



## Global transportation scenarios in the multi-regional EFDA-TIMES energy model

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IEW meeting 2008, June 30 – July 2, IEA, Paris, France





## Disclaimer

The construction, calibration and testing of the EFDA-TIMES model has not yet been finalized. All results shown in this talk must be regarded as preliminary and may be subject to changes due to the improvement and extension of the economic and technological data base.

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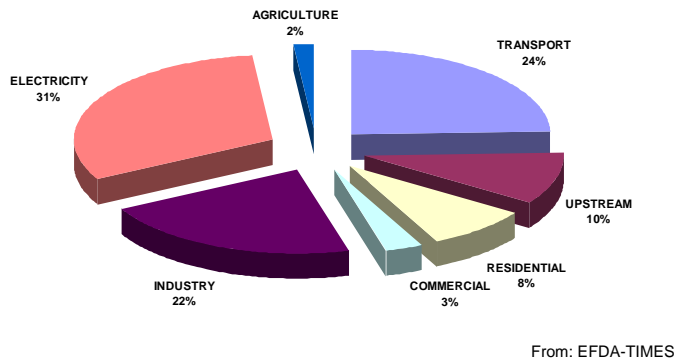


IPP	<h2>Outline</h2>
	<ul style="list-style-type: none"><li>• Motivation<ul style="list-style-type: none"><li>– SERF</li><li>– Transportation sector</li></ul></li> <li>• The EFDA-TIMES model<ul style="list-style-type: none"><li>– Model structure</li><li>– Transportation demands</li><li>– Preliminary scenario studies</li></ul></li> <li>• Conclusions &amp; Outlook</li></ul>
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IPP	<h2>Objectives of the model</h2>
	<ul style="list-style-type: none"><li>• Develop consistent long term scenarios including fusion as an future electricity generation option<ul style="list-style-type: none"><li>– Explore conditions under which fusion becomes a successful contributor</li><li>– Show the potential benefits of fusion</li><li>– Gain visibility and credibility by contributing to the scientific debate</li></ul></li> <li>• Bring fusion into energy modelling by making available the latest technical and economic fusion data</li> <li>• Provide decision makers with well-founded analyses and arguments</li></ul>
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## Transportation sector

- Important end-use sector
  - Today about one fourth of global energy demand
  - Large contributor to CO<sub>2</sub> emissions

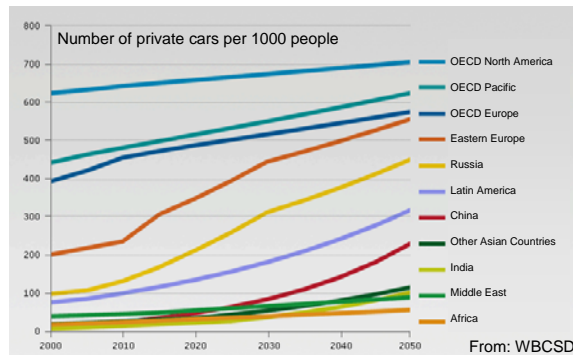


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## Transportation sector

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  - Today about one fourth of global energy demand
  - Large contributor to CO<sub>2</sub> emissions
  - Rapidly growing demands, particularly in developing countries
- High potential for technological change
  - Dominant use of fossil fuels
  - Possible future options
    - » (efficiency improvement)
    - » Electrification
    - » Hydrogen
    - » Biofuels
- Important impact on energy prices and infrastructure



## The EFDA-TIMES Model

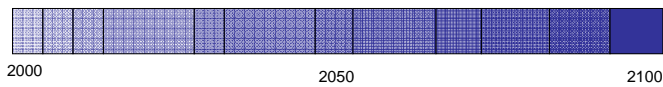
Involved research groups:

- CIEMAT, Spain
- ENEA, Italy
- iSpace, Austria
- IPP, Germany
- POLITO, Italy
- RISOE, Denmark
- UKAEA, UK
- TUG, Austria
- VTT-TEKES, Finland



## The EFDA-TIMES Model

- Partial equilibrium TIMES model
- Bottom-up, technology explicit
- Temporal resolution
  - 2000 – 2100
  - 12 periods

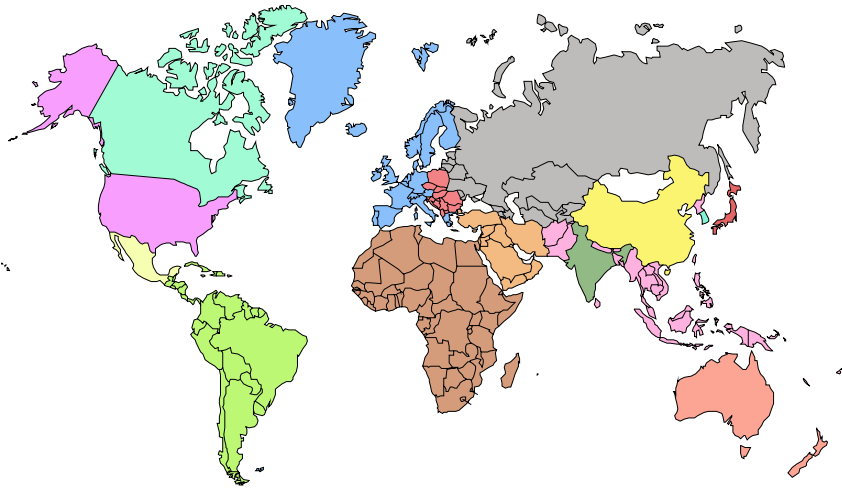


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- Spatial resolution
  - 15 regions



## Spatial structure

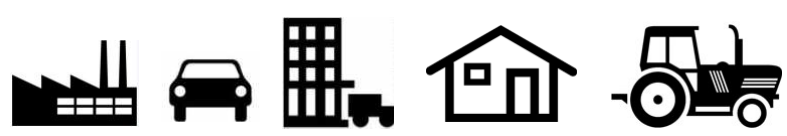


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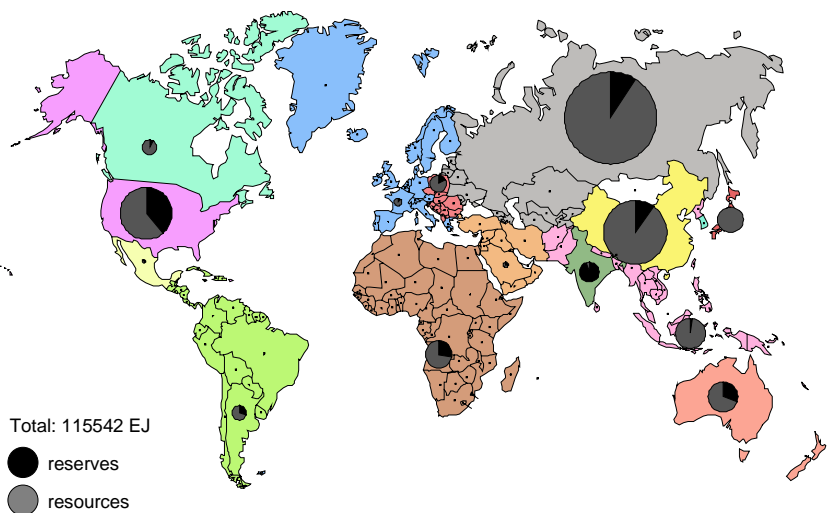
## The EFDA-TIMES Model

- Partial equilibrium TIMES model
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- Final energy service demands, split into 5 sectors
- Demand scenario based on GEM-E3
- Focus on supply side

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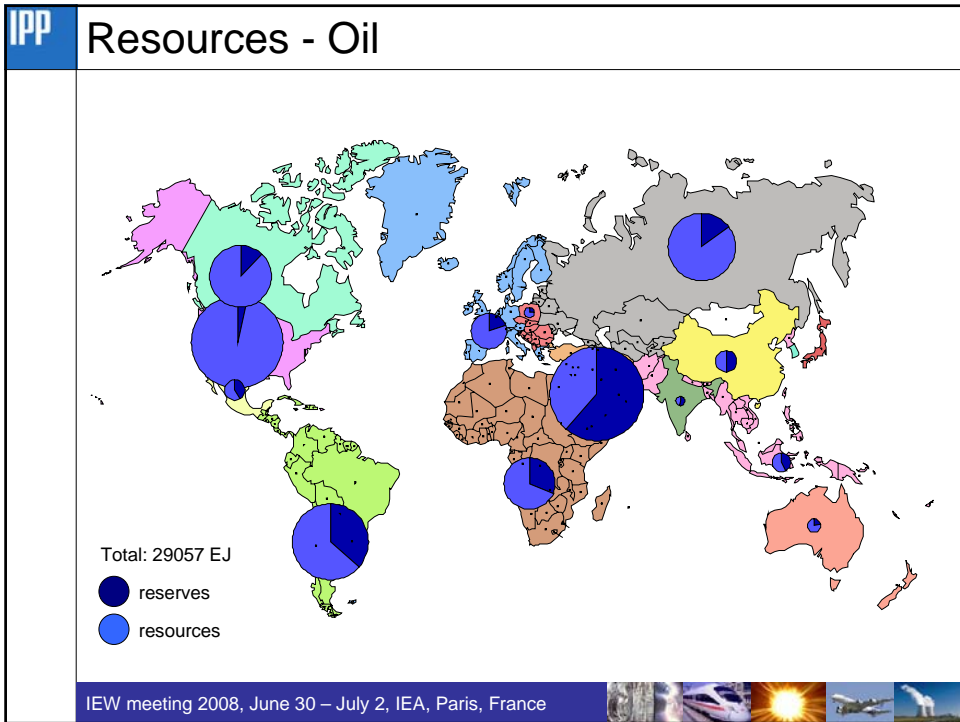
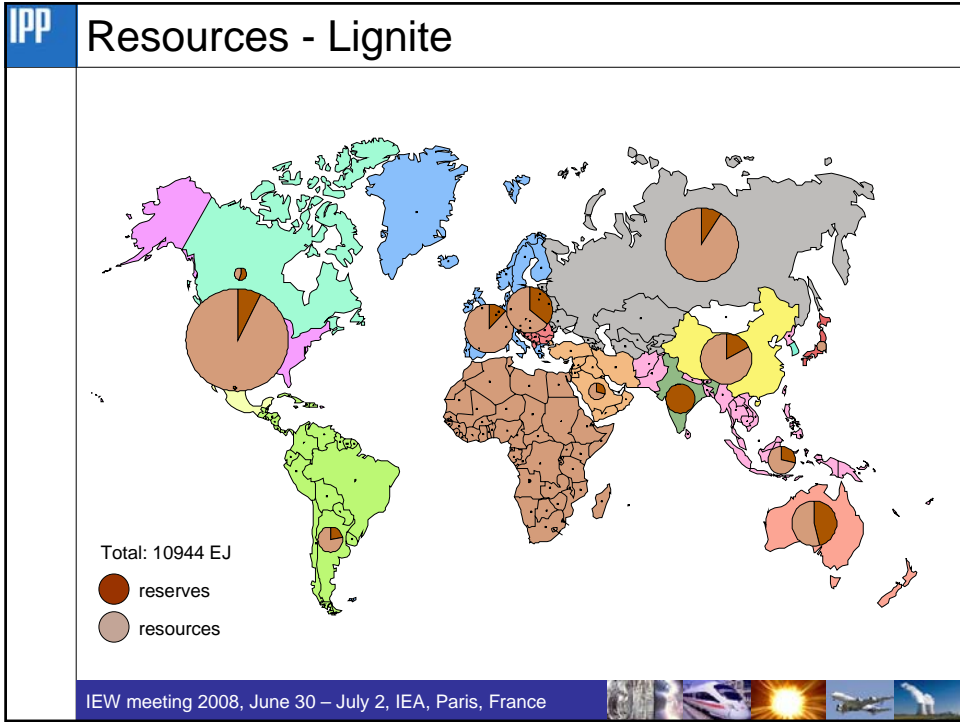


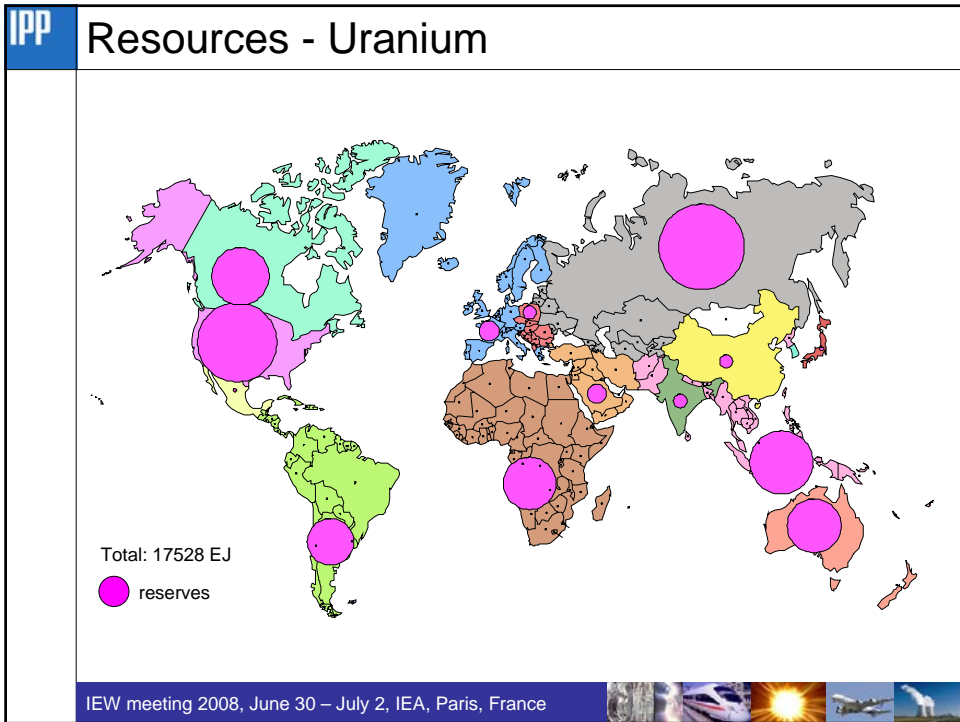
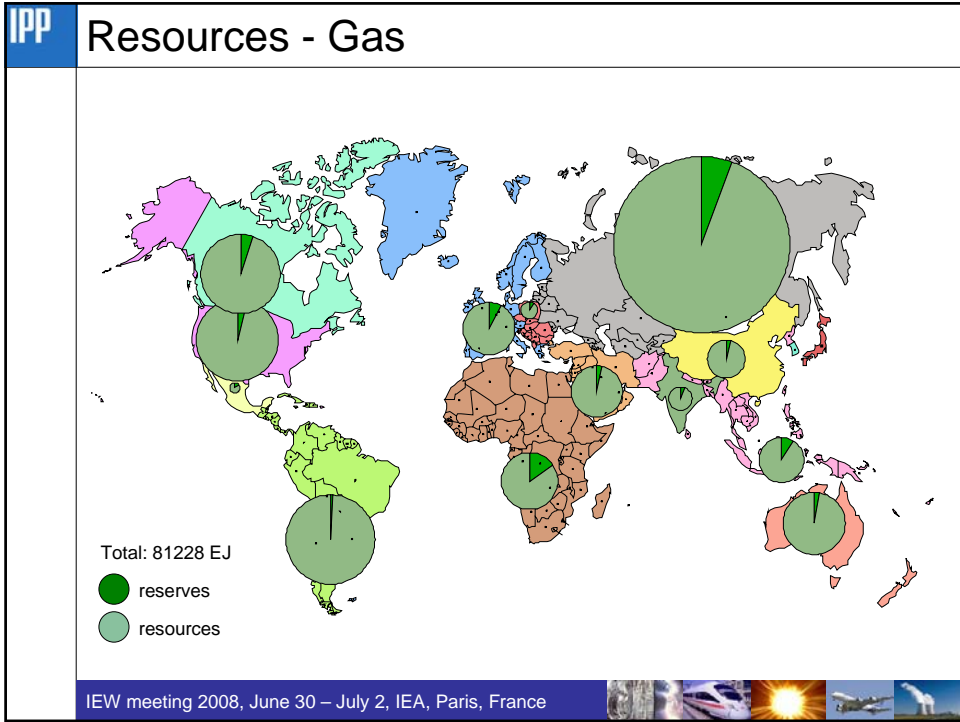
## Resources - Hardcoal

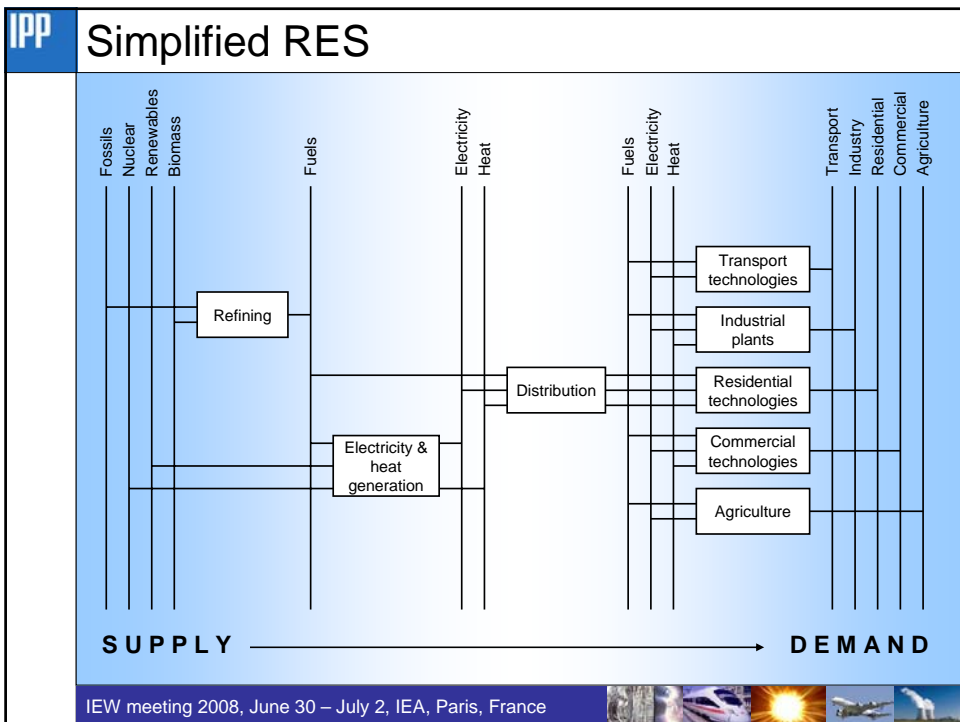
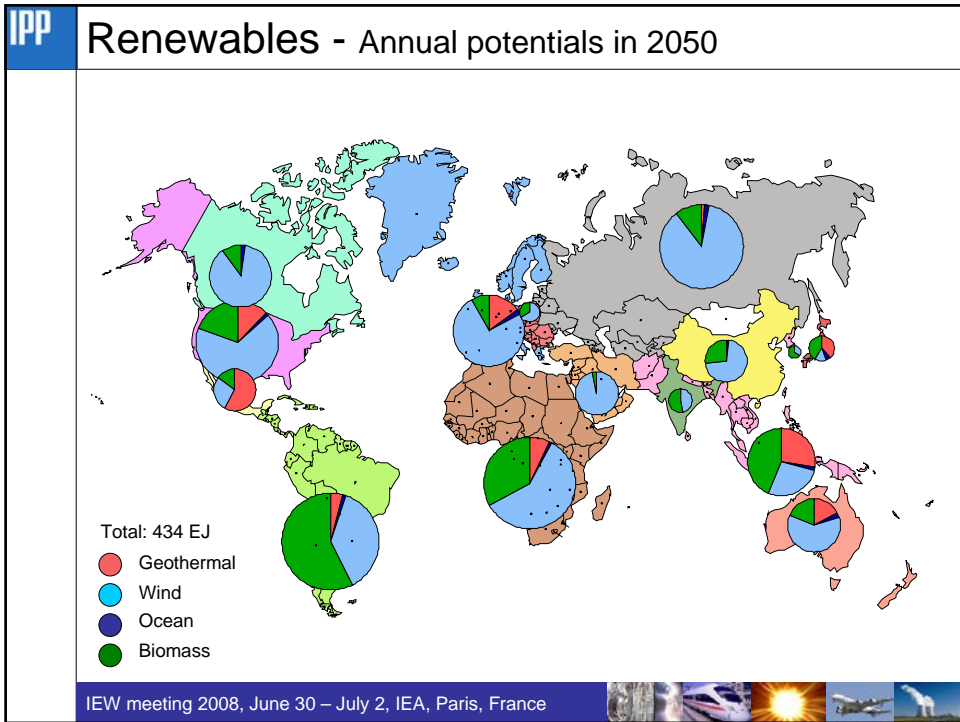


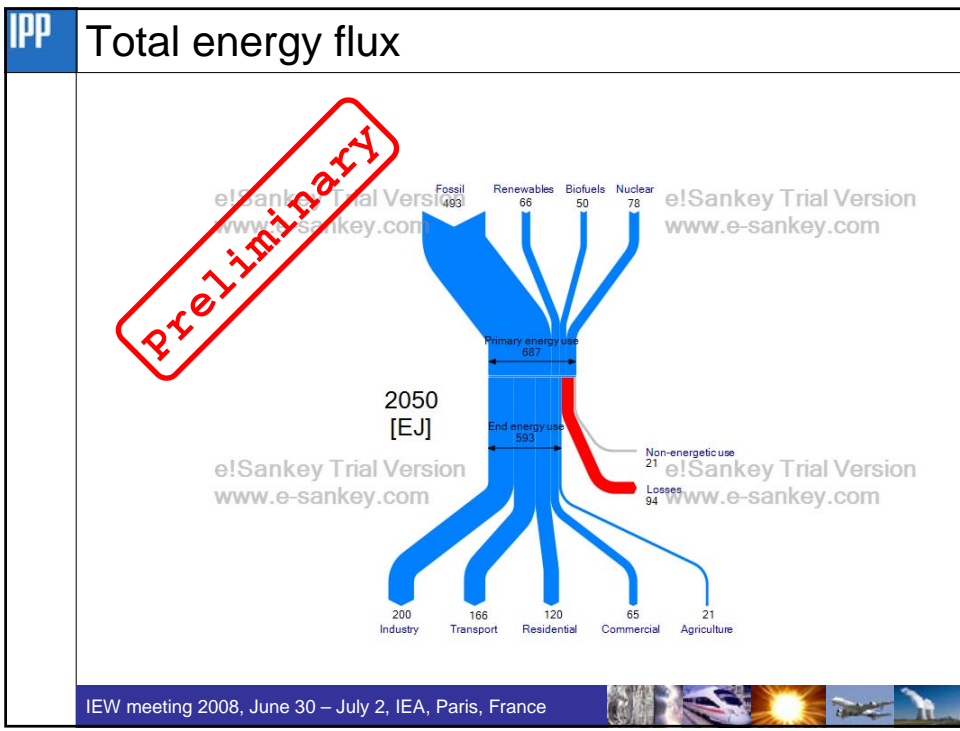
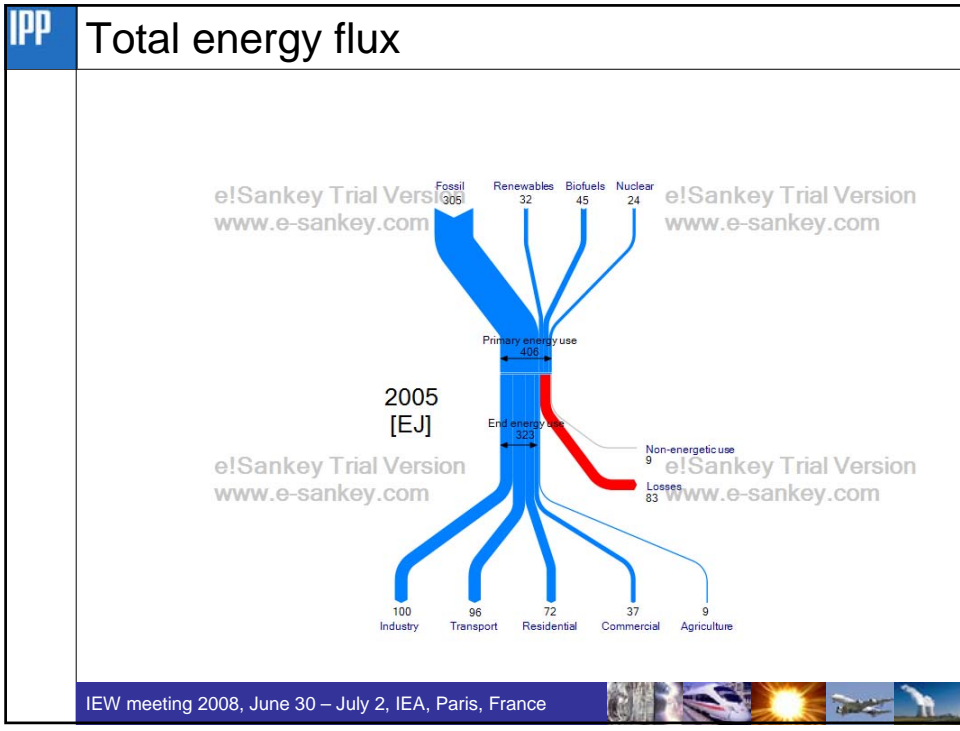
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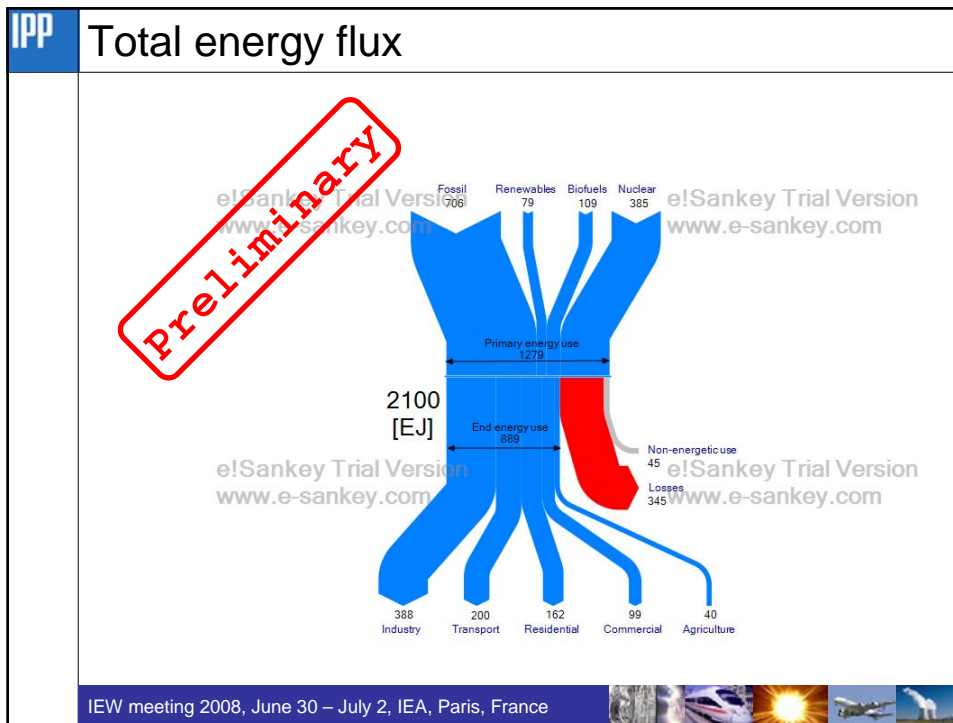




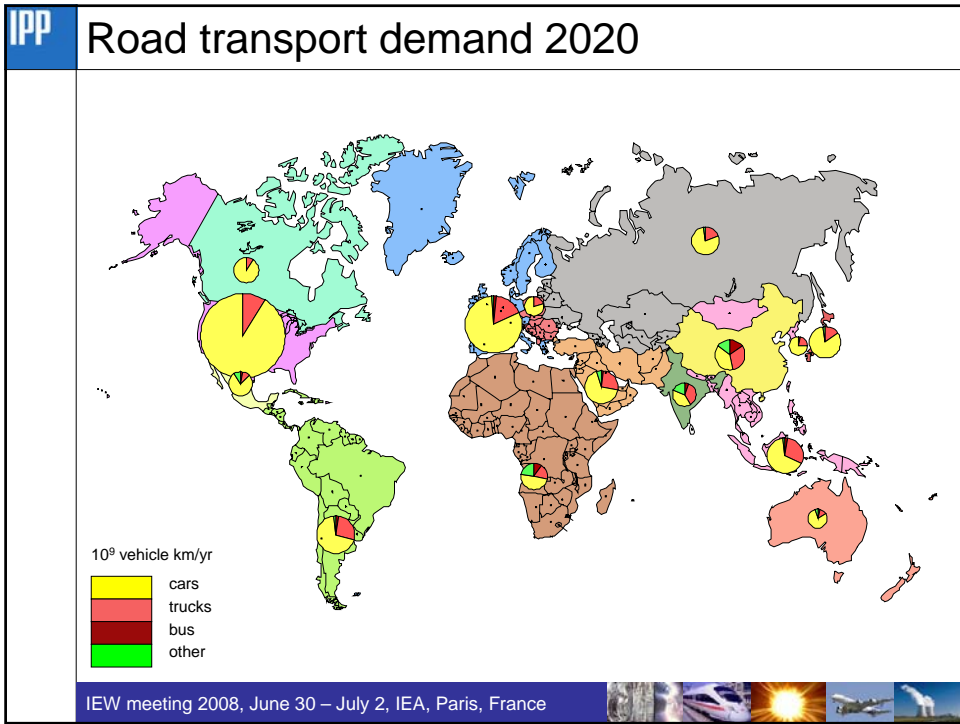
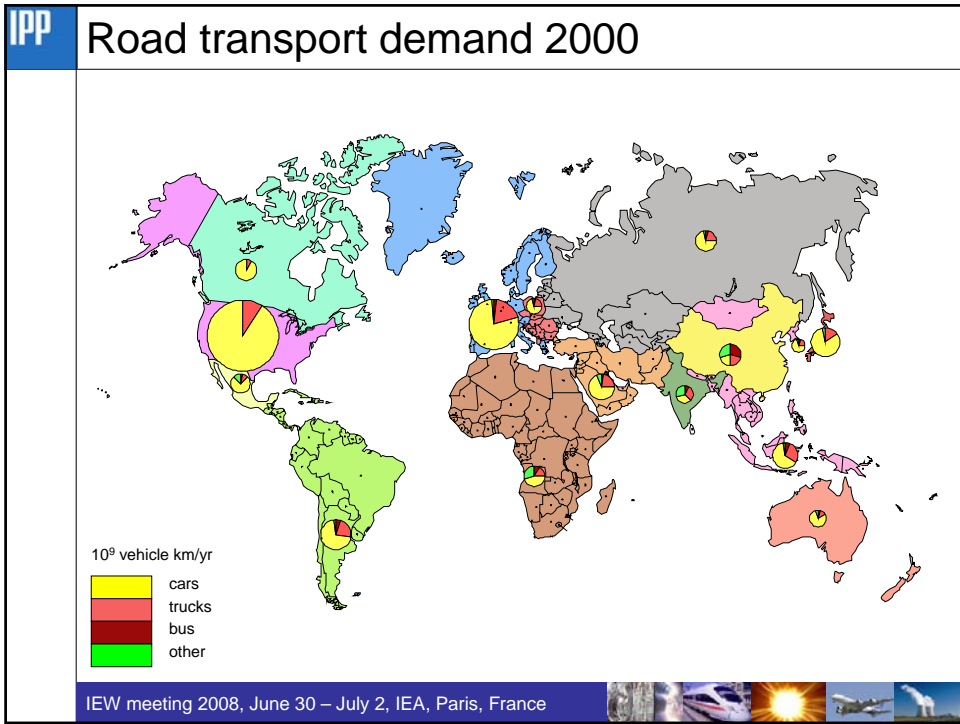


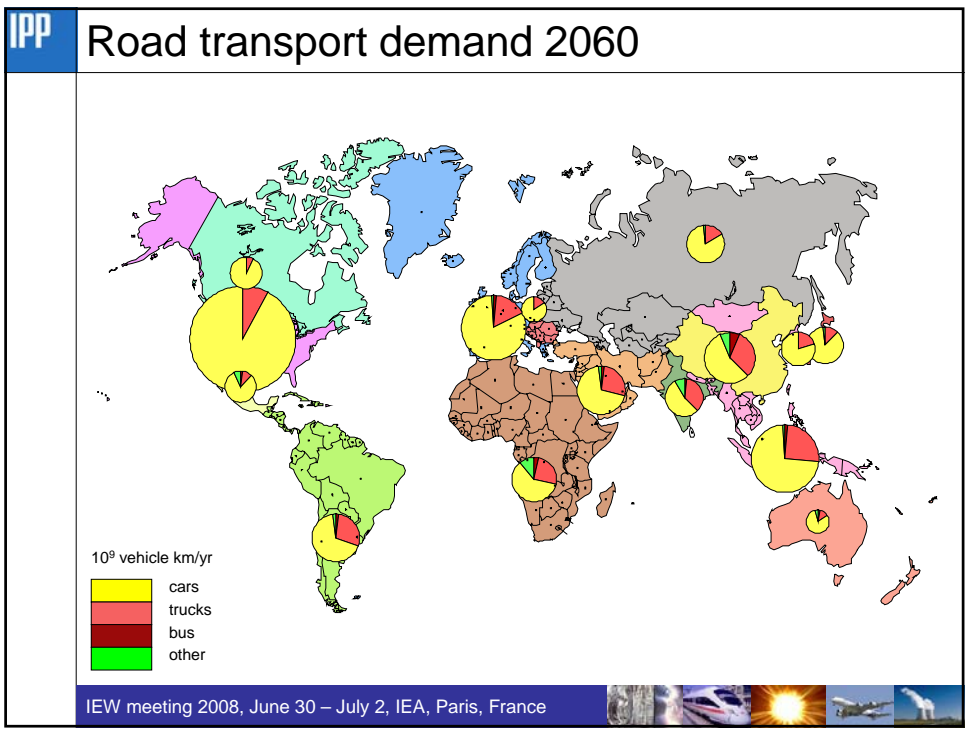
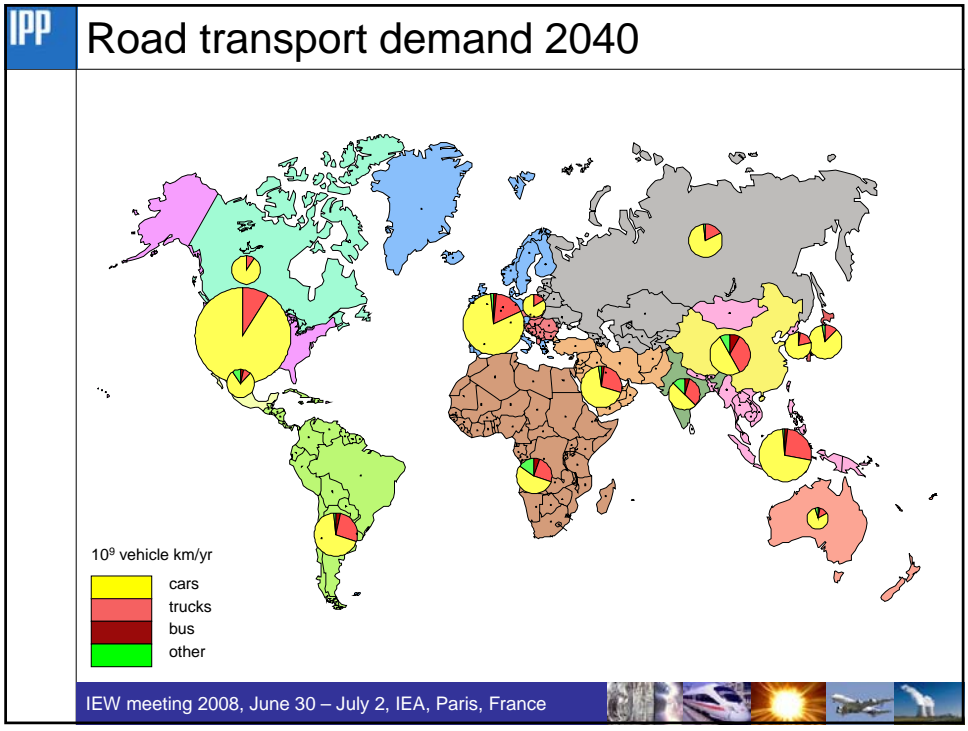


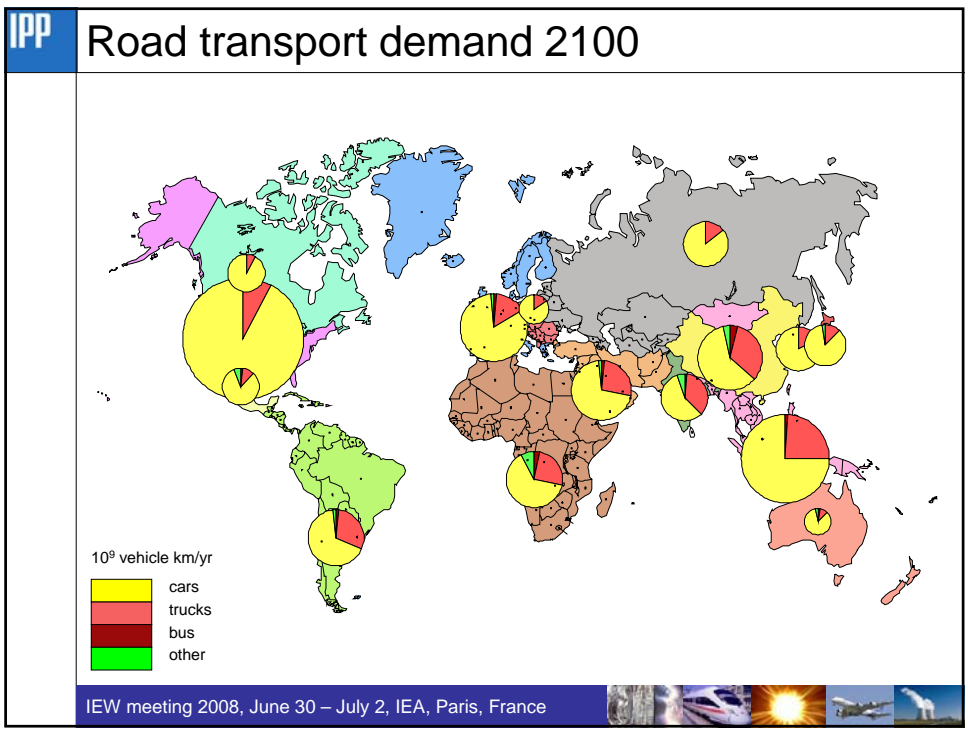
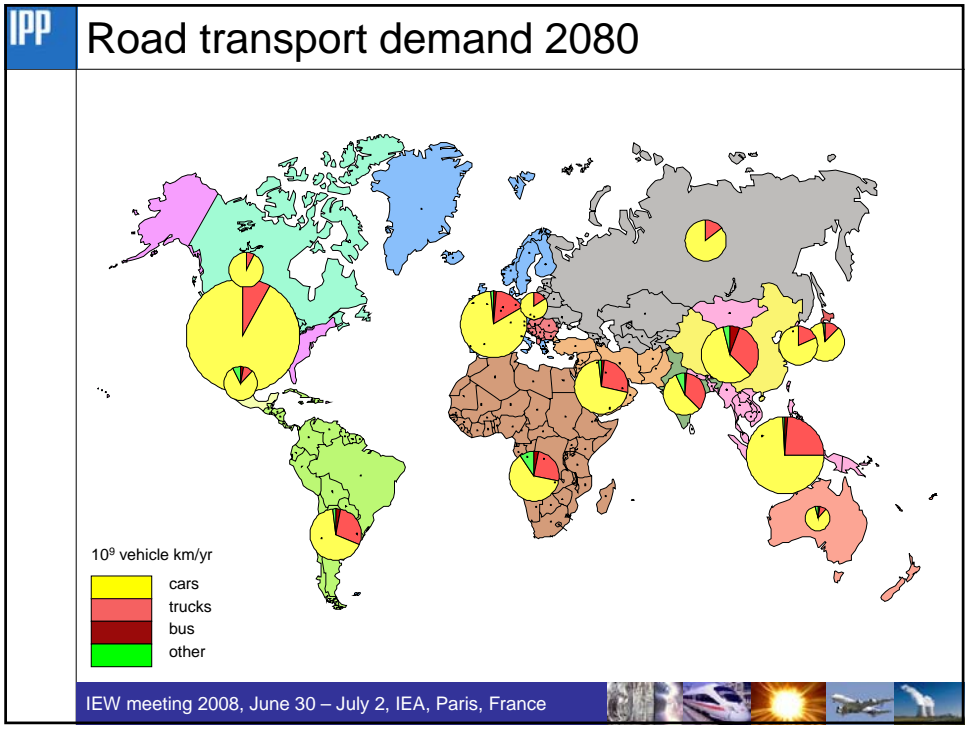


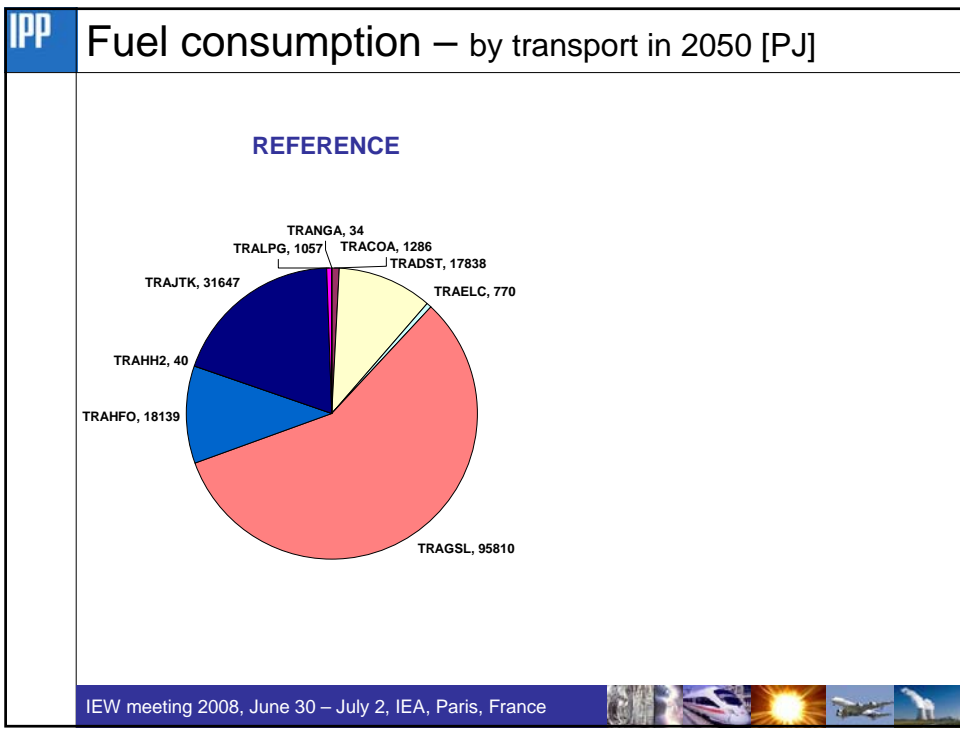
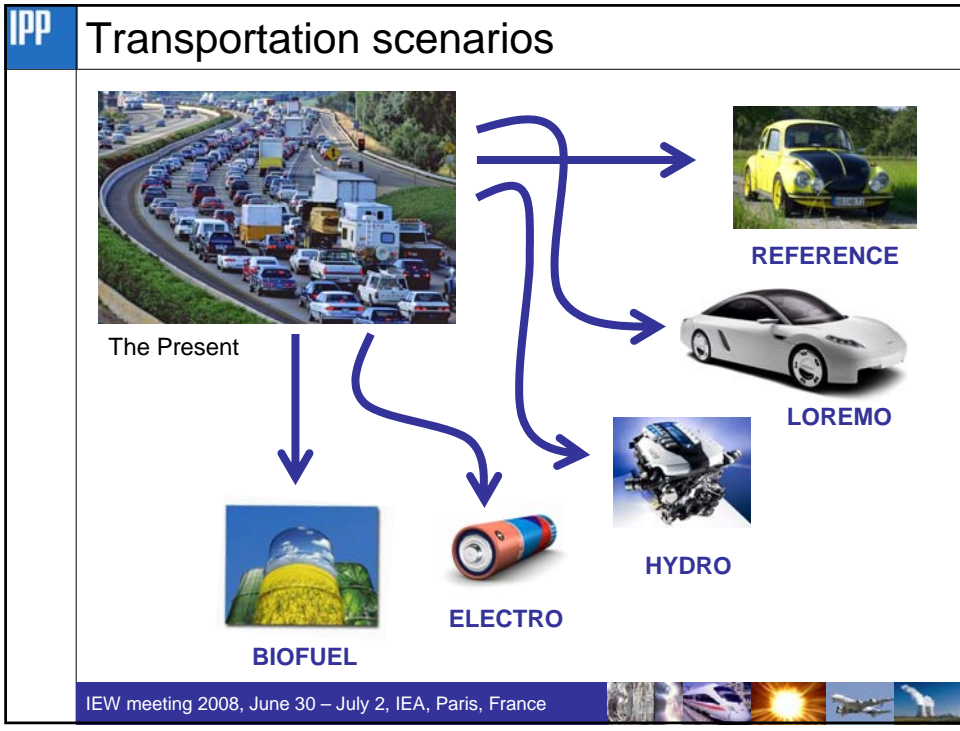


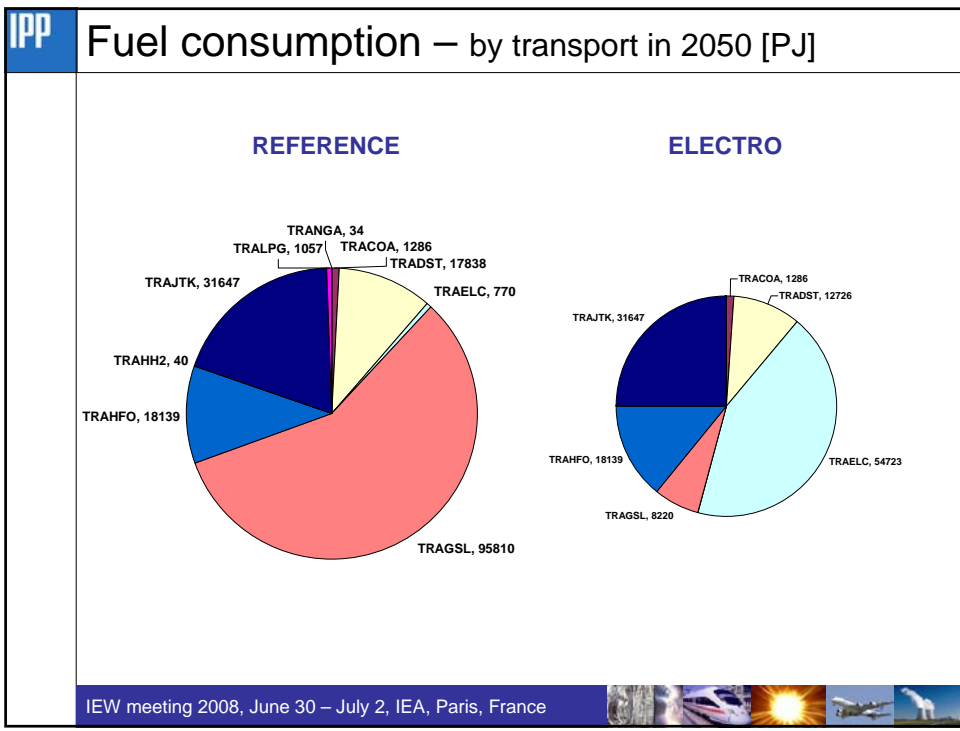
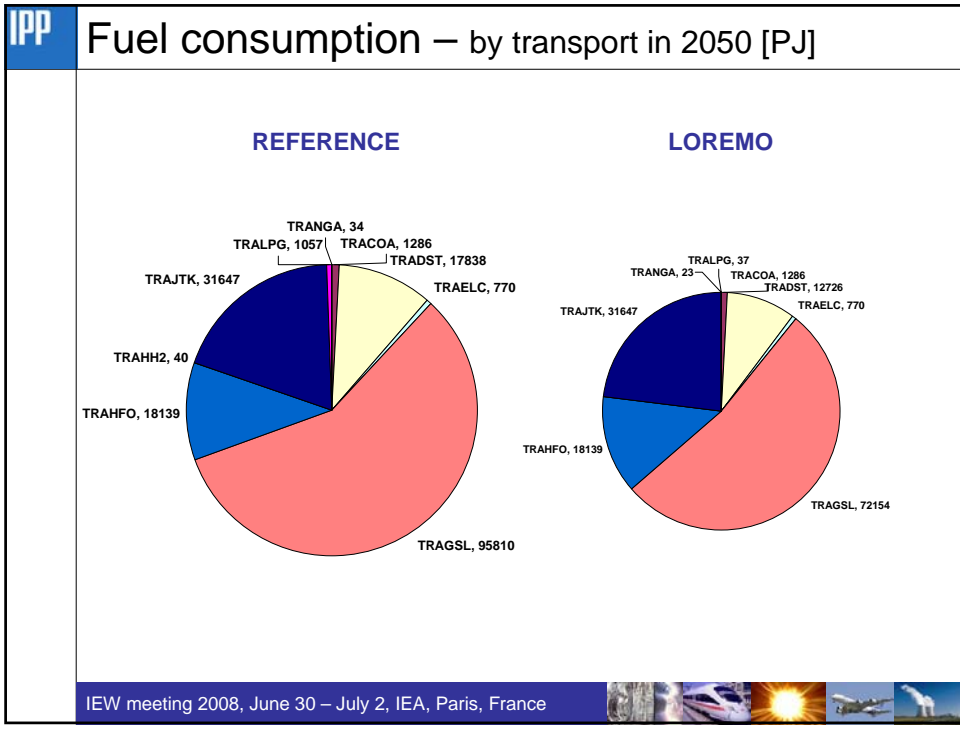
- IPP** Transportation demands
- Subdivided in various transportation segments
    - Road (measure = vehicle kilometers)
      - » Cars (small and large)
      - » Buses
      - » Trucks (light, commercial, heavy, medium)
      - » Two- and three-wheels
    - Non-road (measure = final energy consumption)
      - » Domestic and international aviation
      - » Domestic and international navigation
      - » Passenger and freight trains
  - Demand driven by
    - » GDP: trucks, aviation, navigation, freight train
    - » GDP/cap : cars
    - » Population: busses, two- and three-wheels, passenger train
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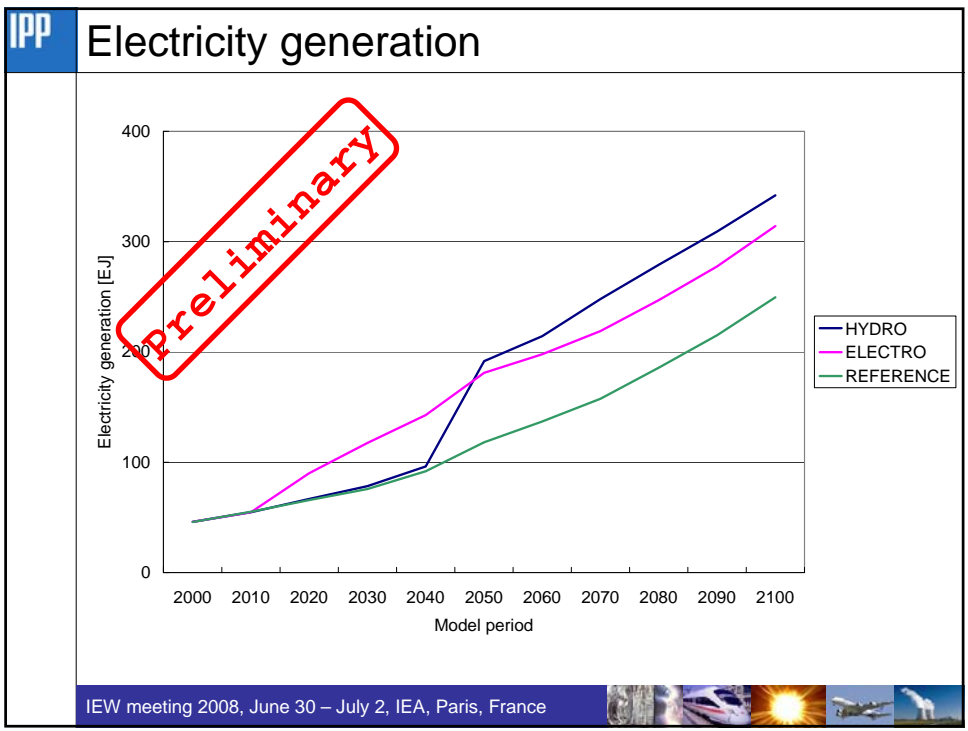
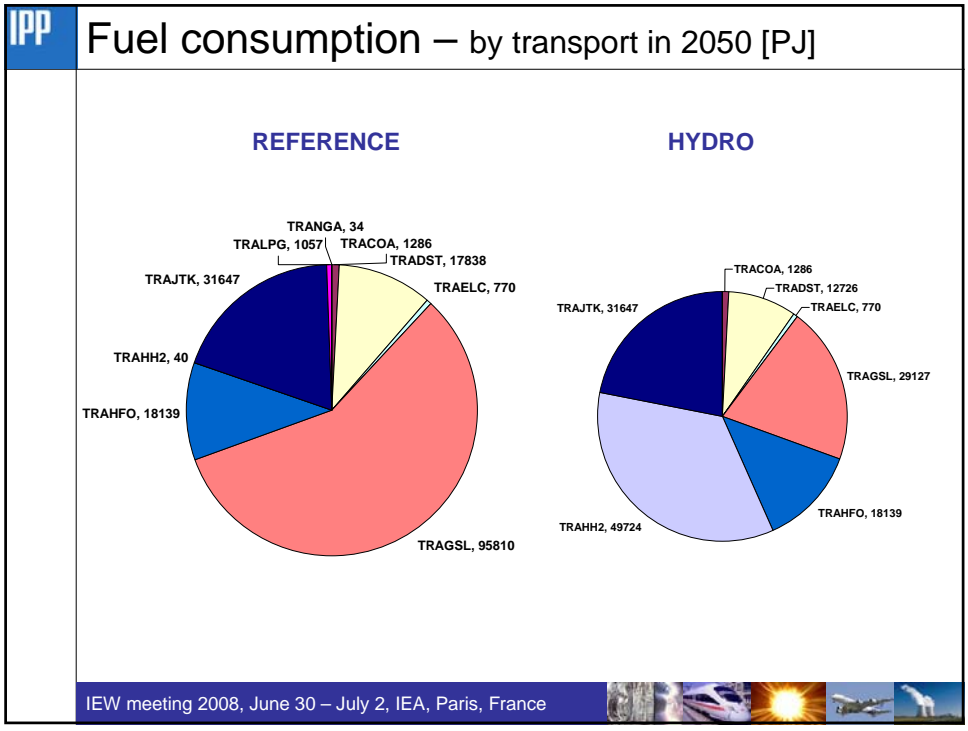


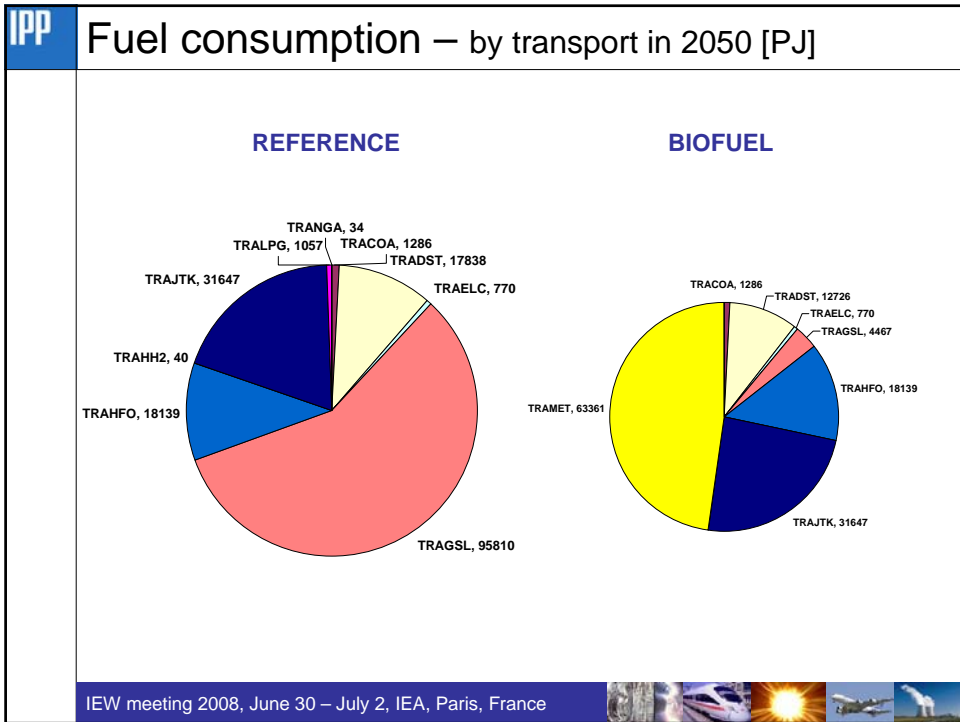
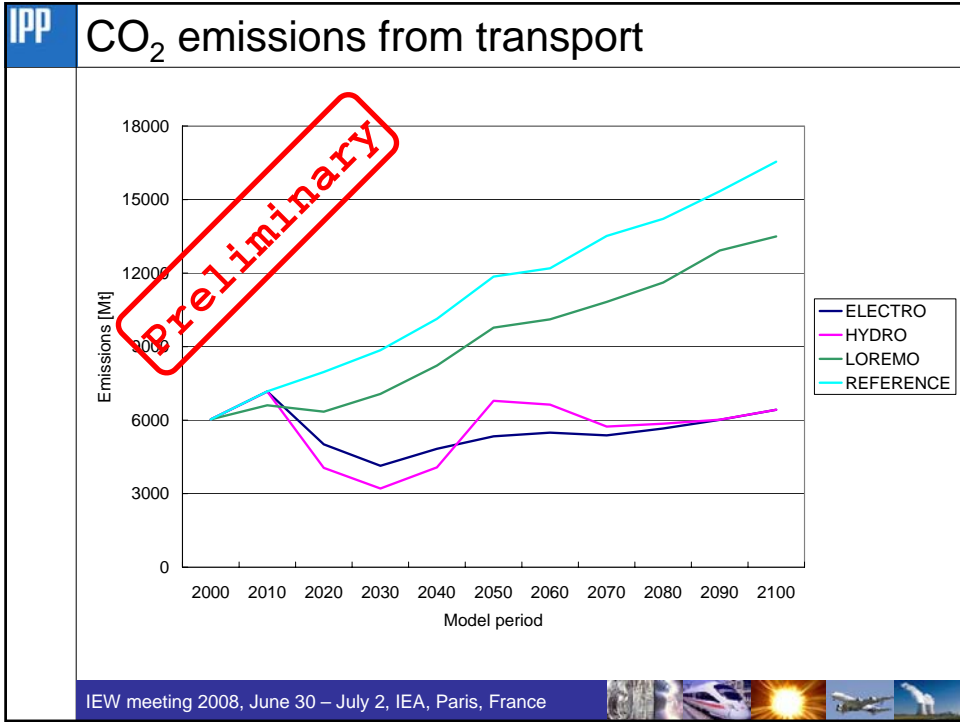












## Outlook – Transportation sector

- Strict relation of GDP/cap and car travel leads to unreasonable results
- New recipe for projecting transportation demands needed
  - Observation (Schafer and Victor, TRA **34** (2000) 171):
    - » on average a person spends 1.1 h a day travelling
    - » a person devotes a predictable fraction of its income for transportation
  - Such a rationale leads to
    - » total transportation activity grows with GDP/capita
    - » modal split towards high speed transportation modes (planes, high speed train)
    - » decline of road traffic at certain levels of GDP/cap



## Outlook – The EFDA-TIMES Model

- Status: Testing and debugging phase
- Validation and benchmarking
  - comparison to competing approaches (MiniCam, Tiam, MESSAGE,...)
- Production of results
  - definition of scenarios
  - joint publication of all involved associations
- Exploitation phase
  - the role of fusion power in the 21st century
  - availability of model to external associations





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für Plasmaphysik



Thank you!

