IEA/ICCA/DECHEMA Roadmap targets

2013 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050

International Energy Agency

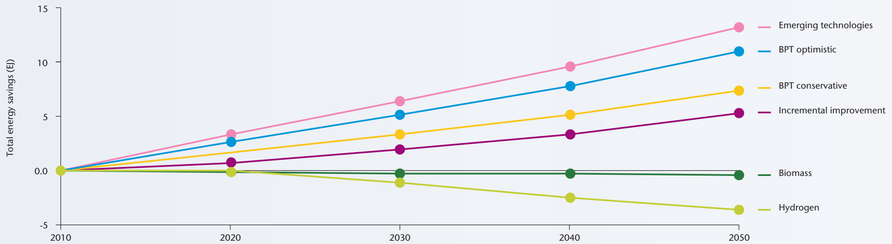
INTERNATIONAL COUNCIL OF CHEMICAL ASSOCIATIONS

DECHEMA

Key findings

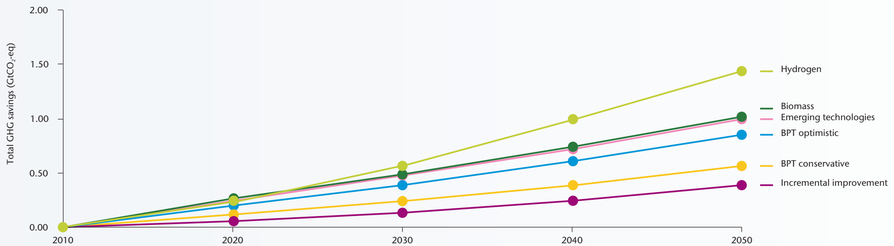
- 18 products (among thousands) account for 80% of energy demand in the chemical industry and 75% of GHG emissions.
- Catalyst and related process improvements could reduce energy intensity for these products by 20% to 40% by 2050 combining all improvement scenarios. This represents savings of 13 EJ/yr, equivalent to 1 $GtCO_2$/yr by 2050. These savings should not be "left behind", yet a revival/rebalancing of R&D, development efforts, and capital will be required for breakthroughs.
- To 2025, steady progress in implementing incremental improvements and deploying best practice technologies (BPT) could provide substantial energy savings and emissions reduction.
- Achieving deeper energy and emissions cuts will require development and deployment of emerging technologies that exceed the capacity of current BPT.
- A step change in the sector's energy consumption and GHG emissions would require the development of "game changer" technologies.
- Sustainable biomass feedstocks and hydrogen from renewable energy sources are examples of potential game changers, although currently they are not viable for broad application as they increase energy use. Long-term investment in R&D is warranted to continue advances.

Energy savings potential in the chemical industry

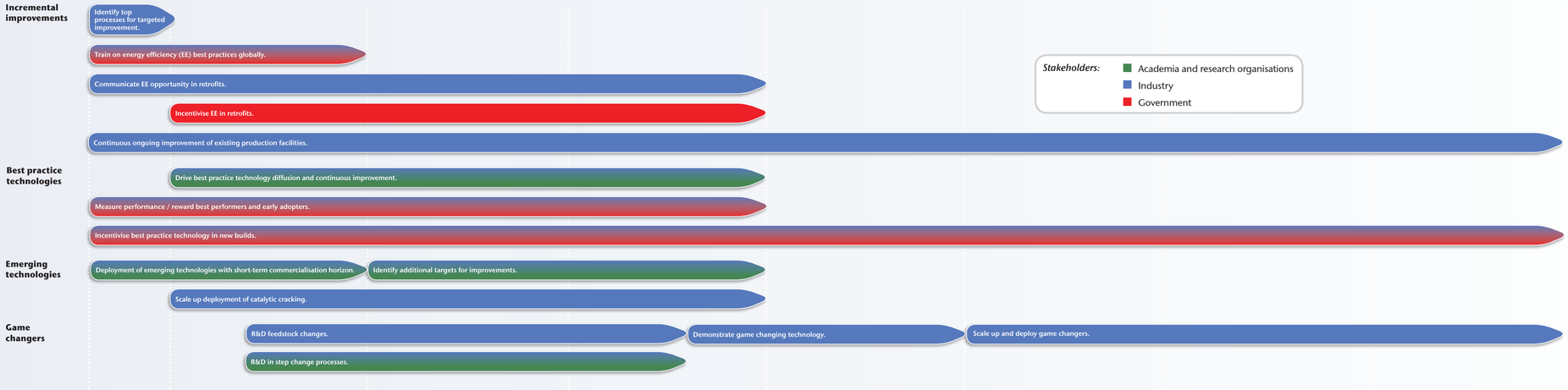


Note: Black line represents zero axis.
Source: DECHEMA.

GHG reductions potential in the chemical industry



Source: DECHEMA.



Key actions over the next ten years

Policymakers

- Develop and implement policies that more highly reward energy efficiency investments and remove barriers for new investments.
- Create a long-term policy framework that encourages investments to reinvigorate catalyst/process improvement and R&D for high energy-consuming processes.
- Introduce enabling policies for best practices in regions where new facilities are built.
- Eliminate energy subsidies which are barriers to use of more energy efficient technology.

Chemical industry

- Identify top catalyst/process-related opportunities; accelerate R&D and capital investments that improve energy efficiency.
- Facilitate R&D on game changers with partners to lower barriers and operating costs.
- Promote global and regional co-operation on reducing energy and/or emissions via industry associations.

Academia and research organisations

- Stimulate academic and national laboratory research on large-volume/high energy use processes.
- Take action with industry leaders to identify top prospects for reducing technical barriers.

Financial institutions

- Work together with the chemical industry to better understand changes in funding needs of a low-carbon chemical sector and funding opportunities of such a transition.

Regional indicators

North America		Low-Demand Case			High-Demand Case		
	2010	2020	2030	2050	2020	2030	2050
Total energy consumption in the 2DS (PJ)	8 043	7 542	7 068	6 128	7 525	6 785	5 266
of which feedstock is	*3 507*	*3 735*	*3 654*	*3 492*	*3 743*	*3 499*	*2 987*
Energy savings (2DS vs. 6DS) (PJ)	0	1 064	1 697	3 247	891	1 765	3 860
Total CO_2 emissions in the 2DS ($MtCO_2$)	268	213	177	120	207	170	95
CO_2 emissions reduction (2DS vs. 6DS) ($MtCO_2$)	0	69	104	175	66	101	184

Non-OECD Europe and Eurasia		Low-Demand Case			High-Demand Case		
	2010	2020	2030	2050	2020	2030	2050
Total energy consumption in the 2DS (PJ)	3 878	3 929	4 121	4 314	4 099	4 359	4 580
of which feedstock is	*2 227*	*2 421*	*2 602*	*2 895*	*2 547*	*2 782*	*3 123*
Energy savings (2DS vs. 6DS) (PJ)	0	548	1 010	1 840	403	879	1 896
Total CO_2 emissions in the 2DS ($MtCO_2$)	172	149	144	126	149	145	126
CO_2 emissions reduction (2DS vs. 6DS) ($MtCO_2$)	0	41	71	120	40	71	127

Latin America		Low-Demand Case			High-Demand Case		
	2010	2020	2030	2050	2020	2030	2050
Total energy consumption in the 2DS (PJ)	1 539	2 262	2 587	2 944	2 275	2 649	3 134
of which feedstock is	*813*	*1 350*	*1 613*	*1 943*	*1 375*	*1 688*	*2 153*
Energy savings (2DS vs. 6DS) (PJ)	0	120	235	621	142	351	1 024
Total CO_2 emissions in the 2DS ($MtCO_2$)	53	61	60	53	60	59	52
CO_2 emissions reduction (2DS vs. 6DS) ($MtCO_2$)	0	15	27	53	17	32	67

Middle East		Low-Demand Case			High-Demand Case		
	2010	2020	2030	2050	2020	2030	2050
Total energy consumption in the 2DS (PJ)	4 973	7 383	9 856	12 503	8 077	10 851	14 781
of which feedstock is	*2 611*	*4 797*	*7 019*	*9 605*	*5 425*	*8 002*	*11 956*
Energy savings (2DS vs. 6DS) (PJ)	0	1 114	2 086	4 656	1 140	2 714	7 519
Total CO_2 emissions in the 2DS ($MtCO_2$)	201	204	204	184	206	201	174
CO_2 emissions reduction (2DS vs. 6DS) ($MtCO_2$)	0	88	171	327	96	201	420

OECD Europe		Low-Demand Case			High-Demand Case		
	2010	2020	2030	2050	2020	2030	2050
Total energy consumption in the 2DS (PJ)	5 938	5 312	4 929	4 257	5 288	4 733	3 676
of which feedstock is	*2 925*	*2 803*	*2 670*	*2 435*	*2 795*	*2 554*	*2 074*
Energy savings (2DS vs. 6DS) (PJ)	0	649	1 023	1 939	546	1 092	2 386
Total CO_2 emissions in the 2DS ($MtCO_2$)	177	135	113	74	132	105	56
CO_2 emissions reduction (2DS vs. 6DS) ($MtCO_2$)	0	39	57	96	39	60	106

China		Low-Demand Case			High-Demand Case		
	2010	2020	2030	2050	2020	2030	2050
Total energy consumption in the 2DS (PJ)	8 760	12 523	14 641	20 054	12 769	15 061	17 297
of which feedstock is	*3 523*	*5 854*	*7 339*	*12 165*	*6 053*	*7 658*	*9 876*
Energy savings (2DS vs. 6DS) (PJ)	0	1 382	2 696	8 419	1 096	2 660	8 949
Total CO_2 emissions in the 2DS ($MtCO_2$)	402	495	523	495	498	548	502
CO_2 emissions reduction (2DS vs. 6DS) ($MtCO_2$)	0	112	210	477	118	213	443

OECD Asia Oceania		Low-Demand Case			High-Demand Case		
	2010	2020	2030	2050	2020	2030	2050
Total energy consumption in the 2DS (PJ)	4 392	4 326	4 134	3 327	4 227	3 888	2 641
of which feedstock is	*2 747*	*2 851*	*2 796*	*2 367*	*2 787*	*2 639*	*1 928*
Energy savings (2DS vs. 6DS) (PJ)	0	354	614	1 217	366	840	1 935
Total CO_2 emissions in the 2DS ($MtCO_2$)	134	108	90	54	103	85	40
CO_2 emissions reduction (2DS vs. 6DS) ($MtCO_2$)	0	29	45	74	30	47	84

Rest of the world		Low-Demand Case			High-Demand Case		
	2010	2020	2030	2050	2020	2030	2050
Total energy consumption in the 2DS (PJ)	4 861	7 210	8 671	11 726	7 361	9 454	12 530
of which feedstock is	*2 910*	*4 764*	*5 962*	*8 711*	*4 911*	*6 686*	*9 671*
Energy savings (2DS vs. 6DS) (PJ)	0	359	813	2 325	495	1 489	4 947
Total CO_2 emissions in the 2DS ($MtCO_2$)	186	219	223	213	222	234	219
CO_2 emissions reduction (2DS vs. 6DS) ($MtCO_2$)	0	47	99	222	58	128	295

Source: International Energy Agency.

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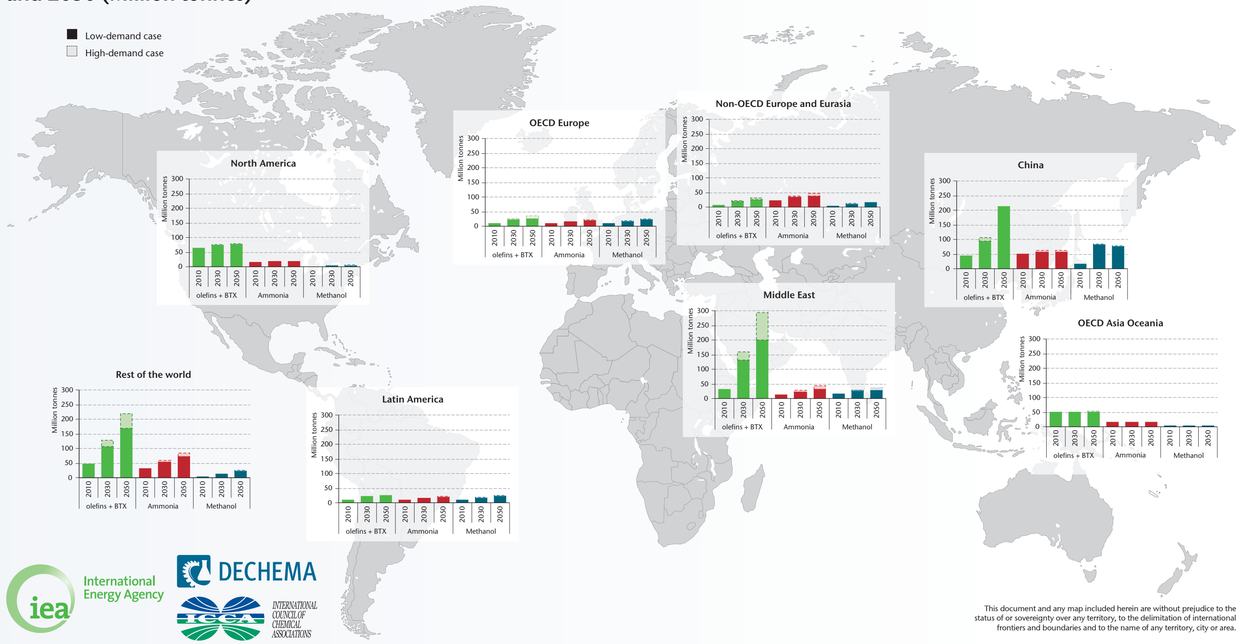
Global HVC production in 2050 low demand case (%)

China 30% | Middle East 29% | North America 11% | OECD Asia Oceania 8% | Rest of the world 8% | OECD Europe 7% | Latin America 4% | Non-OECD Europe and Eurasia 3%

Energy and GHG Reductions in the Chemical Industry via Catalytic Processes

Regional Chemicals production in 2010, 2030 and 2050 (Million tonnes)



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Source: International Energy Agency.