Scénarios énergétiques: enjeux, méthodes, projets scientifiques

P. Criqui

Science and Policy advice

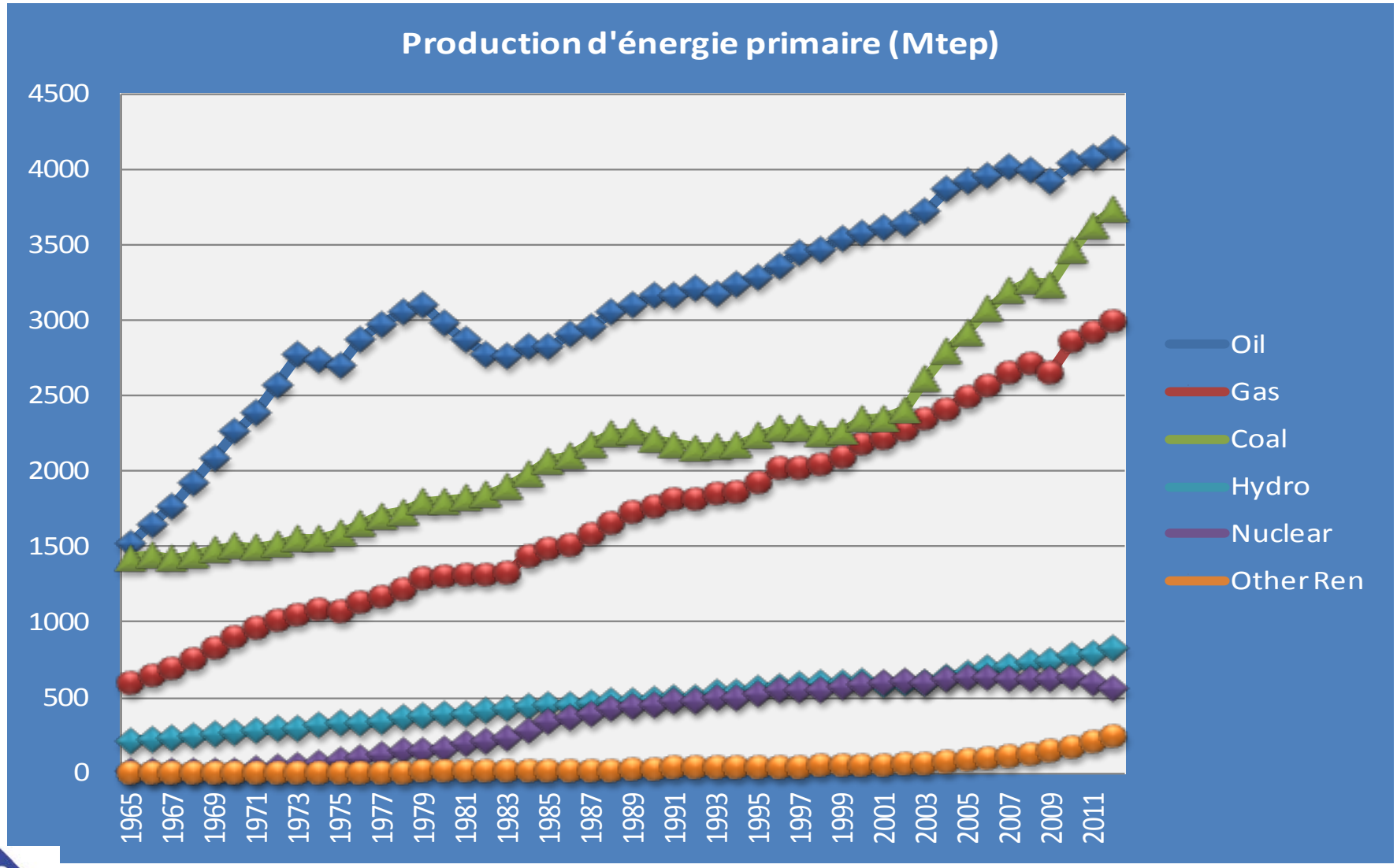
(from Edenhofer & Kowarsch, 2013)

- **Four different philosophical perspectives:**

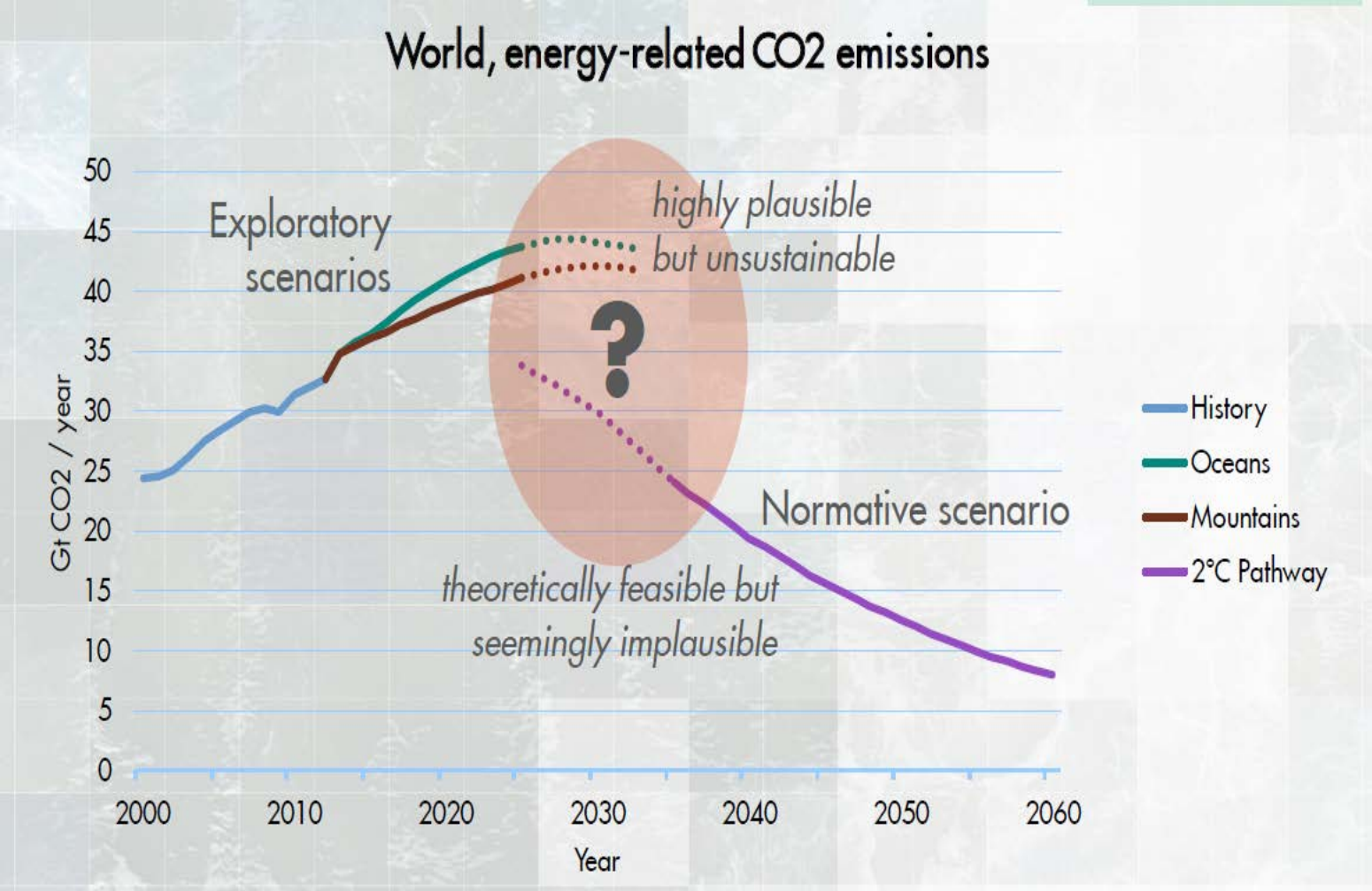
1. **Positivist-scientist:** facts are facts and there is one best solution for any problem; scientists are the best collocated for taking the right decisions (**Hans Jonas'** *"government by the scientists"*; in economics, **W. Nordhaus** with the *intertemporal Cost-Benefit Analysis of climate policies)*
2. **Positivist-decisionist:** there is one best solution, but in everyday's life policy-makers are *"muddling through"* while arbitraging between scientific statements, industries' short-term interests and social acceptability constraints
3. **Constructivist-relativist:** facts are entwined with value judgements and for many social scientists (*"science studies"*) every discourse is socially constructed; this applies to the scientific discourse that do not have a natural pre-eminence (**Bruno Latour**: *we can politically decide that there is a human influence on climate*)
4. **Pragmatic-enlighted model:** different solutions exist to any social problem, depending on value judgements; but the role of scientists is to identify the problems and the solutions in a given context, while documenting their consequences (**John Dewey's** *process of scientific inquiry*)

- ***Anticiper pour “rendre possible ce qui est souhaitable”***
- ***Incertitudes politiques dans la gestion des contraintes physiques***
- ***AMPERE: plusieurs modèles valent mieux qu’un !***
- ***DNTE (et ANCRE): de la “jungle des scénarios” au “jardin français”***
- ***DDPP: réconcilier le bottom-up et le top-down mondial pour Paris-Climat 2015***

Ongoing trends



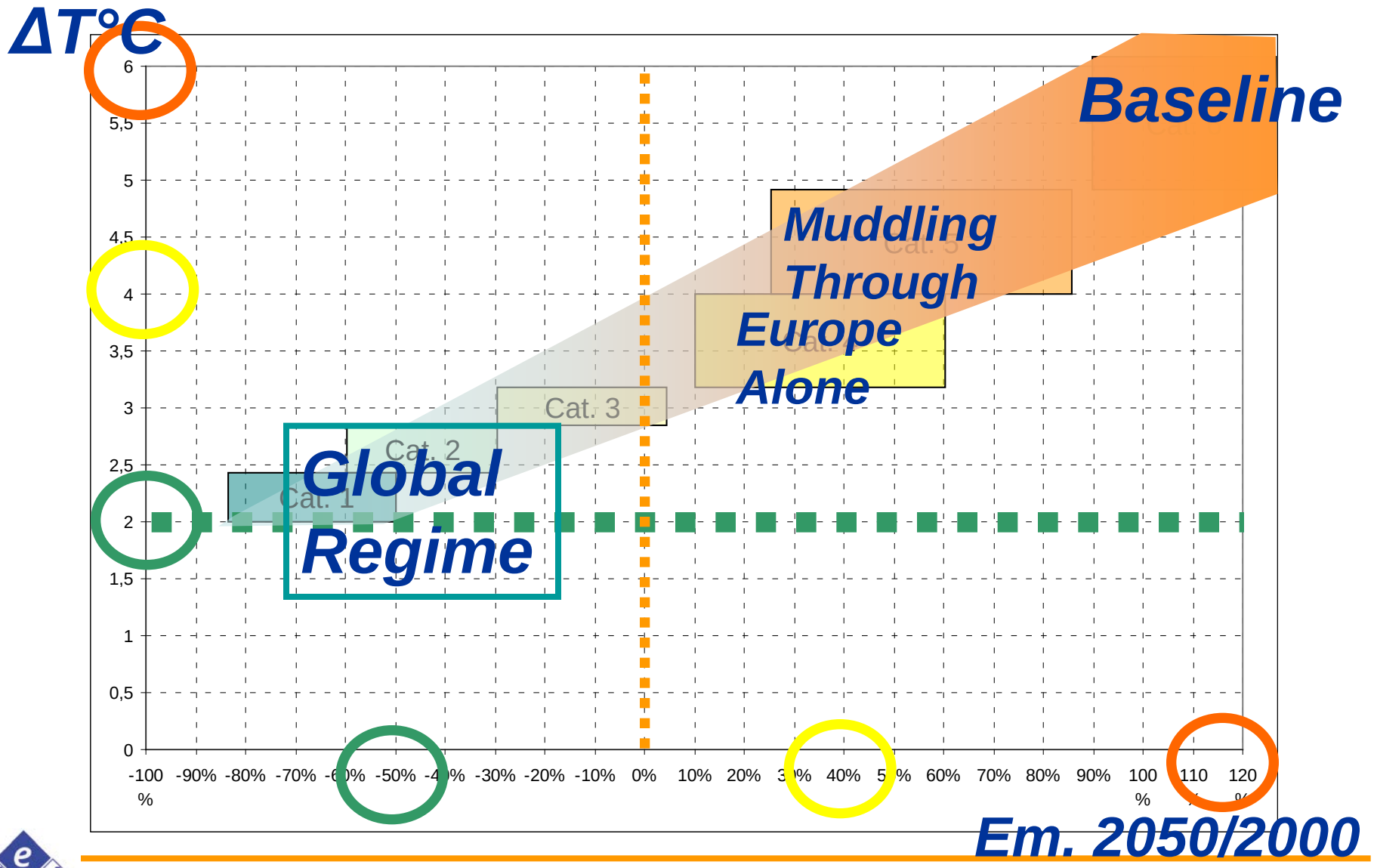
Looking forward: exploratory and normative scenarios



Source SHELL: Mountains and Oceans scenarios

- *Anticiper pour “rendre possible ce qui est souhaitable”*
- ***Incertitudes politiques dans la gestion des contraintes physiques***
- *AMPERE: plusieurs modèles valent mieux qu’un !*
- *DNTE (et ANCRE): de la “jungle des scénarios” au “jardin français”*
- *DDPP: réconcilier le bottom-up et le top-down mondial pour Paris-Climat 2015*

IPCC-AR4: scenarios viewed from SPM T5



EDDEN-ENERDATA: scenarios for world energy markets in VALORCO

Climate policies / Non-conventional gas policies	Muddling Through	Europe Alone	Global Regime
No shale	X	X	X
USA only w/o exports	X	X	X
USA only w/ exports	X	X	X
Everywhere but in Europe	X	X	X
Everywhere	X	X	X

- *Anticiper pour “rendre possible ce qui est souhaitable”*
- *Incertitudes politiques dans la gestion des contraintes physiques*
- ***AMPERE: plusieurs modèles valent mieux qu’un !***
- *DNTE (et ANCRE): de la “jungle des scénarios” au “jardin français”*
- *DDPP: réconcilier le bottom-up et le top-down mondial pour Paris-Climat 2015*

Tools: IAMs in the FP7 AMPERE project

AMPERE is a unique European modeling platform

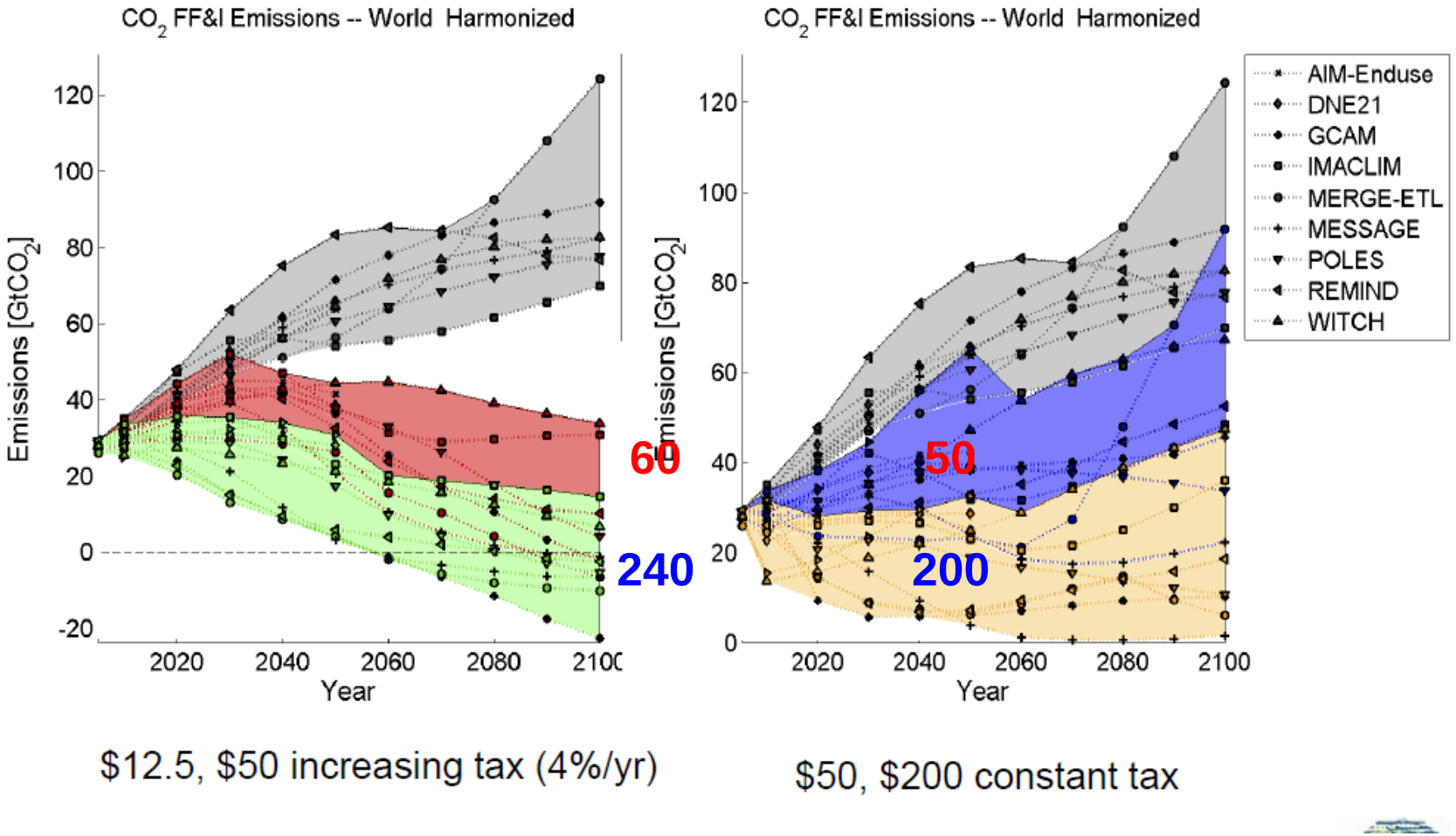
- Bringing together European groups with 10 global and 6 EU27 energy-economy / integrated assessment models
- Plus 5 groups from China (ERI), India (IIM), Japan (NIES, RITE), USA (PNNL)
- Plus 2 climate modeling groups (ClimateAnalytics, Hadley Centre)

	Inter-temporal GE model	CGE	Partial equilibrium energy system model		Other (Bottom-up / econometric models)
Global	REMIND	IMACLIM	IMAGE / TIMER	DNE21+	
Global	WITCH	WorldScan (EU detail)	TIAM-IER	IPAC	
Global	MESSAGE-MACRO	GEM-E3	POLES	GCAM	
Global	MERGE-ETL	AIM			
EU27		GEM-E3	PRIMES, Green-X TIMES-PanEU		GAINS, NEMESIS
India			MARKAL India		

Source: Elmar Kriegler PIK, AMPERE Venice meeting, 23-25 May 2012

FP7 AMPERE: Diagnostics

CO2 Fossil Fuel and Industry Emissions



Source: Elmar Kriegler PIK, AMPERE Venice meeting, 23-25 May 2012

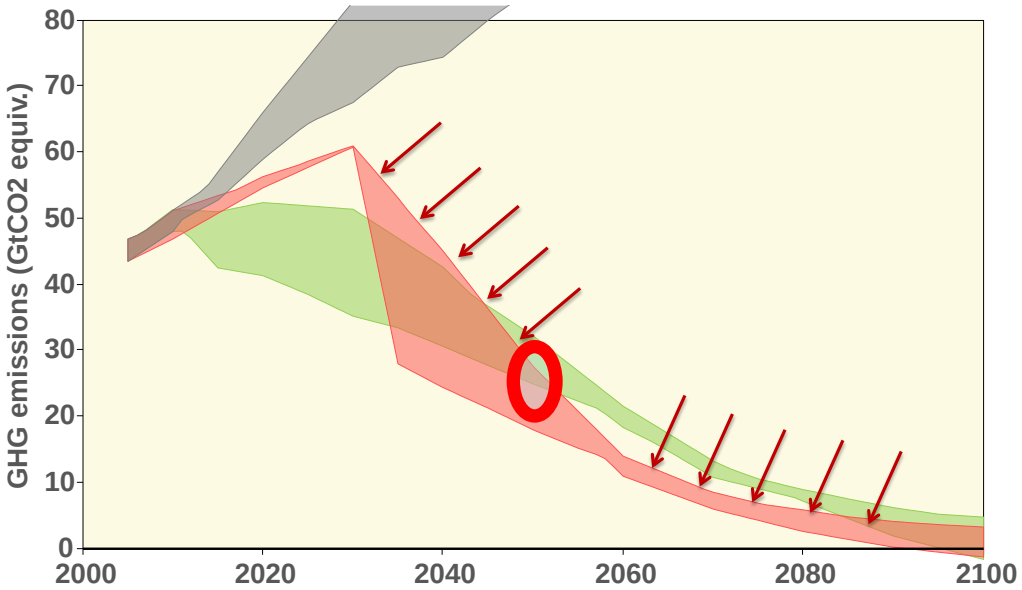
Climate goals and delay:
Delayed action results in the need for unprecedented mitigation in the following decades

Near-term climate action by 2030 will be critical

- Continuation along current pledges exhausts ~70% of the emissions budget by 2030
- The lack of near-term mitigation needs to be compensated by massive emissions reductions later in time

The findings suggest global GHG emissions targets of less than 50 $GtCO_2$ by 2030

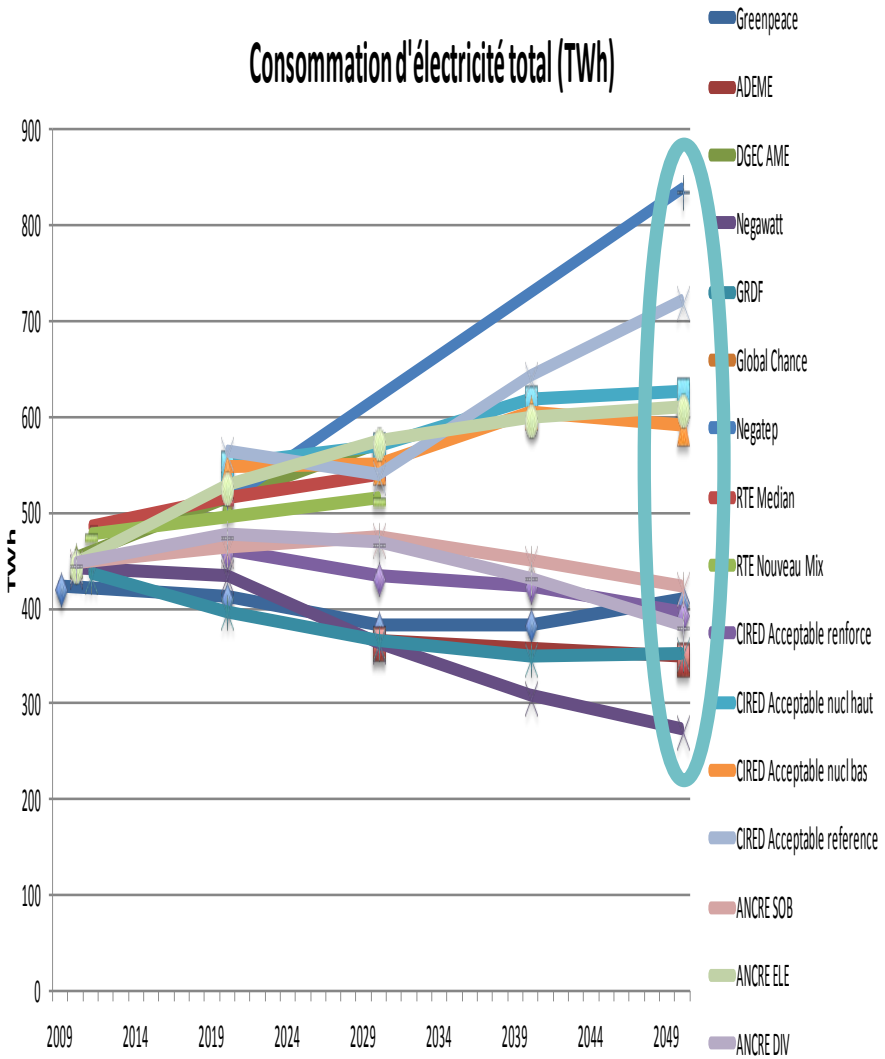
Implications of delayed action for reaching 2°C



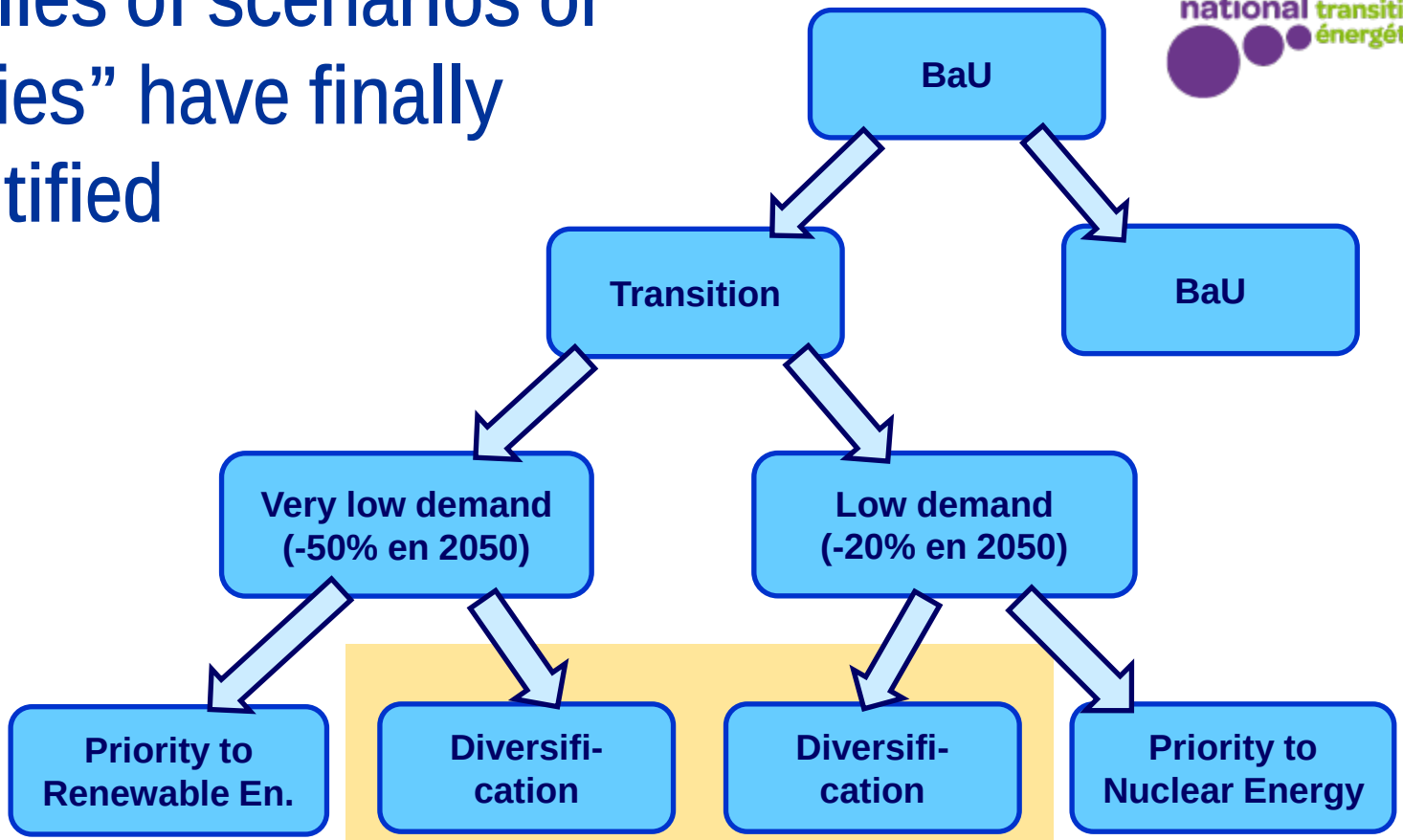
- *Anticiper pour “rendre possible ce qui est souhaitable”*
- *Incertitudes politiques dans la gestion des contraintes physiques*
- *AMPERE: plusieurs modèles valent mieux qu’un !*
- ***DNTE (et ANCRE): de la “jungle des scénarios” au “jardin français”***
- *DDPP: réconcilier le bottom-up et le top-down mondial pour Paris-Climat 2015*

The “scenario jungle”: France 2010-2050

- Hypotheses and results have been gathered from 16 pre-existing scenarios to 2050
- A very wide range of energy futures: total electricity consumption varies from 450 TWh today to between 280 and 820 TWh in 2050
- The main goal of the scenario working group and of its experts has been to:
  1. ***identify a limited number of structural “trajectories”***
  2. ***evaluate them in a mulitcriteria approach***



Four families of scenarios or “trajectories” have finally been identified



Four Trajectories: SOBriety | EFFiciency | DIVersity | DECarbonization

Explored by 15 scenarios:

SOBriety	EFFiciency	DIVersity	DECarbonization
négaWatt	**ADEME**	**ANCREdiv**	**Négatep**
Greenpeace	GRDF	RTEnouvmix	RTEmed
WWF	ANCREsob	DGECams-o	ANCREele
Global Chance	ENCILOCARBrenf		UFE

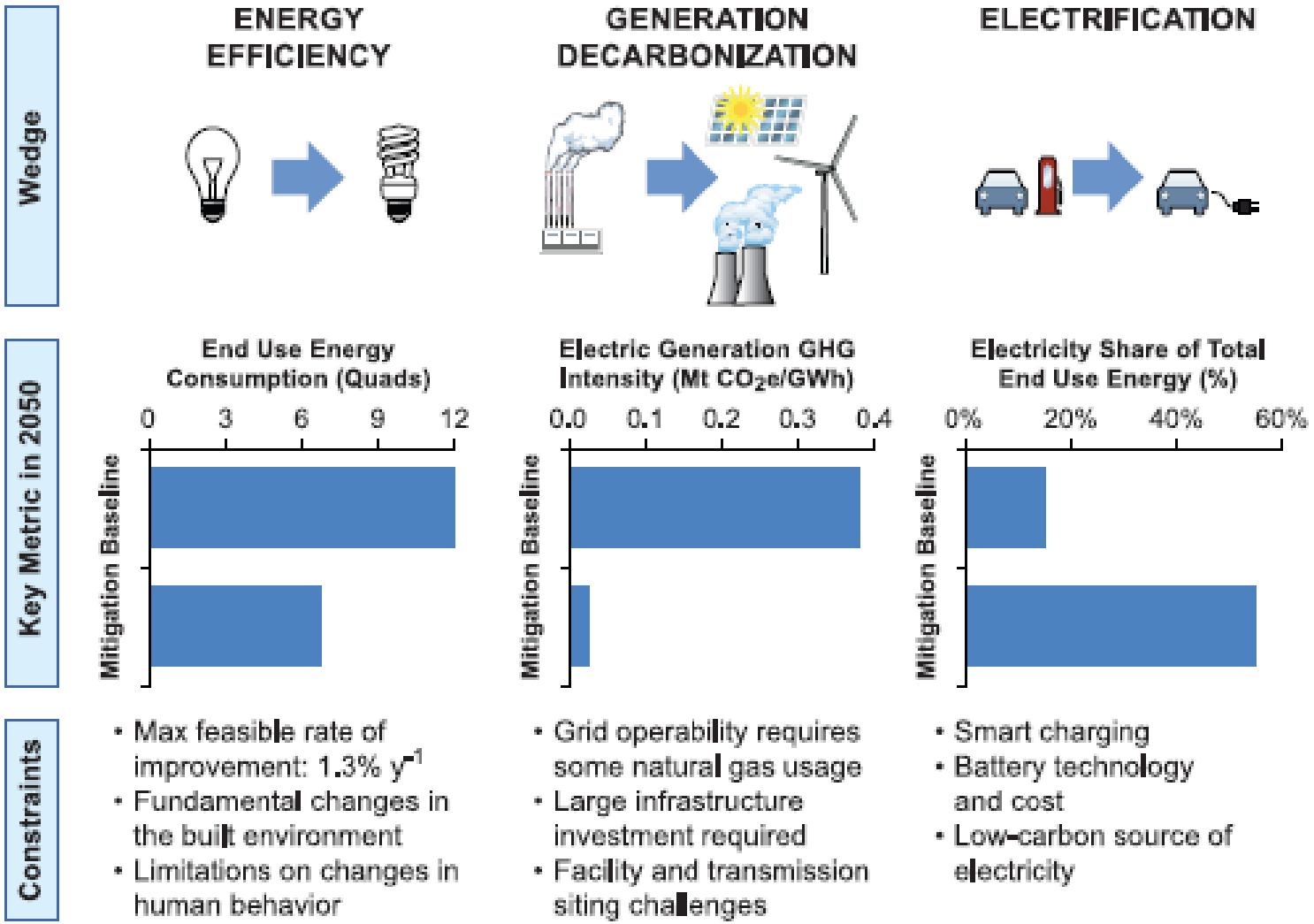
- *Anticiper pour “rendre possible ce qui est souhaitable”*
- *Incertitudes politiques dans la gestion des contraintes physiques*
- *AMPERE: plusieurs modèles valent mieux qu’un !*
- *DNTE (et ANCRE): de la “jungle des scénarios” au “jardin français”*
- ***DDPP: réconcilier le bottom-up et le top-down mondial pour Paris-Climat 2015***

The DDPP - Deep Decarbonisation Pathway Project UN-SDSN (J. Sachs – L. Tubiana)

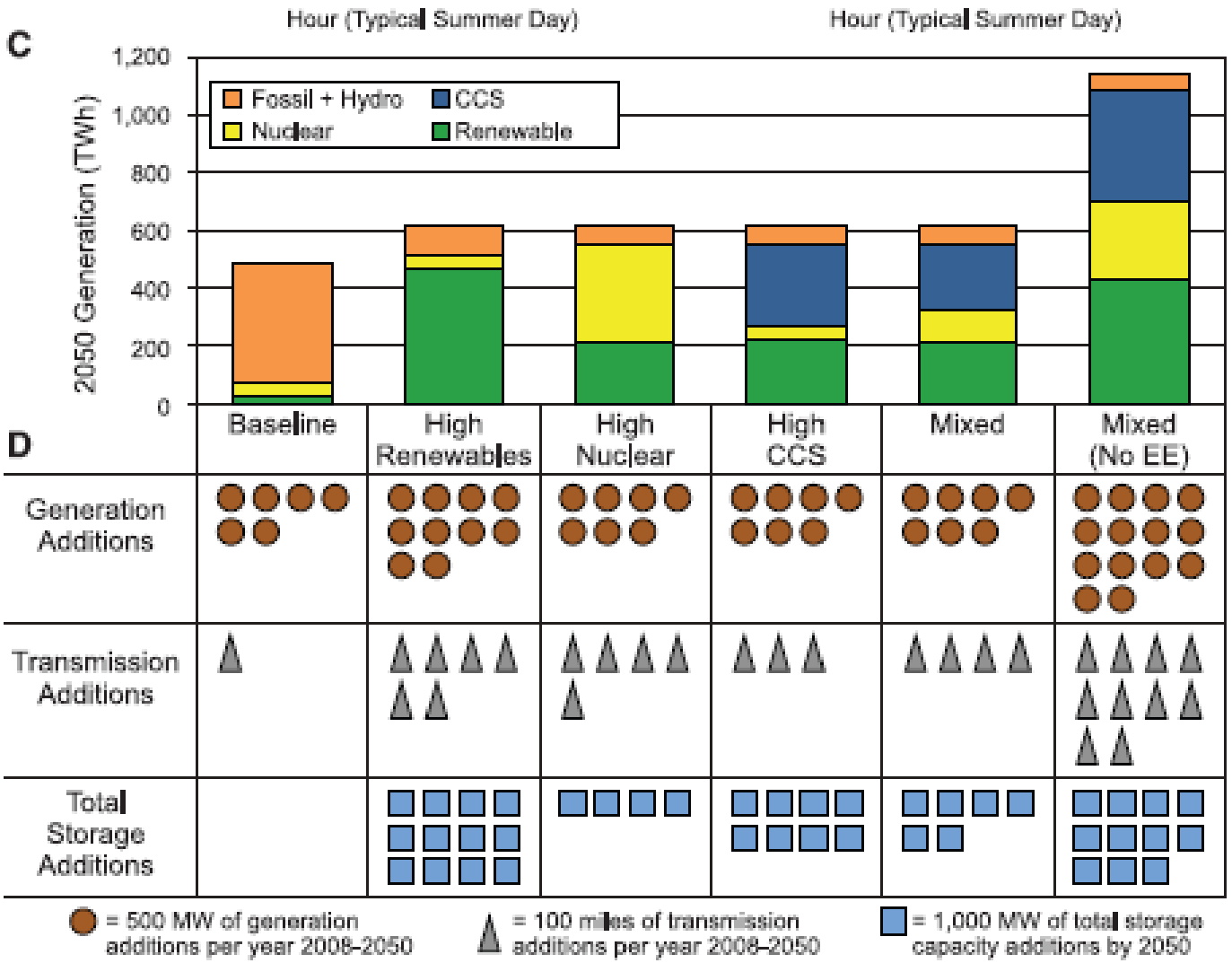
- *31 leading research institutions from 15 countries (the United States of America, Canada, Mexico, Brazil, France, Germany, United Kingdom, Russia, South Africa, India, China, Indonesia, South Korea, Japan, Australia), covering more than 75% of global C02 emissions. The project aims to:*

1. *Prepare **transparent national deep decarbonization pathways** to 2050 to help countries adopt and implement policies to achieve deep decarbonization.*
2. *Support a **positive outcome of the UNFCCC international climate negotiations** by 2015 by helping national decision makers and the international community to understand what deep decarbonization implies for individual countries and regions.*
3. *Review **aggregate global emission reduction pathways** prepared for AR5 by the WG III in light of the national decarbonization pathways.*
4. *Build an on-going global network to **facilitate learning and promote problem solving** in the implementation phase of national of deep decarbonization strategies after 2015*

Wedges (Jim Williams, Science 2012 and DDPP)



Robustness (Jim Williams, Science 2012 and DDPP)



Deep Decarbonisation: a research agenda

- Identify the **wedges for cost-effective decarbonisation** of energy systems (with consideration of the **robustness of the system**):
  1. Energy sobriety/efficiency
  2. Decarbonisation of electric and non-electric energy carriers
  3. Development of low carbon carriers (electricity) for transport uses
- Identify the pillars of a **consistent macro-economic strategy**:
  1. A macro-economic framework: investment substituting to recurrent fossil consumption generates new activities and employment, **under the constraint of economic competitiveness**
  2. An industrial strategy combining: innovation, demand-pull, market consolidation (EU scale) and “first-mover advantage”
- Develop the methodologies for the **assessment of the environmental impacts** of the different scenarios (accidents and health hazards, air quality, land, water, biodiversity...)