## Energy Technology Perspectives 2014

# IEA Global Industry Dialogue and Expert Review Workshop

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#### Part 1. Tracking Progress

#### Track progress against near term milestones

- I. <u>Global outlook</u>: Overview of macro developments and quick snapshot of the scenarios – reference online content **INDUSTRY**
- II. <u>Tracking clean energy progress</u>: build on CEM report and highlight technology developments, incl. IEA work **INDUSTRY**
- Part 2. Driving the Change
  - Use "what if?" approach to analyze the potential impacts of selected technologies and policies
  - Consider thematic analysis to ask key topical questions
    - ETP 2014 analysis on the electrification of the energy system with a focus on the integration of power technology
  - Spotlight on energy technology development in one Key Partner Country



# ETP 2014 - Industry contributions

- Part 1 Tracking Progress
  - Global outlook: Horizon 2050
    - Overall industry sector:
      - Energy use mix projection 2DS, 4DS , 6DS
      - II. Industry sub-sectors contribution to required CO<sub>2</sub> emission reduction
    - Sectoral snapshot: 2DS emission reduction envisaged pathway
      - I. By region
      - II. By technology
  - Tracking clean energy progress: Horizon 2025
    - Energy efficiency progress 2000-2011
    - Energy market changes and impact
    - Material production prospects
    - Energy savings potential compared to BATs level
    - 2DS energy intensity targets
    - Technology development and innovation
    - Special focus on Iron & Steel and Chemicals



# ETP Industry model major changes

#### Greater regional distribution

- EITs group → ATE (Caspian Region), EU7, OETE (non-EU Eastern Europe/Eurasia)
- Coal and oil segregation into specific fuel types
- Start conversion to a different platform, future structural changes:
  - Capacity vs production  $\rightarrow$  level of capacity utilisation
  - Capacity characterization by plant size categories
  - Full segregation of energy use by process requirements, heat/elec generation (CHP) and separate heat generation
  - Separate modeling of waste heat recovery potentials
  - Segregation of biomass, waste and renewable energy sources
  - Improve technologies capital and operational costs assessment



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#### Main assumptions - Population

#### Population projection: UN World Population Prospects: The 2012 Revision

Millions	2011	2015	2020	2025	2030	2035	2040	2045	2050
WORLD	6998	7325	7717	8083	8425	8743	9039	9308	9551
AFRICA	1057	1166	1312	1468	1634	1812	1999	2194	2393
South Africa	52	53	55	57	58	60	61	62	63
ASIA	4210	4385	4582	4749	4887	4997	5080	5136	5164
China	1368	1402	1433	1449	1453	1449	1435	1414	1385
Japan	127	127	125	123	121	118	115	111	108
India	1221	1282	1353	1419	1476	1525	1566	1597	1620
EUROPE	741	743	744	741	736	730	724	717	709
LATIN AMERICA	603	630	662	691	717	739	757	771	782
Brazil	197	204	211	218	223	227	229	231	231
NORTH AMERICA	350	361	376	390	403	415	426	436	446
USA	315	325	338	351	363	373	383	392	401
OCEANIA	37	39	42	45	47	50	52	55	57

Source: United Nations, Department of Economic and Social Affairs, Population Division (2013). World Population Prospects: The 2012 Revision.



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#### Main assumptions - GDP

#### GDP projection: IMF short-term and OECD/IEA long-term

GDP (PPP) – Billion 2012 USD	2010	2017	2020	2025	2030	2035	2040	2045
	2017	2020	2025	2030	2035	2040	2045	2050
World	3.9%	4.3%	3.7%	3.2%	3.0%	2.7%	2.5%	2.4%
OECD	2.1%	2.4%	2.1%	2.0%	1.9%	1.7%	1.6%	1.5%
OECD Americas	2.8%	2.8%	2.4%	2.3%	2.2%	2.0%	1.9%	1.8%
US	2.7%	2.7%	2.3%	2.2%	2.1%	2.0%	1.9%	1.8%
CAN	2.2%	2.1%	2.0%	1.9%	1.8%	1.7%	1.7%	1.5%
OECD Asia Oceania	1.9%	2.1%	1.9%	1.7%	1.5%	1.3%	1.1%	1.1%
JPN	1.1%	1.3%	1.2%	1.1%	1.1%	0.9%	0.7%	0.8%
OECD Europe	1.4%	2.0%	1.9%	1.8%	1.8%	1.5%	1.4%	1.3%
Non-OECD	5.8%	6.0%	4.9%	4.1%	3.7%	3.3%	3.0%	2.8%
Transition Economies	3.6%	3.5%	3.2%	3.1%	3.0%	2.1%	1.5%	1.2%
RUS	3.8%	3.5%	3.3%	3.2%	3.2%	1.8%	1.1%	0.8%
Developing Countries	6.1%	6.2%	5.1%	4.2%	3.8%	3.4%	3.2%	3.0%
Non-OECD Asia	7.1%	7.1%	5.6%	4.5%	4.0%	3.6%	3.4%	3.2%
CHINA	8.3%	7.9%	5.7%	4.1%	3.4%	2.9%	2.6%	2.4%
INDIA	6.4%	7.0%	6.8%	6.2%	5.7%	5.2%	4.8%	4.5%
Non-OECD Latin America	3.8%	3.9%	3.5%	3.1%	2.8%	2.5%	2.2%	1.9%
BRAZIL	3.3%	4.1%	3.9%	3.7%	3.4%	2.9%	2.5%	2.1%
Africa	4.8%	4.6%	3.7%	3.3%	3.1%	3.0%	2.8%	2.6%
SAFR	3.1%	2.9%	2.7%	2.6%	2.5%	2.3%	2.1%	1.9%
ME	3.8%	4.1%	4.0%	3.7%	3.6%	3.3%	2.9%	2.5%



# Material production (preliminary)



Note: 6DS scenario projections. HVC projections vary depending on scenario due to different recycling rates considered.

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#### Direct CO<sub>2</sub> emission reductions by sector



	2050: 2DS vs 6DS		
	low demand	high demand	
Iron & Steel	-46%	-48%	
Chemicals	-45%	-45%	
Cement	-40%	-43%	
Pulp & Paper	-56%	-62%	
Aluminium	-17%	-34%	



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## Sectoral preliminary results



## Iron & Steel - Production





Major Crude Steel production growth	2050 vs 2011
Developing Asia	53%
OECD Europe	11%
EITs	8%



#### Iron & Steel - Energy use





Fuel share in energy	2050 2DS vs 6DS
use change	low demand
Coal	-6%
Oil	0%
Gas	+1%
Electricity	+5%
Other	0%

Note 1: Other includes: heat, combustible biomass, waste and other renewables. Note 2: Energy use includes blast furnaces and coke ovens.



#### Iron & Steel - Direct CO2 emission reductions



Major CO2 emission reduction contributions	6DS vs 2DS (2050) low demand
China	27%
India	20%
EITs	15%



#### **HVC - Production**



Major HVC production growth	2050 vs 2011 Iow demand
Developing Asia	37%
OECD America	17%
Middle East	10%

Note: 6DS scenario projections. HVC projections vary depending on scenario due to different recycling rates considered.

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#### **Ammonia - Production**



Major ammonia production growth	2050 vs 2011 Iow demand
Developing Asia	48%
EITs	12%
Middle East	10%



#### Chemicals - Energy use





Note 1: Other includes: heat, combustible biomass, waste and other renewables.

Note 2: Energy use includes feedstock.

Note 3: Energy use refers to low demand case



#### Chemicals - Direct CO2 emission reductions

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# China India Other Developing Asia Non-OECD Latin America Africa Mideast OECD America OECD Europe & Israel OECD Pacific Economies in Transition (including Russia)

Major CO2 emission reduction contributions	6DS vs 2DS (2050) low demand
China	33%
OECD America	16%
Middle East	11%

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#### **Cement - Production**



Major Cement production growth	2050 vs 2011 low demand
Developing Asia	63%
Africa	10%
Non-OECD Latin America	6%



#### Cement - Energy use





Fuel share in energy	2050 2DS vs 6DS
use change	low demand
Coal	-22%
Oil	-6%
Gas	+2%
Electricity	+2%
Other	+24%

Note: Other includes: heat, combustible biomass, waste and other renewables.



#### Cement - Direct CO2 emission reductions



Major CO2 emission reduction contributions	6DS vs 2DS (2050) low demand
China	28%
India	20%
Other Developing Asia	16%



#### Paper - Production



Major Paper production growth	2050 vs 2011
	low demand
Developing Asia	53%
OECD America	14%
OECD Europe	14%



#### Paper - Energy use





use change	low demand
Coal	-10%
Oil	-3%
Gas	-8%
Electricity	+1%
Other	+20%

Note: Other includes: heat, combustible biomass, waste and other renewables.



#### Paper – Direct CO<sub>2</sub> emission reductions



Major CO2 emission reduction contributions	6DS vs 2DS (2050) low demand
China	24%
OECD America	22%
Other Developing Asia	18%

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## **Aluminium - Production**





Major Primary Aluminium production growth	2050 vs 2011 low demand
Middle East	13%
EITs	6%



## Aluminium - Energy use



Note: Other includes: heat, combustible biomass, waste and other renewables.



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# Aluminium - CO2 emission reductions

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Major CO2 emission reduction contributions	6DS vs 2DS (2050) low demand
China	53%
India	11%
EITs	9%

Note: Direct and indirect CO2 emissions are included.



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# Thank you for you attention

#### Any questions?

