Big Messages!

(from 2014-16 Projects)

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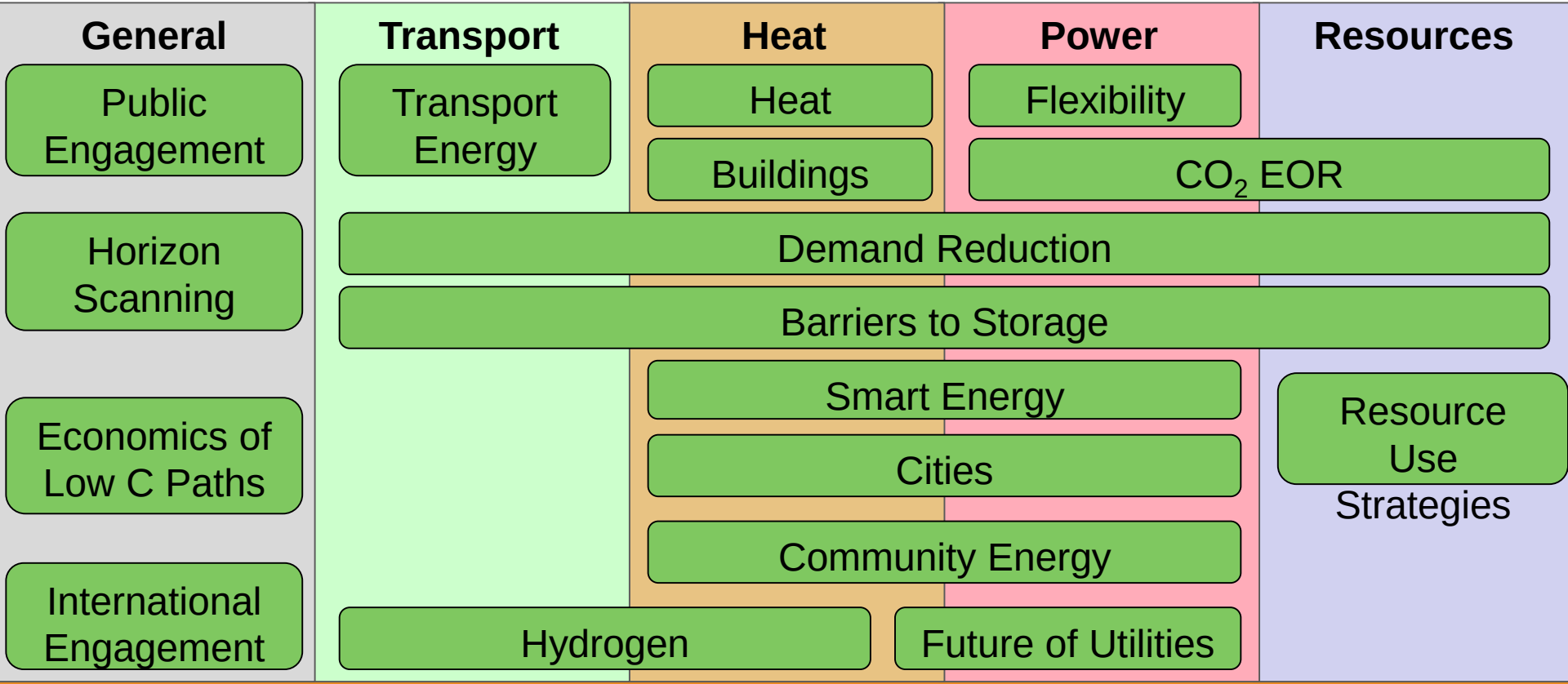
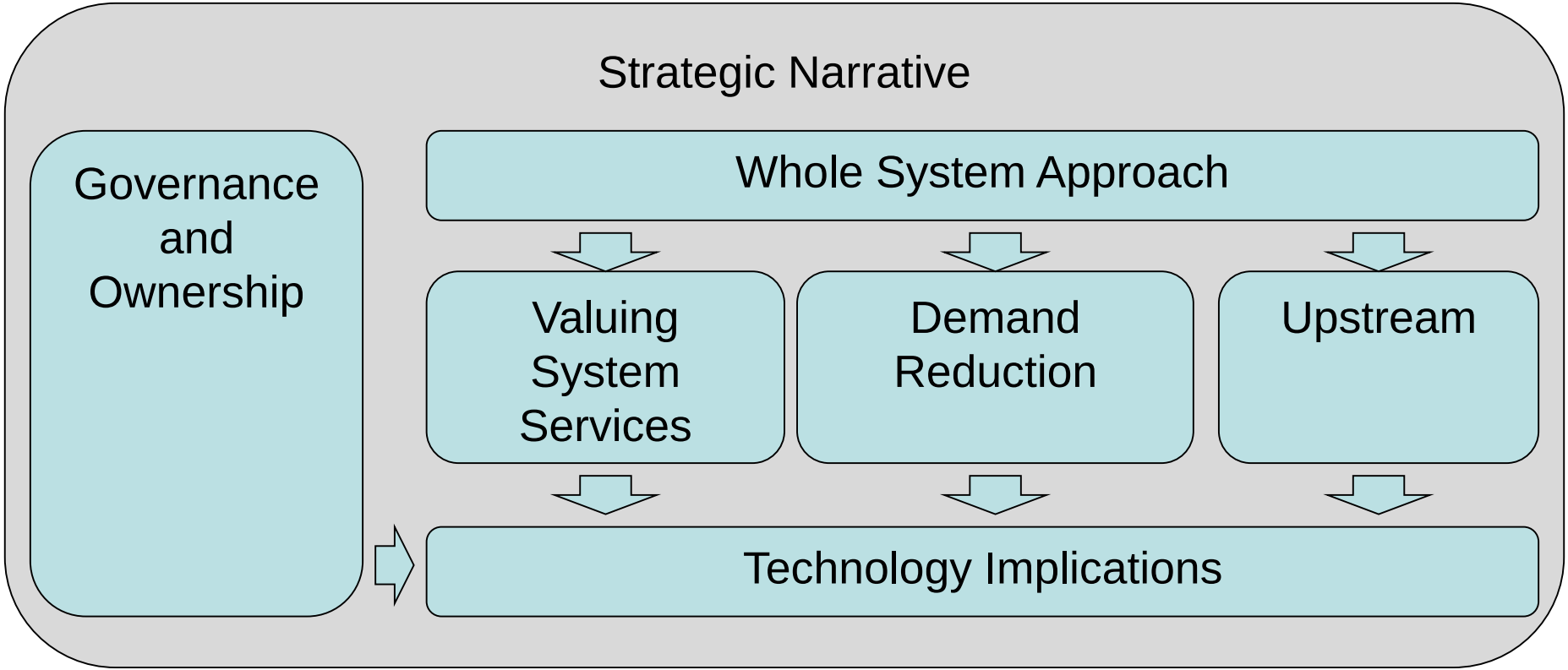
Projects 2014-16



Seven Big Issues



1. Whole System Approach

Flexibility	Don’t look at techs in isolation
Economics	Include local and national economy
Hydrogen	Consider effects on import dependency
Resources	System will adapt to perceived constraints
CO2-EOR	Have to consider source & sink
Storage	Need to look at whole sys to value
Transport	Don’t look at fuels in isolation

2. Valuing System services

- Flexibility
- Storage
- Smart

Technologies that provide system services need to feel market pull

- Inertia
- Reserve
- Response
- Black start
- Constraint relief
- Strategic
- Diversity
- Voltage control
- Firm capacity
- Reactive power

2. Valuing System services

DEMAND
is increasing

More intermittents + Hinkley:

- More reserve
- Less inertia (stability)
- More response
- Response has to be faster

SUPPLY
is disappearing

Traditional suppliers going:

- Closure of coal & Aux GTs
- Closure of Oil
- AGR end of life
- Poor economics for CCGT

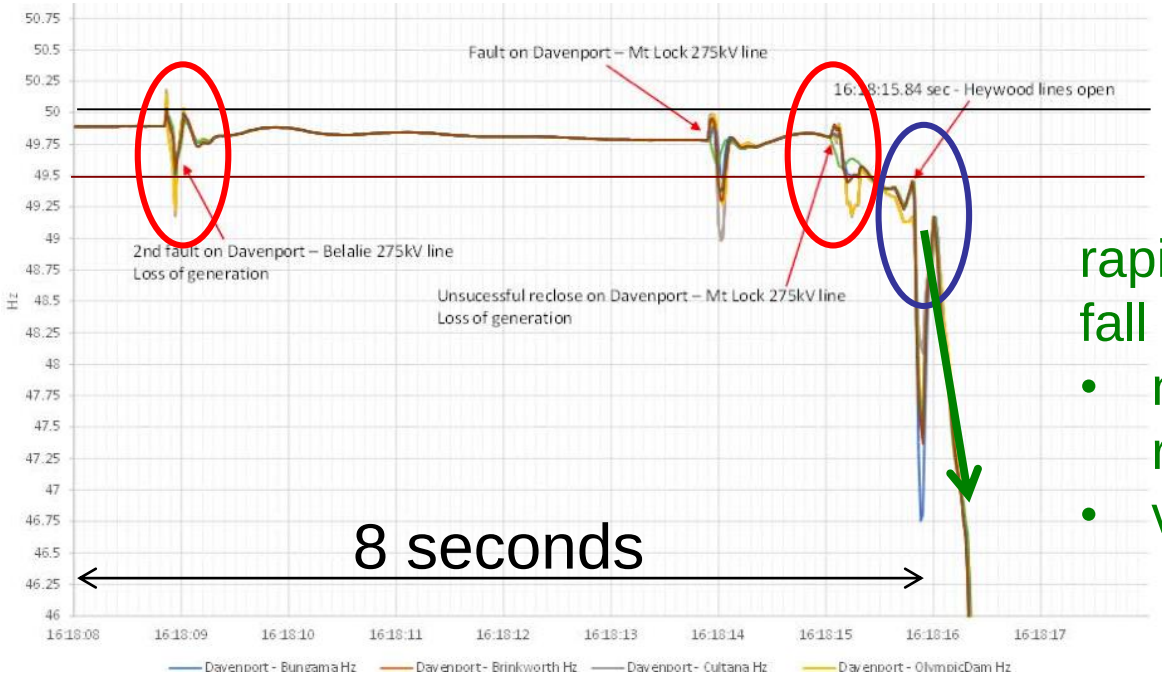
2. Valuing System services

South Australia blackout 28/9/16

50 Hz

49.5 Hz

windfarms disconnect



Interconnect opens, SA islanded

rapid frequency fall

- no Frequency response in SA
- very little inertia

3. Think Upstream

- Hydrogen
- Transport
- Heat

Where does the energy come from?

What are life cycle emissions?

Will it impact energy security?

- Resources

How will system adapt?

4. Dem Reduction is central

Demand

Transport

Buildings

Hydrogen

Many ways to reduce demand for materials and energy

Reducing energy consumption + decarbonising energy vector

Need to tackle 3 gaps: Ambition, Prediction and Performance

Need demand reduction to counteract reduced efficiency

Recommendations

- Tax “bads”
- Food waste & packaging regs
- Public procurement
- Not over-specifying buildings
- Lighter Vehicle
- Random testing of build quality
- Tighter building regs

5. Governace & Ownership is Changing

Utilities 2050

Many models for utilities going forward

Cities

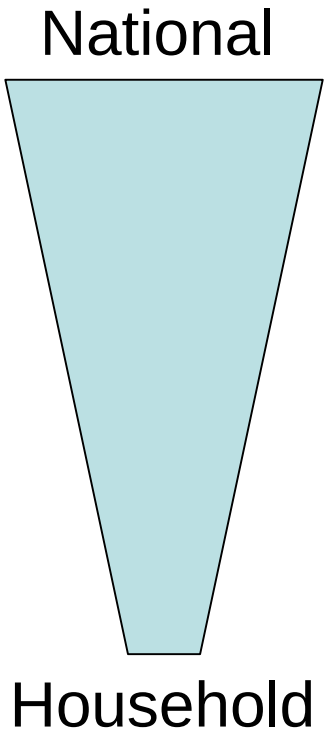
How do local authority ambitions stack with national?

Community Energy

What benefits does community energy bring?

Smart Energy

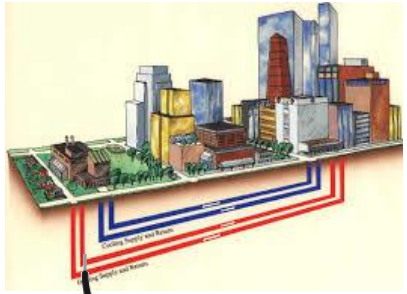
How will individual respond?



6. Implications for Techs

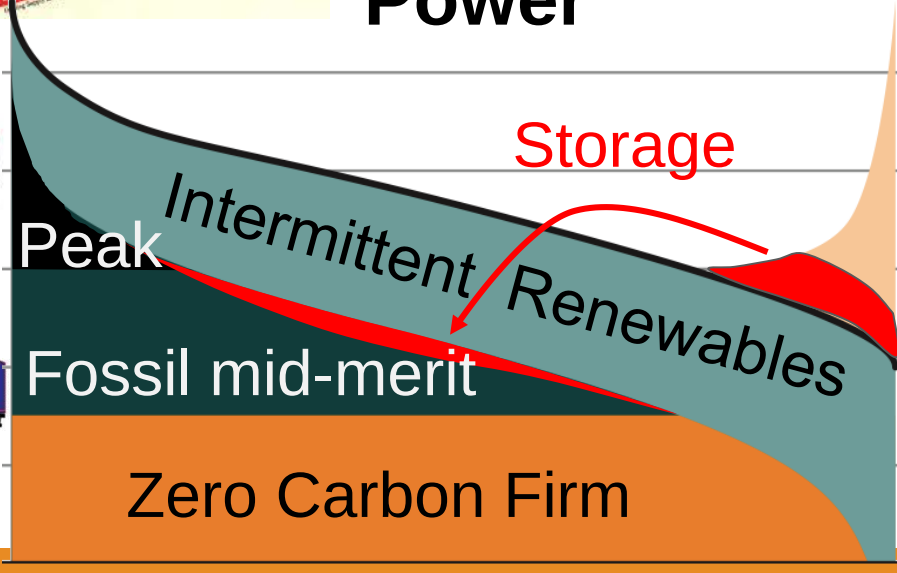
(a) Need a portfolio in each area

- One tech can't do it all / fast enough
- need for diversity



Heat

Power



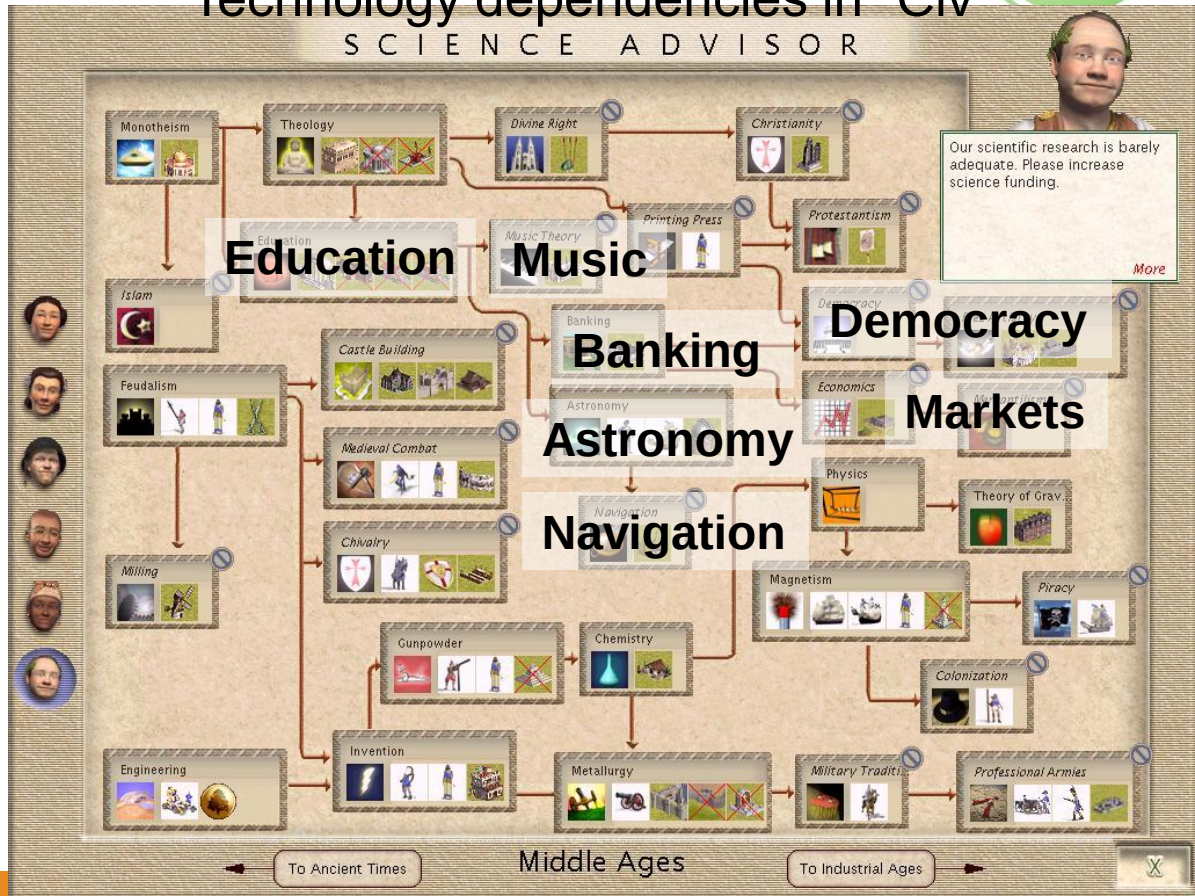
Transport

6. Implications for Techs

(b) Some things are almost unavoidable

- CCS
- Smart controls
- Dem reduction

Technology dependencies in "Civ"



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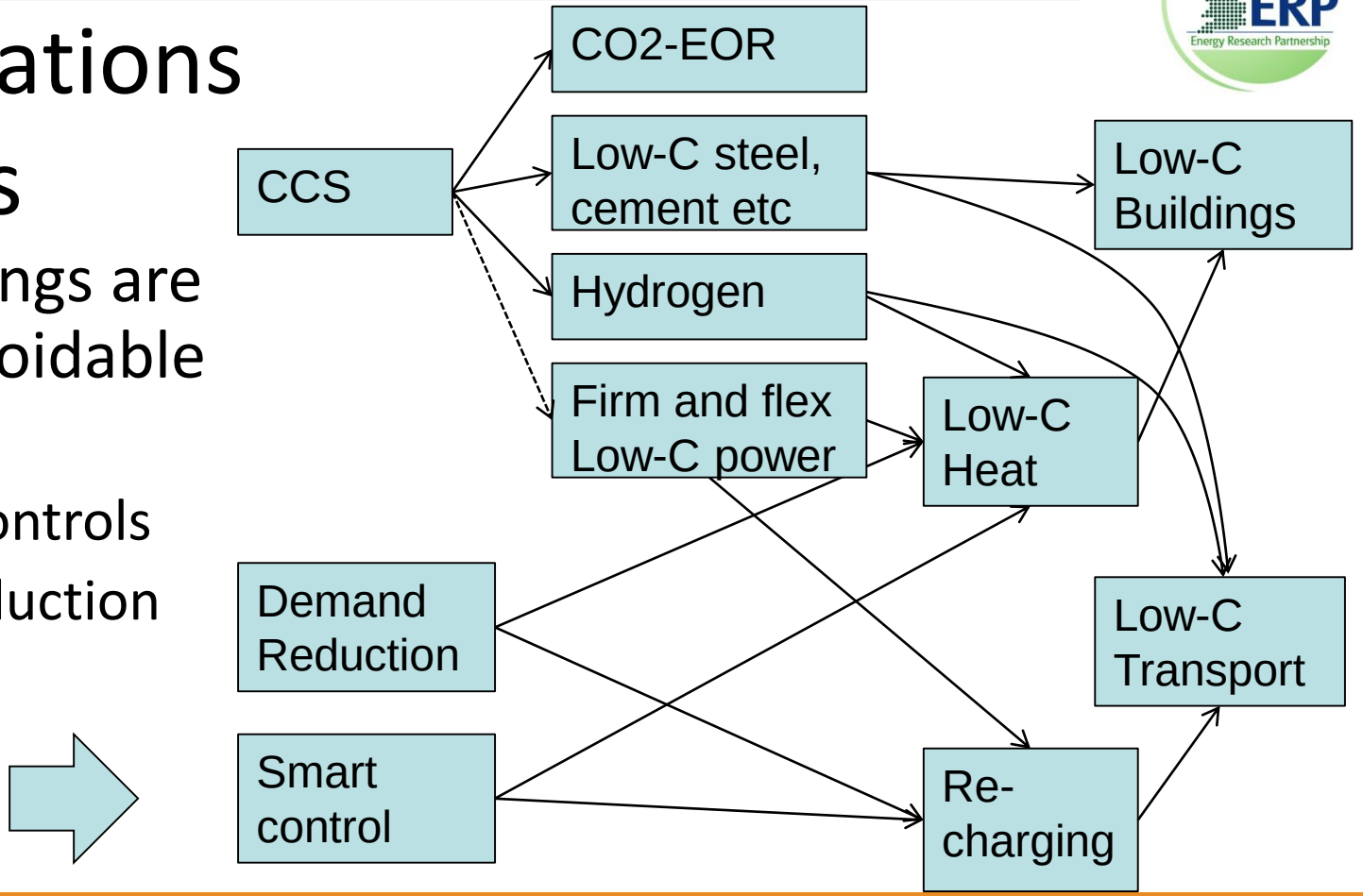
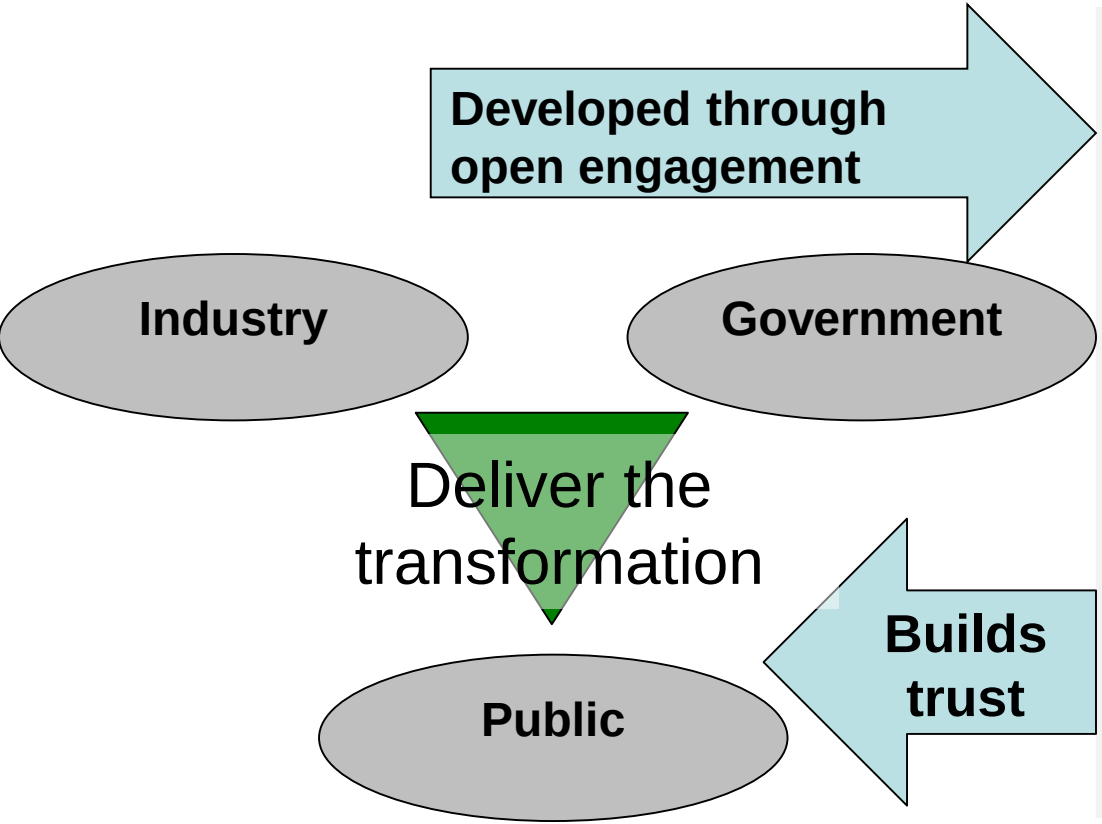
Technology dependencies in energy system



7. Need for Strategic Narrative



Strategic Narrative

- What are the challenges?
- What are the constraints?
- What are the technologies?

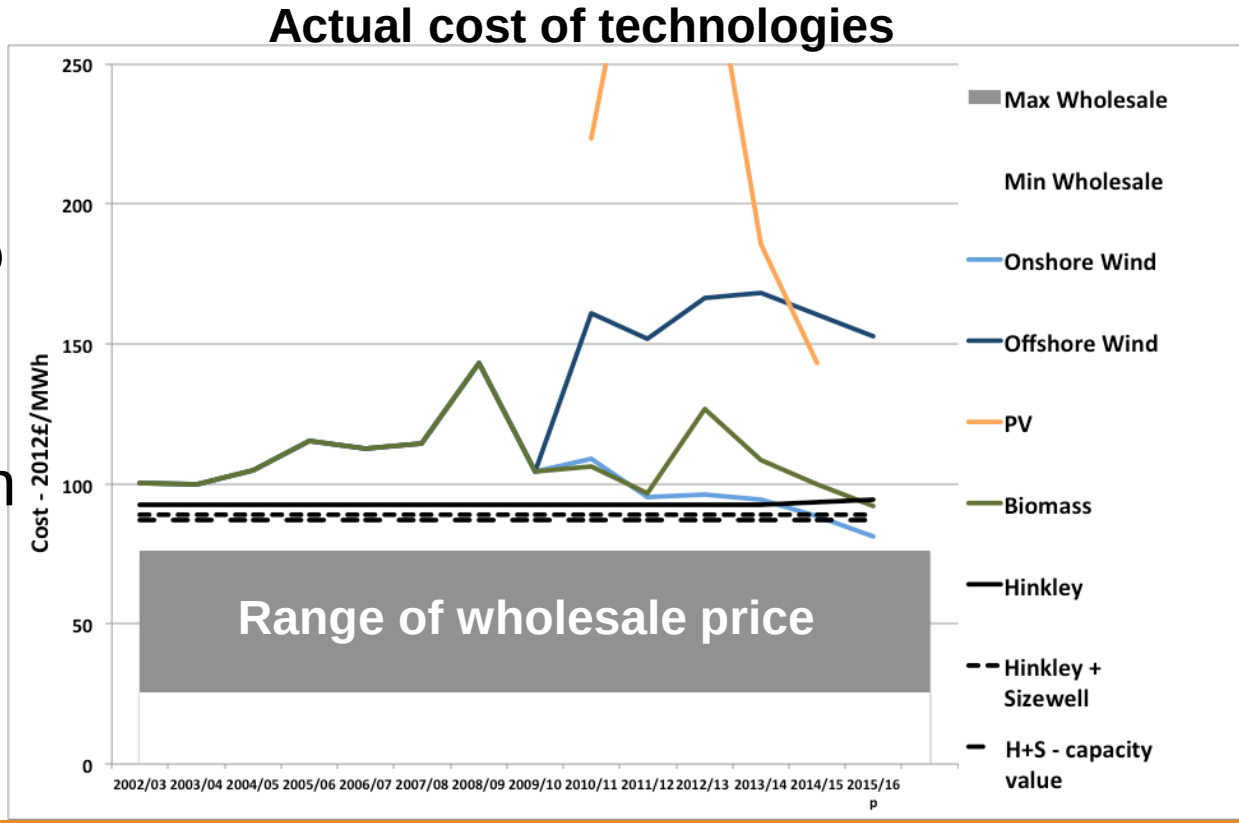
7. Need for Strategic Narrative

Example: **Energy Prices**

It's clear **they have to rise** x2?

Little engagement with the public

So <u>lack of trust</u> of energy co.s + gvt



Qs

- What themes have you seen?
- What are important ones to pursue?