Prospect for Market Expansion of Bioethanol In Korea

2018. 06. 28.

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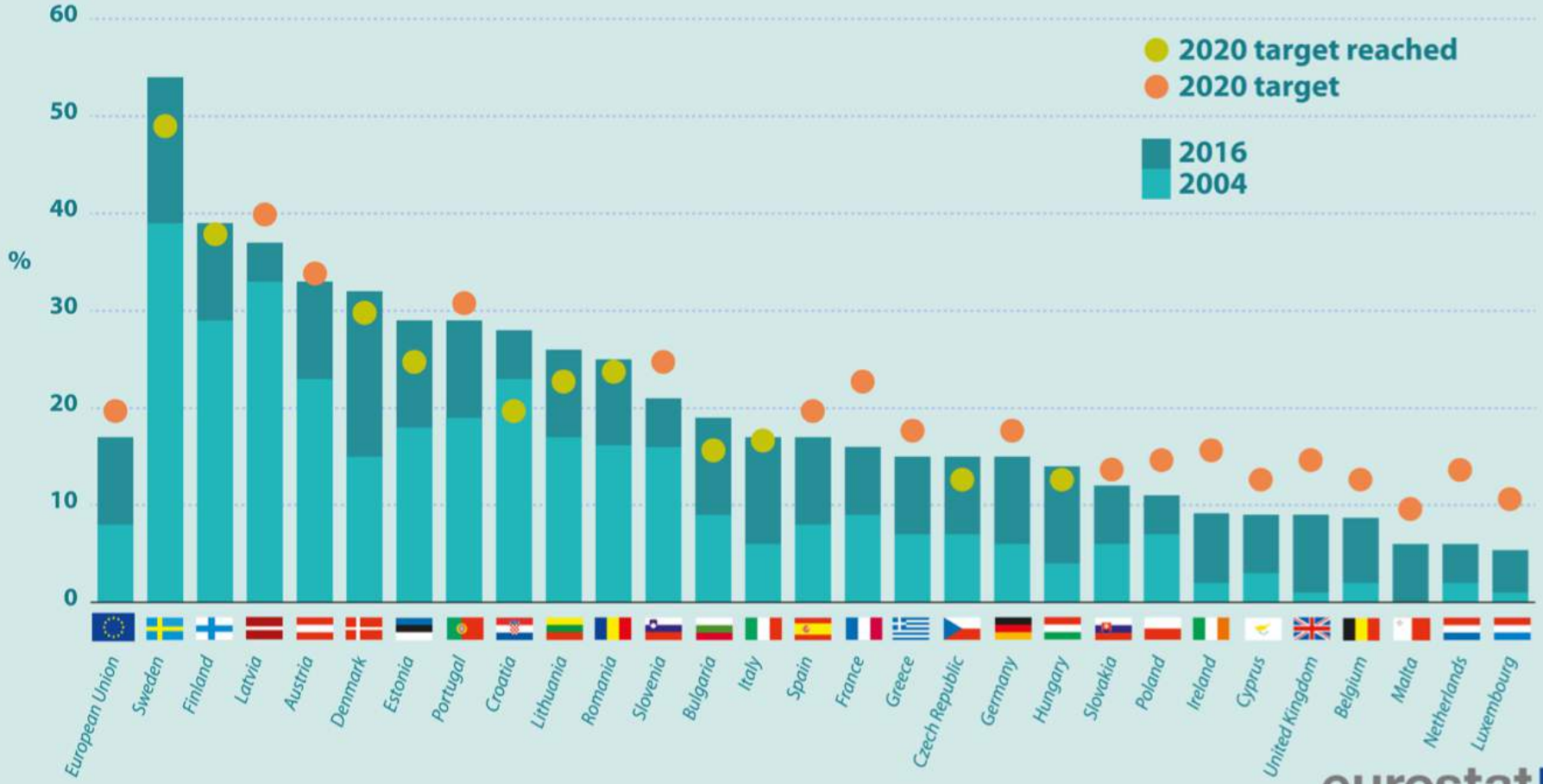
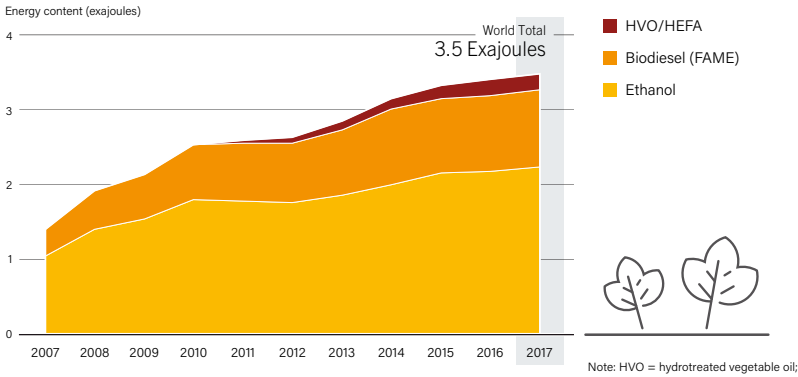
Share of energy from renewable sources in the EU Member States

(in % of gross final energy consumption)



eurostat

		2016	2017
INVESTMENT			
New investment (annual) in renewable power and fuels[1]	billion USD	274	**279.8**
POWER			
Renewable power capacity (including hydro)	GW	2,017	**2,195**
Renewable power capacity (not including hydro)	GW	922	**1,081**
Hydropower capacity[2]	GW	1,095	**1,114**
Bio-power capacity	GW	114	**122**
Bio-power generation (annual)	TWh	501	**555**
Geothermal power capacity	GW	12.1	**12.8**
Solar PV capacity[3]	GW	303	**402**
Concentrating solar thermal power (CSP) capacity	GW	4.8	**4.9**
Wind power capacity	GW	487	**539**
Ocean energy capacity	GW	0.5	**0.5**
HEAT			
Solar hot water capacity[4]	GW_{th}	456	**472**
TRANSPORT			
Ethanol production (annual)	billion litres	103	**106**
FAME biodiesel production (annual)	billion litres	31	**31**
HVO production (annual)	billion litres	5.9	**6.5**
POLICIES[5]			
Countries with national/state/provincial renewable energy targets	#	176	**179**
Countries with 100% renewable electricity targets	#	57	**57**
Countries with 100% renewable heating and cooling targets	#	1	**1**
Countries with 100% renewable transport targets	#	1	**1**
Countries with 100% renewable energy in primary or final energy targets	#	1	**1**
States/provinces/countries with heat obligations/mandates	#	21	**22**
States/provinces/countries with biofuel mandates[6]	#	68	**70**
States/provinces/countries with feed-in policies	#	110	**113**
States/provinces/countries with RPS/quota policies	#	33	**33**
Countries with tendering (held in 2017)	#	34	**29**
Countries with tendering (cumulative)[7]	#	73	**84**



Source: See endnote 56 for this section.

Note: HVO = hydrotreated vegetable oil; HEFA = hydrotreated esters and fatty acids; FAME = fatty acid methyl esters

Ethanol Production: 3% ↑

Biodiesel Production: 0%

HVO Production: 10.1% ↑

	Added During 2017	Existing at End-2017
Transport Fuels Production (billion litres per year)		
Ethanol	2.9	106
FAME Biodiesel	0.1	31
HVO	0.6	6.5

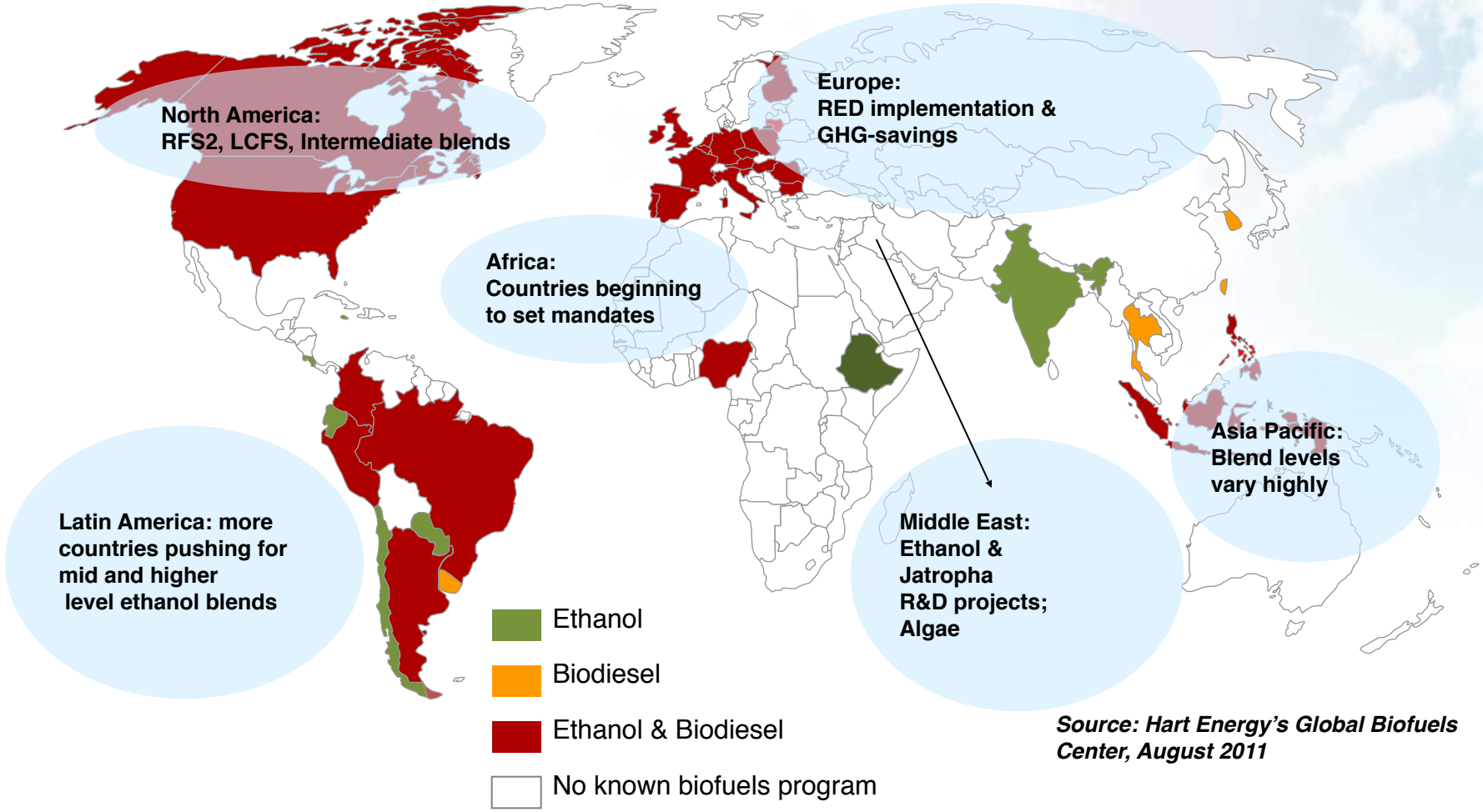
Source: REN21.org

Carbon

Carbon dioxide emissions

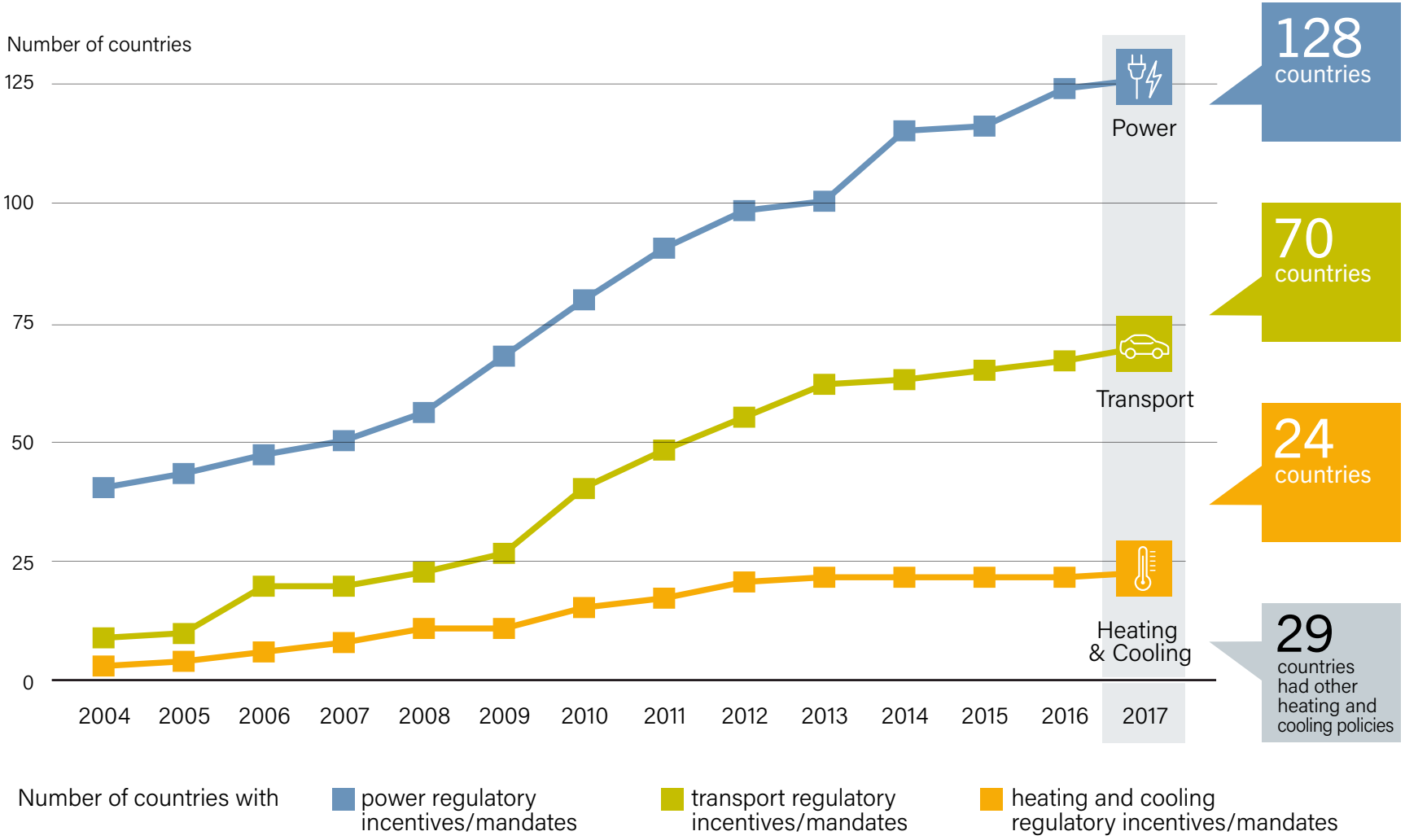
Million tonnes of carbon dioxide	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	**2017**	Growth rate per annum 2017	Growth rate per annum 2006-16	Share 2017
US	5881.4	5704.0	5295.8	5508.3	5374.7	5168.6	5309.1	5360.1	5214.4	5129.5	**5087.7**	-0.5%	-1.2%	15.2%
Canada	551.6	545.9	502.1	525.7	532.1	513.6	529.1	538.0	529.9	543.0	**560.0**	3.4%	0.3%	1.7%
Mexico	428.9	431.6	433.0	442.4	465.4	473.7	474.0	461.7	457.4	488.7	**473.4**	-2.9%	1.4%	1.4%
Total North America	6861.9	6681.6	6230.9	6476.4	6372.2	6156.0	6312.2	6359.8	6201.7	6161.3	**6121.1**	-0.4%	-0.9%	18.3%
Australia	396.8	407.1	402.1	397.6	403.5	396.2	392.3	399.4	407.1	407.1	**406.0**	◆	0.4%	1.2%
Bangladesh	39.7	43.0	47.7	50.8	55.0	60.3	61.5	65.3	77.7	79.6	**82.8**	4.2%	7.7%	0.2%
China	7214.8	7351.8	7680.7	8104.9	8792.3	8966.3	9204.2	9206.5	9163.2	9113.6	**9232.6**	1.6%	3.2%	27.6%
China Hong Kong SAR	85.7	79.2	86.5	88.4	92.1	88.8	91.6	89.8	90.6	92.8	**99.0**	7.0%	1.5%	0.3%
India	1365.5	1466.9	1594.4	1661.8	1737.2	1850.5	1930.9	2084.6	2146.3	2251.0	**2344.2**	4.4%	6.0%	7.0%
Indonesia	386.5	376.0	387.8	427.0	478.7	510.8	524.2	476.5	485.2	486.0	**511.5**	5.5%	3.1%	1.5%
Japan	1266.0	1273.1	1110.7	1182.4	1192.1	1284.5	1274.6	1231.8	1196.9	1180.5	**1176.6**	-0.1%	-0.6%	3.5%
Malaysia	190.5	197.8	190.4	216.5	213.8	226.6	232.8	241.0	245.7	252.1	**255.8**	1.7%	2.9%	0.8%
New Zealand	36.0	37.2	34.2	34.3	33.7	35.2	34.8	35.0	35.3	35.2	**37.0**	5.4%	-0.5%	0.1%
Pakistan	142.0	146.4	146.0	145.7	144.1	145.5	145.5	152.3	160.6	176.7	**189.2**	7.4%	3.1%	0.6%
Philippines	71.8	74.0	74.6	80.1	80.8	83.4	92.2	97.6	106.6	111.7	**119.9**	7.7%	5.2%	0.4%
Singapore	151.4	163.4	176.7	185.3	192.7	192.0	192.8	192.6	204.4	218.6	**226.7**	4.0%	4.5%	0.7%
South Korea	545.4	556.8	559.0	609.8	645.6	644.1	646.5	644.4	655.5	665.2	**679.7**	2.5%	2.5%	2.0%
Sri Lanka	13.8	12.6	13.2	13.1	14.8	16.1	13.9	16.9	19.2	20.2	**21.4**	6.1%	4.5%	0.1%
Taiwan	276.3	258.9	248.1	261.3	271.4	266.1	266.2	271.8	267.7	274.6	**284.5**	3.9%	◆	0.9%
Thailand	236.9	238.1	237.1	249.3	254.2	271.7	275.1	282.2	290.1	294.0	**298.8**	1.9%	2.7%	0.9%
Vietnam	79.2	104.3	102.4	121.9	135.0	132.7	140.8	157.5	183.5	194.9	**196.0**	0.9%	10.4%	0.6%
Other Asia Pacific	125.1	130.3	114.7	117.2	110.8	115.7	112.4	126.4	134.9	159.2	**168.7**	6.2%	1.9%	0.5%
Total Asia Pacific	12623.2	12916.9	13206.3	13947.5	14847.8	15286.6	15632.3	15771.7	15870.4	16013.0	**16330.4**	2.3%	3.1%	48.8%

RFS



Source: Hart Energy's Global Biofuels Center, August 2011

출처: 석유관리원

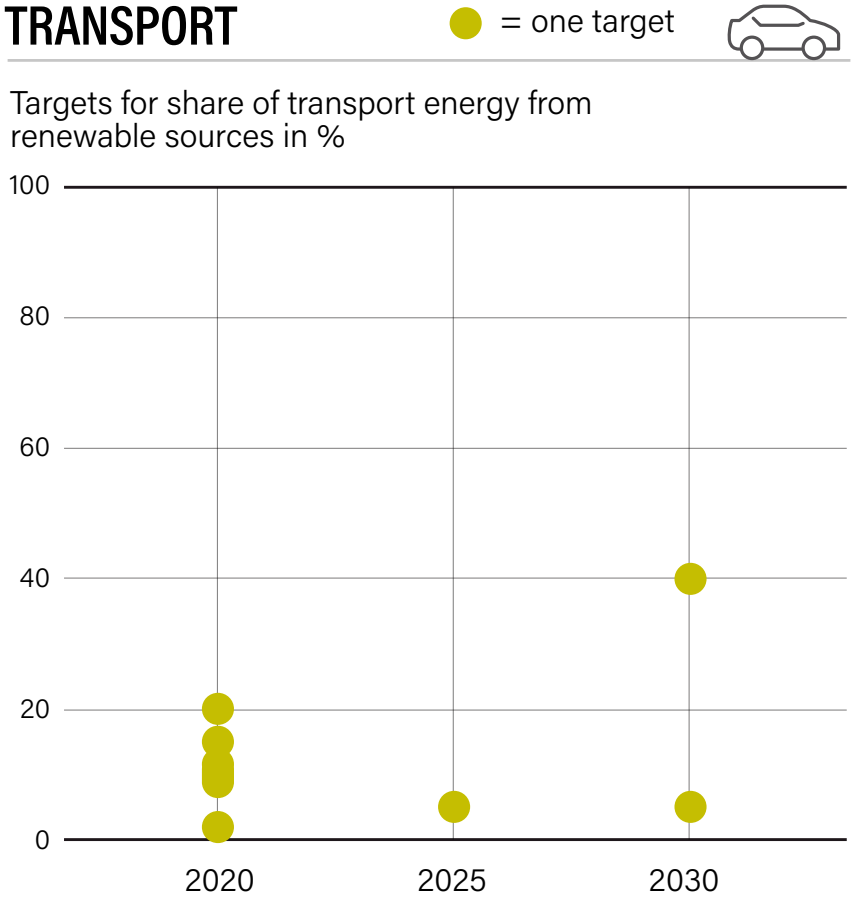

Number of countries
125
100
75
50
25
0
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
Power
Transport
Heating & Cooling
128 countries
70 countries
24 countries
29 countries had other heating and cooling policies
Number of countries with
power regulatory incentives/mandates
transport regulatory incentives/mandates
heating and cooling regulatory incentives/mandates

Annual Investment / Net Capacity Additions / Production in 2017

	1	2	3	4	5
Investment in renewable power and fuels (not including hydro over 50 MW)	**China**	United States	Japan	India	Germany
Investment in renewable power and fuels per unit GDP[1]	**Marshall Islands**	Rwanda	Solomon Islands	Guinea-Bissau	Serbia
Geothermal power capacity	**Indonesia**	Turkey	Chile	Iceland	Honduras
Hydropower capacity	**China**	Brazil	India	Angola	Turkey
Solar PV capacity	**China**	United States	India	Japan	Turkey
Concentrating solar thermal power (CSP) capacity[2]	**South Africa**	-	-	-	-
Wind power capacity	**China**	United States	Germany	United Kingdom	India
Solar water heating capacity	**China**	Turkey	India	Brazil	United States
Biodiesel production	**United States**	Brazil	Germany	Argentina	Indonesia
Ethanol production	**United States**	Brazil	China	Canada	Thailand

Source: REN21.org

TRANSPORT



42 countries have national targets for renewable energy in transport.

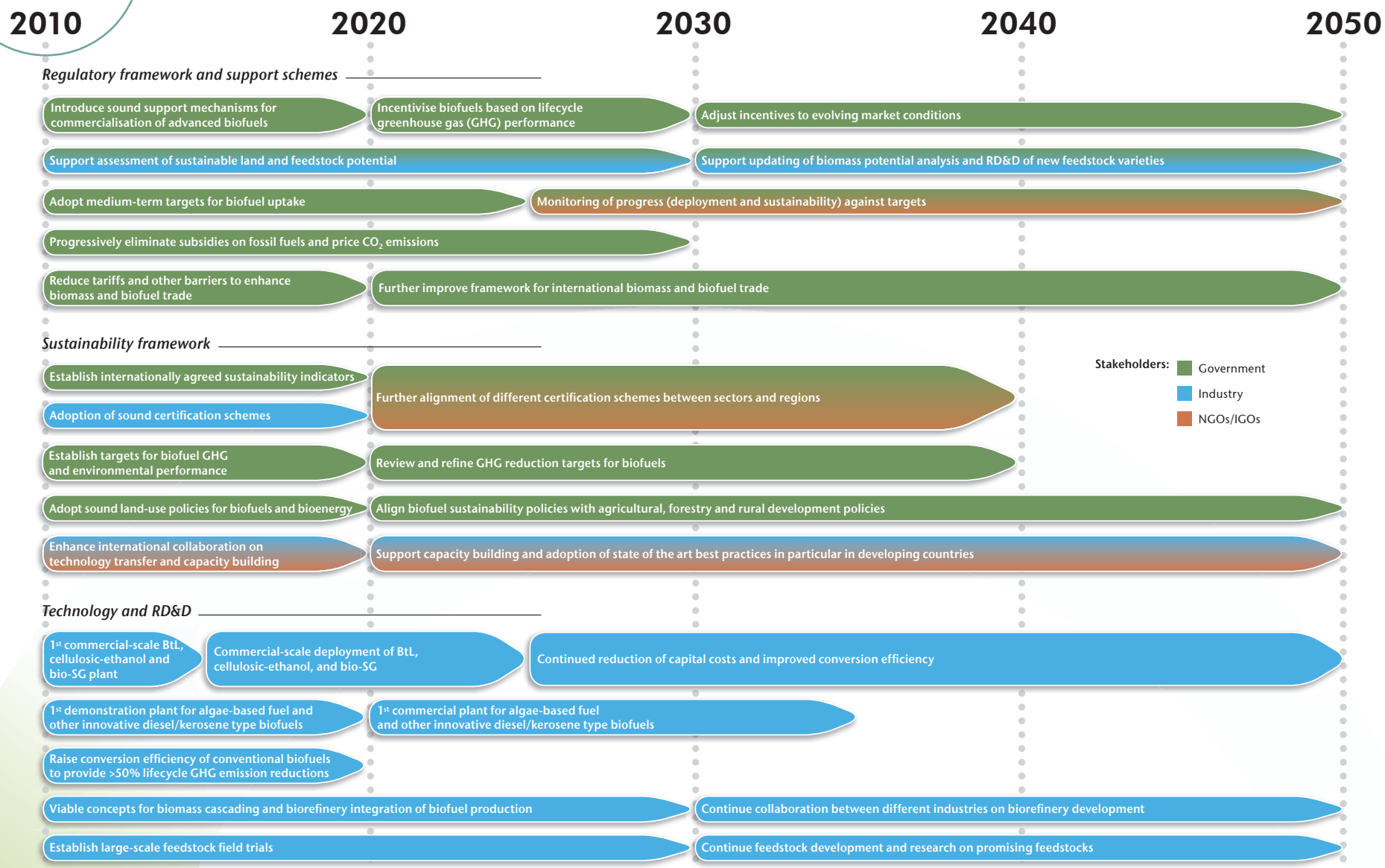
Biofuels production

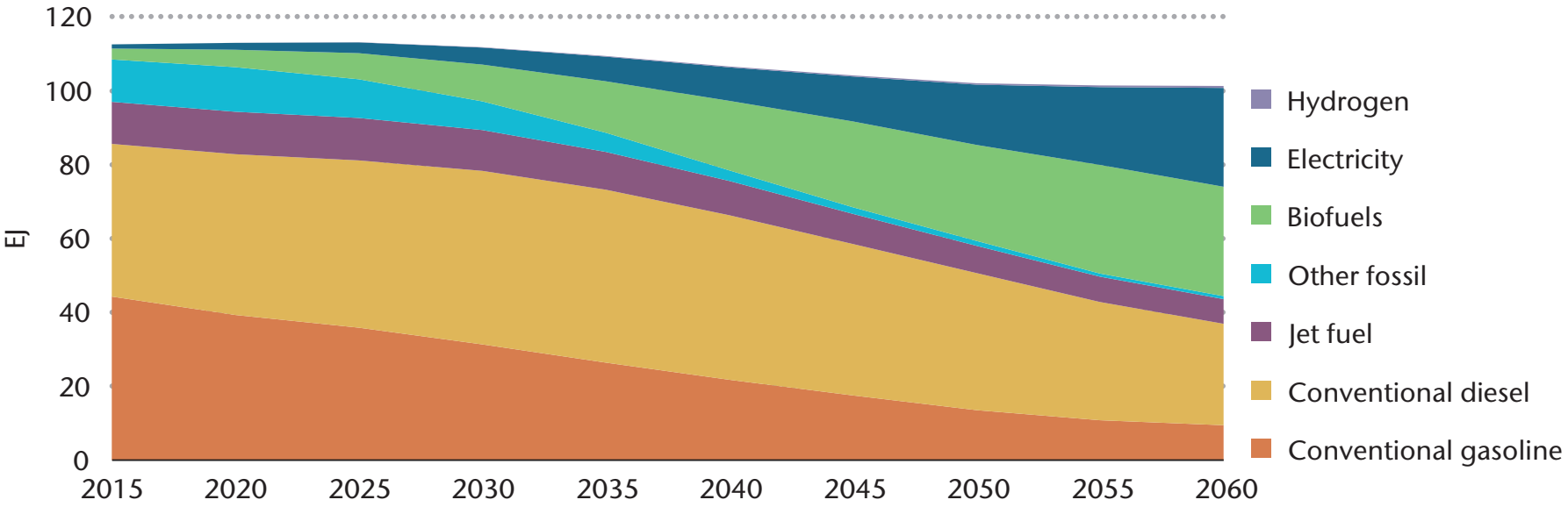
Thousand tonnes oil equivalent	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	**2017**	Growth rate per annum 2017	Growth rate per annum 2006-16	Share 2017
US	14709	20934	23761	28044	31184	29808	31057	32890	33849	35986	**36936**	2.9%	12.9%	43.9%
Canada	502	543	761	787	899	1004	1059	1188	1142	1197	**1239**	3.8%	21.4%	1.5%
Mexico	5	5	5	10	13	9	7	7	5	14	**14**	–	–	◆
Total North America	15216	21481	24527	28841	32095	30821	32124	34086	34996	37197	**38190**	3.0%	13.1%	45.4%
Argentina	173	635	1055	1670	2234	2295	2014	2644	2038	2828	**3131**	11.0%	57.3%	3.7%
Brazil	12427	15486	15277	16866	14403	14739	17114	18005	19332	18168	**18465**	1.9%	6.6%	22.0%
Colombia	155	158	320	455	572	627	650	676	693	626	**617**	-1.1%	15.8%	0.7%
Other S. & Cent. America	606	806	634	232	313	304	359	382	385	409	**456**	11.8%	-2.3%	0.5%
Total S. & Cent. America	13360	17085	17285	19223	17522	17965	20136	21707	22448	22030	**22669**	3.2%	7.9%	26.9%
Austria	222	269	373	391	390	390	374	329	381	419	**391**	-6.5%	14.4%	0.5%
Belgium	146	282	486	523	525	536	526	666	482	477	**471**	-1.0%	35.8%	0.6%
Finland	54	101	231	301	208	263	330	367	432	109	**219**	101.9%	24.2%	0.3%
France	1153	2064	2408	2353	1935	2145	2306	2573	2559	2405	**2224**	-7.3%	13.4%	2.6%
Germany	3243	2805	2834	3022	2967	3031	2770	3460	3191	3228	**3293**	2.3%	2.2%	3.9%
Italy	448	623	772	678	486	298	454	575	572	600	**595**	-0.5%	0.1%	0.7%
Netherlands	82	78	242	391	674	1276	1495	1980	1816	1477	**1658**	12.6%	51.4%	2.0%
Poland	103	290	408	439	414	652	697	750	940	928	**920**	-0.6%	19.7%	1.1%
Portugal	162	149	226	284	330	276	274	301	321	298	**315**	5.9%	15.5%	0.4%
Spain	378	384	1001	1312	851	620	749	1030	1122	1200	**1541**	28.7%	16.0%	1.8%
Sweden	150	183	254	339	400	491	635	789	222	211	**185**	-12.0%	8.7%	0.2%
United Kingdom	374	289	220	304	322	303	517	403	310	554	**617**	11.8%	9.3%	0.7%
Other Europe	504	956	1153	1153	1259	1413	1449	1494	1679	1745	**1738**	-0.1%	15.7%	2.1%
Total Europe	7019	8473	10609	11490	10761	11692	12578	14717	14025	13652	**14167**	4.1%	10.0%	16.8%
Total CIS	2	7	36	34	28	29	23	25	19	19	**19**	–	–	◆
Total Middle East	–	–	–	5	5	5	5	5	5	5	**5**	–	–	◆
Total Africa	6	11	18	8	8	23	32	40	40	40	**40**	–	15.8%	◆
Australia	75	111	174	222	223	241	210	163	162	183	**144**	-21.1%	13.4%	0.2%
China	982	1194	1224	1584	1970	2103	2346	2609	2653	1811	**2147**	18.8%	6.9%	2.6%
India	100	154	61	123	192	168	198	198	438	544	**435**	-19.9%	22.0%	0.5%
Indonesia	217	530	469	723	1110	1397	1750	3110	1314	2238	**2326**	4.2%	48.1%	2.8%
South Korea	78	146	358	511	309	283	321	337	385	386	**406**	5.3%	25.1%	0.5%
Thailand	148	525	656	700	765	1054	1330	1490	1603	1610	**1846**	15.0%	33.9%	2.2%
Other Asia Pacific	227	390	478	443	692	1067	1363	1522	1777	1767	**1727**	-2.0%	28.5%	2.1%
Total Asia Pacific	1827	3051	3419	4306	5262	6313	7518	9429	8333	8540	**9031**	6.0%	20.1%	10.7%
Total World	**37429**	**50109**	**55894**	**63906**	**65680**	**66848**	**72415**	**80009**	**79866**	**81483**	**84121**	**3.5%**	**11.4%**	**100.0%**
of which: OECD	22297	30020	35413	40832	43107	42773	44936	49000	49235	51054	**52552**	3.2%	12.2%	62.5%
Non-OECD	15133	20090	20481	23074	22573	24074	27478	31009	30630	30429	**31569**	4.0%	10.1%	37.5%
European Union	6944	8332	10460	11387	10569	11581	12492	14632	13906	13532	**14044**	4.1%	10.0%	16.7%

◆Less than 0.05%.
Notes: Consumption of fuel ethanol and biodiesel is included in oil consumption tables.
Growth rates are adjusted for leap years.

Source: Includes data from F.O. Lichts; Strategie grains; US Energy Information Administration (March 2018).

Biofuels for transport roadmap milestones




120
100
80
60
40
20
0
EJ
2015
2020
2025
2030
2035
2040
2045
2050
2055
2060
Hydrogen
Electricity
Biofuels
Other fossil
Jet fuel
Conventional diesel
Conventional gasoline

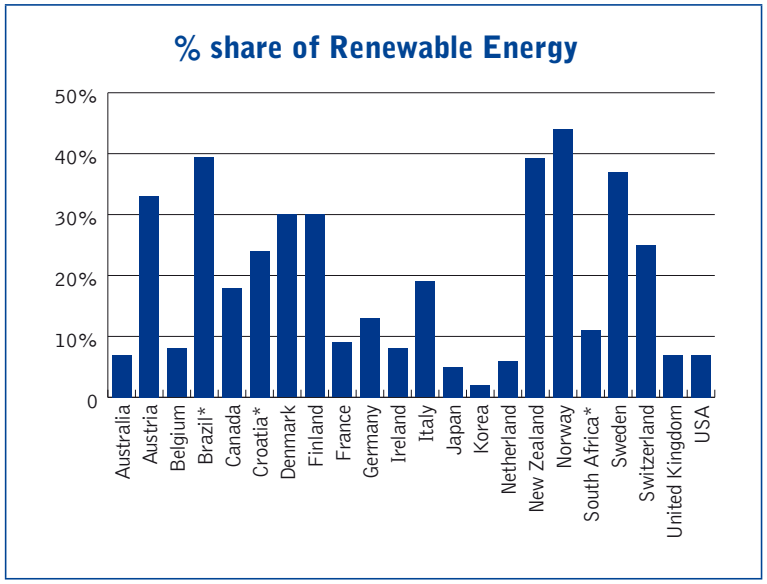


Figure 1: Percentage of renewable energy in year 2014
(Source: World Energy Balances © OECD/IEA 2015)

Note: values for Brazil, Croatia and South Africa are from year 2013

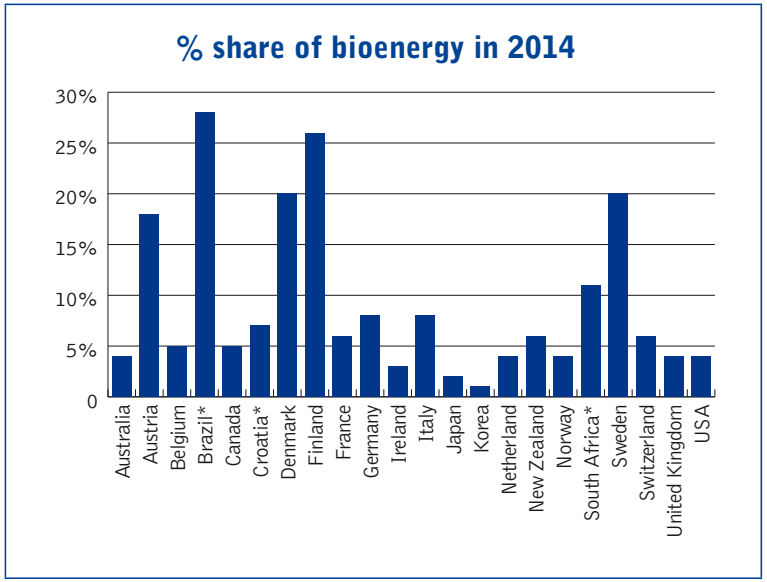
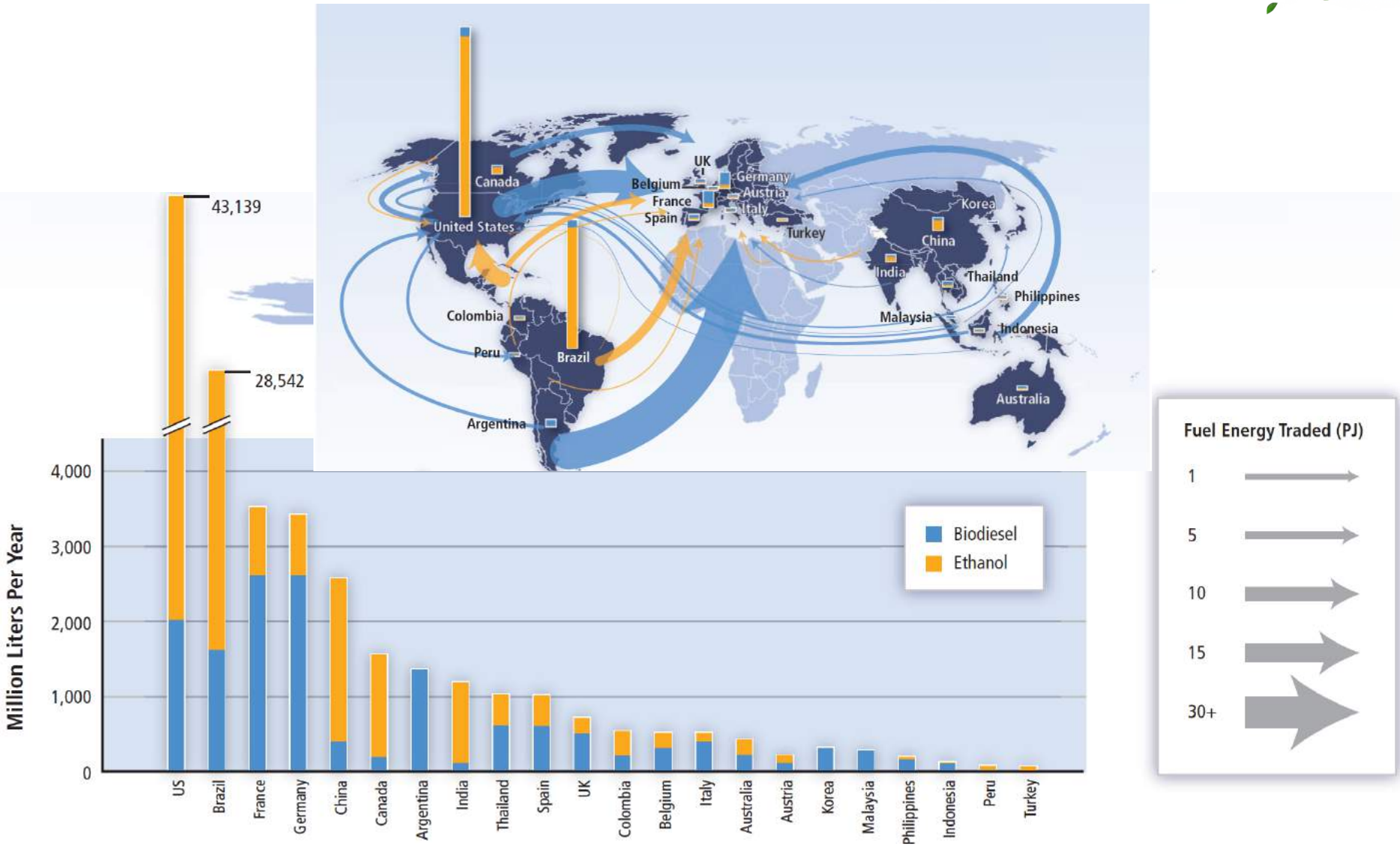


Figure 2: Percentage of bioenergy in year 2014
(Source: Renewables Information © OECD/IEA 2015)

Note: values for Brazil, Croatia and South Africa are from year 2013

Biofuels market



Country	Current mandate/target	Current status	Future andate/ target (2020)
China	E10 (9 rovinces), B5	M	E10 (9 provinces), E15 (T)
Korea	B2.5	M	B3 (2018)
Japan	ETBE, B5	T	10% biofuels (2030)
United States	9.02% renewable fuels B: 68.5 billion litres	M	136 billion litres biofuels by 2022

BiofuelsDigest
The world's most widely read biofuels daily

South Korean April ethanol imports up nearly 39% on year

May 15, 2018 | Meghan Sapp

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In South Korea, Platts reports that April ethanol imports reached 30,510 metric tons, up more than 5% from March and nearly 39% higher than last year. Australia was the lead origin for undenatured ethanol, accounting for 37% of the total volume at just under 5,000 tons, followed by Cambodia and Pakistan. For denatured ethanol, 83% came from the US totaling 17,206 tons. South Korea's ethanol exports fell by more than half to just 1,465 tons, nearly all of which went to Japan as undenatured ethanol.

BiofuelsDigest
The world's most widely read biofuels daily

South Korean March ethanol imports jump more than 52%

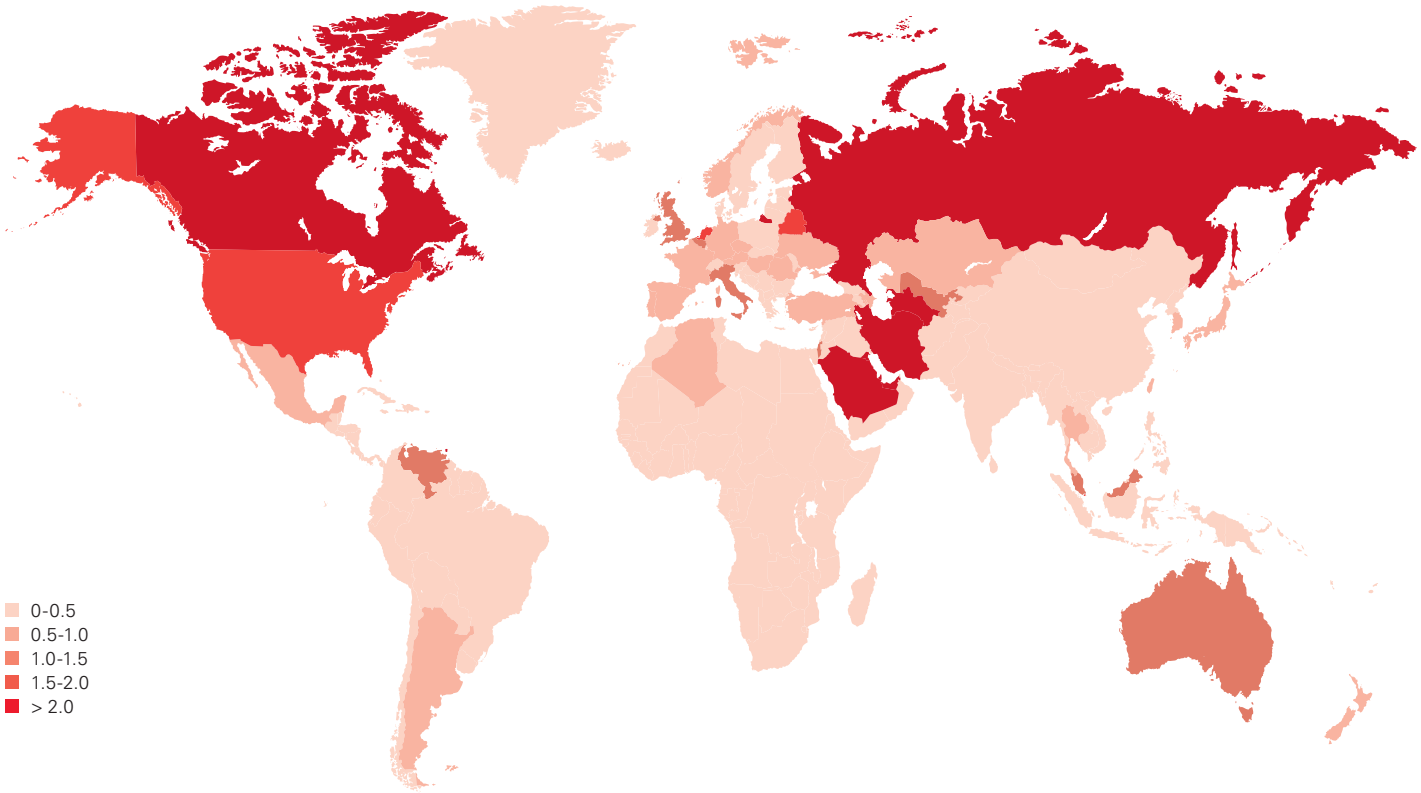
April 12, 2018 | Meghan Sapp

Tweet Share Mail Share

In South Korea, Platts reports that ethanol imports reached 28,946 metric tons in March, more than 52% higher than March 2017 and more than 10% higher than February. With traders eyeing Brazilian B grade ethanol in hopes that growing supplies thanks to the start of the 2018/19 sugarcane crush will push down prices, in March they took advantage of predominantly Australian origin undenatured ethanol while 62% of denatured ethanol came from the US, followed by Pakistan and South Africa.

Natural gas: Consumption per capita 2017

Million tonnes oil equivalent

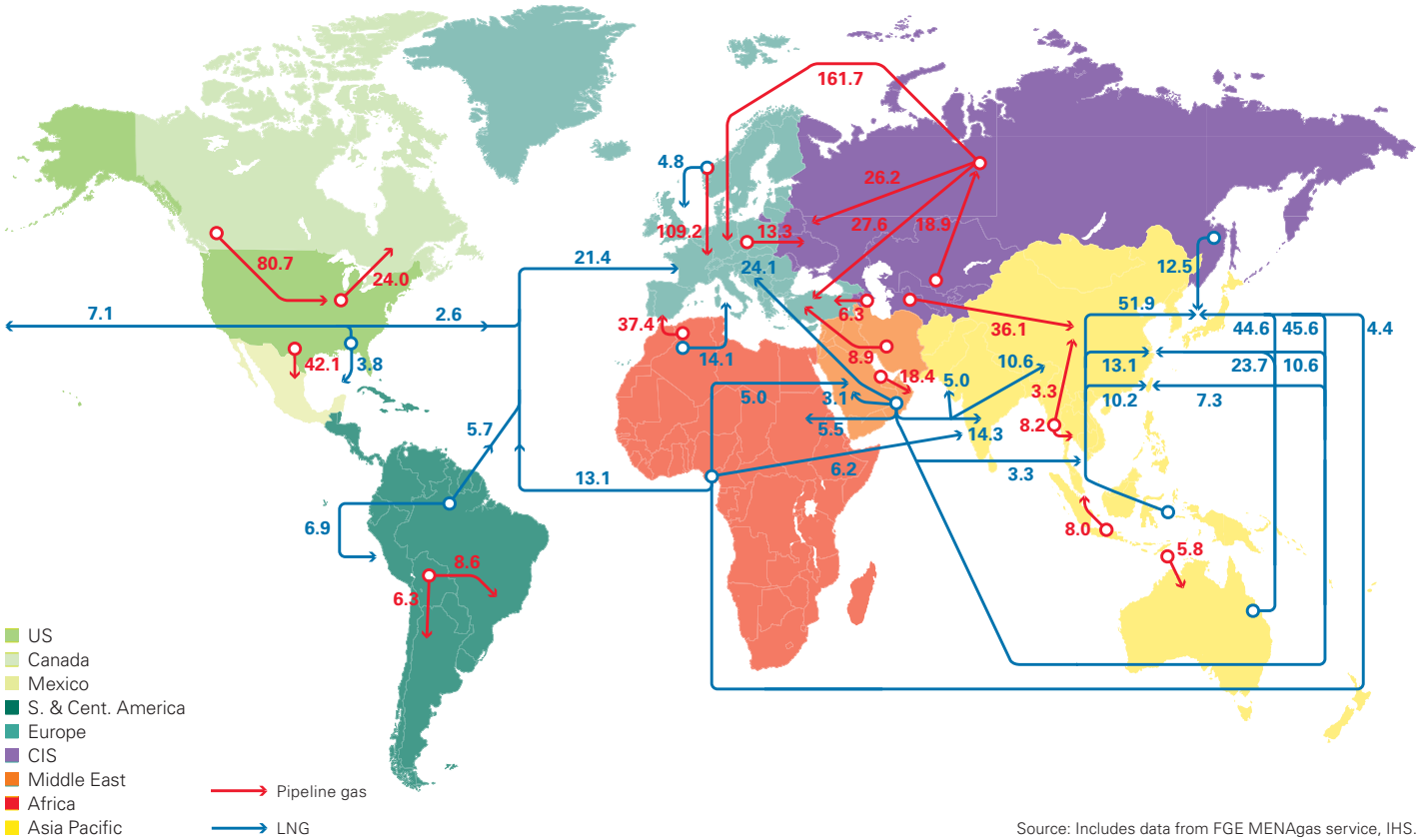


bp

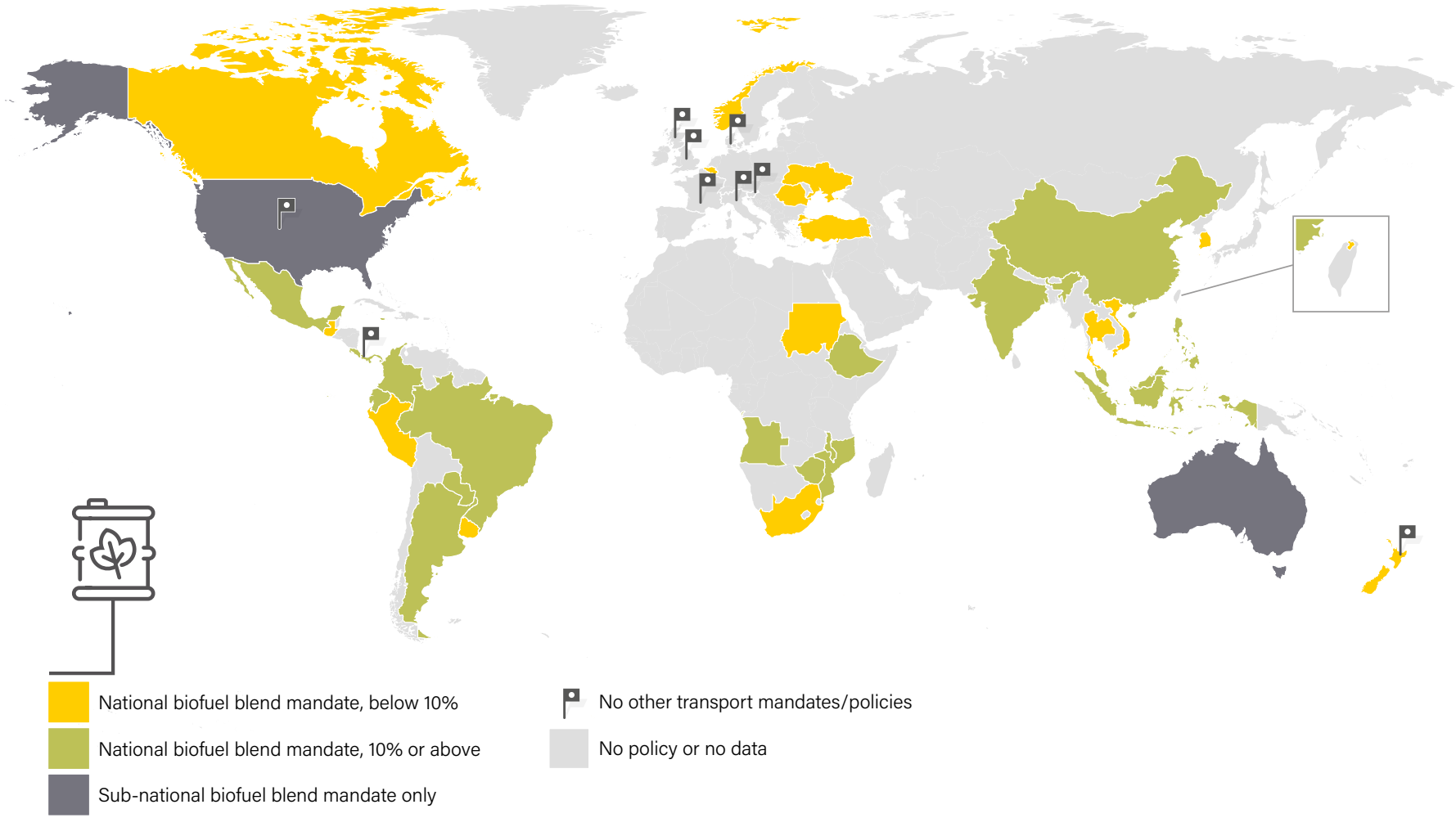
BP Statistical Review of World Energy 2018

Major trade movements 2017

Trade flows worldwide (billion cubic metres)

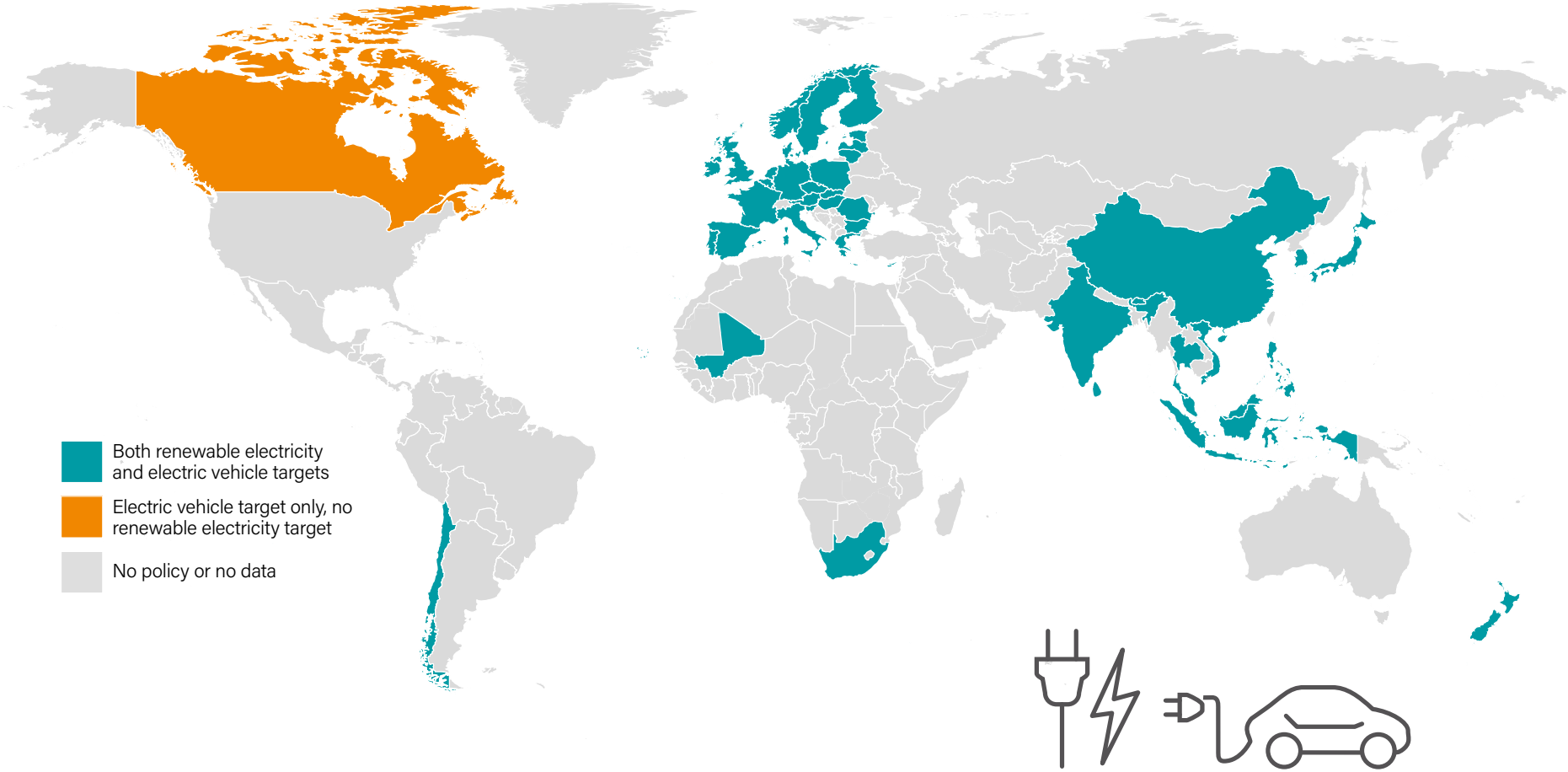


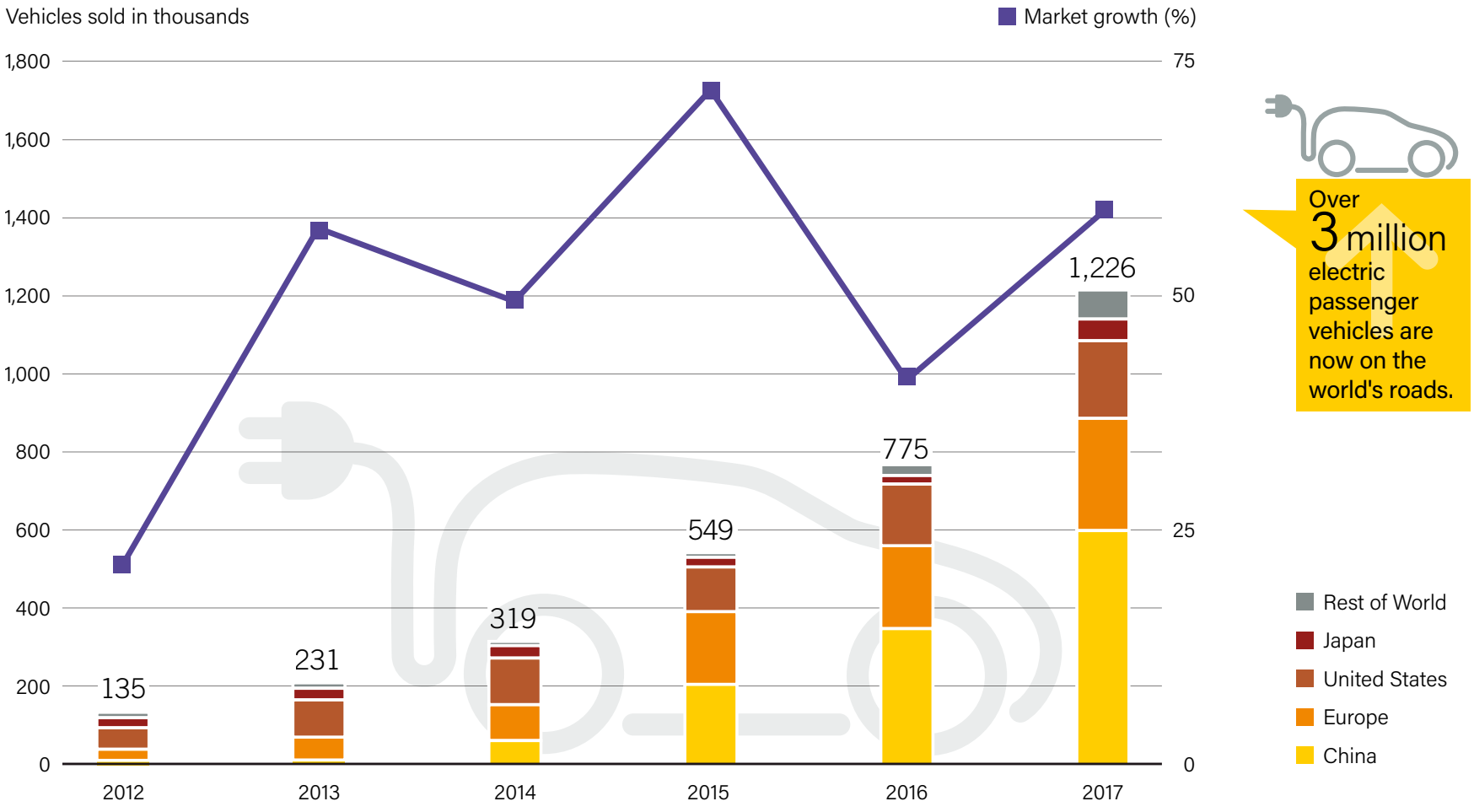
Source: Includes data from FGE MENAgas service, IHS.



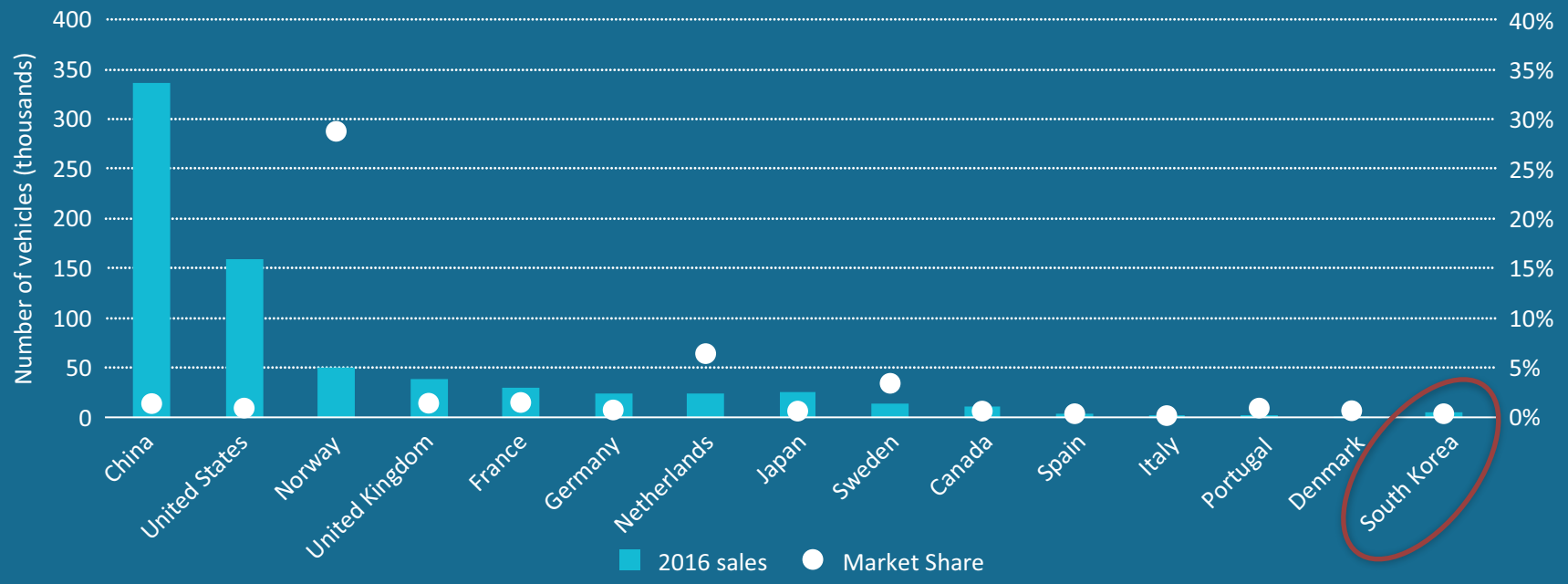
Note: Shading shows countries and states/provinces with mandates for either biodiesel, ethanol or both.
Source: REN21 Policy Database.

NATIONAL TARGETS




Vehicles sold in thousands
Market growth (%)
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
75
50
25
0
135
231
319
549
775
1,226
2012
2013
2014
2015
2016
2017
Over
3 million
electric passenger vehicles are now on the world's roads.
Rest of World
Japan
United States
Europe
China

35 EV sales and market share in a selection of countries, 2016



글로벌 전기차 배터리 출하량 (단위: MWh)

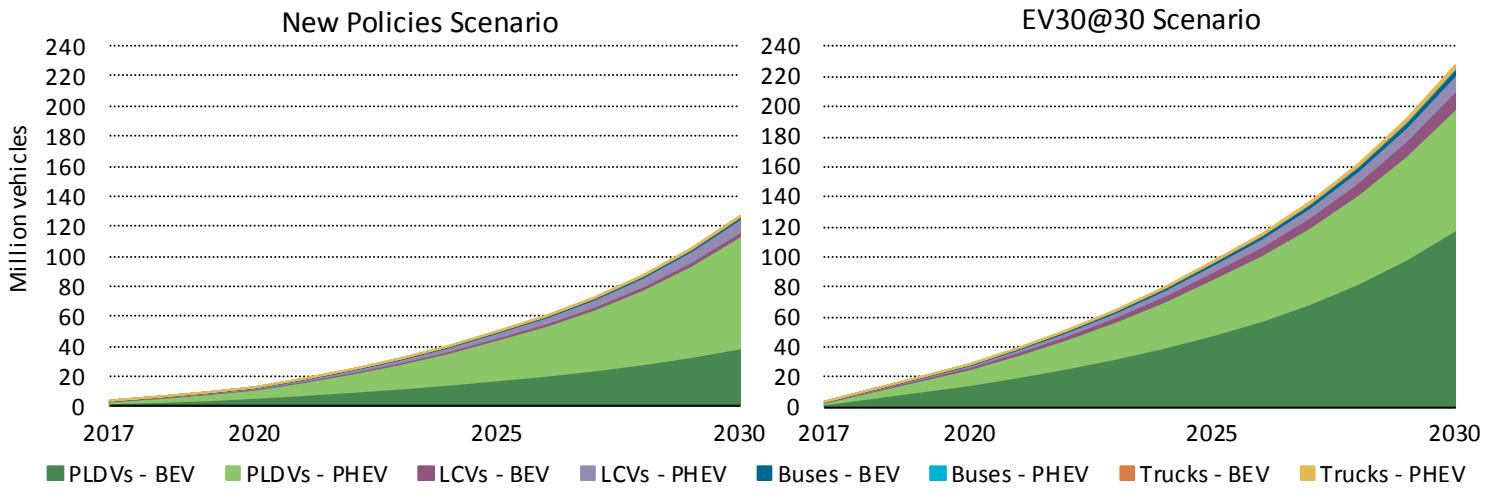
순위	제조사명	2017년 1~2월	2018년 1~2월	성장률
1	파나소닉	1,009.7	**967.3**	-4.2%
2	LG화학	544.5	**706.0**	29.7%
3	AESC	299.0	**460.3**	53.9%
4	삼성SDI	239.9	**405.3**	68.9%
5	Fransis	102.0	**273.0**	167.6%

<자료: SNE리서치>

세계 전기차 배터리 출하량 순위

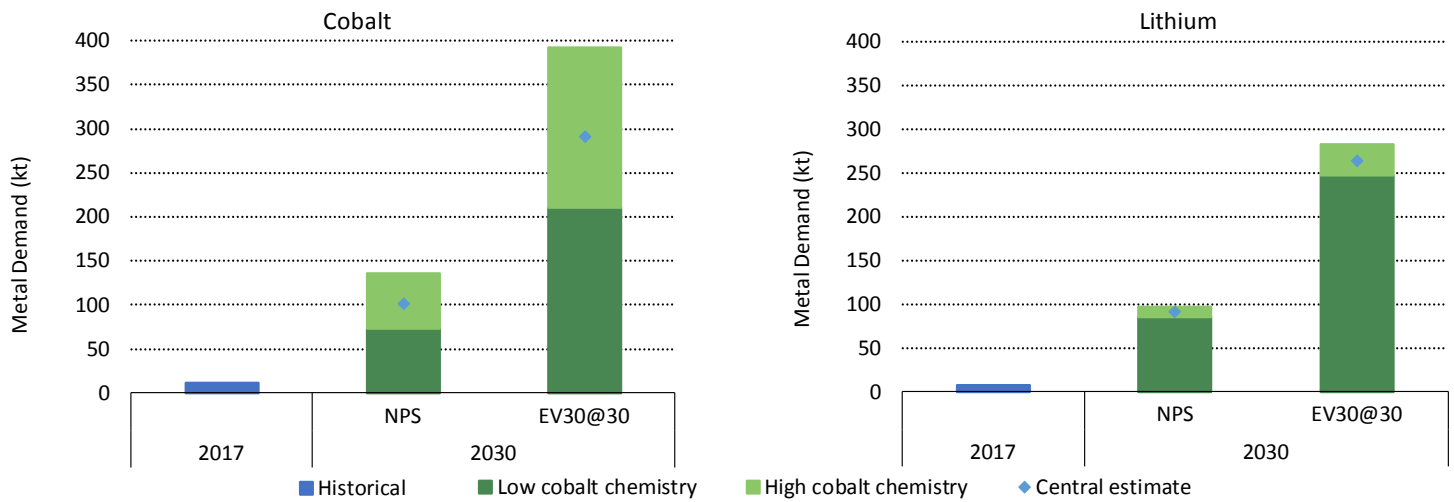
순위	제조사	1~11월 출하량(MWh)	점유율 (%)	전년 대비 성장(%)
1	파나소닉	8384.0	43.8	25.9
2	LG화학	4084.1	21.3	172.4
3	삼성SDI	2183.4	11.4	87.5
4	PEVE	1657.8	8.7	8.3
5	AESC	1589.6	8.3	−2.6
6	LEJ	376.4	2.0	−8.3
7	SK이노베이션	267.6	1.4	−56.5
8	BEC	174.3	0.9	12.0
9	JCI	140.5	0.7	63.6
10	Litec	113.4	0.6	313.0
	그외 기타	188.8	1.0	−0.4

중국 출시 전기차 탑재 중국산 배터리 출하량은 제외. 자료: SNE리서치



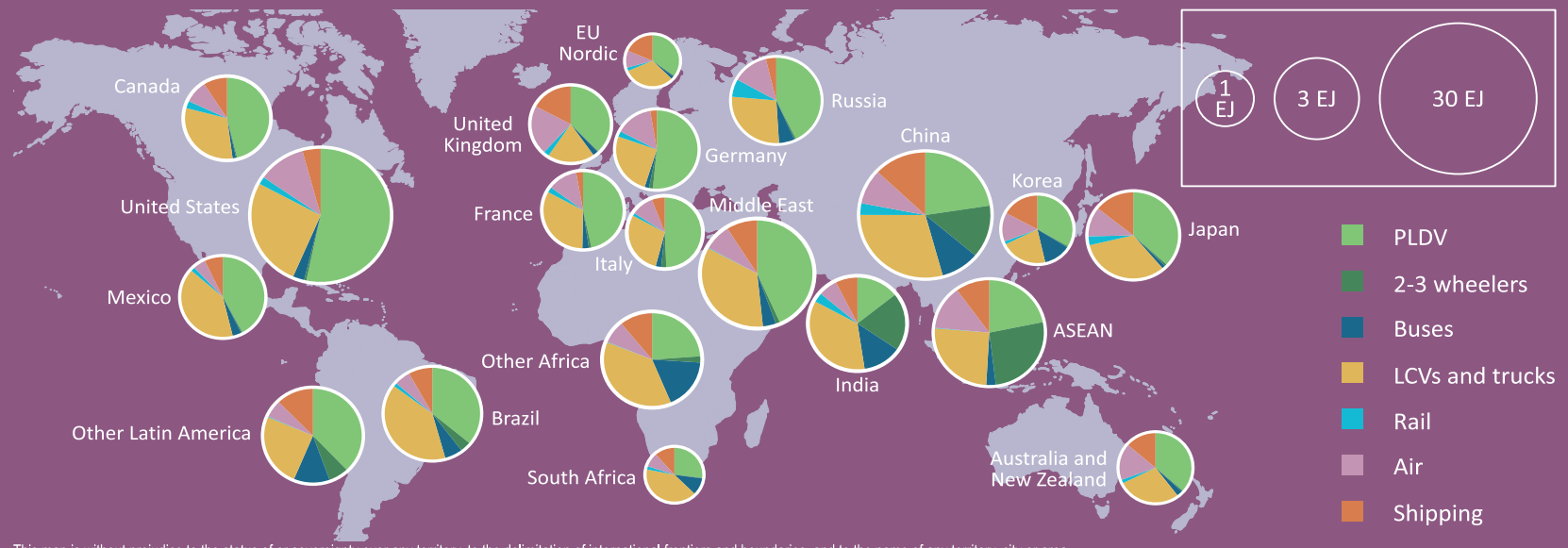
Notes: PLDVs = passenger light duty vehicles; LCVs = light commercial vehicles; BEVs = battery electric vehicles; PHEV = plug-in hybrid electric vehicles.

Source: IEA analysis developed with the IEA Mobility Model (IEA, 2018a).

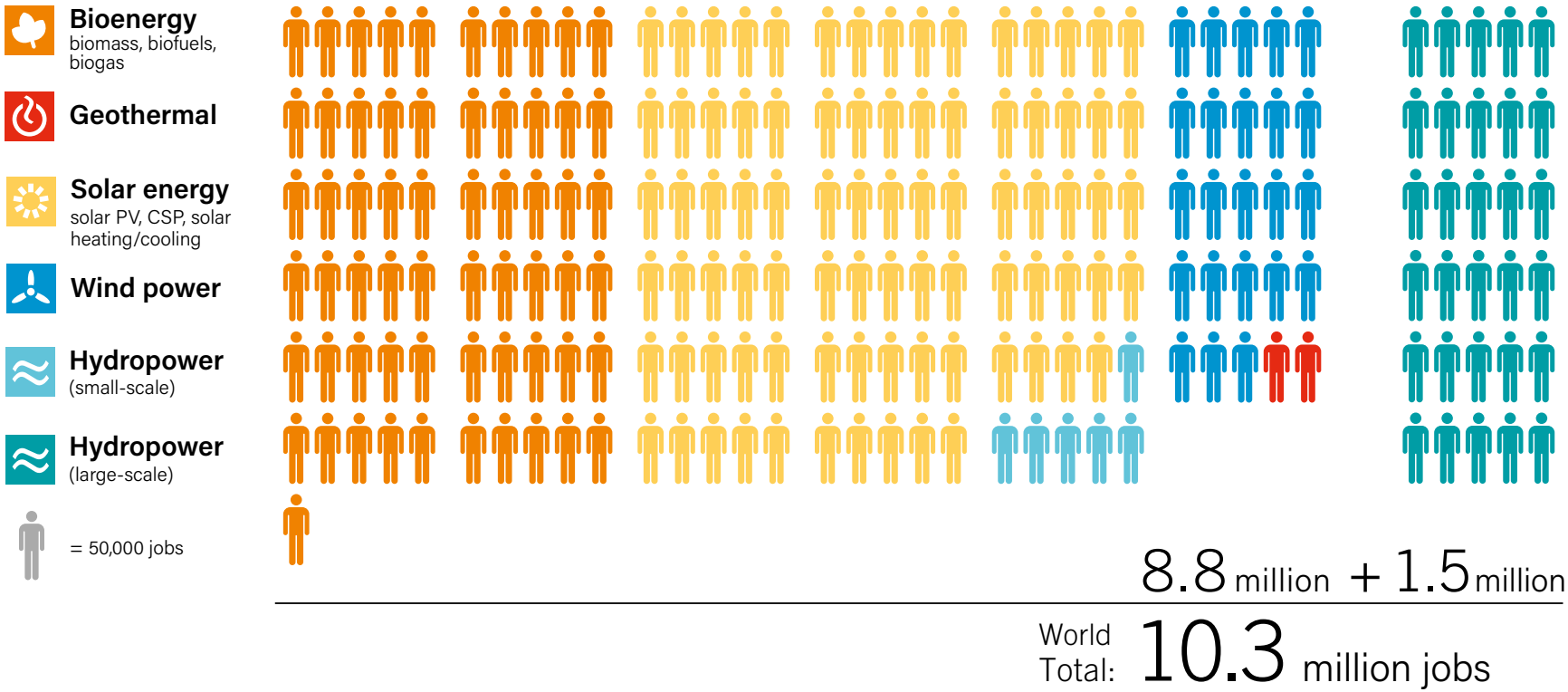


Notes: NPS= New Policies Scenario. Projected battery capacities and sales figures are used to estimate material demand in 2030. Demand figures refer to pure metal contents. In the low cobalt scenario, NMC 811 makes up 90% of battery sales in 2030, with the rest being NCA. In the high cobalt scenario, NMC 622 makes up 90% of sales with NCA the rest. In all scenarios battery demand for HDVs is assumed to be 80% LFP and 20% NMC 622.

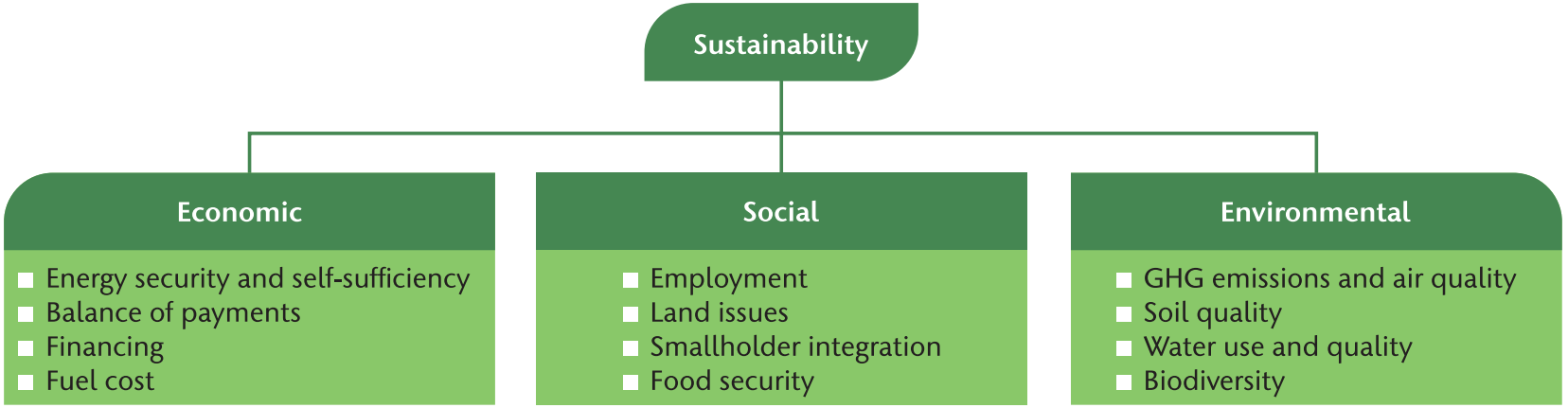
33 Transport energy use, by mode, 2015



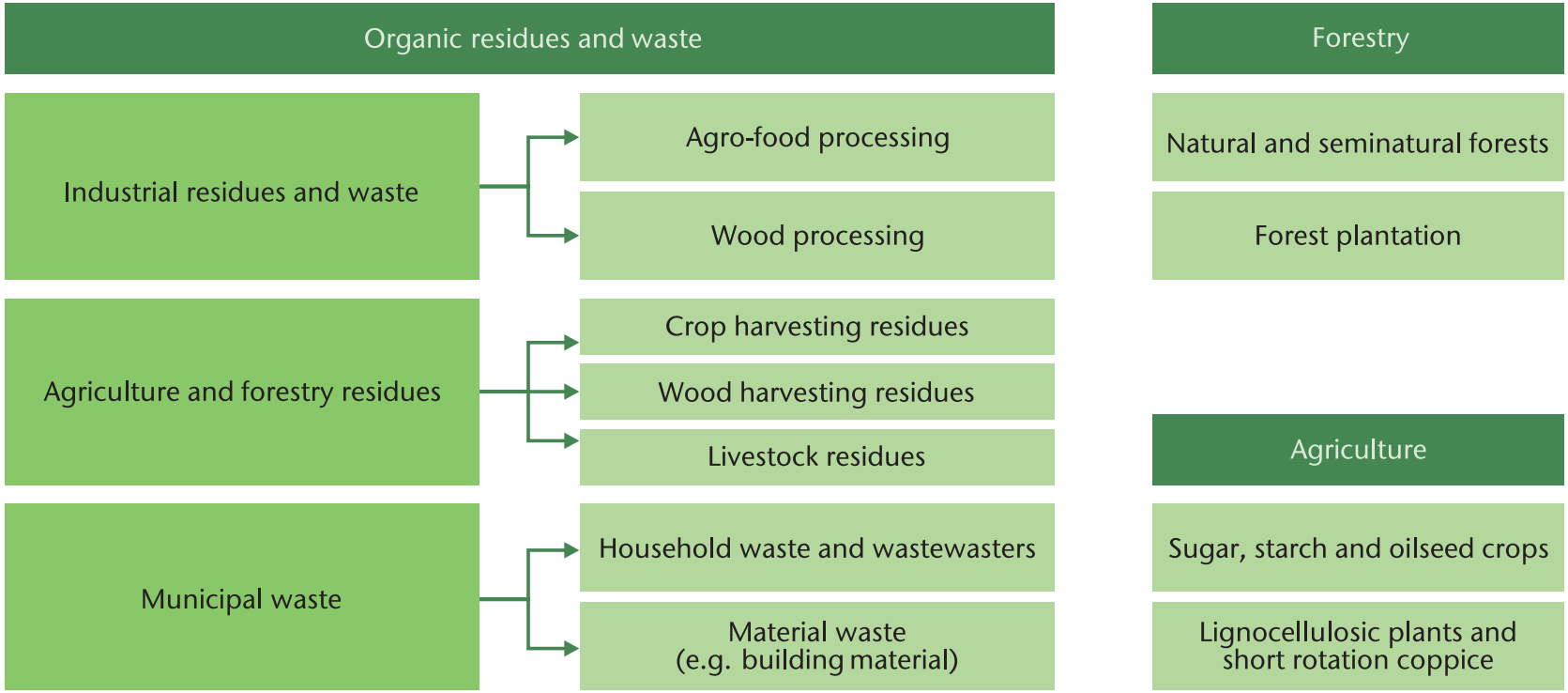
This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.



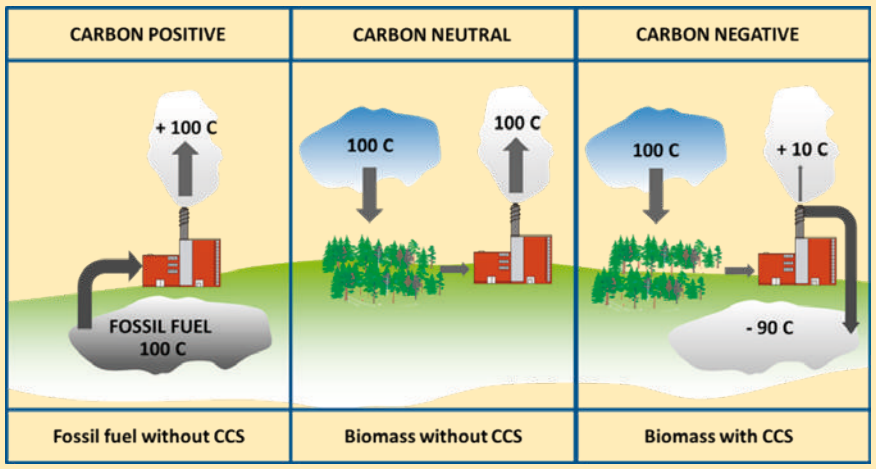
Source: IRENA

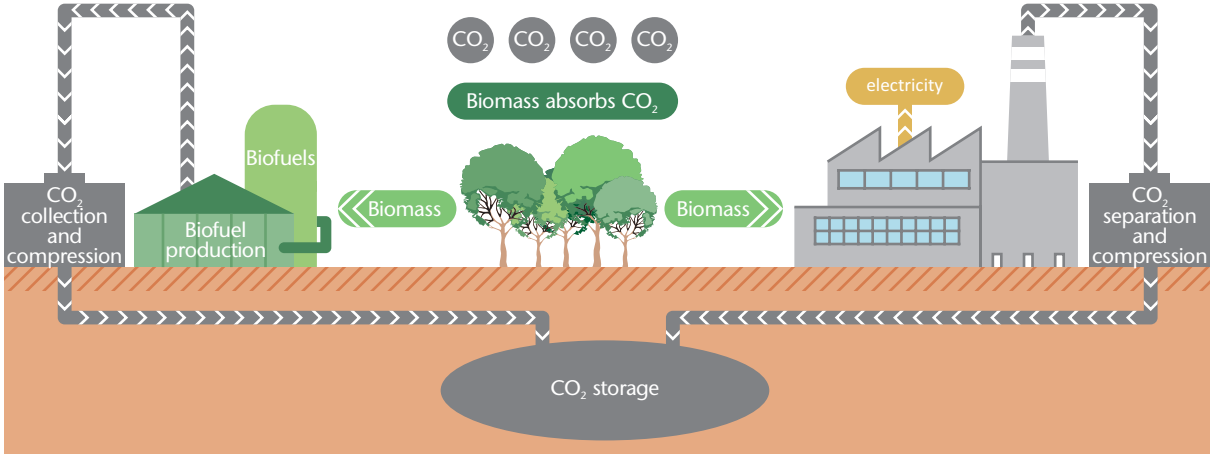


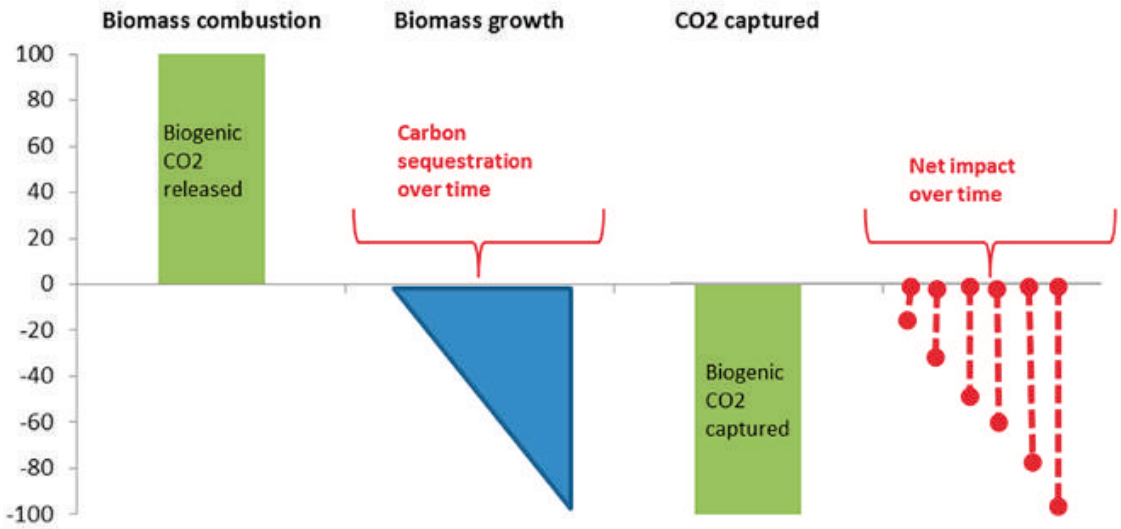
Source: adapted from IEA (2011a), *Technology Roadmap: Biofuels for Transport*.



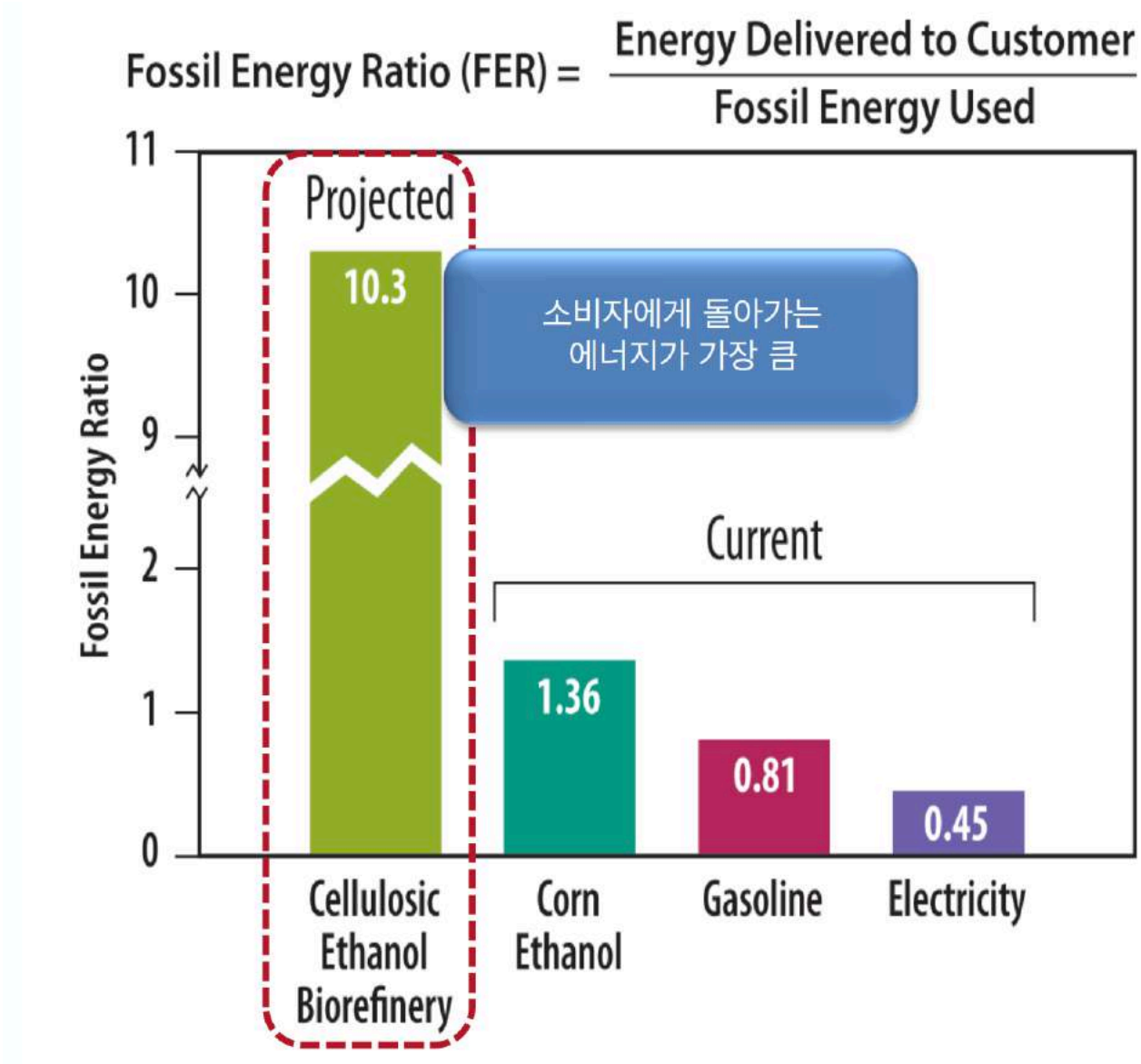
Source: adapted from FAO (2004), *Unified Bioenergy Terminology – UBET*, www.fao.org/docrep/007/j4504e/j4504e00.htm.


CARBON POSITIVE
CARBON NEUTRAL
CARBON NEGATIVE
+ 100 C
FOSSIL FUEL
100 C
100 C
100 C
100 C
+ 10 C
- 90 C
Fossil fuel without CCS
Biomass without CCS
Biomass with CCS

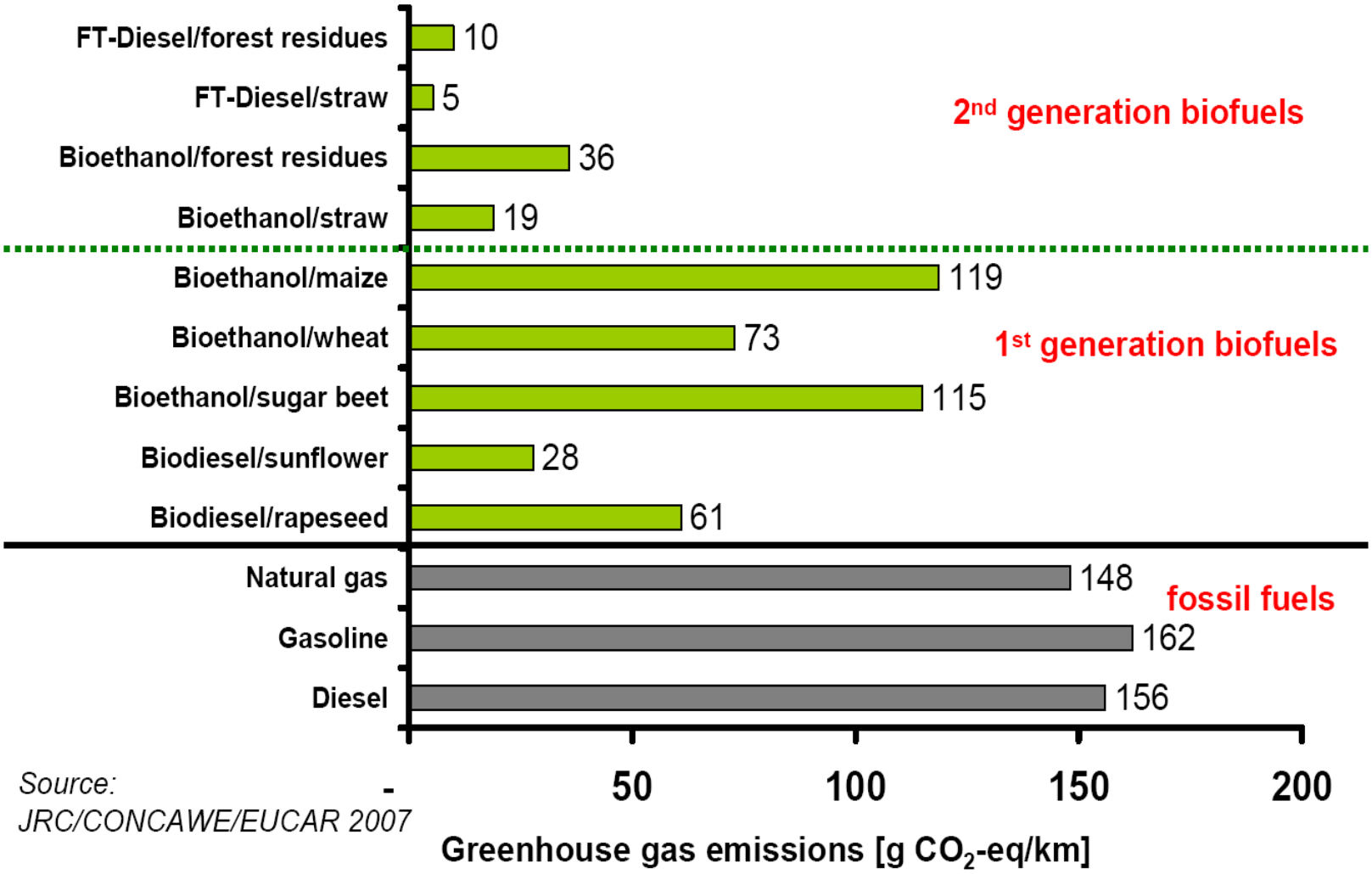

CO_2
CO_2
CO_2
CO_2
Biomass absorbs CO_2
electricity
Biofuels
CO_2 collection and compression
Biofuel production
Biomass
Biomass
CO_2 separation and compression
CO_2 storage


Biomass combustion
Biomass growth
CO2 captured
100
80
60
40
20
0
-20
-40
-60
-80
-100
Biogenic CO2 released
Carbon sequestration over time
Biogenic CO2 captured
Net impact over time

Biofuels?

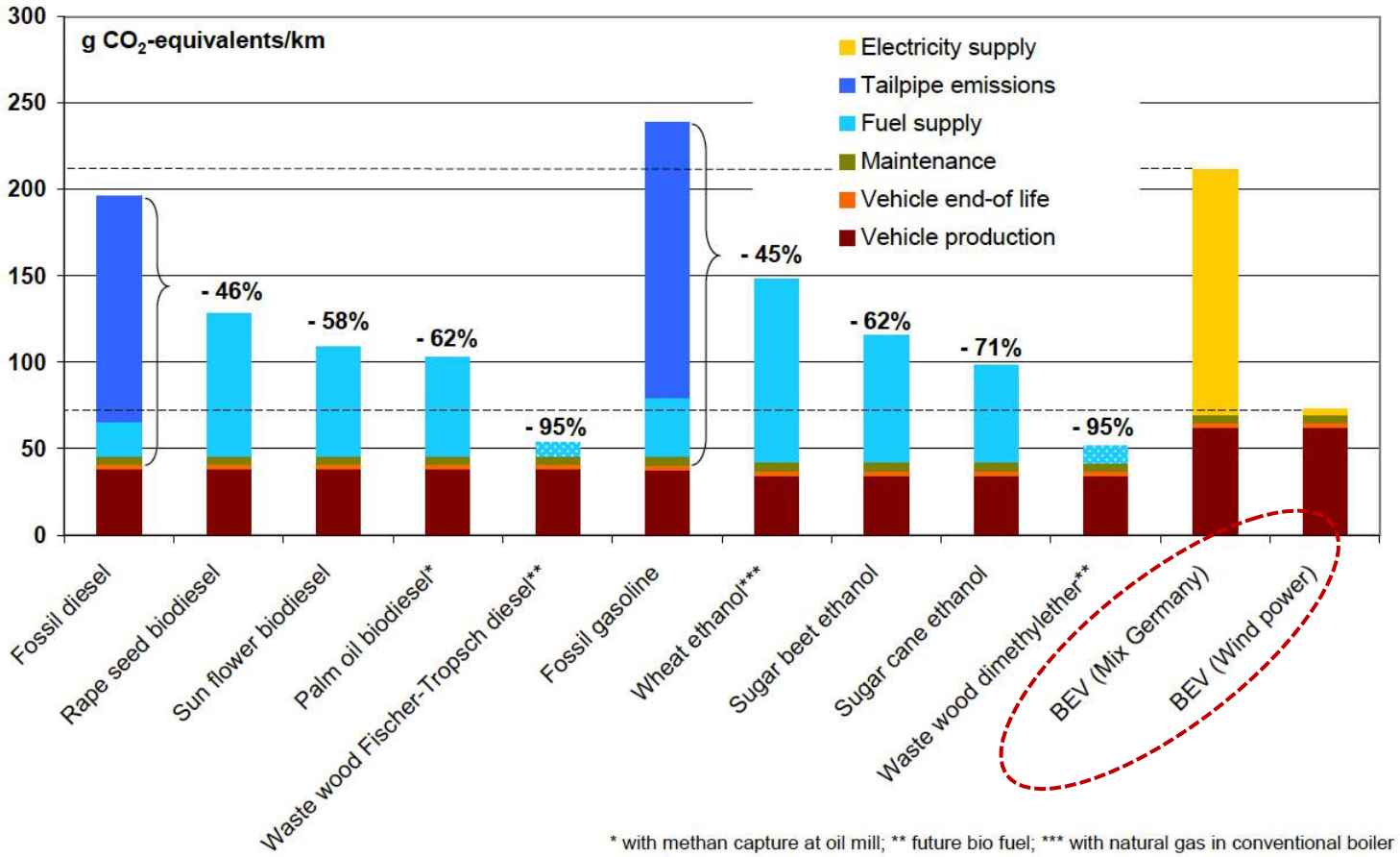

Fossil Energy Ratio (FER) = Energy Delivered to Customer / Fossil Energy Used
Fossil Energy Ratio
11
10
9
2
1
0
Projected
10.3
소비자에게 돌아가는
에너지가 가장 큼
Current
1.36
0.81
0.45
Cellulosic Ethanol Biorefinery
Corn Ethanol
Gasoline
Electricity

Biofuels & GHGs



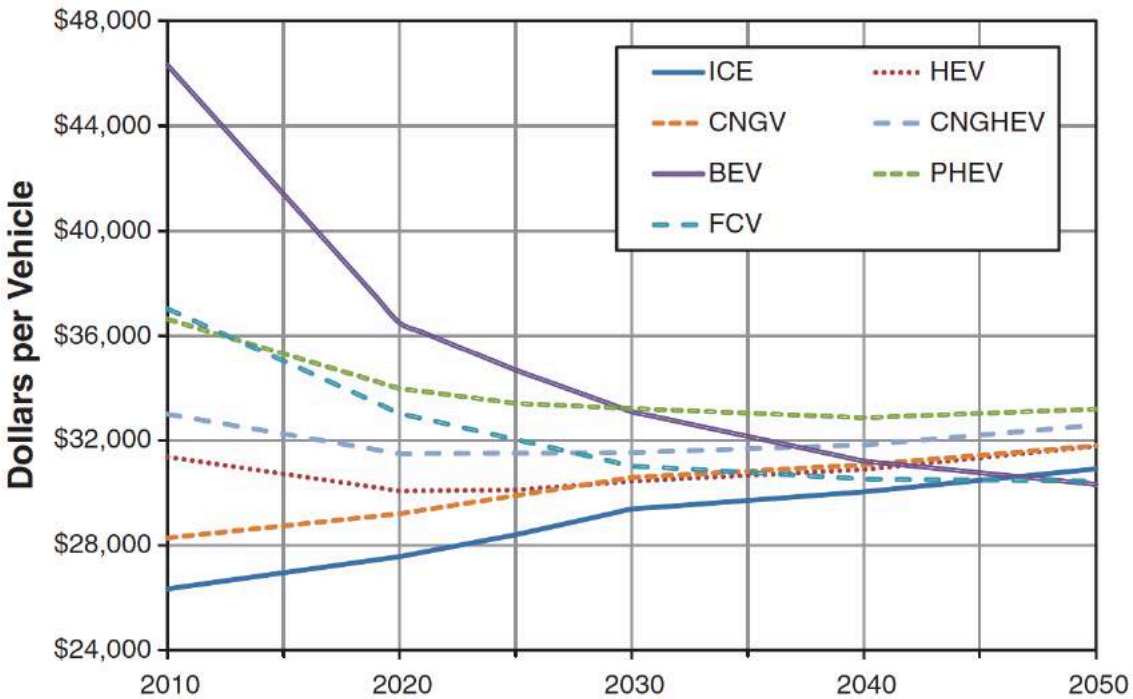
Source: JRC/CONCAWE/EUCAR 2007

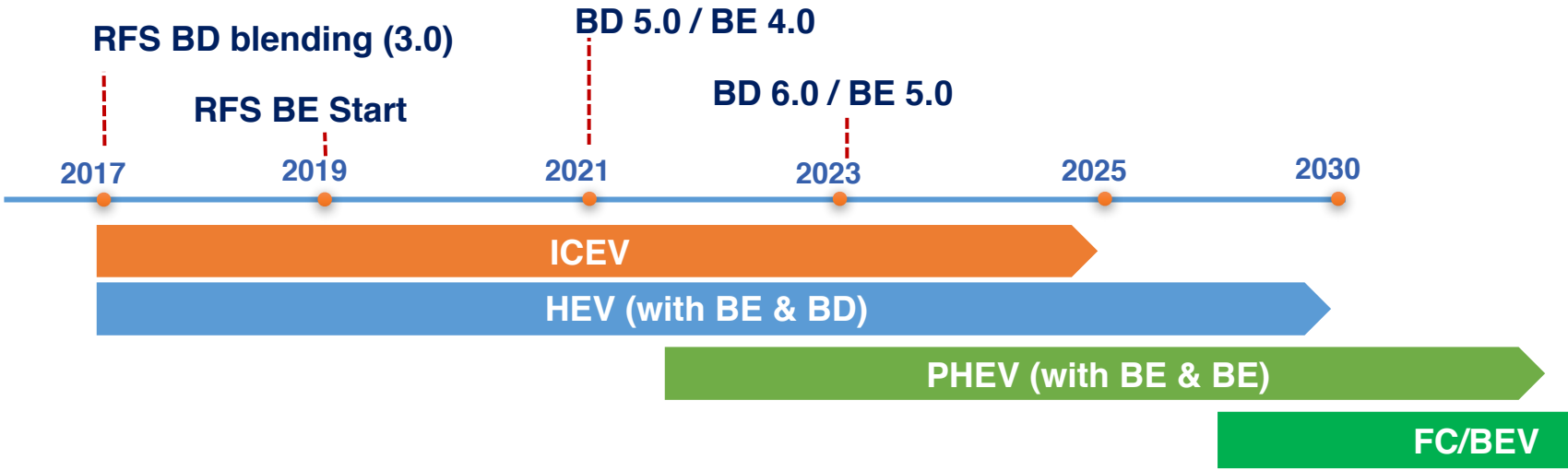
Biofuels & GHG



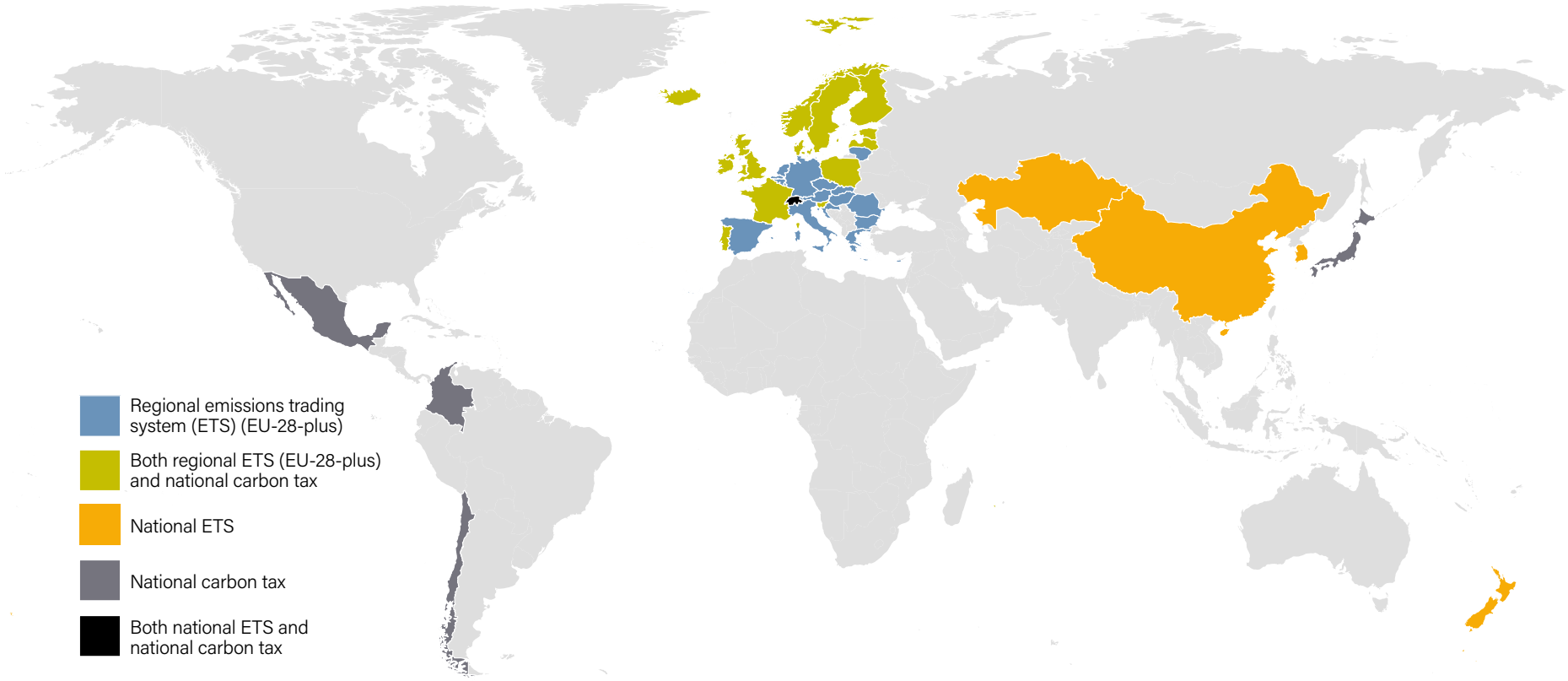
* with methan capture at oil mill; ** future bio fuel; *** with natural gas in conventional boiler

Proposed roadmap for biofuel implementation





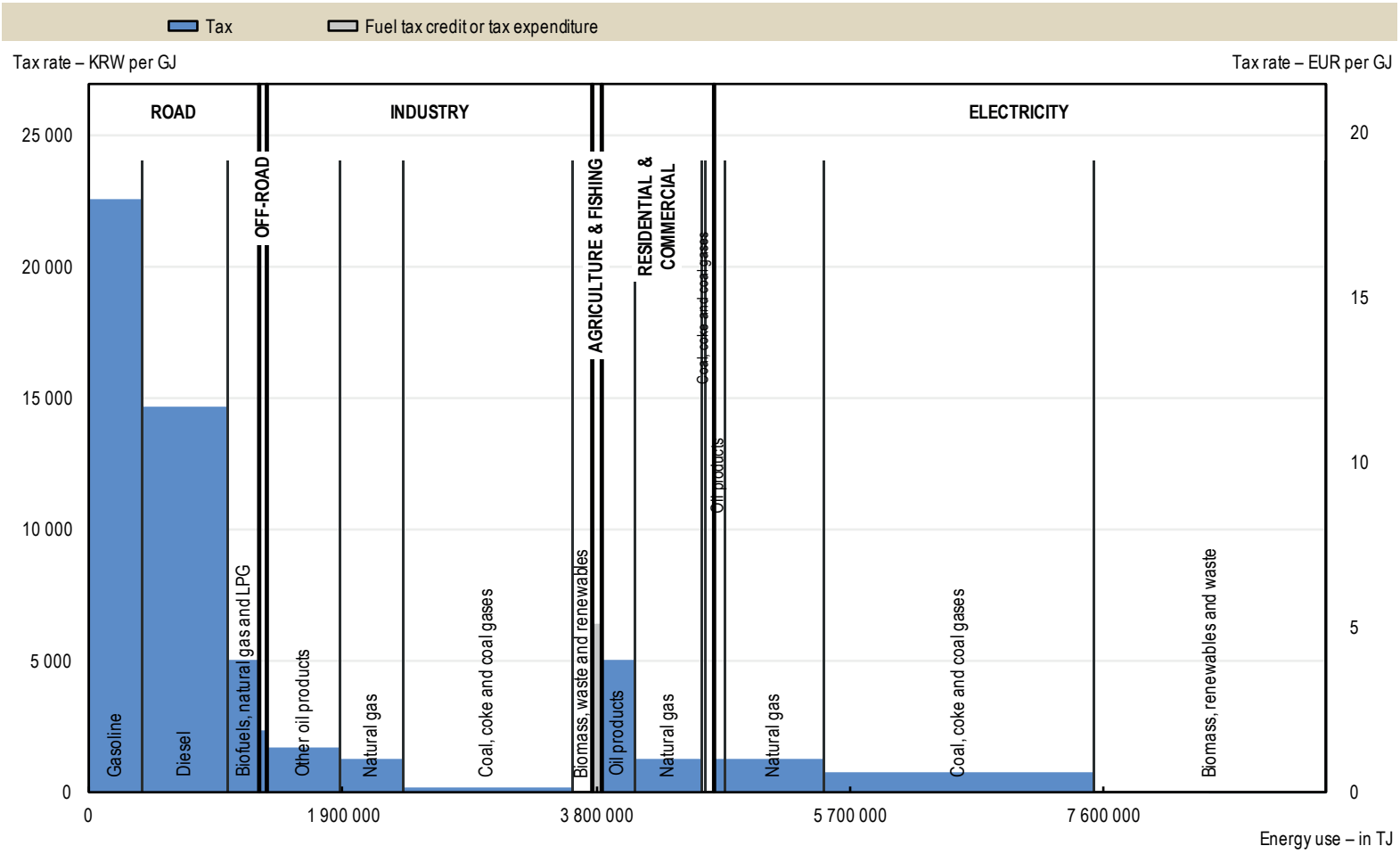
NATIONAL POLICIES

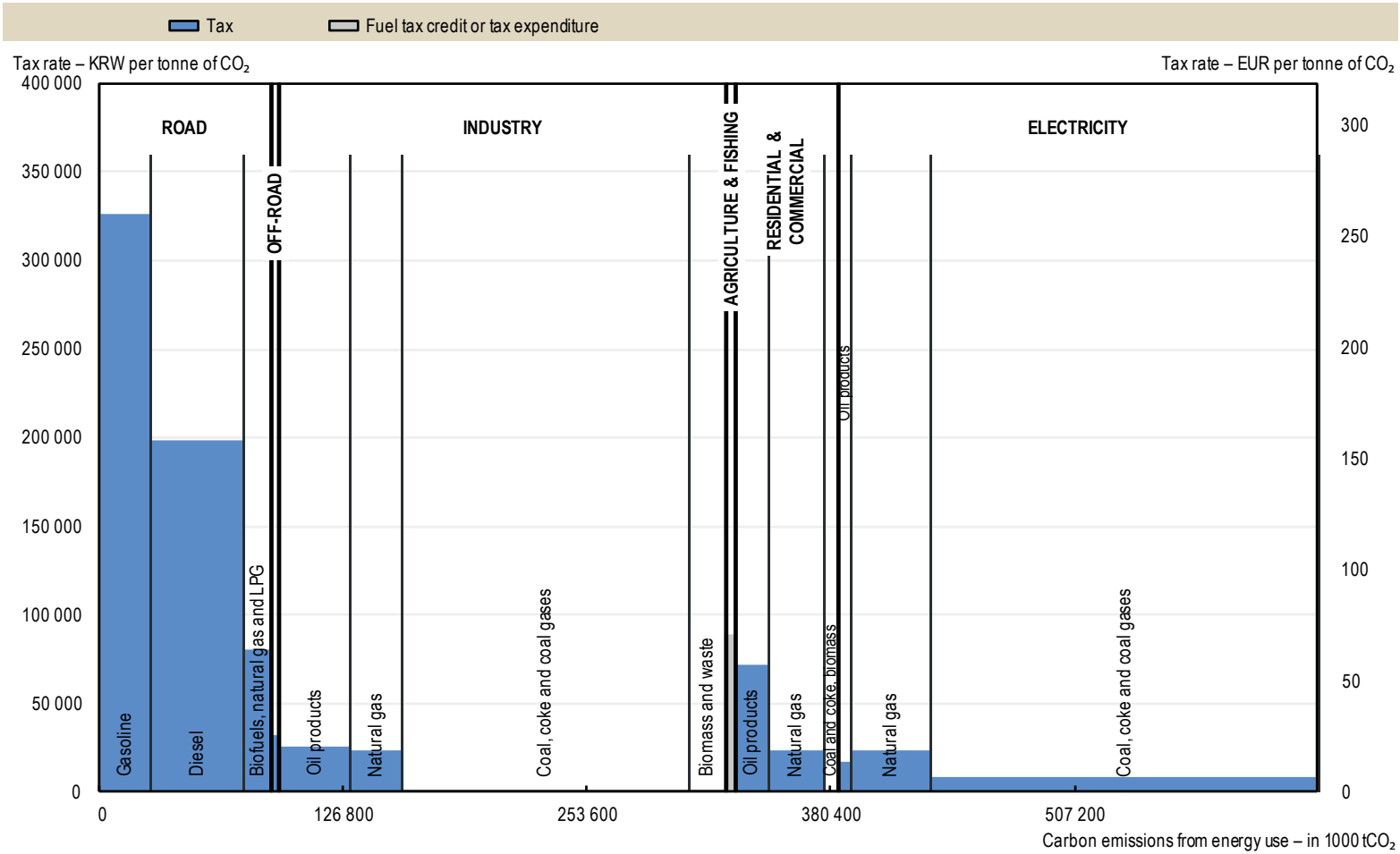


Energy and carbon taxes

The main taxes on energy use in Korea are the following:

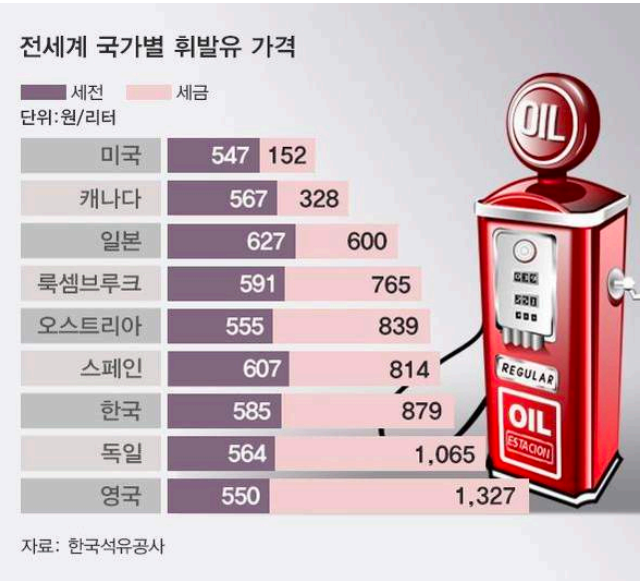
- The transport energy environment tax (TEET) applies to gasoline for road use and to diesel across all sectors;
- The Individual Consumption Tax (ICT) applies to kerosene, heavy fuel oil, LPG, natural gas and bituminous coal, at rates which sometimes differ across sectors;
- An education tax applies to all fuels taxed by the TEET or the ICT, as a percentage (15% or 30%) of their respective tax rate, and is added to the total per-unit tax;
- The regional motor fuel tax applies to all fuels taxed by the TEET, at 26% of the TEET per-unit rate.


Tax
Fuel tax credit or tax expenditure
Tax rate – KRW per GJ
Tax rate – EUR per GJ
ROAD
INDUSTRY
ELECTRICITY
OFF-ROAD
AGRICULTURE & FISHING
RESIDENTIAL & COMMERCIAL
Coal, coke and coal gases
Oil products
Gasoline
Diesel
Biofuels, natural gas and LPG
Other oil products
Natural gas
Coal, coke and coal gases
Biomass, waste and renewables
Oil products
Natural gas
Natural gas
Coal, coke and coal gases
Biomass, renewables and waste
25 000
20 000
15 000
10 000
5 000
0
20
15
10
5
0
0
1 900 000
3 800 000
5 700 000
7 600 000
Energy use – in TJ


Tax
Fuel tax credit or tax expenditure
Tax rate – KRW per tonne of CO_2
Tax rate – EUR per tonne of CO_2
400 000
350 000
300 000
250 000
200 000
150 000
100 000
50 000
0
300
250
200
150
100
50
0
ROAD
OFF-ROAD
INDUSTRY
AGRICULTURE & FISHING
RESIDENTIAL & COMMERCIAL
ELECTRICITY
Gasoline
Diesel
Biofuels, natural gas and LPG
Oil products
Natural gas
Coal, coke and coal gases
Biomass and waste
Oil products
Natural gas
Coal and coke, biomass
Oil products
Natural gas
Coal, coke and coal gases
0
126 800
253 600
380 400
507 200
Carbon emissions from energy use – in 1000 tCO_2

휘발유 1L(리터)당 소비자 가격 구성
L당 1370.26원
※1월26일 평균 판매가 기준
358.89원
국제 상품 가격
897.23
세금
교통에너지환경세 529.00원
교육세 79.35
주행세 137.54
부가세 124.57
관세 10.77
석유수입부과금 16.00
114.14
정유사 정제 비용 및 마진, 주유소 운영비 및 마진

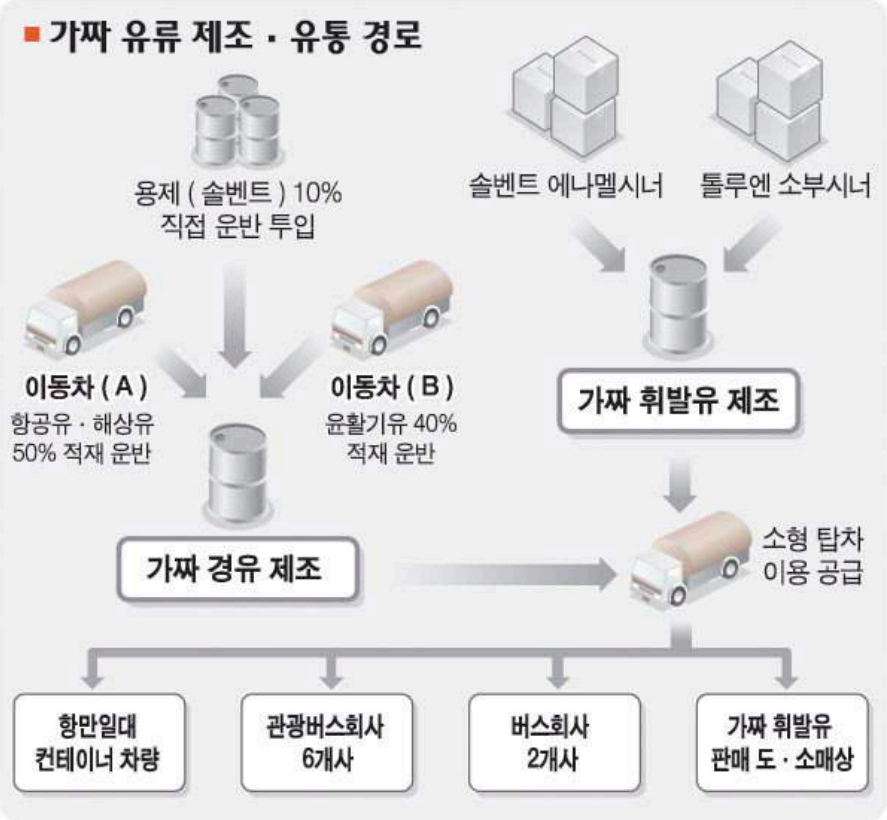
휘발유·경유 소비자가격 구성
12월 2주 기준
휘발유 평균 1,685.7원(100%)
경유 평균 1,492.4원(100%)
136.6원 (8.1%)
유통비용·마진
130.7원 (8.8%)
649.9원 (38.6%)
정유사 가격
697.3원 (46.7%)
899.1원 (53.3%)
세금
664.4원 (44.5%)
자료/ 오피넷
연합뉴스
박주연 인턴기자 / 20141215
트위터 @yonhap_graphics
페이스북 tuney.kr/LeYN1
YONHAP NEWS


전세계 국가별 휘발유 가격
세전
세금
단위:원/리터
미국 547 152
캐나다 567 328
일본 627 600
룩셈브루크 591 765
오스트리아 555 839
스페인 607 814
한국 585 879
독일 564 1,065
영국 550 1,327
OIL
REGULAR
OIL
ESTACION
자료: 한국석유공사

각국 정부 예산에서 유류세가 차지하는 비율
(음수값은 유가안정 위한 정부 보조금 비율)
稅
한국 15%
브라질 13
러시아 8
영국 6
독일 5
미국 3
-25 이집트
-28 베네수엘라
-38 이란

디젤 천국 대한민국
▪ 디젤차 판매는 계속 증가하고 있습니다.
경유차와 휘발유차 신규 등록 차량 수 (단위:대)
86만797
경유차
휘발유차
96만2127
53만8176
68만1601
2011년
12
13
14
15
*자료:한국자동차산업협회
늘어난 국내 독일차 판매량(단위:대, %) *2015년 기준
BMW 4만7877(19.2)
벤츠 4만6994(33.5)
폭스바겐 3만5778(16.5)
아우디 3만2538(17.7)
*괄호 안은 전년 대비 증가율 *자료:한국수입자동차협회

■ 가짜 유류 제조 · 유통 경로



가짜석유 탈세액

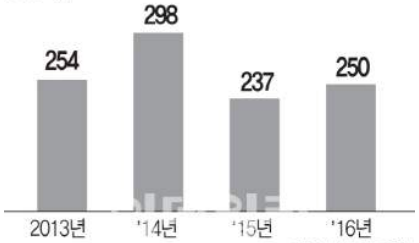
(단위:억원)

※ 2016년 기준

자료:산업통상자원부, 한국석유관리원

가짜석유 판매 주유소 적발 현황

(단위:개)



자료:산업통상자원부

정상과 가짜 경유 1리터의 가격구조 비교 작년 11월 기준

자료: 한국석유관리원

Hydration of Ethene vs. Fermentation

Hydration of Ethene

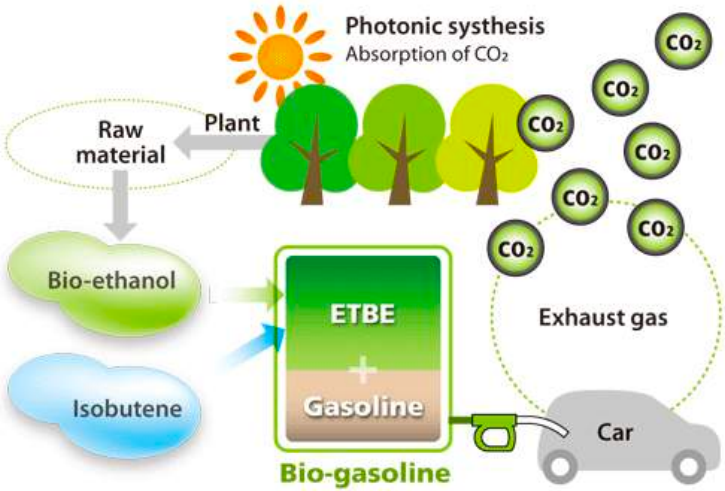
- **Advantages**
- No waste products
- Produces ethanol continuously

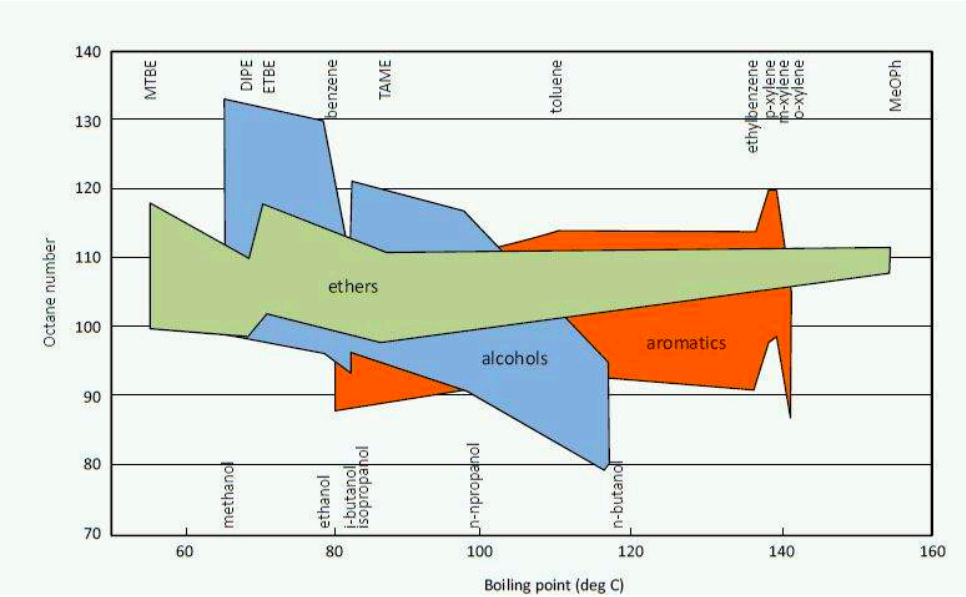
- **Disadvantages**
- Uses crude oil which is non-renewable
- Requires a lot of energy for high heat and high pressure

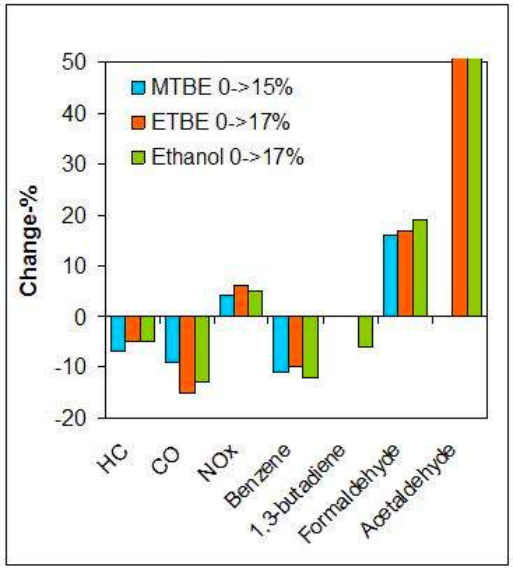
Fermentation

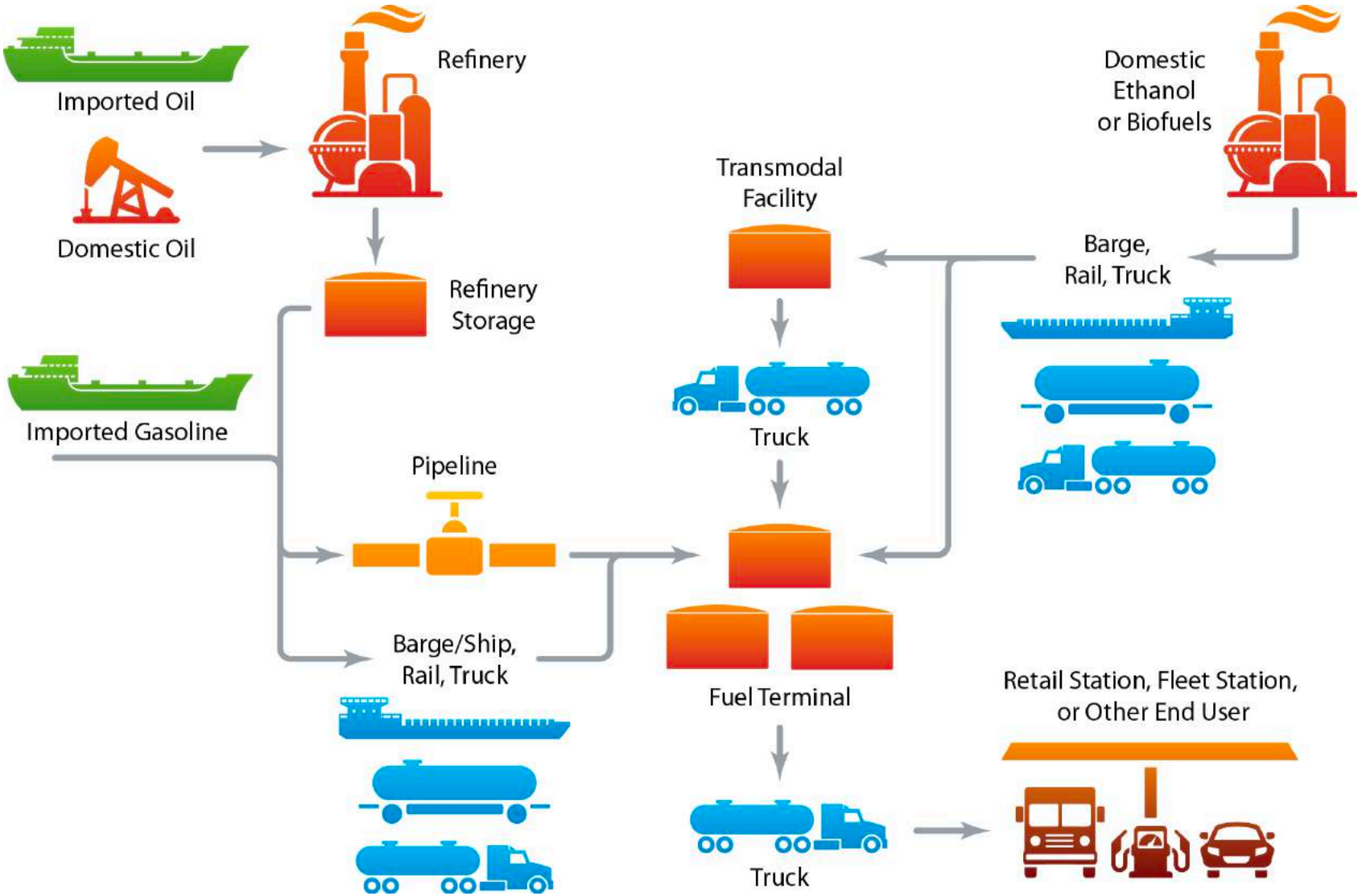
- **Advantages**
- Renewable (uses plants)
- Uses less energy, lower temperatures

- **Disadvantages**
- Slow, batch process, have to start a new batch once yeast die
- Produces CO_2 as waste


Photonic systhesis
Absorption of CO2
Plant
Raw material
Bio-ethanol
Isobutene
ETBE
+
Gasoline
Bio-gasoline
Exhaust gas
Car
CO2

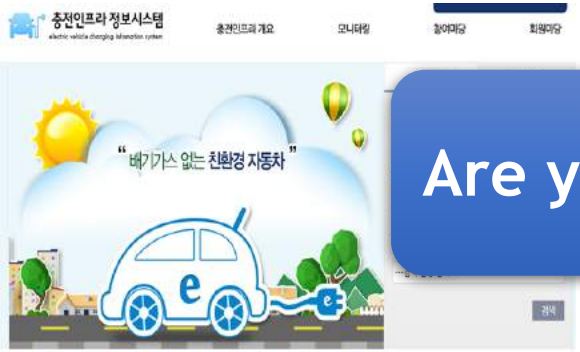

Octane number
Boiling point (deg C)
MTBE
DIPE
ETBE
benzene
TAME
toluene
ethylbenzene
p-xylene
m-xylene
o-xylene
MeOPh
ethers
alcohols
aromatics
methanol
ethanol
i-butanol
isopropanol
n-npropanol
n-butanol


MTBE 0->15%
ETBE 0->17%
Ethanol 0->17%
Change-%
HC
CO
NOx
Benzene
1,3-butadiene
Formaldehyde
Acetaldehyde

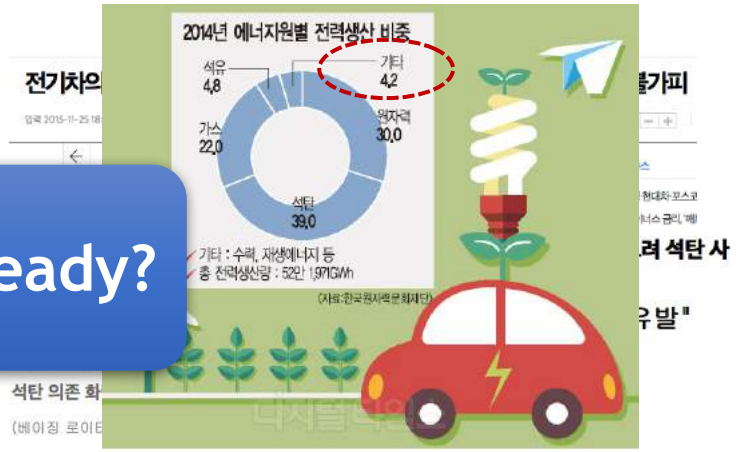

Imported Oil
Domestic Oil
Refinery
Refinery Storage
Imported Gasoline
Pipeline
Barge/Ship, Rail, Truck
Transmodal Facility
Truck
Fuel Terminal
Truck
Domestic Ethanol or Biofuels
Barge, Rail, Truck
Retail Station, Fleet Station, or Other End User

Biofuels??

BEV



Are you ready?

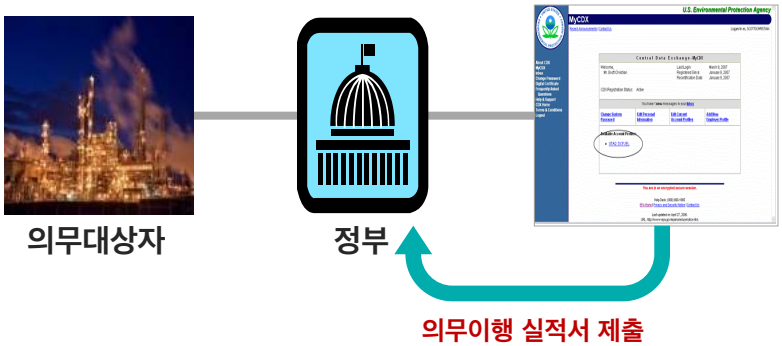


Hydrogen FCV

飲水思源

Renewable energy policy in Korea

연간 공급 · 사용량 X 의무비율 = 연간 의무이행량



- 고체 : 목재칩, 목재펠릿 등
- 액체 : 바이오디젤, 바이오에탄올 등
- 기체 : 바이오가스 등

- RPS (Renewable Portfolio Standard) : 신재생에너지 공급 의무화 제도
- RFS (Renewable Fuel Standard) : 신재생에너지 연료 혼합의무화 제도
- RHO (Renewable Heat Obligation) : 신재생열원 공급의무화 제도

Biofuels market in Korea

Fossil fuels		Biofuels	
Diesel	»	Biodiesel	Mandatory blending (2.5%)
Gasoline	»	BioEtOH	N/A
Natural gas	»	Biomethane	Used, but not mandatory
LPG	»	BioDME	N/A

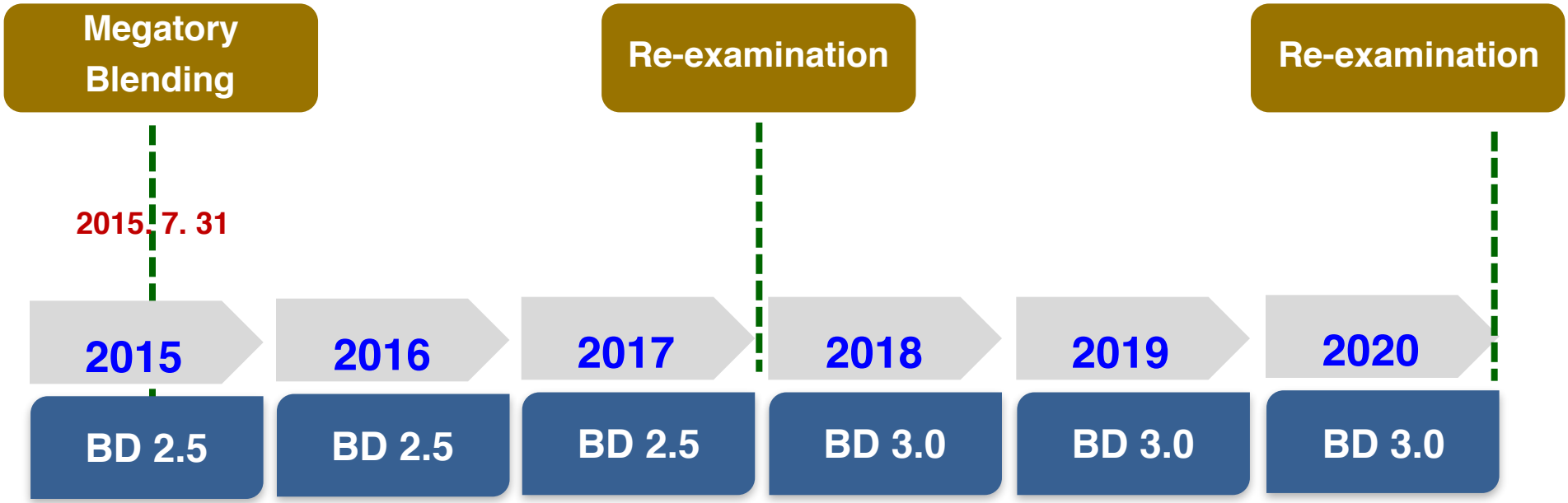
* 상용보급 중, HBD(상용 전단계), 미세조류 바이오디젤, BTL 디젤 등 R & D 중

* BE 실증평가 완료, 2세대 바이오알코올(바이오부탄올, 셀룰로스계 바이오에탄올 등) R & D 중

* 바이오가스 생산 플랜트 증가 추세, 인프라 구축, 도시가스와 수송용연료 일부 공급 중

* LPG 적용 가능한 바이오DME 연료 타당성 검토 및 R&D 중

RFS - BD



출처 : 신재생에너지법 시행령 개정문, **2015.6.15**

BD– Distribution

Distribution

BD100

Blended diesel (BD3.0)

BD production company
* 2016.09 : 14 companies (active com. 9)

Oil refinery (5 companies)

Gas stations

Blended diesel (BD3.0)

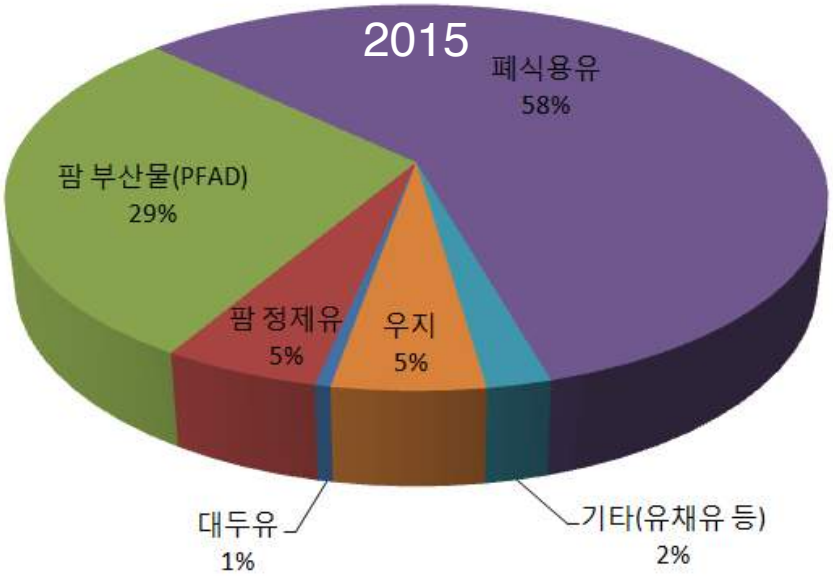
BD20

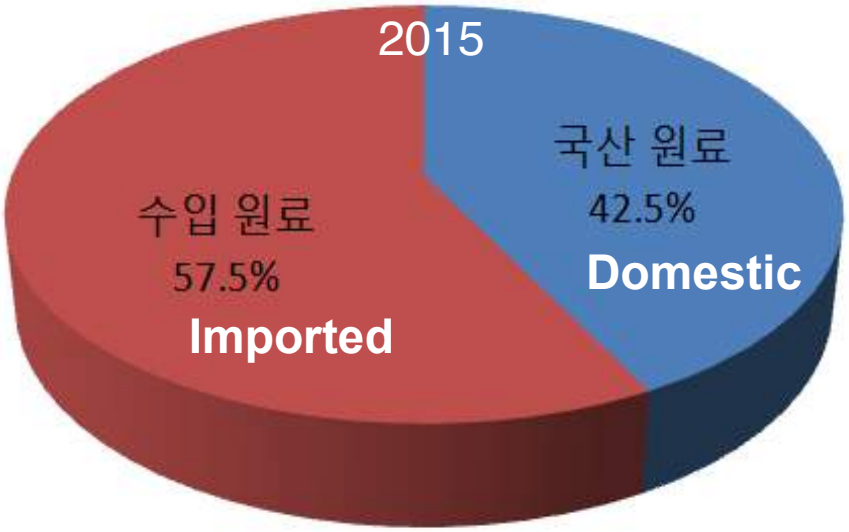
BD10 in winter season (11/1~3/31)

HDV

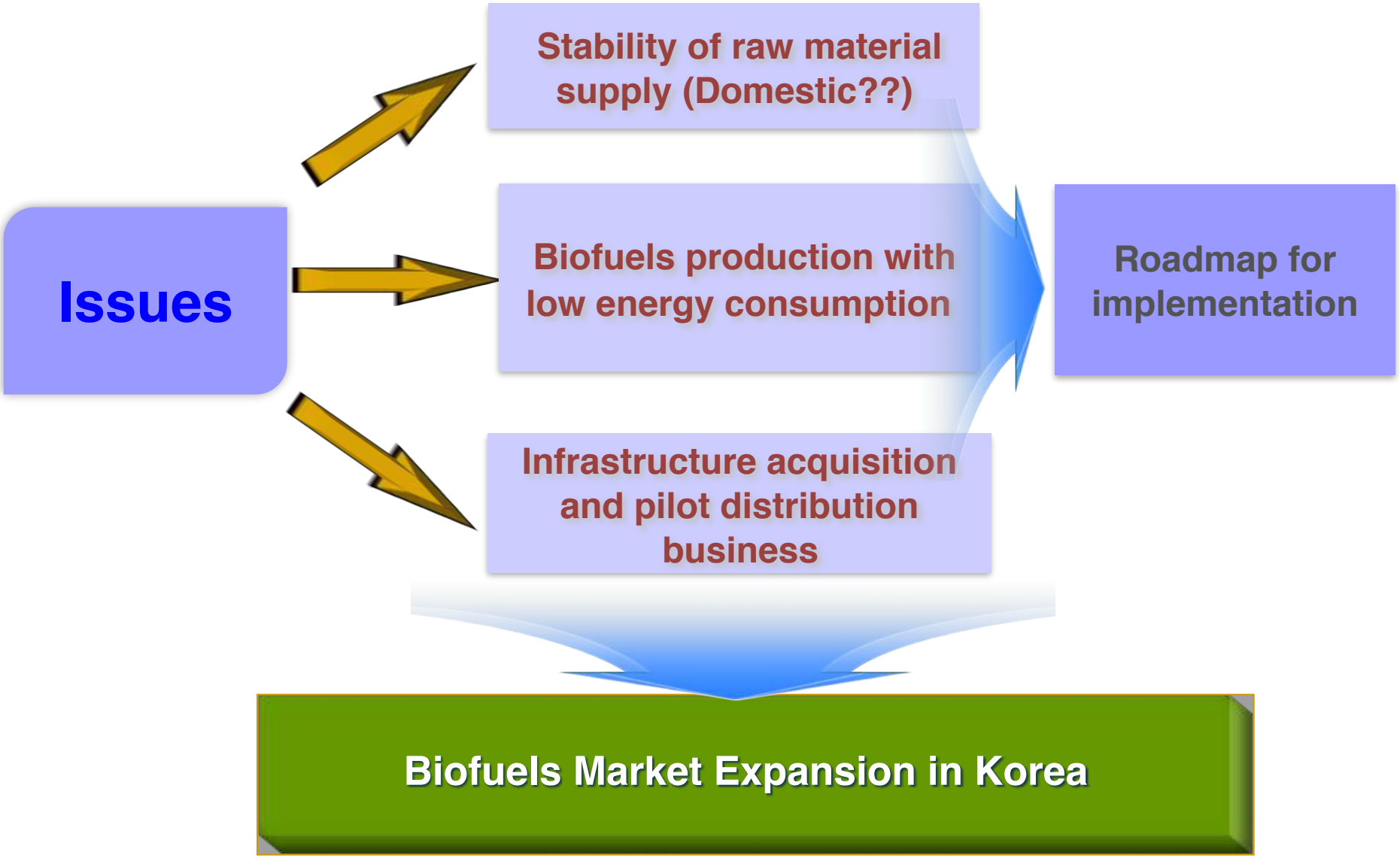
Consumers

BD - Raw materials

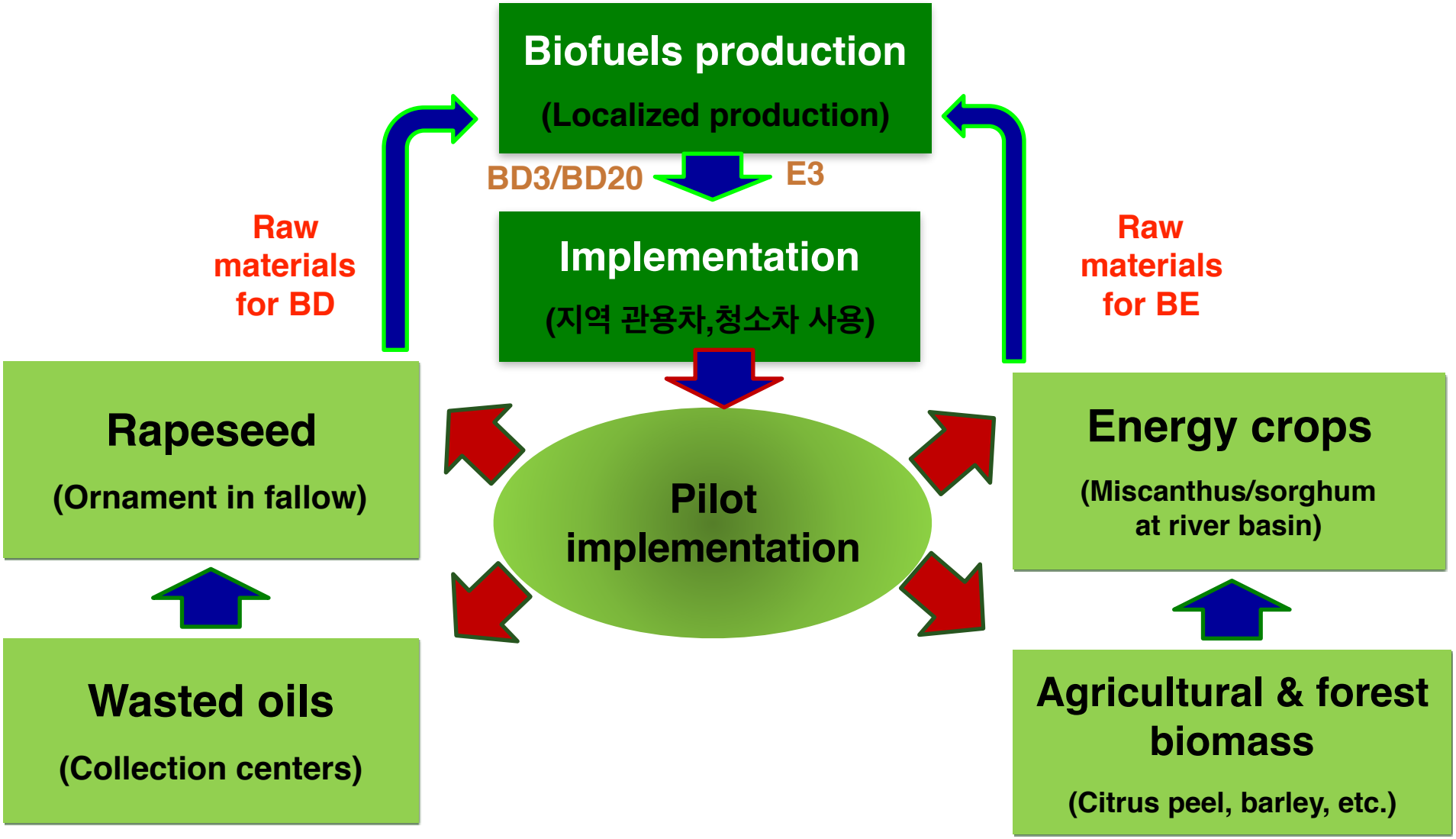




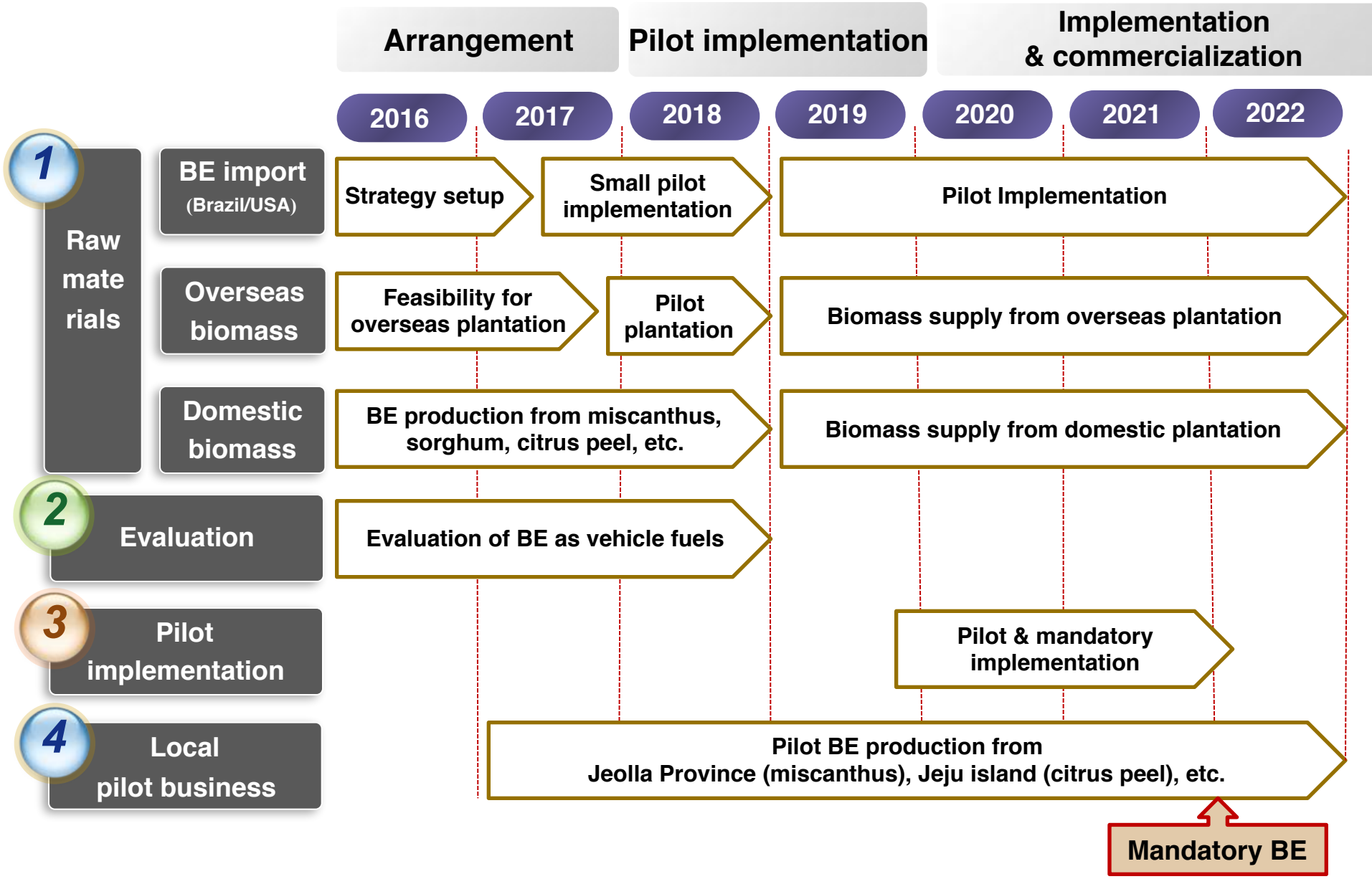
Strategy for biofuel implementation



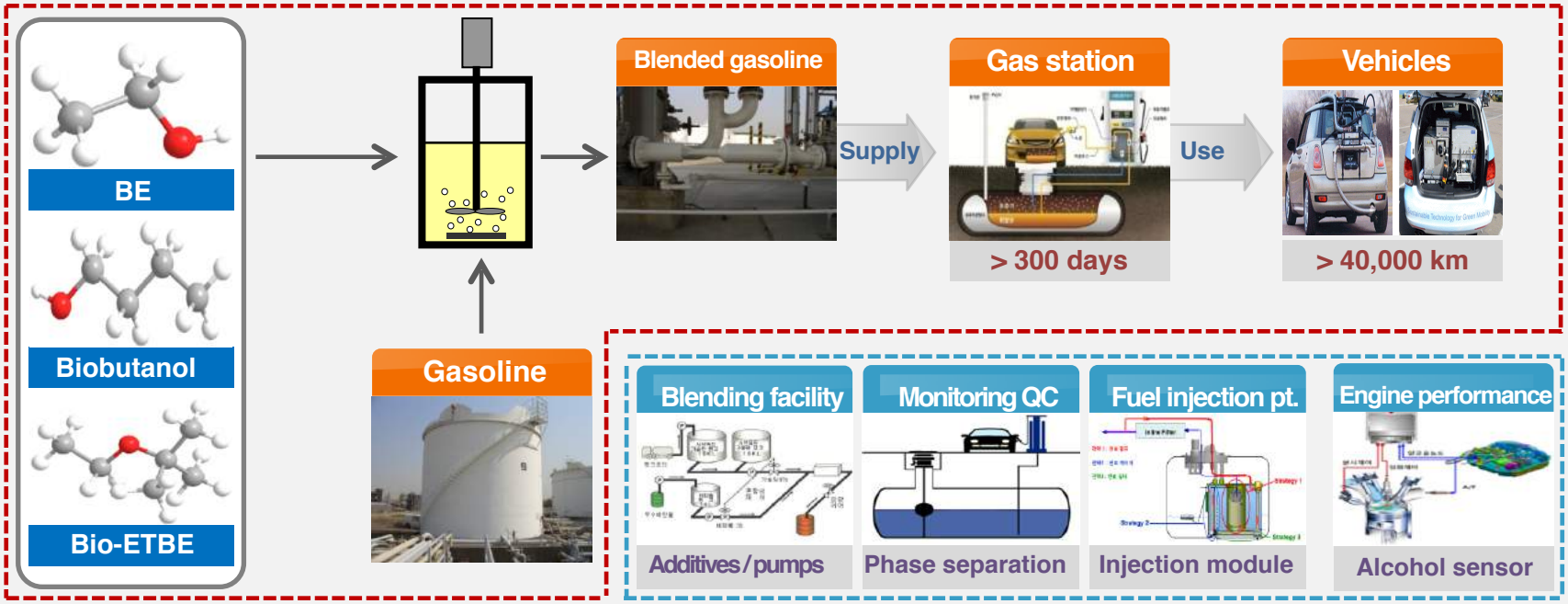
Strategy for biofuel implementation using domestic biomass



Introduction strategy of bio-alcohol

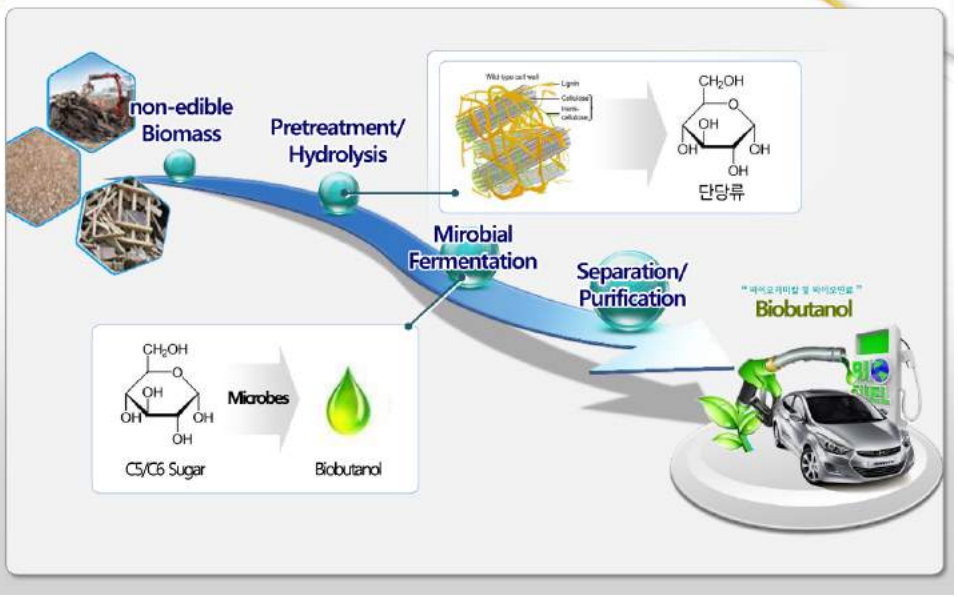


Pilot implementation and evaluation of BE3



셀룰로오식 바이오연료(부탄올)

GS 칼텍스



한국경제

GS, 전남을 바이오화학산업 거점으로

전남 광조경제혁신센터 출범

GSC 셀룰로오식 바이오부탄올 Pilot

GS 칼텍스

■ 바이오부탄올 Piot Plant

- Capacity : 약 250 kg biomass /day
- Feed handling에서 분리/정제 공정까지 일관 연속 공정

GS칼텍스 바이오부탄올 실증플랜트

GS 칼텍스

국내 최초의 10톤/일 규모 셀룰로오식 바이오부탄올 실증플랜트 구축

- 약 10,000 m^2 부지에 건설 (~'17. 1Q)
- Feed handling에서 최종 제품 생산까지 일관, 통합 공정
- 다양한 Biomass Test, Commercial Scale 공정 건설을 위한 엔지니어링 기술 확보

Thank you.