



The G8 Industry Task
IEA Petrochemical Scenarios for
2030-2050
Energy Technology Perspectives

Kamel Bennaceur, Dolf Gielen, Cecilia Tam
International Energy Agency

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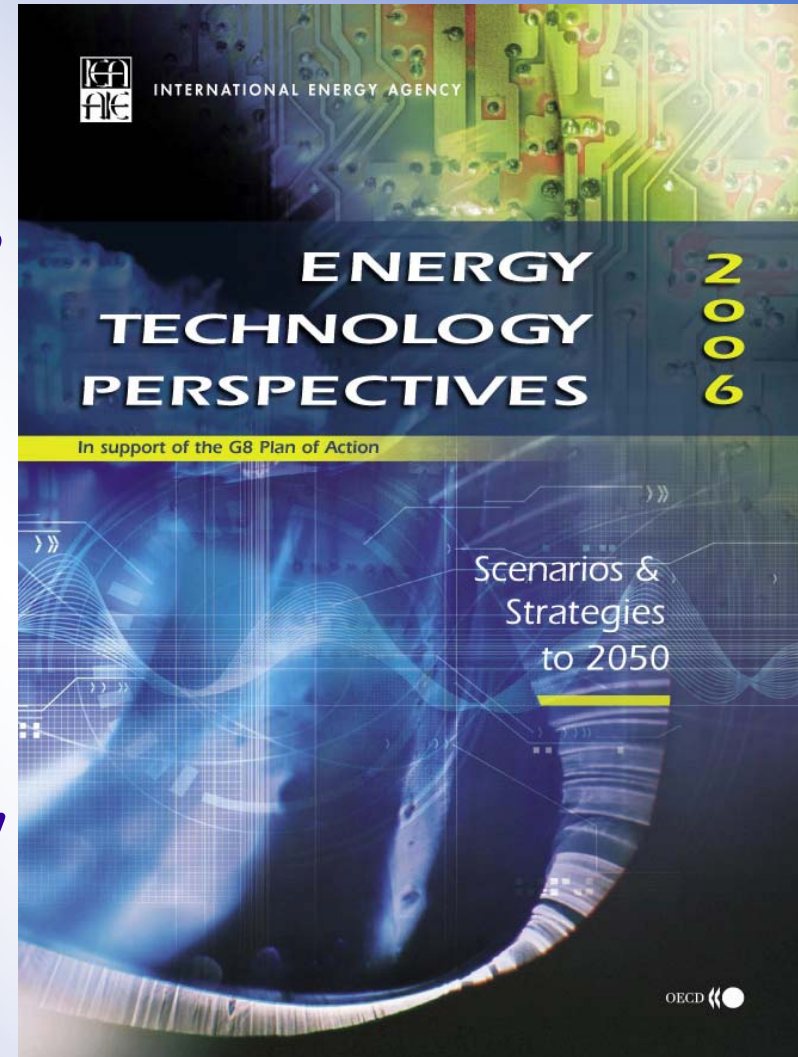
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Energy Technology Perspectives 2006

ETP 2006 provides part of IEA's "advice on scenarios and strategies" at G8 Summit in St. Petersburg

ETP 2006 presents a groundbreaking review of technologies across all sectors and assess how they together can make a difference



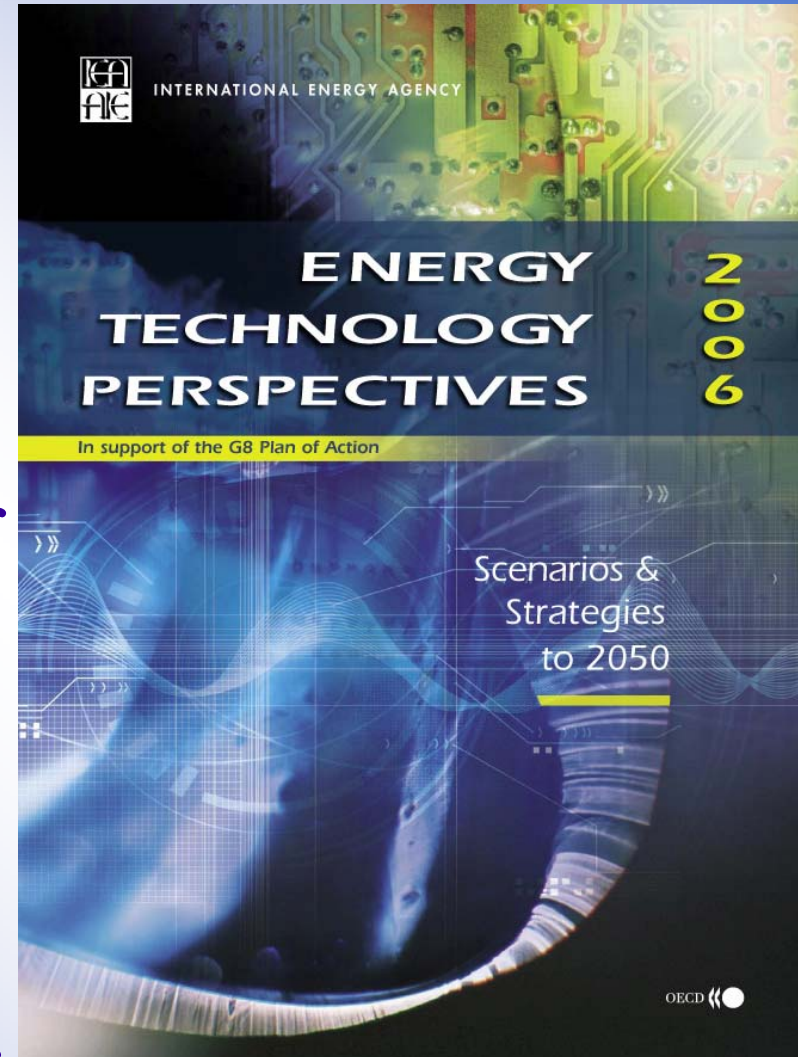


Energy Technology Perspectives 2006

Modelling Tool: IEA-ETP, a MARKAL modelling tool that optimizes the energy mix required

Uses a 15-region Model for predictions to 2050

Global Scenarios to illustrate potentials for different technologies under accelerated policies



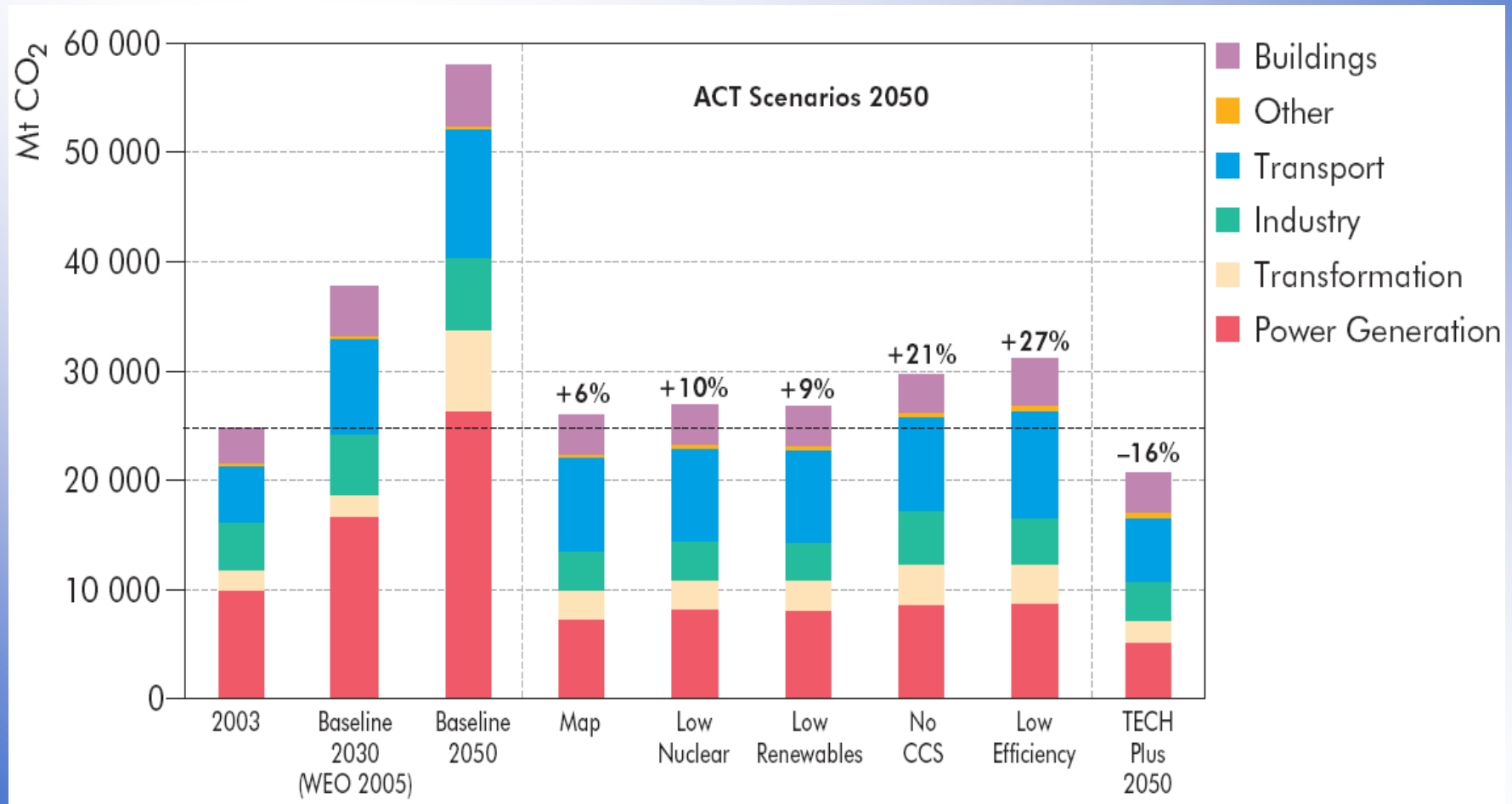


Scenario Analysis

- Scenarios analysed:
 - ◆ Baseline Scenario
 - ◆ Accelerated Technology Scenarios (ACT)
 - ◆ TECH Plus scenario
- ACT and TECH Plus scenarios:
 - ◆ Analyse the impact from R&D, Demonstration and Deployment measures
 - ◆ Incentives equivalent to 25 \$/tonne CO₂ for low-carbon technologies implemented world-wide from 2030 and on
 - ◆ Individual scenarios differ in terms of assumptions for key technology areas



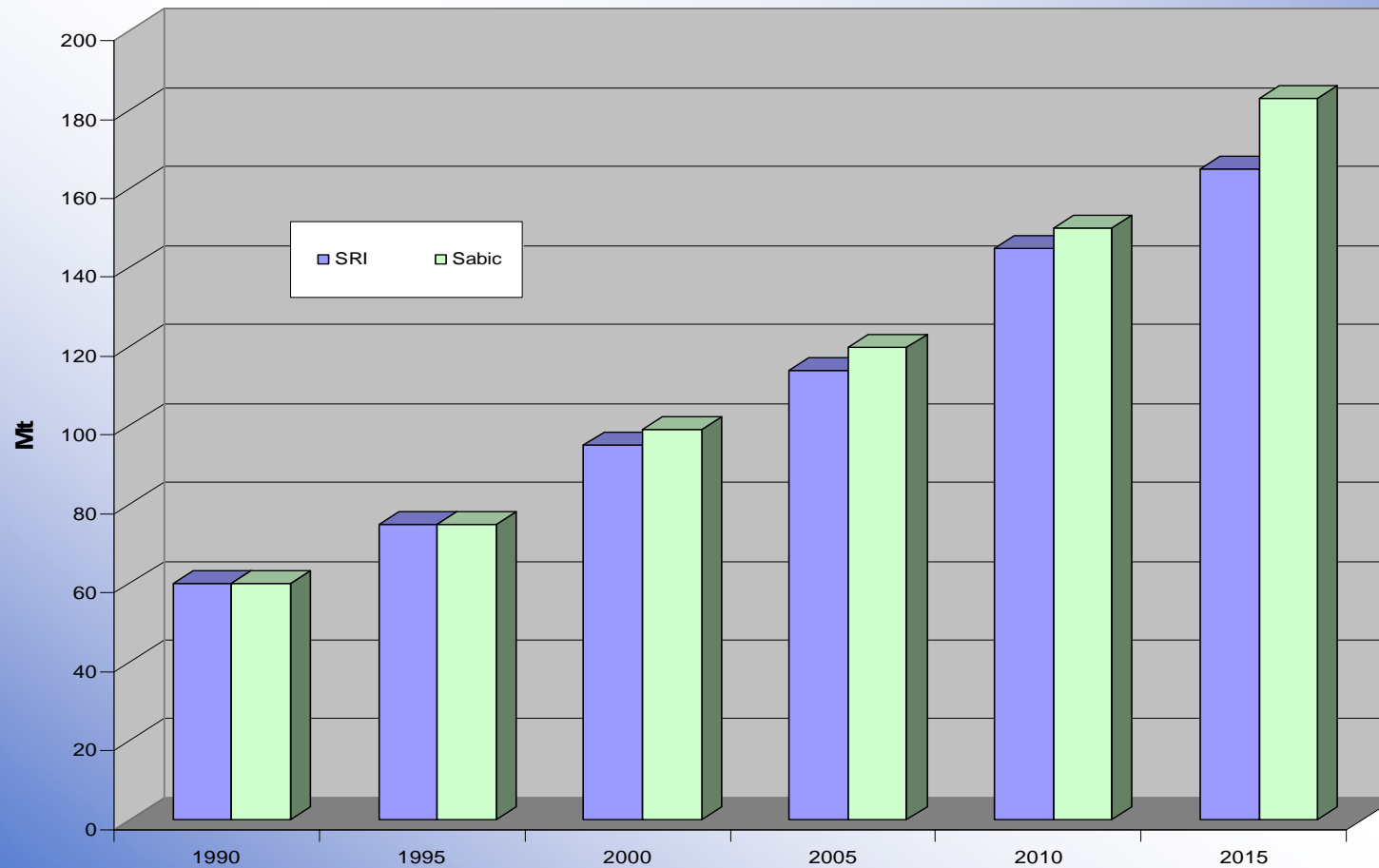
2050 ETP: Baseline and ACT





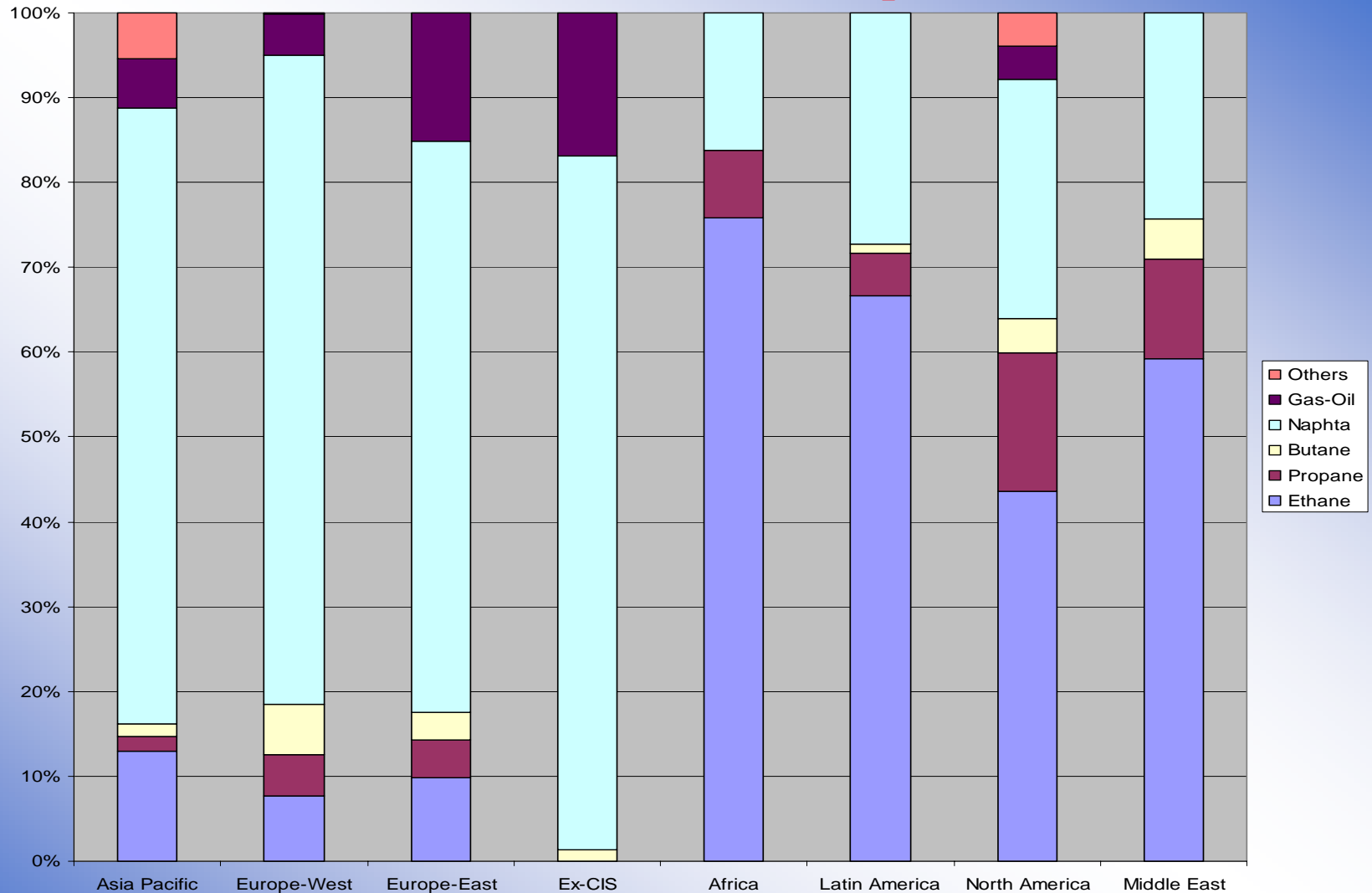
Petrochemical Status & Outlook

Ethylene Production Trends and Projections
1990-2015





Cracker Feedstock per Area





Technology Perspectives

- **Steam Cracking / CHP**
- **Biomass feedstock**
- **Biopolymers**
- **Waste Treatment**



Steam Cracking / CHP

- **State-of-the-art crackers can improve energy efficiency by more than 25 % (Ren et al.- 2005)**
- **Improvements such as HT furnaces and gas turbine integration can improve EE by an additional 12 %**
- **Fluid Catalytic Crackers → Propylene**
- **CHP / Solid Oxide Fuel Cells**



Biomass and Biopolymers

- Biomass = carbon neutral feedstock
- Ethanol → Ethylene (dehydrogenation)
- Options for biomass:
 - ◆ Feedstock substitution
 - ◆ Biomass feedstock → existing monomers
 - ◆ New biopolymers
 - ◆ Quantum change for new biomaterials

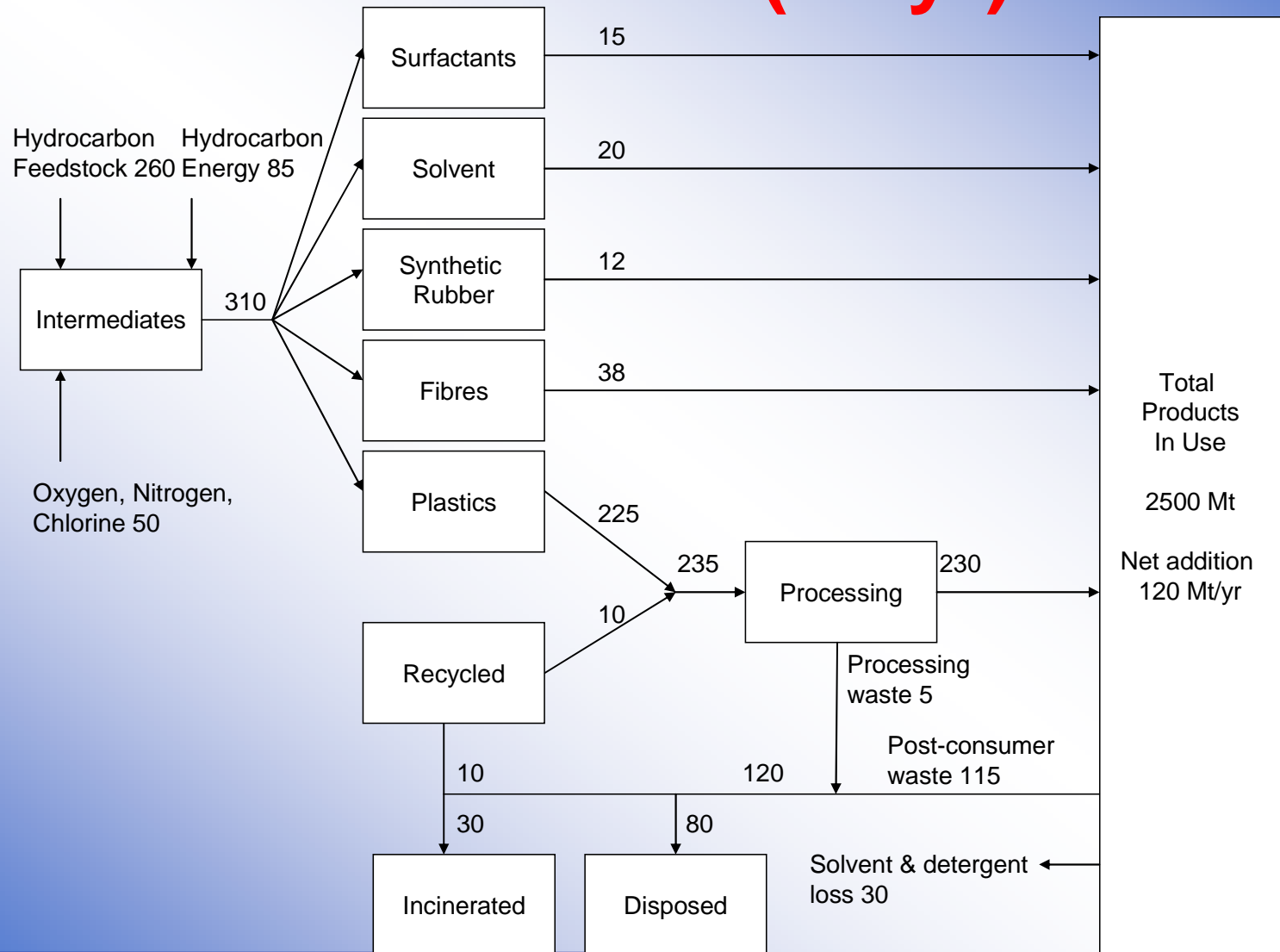


Biopolymers for EE and CO₂ emissions reduction (Patel 2003)

Product	Energy Savings	CO2 Emissions Reduction
	GJ/t	tCO2/t polymer
Thermoplastic pellets	51	3.7
Polylactic Acid pellets	10	1
Lacquer	195	8.3
Transport Pallet	33	1.6



The World Petrochemicals Balance (Mt/yr)



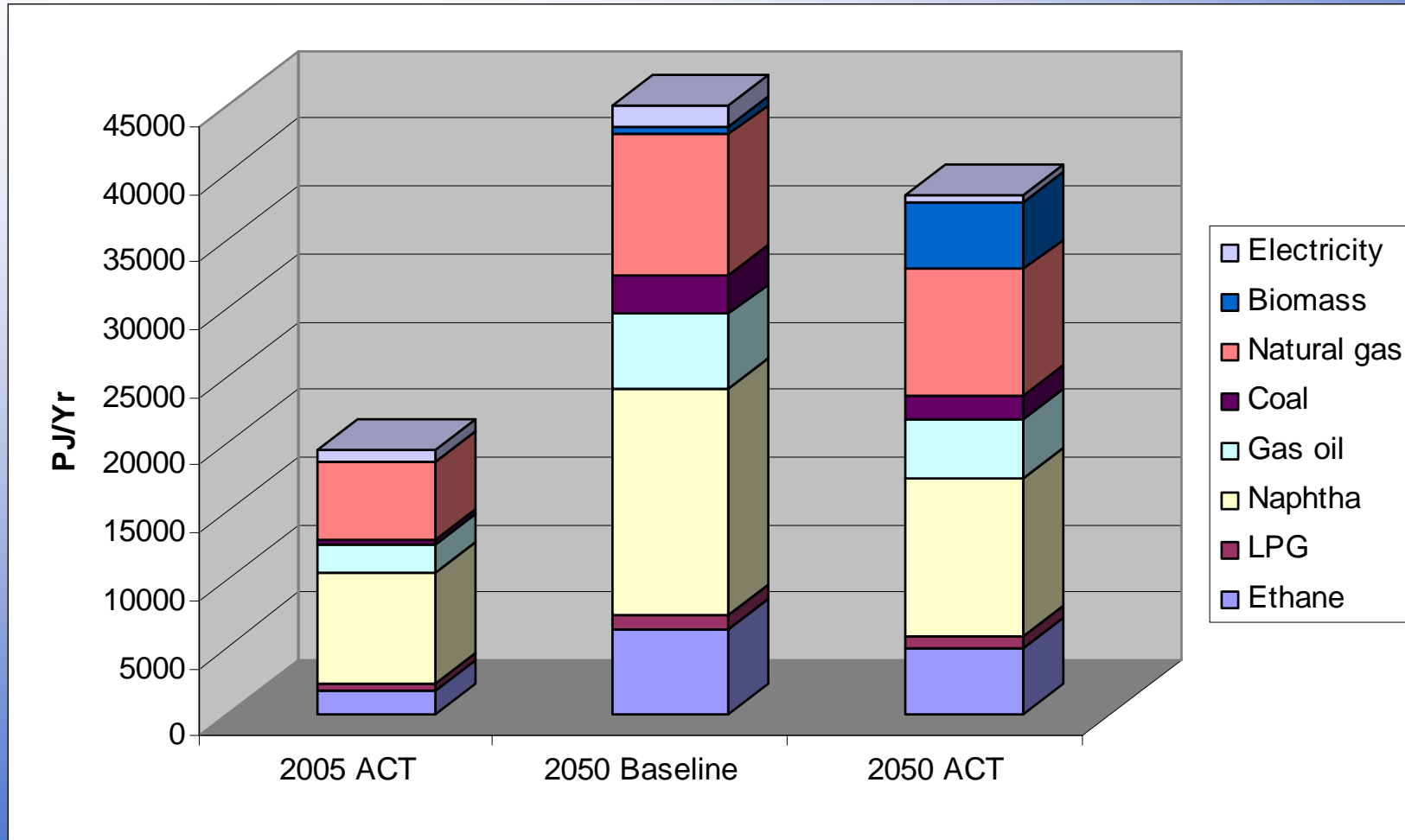


Waste Treatment

- Significant impact of plastics recycling
- 10 Mt/yr are recycled compared to a waste arising of 120 Mt/yr
- General trend is toward increased mechanical recycling and energy recovery

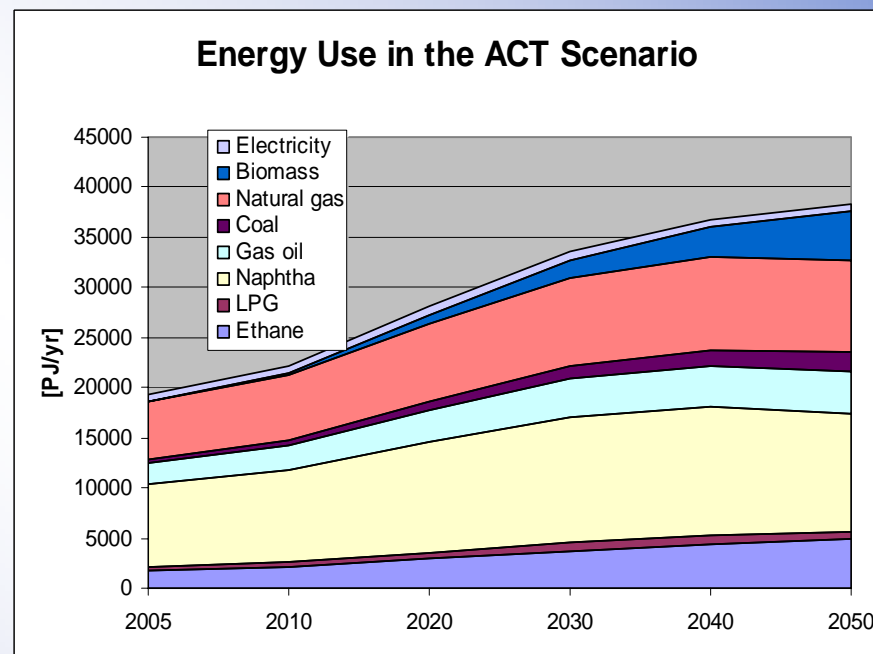
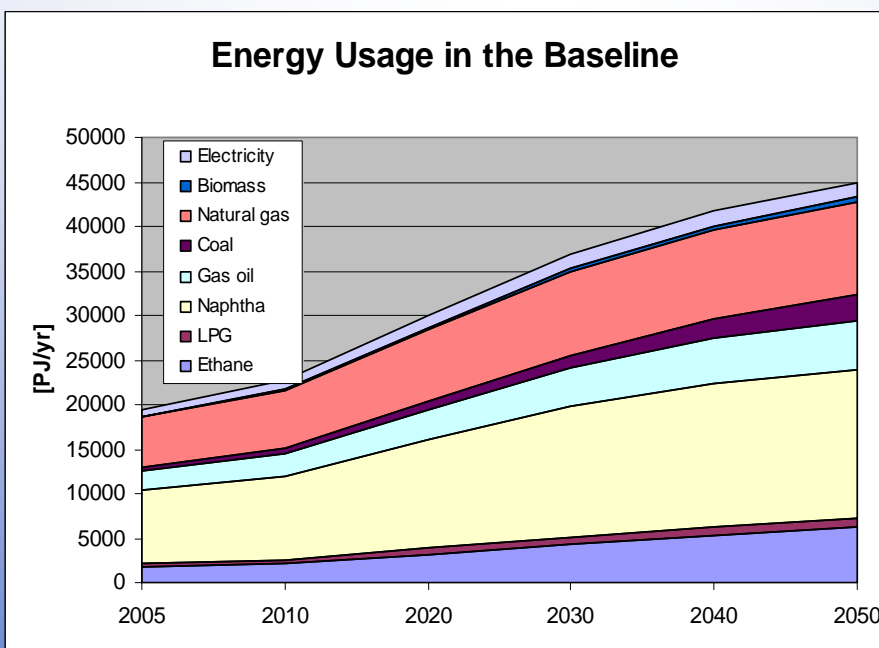


Energy Use in Baseline and ACT





Baseline and ACT





Main Assumptions

- **Autonomous EE gain (excl. feedstock) is 1 % in Baseline vs 1.5 % in ACT**
- **Plastics recycling: 11 % in Baseline vs. 26 % in ACT**
- **Bioplastics: 1% in Baseline vs. 4 % in ACT**



Main Assumptions (cont.)

- **Gas-based CHP accounts for 40 % of the steam in Baseline vs 65 % in the ACT**
- **Waste Treatment: larger amount of waste incineration in kilns (30 % in ACT vs 5 % in Baseline)**



CO2 Emissions (Baseline and ACT)

	Baseline		ACT
	2005	2050	2050
CCS	0.0	0.0	-150.0
Direct	493.9	891.1	224.8
Electricity from grid	151.2	297.2	31.7
Emissions during use	170.0	480.6	434.0
Waste incineration	96.7	428.1	342.0
Total	911.7	2097.0	882.5



Thank you

kamel.bennaceur@iea.org

dolf.gielen@iea.org

cecilia.tam@iea.org