Future energy vectors for transport

Energy systems implications and use of energy sources

14th October 2015

Scope

- Routes for decarbonising transport
- Interactions with wider energy sector
- Indications of the “best use” of energy sources

Current conclusions

Three over-arching themes:

- Technological breakthroughs are needed:
  - e.g. fuels for heavy transport
- Solutions depend upon other developments:
  - e.g. CCS
- Wider uptake requires strategy:
  - e.g. effective regulations for emissions

Overview of presentation

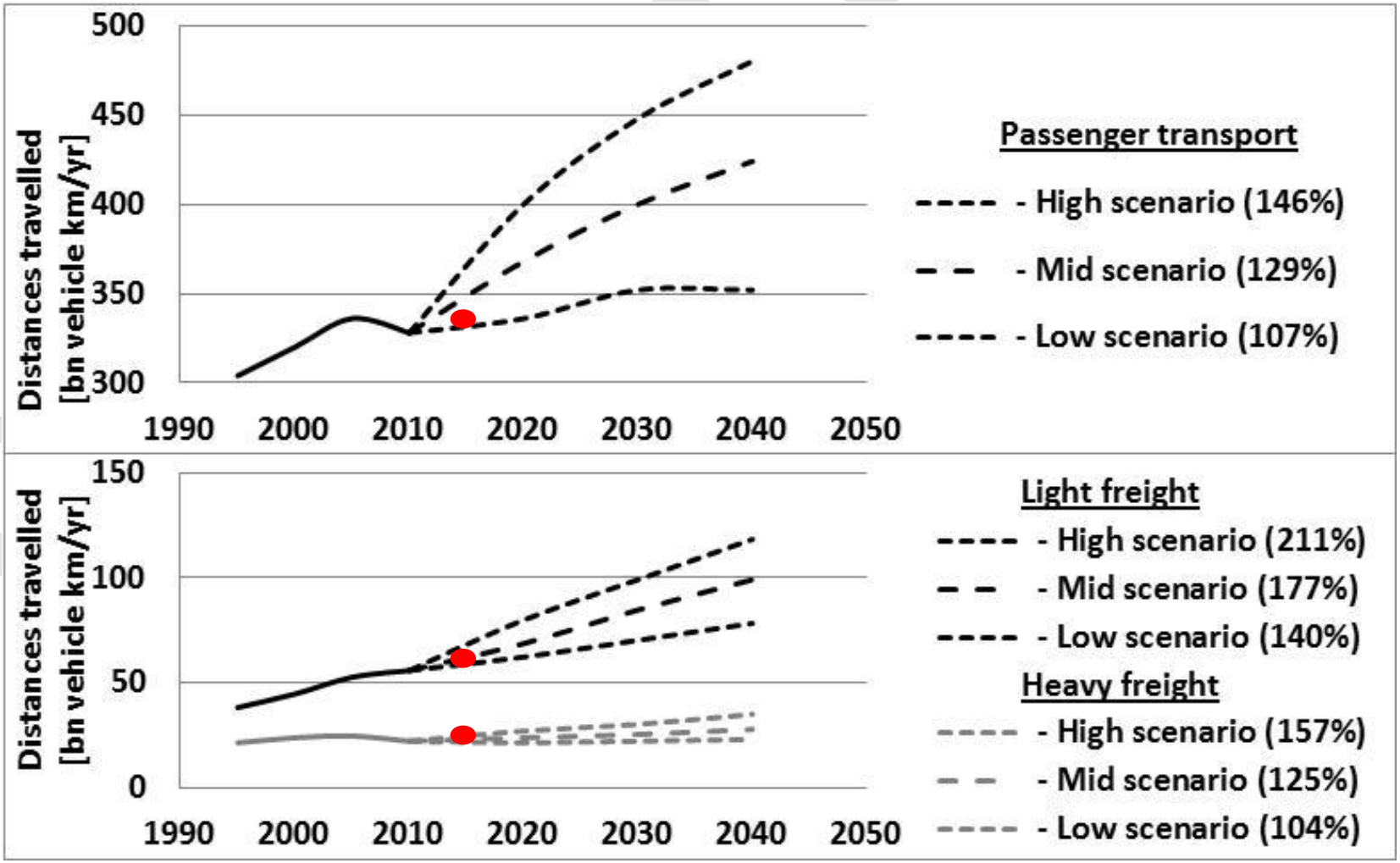
- Scenarios of future transport demand

- Energy vectors and their impacts
- Interactions with wider energy sector
- “Best use” of energy sources

- Current conclusions
- Next steps

Scenarios of UK transport demand

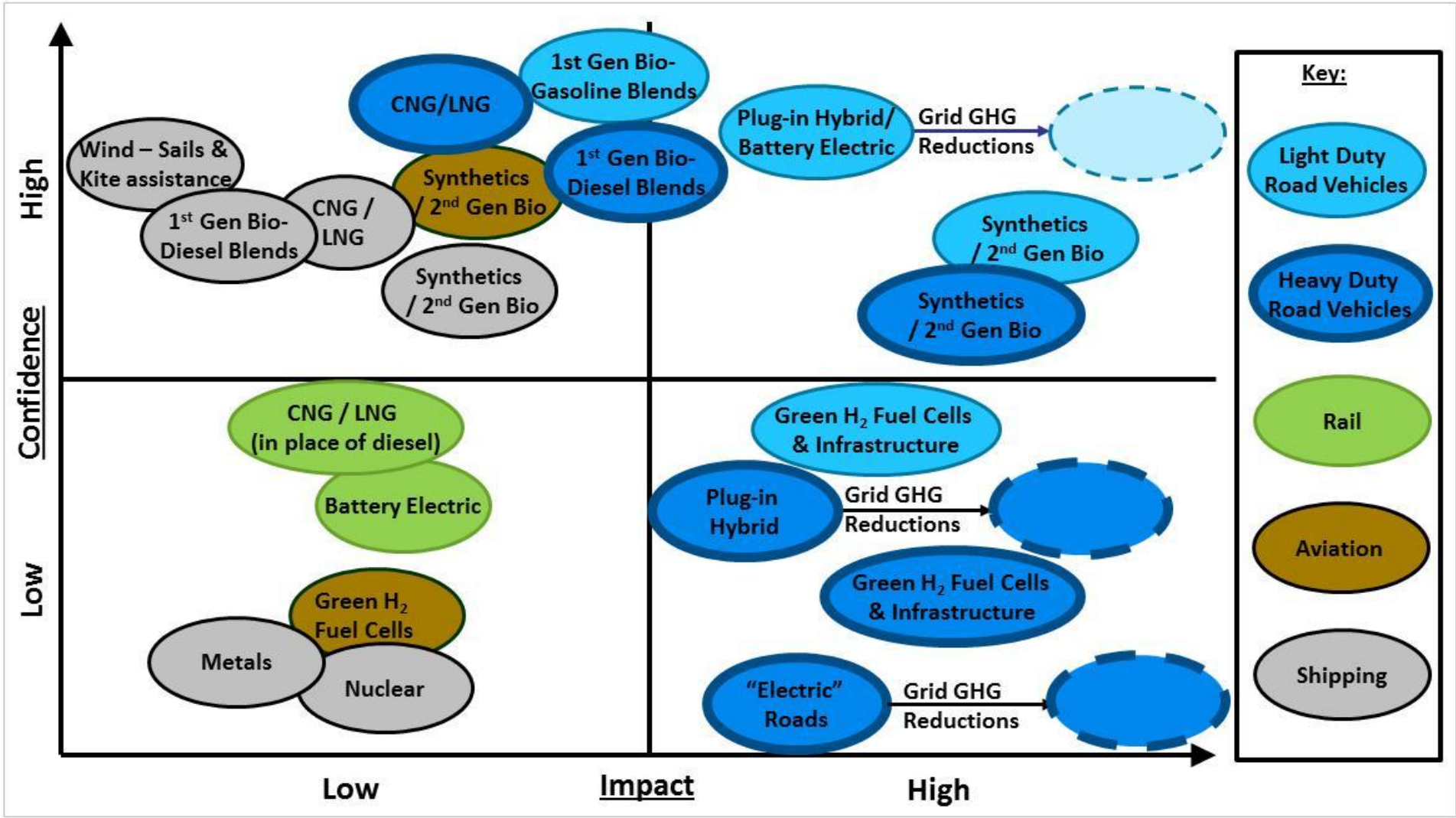
- Distances travelled could rise significantly



[DfT, 2015]

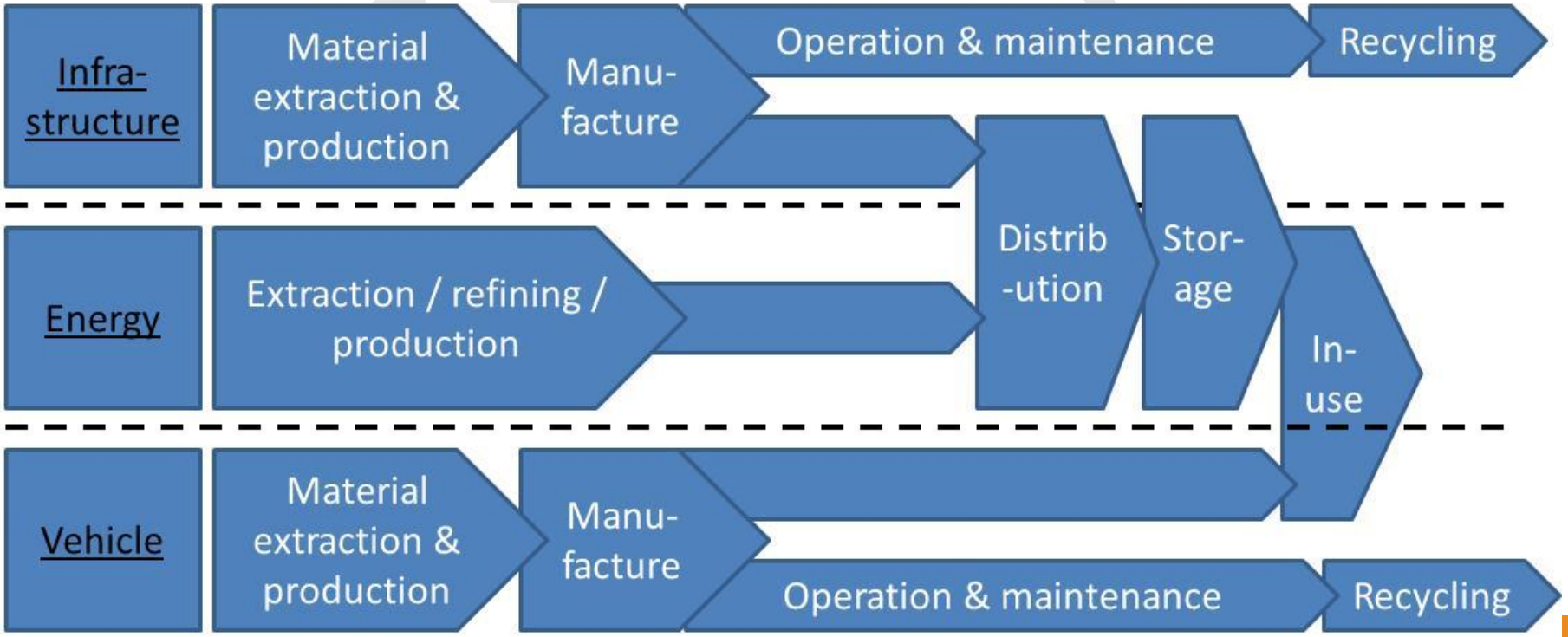
Energy vectors for transport

- Need high confidence of high impact (on GHG)



Impacts of energy vectors

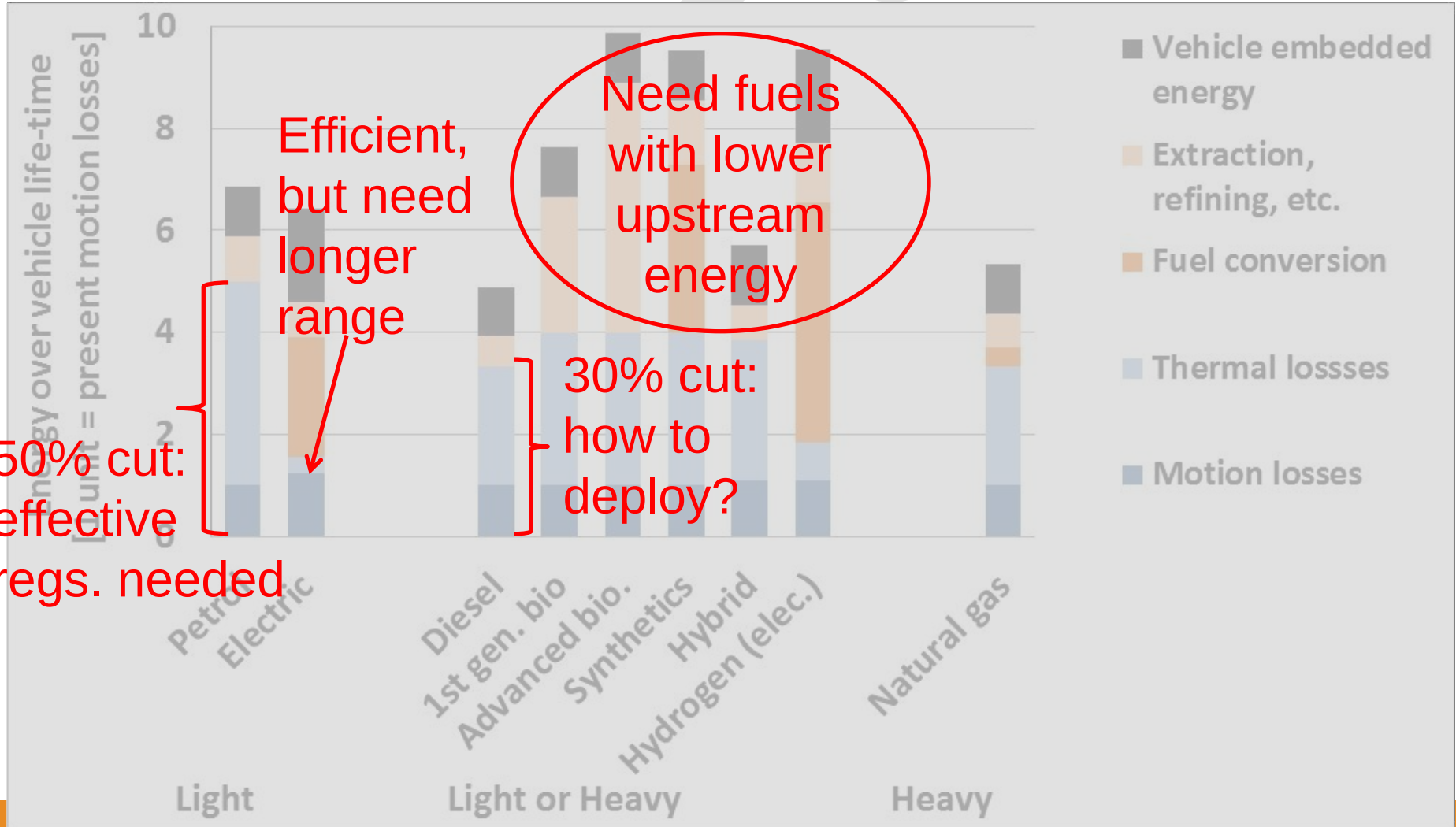
- Must consider range of factors
  - GHG, air quality, energy, costs, etc.
- Must include whole life-cycles
  - Energy vectors, vehicles & infrastructure



Results are illustrative; details of data are subject to review

Impacts: energy in life-cycles

- Must consider in-use, upstream & embedded



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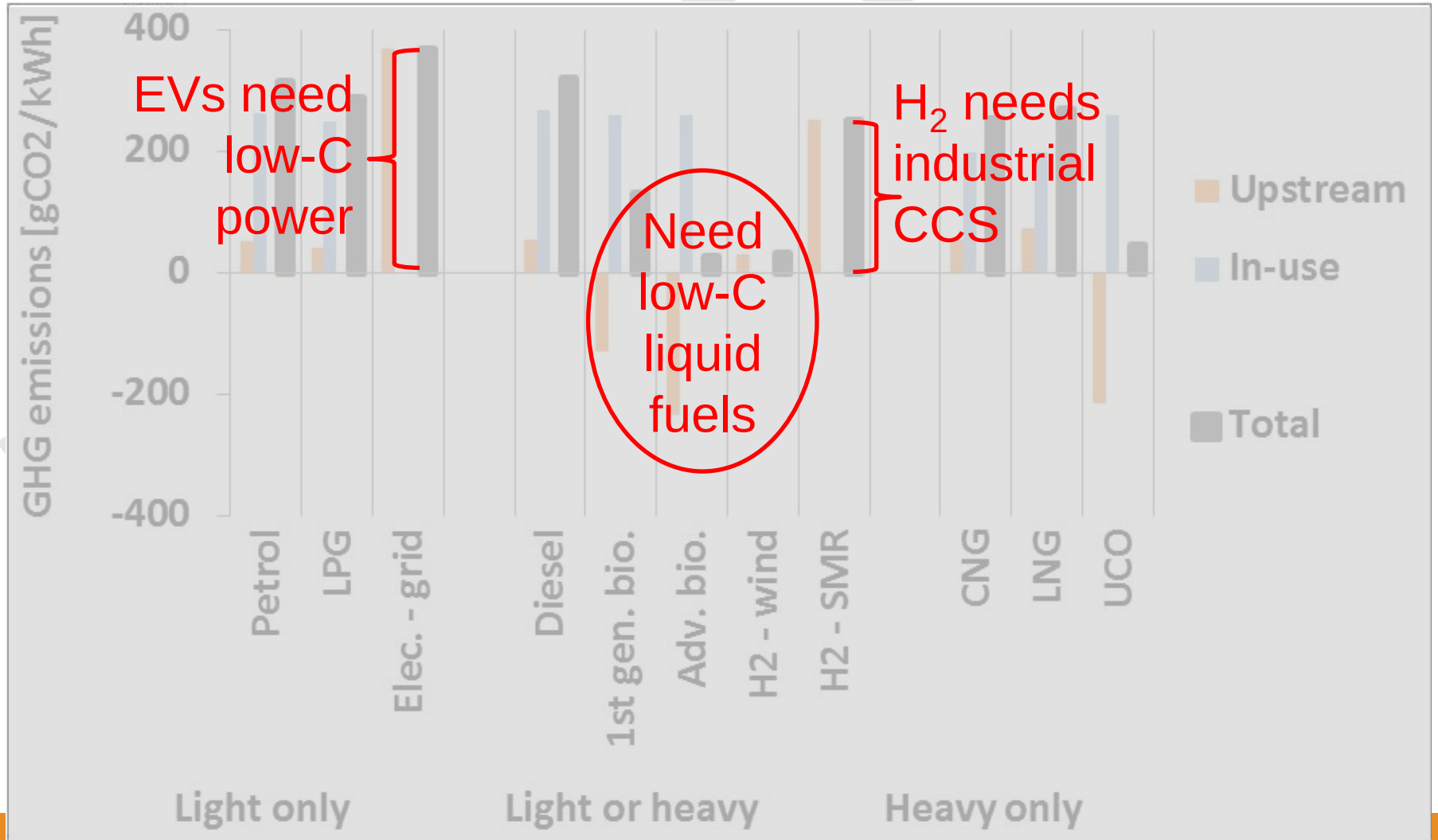
Impacts: GHG in fuel life-cycle

- Must consider fuels in-use & upstream



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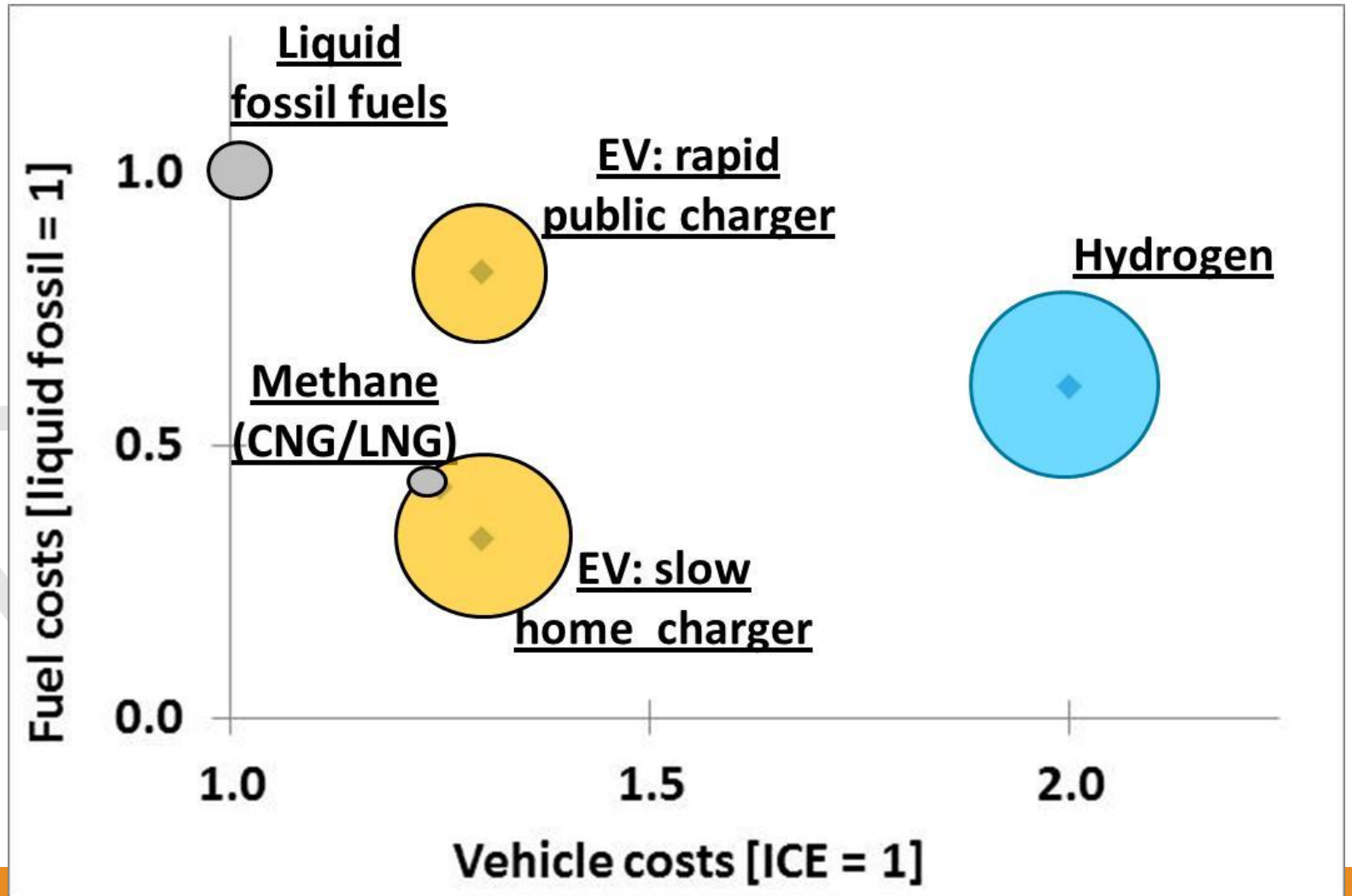
Impacts: costs

- Must consider fuels, vehicles & infrastructure



Interactions with wider energy sector

- Liquid fuels:
  - Higher biofuel blends require adaptations
  - Lower sales could affect universal coverage & distribution of costs

- Natural gas / bio-methane:
  - Increase gas demand (probably small)
  - Impact on balancing (probably small, possibly helpful)
  - **Conclusion**: would need strategic deployment if gas is to be widely available (not just individual hauliers)

Interactions with wider energy sector

- Electricity:
  - More charging points will be deployed
  - **Conclusion**: Grid solutions needed (inc. some storage)

- Hydrogen:
  - Can operate in multiple markets (opportunities & risks)
  - Central production needs new/repurposed networks
  - Local production needs utilities (water / gas / power)
  - **Conclusion**: would need strategic deployment of infrastructure to give confidence to commercial plans

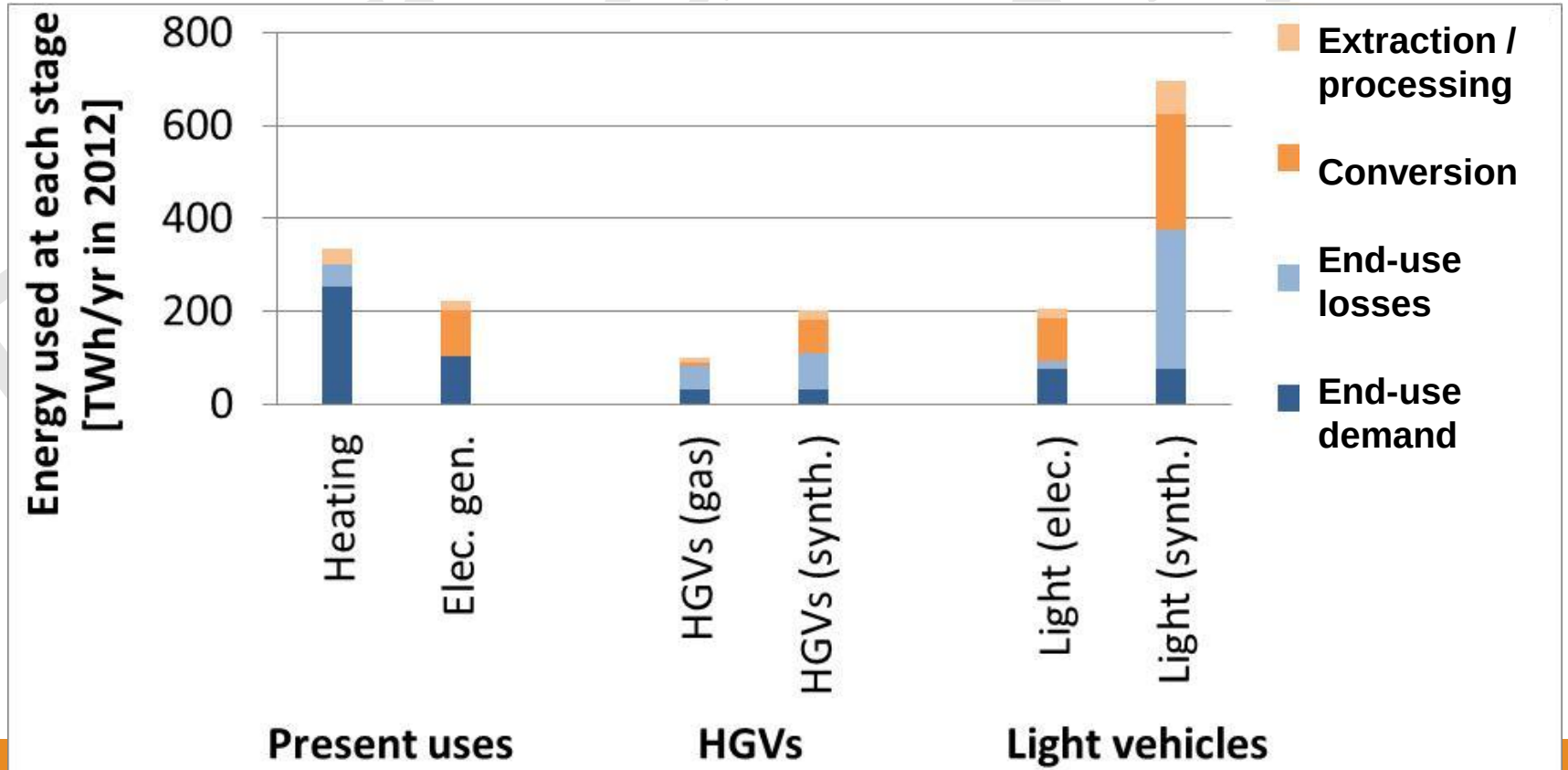
"Best use" of energy sources

- Complex issue: multiple uses for energy sources
  - What has to be optimised?
    - e.g. GHG
  - How are other factors traded-off?
    - e.g. least cost
  - Technical requirements?
    - e.g. high energy density for heavy transport
  - Strategic considerations?
    - e.g. reliance on one fuel (dash for gas)
  - Resource limitations?
    - e.g. supply of 2nd gen. biomass

Results are illustrative; details of data are subject to review

"Best use": questions for gas

- Optimisation: GHG (HGVs/heat?), energy efficiency (heat?)
- Costs: extra production and infrastructure
- Security of supply: less diverse energy mix



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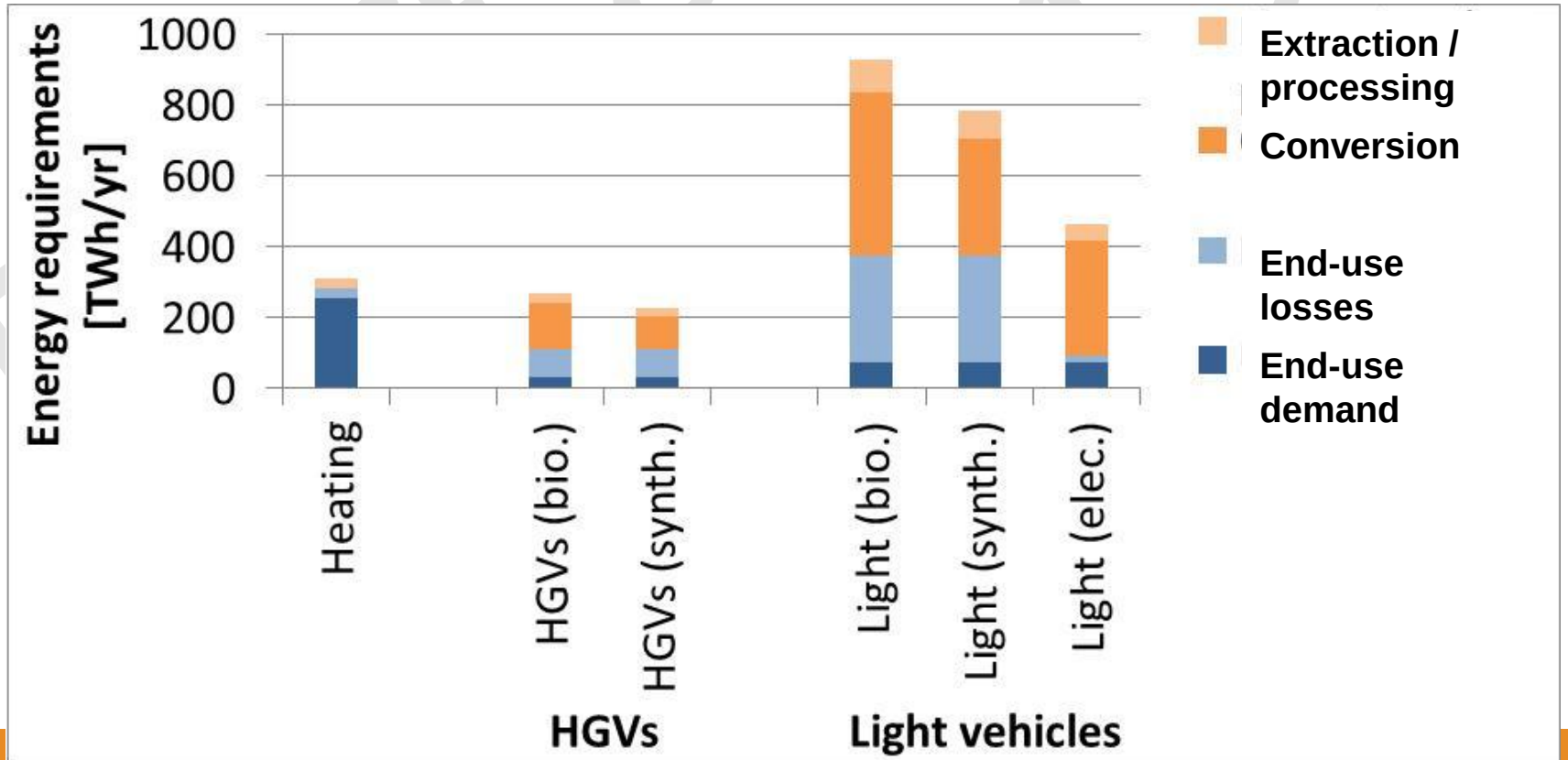
"Best use": questions for biomass

- Optimisation: GHG (power?), energy efficiency (heat?)
- Resource limitations: not enough for all sectors
- Technical stipulations: heavy transport needs liquid fuels



Current conclusions

- Some technological breakthroughs are needed:
  - New fuels for heavy transport
  - Energy storage gains would help EVs
- Some solutions depend on other developments:
  - Industrial CCS: for liquid fuels (and hydrogen)
  - Low-carbon power: for EVs (and hydrogen)
  - Energy storage: for EV charging on low capacity networks
- Wide use of some solutions would need strategy:
  - Regulations to ensure achievable benefits are delivered
  - HGV energy efficiency adopted widely
  - Strategic decisions for gas or hydrogen infrastructure

Next steps

- Develop scenarios
  - Transport demand predictions
  - Estimated efficiency improvements
  - Deployment scenarios that meet GHG targets
- Develop recommendations
  - Short-term steps needed to reach end goals e.g.
    - Areas for research
    - Addressing regulatory or market failures
- Seek comments from ERP members
- Publish final report in January 2016