



*Technology Options for a Sustainable  
Energy and Transport System:  
Activities within the  
IEA Energy Technology Network*

A3PS Conference “Eco Mobility 2014”

Vienna 20-21.10.2014

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IEA EUWP Vice Chairman for Transport



# Outline

- General about IEA
- IEA energy technology activities
- IEA's energy technology network ETN
- Transport specific ETN activities
- Discussion on energy efficient and intelligent transport systems
- Summary

# IEA Overview

## Founded in 1974

- Formed in wake of 1973 oil embargo with mission to promote member country energy security -- autonomous agency of the Organisation for Economic Cooperation and Development (OECD)

## 28 member countries

- **Asia Pacific:** Australia, Japan, Republic of Korea and New Zealand
- **North America:** United States, Canada
- **Europe:** Austria, Belgium, Czech Rep, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey and United Kingdom
- **European Commission** also participates in the work of the IEA
- **Chile and Estonia** are in the process of accession to become members of the IEA

## Headquarters: Paris

## Decision-making body: Governing Board

- Consists of member country representatives
- Under the Governing Board, several committees are focusing on each area

## Secretariat:

- **Staff of around 240**, mainly energy experts and statisticians from its member countries

# IEA Mission

## The 3 'E's of Sound Energy Policy

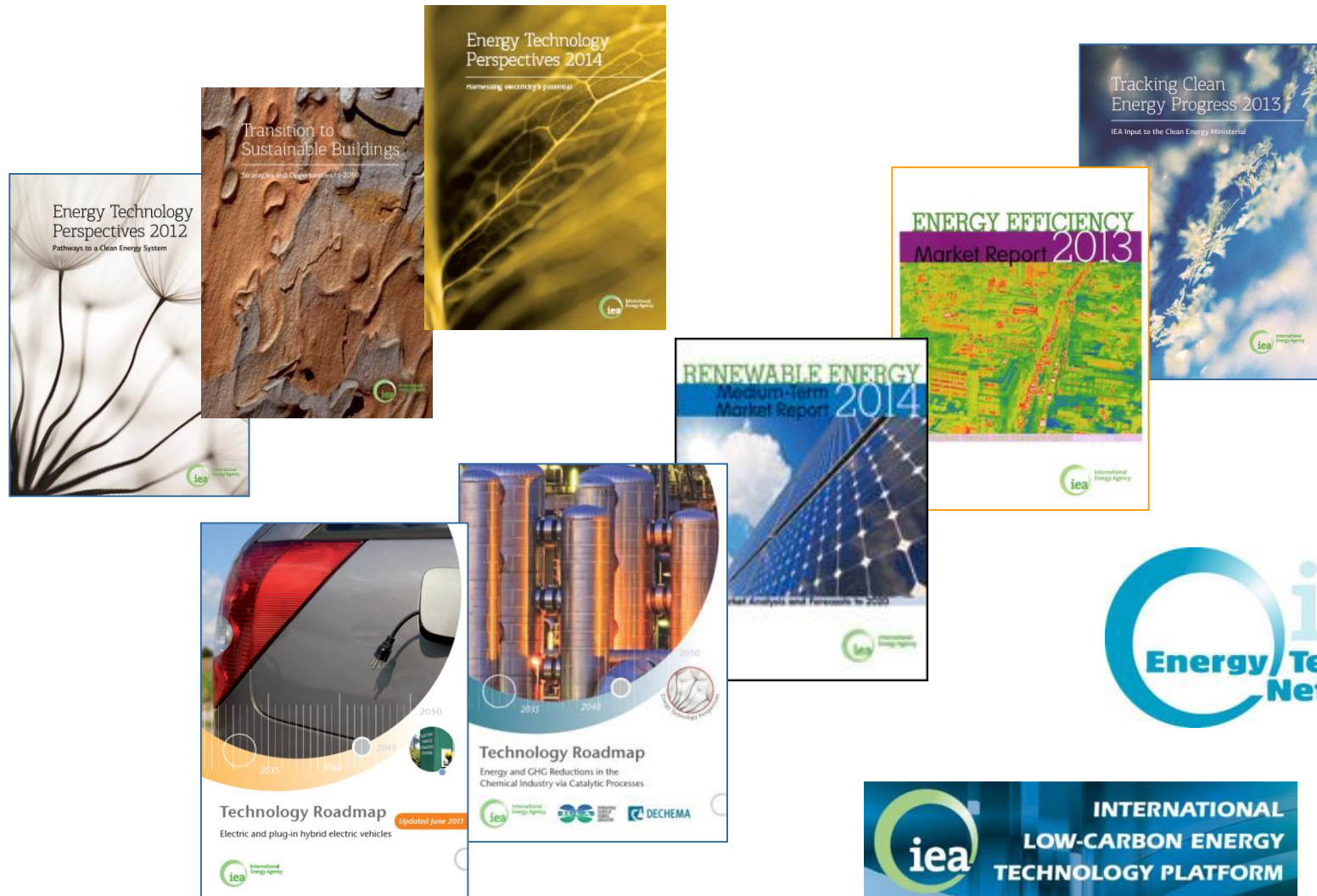
- Energy security
- Economic growth
- Environmental sustainability

## And a fourth 'E'

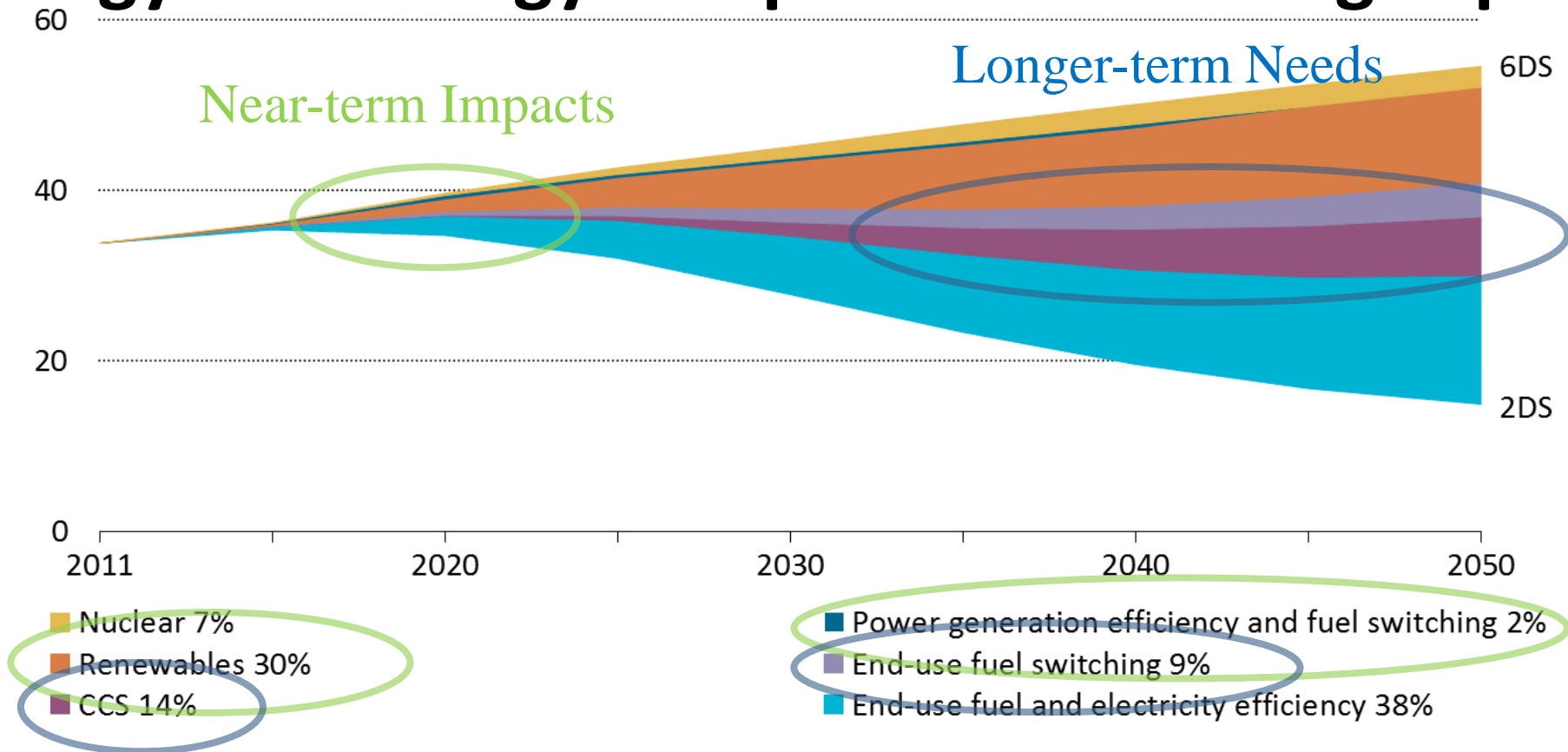
- Engagement worldwide
  - Fundamental global shifts in energy demand
  - Common challenges – energy security and climate change
  - Sharing and transparency



# IEA Energy Technology Activities



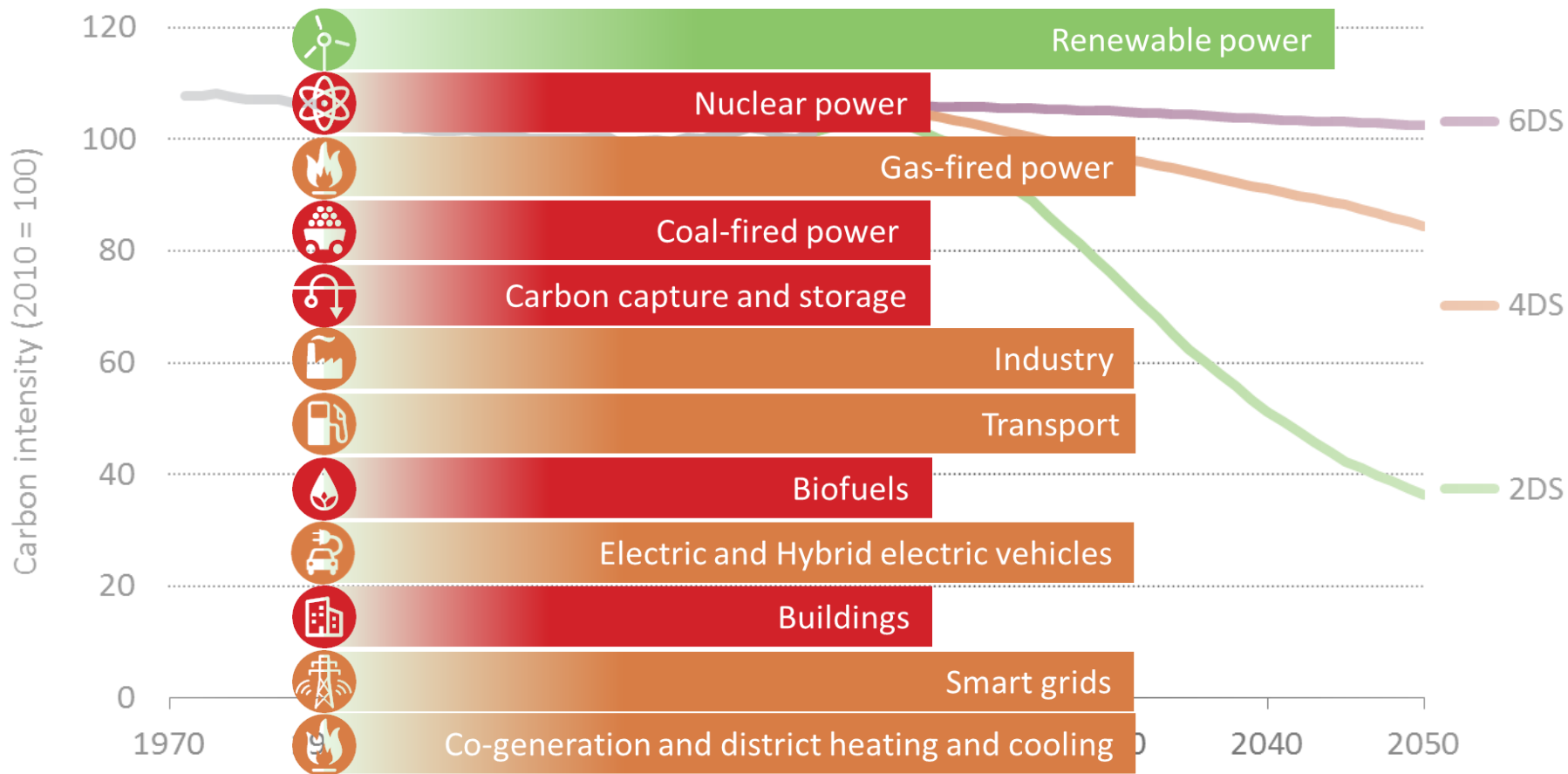
# Energy Technology Perspectives: The Flagship



*...and we to have the tools to develop a strategy and be proactive.*

ETP  
2014

# Tracking Clean Energy Progress – ETP 2014



# ETP Publication Programme

ETP 2014	ETP 2015	ETP 2016
<b>Part 1. Setting the Scene</b> Global Outlook, Tracking Clean Energy Progress		
<b>Part 2. Driving the Change (Thematic Focus)</b>		
The age of electrification	Energy Technology and Innovation impacts on Climate change mitigation	Urban Energy Systems
<b>Partner Country</b>		
India	China	Mexico



# IEA Technology Roadmaps

2009

2010

2011

2012

2013



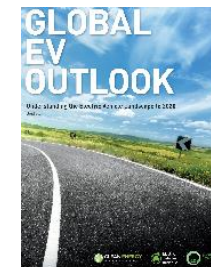
**2015**

- Hydrogen
- Smart Grids

## Low-Carbon Technology Roadmaps

# Special Activities in Transport

## Electric Vehicles Initiative EVI

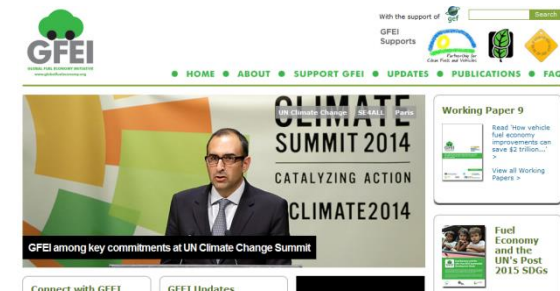


- The Electric Vehicles Initiative (EVI) is a multi-government policy forum dedicated to accelerating the introduction and adoption of electric vehicles worldwide.
- EVI is one of several initiatives launched in 2010 under the [Clean Energy Ministerial \(CEM\)](#), a high-level dialogue among energy ministers from the world's major economies.
- EVI currently includes 16 member governments from Africa, Asia, Europe and North America, as well as participation from the International Energy Agency (IEA).
- <http://www.iea.org/topics/transport/subtopics/electricvehiclesinitiative/>

# Special Activities in Transport

## Global Fuel Economy Initiative GFEI: 50 by 50

- The Global Fuel Economy Initiative exists to promote debate and discussion around the issue of fuel economy.
- Huge gains could be made in the fuel economy, gains which could help every country, but particularly those in the developing world.
- To that end, we will continue to raise awareness, present evidence, and offer support, in a way which enables more and more countries to adopt effective fuel economy standards and policies which work in their circumstances and with their fleet.
- <http://www.globalfueleconomy.org>





# IEA's Energy Technology Network

## Multilateral Technology Initiatives

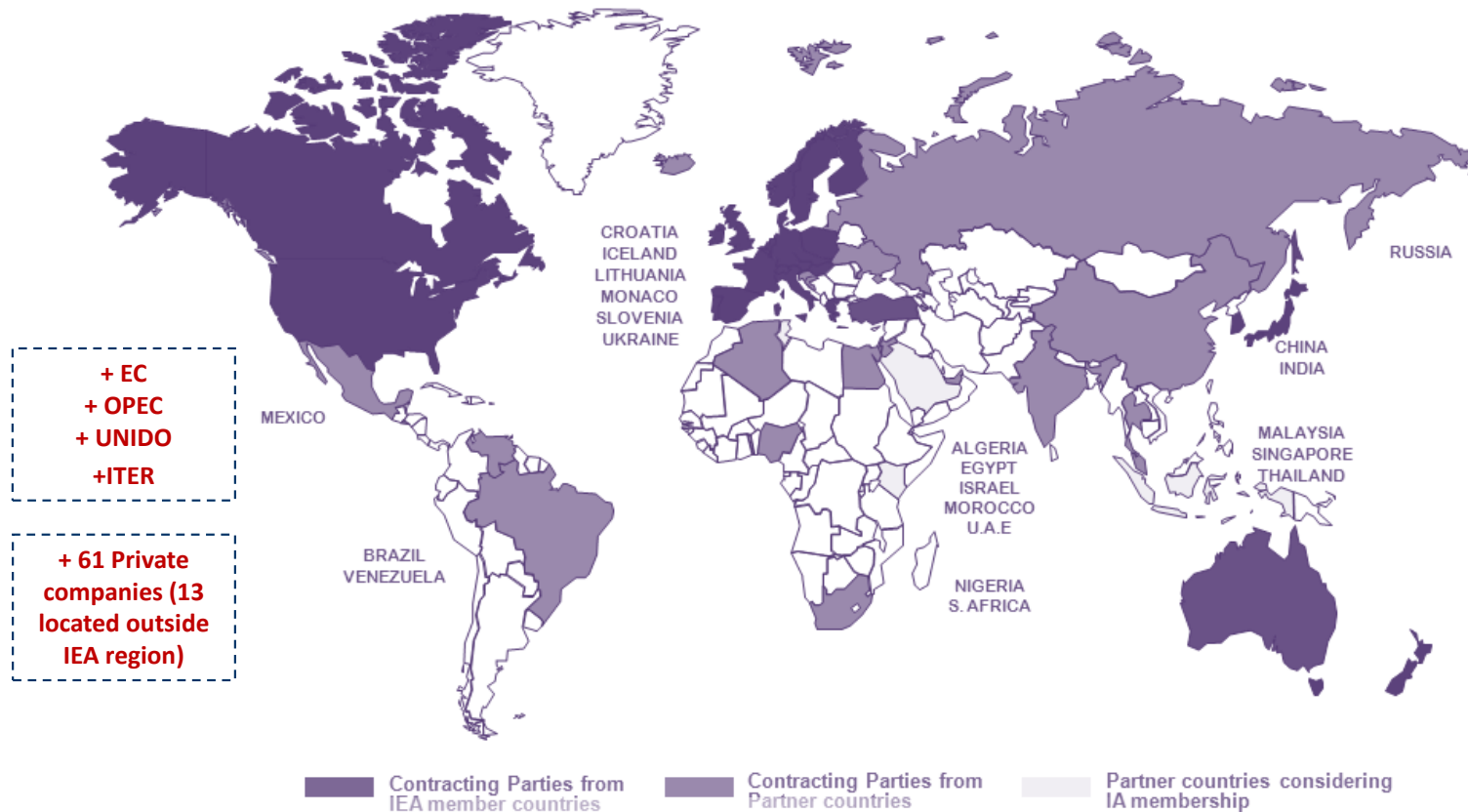
A photograph of an industrial facility, possibly a power plant or refinery, with several large cylindrical tanks and a tall lattice tower. The scene is set against a sunset sky with warm orange and red tones.

Ensuring energy security and addressing climate change cost-effectively are key global challenges. Tackling these issues will require efforts from stakeholders worldwide. To find solutions, the public and private sectors must work together, sharing burdens of resources, while at the same time multiplying results and outcomes.

Through its broad range of more than 40 multilateral technology initiatives (also known as Implementing Agreements), the IEA enables member and non-member countries, businesses, industries, international organisations and non-government organisations to share research on breakthrough technologies, to fill existing research gaps, to build pilot plants and to carry out deployment or demonstration programmes. In short their work can comprise any technology-related activity that supports energy security, economic growth, environmental protection and engagement worldwide. A new initiative may be created at any time, provided at least two IEA member countries agree to work on it together.



# IEA's Energy Technology Network



**More than 6,000 scientists and experts**

**Representing 500 government agencies, research organisations, universities, energy companies, industries, businesses, and consultants**

**Over 1,400 projects completed to date**

# IEA's Energy Technology Network

## SCOPE AND PORTFOLIOS

		Basic science <sup>1</sup>	Applied science <sup>2</sup>	Demonstration and deployment <sup>3</sup>	Socio-economic issues <sup>4</sup>
Cross-cutting	Climate Technology Initiative			✓	✓
	Energy Technology Data Exchange			✓	✓
	Energy Technology Systems Analysis			✓	✓
End-use: buildings	Buildings and Communities		✓	✓	✓
	District Heating and Cooling		✓	✓	✓
	Energy Efficient Electrical Equipment		✓	✓	✓
	Energy Storage		✓	✓	✓
	Heat Pumping Technologies		✓	✓	✓
End-use: electricity	Demand-Side Management		✓	✓	✓
	High-temperature Superconductivity		✓	✓	✓
	Smart Grids		✓	✓	✓
End-use: industry	Emissions Reduction in Combustion	✓	✓	✓	✓
	Industrial Technologies and Systems		✓	✓	✓
End-use: transport	Advanced Fuel Cells		✓	✓	✓
	Advanced Motor Fuels		✓	✓	✓
	Advanced Transport Materials	✓	✓	✓	✓
	Hybrid and Electric Vehicles		✓	✓	✓
			✓	✓	✓
Fossil fuels	Clean Coal Centre		✓	✓	✓
	Enhanced Oil Recovery		✓	✓	✓
	Fluidized Bed Conversion		✓	✓	✓
	Greenhouse Gas R&D		✓	✓	✓
	Multiphase Flow Sciences	✓	✓	✓	✓
Fusion power	Environmental, Safety and Economy			✓	✓
	Fusion Materials	✓	✓		
	Nuclear Technology Fusion Reactors	✓	✓		
	Plasma Wall Interaction	✓	✓		
	Reversed Field Pinches	✓	✓		
	Spherical Tori	✓	✓		
	Stellarator-Heliotron Concept	✓	✓		
	Tokamaks	✓	✓		
Renewables and hydrogen	Bioenergy		✓	✓	✓
	Concentrating solar		✓	✓	✓
	Deployment		✓	✓	✓
	Geothermal		✓	✓	✓
	Hydrogen		✓	✓	✓
	Hydropower		✓	✓	✓
	Ocean		✓	✓	✓
	Photovoltaics		✓	✓	✓
	Solar Heating and Cooling		✓	✓	✓
	Wind Energy Systems		✓	✓	✓

- 40 years of experience, advantages known to participants
- Scope: basic science - deployment

# IEA Implementing Agreements

## Sharing Information

- IEA OPEN Bulletin
  - News of IA developments
    - ◆ Project results
    - ◆ Publications, workshops, interviews
  - 18,000+ subscribers
  - New design – IEA website
  
- In addition, websites of individual IAs



*The Open Energy Technology Bulletin circulates news of activities and findings of the IEA energy technology initiatives (formally known as Implementing Agreements or 'IAs'). These multilateral groups are at the core of a vast network of senior technology experts - the IEA Energy Technology Network - that strives to accelerate technology deployment worldwide. In addition to carrying out independent studies, IA experts may also contribute to IEA analyses related to clean energy technologies and energy efficiency.*

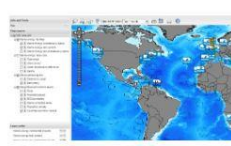
**Technology Spotlight**

*Technology Spotlight will regularly highlight an interesting outcome or finding from one of the Implementing Agreement work programmes.*






**Launch of interactive ocean energy mapping tool**

The Chair of the Implementing Agreement for a Co-operative Programme on Ocean Energy Systems responds to questions about the recently-developed web-based Geographical Information System (GIS) tool and the future of marine technologies. [More...](#)

*Screen shot of the GIS tool*



**Recent activities and findings**

 Cross cutting	 Transport
 Buildings	 Fossil fuels
 Electricity	 Renewable energies & hydrogen

### Related IEA analysis

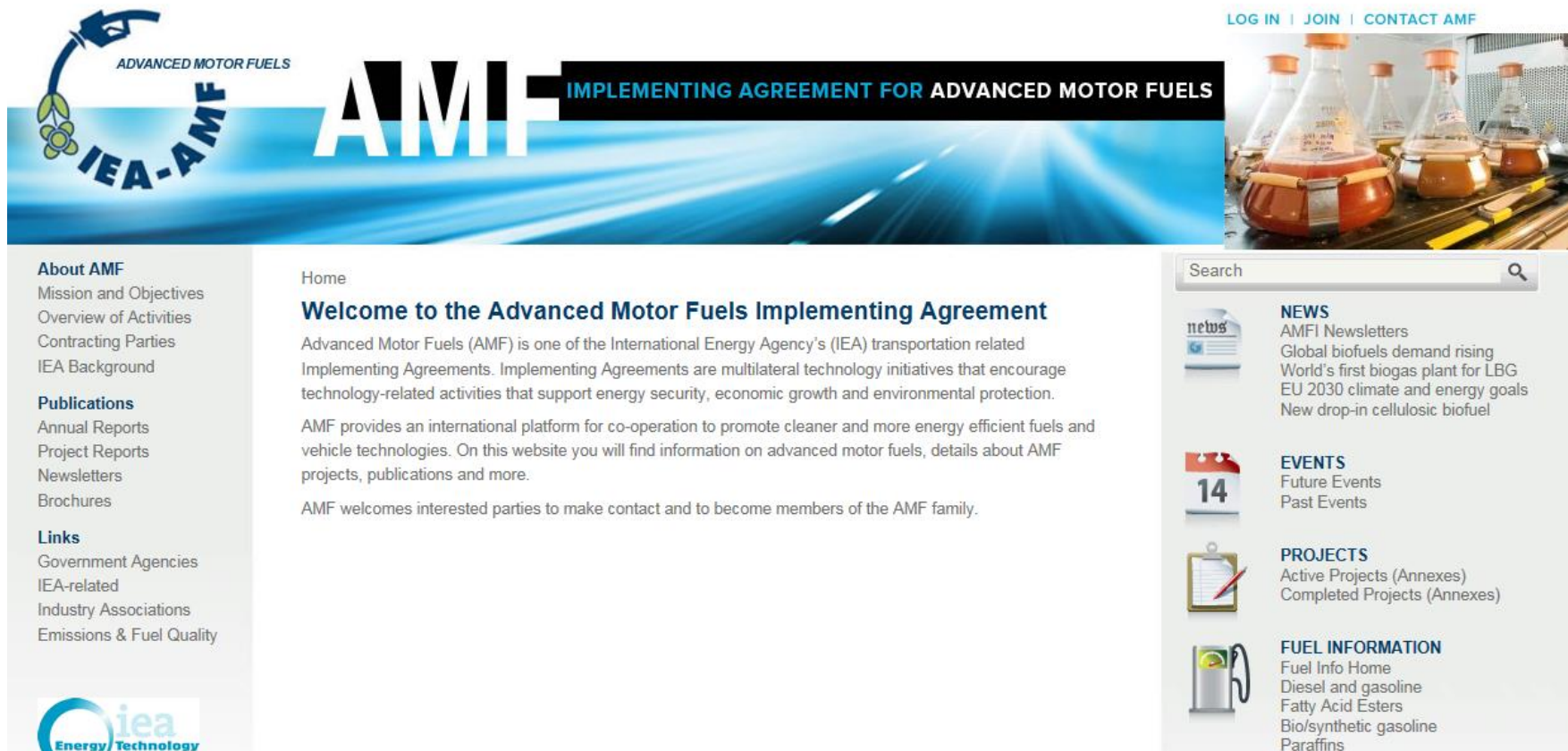
- Energy Technology Perspectives (ETP 2014)
- Tracking Clean Energy Progress 2014
- Energy Efficiency Indicators: Essentials for Policy Making
- Energy Efficiency Indicators: Fundamentals on Statistics
- Energy Technology Initiatives 2013
- Technology Roadmap: Energy Efficient Building Envelopes
- Technology Roadmap: Solar Photovoltaic Energy - 2014
- Technology Roadmap: Solar Thermal Electricity - 2014
- Technology Roadmap: Energy Storage
- Medium-Term Renewable Energy Market Report 2014
- Capturing the Multiple Benefits of Energy Efficiency

### Related IEA events

- EGRD workshop: Role of Storage in Energy System Flexibility, 22-23 Oct 2014
- Global Industry Experts Dialogue workshop: 22 Oct 2014
- Sustainable Buildings workshop: 12 Nov 2014
- IEA-MOST workshop: Advances in



# Example: Advanced Motor Fuels



The screenshot shows the homepage of the IEA-AMF website. At the top, there is a navigation bar with the text "LOG IN | JOIN | CONTACT AMF". Below this is a large banner featuring the IEA-AMF logo on the left, which includes a stylized fuel nozzle and the text "ADVANCED MOTOR FUELS" and "IEA-AMF". To the right of the logo, the text "AMF IMPLEMENTING AGREEMENT FOR ADVANCED MOTOR FUELS" is displayed in large, bold letters. The background of the banner is a blue gradient with light streaks. On the right side of the banner, there is a photograph of several glass bottles containing orange liquid, likely biofuels, on a laboratory bench.

Below the banner, the website is organized into several sections:

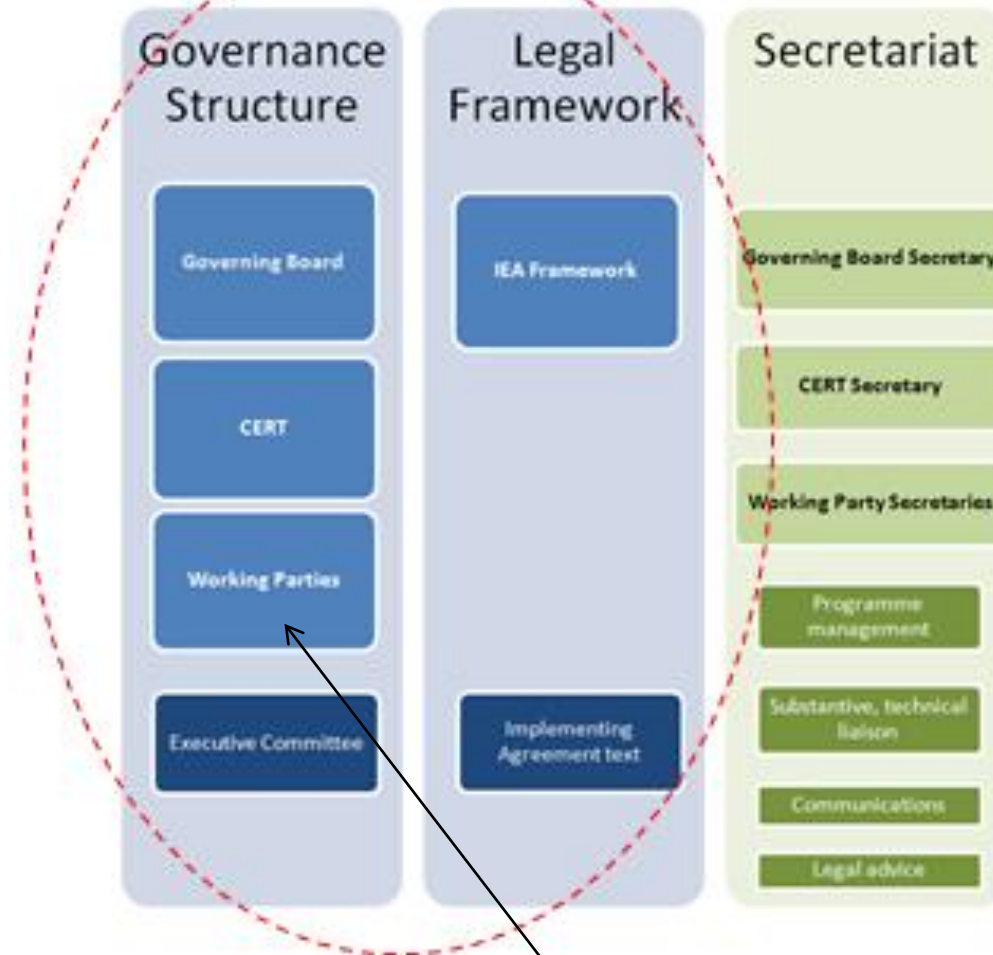
- About AMF:** Mission and Objectives, Overview of Activities, Contracting Parties, IEA Background.
- Publications:** Annual Reports, Project Reports, Newsletters, Brochures.
- Links:** Government Agencies, IEA-related, Industry Associations, Emissions & Fuel Quality.
- Home:**
  - Welcome to the Advanced Motor Fuels Implementing Agreement**
  - Advanced Motor Fuels (AMF) is one of the International Energy Agency's (IEA) transportation related Implementing Agreements. Implementing Agreements are multilateral technology initiatives that encourage technology-related activities that support energy security, economic growth and environmental protection.
  - AMF provides an international platform for co-operation to promote cleaner and more energy efficient fuels and vehicle technologies. On this website you will find information on advanced motor fuels, details about AMF projects, publications and more.
  - AMF welcomes interested parties to make contact and to become members of the AMF family.
- Search:** A search bar with a magnifying glass icon.
- NEWS:** AMFI Newsletters, Global biofuels demand rising, World's first biogas plant for LBG, EU 2030 climate and energy goals, New drop-in cellulosic biofuel.
- EVENTS:** Future Events, Past Events.
- PROJECTS:** Active Projects (Annexes), Completed Projects (Annexes).
- FUEL INFORMATION:** Fuel Info Home, Diesel and gasoline, Fatty Acid Esters, Bio/synthetic gasoline, Paraffins.

At the bottom left of the page, there is a small IEA Energy Technology logo.

<http://www.iea-amf.org/>



# Elements of IA governance



e.g., EUWP; REWP

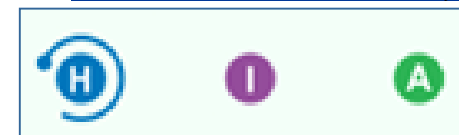
# IEA Implementing Agreements with Transport Related Activities

## ■ End-Use

- Advanced Fuel Cells AFC
- Advanced Materials for Transport AMT
- Advanced Motor Fuels AMF
- Combustion
- Hybrid and Electric Vehicles HEV

## ■ Renewable Energy

- Bioenergy
- Hydrogen
- Renewable Energy Technology Deployment



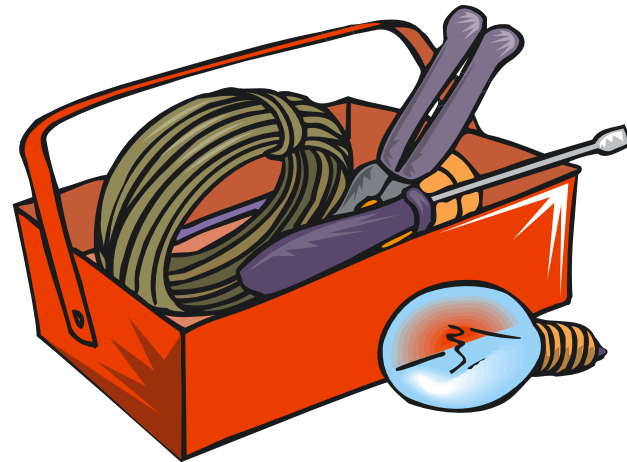
# What are we aiming at?

- Reduced energy consumption in transport
- Reduced environmental impacts
- Introduction of renewable energy in transport
  
- True international cooperation
- Creating networks
- Sharing information
- Leveraging efforts



# Technical toolbox for a cleaner future

- Improved engine technologies
  - Combustion, AMT
- Reduced need for power
  - AMT
- Hybridisation
  - HEV
- Electrification
  - HEV, AFC
- Fuel cell technology
  - AFC, HEV, Hydrogen
- Alternative fuels
  - AMF, Bioenergy, Combustion, Hydrogen





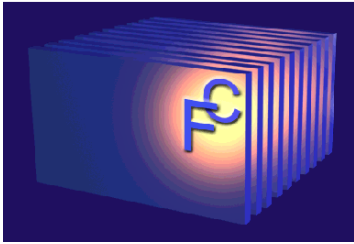
# Task menu: Hybrid and Electric Vehicles HEV

## IA-HEV Task forces - menu

Status 7 August 2014.



Task title	Task no.	Running time	Financial contribution per participant, per year	In kind contribution per participant, per year	Operating Agent (responsible for the Task)	E-mail Operating Agent
Information exchange	01	Continuous	None.	Country presentation, country chapter for annual report, information for newsletter.	Ms Julie Perez	<a href="mailto:jperez@nwttech.com">jperez@nwttech.com</a>
Electrochemical systems	10	Continuous	None.	Varies. Enough (few days) to make meetings meaningful.	Mr James Barnes	<a href="mailto:james_barnes@ee.doe.gov">james_barnes@ee.doe.gov</a>
System optimization and vehicle integration	17	Until February 2015	Max. 5,000 Euros.	--	Mr Michael Nikowitz	<a href="mailto:michael.nikowitz@a3ps.at">michael.nikowitz@a3ps.at</a>
Life Cycle Assessment of electric vehicles	19	November 2011 - February 2015	5,500 Euros.	Participate in working tasks.	Mr Gerfried Jungmeier	<a href="mailto:gerfried.jungmeier@joanneum.at">gerfried.jungmeier@joanneum.at</a>
Quick charging technology	20	November 2011- December 2014	6,000 Euros.	At least one person-month.	Mr Ignacio Martin	<a href="mailto:imartin@fcirce.es">imartin@fcirce.es</a>
Accelerated ageing testing for lithium-ion batteries	21	January 2013 - end of 2017	Tbd.	In the first year about 1.5 person-month.	Mr Mario Conte	<a href="mailto:mario.conte@enea.it">mario.conte@enea.it</a>
EV business models	22	October 2012 - mid 2014	None.	--	Mr David Beeton	<a href="mailto:david.beeton@urbanforesight.org">david.beeton@urbanforesight.org</a>
Light electric vehicle parking and charging infrastructure	23	November 2013 - October 2017	None.	To be chosen per participant.	Mr Hannes Neupert	<a href="mailto:hannes.neupert@energybus.org">hannes.neupert@energybus.org</a>
Economic impact assessment of e-mobility	24	May 2014 - December 2015	None.	Share information on the topic.	Ms Sonja Munnix Mr Carlo Mol	<a href="mailto:sonja.munnix@agentschapnl.nl">sonja.munnix@agentschapnl.nl</a> <a href="mailto:carlo.mol@vito.be">carlo.mol@vito.be</a>
Plug-in Electric Vehicles	25	May 2014 - May 2017	Tbd.	At least one person-month.	Mr Aymeric Rousseau	<a href="mailto:arousseau@anl.gov">arousseau@anl.gov</a>
Wireless power transfer for electric vehicles	26	May 2014 - May 2017	Through elevated IA-HEV membership fee.	At least one person-month.	Mr P.T. Jones	<a href="mailto:jonesp@ornl.gov">jonesp@ornl.gov</a>

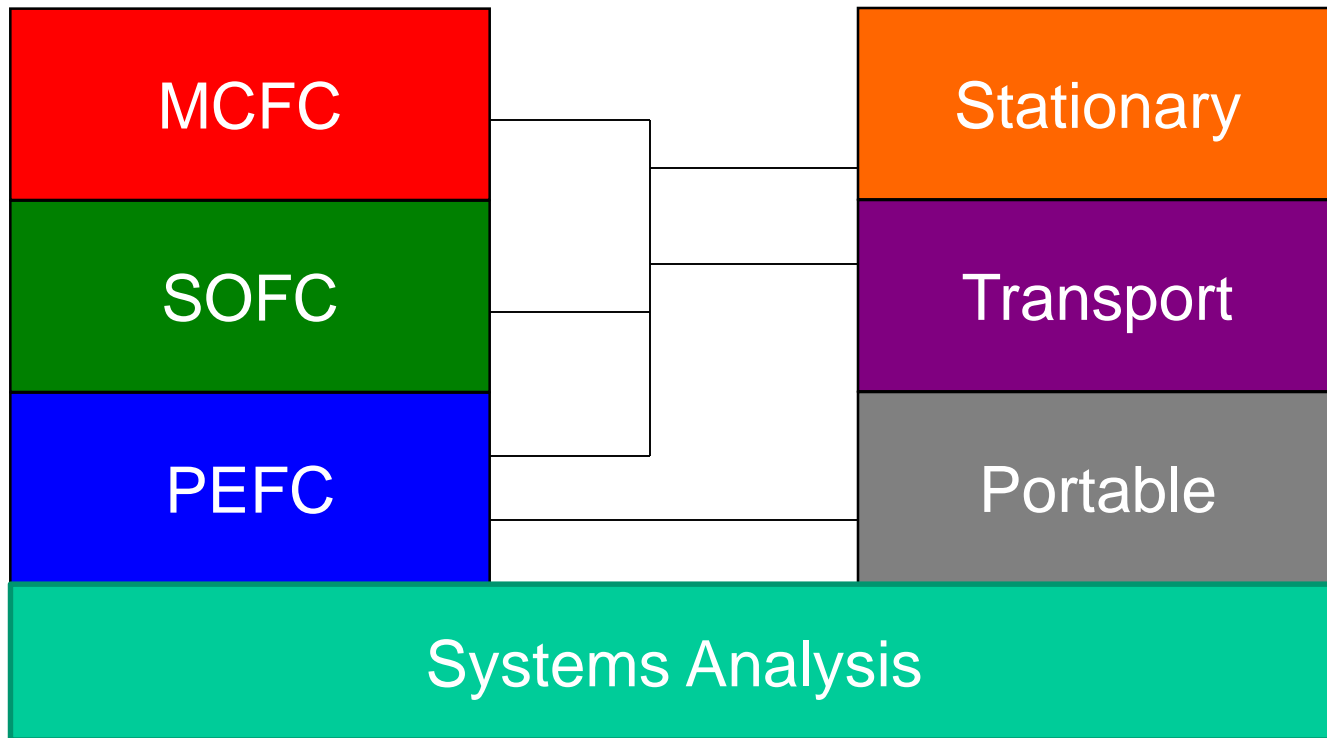


# Annex structure



Technology annexes

Application annexes



# The EUWP view on transport

- The eight transport related Implementing Agreements all contribute to a cleaner future
- The individual technologies are not in competition, they complement each other
- One single technology cannot solve all challenges of the future
- The Transport Contact Group and the Implementing Agreements provide input for IEA technology roadmaps and forecasts such as ETP
- Currently the ETN has a gap:
  - We are lacking a systemic approach to transport!

**As for technology options:  
Remember: In reality, one size doesn't fit all!**

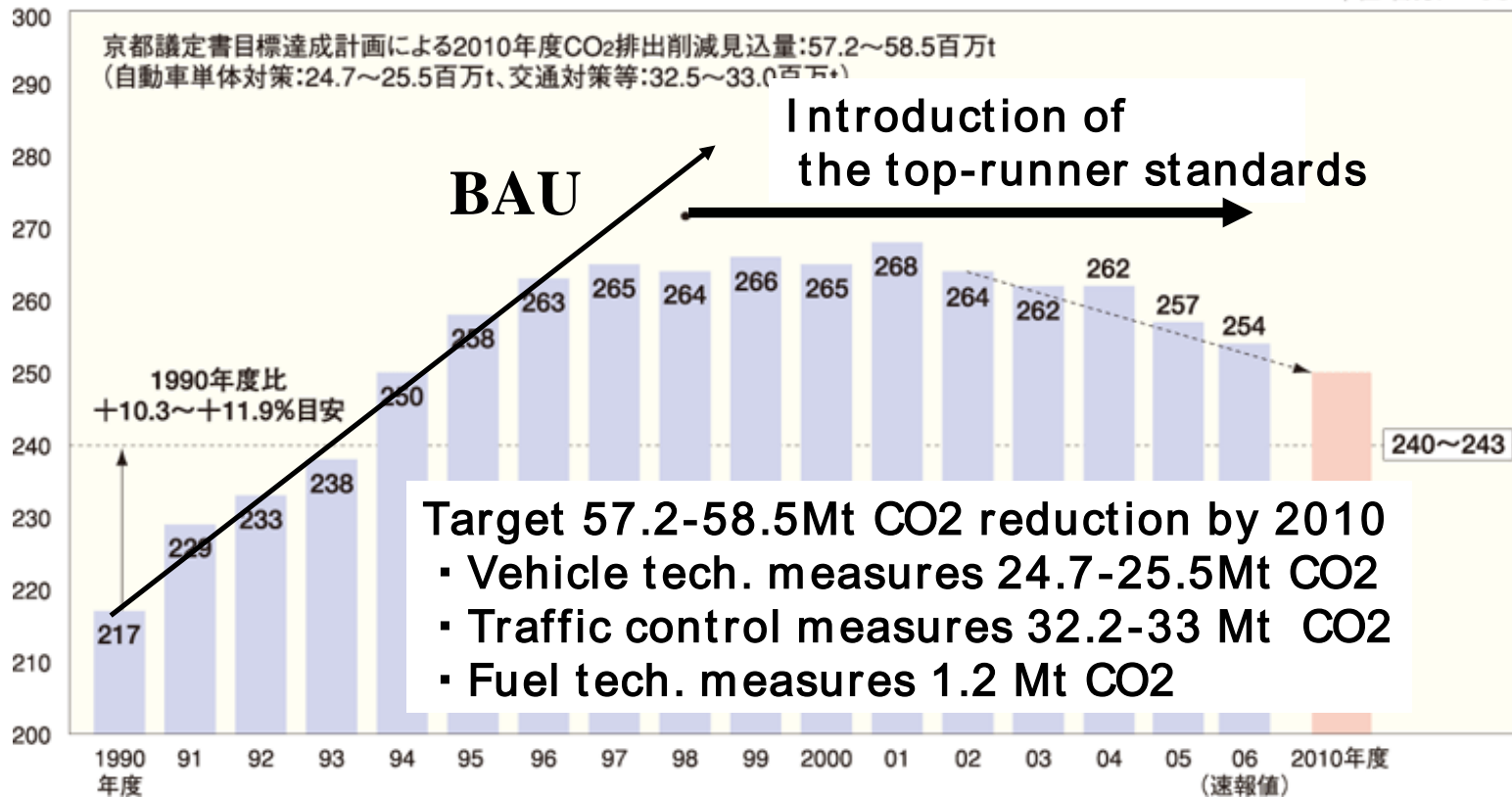




# Japan has succeeded in cutting CO<sub>2</sub> emissions

Mt CO<sub>2</sub>

単位:百万トン-CO<sub>2</sub>



Vehicle technology 42 %  
**Traffic control measures 56 %**  
 Fuels 2 %

N. Iwai/NEDO 12/2008



## GLOBAL LAND TRANSPORT INFRASTRUCTURE REQUIREMENTS

*Estimating road and railway  
infrastructure capacity and costs to 2050*

*“The world cannot support continued business-as-usual growth without some major changes in how we approach transport: either through ICT or mode shifting or some combination of these options. In developing regions in particular, **it simply will not be possible to build enough roads to support 3 billion vehicles by 2050, electric, gas or conventional diesel***

*... this is certainly a driver for finding real solutions to sustain long-term travel demand growth beyond vehicle and fuel technologies.”*

*John Dulac/IEA 2013*

# Energy Efficient and Intelligent Transport Systems (EEITS)

- The current IEA Energy Technology Network (ETN) comprises 8 Implementing Agreements with transport related activities.
- These Agreements are typically technology driven, e.g., hybrid and electric vehicles, fuel cells, motor fuels, materials technology.
- Improving technology only will not take us all the way, we also have to improve the transport system as a whole.
- The IEA End Use Working Party started discussing technology gaps and systems analysis in industry and transport in the fall 2012.
- As for transport, general consensus is that integrated transport system analysis towards a sustainable transport system (including public transport, logistics, modal shift, infrastructure, functionality, information technology for transport, efficient management, etc.) is not sufficiently covered within the existing ETN network.

# Energy Efficient and Intelligent Transport Systems (EEITS)

- A workshop was arranged at IEA Headquarters in Paris on April 16th 2014
- The aim of the workshop was to bring together experts to:
  - Discuss challenges in transport
  - Discuss how to best cover transport system level issues within the IEA framework of cooperation
  - Outline the next steps in the process



# EEITS Workshop in Paris 16.4.2014

- Welcome & Challenges for the future transport system
  - John Dulac, IEA Energy Analyst
- Seamless mobility: thoughts and outlooks on future mobility demand
  - Philippe Crist, International Transport Forum
- Sustainable mobility in smart cities: opportunities and support actions at European level
  - Henriette van Eijl & Axel Volkery, European Commission
- ICT, ITS & Internet of Things: technology for a paradigm shift in transport
  - Merja Penttinen, VTT Technical Research Centre of Finland
- Daily mobility and digital transport: integrative data experience in France
  - Denys Alapetite on French research programmes for digital mobility
- Integrated approach to transport: a city view to traffic planning and sustainable traffic
  - Nicolas Pernoud, Grand Lyon
- An industry view to efficient and sustainable public transport
  - Ulf Gustafsson, Volvo Group
- Applicability of DSM to transport
  - Hans Nilsson, IEA DSM
- Overview of IEA ETN Building and Communities related activities
  - Ezilda Costanzo, IEA EUWP Vice Chairman Buildings (presented by John Dulac)
- Overview of IEA ETN Transport related activities, including discussions on technology gaps
  - Nils-Olof Nylund, IEA EUWP Vice Chairman Transport
- Possibility for the related IAs (transport, buildings, electricity) to present their view and discussion on how to go on
- Upcoming IEA Smart City related activities
  - John Dulac and PierPaolo Cazzola, IEA Energy Analysts
- Next steps
- Close of workshop

# Outcome of discussions

## ■ Five options were discussed:

1. Starting a new Implementing Agreement (IA)
2. Generate a joint Annex or Task between some on the existing IAs
3. Joining forces with some other actor in ITS
4. Having regular workshops on ITS
5. Drop the idea to have coordinated actions on ITS

## ■ Conclusions:

- The outcome of the discussions, both within TCG and in the workshop, was a combination of item 2 and (joint Annex) and item 4 (workshops).
- However, the idea was not to have regular workshops but rather a workshop to scope the activities of the possible joint exercise.
- The European Commission is interested in interacting with IEA in the “Smart Cities and Communities” theme (strong link to ETP 2016)

# Summary

- IEA's activities focus around four "E"s:
  - Energy security, Economic growth, Environmental sustainability & Engagement worldwide
- IEA has a lot of energy technology related activities and a large number of high-class publications
- The Energy Technology Network ETN, comprising more than 40 Implementing Agreements, is a very important asset
- Currently eight IAs have transport related activities, most of them with a rather narrow technical scope
- Discussions how to better handle transport system related issues are under way