

IPCC SRES and Stabilizing GHG Concentrations

Nebojša Nakićenović

Technische Universität Wien 

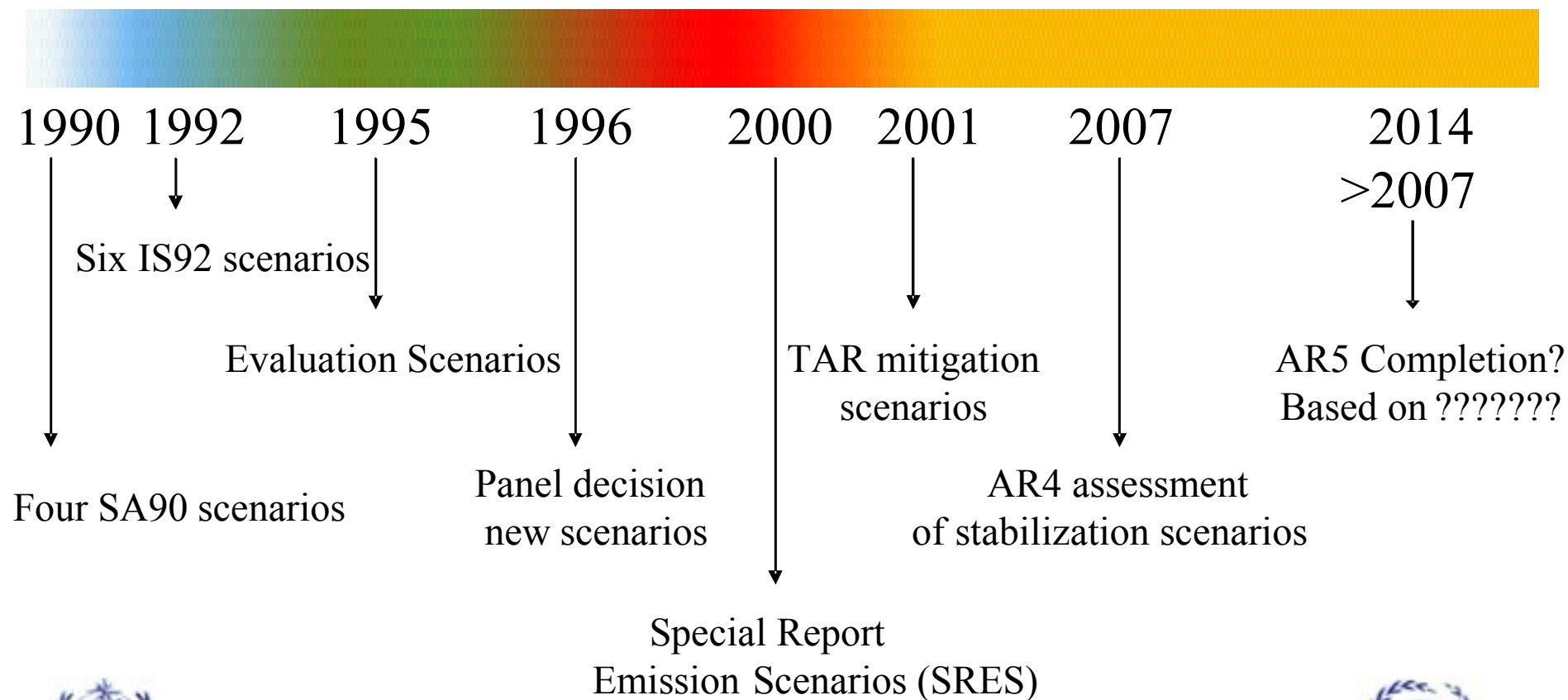
International Institute for Applied Systems Analysis 

naki@eeg.tuwien.ac.at

SRES Reference Characteristics

- The ranges of drivers and emissions have not changed *very much* (growth)
- Population scenarios from major demographic institutions are lower (A2)
- SO_x and NO_x emissions are generally lower in the latest scenarios (mitigation)
- More scenarios with black and organic carbon emissions
- The choice of MER or PPP as GDP metrics does not affect the emissions

Previous IPCC Scenarios and Future Outlook



INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)





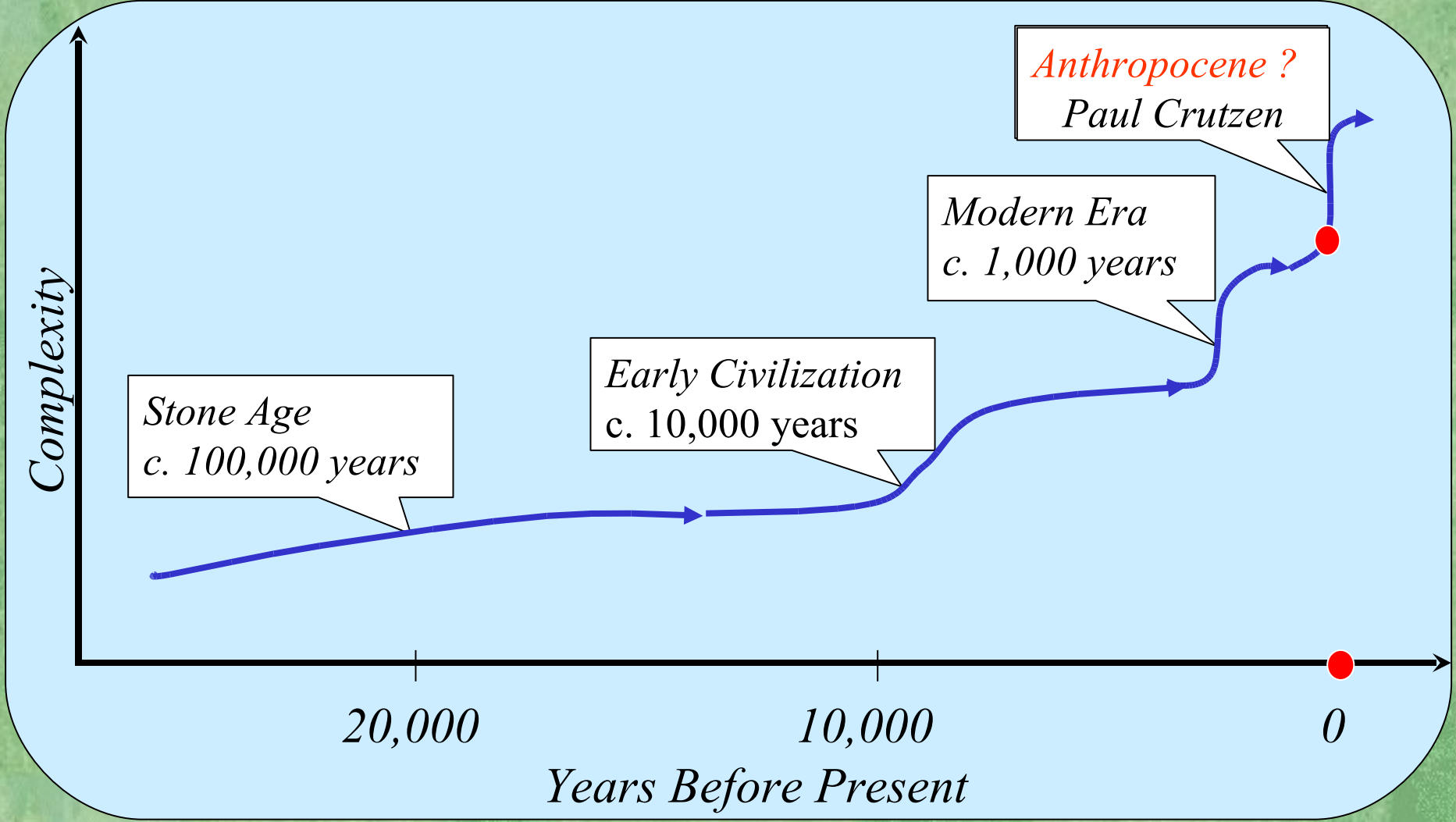
**Which world
do we want?**

The future is always present, as a promise and a lure.

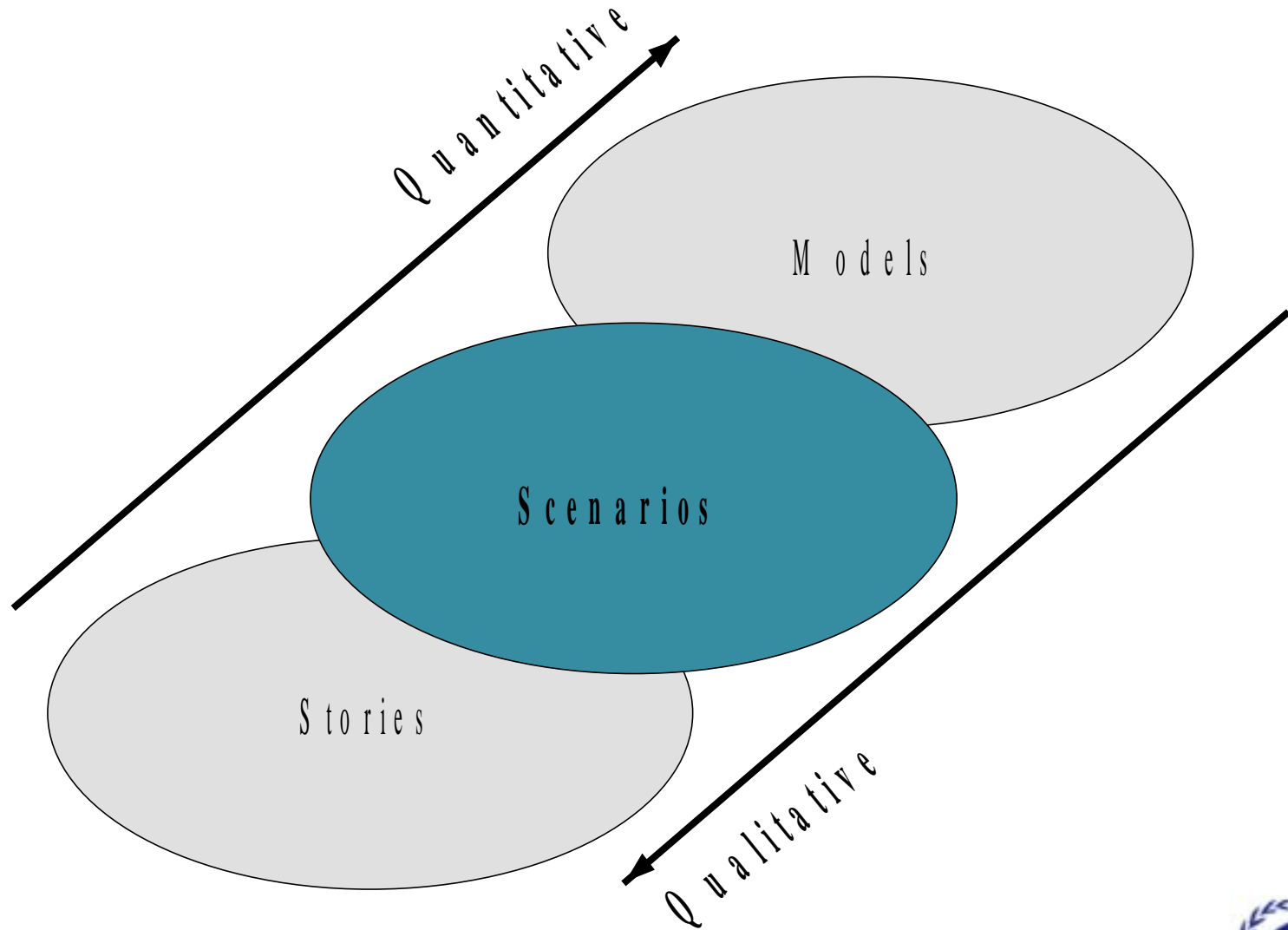
Karl Popper



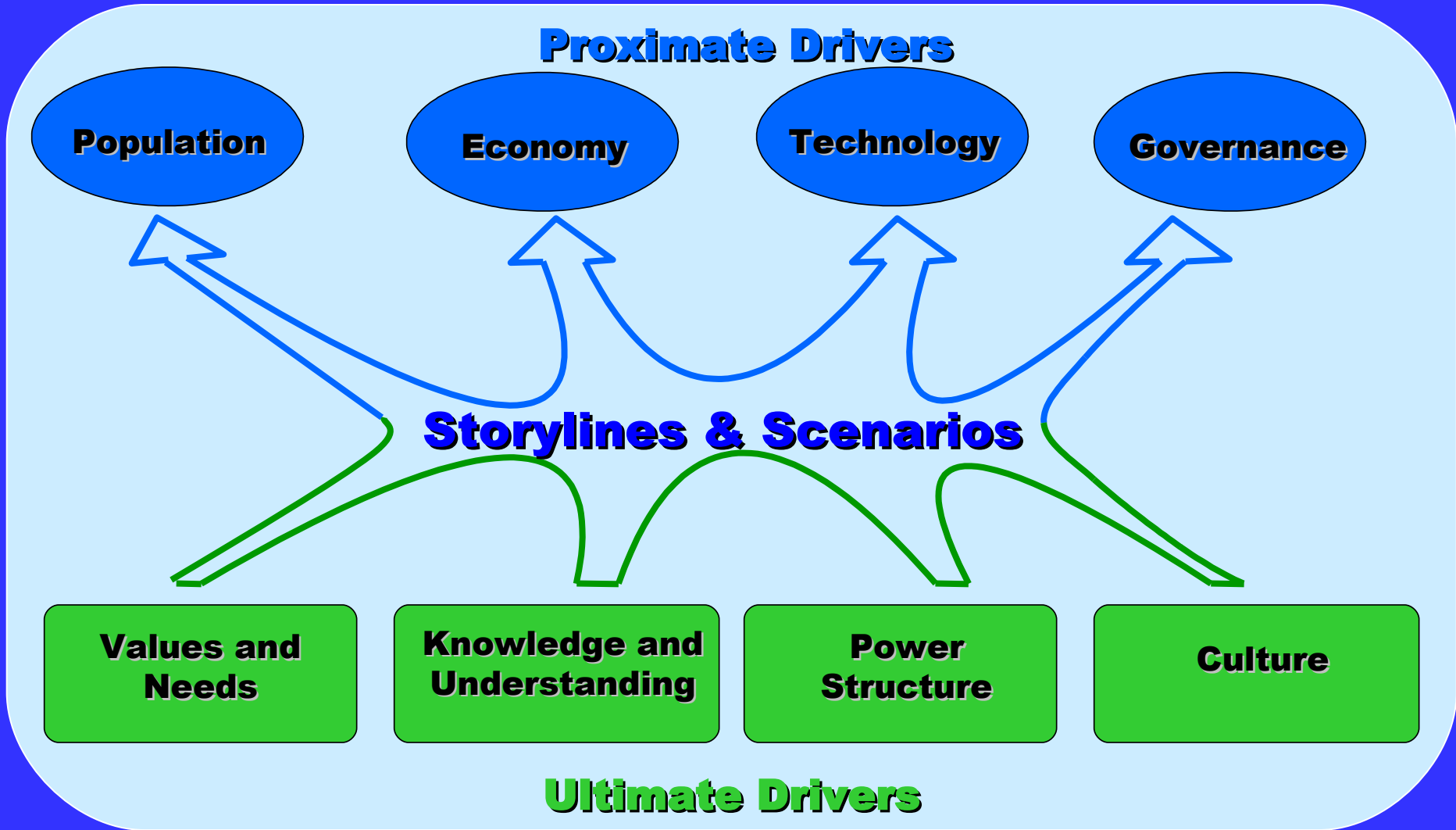
Historical Transitions



SRES Modeling Approach



Proximate and Ultimate Drivers

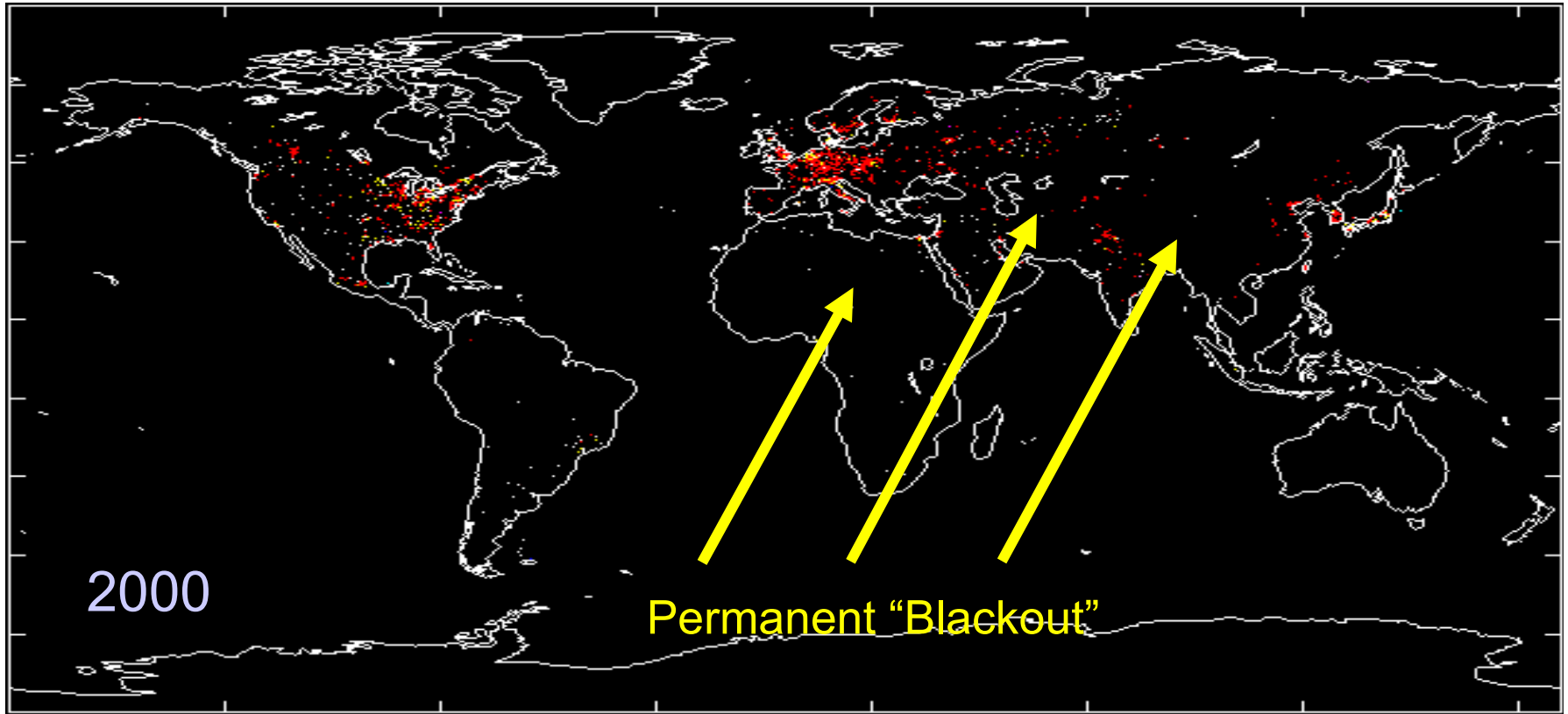


Global Climate Challenges

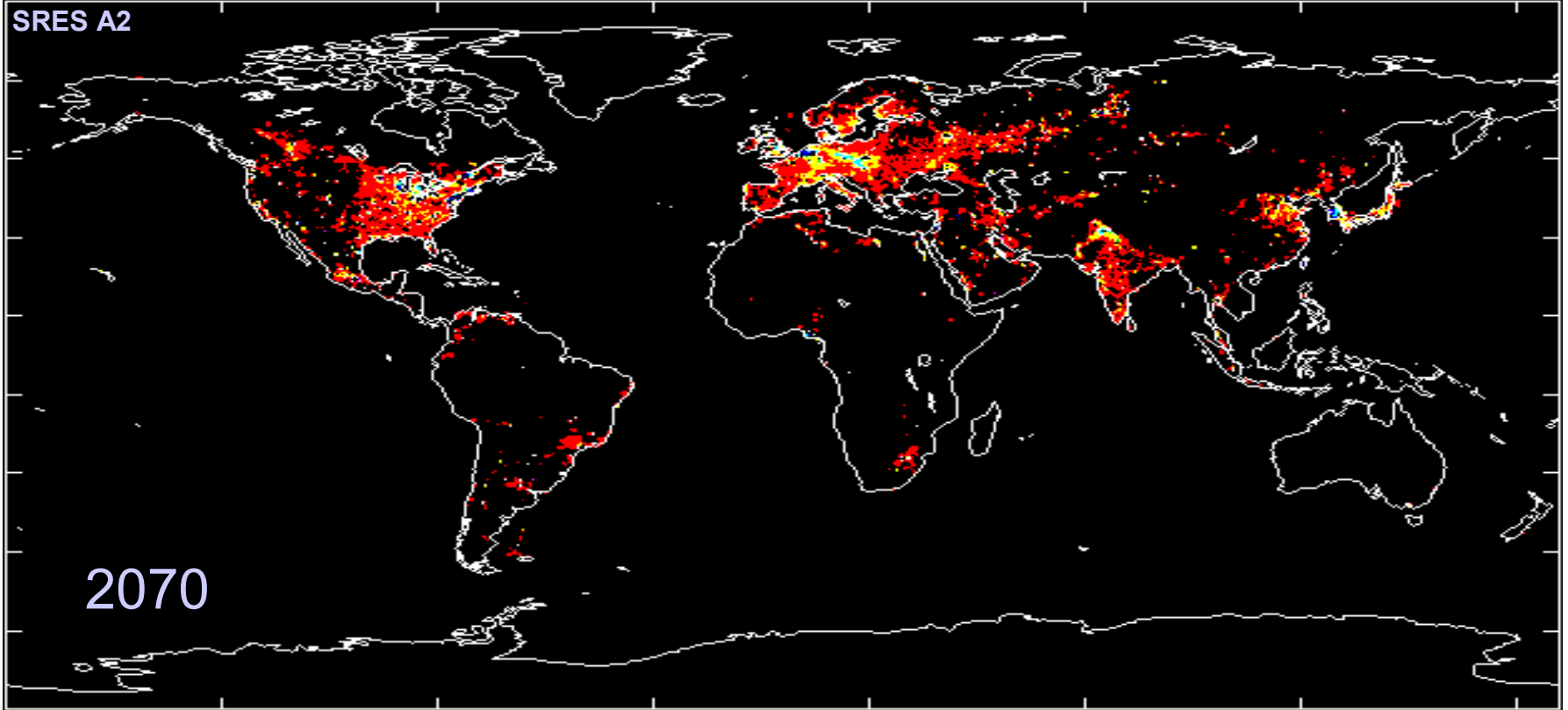
Towards a more Sustainable Future

- The *magnitude* of the change required is *huge*
- The challenge is to find a way forward that addresses all the issues *simultaneously*
- A paradigm shift is needed: energy end-use efficiency, new renewables, advanced nuclear, carbon capture and storage, and land-use changes

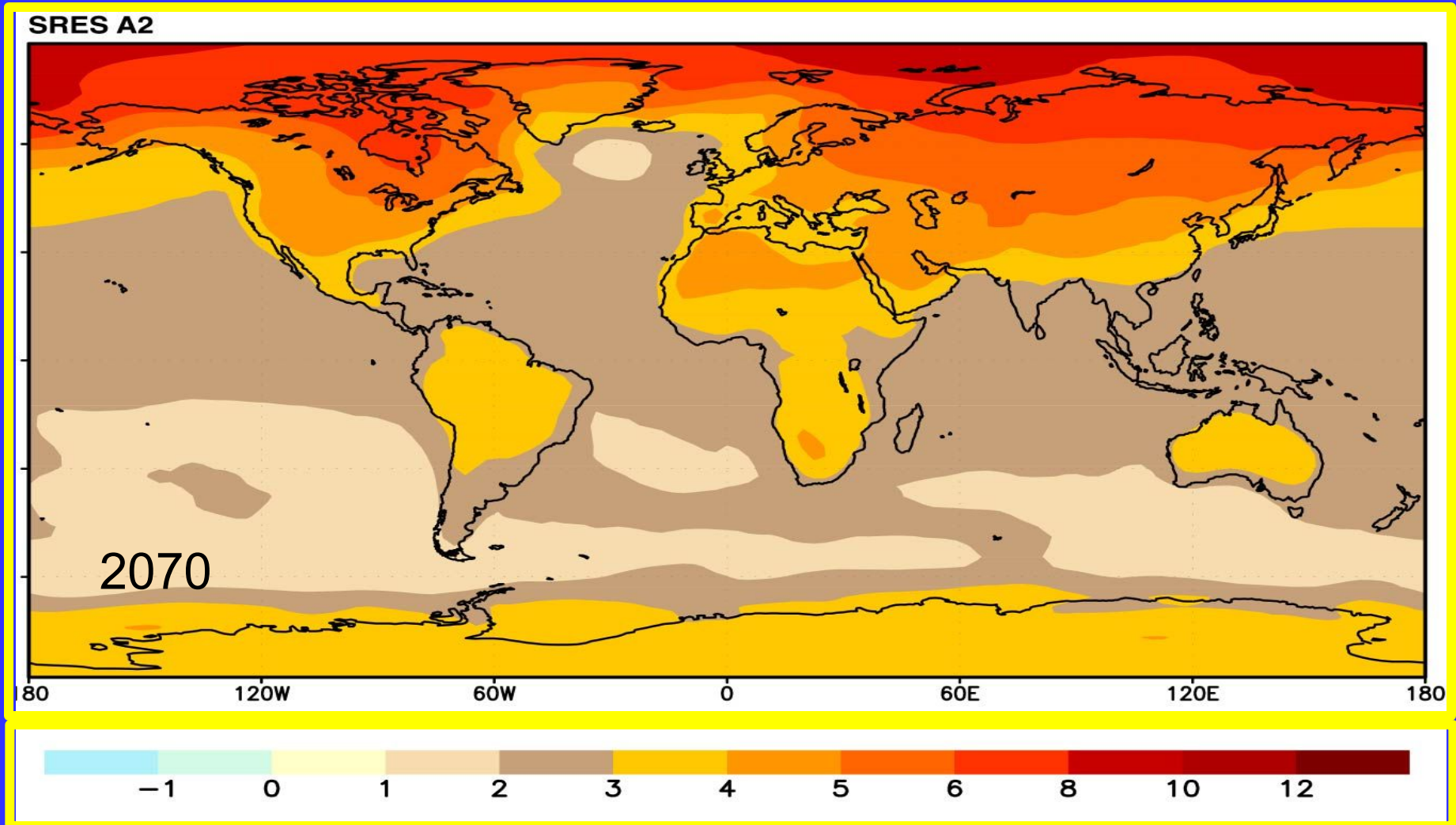
Night Lights



Night Lights

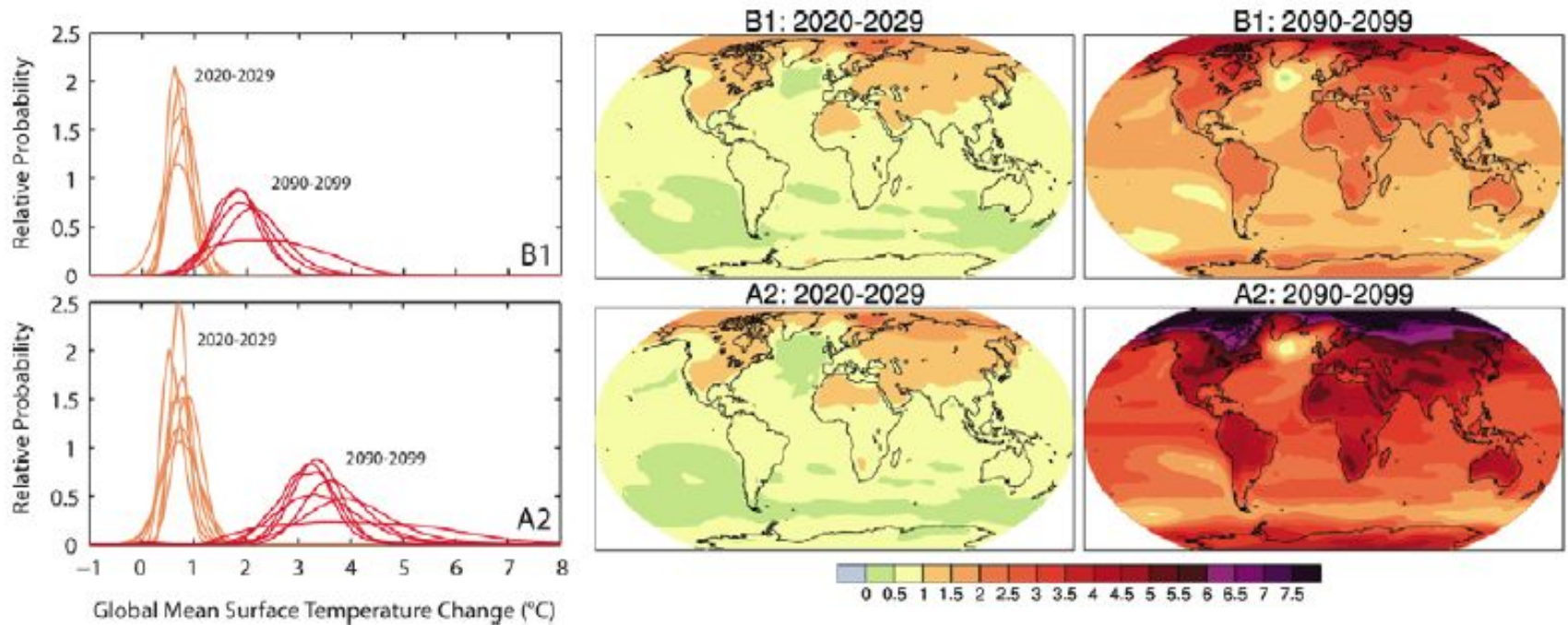


Δ Temperature



Surface Temperature Change

AOGCM projections for illustrative SRES scenarios



WMO

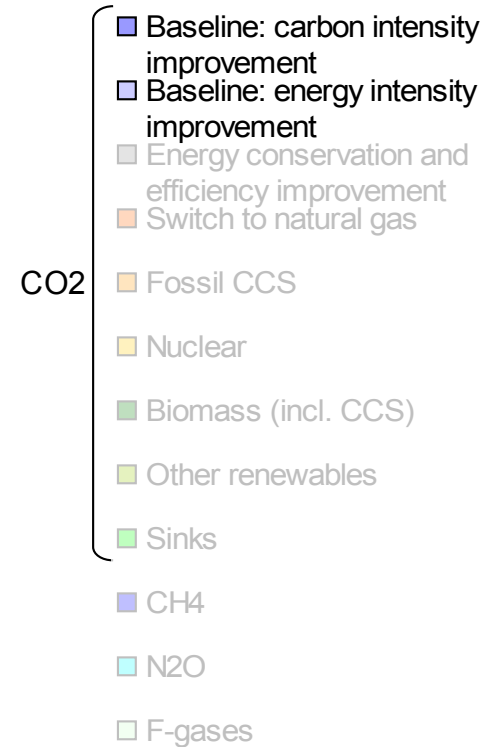
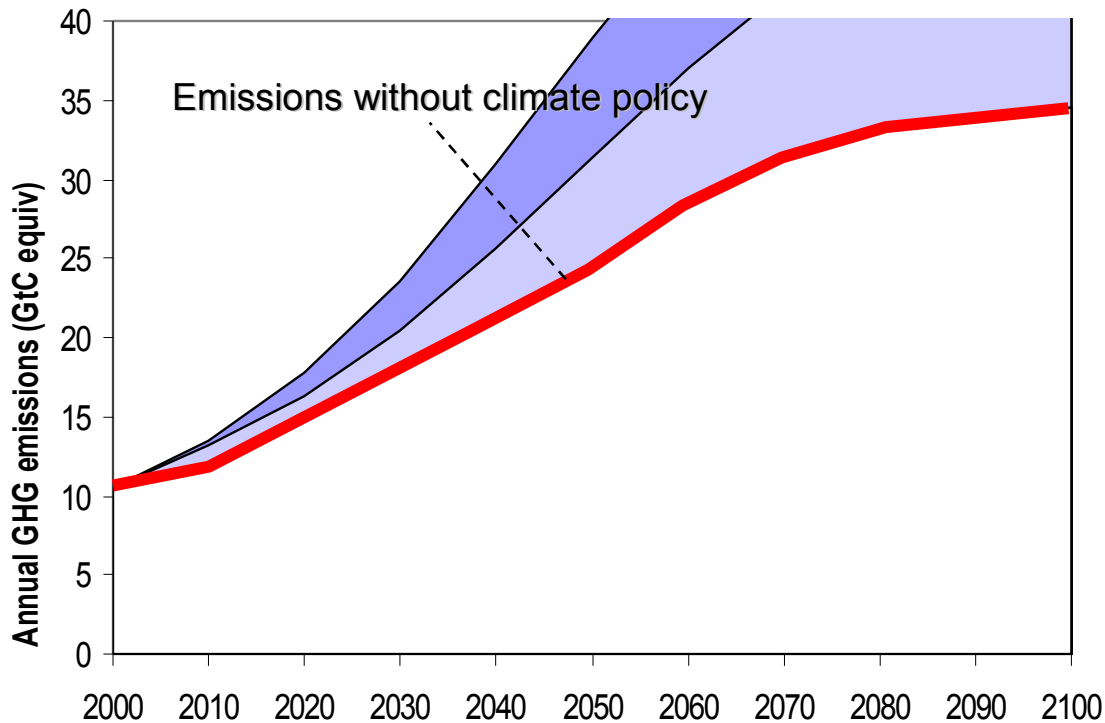
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)



UNEP

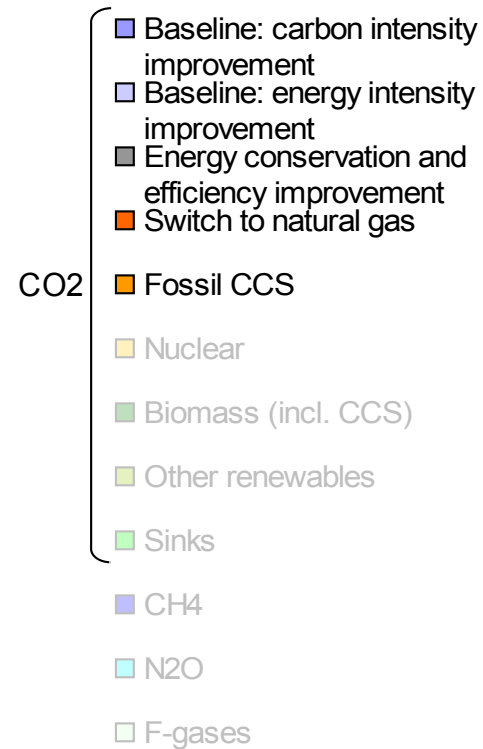
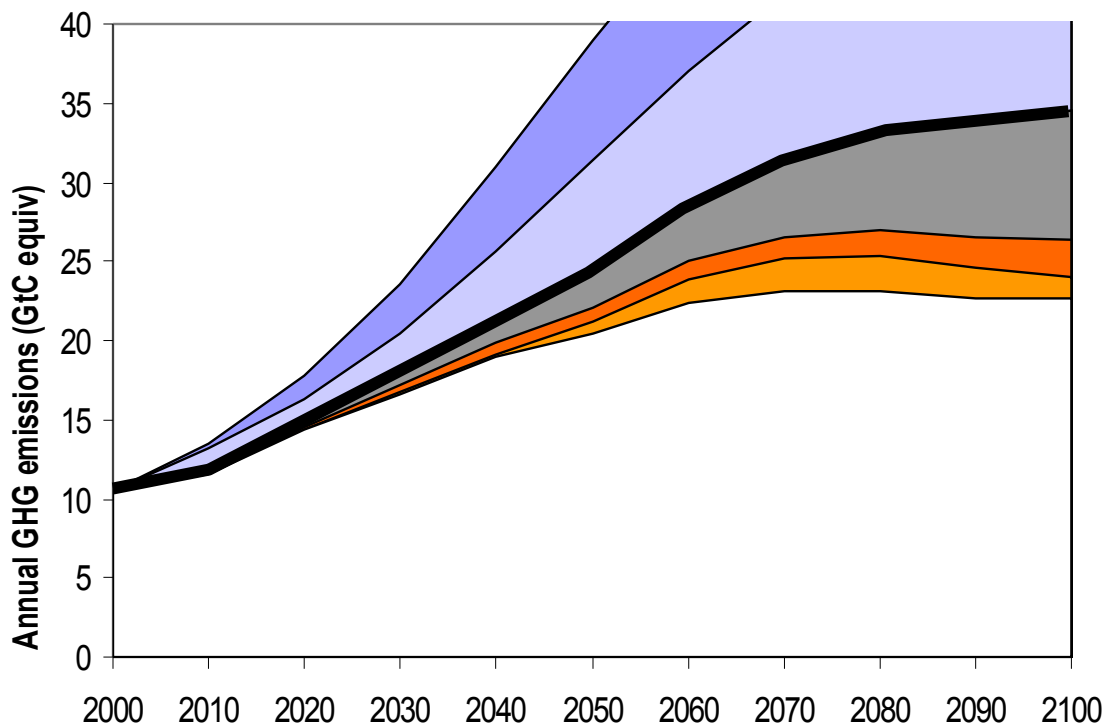
World GHG Emissions

IIASA A2r Scenario



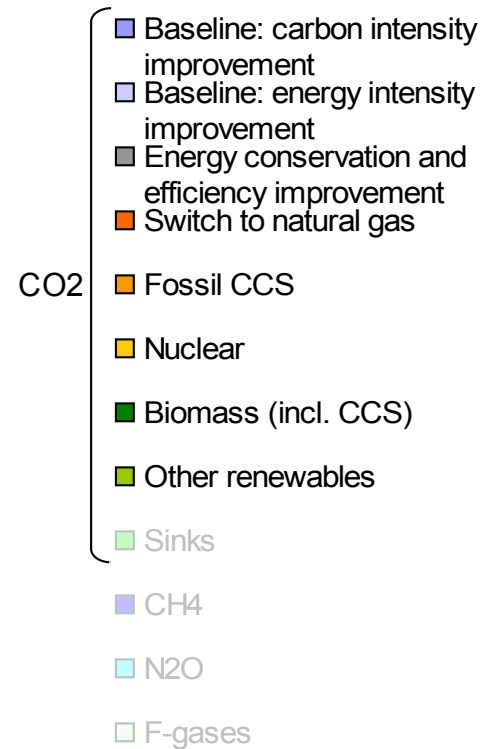
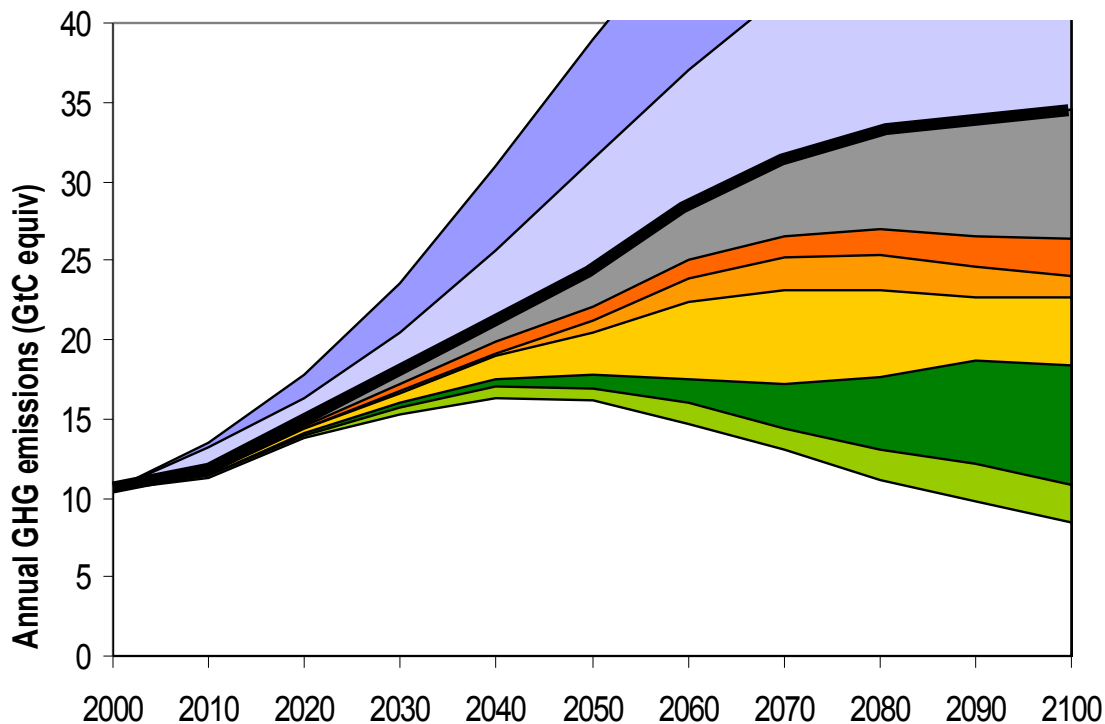
World GHG Emissions

IIASA A2r Scenario



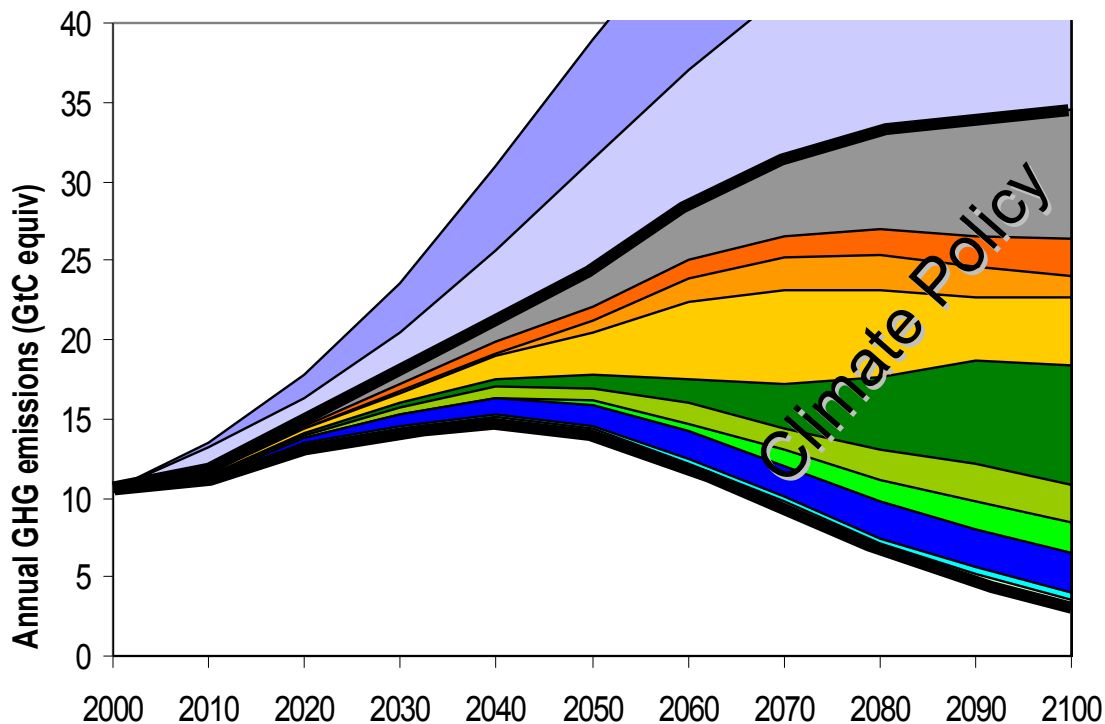
World GHG Emissions

IIASA A2r Scenario



World GHG Emissions

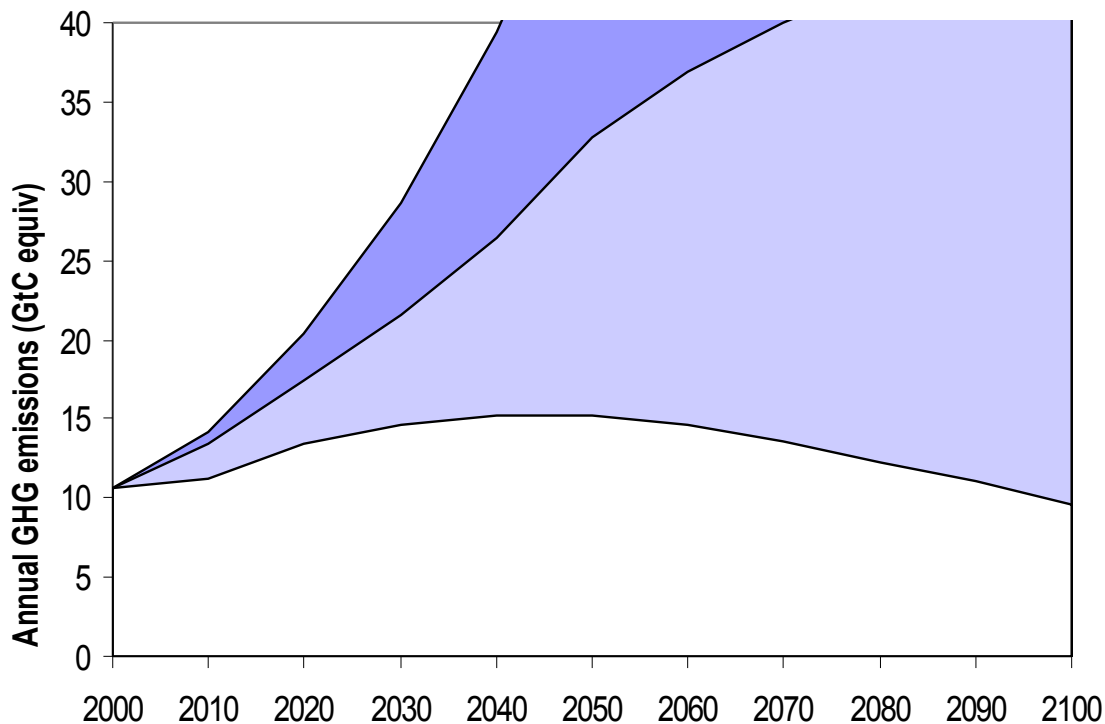
IIASA A2r Scenario



- Baseline: carbon intensity improvement
- Baseline: energy intensity improvement
- Energy conservation and efficiency improvement
- Switch to natural gas
- CO2
- Fossil CCS
- Nuclear
- Biomass (incl. CCS)
- Other renewables
- Sinks
- CH4
- N2O
- F-gases

World GHG Emissions

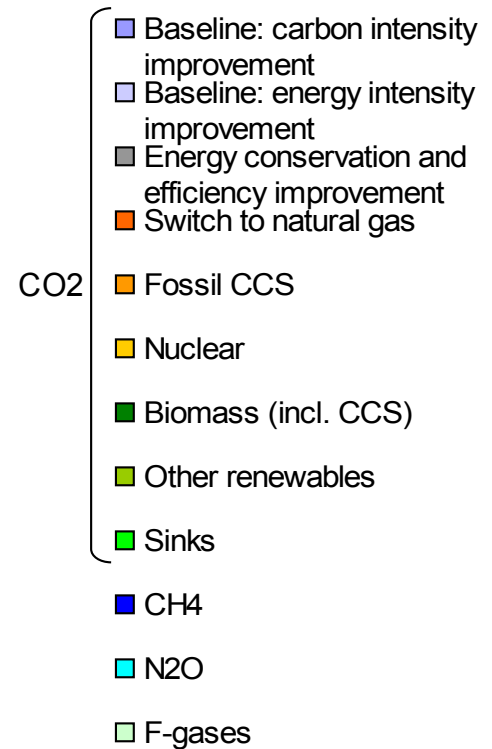
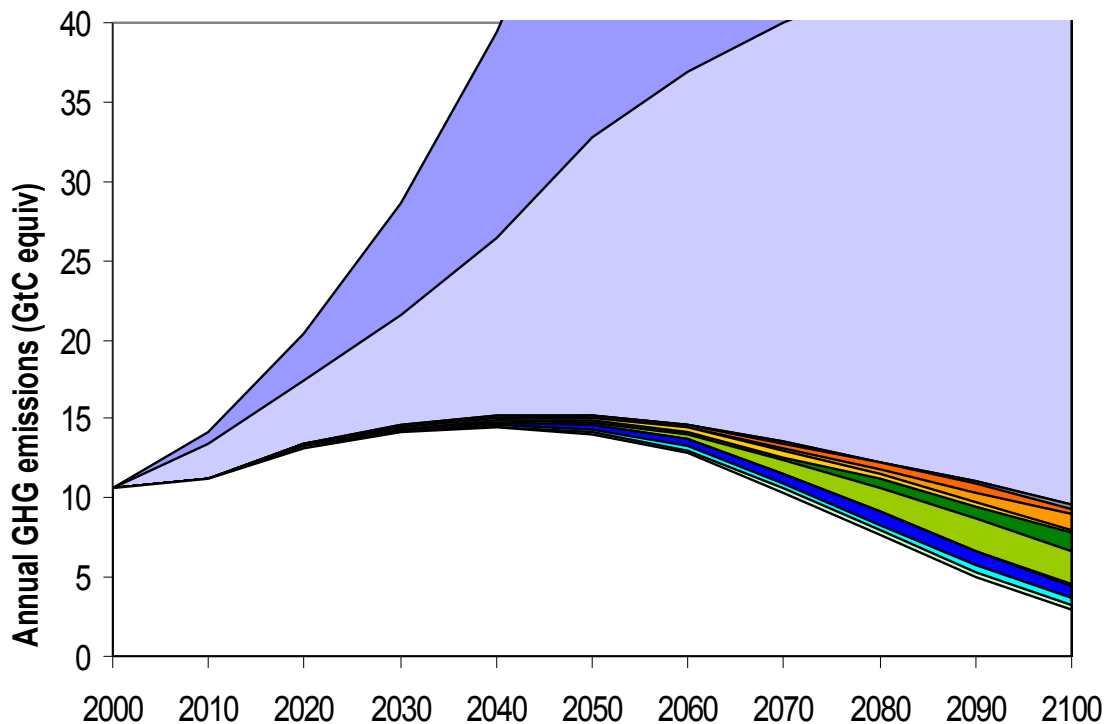
IIASA B1 Scenario



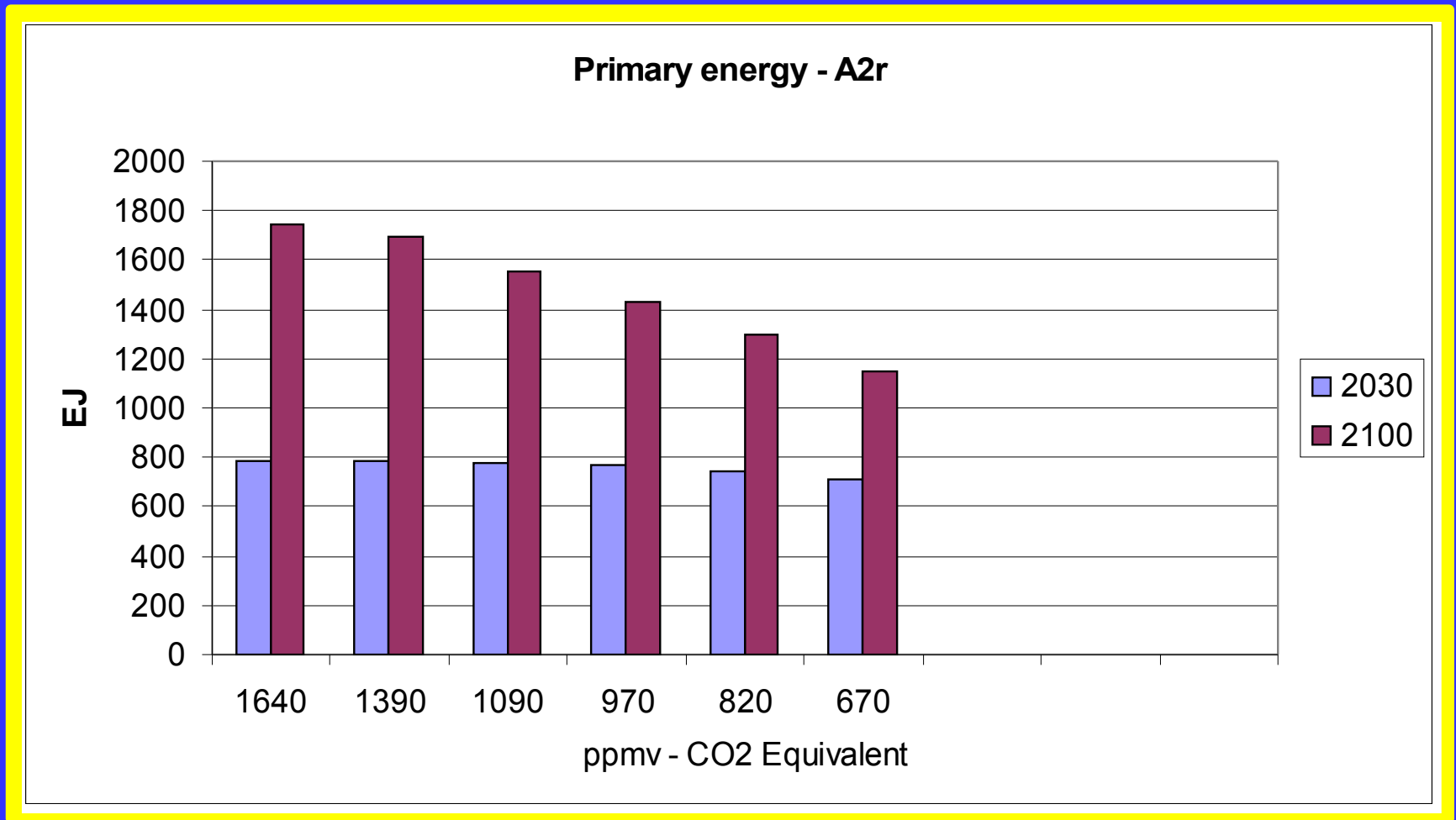
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World GHG Emissions

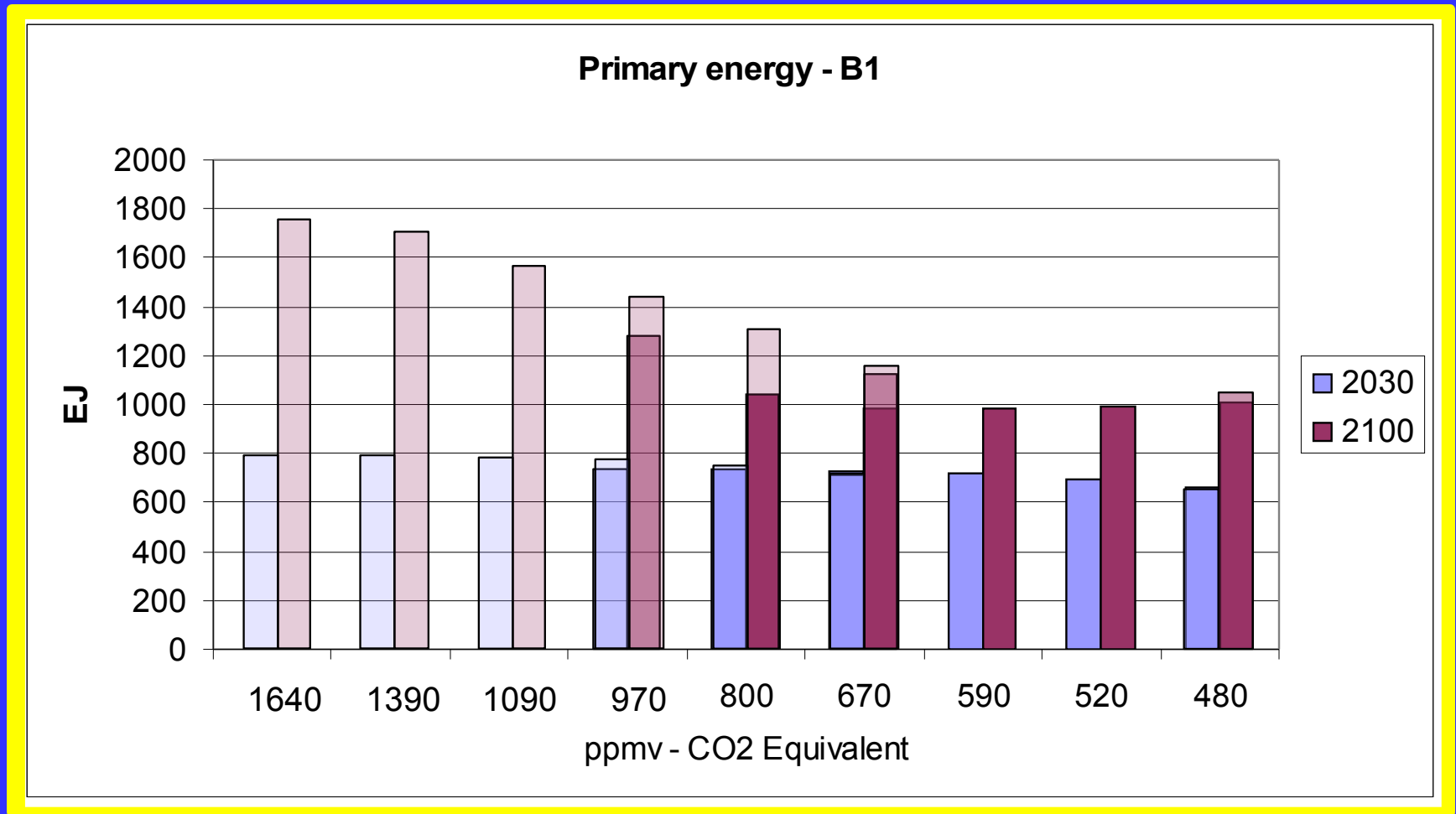
IIASA B1 Scenario



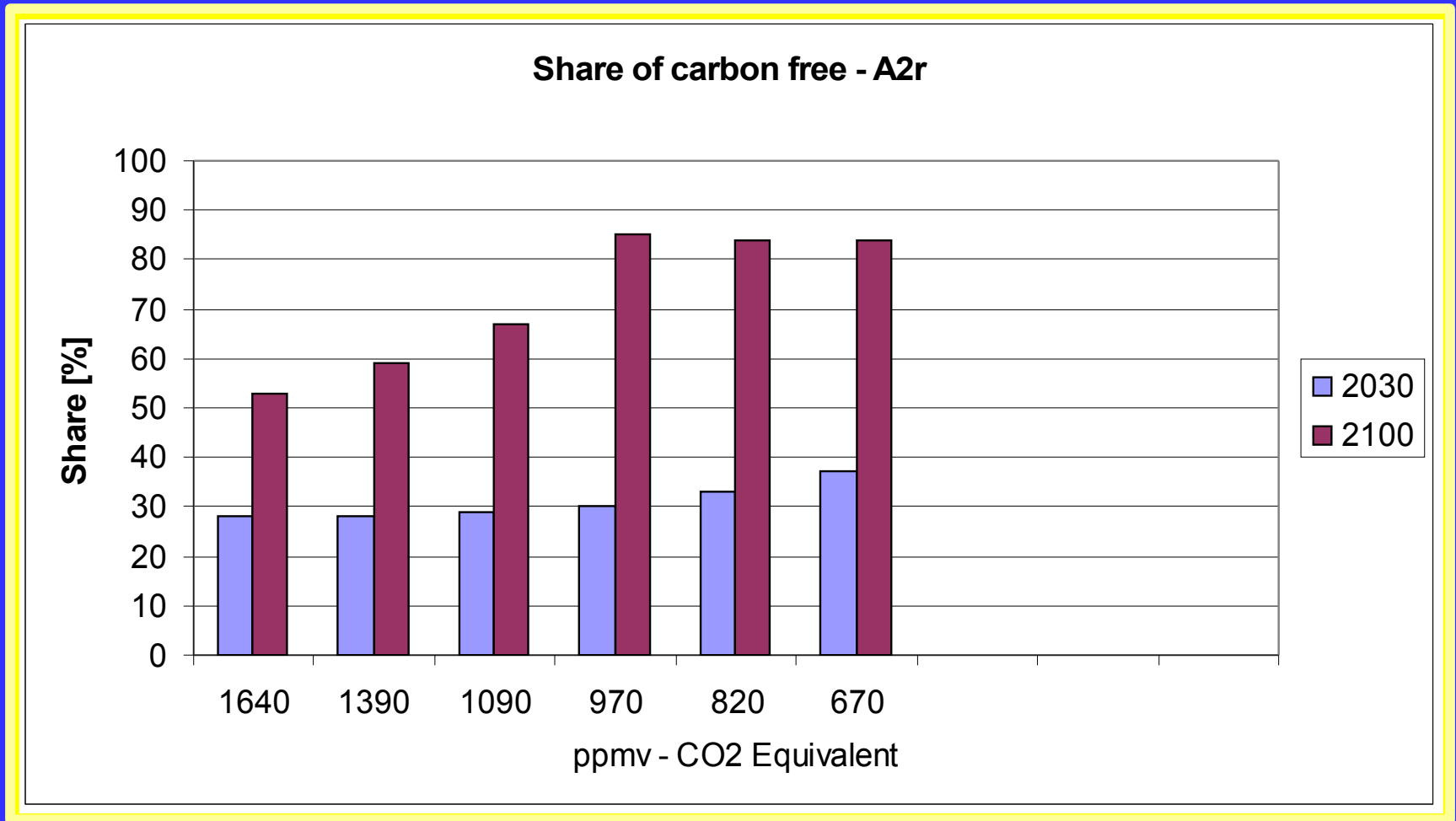
Primary Energy in A2r



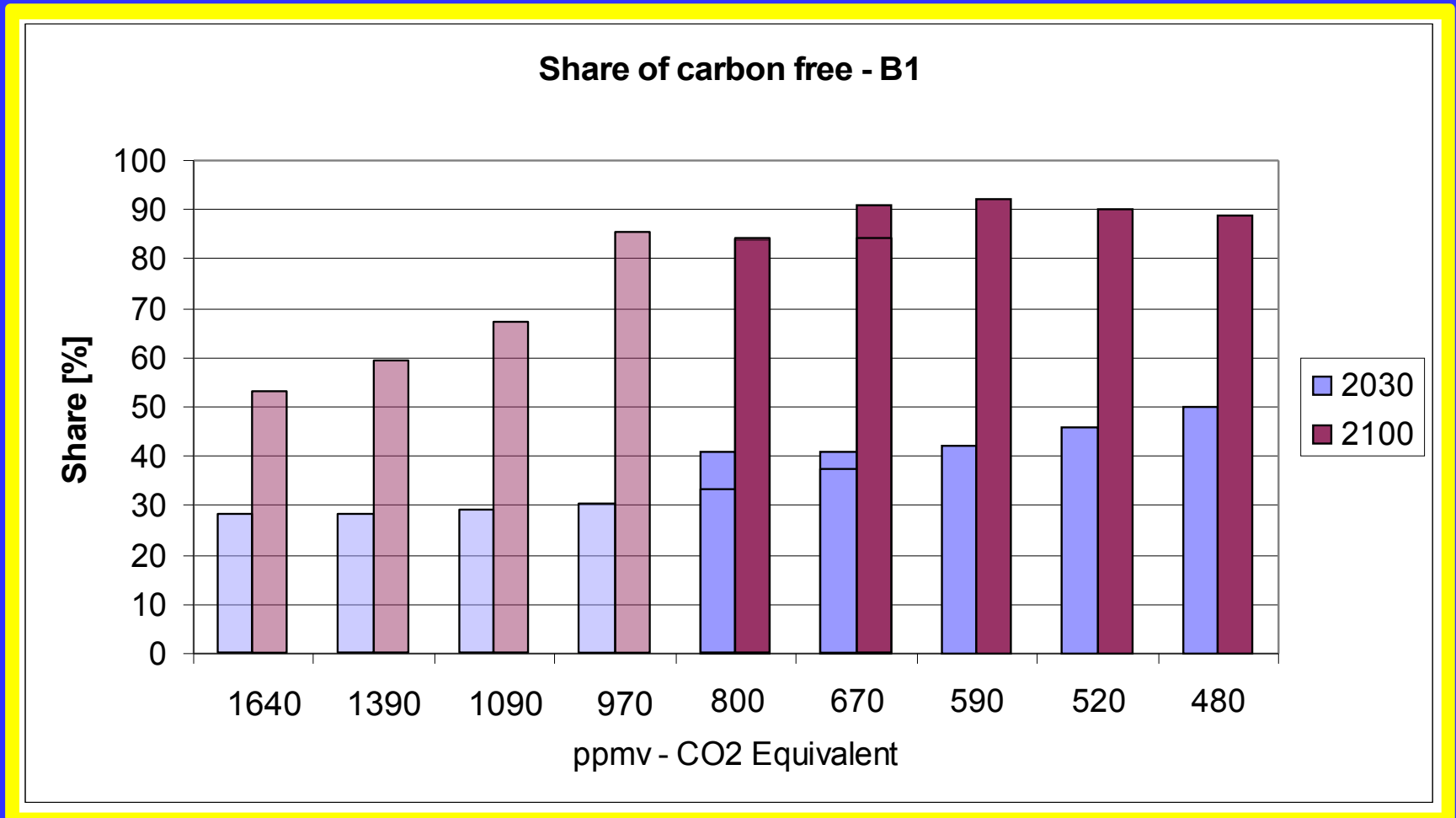
Primary Energy in B1r



Share of Carbon-Free in A2r

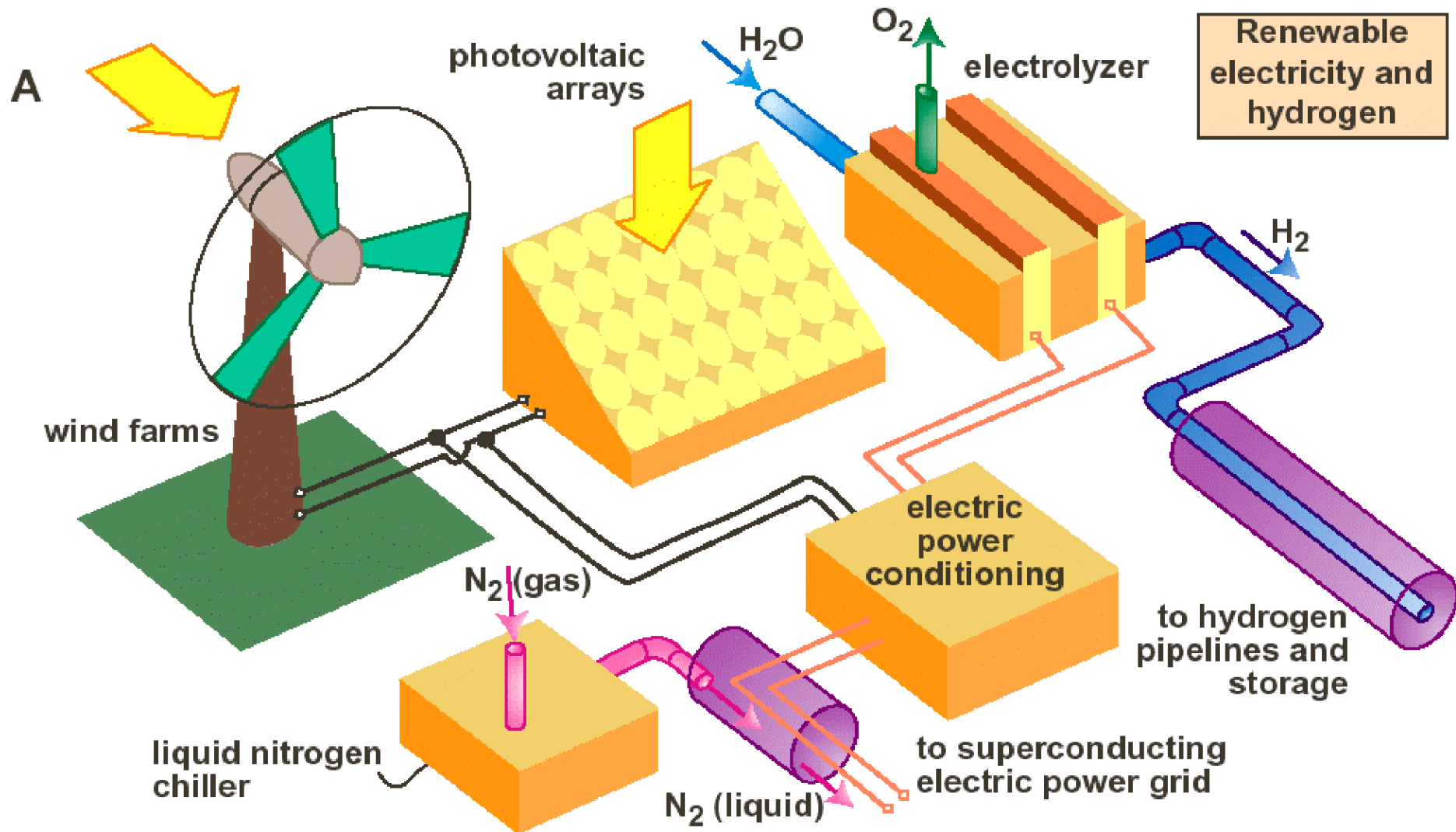


Share of Carbon-Free in B1_r



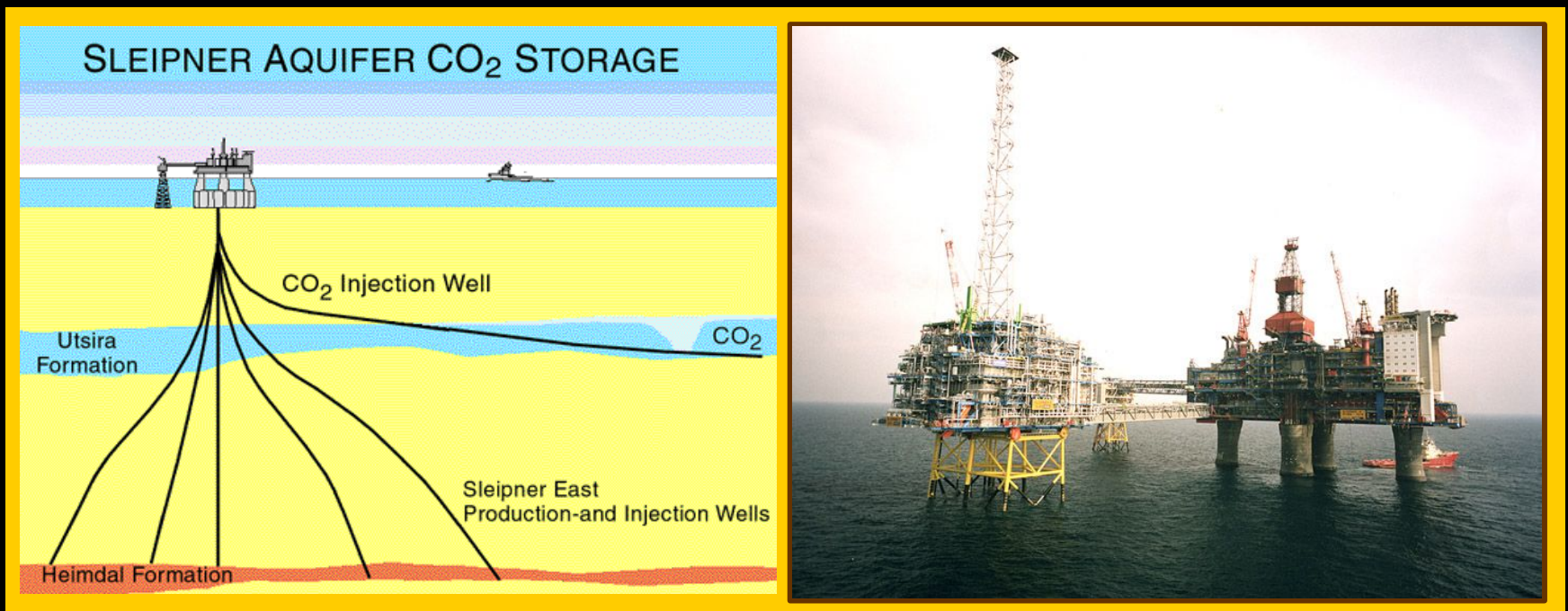
RENEWABLES

Hoffert et al., Science, 2002



Existing and Planned Projects

- Sleipner Project, saline formation, North Sea
- Weyburn, EOR, Saskatchewan, Canada
- In Salah, gas reservoir, Algeria (development)
- Snohvit, off-shore saline formation, North Sea
- Gorgon, saline formation, Australia (planning)

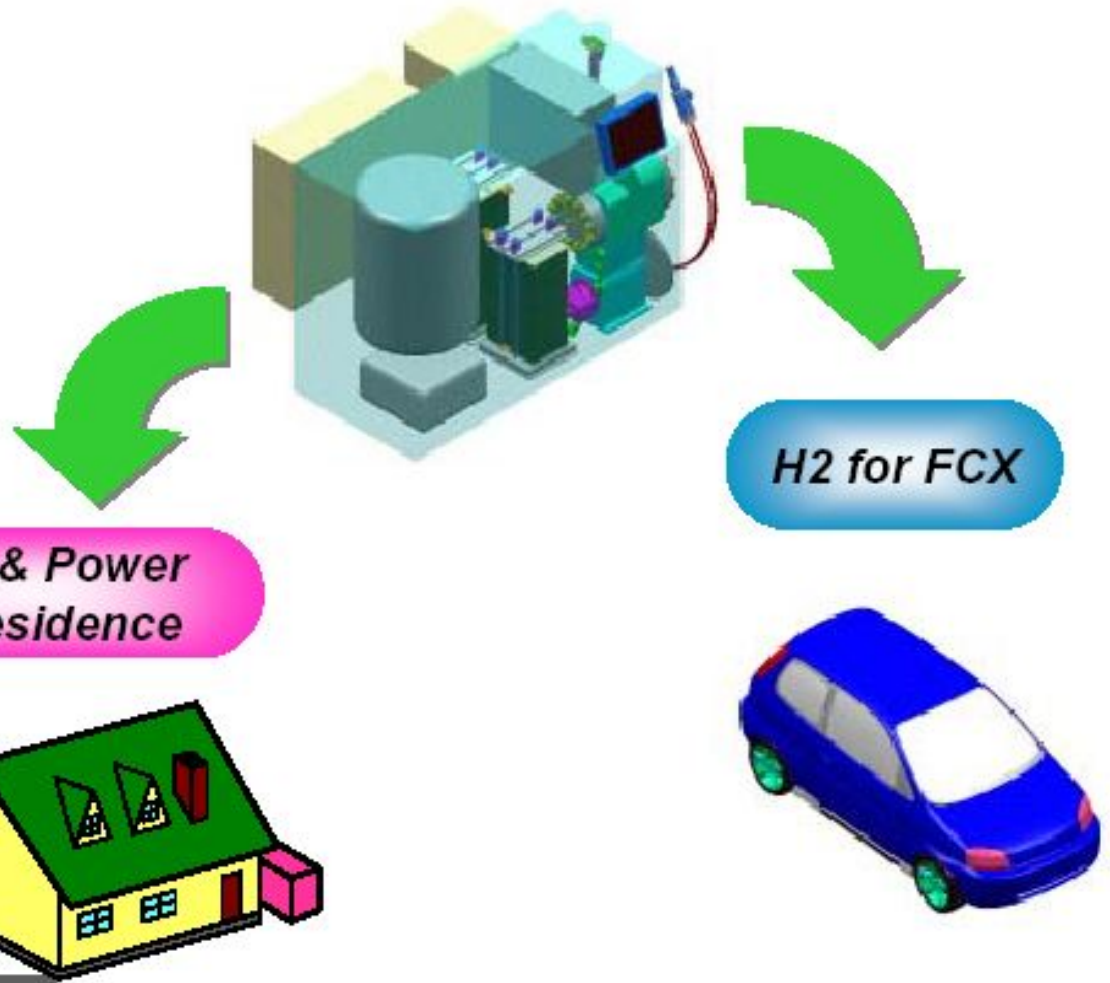


Toyota Prius CNG

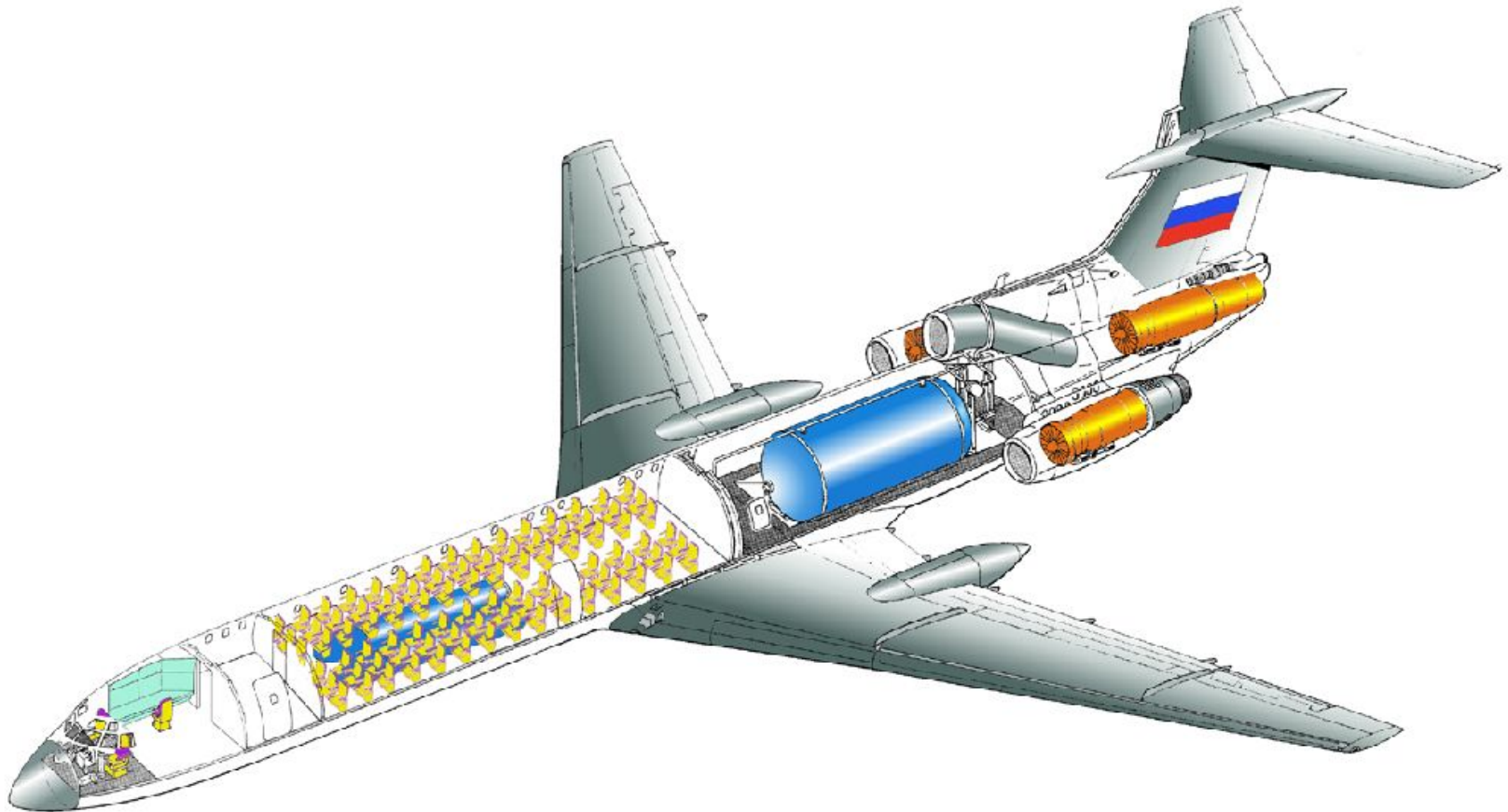


Home Refueling System Concept

- ▶ *Home-size combined system, which provides Hydrogen to FCV as well as Electricity and Heat to household.*



CNG & Hydrogen Airplane



Source: Tupolev

Hydrogen Airplane Design



Source: Airbus

Hydrogen Airplane Design



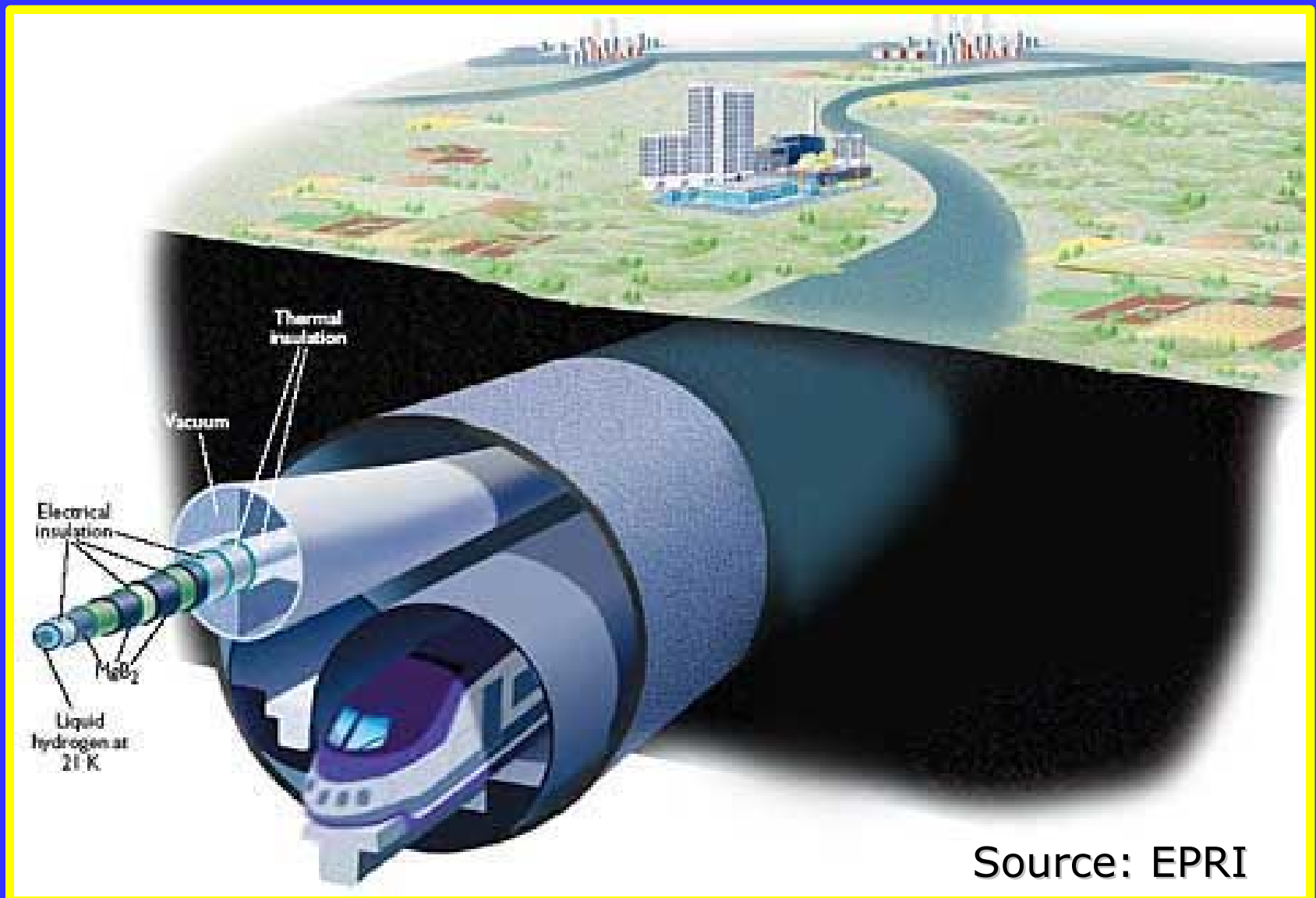
Source: Tupolev

Hydrogen Airplane Design

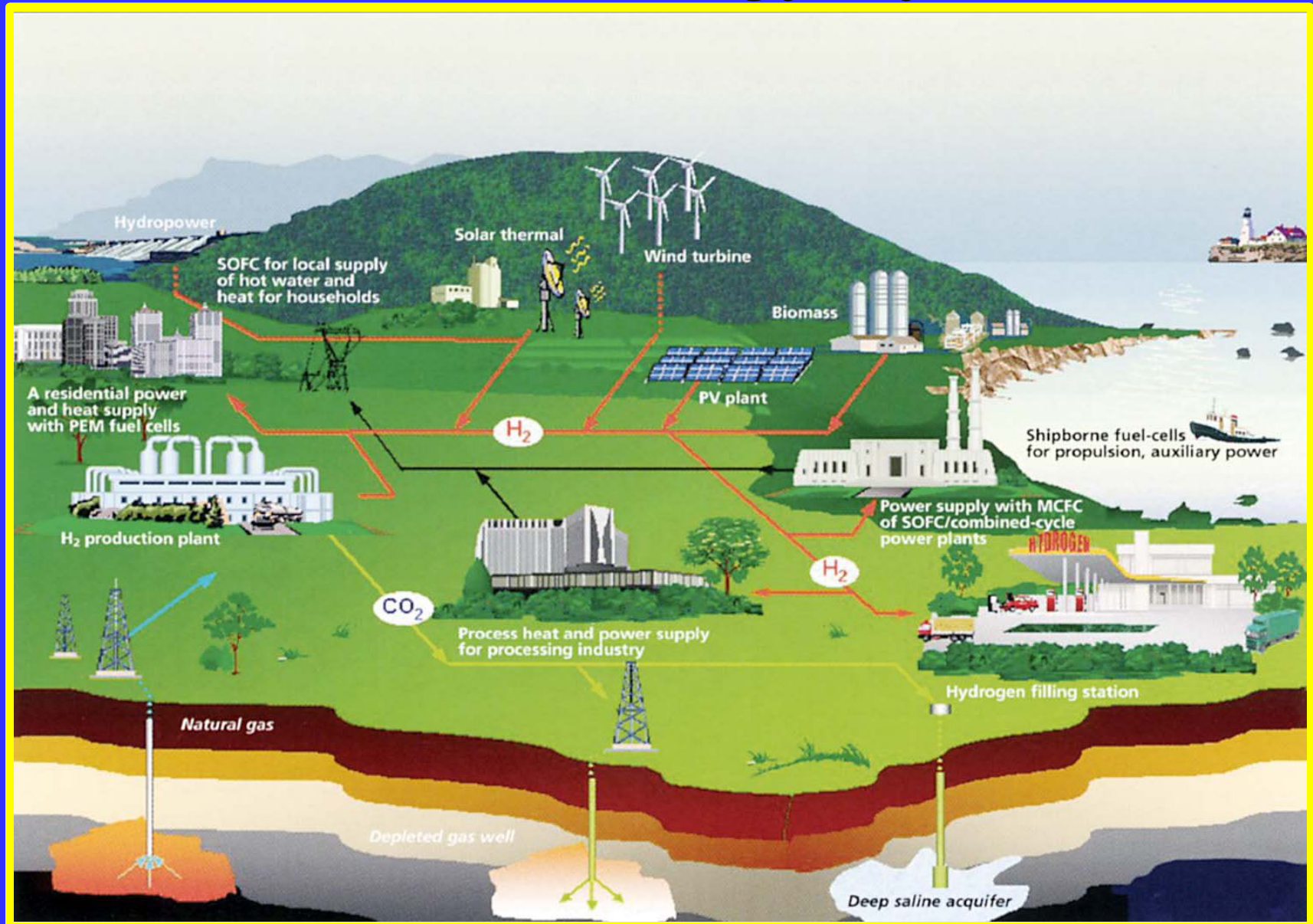


Source: Tupolev

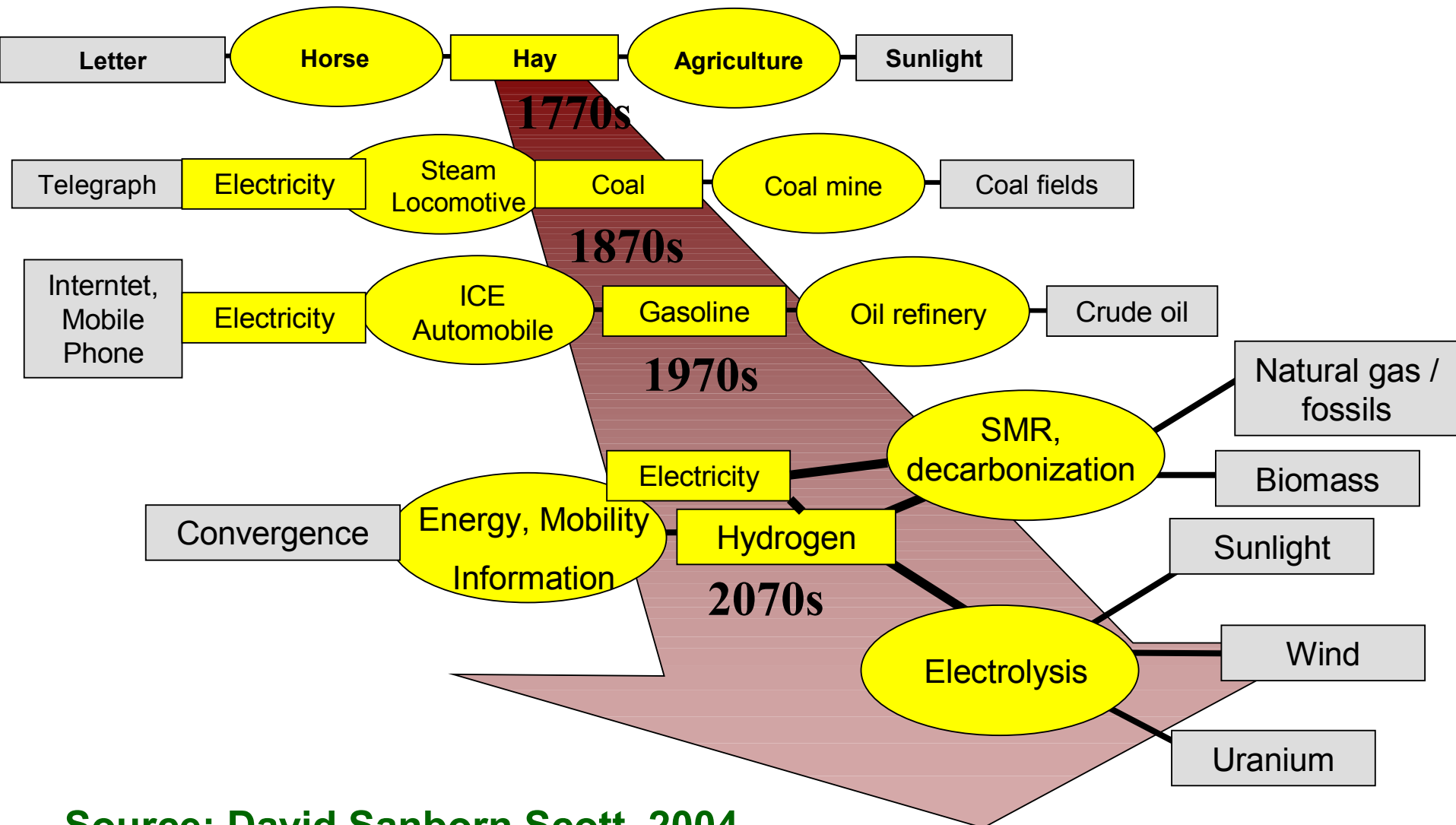
Energy SuperGrid and MagLev Trains



A Future Energy System



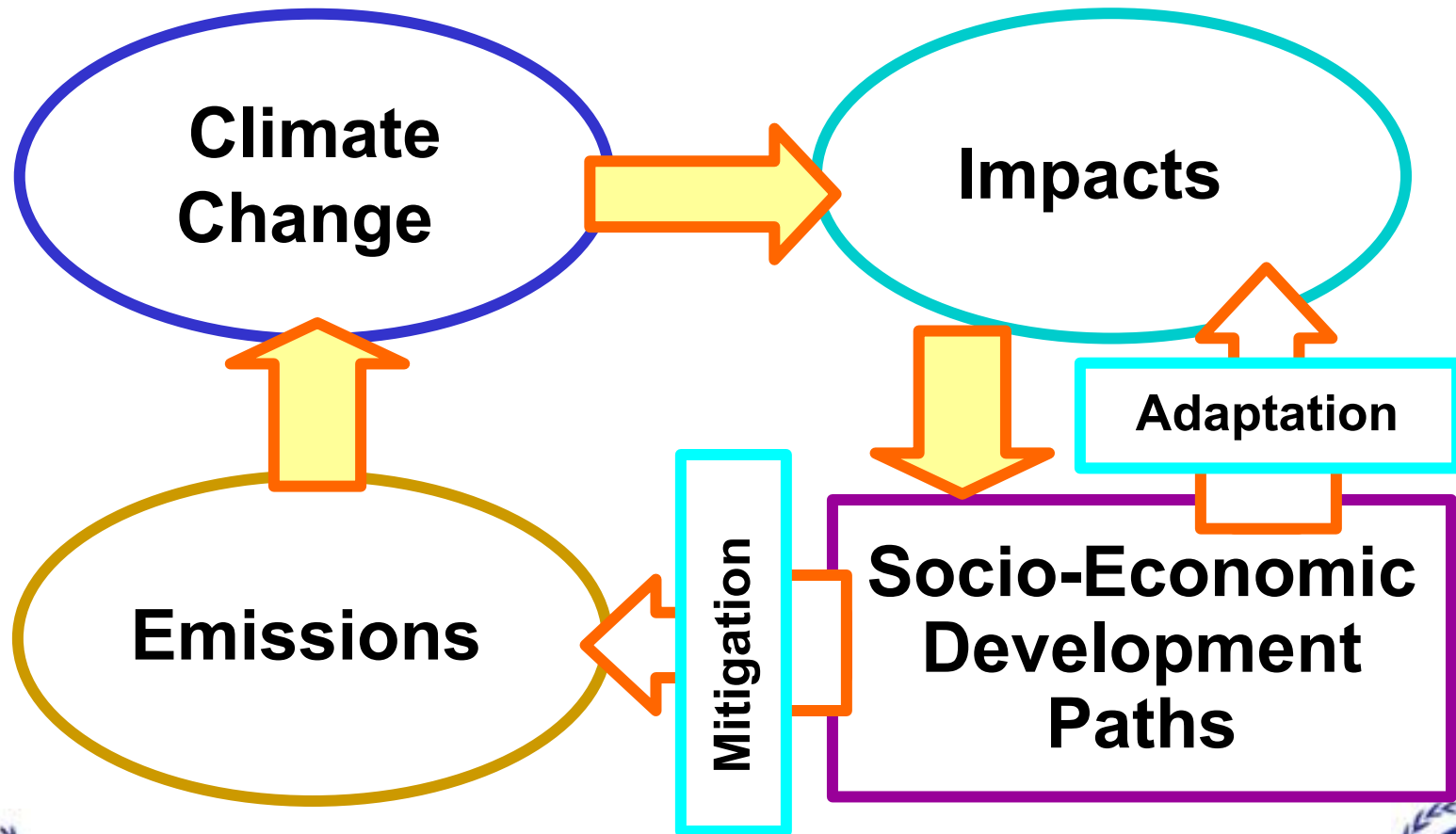
Energy Services and Sources Through Time



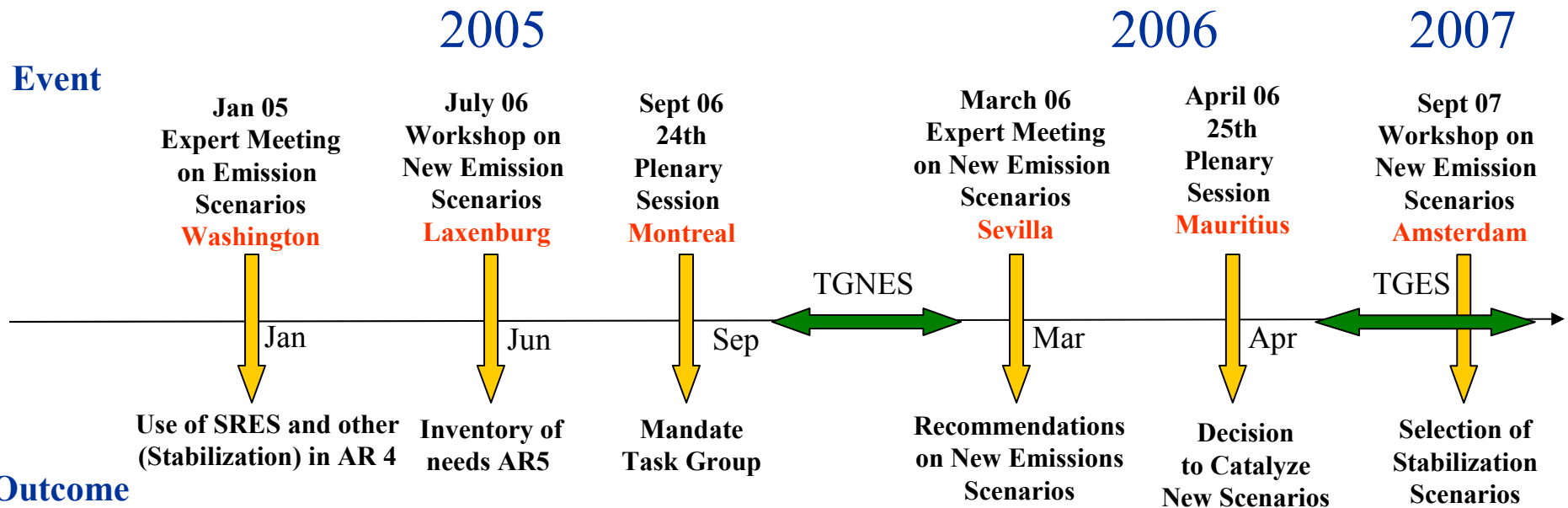
Source: David Sanborn Scott, 2004

Integrated Assessment Framework

IPCC 2001



IPCC Scenario Events and Outcomes

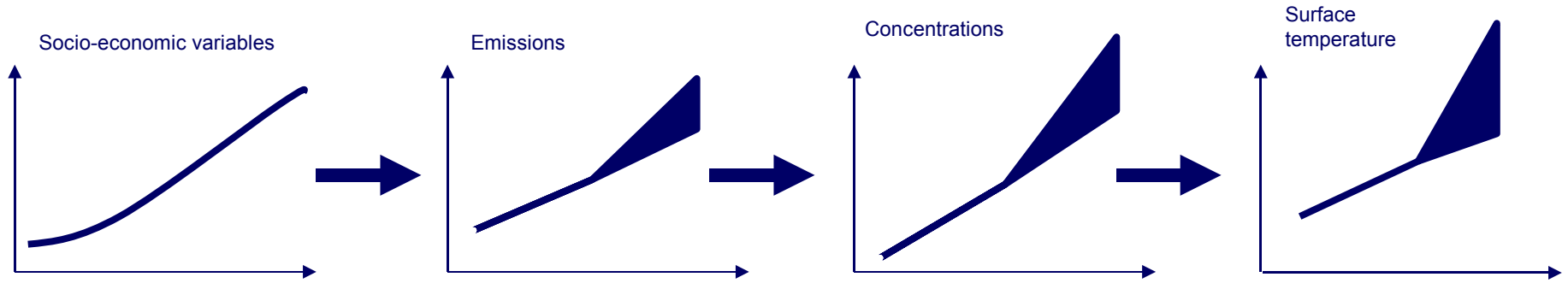


SOURCE; AFTER BERT METZ, 2006

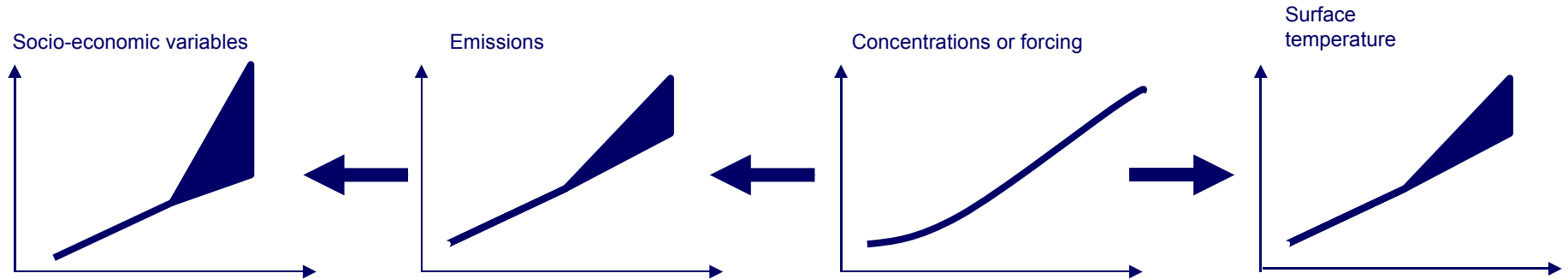
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)



Forward approach: start with socio-economic variables



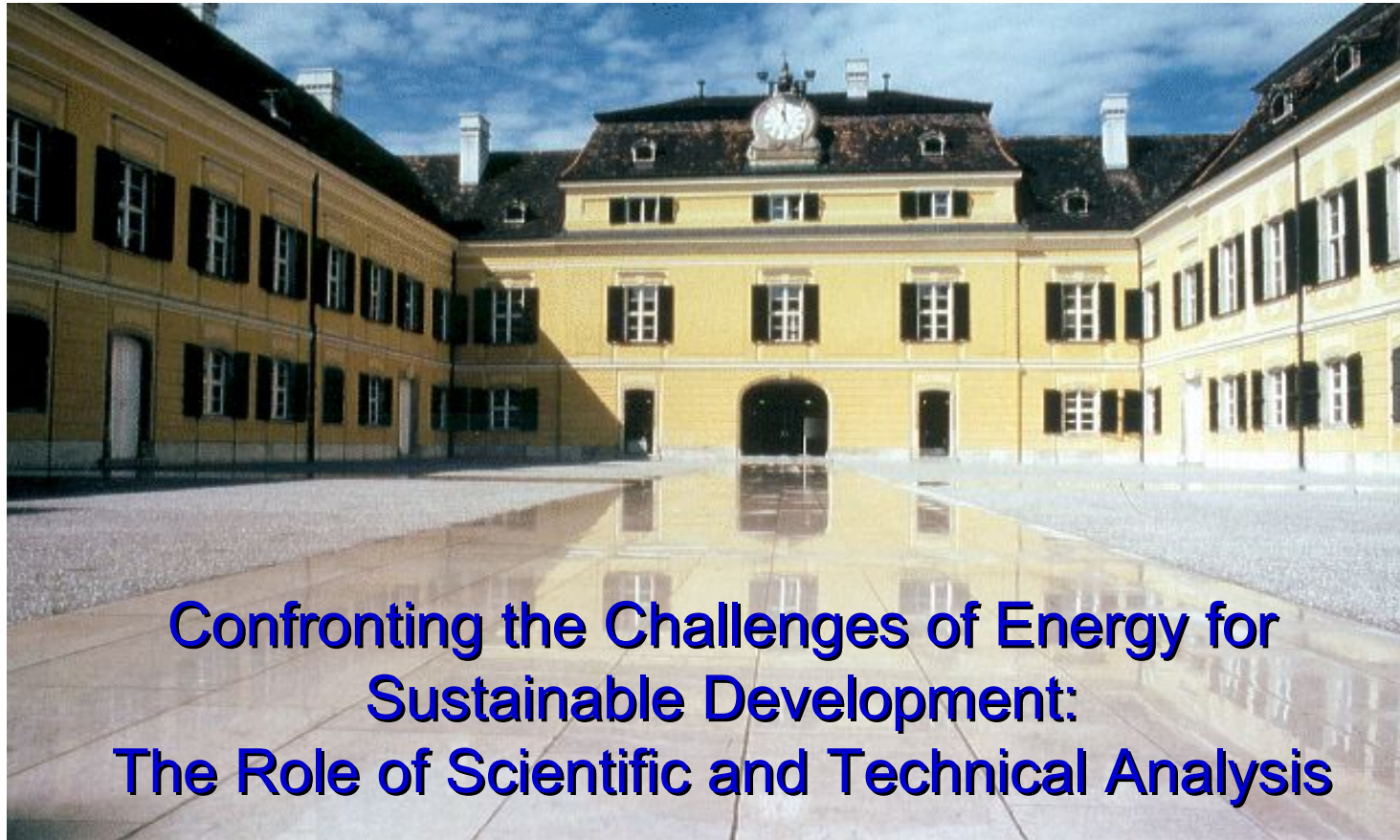
Reverse approach: start with stabilization scenario concentrations



International Consortium

Facilitate the coordination of scenario development efforts

		
International Institute for Applied Systems Analysis (IIASA)	Energy Modeling Forum (EMF) Stanford University	National Institute for Environmental Studies (NIES)
<ul style="list-style-type: none"> - <i>Asbjorn Aaheim</i> CICERO University of Oslo - <i>Keigo Akimoto</i> Research Institute of Innovative Technology for the Earth (RITE) - <i>Eduardo Calvo</i> WG III Bureau IPCC - <i>Patrick Criqui</i> Institut d'Economie et de Politique de l'Energie, IEPE-CNRS - <i>Francisco de la Chesnaye</i> US Environmental Protection Agency - <i>Jae Edmonds</i> Pacific Northwest National Laboratory - <i>Allen Fawcett</i> US Environmental Protection Agency - <i>Brian Fischer</i> CRA International - <i>Donald Hanson</i> Argonne National Laboratory - <i>Jean-Charles Hourcade</i> CIRED/CNRS/EHESS - <i>María E. Ibarrarán</i> Universidad de las Américas, Puebla - <i>Kejun Jiang</i> Energy Research Institute 	<ul style="list-style-type: none"> - <i>Mikiko Kainuma</i> National Institute for Environment Studies (NIES) - <i>Claudia Kemfert</i> DIW Berlin - <i>Atsushi Kurosawa</i> The Institute of Applied Energy - <i>Emilio Lèbre La Rovere</i> Programa de Planejamento Energético - PPE/COPPE/UFRJ - <i>Bruce McCarl</i> Texas A&M University - <i>Nebojsa Nakicenovic</i> International Institute for Applied Systems Analysis (IIASA) - <i>Hom Pant</i> Australian Bureau of Agricultural and Resource Economics (ABARE) - <i>Keywan Riahi</i> International Institute for Applied Systems Analysis (IIASA) - <i>Richard Richels</i> Electric Power Research Institute (EPRI) - <i>Thomas Rutherford</i> Economist 	<ul style="list-style-type: none"> - <i>Ronald Sands</i> Joint Global Change Research Institute - <i>Priyadarshi Shukla</i> Indian Institute of Management - <i>Steve Smith</i> Pacific Northwest National Laboratory - <i>Richard Tol</i> University of Hamburg, Institute for Environmental Studies (IVM), Economic and Social Research Institute (ESRI) - <i>Jose Eddy Torres</i> Energy-Environment-Economy Modeling and Analysis Group Universidad de Los Andes / Universidad Nacional de Colombia - <i>Detlef van Vuuren</i> The Netherlands Environmental Assessment Agency (MNP) - <i>Marc Vielle</i> CEA-LERNA - <i>Virginia Vilariño</i> Business Council for Sustainable Development – Argentina - <i>John Weyant</i> Energy Modeling Forum (EMF), Stanford University



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