



REmap 2030

A Renewable Energy Roadmap

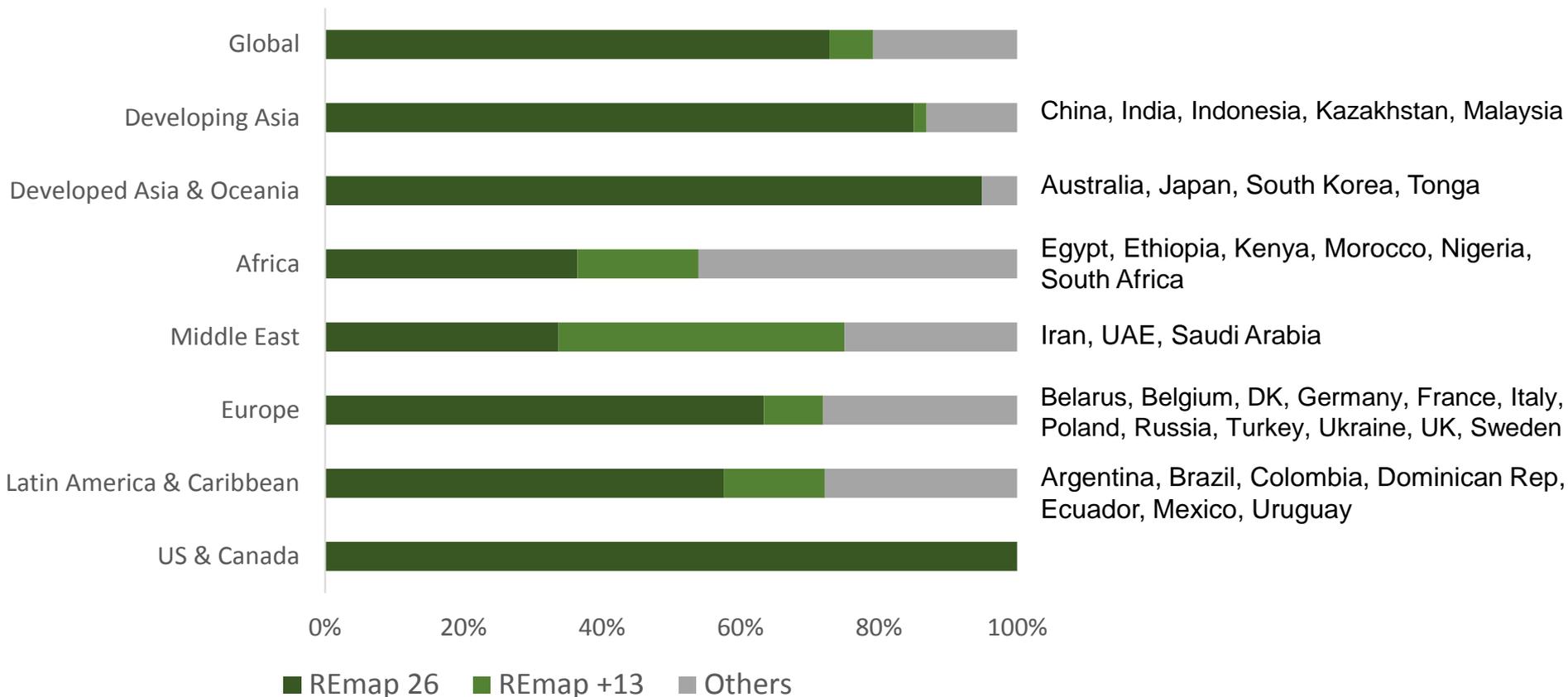


11 February, 2015

REmap 2030 - A roadmap for doubling the RE share

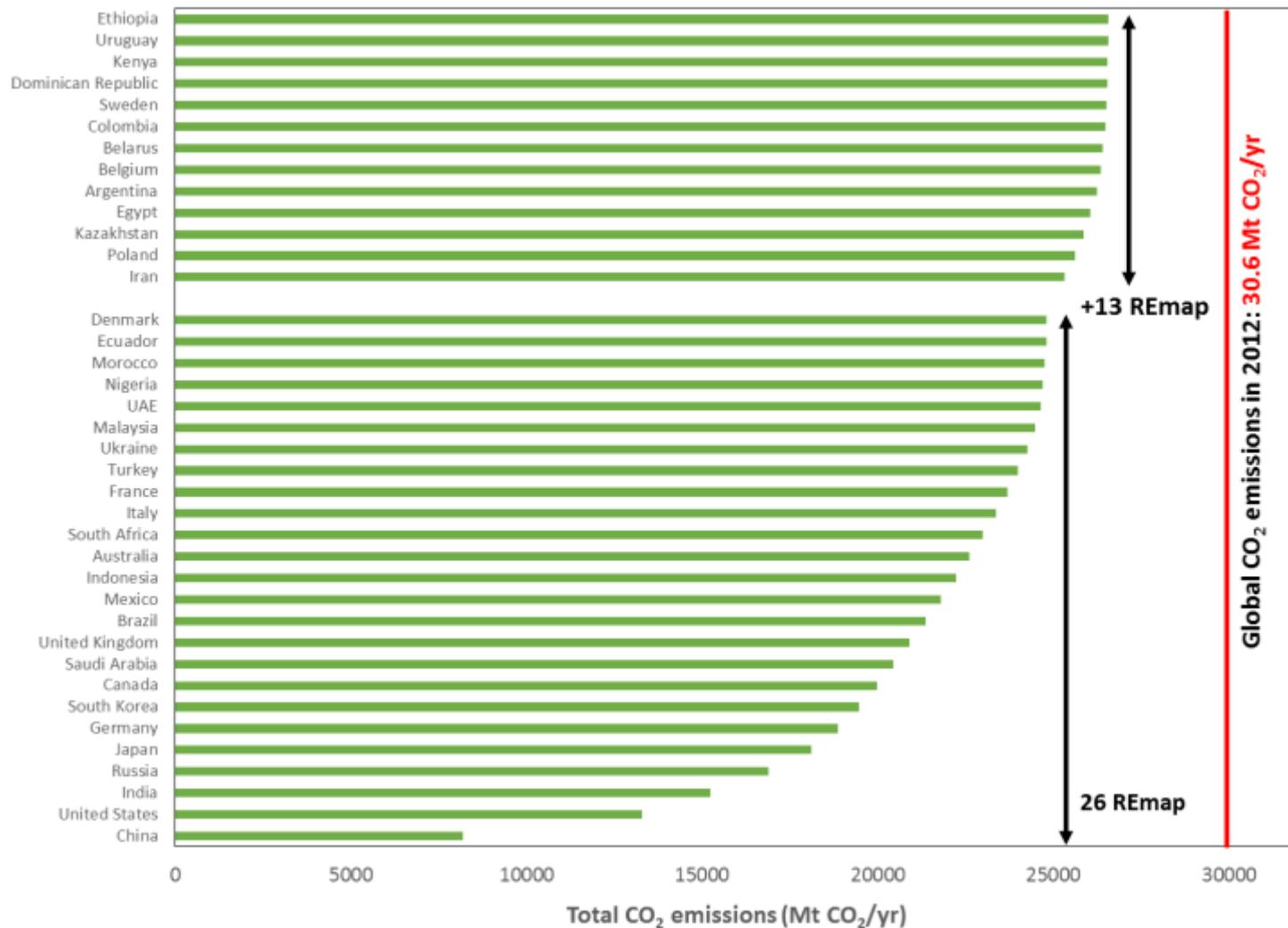
- REmap explores the **potential**, **cost** and **benefits** of doubling the renewables share in the global energy mix
- REmap is an exploratory study, *not* a target setting exercise
- **Technology options** instead of scenarios
 - Based on national plans and scientific literature
 - Characterised by their cost and potentials
- Focuses on power, district heat and end-use sectors
- **26 countries** covering 75% of the global energy use
- **13 additional** country analyses are on-going
- Country reports translate technology options into actionable items

Country coverage



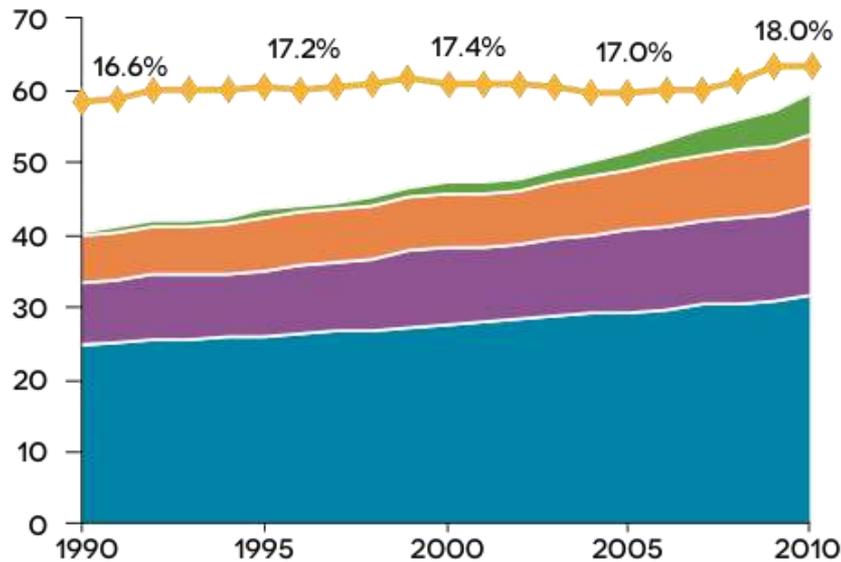
REmap total global final consumption coverage is reaching 80%

Country coverage



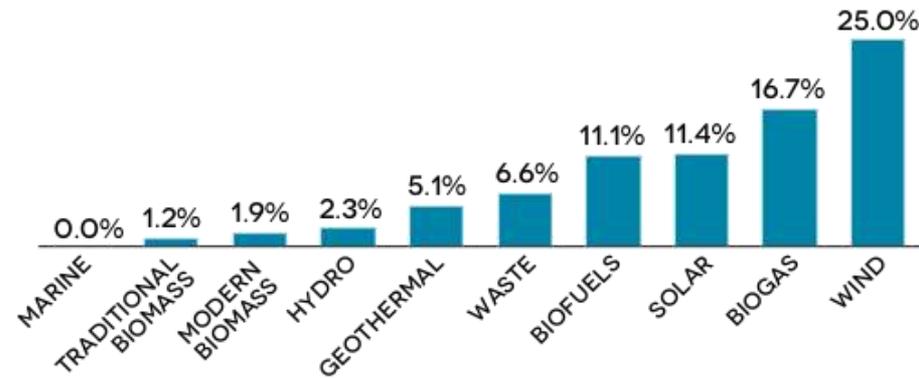
REmap global CO₂ emissions from fossil fuel combustion is reaching 90%₄

Breakdown of Global Renewable Energy Use today



WORLD CONSUMPTION OF RENEWABLE ENERGY (EXAJOULES) AND SHARE OF RENEWABLE ENERGY IN TFC (%)

■ OTHER RE ■ HYDRO ■ MODERN BIOMASS
■ TRADITIONAL BIOMASS ◆ RE SHARE IN TFC



COMPOUND ANNUAL GROWTH RATES (CAGRS) BY RENEWABLE ENERGY SOURCE, 1990-2010

SOURCE: IEA 2012A.

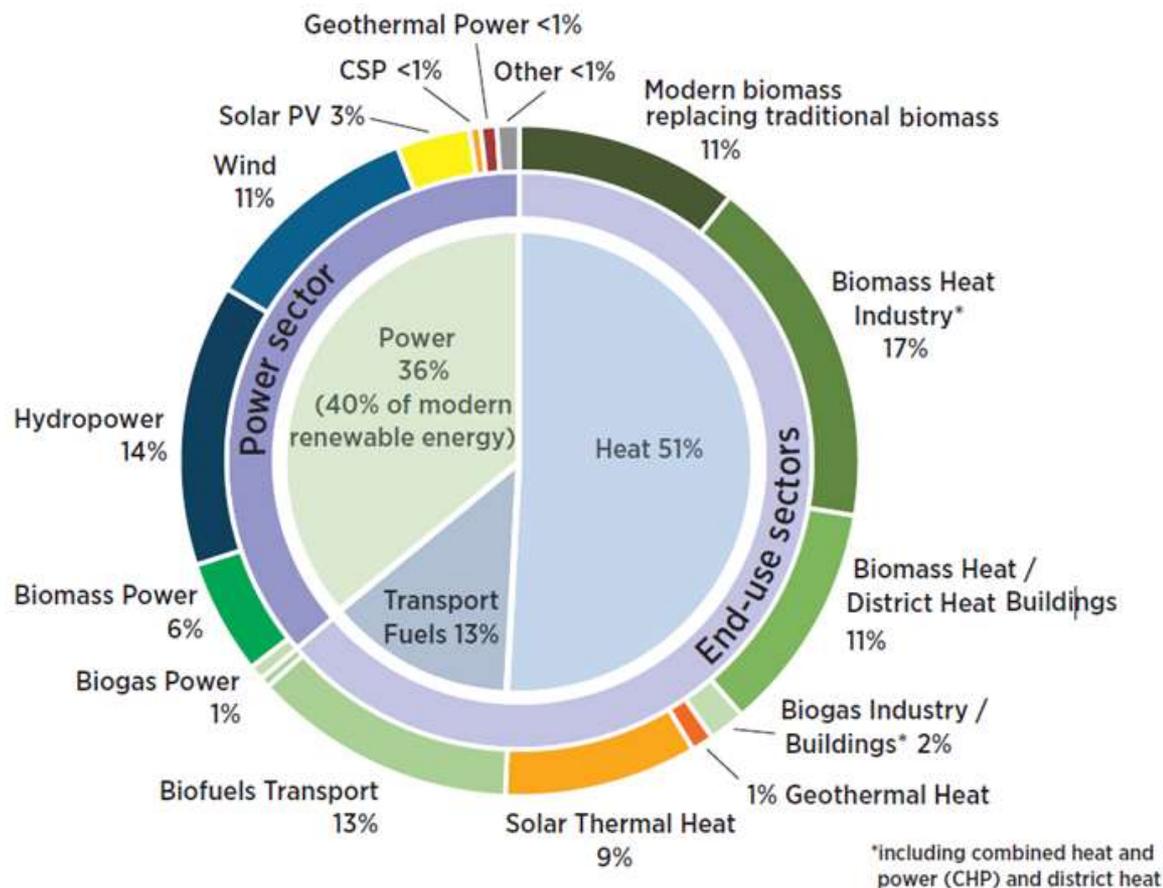
SOURCE: IEA 2012A.

NOTE: TFC = TOTAL FINAL ENERGY CONSUMPTION; RE = RENEWABLE ENERGY.

RE share remains flat between 1990 and 2010, some sources growing exponentially from a small base

Between 2010-2012, significant growth from 17.8% to 18.1%, but still below the six-fold acceleration needed

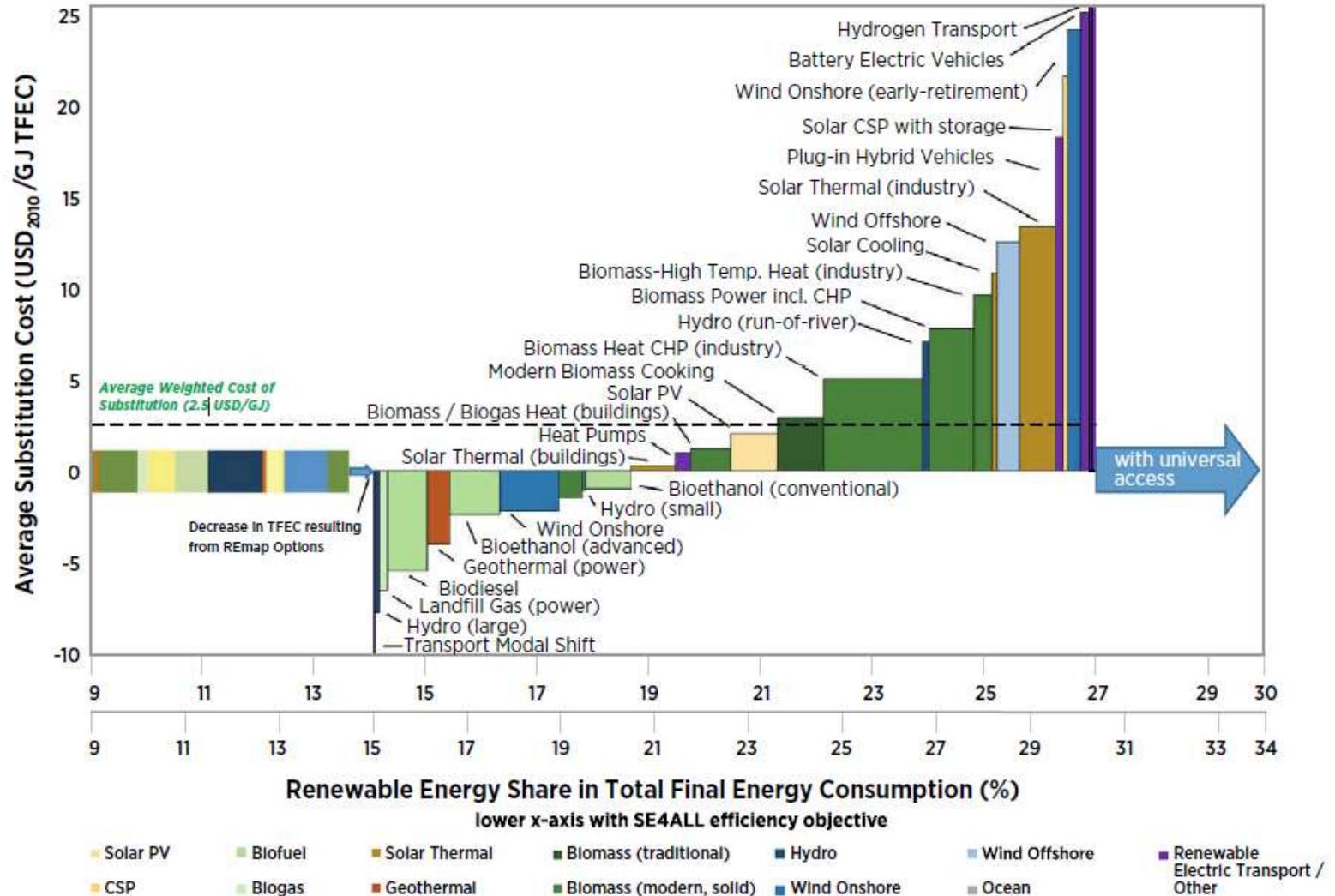
Global RE Use in 2030 including REmap Options



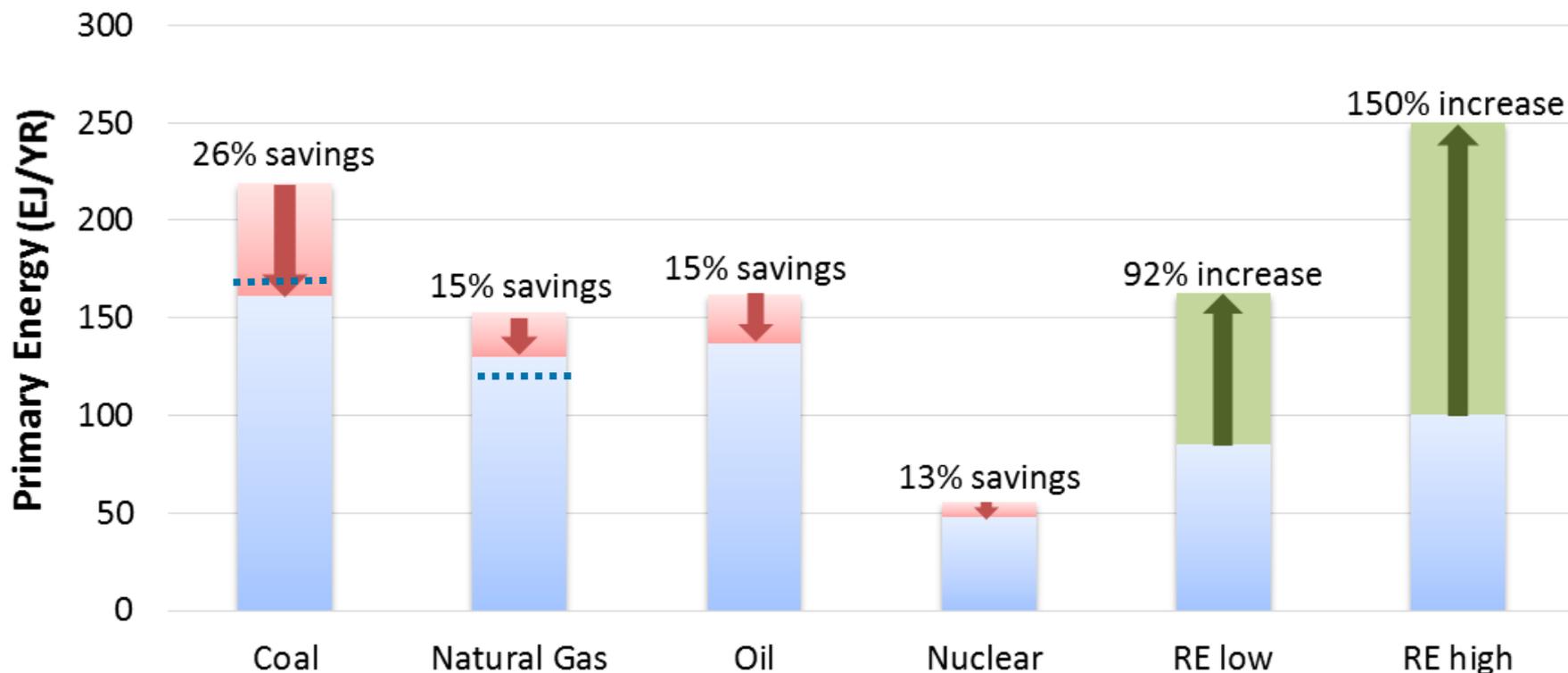
REmap 2030 – 132 EJ final renewable energy

Various biomass applications represent 60% of the total

Global technology cost curve



Energy Supply Consequences



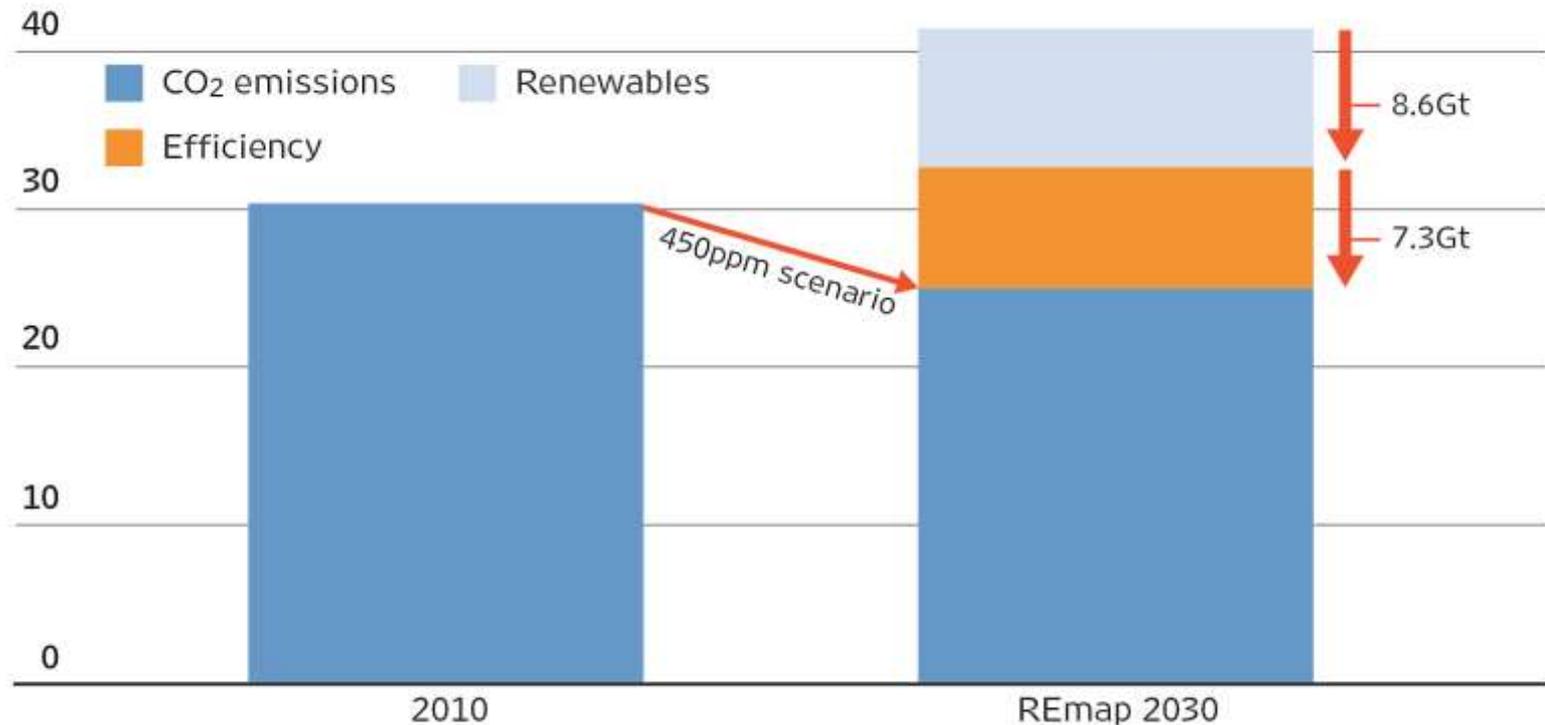
..... Indicates 2012 level

The doubling of renewables will mostly offset coal consumption

Renewables can be the largest source by 2030

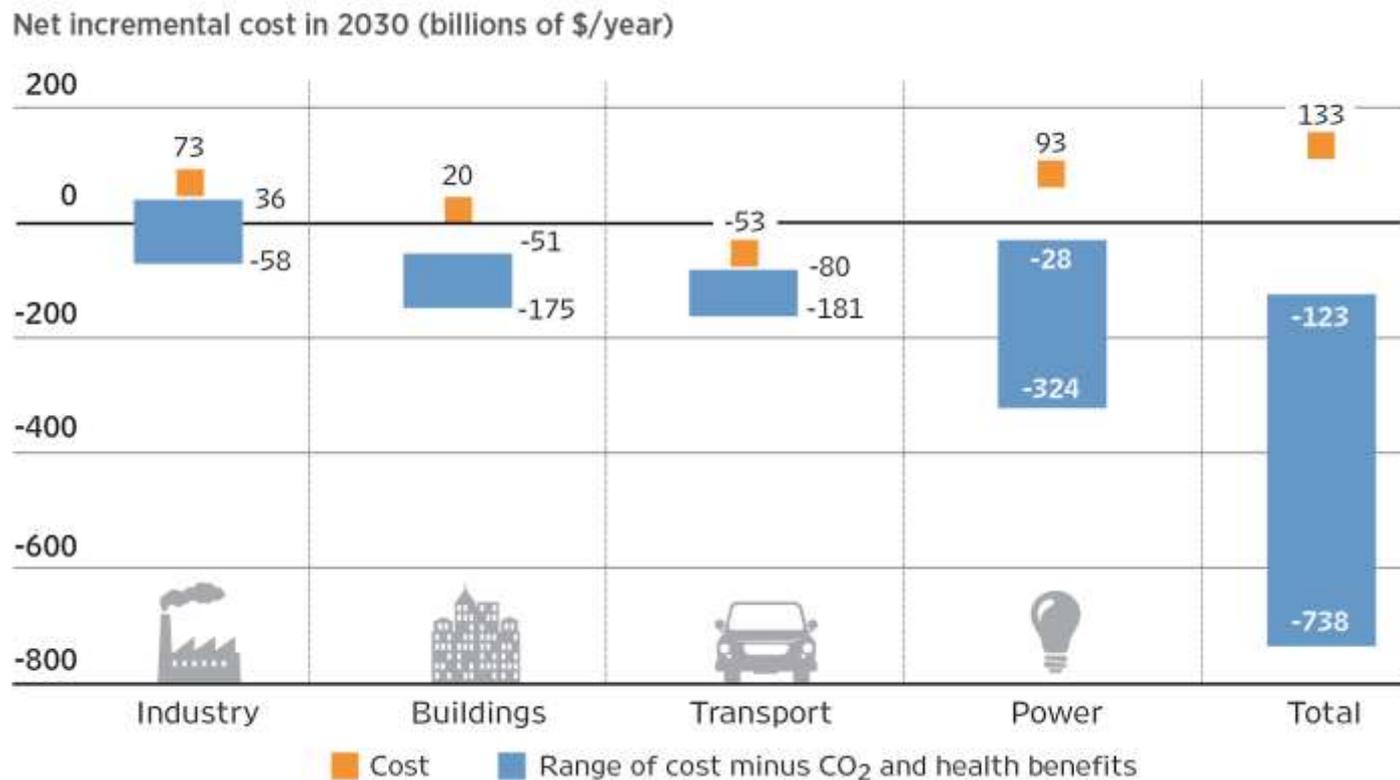
With renewables & efficiency on a 450ppm path

Annual global energy-related CO₂ emissions (Gt/year)



Fossil fuel substitution yields 8.6 Gt CO₂ reduction –
on par with the role of efficiency

The energy transition is affordable



Benefits exceed costs

better human health and CO₂ emission reductions are virtually for free



PLANNING



ENABLING
BUSINESS



SPREADING
KNOWLEDGE



INTEGRATING



INNOVATING

- Planning transition pathways
- Creating an enabling business environment
- Ensuring smooth integration into the existing infrastructure
- Creating and managing knowledge
- Unleashing innovation

Comprehensive country reports

 REmap 2030
A Renewable Energy Roadmap

 REmap 2030
A Renewable Energy Roadmap

 REmap 2030
A Renewable Energy Roadmap



RENEWABLE ENERGY PROSPECTS:

CHINA

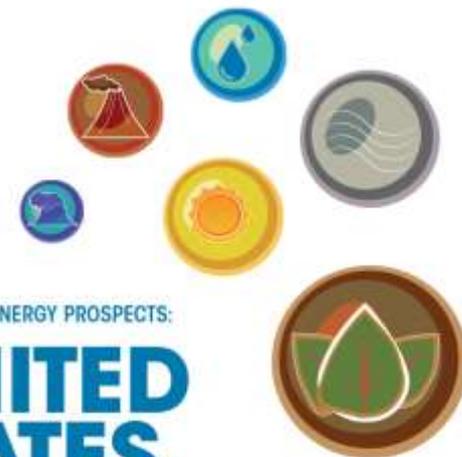
November 2014



RENEWABLE ENERGY PROSPECTS:

MEXICO

2015



RENEWABLE ENERGY PROSPECTS:

UNITED STATES OF AMERICA

January 2015



REmap Summary Tables (US example)

1. Electricity generation		Unit	2010	Reference Case 2030	REmap 2030
Power Capacity	Renewable energy	GW _e			
	Hydropower (excl. pumped hydro)	GW _e	78	80	114
	Wind Onshore	GW _e	39	61	314
	Wind Offshore	GW _e	0	2	42
	Biomass (incl. CHP)	GW _e	9	24	76
	Biogas	GW _e	3	8	8
	Solar PV	GW _e	2	24	135
	Solar CSP	GW _e	0.5	1	2.5
	Geothermal	GW _e	2.5	6	24
2. Heat Supply					
	Solar water heater / cooling	PJ	96	126	996
	Geothermal energy for heating	PJ	11	22	25
	Biomass residential	PJ	576	602	779
	Biomass industrial	PJ	1 529	2 060	5 077
	Total	PJ	2 212	2 810	6 877
3. Vehicle					
	Electric vehicles (EV, PHEV)	Mln	0	1	27
	Electric vehicles	TWh	0	5	147
	Biofuels	PJ	1 196	1 567	3 108
4. Ratio of electricity generation					
	Gross power generation	TWh	4 129	4 868	5 224
	Generation ratio of renewables	%	11%	16%	48%
5. Ratio of TFEC					
	TFEC	PJ	64 150	66 678	65 688
	Renewable gas, heat and fuel	PJ	3 410	4 478	9 985
	All renewable energy	PJ	5 105	6 812	18 100
	RE share in TFEC	%	8%	10.2%	27.5%
6. Ratio of Total Primary Energy Demand					
	Total TPED – Partial Substitution Method	PJ	89 900	95 100	88 400
	Renewable primary fuels or equivalent	PJ	7 700	11 800	29 800
	RE share in TPED	%	8.6%	12.4%	33.7%
7. Total CO₂ emissions					
	Total	Mt CO ₂	5 604	5 547	3 909
	Power and district heat generation sectors	Mt CO ₂	2 369	2 364	1 188
	Manufacturing industry	Mt CO ₂	760	867	683
	Transport	Mt CO ₂	1 904	1 772	1 586
	Buildings	Mt CO ₂	570	544	453
	Total avoided CO ₂ emissions with renewables	Mt CO ₂	-	-	1 639
8. Financial indicators					
	Incremental system costs related to renewables	USD bln/yr		13 - 20	
	Savings from human health externalities	USD bln/yr		from -29 to -10	
	Savings from CO ₂ externalities	USD bln/yr		from -128 to -32	
	Net cost-benefits	USD bln/yr		from -137 to -29	
	Total investment needs for renewables	USD bln/yr	-	9	77

RE technology development

- Current levels
- National plans (BAU)
- REmap 2030 potential

Developments in the entire energy system

CO₂ emission developments (by sector)

Cost – benefit analysis



REmap 2030

A Renewable Energy Roadmap



THANK YOU!

REmap@irena.org