



# The Energy Technologies Institute – Activities in CO<sub>2</sub> Storage

**Andrew Green**

**Programme Manager - CCS**

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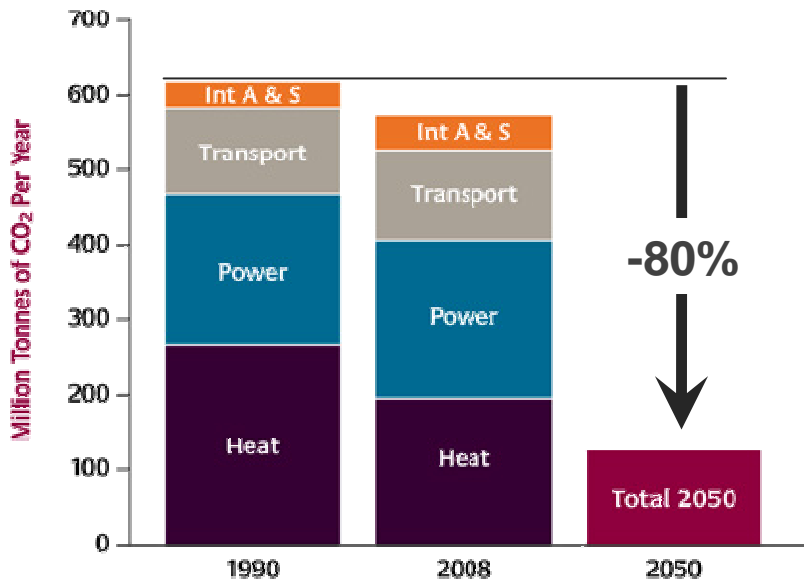
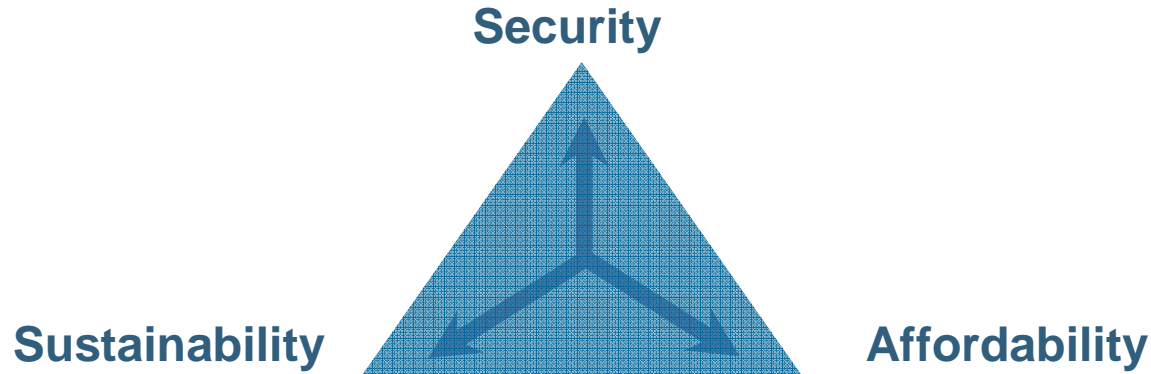
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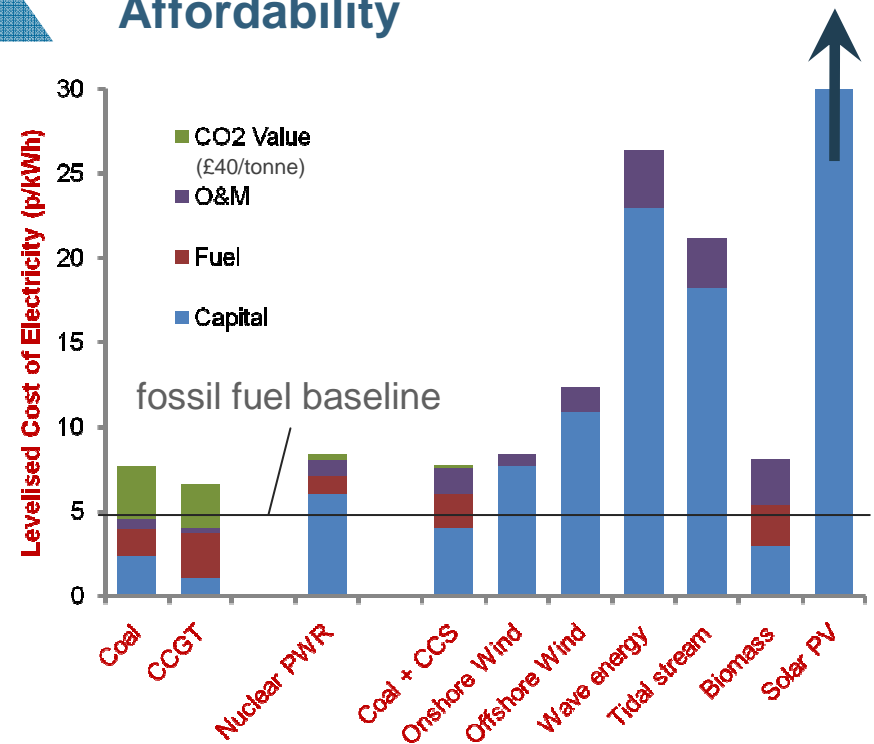
# Contents of Talk

- Brief Introduction to the ETI
- UK Storage Appraisal Project
- ETI Activities in Measurement, Monitoring & Verification

# Addressing the UK's energy challenges



Int A & S = International Aviation & Shipping  
DUKES data



# Addressing the UK's 2020 and 2050 energy challenges requires ....



## Setting a strategic direction



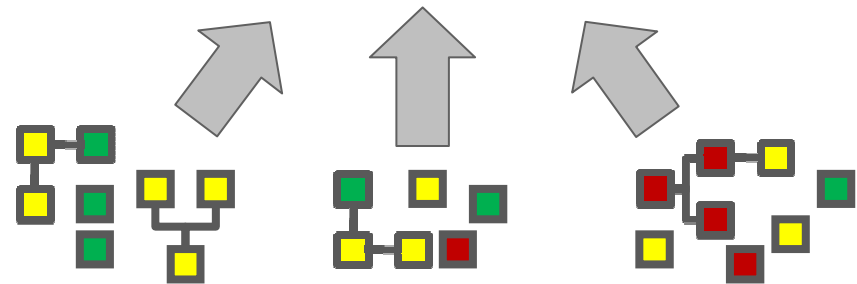
Which energy technologies do we need and when?

## Creating commercial confidence

**Viable commercial operation**

**Full system demonstration**

- Reducing risk
- Increasing investor confidence
- Bringing together new supply-chains



Innovative technologies and sub-systems

# The ETI - Addressing the UK's 2020 and 2050 energy challenges by ....



## Setting a strategic direction

**World-class ETI capability in energy system modelling and strategic analysis**

**Focused on the integrated UK energy system – power, heat, transport and associated infrastructure**

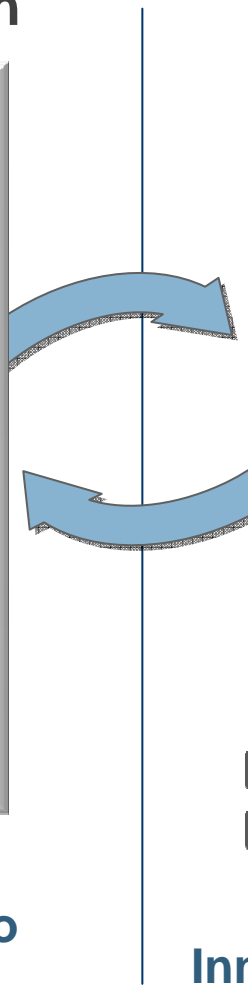
**Which energy technologies do we need and when?**

## Creating commercial confidence

**Viable commercial operation**

**ETI Delivery of engineering demonstrations of innovative low carbon energy systems**

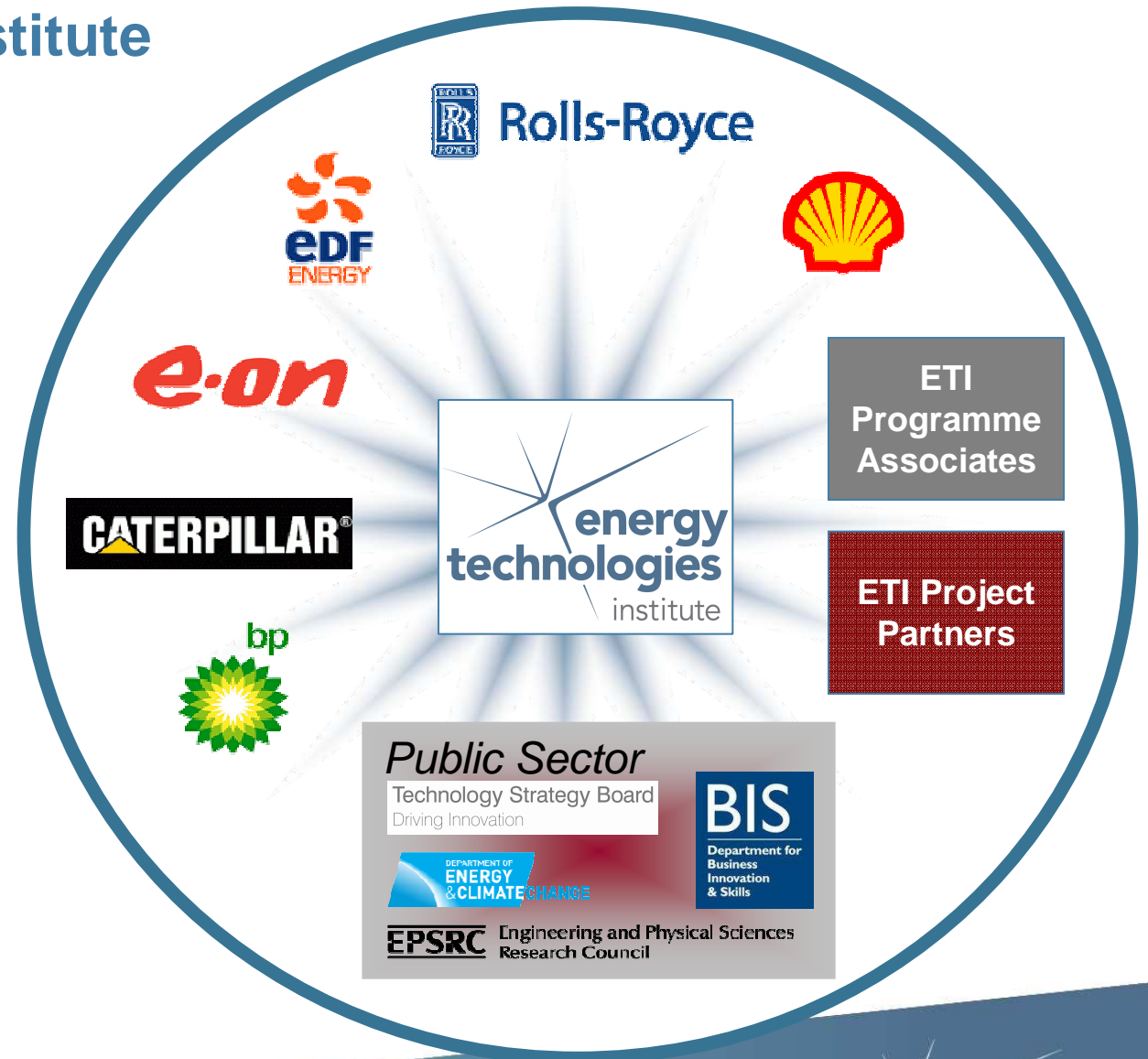
**Innovative technologies and sub-systems**



# Energy Technologies Institute

Addressing the challenges of climate change and low carbon energy

- Improving energy usage, efficiency, supply and generation
- Demonstrating systems and technologies
- Developing knowledge, skills and supply-chains
- Informing development of policy, regulation and standards
- Enabling deployment of affordable, secure, low carbon energy systems



# ETI 2010 portfolio addresses key energy challenges

## ⇒ Wind

- Offshore specific system design and engineering

## ⇒ Marine

- Tidal Stream and Wave

## ⇒ Distributed Energy (DE)

- Combined Heat and Power (CHP), demand management, efficiency

## ⇒ Buildings

- Retrofit of new technologies and systems

## ⇒ Energy Storage and Distribution

- Infrastructure, heat and energy storage, fault management, smart networks

## ⇒ Carbon Capture and Storage (CCS)

- Storage appraisal & MMV, capture technologies, CCS system modelling, mineralisation

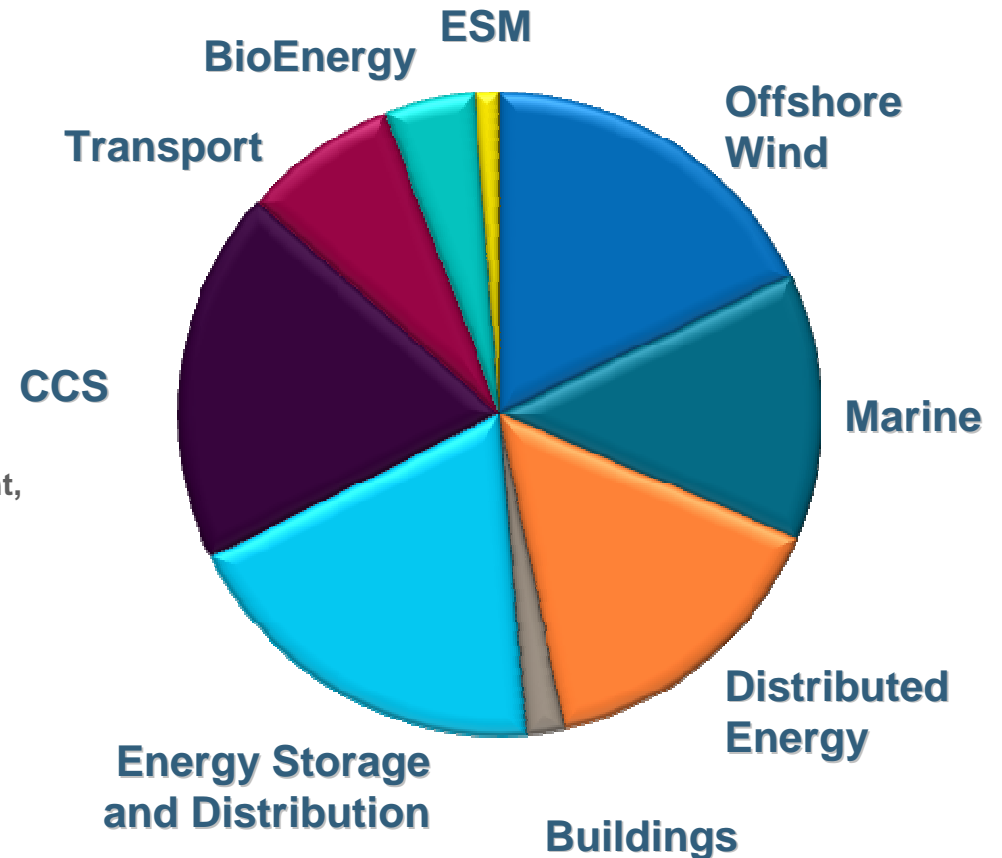
## ⇒ Transport

- Electric vehicle infrastructure, heavy duty vehicle efficiency

## ⇒ BioEnergy

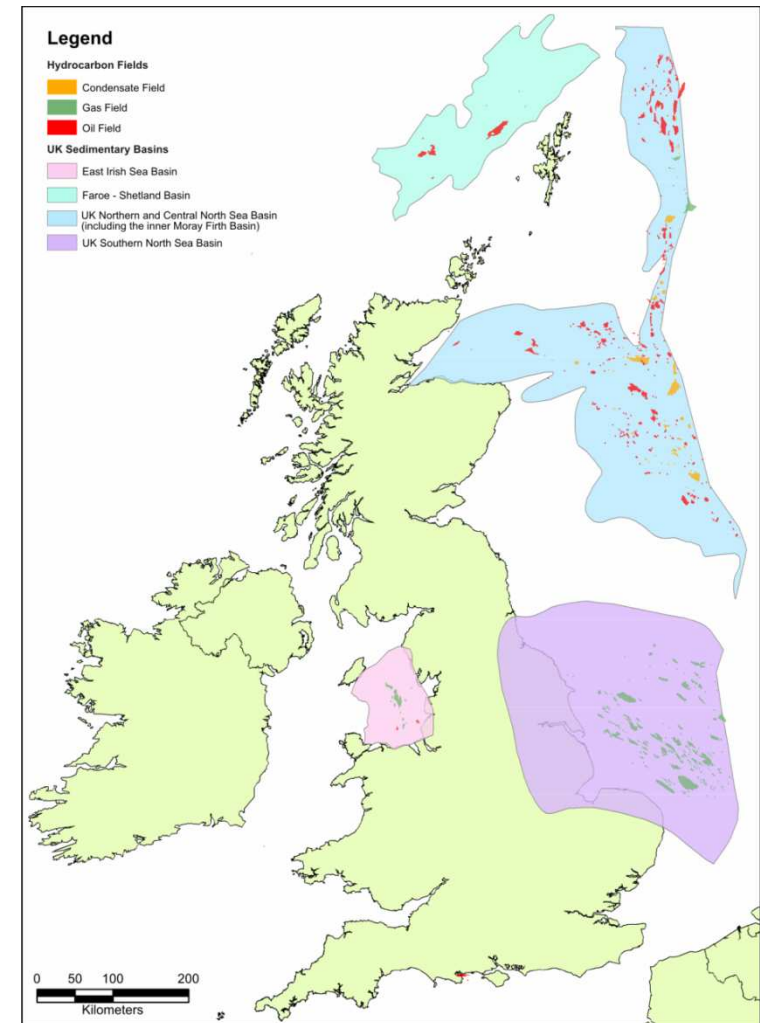
- Soil chemistry and agronomy, value chains, energy conversion

## ⇒ Energy Systems Modelling (ESM)



# UKSAP UK CO<sub>2</sub> Storage Appraisal Project

- Goals/benefits
  - Step change in methodologies to make a realistic assessment of practical CO<sub>2</sub> storage capacity
  - Overall estimate of capacity
  - GIS database of potential storage units, including risks & economics
  - Inform investment decisions for CCS roll out in the UK
- £3.8M Project
  - Started in October 2009
  - Completion in April 2011



Courtesy BGS

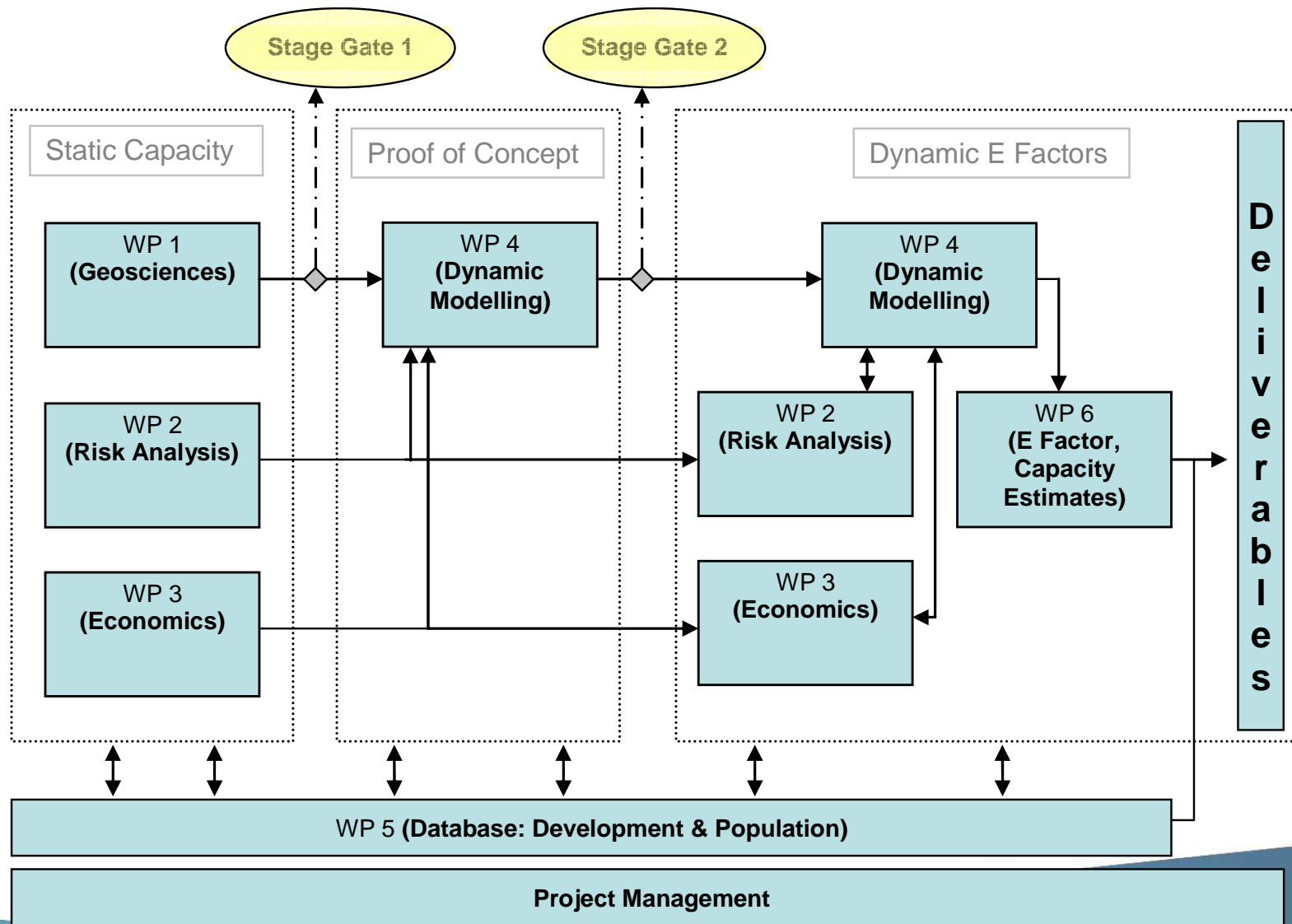
# UKSAP - Participants

Project led by Senergy Alternative Energy

Other Participants:

- British Geological Survey
- Durham University
- Element Energy
- GeoPressure Technology
- Geospatial Research
- Heriot-Watt University
- Imperial College London
- RPS Energy Consultants
- Senergy Survey & Geoengineering
- University of Edinburgh

# UKSAP Workflow



# UKSAP – Key Features

- Scale of the project
  - 5 regions of UKCS from 800m to basement (UK SNS, CNS, NNS, Western English Channel, East Irish Sea)
  - All potential storage units considered (saline formations & HC reservoirs)
  - Significant investment in use of best available data
- Outputs will be fully auditable & defensible
  - Consistent methodologies across regions
  - Methodologies put in public domain for peer review
  - All data sources referenced
- Results expressed as probability distributions
  - Take into account quality/uncertainty of data

## UKSAP – Key features (2)

- The study will deal with risk in structured way
  - Geological & operational risk
  - Consistent, objective risking methodology
  - Fully documented risk assessment
  - Easy to modify based on risk appetite and update based on improved understanding
- Dynamic effects will be fully addressed
  - Limitations on practical capacity caused by dynamic CO<sub>2</sub> injection effects
  - 3D modelling of CO<sub>2</sub> injection and movement in subsurface
  - Modelling of range of parameters in simplified ‘representative structures’ and validation with small number of ‘exemplars’
  - Extrapolation of results to provide estimates of dynamic capacity of all storage units

## UKSAP – Key features (3)

- Interactive Database as final deliverable
  - Captures key storage, economic and risk data on a unit by unit basis
  - Web enabled with full GIS capability
  - Audit trail for estimates – source data referenced
  - Calculates derived parameters ‘on the fly’
  - Searchable and filterable
  - Designed for easy future maintenance & updates

## UKSAP – Key features (4)

- Brings together key UK industrial and academic storage expertise
- Close involvement of ETI Member experts
  - BP
  - EDF
  - E.ON
  - Shell

## UKSAP – Dissemination of Results

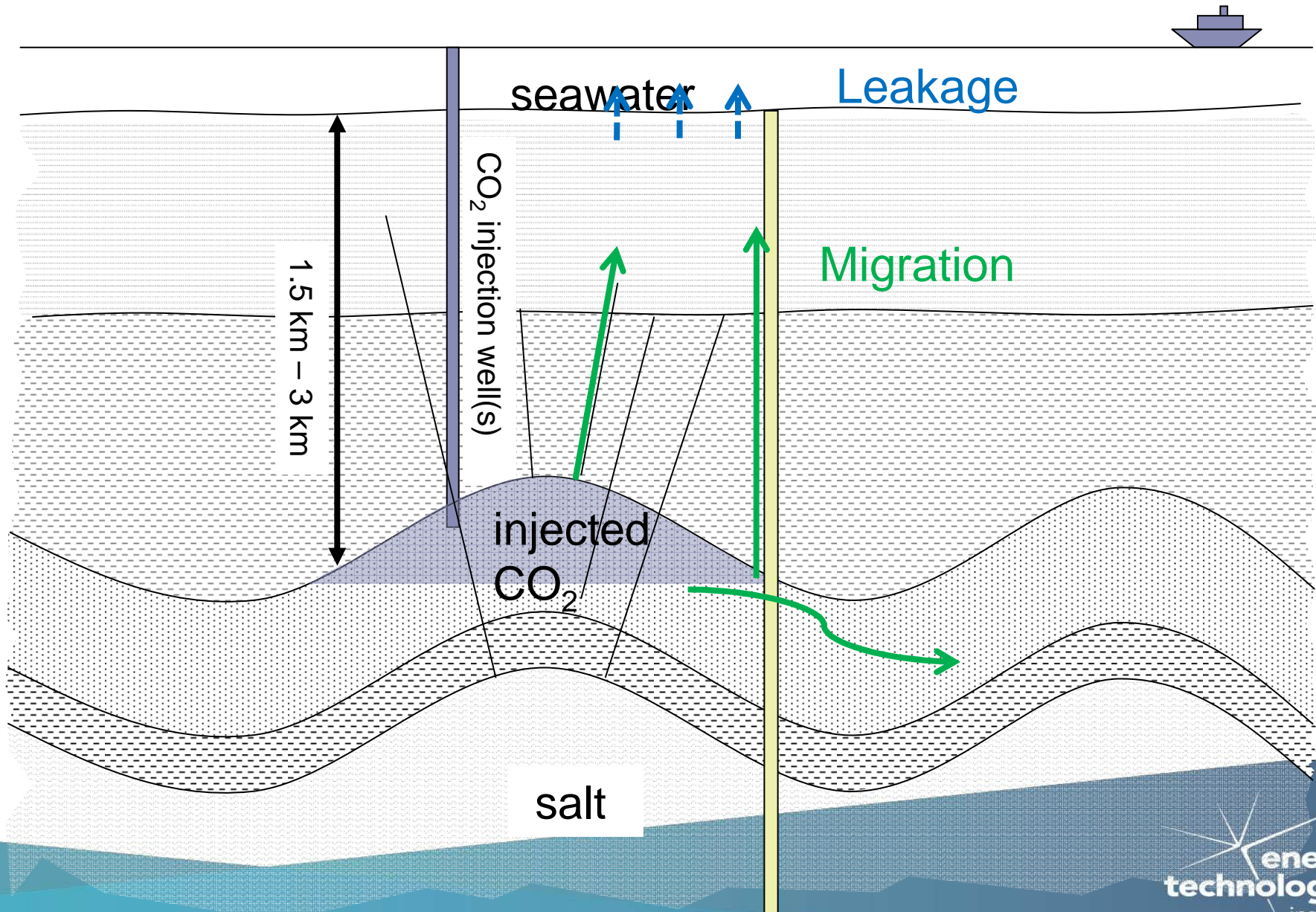
- Academic participants encouraged to publish and share methodologies for peer review
- ETI Board has given in principle approval for widespread dissemination of results
- Mechanisms and timing of dissemination will be agreed by ETI Programme Management Board

# Storage: Measurement, Monitoring & Verification (MMV)

- ‘Seed’ Project – inform ETI of requirements & priority projects
- Analysis of UK needs
  - UK/EU legislative drivers
  - Quantitative (‘how much is there’), not qualitative (‘where is it’) measurements
  - Offshore application
  - UK geologies
- Review of current technologies & gap analysis
- Lead Contractor BGS (+ TNO & Quintessa)
- Project Completion – June 2010
- Priority technology projects kick off in Q1 2011

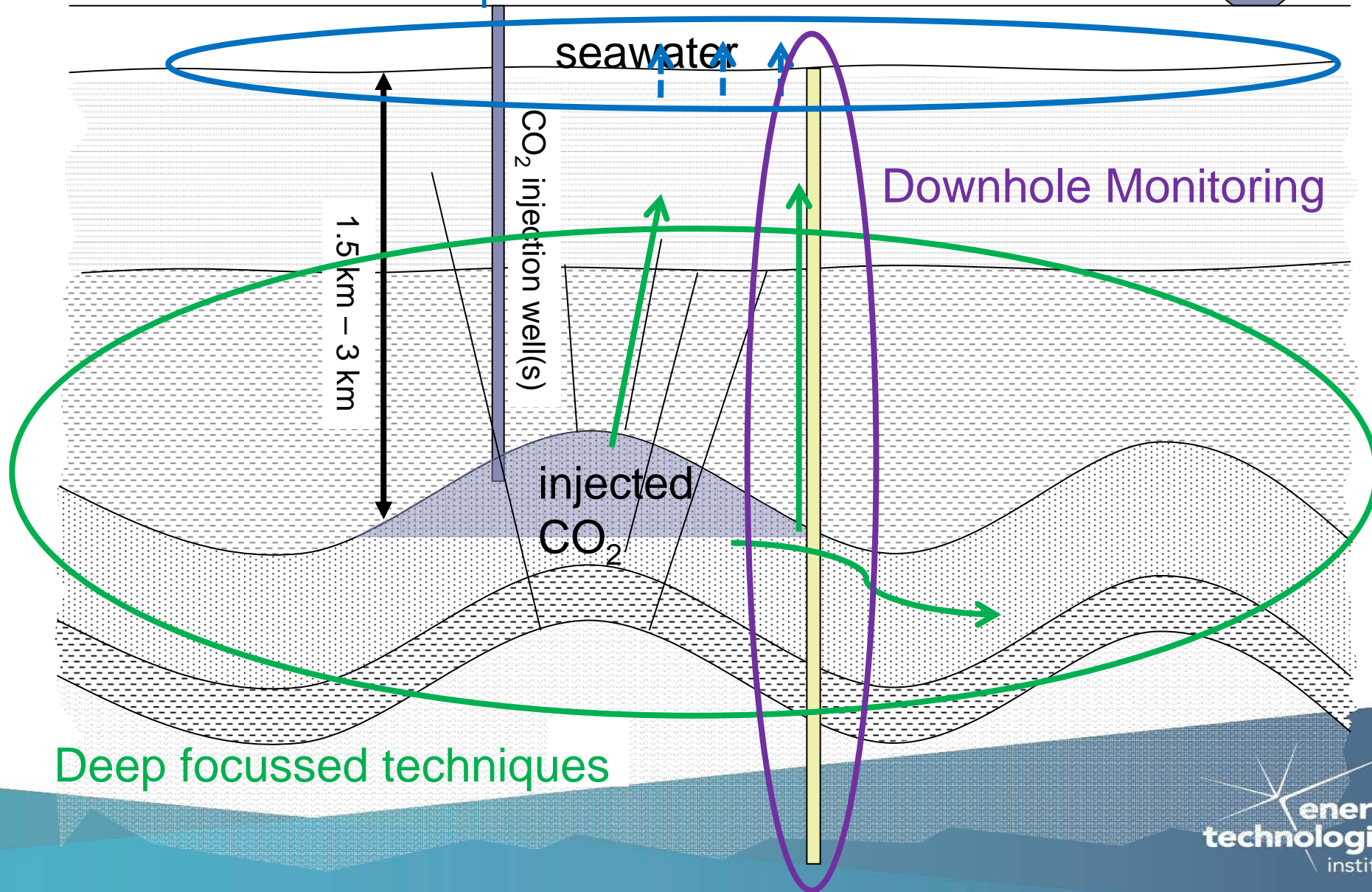
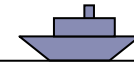


# Typical UK Storage Site



# Typical UK Storage Site

## Shallow focussed techniques



## Deep focussed techniques



**Building Partnerships**

**Delivering Innovation**

**Informing Policy**

**Demonstrating Affordable systems**

***for Secure, Low Carbon Energy***

**Contact [andrew.green@eti.co.uk](mailto:andrew.green@eti.co.uk)**

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