Intelligent Transport Systems to reduce Energy Consumption

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Chief Scientific Advisor
Rather than a specified programme, research tends to be carried out as needed to provide evidence and evaluation.

Key areas of interest include:
- Ultra low emissions vehicles
- Autonomous vehicles
- Cooperative and Autonomous Vehicle
- C-ITS and smart traffic management
- Rail
- Aviation
- Maritime
Key Future Themes

- Energy, Air Quality and Climate Change
- Cooperative and Autonomous Vehicles
- New Materials and Intelligent Infrastructure
- Alternative Business Models/Mobility as a Service and Smart Payment
- Data Science, IoT and Analytics
- Age Friendly and Assessable Transport
- Making better and Smarter use of our Transport Assets
- Putting people at the heart of Transport Design
Intelligent Transport Systems Contribution to Energy Reduction

- Electric Vehicles
- Connected C-ITS
- Automation
- Eco Driving
- Smart Traffic Management
Ultra Low Emissions Vehicles (ULEVs)

- Office of Low Emissions Vehicles (OLEV) operates jointly with the Department for Energy & Climate Change and the Department for Business and Innovation.
- It provides over £900 million to position the UK at the global forefront of ULEV development, manufacture and use.
- Provides grants, supports a programme of research, and encourages uptake of ULEVs.
Understanding EV charging behaviour and energy demand

**Home charging**
- Home private
- Home Org Ind
- Home Org Pool

**Work charging**
- Work Private
- Work Org Ind
- Work Org Pool

**CYC charging**
- Public Private
- Public Org Ind
- Public Org Pool

**Other charging**
- Other Private
- Other Org Ind
- Other Org Pool
Emissions and Energy Use from EV’s

Source SwitchEV Project (Newcastle University). Based upon data recorded from 65,000 EV Journeys
Connected ITS (C-ITS)

- Developing connectivity between the infrastructure and the vehicles
- Delivers traffic management infrastructure that can cooperate with vehicles to deliver a level of optimisation
- Department funding a number of ‘smart corridors to facilitate this, including:
  - M2/A2 Corridor
  - Newcastle : Gosforth Corridor
  - Coventry corridor
C-ITS Use Cases currently under evaluation in UK

Road Hazard Warning (RHW)  Red Light Violation Warning (RLVW)  Energy Efficient Intersection Service (IEIS)

Source: Compass4D Project
Compass 4D: Newcastle upon Tyne
C-ITS: Speed Advice and Priority

- Optimum speed to ensure passage through the signals on green.
- Confirmation that priority has been requested
C-ITS: Evaluation of Link Travel Times

Link travel time by time of day

![Bar chart showing link travel time by time of day for AM and MD showing control and experimental groups.](chart.png)
C-ITS: Energy Consumption with EEIS

Average power consumption per run

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Autonomous Vehicles

- Centre for Connected and Autonomous Vehicles (C-CAV) works to promote them by:
  - leading innovating policy development in this sector
  - delivering a programme of research, development, demonstration, and deployment activity, worth up to £200 million
  - providing co-ordination across government departments
  - being the single contact point for stakeholder engagement
Making Sense of the Road Environment
UK Trials and Demonstrators

- Competition launched November 2014
- 4 cities will host trials:
  - Bristol
  - Greenwich
  - Coventry
  - Milton Keynes
- Bring driverless cars to public view
- Look at practicalities of how they could be implemented some time in the future
- First tranche of trials go live by summer 2016
- Further on road trials of autonomous cars and of platooning will be launched in 2017
Platooning

- Join vehicles together so they all follow the speed of the vehicle in front
- Potentially improve safety and increase road capacity
- Also can set optimum driving speed to reduce fuel use and associated emissions
- Some promising evaluation of reductions in fuel and energy from previous platooning trials in EU projects by significant margins ranging from 5-15%
- If driverless cars are ‘crash-free’ can we reduce their weight due to reduction in need for safety protection system – this will reduce fuel consumption and thus energy

🔗 https://www.youtube.com/watch?v=tasa3D1vVTc
Other Trends: Intelligent Vehicles

- Surround Sensing
- Traffic Sign Recognition
- Emergency Braking
- Pedestrian Detection
- Collision Avoidance
- Lane Departure Warning
- Park Assist
- Cross Traffic Alert
- Blind Spot Detection
- Rear Collision Warning
- Park Assistance
- Surround View
- Digital Side Mirror

Legend:
- Long-Range Radar
- LIDAR
- Camera
- Short-/Medium-Range Radar
- Ultrasound/Ultra-Short-Range Radar
Eco-Driving or Efficient Driving can Improve fuel efficiency By up to 20%

How to ensure the long term effectiveness of such strategies?
Other Trends: Managed Motorways

‘Smother’ driving reduces fuel consumption by Up to 10%

Source: Highways England
Other Trends: Smart Capacity Management
Takeaways

- Challenges are international
- Need for Agility
- Role for Government
- Role for Research (H2020)
- Other key issues
  - Standards
  - Skills
  - People
  - Security and Privacy
  - Gather evidence of schemes effectiveness from energy reduction point of view
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