Energy Options for Transport

Energy Research Partnership
Report launch, 21st April 2016
Key messages

• Range of options can cut road GHG emissions
  – Impacts will depend upon technology mix and timings

• Decisions must weigh up strategic considerations

• Interactions with wider energy sector:
  • alternative uses of limited low-carbon energy resources
  • primary energy consumption and security of supply

• Transport options offer different balances of:
  • effort of deployment
  • confidence of performance

• Steps can be taken to
  – aid deployment and ensure performance
  – manage implications
Scenarios for road transport

• Three scenarios considered:
  – ICEVs with carbon-based fuels
  – BEVs with low-carbon electricity
  – FCEVs with hydrogen

• Scenarios are not exhaustive, and are used to:
  – consider potential for ~80% GHG cuts (well-to-wheel)
  – highlight implications, and steps needed for delivery
Scenario 1: ICEV Evolution

Key points:

- reduce energy consumption
- use liquid bio/synthetic fuels
- use biogas used for HGVs
- use electricity (PHEVs) to meet remaining demand
ICEVs: Steps required

• Research
  – New low-carbon drop-in liquid fuels especially for HGVs

• Regulations & Incentives
  – Regulations to drive ICEV improvements
  – Incentives for advanced biofuels (& bio-gas) production
  – Incentives for optimal PHEV operation

• Infrastructure decisions
  – Modify for high-blend fuels, and optimise fuel selection
Scenario 2: Electric Transition

**Key points:**
- potential depends upon segmentation of demand:
  - trip length is used for cars
  - road type is used for freight
Electric: Steps required

• Research
  – Improved battery performance (range or charging time)
  – Network trials, with third-party leadership where needed

• Regulations & Incentives
  – Innovations for smaller freight operators’ logistics

• Infrastructure decisions
  – Further grid decarbonisation
  – Higher generation capacity
**Scenario 3: Hydrogen Transition**

- **Key points:**
  - No demand segmentation needed
  - Two main production methods (SMR & electrolysis)
Hydrogen: Steps required

• Infrastructure decisions (SMR)
  – Centralised SMR facilities
  – Repurposed low-pressure gas distribution networks

• Infrastructure decisions (electrolysis)
  – Further grid decarbonisation
  – Higher generation capacity
All options: Steps required

• Research required:
  – Light-weight materials with reduced embedded impacts
  – Customers’ perceptions of light-weight vehicles
  – Impacts on demand due to automation

• Infrastructure decisions:
  – Provide coverage of existing and emerging fuels
  – $CO_2$ pipelines & storage for range of energy options
Strategic considerations

Energy system interactions:

• Wider decarbonisation
  – sectors’ GHG ambitions need to balance for UK target
  – multiple possible uses for limited resources

• Energy consumption
  – new consumption profiles affect network operation
  – increased consumption changes supply chains
  – reliance upon fewer energy vectors for more of UK’s critical sectors could affect security of supply
Strategic considerations

Weigh up deployment and performance:

• **Effort of deployment**
  
  – *ICEVs require less new infrastructure than EVs or FCEVs*

• **Performance (GHG)**
  
  – *harder to ensure for ICEVs (need regulations to drive technological gains)*
  
  – *easier to ensure for EVs and FCEVs (by focussing on upstream energy production)*

• **Co-benefits**
  
  – *Reduced air and noise pollution with EVs and FCEVs*
  
  – *Resilience from dual-fuel operation with PHEVs*
Strategic considerations

Questions of timings and costs:

• Timings of infrastructure deployment
  – Some infrastructure needed for multiple scenarios (e.g., electrical for BEVs and ICEVs/PHEVs)
  – Earlier deployment could offer efficiencies with other projects, or later deployment could smooth workloads

• Costs of options
  – Vehicles’ TCO expected to converge by ~2030
  – But upfront costs affect customer decisions
  – Must be workable & affordable (perhaps not least-cost)
  – Customer decisions could set direction for infrastructure
  – Distribution of costs will be a policy judgement
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