why Energy Security?

- Greater understanding of renewable energy technology development
  - HMRC, Wave energy technology development
  - Engineering solutions must be consider affordability at design stage
- Multidisciplinary approach required
  - Engineering
  - Energy Systems
  - Environment
  - Economics
- Need for greater understanding of life cycle costs of energy technologies & system
  - Systems Thinking combining engineer & economist perspective
- Sociologically of critical importance
  - Energy security remains poorly defined & poorly quantified

# Define Energy Security

**Irish Energy Expenditure**

Source: BP, IMF



**Affordability**  
(Economics)

**Availability**  
(Energy Resources)

**Acceptability**  
(Environment)

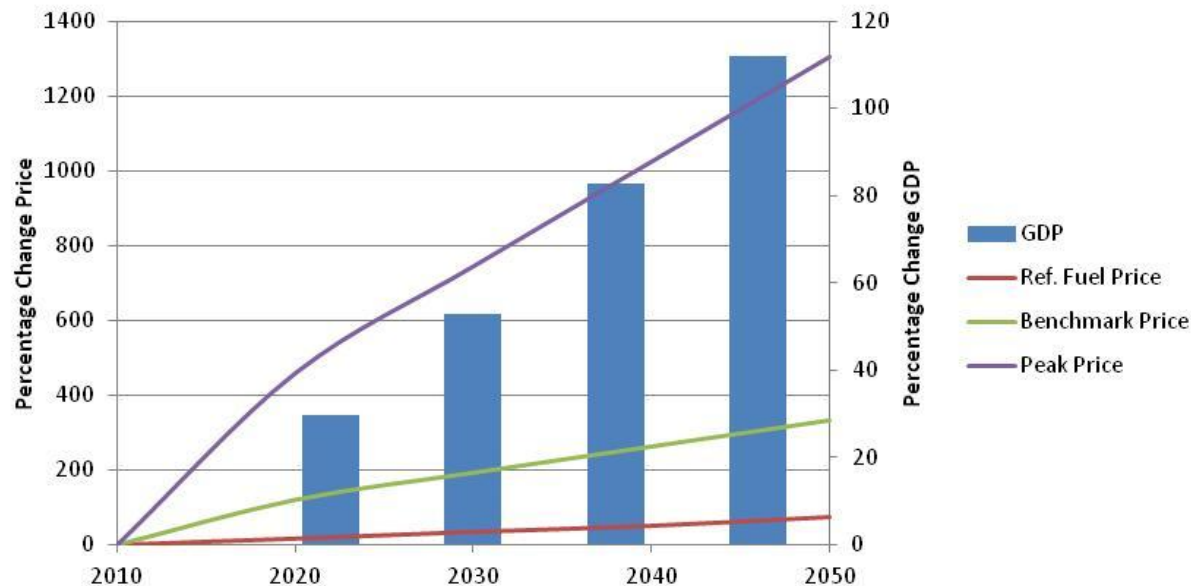
**Accessibility**  
(Geopolitical Risk)



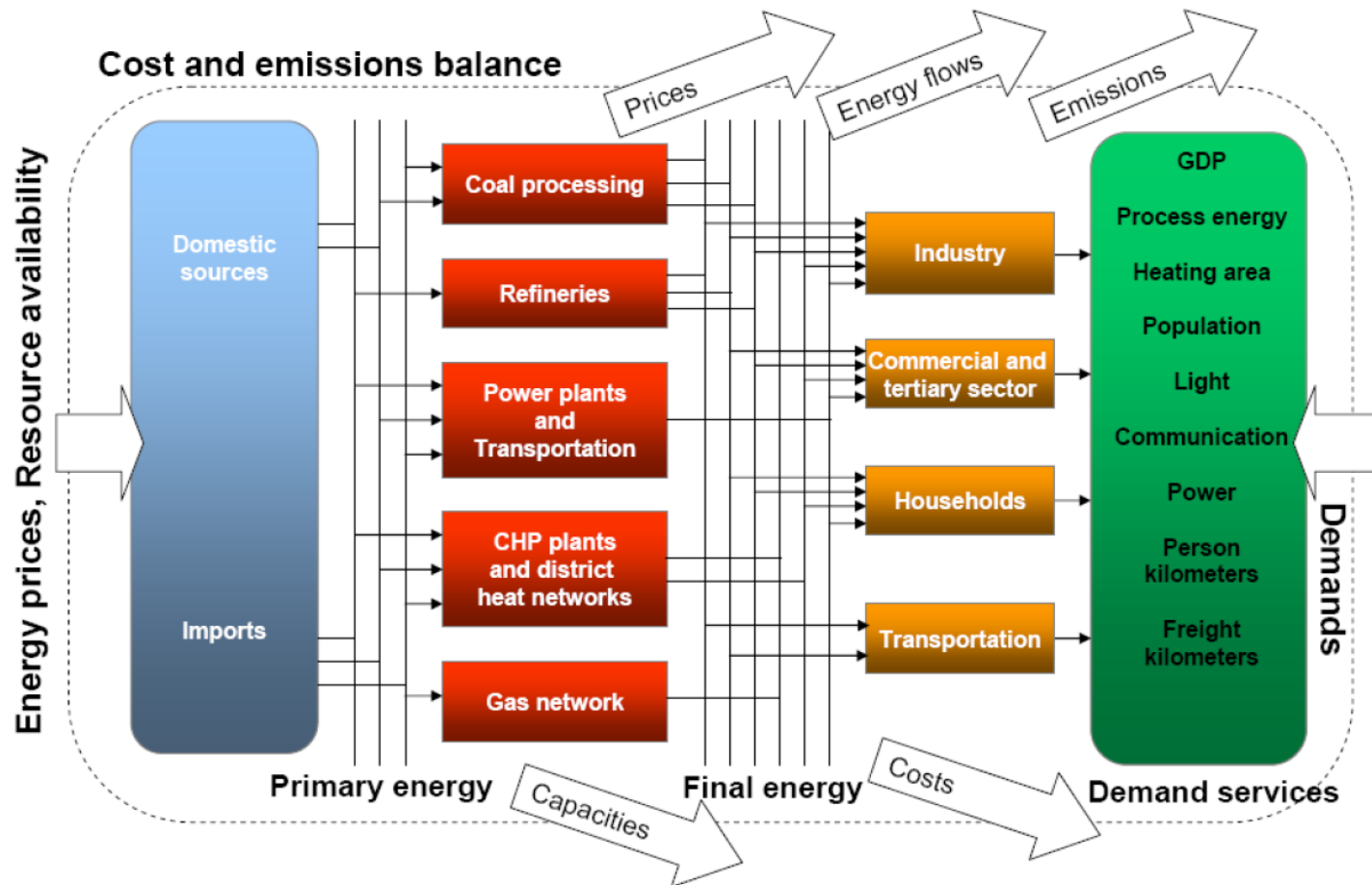


- Literature review
  - Supply Demand Indices
  - Risk aversion security Indices
  - Diversity Indices
  - European REACCESS Project
- TIMES Model Training
  - National Technical University of Athens, Greece
  - IEA ETSAP Workshop
- Preliminary Model Runs

- Preliminary Irish-TIMES SoS Model Runs
  - Exploring Effects of Long Term Decline In Oil Commodity Import Availability
    - Import/Supply Constraints
    - Price Constraints
- Model Assumptions

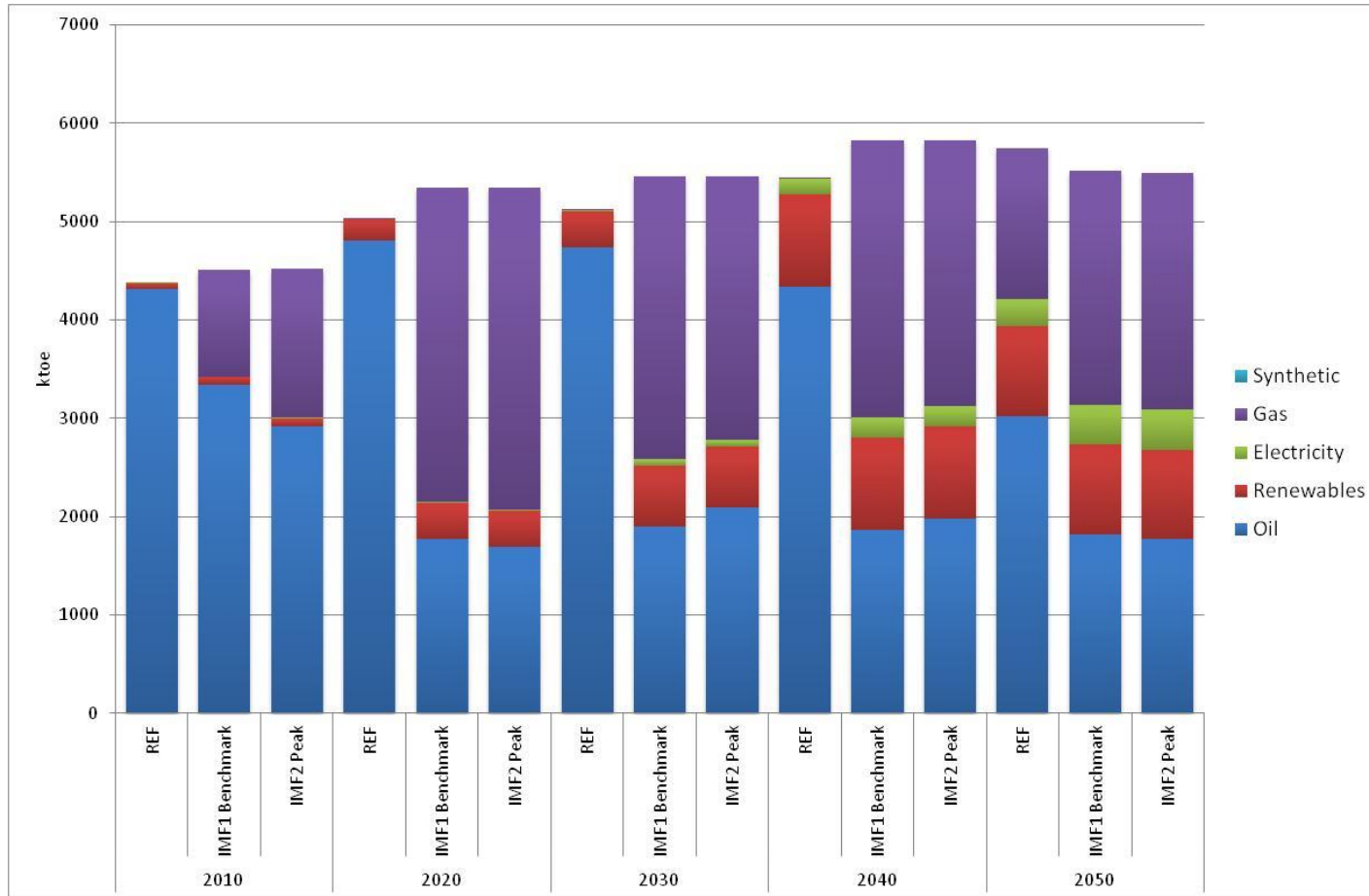


- Irish TIMES – Techno-Economic LP Model





- IMF WEO 2011, Oil Price Scenarios



- Continue initial investigation of oil security of supply scenarios
  - Estimate changes in energy system balance & costs
  - Quantify energy security indices for Irish scenarios
    - Security of Supply scenarios
    - 2020 & 2050 target carbon reduction scenario
- Collaboration & exchange with EU Energy Research Centre, Petten, Netherlands
- Investigate alternative macro-economic model drivers
  - Energy related production functions
    - Energy Price ~ Economic Growth Correlated
    - Soft link initial runs
    - Exogenous price & demand profiles
- Thank You For Your Attention