UNIVERSITY OF CAMBRIDGE | Electricity Policy Research Group

JOHNS HOPKINS UNIVERSITY

How Can We Use Scenarios? Planning Transmission Under Uncertainty

Benjamin F. Hobbs
EPRG, University of Cambridge
Whiting School of Engineering, Johns Hopkins University
Market Surveillance Committee, California Independent System Operator
bhobbs@jhu.edu

Harry van der Weijde
EPRG, University of Cambridge

Energy Scenarios and Modelling:
Advancing the 'Grand Challenge' of a Low Carbon Economy
London,7 July 2010

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

SUPERGEN FLEXNet

Making networks fit for renewables …

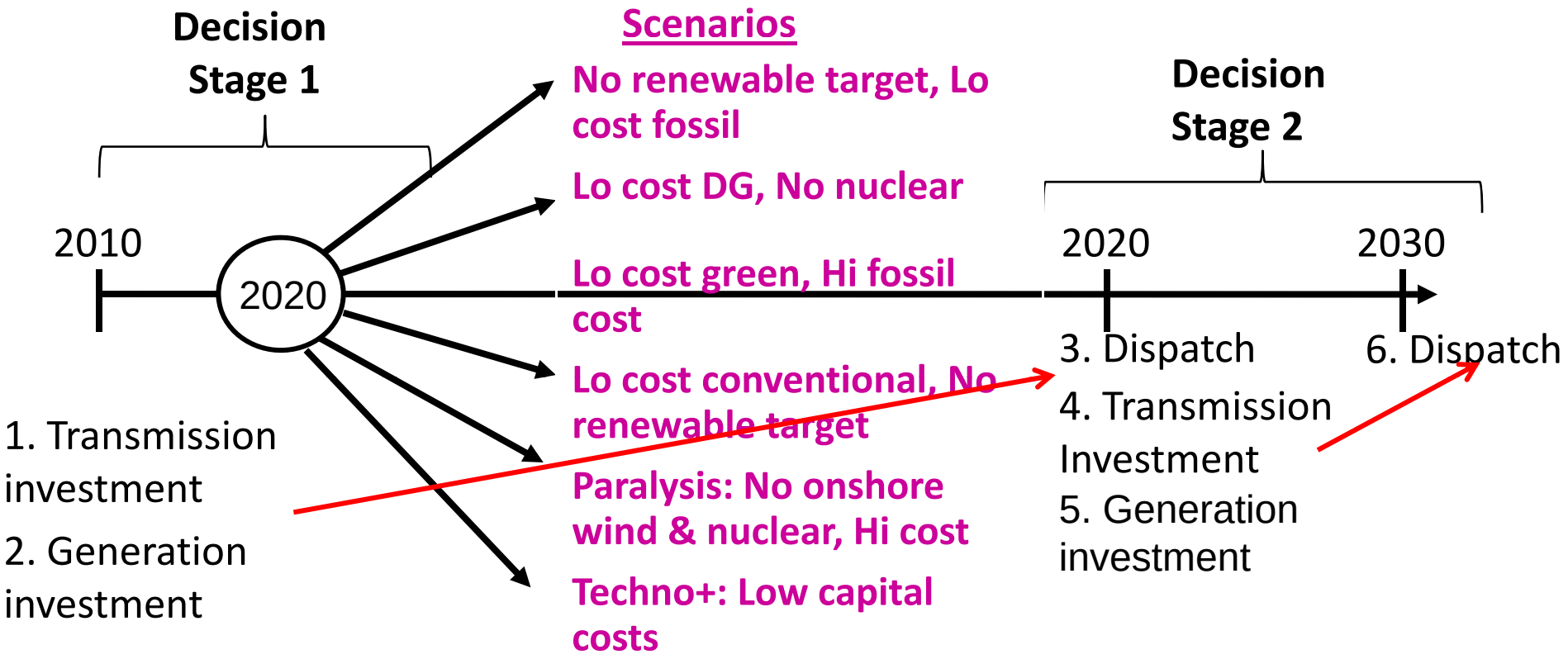
Questions

- *Which actions are robust?:*
  - Which attractive under all scenarios?
  - Optimal strategy considering all scenarios at once?
- *Value of better forecasts?*
- *Cost of disregarding uncertainty?*
- *Value of options/flexibility?*

Deterministic planning cannot answer!

Example: UK transmission infrastructure planning

Decision analysis with multiple scenarios



Objective: MIN social cost (investment + variable)

Subject to: Constraints on ~ 10^6 variables:

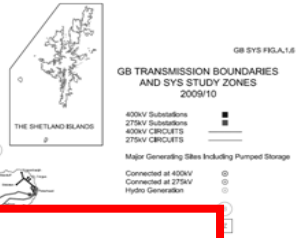
power flow, wind availability, build limits, renewables targets

Optimal stochastic solution

Onshore

CCGT

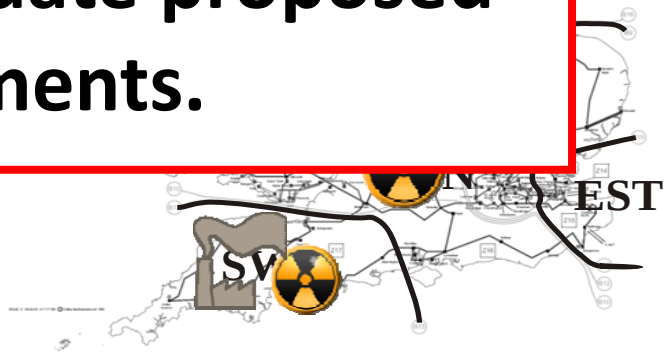
2010



Disclaimer: the following results are preliminary and based on restrictive assumptions.

They cannot be used to evaluate proposed transmission investments.

Biomass



- **Cf. Optimal Deterministic Solutions (which have more transmission)**
- ***Why?*** **There's an option value to waiting.**
- **Cost of ignoring uncertainty: £0 to £432M**