

# REGIONAL IMPACTS OF THE GLOBAL CARBON STAKES: LONG TERM PROSPECTIVE WITH TIAM-FR

Sandrine SELOSSE, Edi ASSOUMOU and Nadia MAIZI

Center for Applied Mathematics, MINES ParisTech  
Chair ParisTech Modeling for sustainable development



Chaire ParisTech Modélisation prospective  
au service du développement durable



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# Outline of the presentation



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1. TIAM Business as usual
2. Scenarios specifications
3. Scenarios results and analysis
4. Concluding remarks

# 1 - TIAM Business as usual

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## General assumptions:

- Main socio-economic drivers: Energy consumption based on external projections of:
  - ▣ The growth of regional GDP (World AAGR [2000-2050] = 3.072%)
  - ▣ The growth of population (9 billions of people in 2050)
  - ▣ The level of various economic sectors: Agriculture, Iron and Steel, Services, etc.
- Fossil fuel extraction prices: prices for crude oil, natural gas and hard coal
  - ▣ World Energy Outlook
  - ▣ DGEMP (General Directorate for Energy and Raw Materials)
  - ▣ International Energy Agency
  - ▣ Department Of Energy (US)

## 2- Scenarios specifications (1)



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Regions	Ref. year	Target COP 15		Target Post COP 15		Target Post COP 15 (2)	
		2020	2050	2020	2050	2020	2050
Australia	2005	NO	NO	34%	80%	34%	60%
Canada	2005	NO	NO	34%	80%	34%	60%
China	2005	40% (carbon intensity)	80% (carbon intensity)	60% (carbon intensity)	80% (carbon intensity)	10%	20%
Japan	1990	25%	80%	25%	80%	25%	80%
United States	2005	17%*	80%	34%	80%	34%	60%
Western Europe	1990	30%	80%	30%	80%	30%	80%

\* COP 15: United States: 42% by 2030

## 2- Scenarios specifications (2)

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### What does it mean?

#### □ China:

- COP 15: 2020<sub>/1990</sub>: +292% and 2050<sub>/1990</sub>: +485%
- Post COP 15: 2020<sub>/1990</sub>: +161% and 2050<sub>/1990</sub>: +485%
- Post COP 15 (2): 2020<sub>/1990</sub>: +109% and 2050<sub>/1990</sub>: +86%

#### □ United States:

- COP 15: 2020<sub>/1990</sub>: -0.33% and 2050<sub>/1990</sub>: -76%
- Post COP 15: 2020<sub>/1990</sub>: -20% and 2050<sub>/1990</sub>: -76%
- Post COP 15 (2): 2020<sub>/1990</sub>: -20% and 2050<sub>/1990</sub>: -52%

#### □ Western Union: 2020<sub>/2005</sub>: -52% and 2050<sub>/2005</sub>: -86%

#### □ Japan: 2020<sub>/2005</sub>: -32% and 2050<sub>/2005</sub>: -82%

## 2- Scenarios specifications (3)



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### Remarks: Reference data for CO<sub>2</sub> emissions

Regions	1990		2005	
	UN Data (Gt)	TIAM (Gt)	UN Data (Gt)	TIAM (Gt)
AU	0.316	<b>0.328</b>	0.396	<b>0.411</b>
CAN	0.450	<b>0.447</b>	0.560	<b>0.556</b>
CHI	2.415	<b>1.953</b>	5.626	<b>4.550</b>
JPN	1.172	<b>2.162</b>	1.300	<b>2.398</b>
USA	4.865	<b>5.067</b>	5.841	<b>6.085</b>
WEU	2.352	<b>2.448</b>	3.417	<b>3.556</b>

# 3- Scenario analysis results (1)



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Results presented at COP 15 in a side event organised by ParisTech  
« *Beyond the financial crisis: Regional energy policy and global carbon constraints* »

The focus is on the effects on :

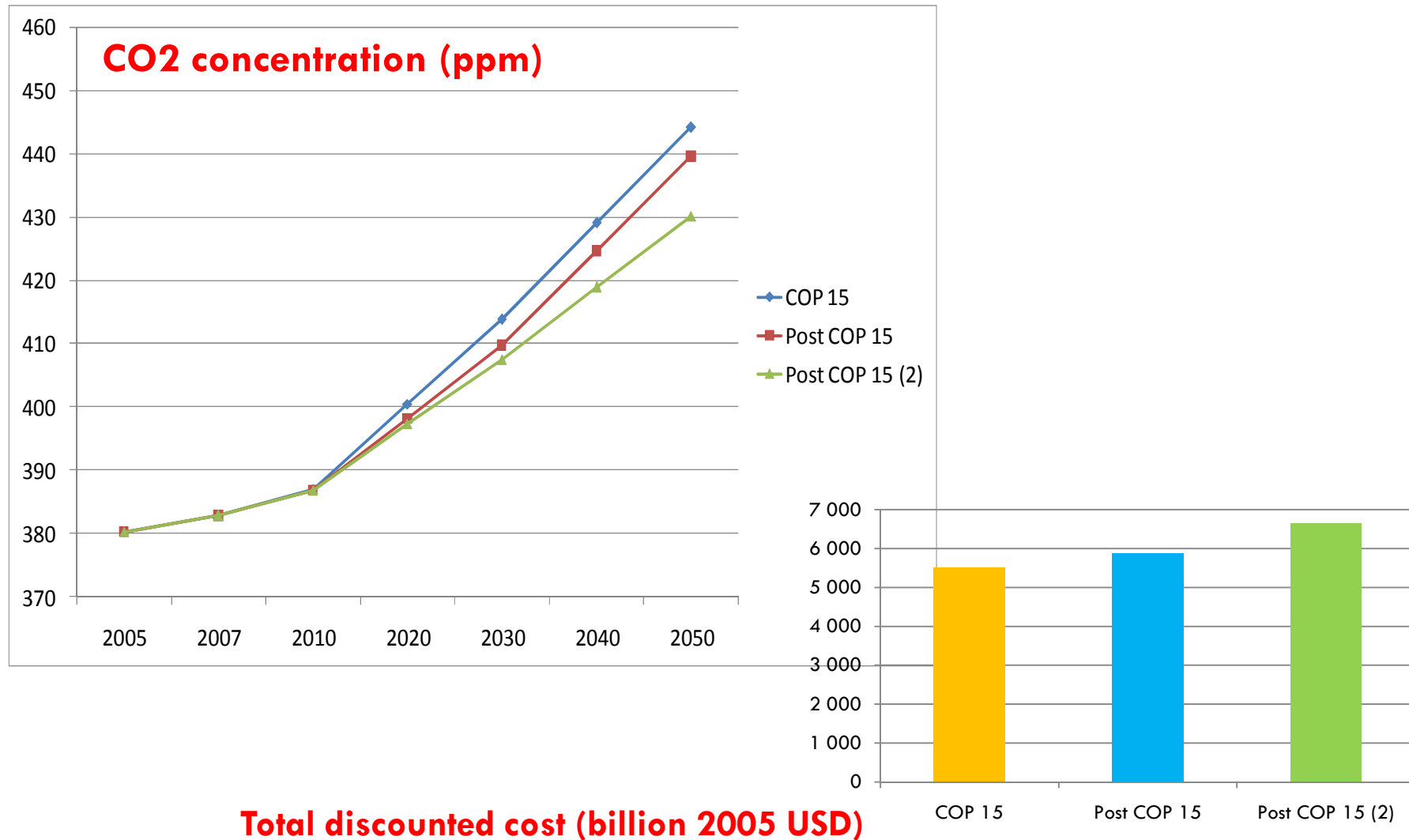
- World and regional CO<sub>2</sub> emissions
- Total costs of the policy
- Regional carbon costs
- Total energy consumption

...associated with the different CO<sub>2</sub> mitigation targets

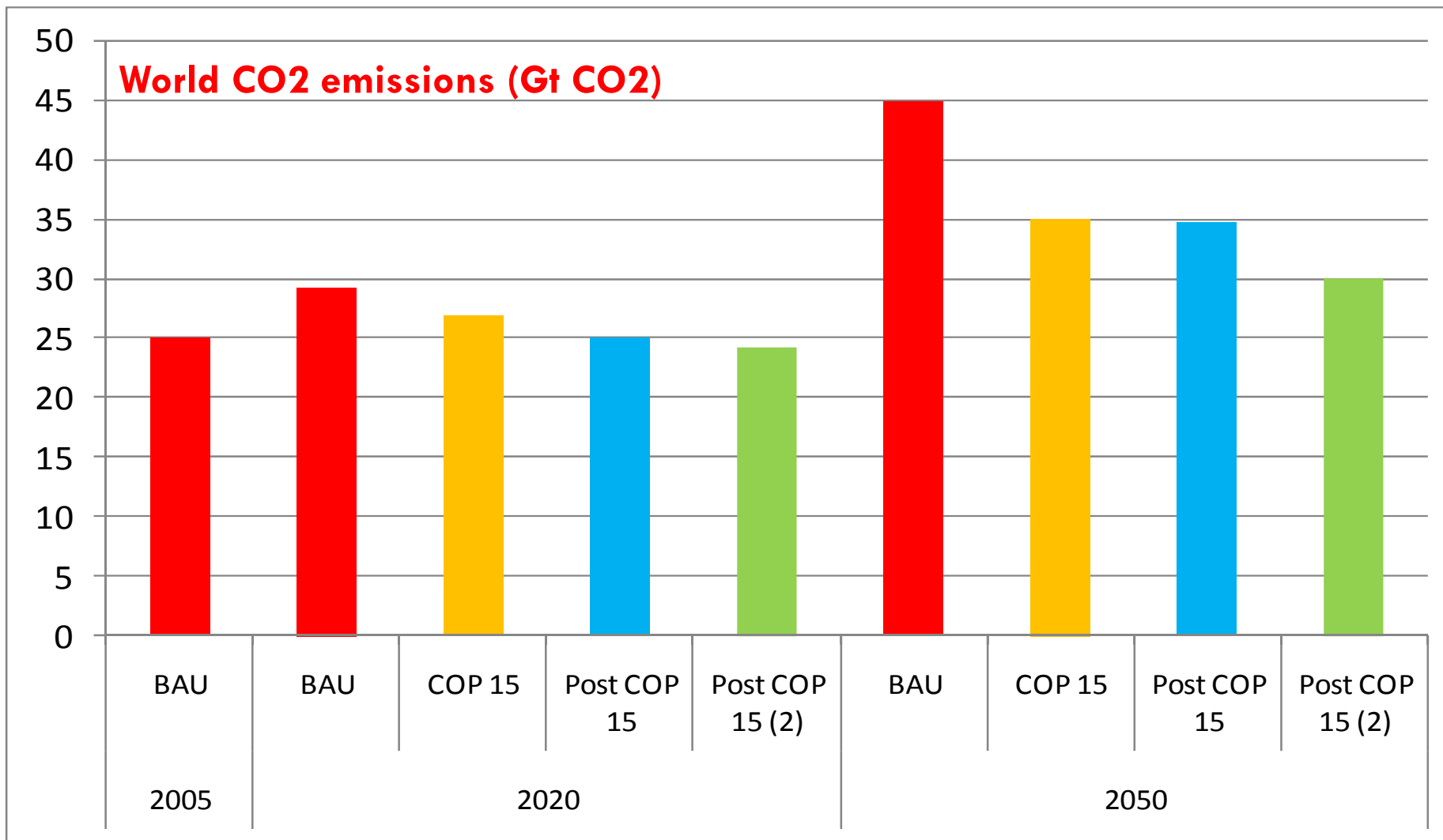
# 3- Scenarios results and analysis (2)

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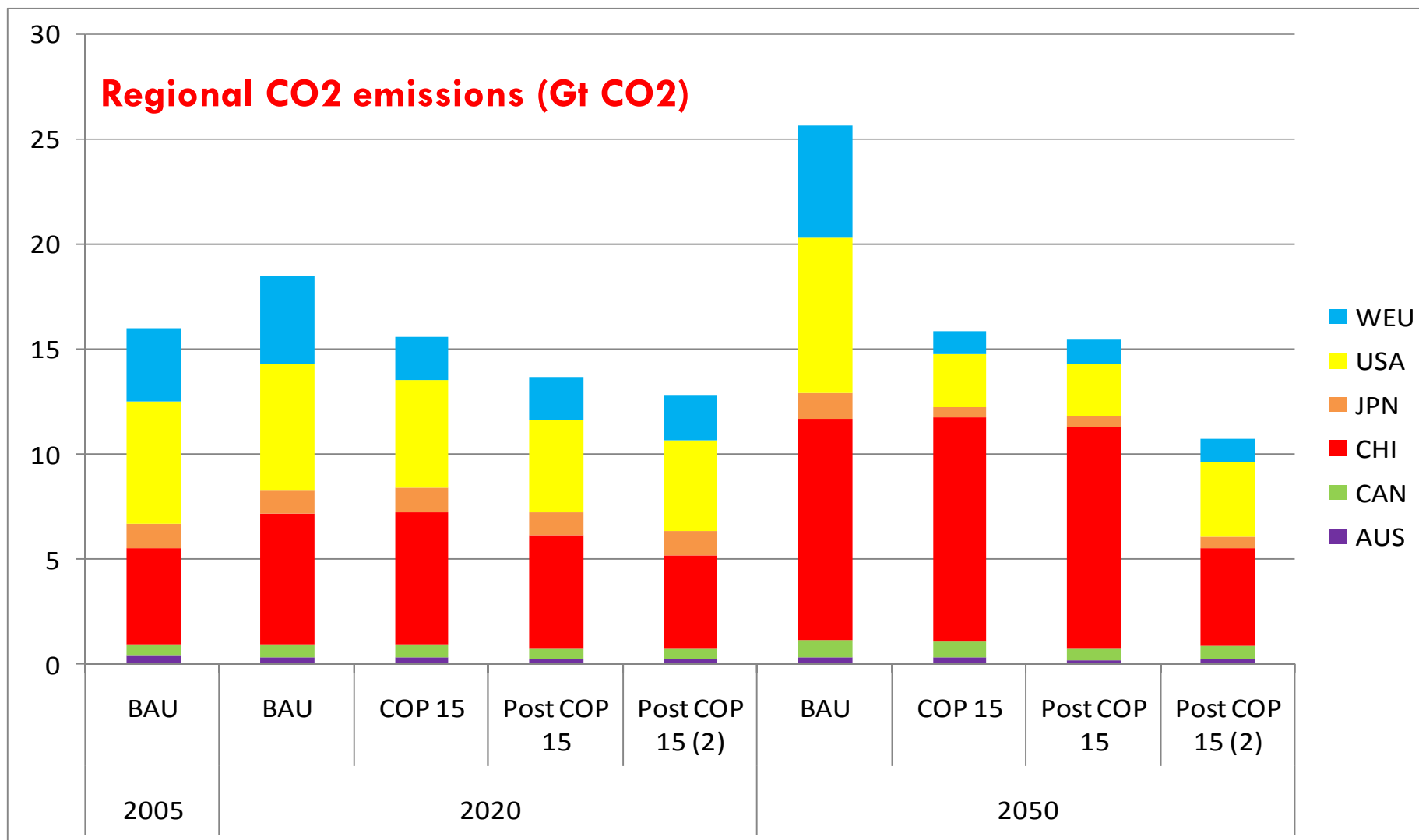
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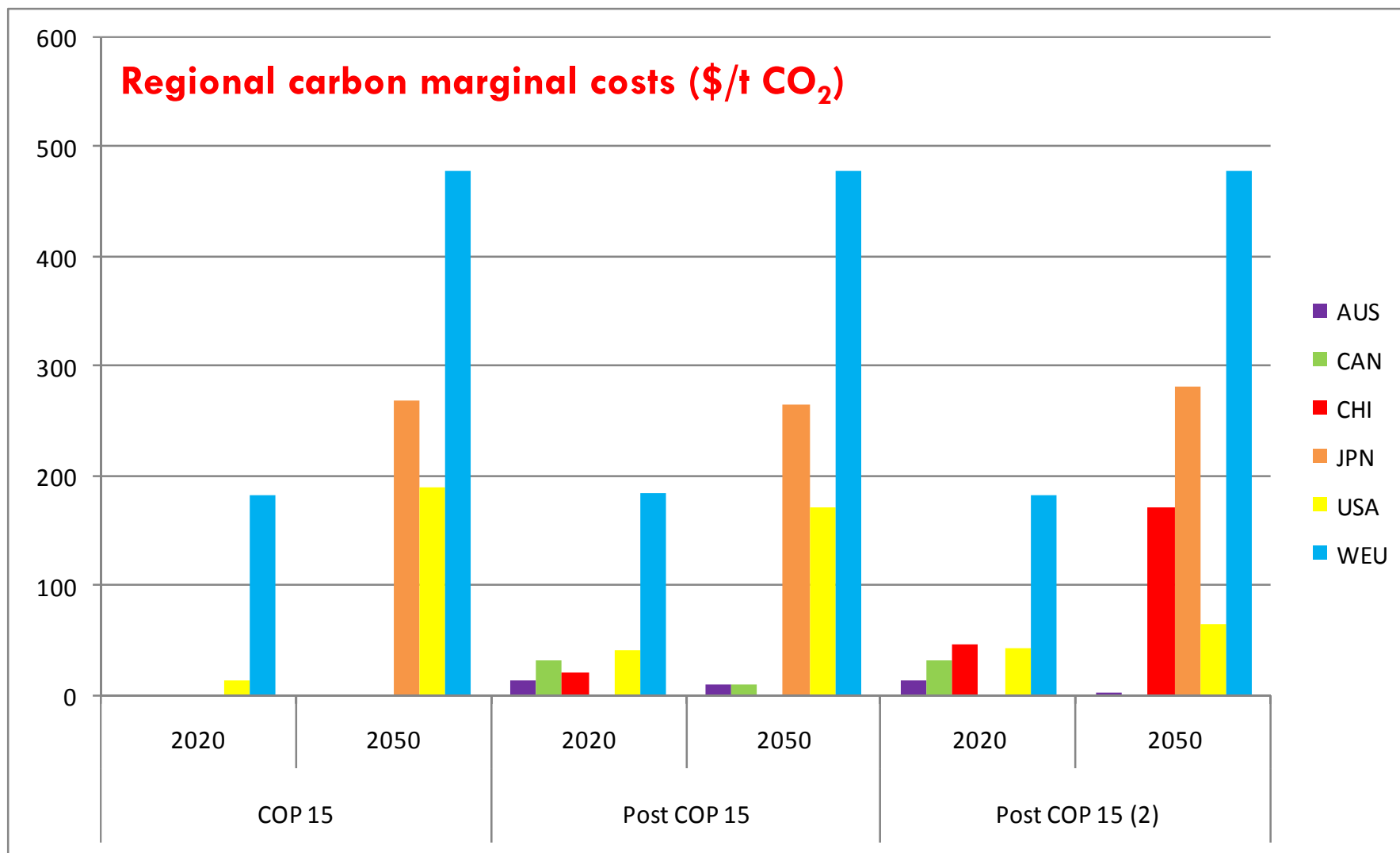
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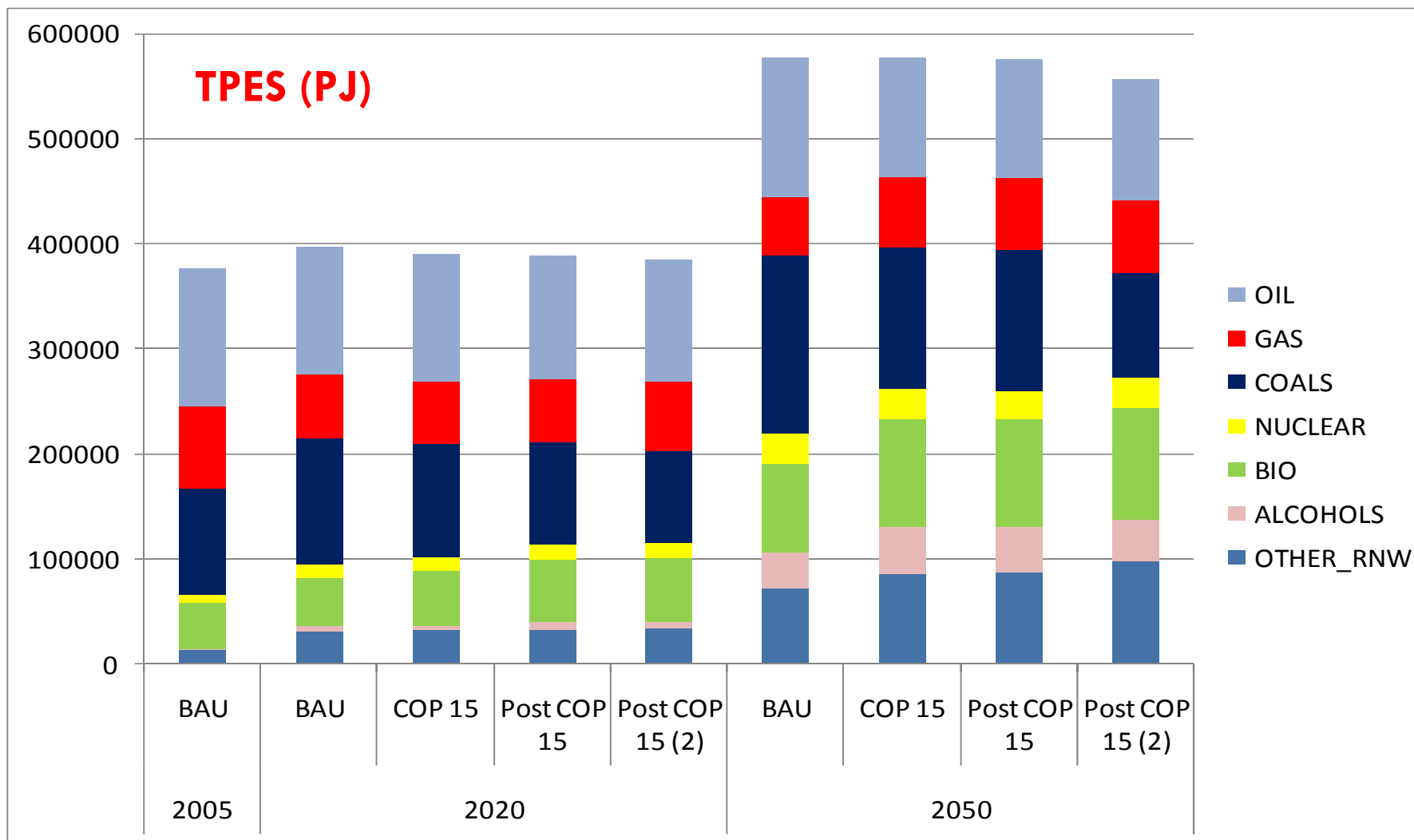
# 3- Scenarios results and analysis (4)



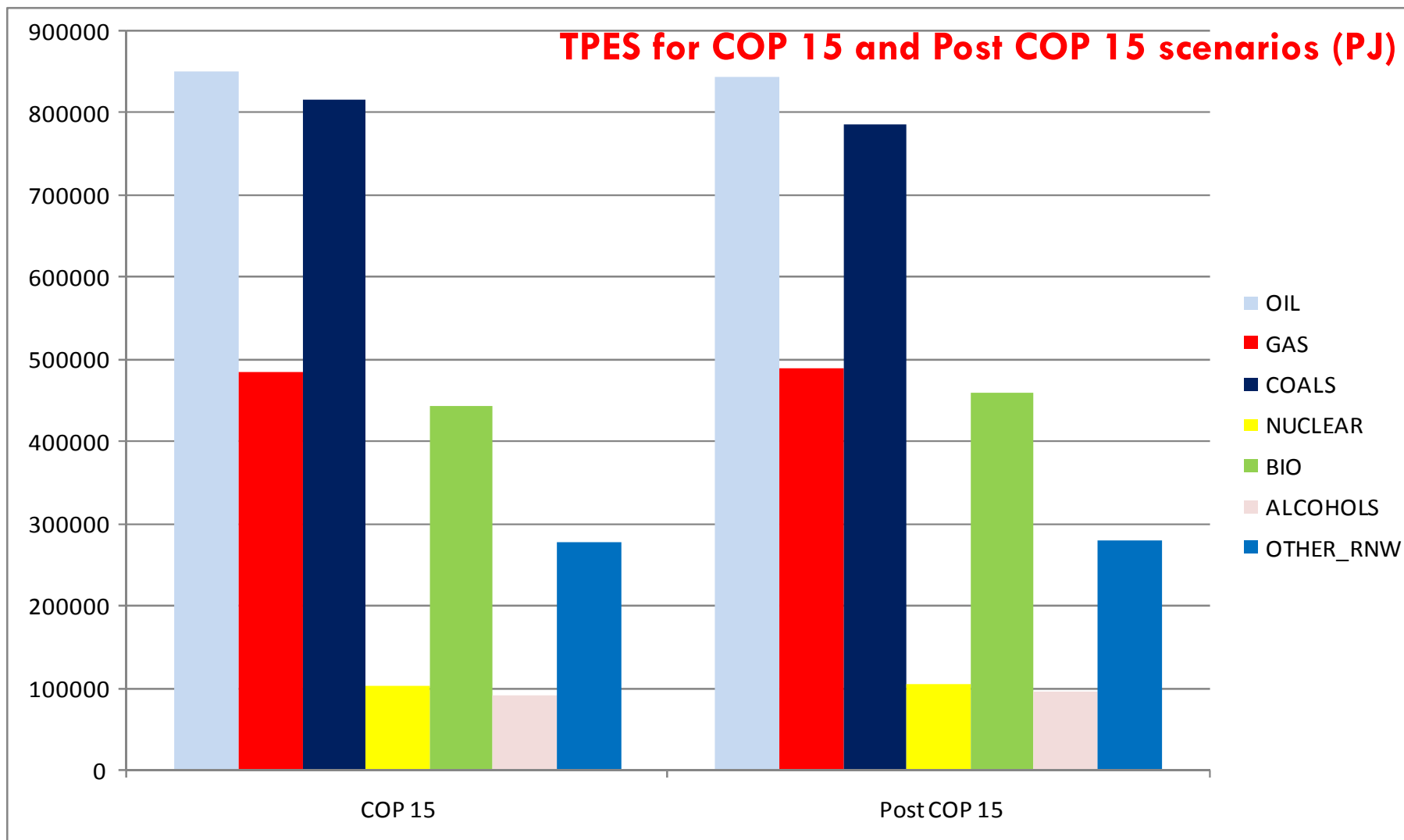
# 3- Scenarios results and analysis (5)



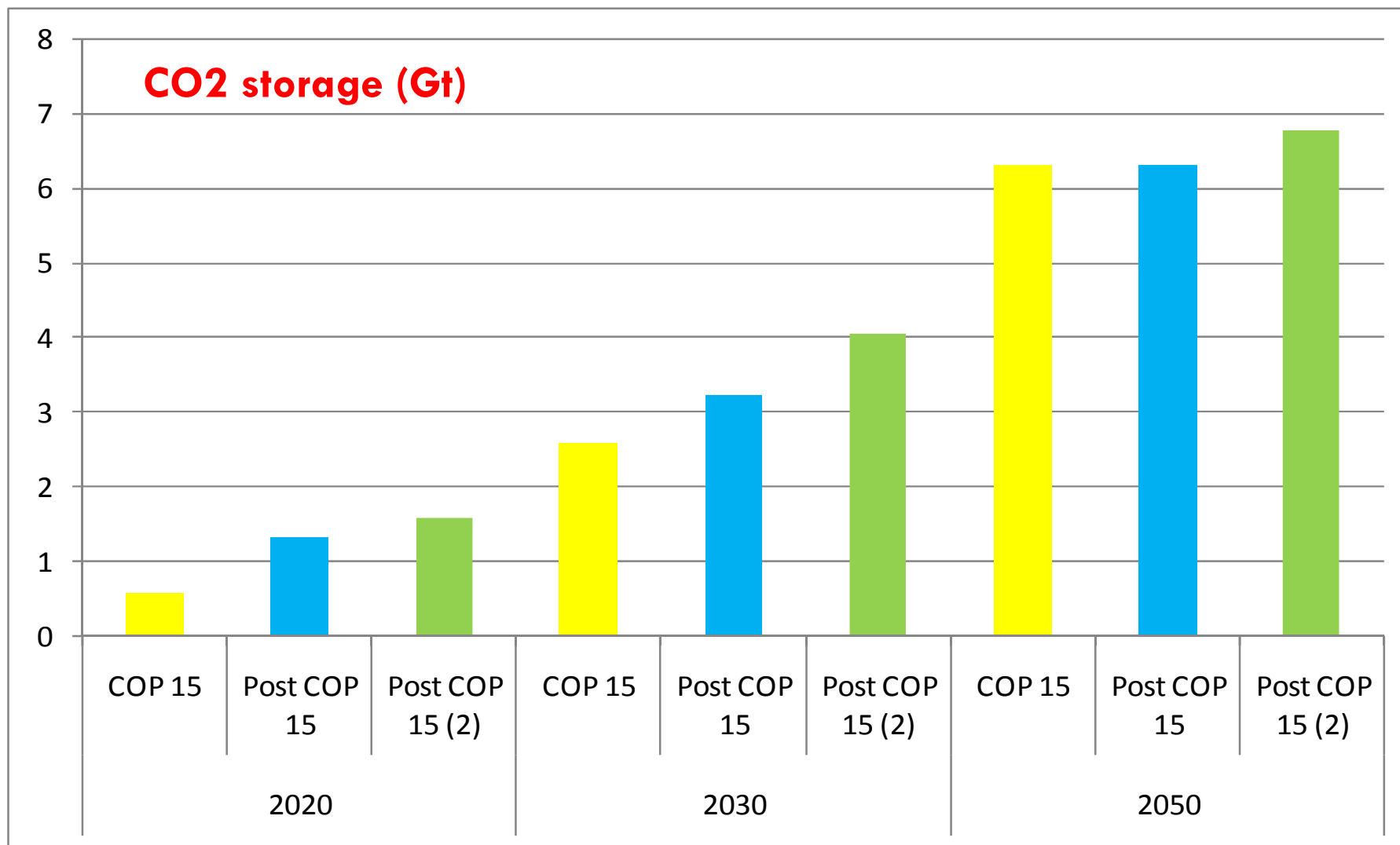
# 3- Scenarios results and analysis (6)



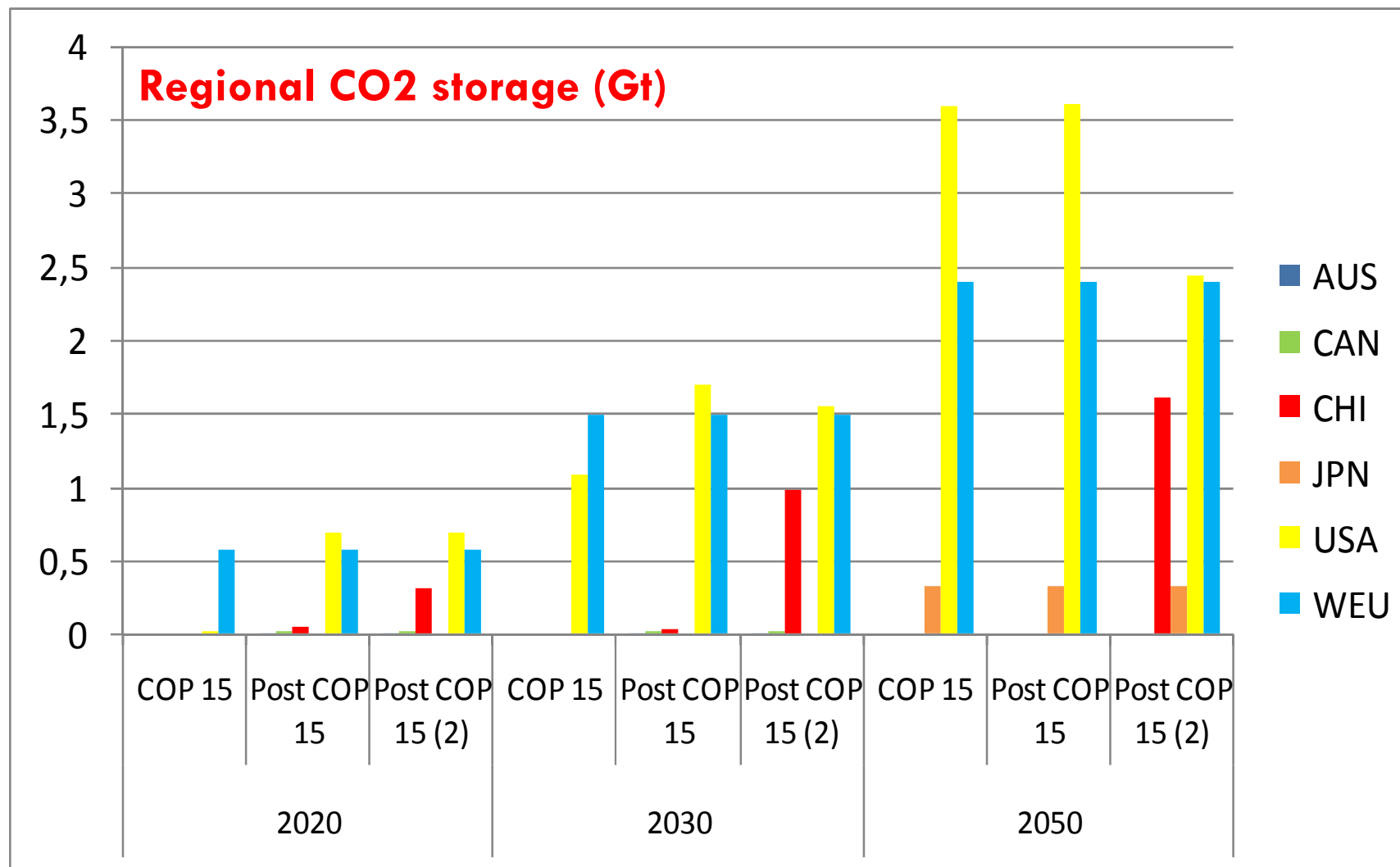
# 3- Scenarios results and analysis (6)



# 3- Scenarios results and analysis (7)



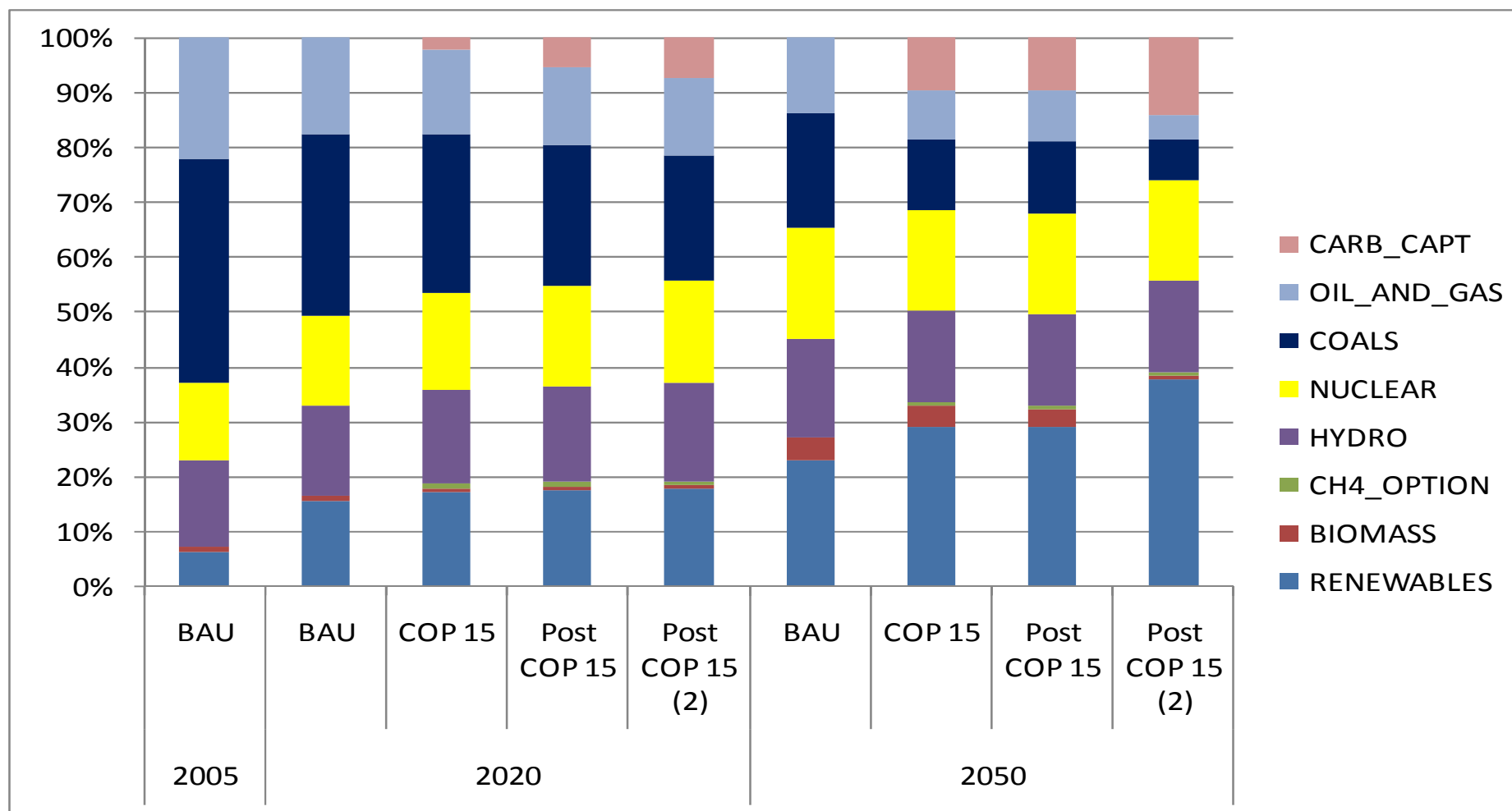
# 3- Scenarios results and analysis (8)



# 3- Scenarios results and analysis (9)



## Electricity production by technology



## 4- Concluding remarks



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### Further developments:

- Adapt carbon constraint scenario to the new announced pledges
- Improve the CCS constraint : are the 6000 TWh based on CCS technologies needed to avoid 7 Gt of CO<sub>2</sub> emissions feasible ?

**Thank you for your attention !**

# ANNEXES



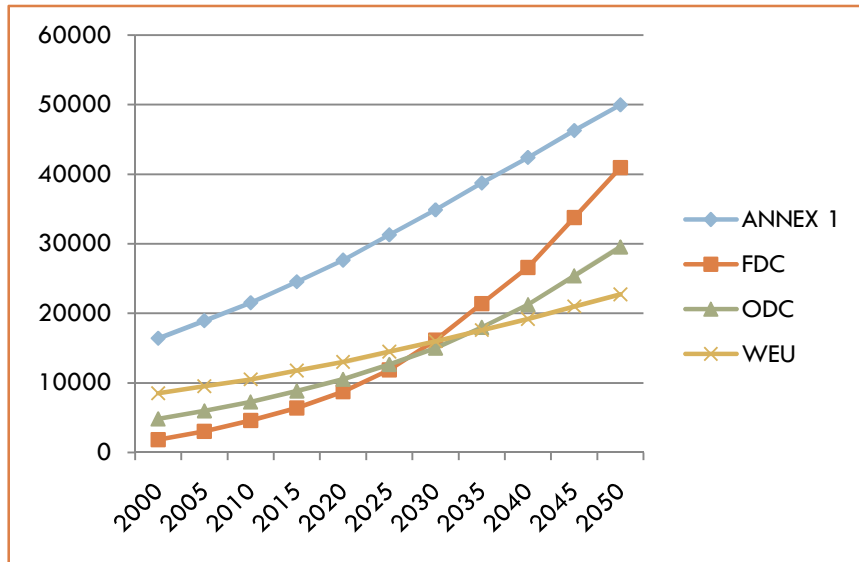
# 1 - TIAM Business as usual (1)

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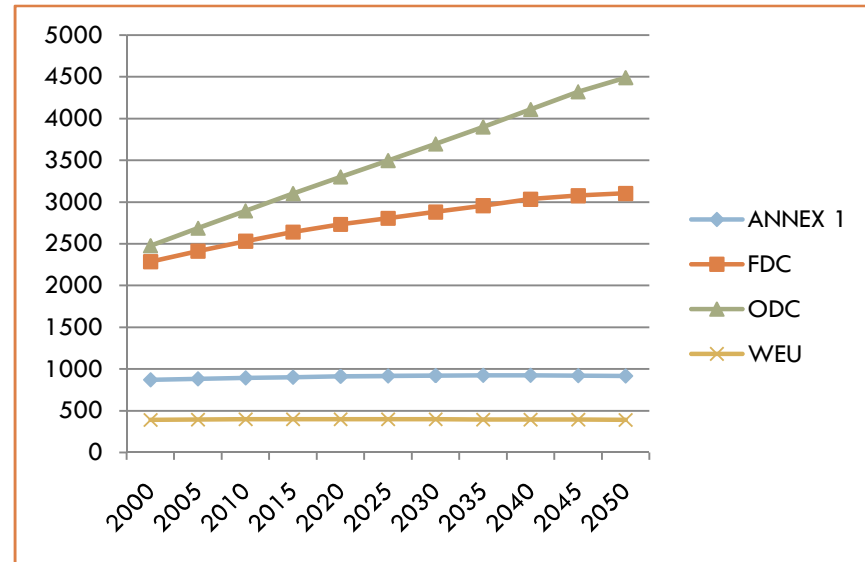
## General assumptions:

- Main socio-economic drivers: Energy consumption based on external projections of:
  - ▣ The growth of regional GDP (AAGR [2000-2050] = 3.072%)
  - ▣ The growth of population (9 milliards of people in 2050)

Regional GDP (in billion current 2000 US \$)



Regional population (in million)

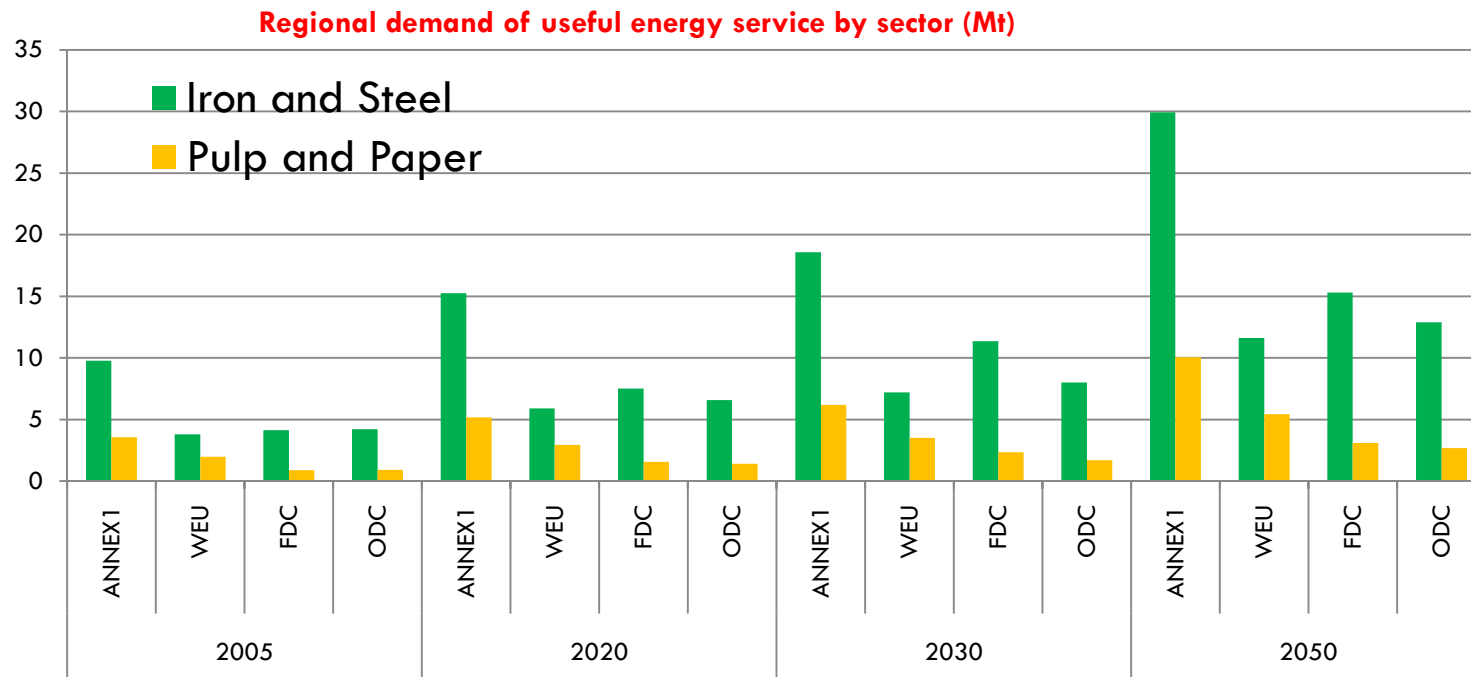


# 1 - TIAM Business as usual (2)

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## General assumptions:

- Main socio-economic drivers: Energy consumption based on external projections of:
  - The volume of various economic sectors: Agriculture, Iron and Steel, Services, etc.



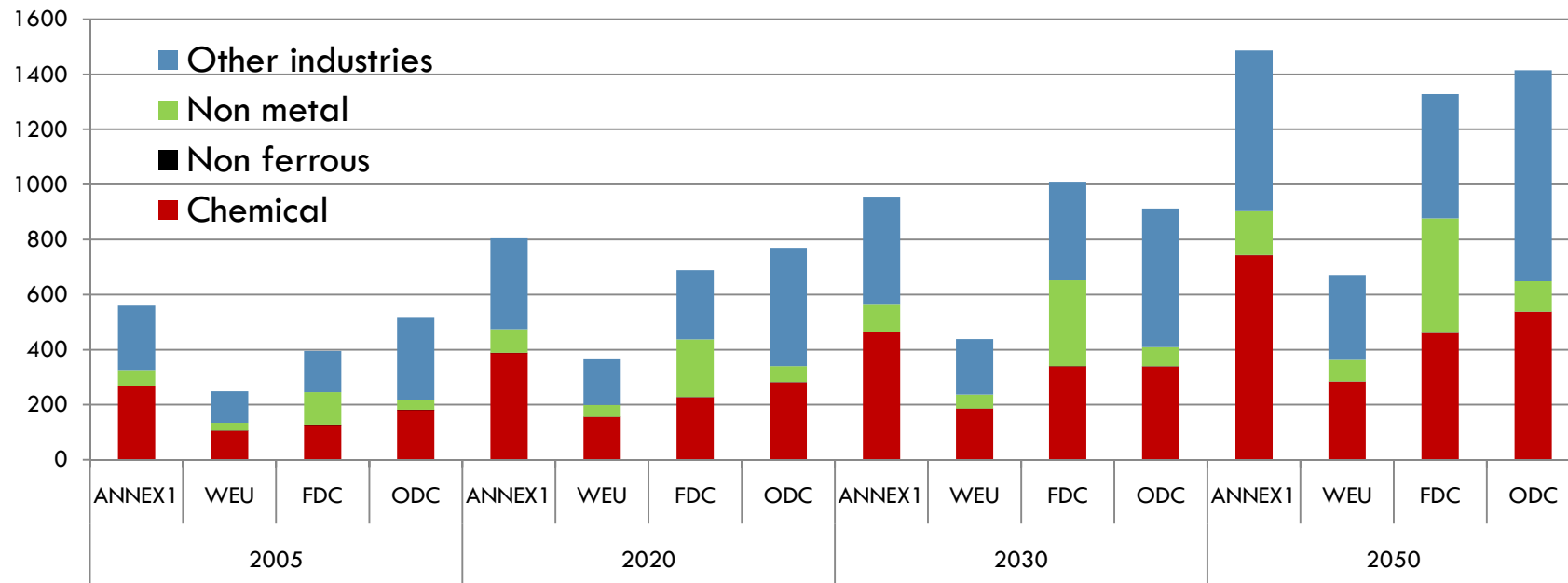
# 1 - TIAM Business as usual (3)

Joint TERI-ETSAP Workshop – 21-22 January 2010 – New Delhi

## General assumptions:

- Main socio-economic drivers: Energy consumption based on external projections of:
  - The volume of various economic sectors: Agriculture, Iron and Steel, Services, etc.

Regional demand of useful energy service by sector (PJ)

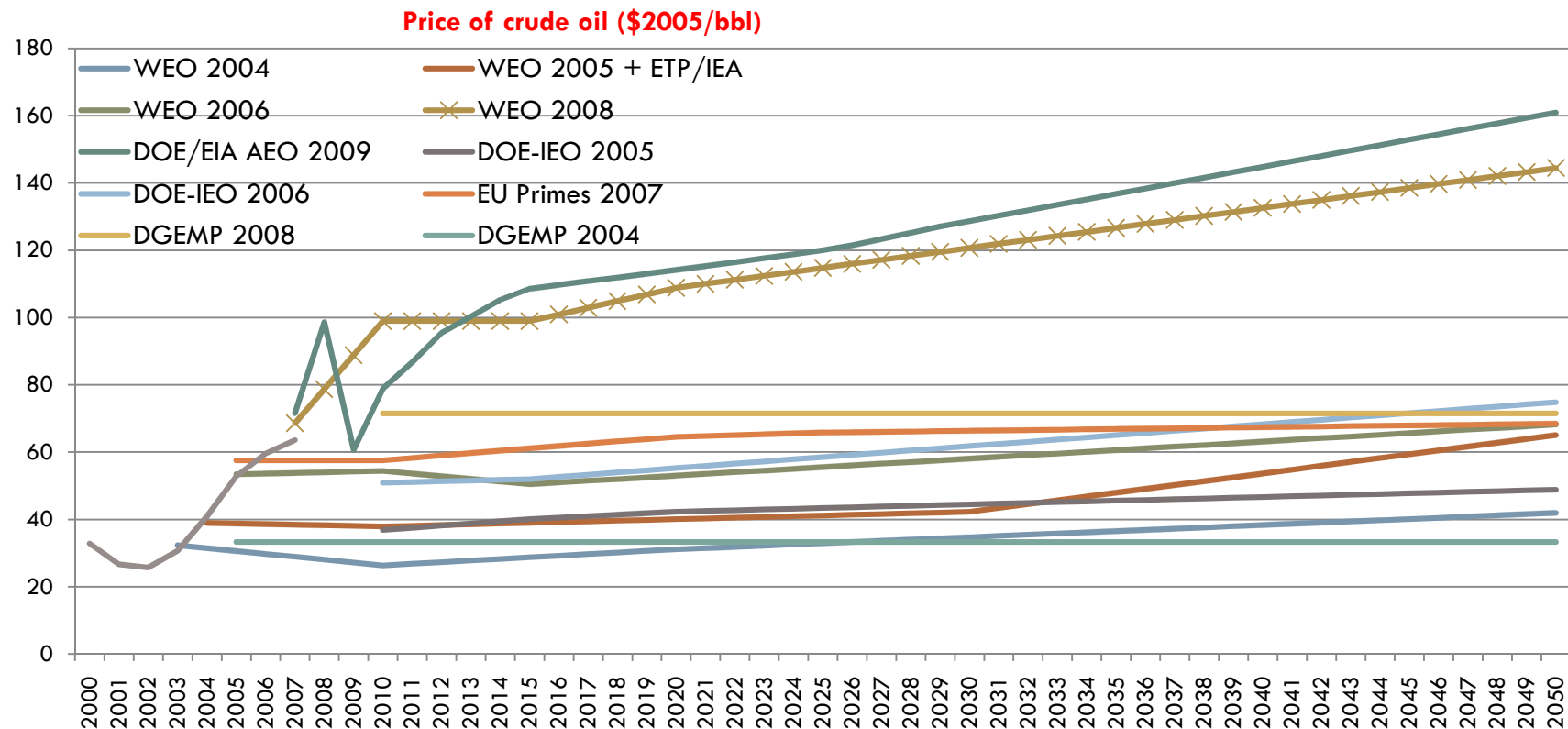


# 1 - TIAM Business as usual (4)

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## General assumptions:

- Fossil fuel extraction prices: prices for crude oil, natural gas and hard coal



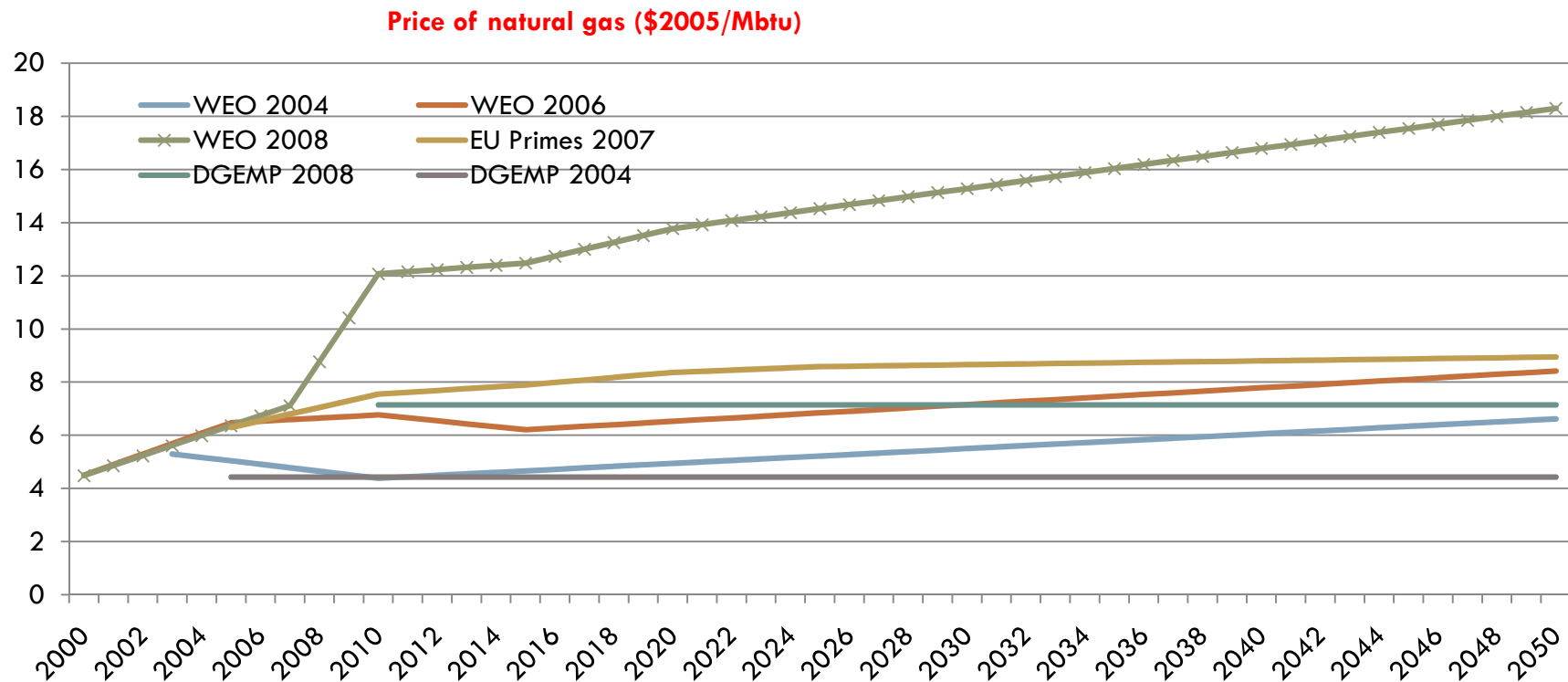
# 1 - TIAM Business as usual (5)



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## General assumptions:

- Fossil fuel extraction prices: prices for crude oil, natural gas and hard coal

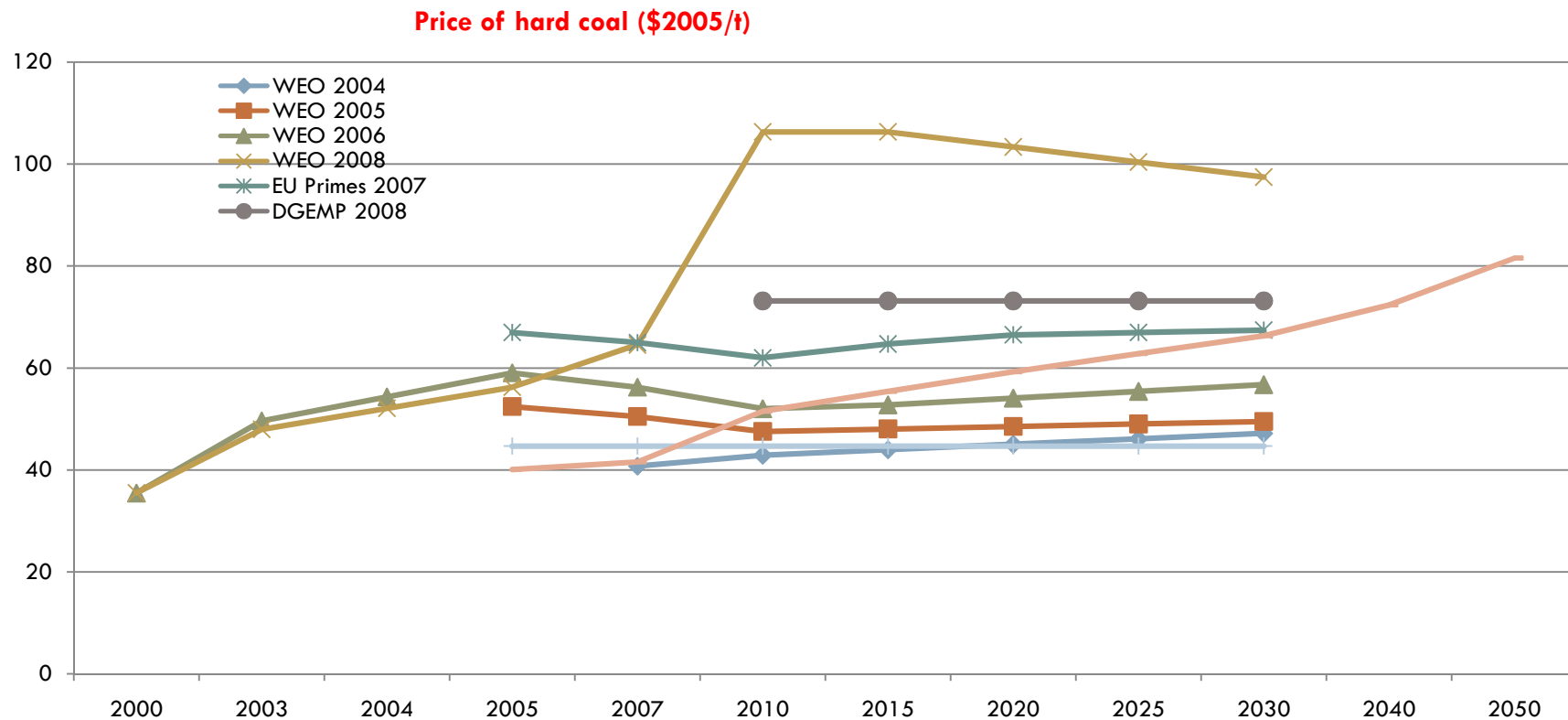


# 1 - TIAM Business as usual (6)

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## General assumptions:

- Fossil fuel extraction prices: prices for crude oil, natural gas and hard coal



# 1 - TIAM Business as usual (7)



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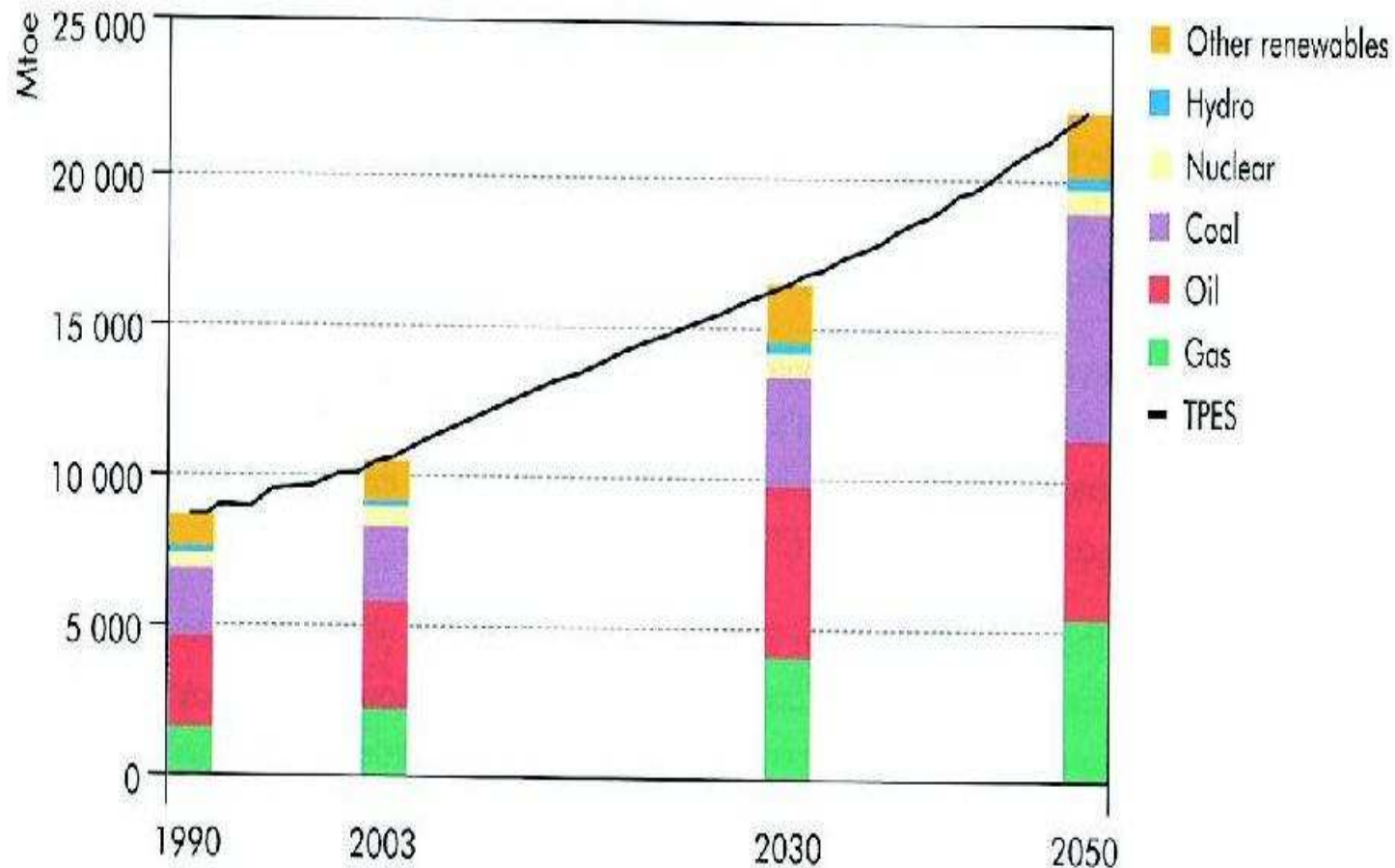
## General assumptions:

- Fossil fuel extraction prices: prices for crude oil, natural gas and hard coal...

Fossil fuel	2000	2005	2010	2020	2030	2040	2050
Hard coal (2005\$/t)	36,564	46,8407	88,5846	86,1193	81,1887	83,5432	85,87
Brown coal (2005\$/t)	34,736	44,514	84,153	81,826	77,145	79,361	81,577
Coke oven coke (2005\$/t)	46,425	59,500	112,490	109,360	103,127	106,091	109,055
Gas coke (2005\$/t)	46,425	59,500	112,490	109,360	103,127	106,091	109,055
Natural gas_EU (2005\$/Mbtu)	3,2348	5,1962	9,6907	11,0464	12,3325	13,6197	14,9058
Natural gas_JP (2005\$/Mbtu)	5,4367	6,2407	11,0380	12,6195	13,9499	15,2878	16,6266
Natural gas_USA (2005\$/Mbtu)	4,4523	5,3354	11,1076	12,6628	14,0196	15,3753	16,7311
Crude oil (2005\$/bbl)	30,221	44,269	82,669	90,669	100,800	110,400	120,531
Distillates (2005\$/bbl)	39,290	57,549	107,469	117,869	131,040	143,520	156,691
Gasoline (2005\$/bbl)	42,310	61,971	115,731	126,931	141,120	154,560	168,749
Heavy fuel oil (2005\$/bbl)	36,269	53,120	99,200	108,800	120,960	132,480	144,640
Jet fuel gas (2005\$/bbl)	36,269	53,120	99,200	108,800	120,960	132,480	144,640
Jet kerosene (2005\$/bbl)	36,269	53,120	99,200	108,800	120,960	132,480	144,640
Liquid petroleum gas (2005\$/bbl)	36,269	53,120	99,200	108,800	120,960	132,480	144,640
Natural gas liquid (2005\$/bbl)	36,269	53,120	99,200	108,800	120,960	132,480	144,640
Non specific oil (2005\$/bbl)	36,269	53,120	99,200	108,800	120,960	132,480	144,640
Other kerosene (2005\$/bbl)	39,290	57,549	107,469	117,869	131,040	143,520	156,691

# COMPARATIVE REFERENCE SCENARIO

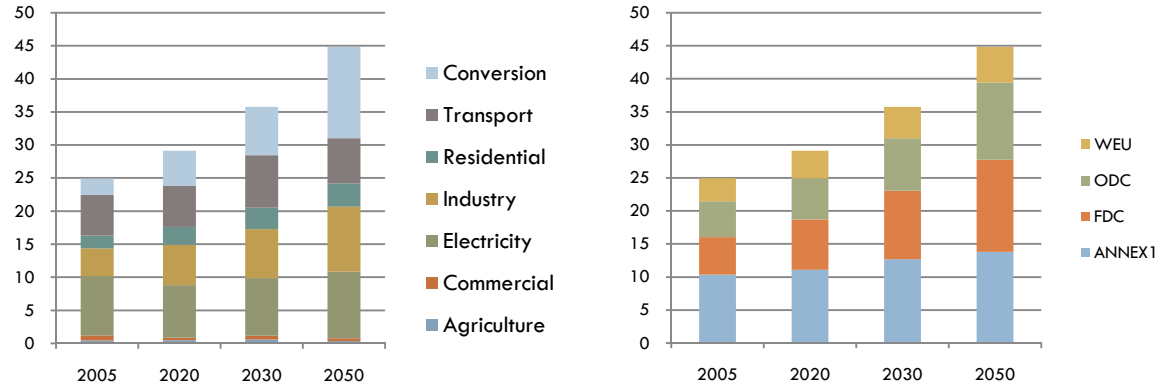
**World total primary energy supply (TPES) by fuel  
in the ETP 2006 Baseline Scenario**



**World CO2 emission by sector and by region in the ETP 2006 Baseline Scenario (Gt)**

CO2 emissions (Gt)	2003	2050
OECD	12,969	21,949
Transition economies	2,543	3,953
Developping countries	9,02	32,12
<b>World</b>	<b>24,532</b>	<b>58,022</b>

**World CO2 emission by sector and by region in the TIAM Baseline Scenario (Gt)**



**Regional CO2 emission by sector in the TIAM Baseline Scenario (Gt)**

