

# ROADMAP FOR A RENEWABLE ENERGY FUTURE

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REmap results by country  
Status as of March, 2016



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## About IRENA

The International Renewable Energy Agency (IRENA) is an intergovernmental organisation that supports countries in their transition to a sustainable energy future and serves as the principal platform for international co-operation, a centre of excellence, and a repository of policy, technology, resource and financial knowledge on renewable energy. IRENA promotes the widespread adoption and sustainable use of all forms of renewable energy, including bioenergy, geothermal, hydropower, ocean, solar and wind energy, in the pursuit of sustainable development, energy access, energy security and low-carbon economic growth and prosperity.

The full version of the REmap report 2016 edition can be downloaded through [www.irena.org/Publications](http://www.irena.org/Publications). All REmap related publications and other supporting material are available at [www.irena.org/remap](http://www.irena.org/remap)

For further information or to provide feedback, please contact the REmap team at [remap@irena.org](mailto:remap@irena.org)



## Note about Data Status

REmap is an ongoing project and country analyses are constantly updated as new information, government plans, and markets developments occur. The information presented in this document is the status of data and REmap findings as of March 2016 and is background information to the 2016 edition of REmap that was released on 17 March, 2016. For more information please email the REmap team at [remap@irena.org](mailto:remap@irena.org).

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## REmap: ROADMAP FOR A RENEWABLE ENERGY FUTURE

Doubling renewables in the global energy mix by 2030 is not only feasible, but cheaper than not doing so. Economic savings would far exceed the costs. It would create more jobs, boost economic growth and save millions of lives annually through reduced air pollution. It would also, when coupled with greater energy efficiency, put the world on track to keep the rise of temperatures within 2°C, in line with the Paris Agreement.

But to meet that goal, renewable energy deployment must happen six times faster than today.

The second edition of IRENA's global roadmap provides an in-depth perspective on the energy transition in 40 economies, representing 80% of global energy use. It offers concrete technology options and outlines solutions to accelerate renewable energy growth.

The age of renewables is here. But without concerted action, they cannot reach their potential soon enough to meet international climate and development targets. For decision makers in the public and private sectors alike, this roadmap sends an alert – on the opportunities at hand and the costs of not taking them.

These REmap country results are part of IRENA's *REmap: Roadmap for a Renewable Energy Future* report.

Methodology and definitions can be found in the full version of the report in the section *REmap: Country process and analytical approach* and the *Appendix: REmap methodology and data*. Additional information is available on the REmap website at [www.irena.org/remap](http://www.irena.org/remap) in the *Datasheets and Sources* and *Methodology* sections of the webpage.



**Abbreviations:**

BF - blast furnace

bln - billion

CO - coke oven

CO<sub>2</sub> - carbon dioxide (CO<sub>2</sub>)

CSP - concentrated solar power

DH - district heat

EJ - exajoule

excl. - excluding

GW - gigawatt

Mt - megatonne

N/A - not available/applicable

PJ - petajoule

PV - photovoltaic

RE - renewable energy

TWh - terawatt-hour

UAE - United Arab Emirates

UK – United Kingdom of Great Britain and Northern Ireland

USA - United States of America

USD - United States dollar

yr - year



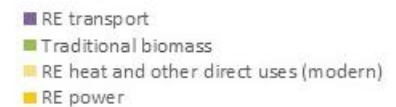
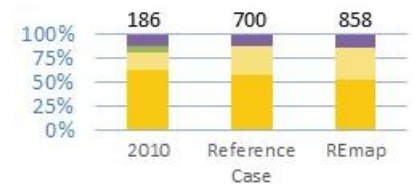
# REmap Country Results - Argentina

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	29	60	62
		Renewable capacity	GW	10	36	42
		Hydropower (excl. pumped hydro)	GW	10	23	23
		Wind	GW	0	6	9
		Biofuels (solid, liquid, gaseous)	GW	0	3	4
		Solar PV	GW	0	4	6
		CSP	GW	0	0	0
		Geothermal	GW	0	0	0
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	19	24	21
	<b>Total electricity generation</b>	TWh	125	236	236	
	Renewable generation	TWh	36	128	144	
	Hydropower	TWh	34	85	85	
	Wind	TWh	0	17	26	
	Biofuels (solid, liquid, gaseous)	TWh	2	19	22	
	Solar PV	TWh	0	7	11	
	CSP	TWh	0	0	0	
	Geothermal	TWh	0	0	0	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	89	108	92	
DH	<b>Total district heat generation</b>	PJ	0	0	0	
	Biofuels (solid, liquid, gaseous)	PJ	0	0	0	
	Other renewables	PJ	0	0	0	
	Non-renewable DH	PJ	0	0	0	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	836	2 056	2 067
		Direct uses of renewable energy	PJ	46	215	287
		Solar thermal - Buildings	PJ	0	40	70
		Solar thermal - Industry	PJ	0	10	30
		Geothermal	PJ	0	0	0
		Bioenergy (traditional) - Buildings	PJ	13	0	0
		Bioenergy (modern) - Buildings	PJ	0	57	62
		Bioenergy - Industry	PJ	33	108	125
		Non-renewable - Buildings	PJ	485	1 106	1 081
		Non-renewable - Industry	PJ	286	629	593
	Non-renewable - BF/CO	PJ	19	106	106	
	Transport	<b>Total fuel consumption</b>	PJ	647	1 544	1 534
		Liquid biofuels	PJ	23	79	115
		Conventional biogasoline	PJ	13	29	41
		Advanced biogasoline	PJ	0	0	0
Biodiesel (conventional and advanced)		PJ	10	50	74	
Biomethane		PJ	0	4	5	
Non-renewable fuels	PJ	624	1 461	1 415		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		PJ	2 036	4 682	4 684	
RE shares	RE share in electricity generation		29%	54%	61%	
	RE share in district heat generation		0%	0%	0%	
	RE share in Buildings - final energy use, direct uses (modern)		0%	8%	11%	
	RE share in Industry - final energy use, direct uses		10%	16%	21%	
	RE share in Transport fuels		4%	5%	8%	
Share of modern RE in TFEC <sup>3</sup>			9%	15%	18%	
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	- 2	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	6	7	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	0.4	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	1.0	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	0.7	
CO <sub>2</sub> emissions from energy [Mt/yr]			137	263	249	

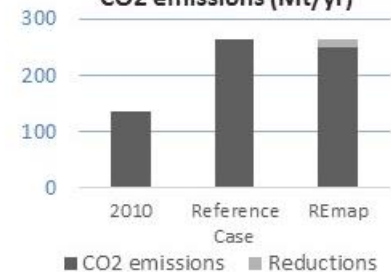
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



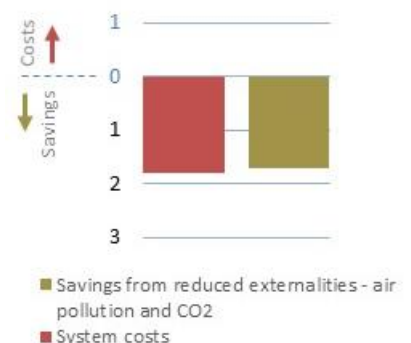
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



References for further consultation:

- Escenarios Energéticos de Argentina, Plataforma Escenarios Energéticos Argentina 2035 (2015).



# REmap Country Results - Australia

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	58	71	91
		Renewable capacity	GW	12	22	52
		Hydropower (excl. pumped hydro)	GW	7	8	10
		Wind	GW	5	9	19
		Biofuels (solid, liquid, gaseous)	GW	0	1	2
		Solar PV	GW	1	4	21
		CSP	GW	0	0	0
		Geothermal	GW	0	1	1
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	45	49	39
	<b>Total electricity generation</b>	TWh	262	317	334	
	Renewable generation	TWh	38	64	137	
	Hydropower	TWh	17	19	27	
	Wind	TWh	14	27	54	
	Biofuels (solid, liquid, gaseous)	TWh	5	8	15	
	Solar PV	TWh	1	7	35	
	CSP	TWh	0	0	0	
	Geothermal	TWh	0	4	6	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	225	253	197	
DH	<b>Total district heat generation</b>	PJ	0	0	0	
	Biofuels (solid, liquid, gaseous)	PJ	0	0	0	
	Other renewables	PJ	0	0	0	
	Non-renewable DH	PJ	0	0	0	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	1 303	2 218	2 192
		Direct uses of renewable energy	PJ	183	212	379
		Solar thermal - Buildings	PJ	11	12	30
		Solar thermal - Industry	PJ	0	0	35
		Geothermal	PJ	0	0	0
		Bioenergy (traditional) - Buildings	PJ	0	0	0
		Bioenergy (modern) - Buildings	PJ	54	41	66
		Bioenergy - Industry	PJ	118	159	248
		Non-renewable - Buildings	PJ	240	361	296
		Non-renewable - Industry	PJ	782	1 557	1 429
	Non-renewable - BF/CO	PJ	97	89	89	
	Transport	<b>Total fuel consumption</b>	PJ	1 466	1 928	1 821
		Liquid biofuels	PJ	9	11	53
		Conventional biogasoline	PJ	6	5	17
		Advanced biogasoline	PJ	0	3	3
Biodiesel (conventional and advanced)		PJ	3	3	33	
Biomethane		PJ	0	0	0	
Non-renewable fuels	PJ	1 457	1 917	1 768		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		<b>PJ</b>	<b>3 593</b>	<b>5 236</b>	<b>5 182</b>	
RE shares	RE share in electricity generation		14%	20%	41%	
	RE share in district heat generation		0%	0%	0%	
	RE share in Buildings - final energy use, direct uses (modern)		21%	13%	25%	
	RE share in Industry - final energy use, direct uses		13%	9%	17%	
	RE share in Transport fuels		1%	1%	3%	
Financial indicators	Share of modern RE in TFEC <sup>3</sup>		8%	8%	17%	
	System costs [USD bln/yr in 2030]		N/A	N/A	2	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	1	5	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	2.5	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	14.7	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	3.9	
	CO <sub>2</sub> emissions from energy [Mt/yr]		375	507	429	

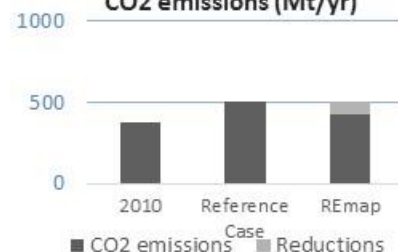
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



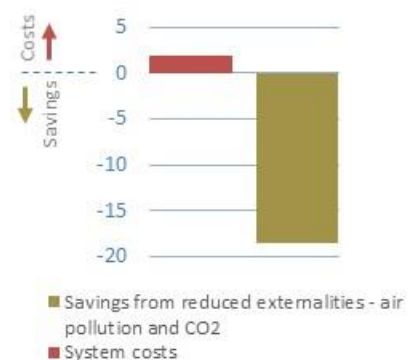
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



**References for further consultation:**

- Australian Energy Projections 2014-15 to 2049-50, BREE (2014).
- "Chapter 3: THE OUTLOOK FOR GAS IN THE TRANSPORT FUEL MARKET", Transport Fuels from Australia, CSIRO





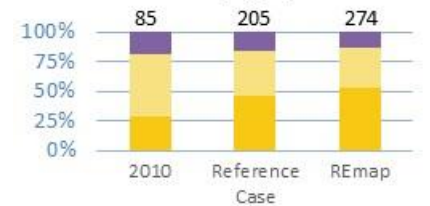
# REmap Country Results - Belgium

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	18	25	32
		Renewable capacity	GW	4	11	20
		Hydropower (excl. pumped hydro)	GW	1	0	0
		Wind	GW	1	4	6
		Biofuels (solid, liquid, gaseous)	GW	1	2	2
		Solar PV	GW	1	5	11
		CSP	GW	0	0	0
		Geothermal	GW	0	0	0
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	14	14	13
	<b>Total electricity generation</b>	TWh	94	84	85	
	Renewable generation	TWh	8	26	41	
	Hydropower	TWh	0	0	0	
	Wind	TWh	1	11	18	
	Biofuels (solid, liquid, gaseous)	TWh	6	10	10	
	Solar PV	TWh	1	5	13	
	CSP	TWh	0	0	0	
	Geothermal	TWh	0	0	0	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	86	58	44	
DH	<b>Total district heat generation</b>	PJ	36	44	44	
	Biofuels (solid, liquid, gaseous)	PJ	4	6	10	
	Other renewables	PJ	0	0	0	
	Non-renewable DH	PJ	32	38	34	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	750	726	722
		Direct uses of renewable energy	PJ	42	70	82
		Solar thermal - Buildings	PJ	0	12	17
		Solar thermal - Industry	PJ	0	0	2
		Geothermal	PJ	0	0	0
		Bioenergy (traditional) - Buildings	PJ	0	0	0
		Bioenergy (modern) - Buildings	PJ	11	13	13
		Bioenergy - Industry	PJ	31	45	50
	Non-renewable - Buildings	PJ	418	386	377	
	Non-renewable - Industry	PJ	247	233	226	
	Non-renewable - BF/CO	PJ	43	37	37	
	Transport	<b>Total fuel consumption</b>	PJ	379	333	324
		Liquid biofuels	PJ	15	33	35
		Conventional biogasoline	PJ	3	6	6
Advanced biogasoline		PJ	0	0	0	
Biodiesel (conventional and advanced)		PJ	12	27	29	
Biomethane		PJ	0	0	0	
Non-renewable fuels	PJ	364	299	289		
<b>Total final energy consumption (electricity, DH, direct uses)</b>		PJ	1 452	1 404	1 396	
RE shares	RE share in electricity generation		8%	31%	48%	
	RE share in district heat generation		10%	15%	22%	
	RE share in Buildings - final energy use, direct uses (modern)		3%	6%	7%	
	RE share in Industry - final energy use, direct uses		11%	16%	19%	
	RE share in Transport fuels		4%	10%	11%	
Financial indicators	Share of modern RE in TFEC <sup>3</sup>		6%	15%	20%	
	System costs [USD bln/yr in 2030]		N/A	N/A	-0.1	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	1	2	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	0.1	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	0.3	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	0.3	
	CO <sub>2</sub> emissions from energy [Mt/yr]		89	85	78	

TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)

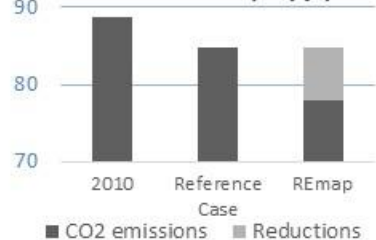


Final RE use by sector (%) and total (PJ/yr)

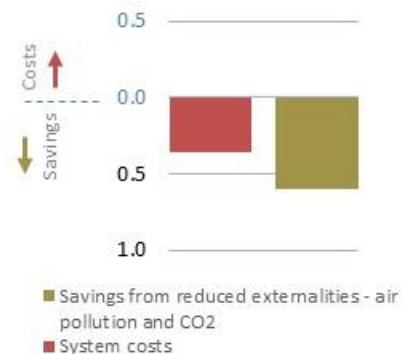


■ RE transport ■ Traditional biomass  
■ RE power

CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



**References for further consultation:**

- Het Belgische energiesysteem in 2050: Waar naartoe. Federaal Planbureau (2014).
- Potentieel studie hernieuwbare energie 2030 in Vlaanderen, VITO (2014).
- Towards 100% renewable energy in Belgium by 2015, VITO (2013).



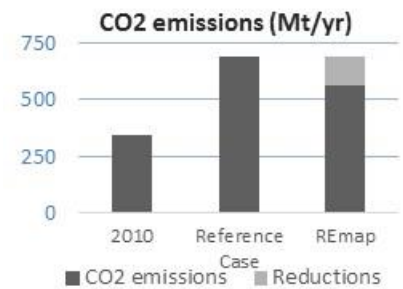
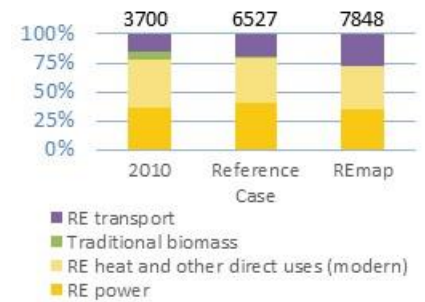
# REmap Country Results - Brazil

		Unit	2010	Reference Case 2030	REmap 2030			
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	115	249	257		
		Renewable capacity	GW	91	203	224		
		Hydropower (excl. pumped hydro)	GW	82	131	134		
		Wind	GW	1	36	42		
		Biofuels (solid, liquid, gaseous)	GW	8	25	25		
		Solar PV	GW	0	10	21		
		CSP	GW	0	1	2		
		Geothermal	GW	0	0	0		
		Marine, other	GW	0	0	0		
		Non-renewable capacity	GW	24	45	33		
	<b>Total electricity generation</b>		TWh	515	994	994		
	Renewable generation		TWh	437	834	884		
	Hydropower		TWh	403	610	622		
	Wind		TWh	2	96	116		
	Biofuels (solid, liquid, gaseous)		TWh	32	111	112		
	Solar PV		TWh	0	14	30		
	CSP		TWh	0	2	4		
	Geothermal		TWh	0	0	0		
	Marine, other		TWh	0	0	0		
	Non-renewable generation		TWh	78	160	110		
DH	<b>Total district heat generation</b>		PJ	0	0			
	Biofuels (solid, liquid, gaseous)		PJ	0	0			
	Other renewables		PJ	0	0			
	Non-renewable DH		PJ	0	0			
	Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>		PJ	3 442	5 526	5 485
			Direct uses of renewable energy		PJ	1 774	2 611	2 866
			Solar thermal - Buildings		PJ	0	23	94
			Solar thermal - Industry		PJ	0	0	163
			Geothermal		PJ	0	0	10
			Bioenergy (traditional) - Buildings		PJ	225	149	0
Bioenergy (modern) - Buildings			PJ	108	102	154		
Bioenergy - Industry			PJ	1 441	2 337	2 445		
Non-renewable - Buildings			PJ	316	432	432		
Non-renewable - Industry			PJ	1 352	2 483	2 187		
Non-renewable - BF/CO		PJ	0	0	0			
Transport		<b>Total fuel consumption</b>		PJ	2 924	6 355	6 344	
		Liquid biofuels		PJ	589	1 228	2 187	
		Conventional biogasoline		PJ	389	892	1 544	
		Advanced biogasoline		PJ	0	6	224	
	Biodiesel (conventional and advanced)		PJ	200	330	418		
	Biomethane		PJ	0	0	0		
Non-renewable fuels		PJ	2 335	5 128	4 157			
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>			PJ	8 294	15 534	15 422		
RE shares	RE share in electricity generation			85%	84%	89%		
	RE share in district heat generation			0%	0%	0%		
	RE share in Buildings - final energy use, direct uses (modern)			17%	18%	37%		
	RE share in Industry - final energy use, direct uses			52%	48%	54%		
	RE share in Transport fuels			20%	19%	34%		
Financial indicators	Share of modern RE in TFEC <sup>3</sup>			43%	42%	51%		
	System costs [USD bln/yr in 2030]			N/A	N/A	- 11		
	RE investment needs [USD bln/yr (2010-2030)]			N/A	17	22		
	Investment support for renewables [USD bln/yr in 2030]			N/A	N/A	3.0		
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]			N/A	N/A	19.5		
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]			N/A	N/A	6.3		
	CO <sub>2</sub> emissions from energy [Mt/yr]			347	690	564		

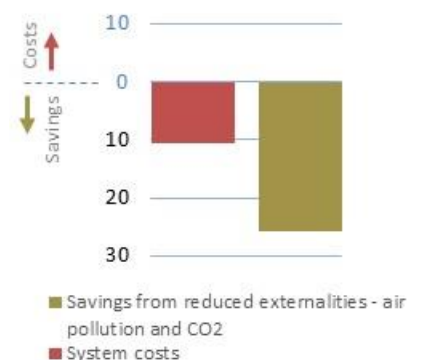
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



Final RE use by sector (%) and total (PJ/yr)



Costs and savings (USD bln in 2030)



**References for further consultation:**

- Plano Nacional de Energia 2050, Ministério de Minas e Energia. Empresa de Pesquisa Energética (2014).
- Plano Decenal de Energia 2024, Ministério de Minas e Energia. Empresa de Pesquisa Energética (2015).





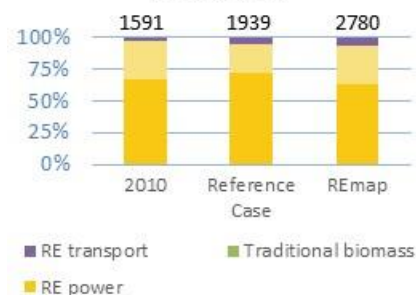
# REmap Country Results - Canada

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	129	166	187
		Renewable capacity	GW	81	113	147
		Hydropower (excl. pumped hydro)	GW	75	87	90
		Wind	GW	4	18	31
		Biofuels (solid, liquid, gaseous)	GW	2	4	12
		Solar PV	GW	0	5	13
		CSP	GW	0	0	0
		Geothermal	GW	0	0	1
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	48	53	40
	<b>Total electricity generation</b>	TWh	610	751	785	
	Renewable generation	TWh	370	497	615	
	Hydropower	TWh	351	432	447	
	Wind	TWh	9	33	76	
	Biofuels (solid, liquid, gaseous)	TWh	9	16	60	
	Solar PV	TWh	1	16	25	
	CSP	TWh	0	0	0	
	Geothermal	TWh	0	0	7	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	240	254	170	
DH	<b>Total district heat generation</b>	PJ	19	34	34	
	Biofuels (solid, liquid, gaseous)	PJ	2	0	20	
	Other renewables	PJ	0	0	0	
	Non-renewable DH	PJ	17	34	14	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	2 770	5 171	5 114
		Direct uses of renewable energy	PJ	481	447	828
		Solar thermal - Buildings	PJ	0	3	8
		Solar thermal - Industry	PJ	0	0	15
		Geothermal	PJ	0	3	3
		Bioenergy (traditional) - Buildings	PJ	0	0	0
		Bioenergy (modern) - Buildings	PJ	94	145	213
		Bioenergy - Industry	PJ	387	296	589
		Non-renewable - Buildings	PJ	1 204	1 942	1 766
		Non-renewable - Industry	PJ	1 085	2 743	2 481
	Non-renewable - BF/CO	PJ	0	39	39	
	Transport	<b>Total fuel consumption</b>	PJ	2 449	2 762	2 331
		Liquid biofuels	PJ	52	99	195
		Conventional biogasoline	PJ	42	62	94
		Advanced biogasoline	PJ	0	19	51
		Biodiesel (conventional and advanced)	PJ	9	18	50
		Biomethane	PJ	0	0	0
		Non-renewable fuels	PJ	2 398	2 663	2 135
		<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>	PJ	7 152	10 371	10 003
		RE shares	RE share in electricity generation		61%	66%
RE share in district heat generation				11%	0%	59%
RE share in Buildings - final energy use, direct uses (modern)			7%	7%	11%	
RE share in Industry - final energy use, direct uses			26%	10%	20%	
RE share in Transport fuels			2%	4%	8%	
Share of modern RE in TFEC <sup>3</sup>			22%	19%	28%	
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	6	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	6	11	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	5.1	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	14.7	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	5.2	
CO <sub>2</sub> emissions from energy [Mt/yr]		448	593	489		

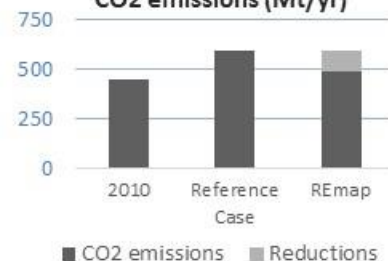
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



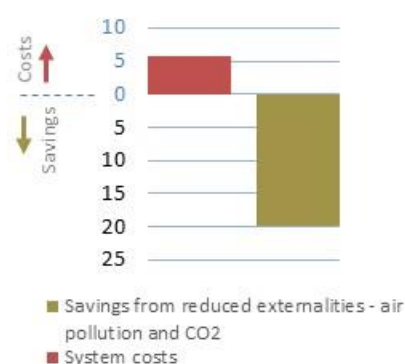
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



**References for further consultation:**

- Canada's Energy Future 2016: Energy Supply and Demand Projections to 2040, NEB (2016).
- Report on Energy Supply and Demand in Canada, Government of Canada (2016).



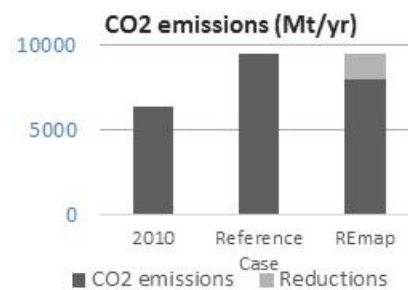
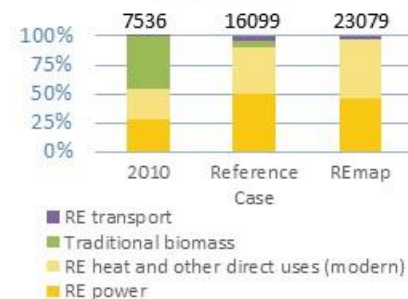
## REmap Country Results - China

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	998	2 467	2 731
		Renewable capacity	GW	266	1 066	1 484
		Hydropower (excl. pumped hydro)	GW	213	400	400
		Wind	GW	45	315	562
		Biofuels (solid, liquid, gaseous)	GW	6	38	67
		Solar PV	GW	2	300	422
		CSP	GW	0	12	31
		Geothermal	GW	0	1	1
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	732	1 401	1 248
	<b>Total electricity generation</b>	TWh	4 234	9 315	9 466	
	Renewable generation	TWh	802	2 891	3 809	
	Hydropower	TWh	722	1 600	1 600	
	Wind	TWh	45	648	1 200	
	Biofuels (solid, liquid, gaseous)	TWh	33	192	358	
	Solar PV	TWh	1	425	595	
	CSP	TWh	0	18	46	
	Geothermal	TWh	1	9	9	
	Marine, other	TWh	0	0	0	
Non-renewable generation	TWh	3 433	6 424	5 657		
DH	<b>Total district heat generation</b>	PJ	2 934	3 530	3 530	
	Biofuels (solid, liquid, gaseous)	PJ	34	41	1 401	
	Other renewables	PJ	0	0	0	
	Non-renewable DH	PJ	2 900	3 489	2 129	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	36 167	43 488	41 758
		Direct uses of renewable energy	PJ	5 310	7 236	10 258
		Solar thermal - Buildings	PJ	860	2 674	3 244
		Solar thermal - Industry	PJ	0	84	1 219
		Geothermal	PJ	150	301	446
		Bioenergy (traditional) - Buildings	PJ	3 400	891	0
		Bioenergy (modern) - Buildings	PJ	793	2 407	3 632
		Bioenergy - Industry	PJ	107	879	1 717
		Non-renewable - Buildings	PJ	5 883	6 083	3 593
		Non-renewable - Industry	PJ	19 743	24 135	21 872
	Non-renewable - BF/CO	PJ	5 231	6 035	6 035	
	Transport	<b>Total fuel consumption</b>	PJ	7 226	17 372	16 409
		Liquid biofuels	PJ	51	751	751
		Conventional biogasoline	PJ	32	516	516
		Advanced biogasoline	PJ	0	2	2
Biodiesel (conventional and advanced)		PJ	18	233	233	
Biomethane	PJ	0	0	0		
Non-renewable fuels	PJ	7 175	16 622	15 658		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		PJ	57 156	90 172	88 213	
RE shares	RE share in electricity generation		19%	31%	40%	
	RE share in district heat generation		1%	1%	40%	
	RE share in Buildings - final energy use, direct uses (modern)		16%	44%	67%	
	RE share in Industry - final energy use, direct uses		1%	4%	12%	
	RE share in Transport fuels		1%	4%	5%	
Financial indicators	Share of modern RE in TFEC <sup>3</sup>		7%	17%	26%	
	System costs [USD bln/yr in 2030]		N/A	N/A	46	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	105	160	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	56.4	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	116.1	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	74.4	
	CO <sub>2</sub> emissions from energy [Mt/yr]		6 394	9 499	8 010	

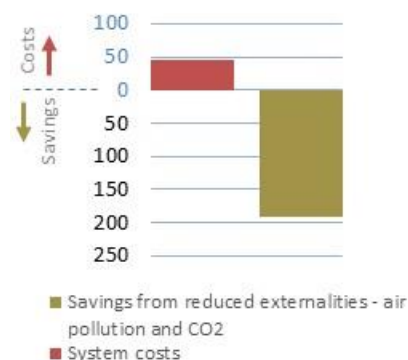
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



Final RE use by sector (%) and total (PJ/yr)



Costs and savings (USD bln in 2030)



References for further consultation:

- World Energy Outlook 2012 & 2015, IEA (2012; 2015).



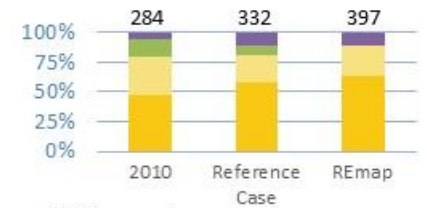
# REmap Country Results - Colombia

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	13	22	26
		Renewable capacity	GW	9	16	22
		Hydropower (excl. pumped hydro)	GW	9	15	17
		Wind	GW	0	1	3
		Biofuels (solid, liquid, gaseous)	GW	0	0	1
		Solar PV	GW	0	0	2
		CSP	GW	0	0	0
		Geothermal	GW	0	0	0
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	3	6	4
	<b>Total electricity generation</b>	TWh	56	98	103	
	Renewable generation	TWh	41	63	80	
	Hydropower	TWh	40	58	66	
	Wind	TWh	0	1	6	
	Biofuels (solid, liquid, gaseous)	TWh	1	2	3	
	Solar PV	TWh	0	0	4	
	CSP	TWh	0	0	0	
	Geothermal	TWh	0	2	3	
	Marine, other	TWh	0	0	0	
Non-renewable generation	TWh	15	35	23		
DH	<b>Total district heat generation</b>	PJ	0	0	0	
	Biofuels (solid, liquid, gaseous)	PJ	0	0	0	
	Other renewables	PJ	0	0	0	
	Non-renewable DH	PJ	0	0	0	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	438	530	511
		Direct uses of renewable energy	PJ	133	104	101
		Solar thermal - Buildings	PJ	0	0	0
		Solar thermal - Industry	PJ	0	0	4
		Geothermal	PJ	0	0	0
		Bioenergy (traditional) - Buildings	PJ	39	28	0
		Bioenergy (modern) - Buildings	PJ	39	28	36
		Bioenergy - Industry	PJ	55	48	61
		Non-renewable - Buildings	PJ	92	136	136
		Non-renewable - Industry	PJ	200	271	256
	Non-renewable - BF/CO	PJ	13	18	18	
	Transport	<b>Total fuel consumption</b>	PJ	364	719	659
		Liquid biofuels	PJ	17	35	45
		Conventional biogasoline	PJ	14	26	27
		Advanced biogasoline	PJ	0	0	0
		Biodiesel (conventional and advanced)	PJ	3	9	18
		Biomethane	PJ	0	0	0
Non-renewable fuels		PJ	347	685	614	
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		PJ	984	1 551	1 495	
RE shares	RE share in electricity generation		74%	64%	78%	
	RE share in district heat generation		0%	0%	0%	
	RE share in Buildings - final energy use, direct uses (modern)		23%	15%	21%	
	RE share in Industry - final energy use, direct uses		21%	15%	20%	
	RE share in Transport fuels		5%	5%	7%	
Share of modern RE in TFEC <sup>3</sup>			25%	20%	27%	
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	1	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	1	2	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	1.3	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	1.6	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	0.7	
	CO <sub>2</sub> emissions from energy [Mt/yr]		54	98	84	

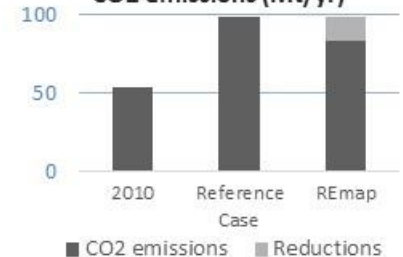
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



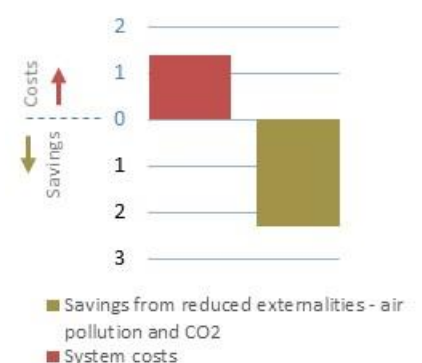
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



References for further consultation:

- Plan de Expansión de Referencia Generación – Transmisión 2014-2028, UPME (2013).
- Integración de las energías renovables no convencionales en Colombia, UPME (2015).





# REmap Country Results - Cyprus

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	1.7	2.0	2.7
		Renewable capacity	GW	0.2	0.9	1.7
		Hydropower (excl. pumped hydro)	GW	0.0	0.0	0.0
		Wind	GW	0.1	0.3	0.3
		Biofuels (solid, liquid, gaseous)	GW	0.0	0.0	0.0
		Solar PV	GW	0.0	0.6	1.3
		CSP	GW	0.0	0.1	0.1
		Geothermal	GW	0.0	0.0	0.0
		Marine, other	GW	0.0	0.0	0.0
		Non-renewable capacity	GW	1.5	1.1	0.9
	<b>Total electricity generation</b>	TWh	4.9	6.1	6.6	
	Renewable generation	TWh	0.1	1.6	3.0	
	Hydropower	TWh	0.0	0.0	0.0	
	Wind	TWh	0.0	0.4	0.5	
	Biofuels (solid, liquid, gaseous)	TWh	0.0	0.1	0.1	
	Solar PV	TWh	0.0	0.9	2.2	
	CSP	TWh	0.0	0.2	0.2	
	Geothermal	TWh	0.0	0.0	0.0	
	Marine, other	TWh	0.0	0.0	0.0	
	Non-renewable generation	TWh	4.8	4.5	3.7	
DH	<b>Total district heat generation</b>	PJ	0.0	0.0	0.0	
	Biofuels (solid, liquid, gaseous)	PJ	0.0	0.0	0.0	
	Other renewables	PJ	0.0	0.0	0.0	
	Non-renewable DH	PJ	0.0	0.0	0.0	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	19.6	16.5	16.3
		Direct uses of renewable energy	PJ	3.3	5.8	6.4
		Solar thermal - Buildings	PJ	2.6	3.6	4.0
		Solar thermal - Industry	PJ	0.0	0.1	0.2
		Geothermal	PJ	0.0	0.1	0.1
		Bioenergy (traditional) - Buildings	PJ	0.0	0.0	0.0
		Bioenergy (modern) - Buildings	PJ	0.3	1.0	1.0
		Bioenergy - Industry	PJ	0.5	1.1	1.1
	Non-renewable - Buildings	PJ	7.0	6.6	6.2	
	Non-renewable - Industry	PJ	9.3	4.0	3.7	
	Non-renewable - BF/CO	PJ	0.0	0.0	0.0	
	Transport	<b>Total fuel consumption</b>	PJ	43.7	51.3	46.0
		Liquid biofuels	PJ	0.6	5.2	5.2
		Conventional biogasoline	PJ	0.2	1.7	1.7
		Advanced biogasoline	PJ	0.0	0.5	0.5
Biodiesel (conventional and advanced)		PJ	0.5	3.0	3.0	
Biomethane		PJ	0.0	0.0	0.0	
Non-renewable fuels		PJ	43.1	46.1	40.9	
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		PJ	81	88	85	
RE shares	RE share in electricity generation		1%	26%	45%	
	RE share in district heat generation		0%	0%	0%	
	RE share in Buildings - final energy use, direct uses (modern)		29%	42%	45%	
	RE share in Industry - final energy use, direct uses		5%	22%	26%	
	RE share in Transport fuels		1%	10%	11%	
Share of modern RE in TFEC <sup>3</sup>		5%	19%	26%		
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	0.05	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	0.00	0.00	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	0.04	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	0.10	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	0.04	
CO <sub>2</sub> emissions from energy [Mt/yr]		9	6	5		

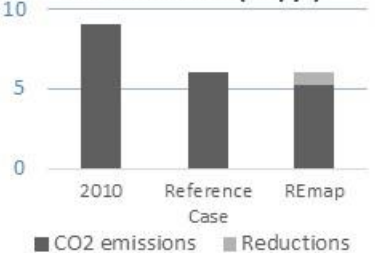
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



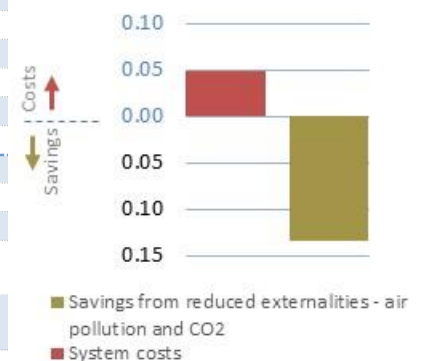
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



**References for further consultation:**

- Renewable Energy Roadmap for the Republic of Cyprus, IRENA (2015).
- National Renewable Energy Action Plan (NREAP), Republic of Cyprus submitted to EC (2013).



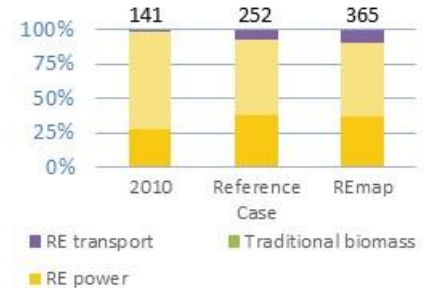
# REmap Country Results - Denmark

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	14	19	22
		Renewable capacity	GW	5	14	17
		Hydropower (excl. pumped hydro)	GW	0	0	0
		Wind	GW	4	9	11
		Biofuels (solid, liquid, gaseous)	GW	1	2	3
		Solar PV	GW	0	3	3
		CSP	GW	0	0	0
		Geothermal	GW	0	0	0
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	9	6	5
	<b>Total electricity generation</b>	TWh	39	39	49	
	Renewable generation	TWh	13	29	43	
	Hydropower	TWh	0	0	0	
	Wind	TWh	8	20	30	
	Biofuels (solid, liquid, gaseous)	TWh	5	7	11	
	Solar PV	TWh	0	2	2	
	CSP	TWh	0	0	0	
	Geothermal	TWh	0	0	0	
Marine, other	TWh	0	0	0		
Non-renewable generation	TWh	26	10	7		
DH	<b>Total district heat generation</b>	PJ	145	125	115	
	Biofuels (solid, liquid, gaseous)	PJ	60	63	101	
	Other renewables	PJ	0	1	11	
	Non-renewable DH	PJ	85	61	3	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	193	168	119
		Direct uses of renewable energy	PJ	54	82	94
		Solar thermal - Buildings	PJ	1	1	1
		Solar thermal - Industry	PJ	0	0	0
		Geothermal	PJ	0	0	3
		Bioenergy (traditional) - Buildings	PJ	0	0	0
		Bioenergy (modern) - Buildings	PJ	40	53	53
		Bioenergy - Industry	PJ	13	29	38
		Non-renewable - Buildings	PJ	59	33	11
		Non-renewable - Industry	PJ	80	53	14
	Non-renewable - BF/CO	PJ	0	0	0	
	Transport	<b>Total fuel consumption</b>	PJ	207	243	216
		Liquid biofuels	PJ	1	19	34
		Conventional biogasoline	PJ	1	19	19
Advanced biogasoline		PJ	0	0	10	
Biodiesel (conventional and advanced)		PJ	0	0	6	
Biomethane	PJ	0	0	0		
Non-renewable fuels	PJ	206	224	182		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		<b>PJ</b>	<b>647</b>	<b>664</b>	<b>614</b>	
RE shares	RE share in electricity generation		34%	74%	86%	
	RE share in district heat generation		42%	51%	97%	
	RE share in Buildings - final energy use, direct uses (modern)		41%	62%	83%	
	RE share in Industry - final energy use, direct uses		14%	35%	73%	
	RE share in Transport fuels		1%	8%	16%	
	Share of modern RE in TFEC <sup>3</sup>		22%	38%	60%	
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	-0.4	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	1	2	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	1.0	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	2.2	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	0.7	
	CO <sub>2</sub> emissions from energy [Mt/yr]		46	33	18	

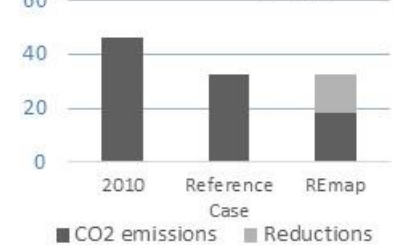
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



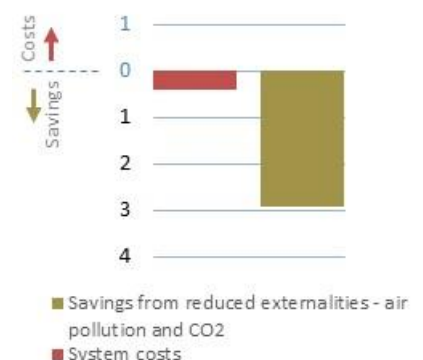
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



**References for further consultation:**

- National Renewable Energy Action Plan (NREAP), Denmark submitted to EC (2013).
- Danish Energy Outlook, Energi Styrelsen (2011).
- Accelerating Green Energy Towards 2020, Danish Energy Agreement (2012).





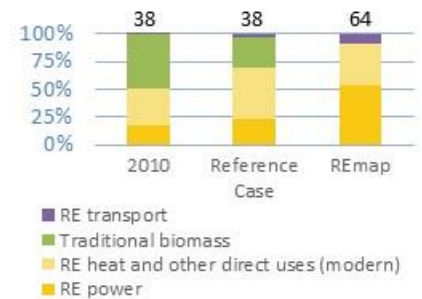
# REmap Country Results – Dominican Republic

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	5	7	9
		Renewable capacity	GW	1	1	5
		Hydropower (excl. pumped hydro)	GW	1	1	1
		Wind	GW	0	0	3
		Biofuels (solid, liquid, gaseous)	GW	0	0	0
		Solar PV	GW	0	0	1
		CSP	GW	0	0	0
		Geothermal	GW	0	0	0
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	4	6	4
	<b>Total electricity generation</b>	TWh	14	30	30	
	Renewable generation	TWh	2	3	11	
	Hydropower	TWh	2	2	2	
	Wind	TWh	0	1	5	
	Biofuels (solid, liquid, gaseous)	TWh	0	0	2	
	Solar PV	TWh	0	0	2	
	CSP	TWh	0	0	0	
	Geothermal	TWh	0	0	0	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	12	27	19	
DH	<b>Total district heat generation</b>	PJ	0	0	0	
	Biofuels (solid, liquid, gaseous)	PJ	0	0	0	
	Other renewables	PJ	0	0	0	
	Non-renewable DH	PJ	0	0	0	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	76	93	85
		Direct uses of renewable energy	PJ	31	28	24
		Solar thermal - Buildings	PJ	0	1	1
		Solar thermal - Industry	PJ	0	0	1
		Geothermal	PJ	0	0	0
		Bioenergy (traditional) - Buildings	PJ	18	10	0
		Bioenergy (modern) - Buildings	PJ	3	3	7
		Bioenergy - Industry	PJ	9	13	15
		Non-renewable - Buildings	PJ	25	36	35
		Non-renewable - Industry	PJ	20	29	26
	Non-renewable - BF/CO	PJ	0	0	0	
	Transport	<b>Total fuel consumption</b>	PJ	96	135	132
		Liquid biofuels	PJ	0	1	5
		Conventional biogasoline	PJ	0	1	1
		Advanced biogasoline	PJ	0	0	0
		Biodiesel (conventional and advanced)	PJ	0	0	4
Biomethane		PJ	0	0	0	
Non-renewable fuels	PJ	95	134	126		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		PJ	221	322	311	
RE shares	RE share in electricity generation		13%	9%	37%	
	RE share in district heat generation		0%	0%	0%	
	RE share in Buildings - final energy use, direct uses (modern)		7%	9%	19%	
	RE share in Industry - final energy use, direct uses		32%	30%	38%	
	RE share in Transport fuels		0%	1%	4%	
Share of modern RE in TFEC <sup>3</sup>			9%	8%	21%	
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	-1	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	0.1	0.4	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	0.03	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	1.8	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	0.4	
CO <sub>2</sub> emissions from energy [Mt/yr]			20	36	29	

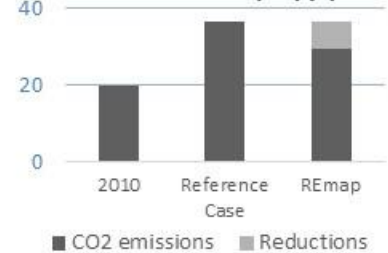
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



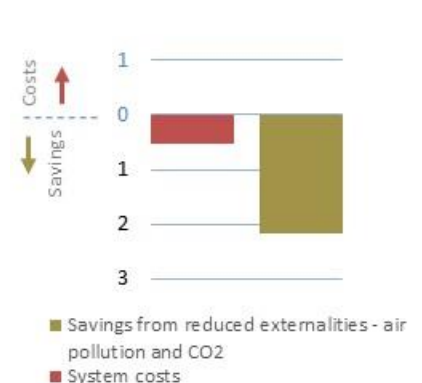
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



**References for further consultation:**

- Prospectiva demanda de la República Dominicana CNE (forthcomig).
- Harnessing the Dominican Republic's Sustainable Energy Resources, WorldWatch Institute (2015).



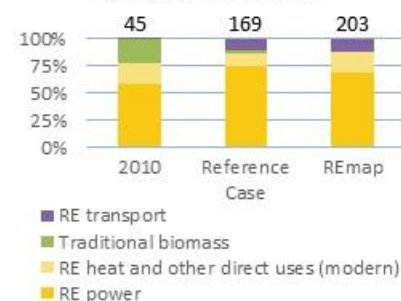
# REmap Country Results – Ecuador

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	5	14	14
		Renewable capacity	GW	2	10	11
		Hydropower (excl. pumped hydro)	GW	2	9	9
		Wind	GW	0	0	1
		Biofuels (solid, liquid, gaseous)	GW	0	0	0
		Solar PV	GW	0	0	1
		CSP	GW	0	0	0
		Geothermal	GW	0	0	0
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	3	4	3
	<b>Total electricity generation</b>	TWh	20	60	60	
	Renewable generation	TWh	9	43	48	
	Hydropower	TWh	9	42	44	
	Wind	TWh	0	1	2	
	Biofuels (solid, liquid, gaseous)	TWh	0	0	1	
	Solar PV	TWh	0	1	1	
	CSP	TWh	0	0	0	
	Geothermal	TWh	0	0	1	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	11	17	12	
DH	<b>Total district heat generation</b>	PJ	0	0	0	
	Biofuels (solid, liquid, gaseous)	PJ	0	0	0	
	Other renewables	PJ	0	0	0	
	Non-renewable DH	PJ	0	0	0	
Final energy use - direct uses <sup>1,1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	113	158	153
		Direct uses of renewable energy	PJ	19	26	39
		Solar thermal - Buildings	PJ	0	0	1
		Solar thermal - Industry	PJ	0	0	5
		Geothermal	PJ	0	0	0
		Bioenergy (traditional) - Buildings	PJ	10	7	0
		Bioenergy (modern) - Buildings	PJ	0	7	9
		Bioenergy - Industry	PJ	9	12	24
		Non-renewable - Buildings	PJ	43	60	59
		Non-renewable - Industry	PJ	51	72	55
	Non-renewable - BF/CO	PJ	0	0	0	
	Transport	<b>Total fuel consumption</b>	PJ	209	309	298
		Liquid biofuels	PJ	0	17	24
		Conventional biogasoline	PJ	0	17	21
		Advanced biogasoline	PJ	0	0	0
Biodiesel (conventional and advanced)		PJ	0	0	2	
Biomethane	PJ	0	0	0		
Non-renewable fuels	PJ	209	292	275		
<b>Total final energy consumption (electricity, DH, direct uses) <sup>2</sup></b>		<b>PJ</b>	<b>383</b>	<b>647</b>	<b>632</b>	
RE shares	RE share in electricity generation		45%	72%	80%	
	RE share in district heat generation		0%	0%	0%	
	RE share in Buildings - final energy use, direct uses (modern)		0%	9%	15%	
	RE share in Industry - final energy use, direct uses		15%	15%	34%	
	RE share in Transport fuels		0%	5%	8%	
Share of modern RE in TFEC <sup>3</sup>			9%	25%	32%	
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	- 1	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	1	1	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	0.0	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	0.8	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	0.3	
CO <sub>2</sub> emissions from energy [Mt/yr]			31	45	39	

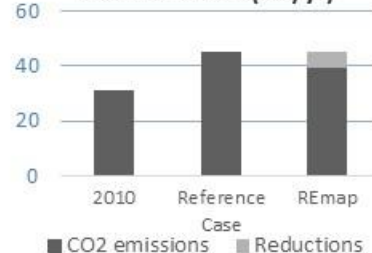
**TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)**



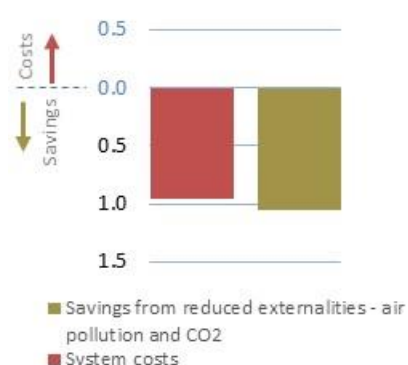
**Final RE consumption by sector (%) and total (PJ/yr)**



**CO<sub>2</sub> emissions (Mt/yr)**



**Costs and savings (USD bln in 2030)**



**References for further consultation:**

- Plan Nacional para el buen vivir 2013-2017, Tomo I, Consejo Nacional de Planificación (2013).
- Plan Maestro de Electrificación (PME) 2013-2022, CONELEC (2013).
- Evaluación Rápida y Análisis de Brechas del Sector Energético, Roberto Gomelsky (2013).



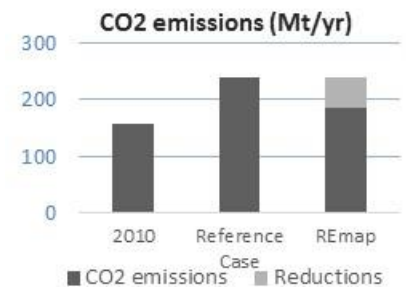
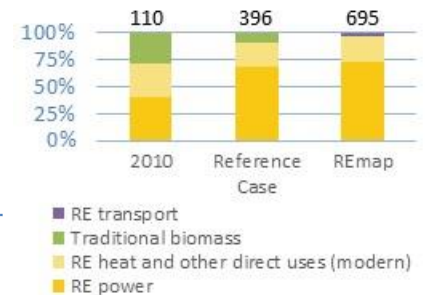
# REmap Country Results – Egypt

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	<b>GW</b>	<b>25</b>	<b>56</b>	<b>78</b>
		Renewable capacity	GW	3	25	59
		Hydropower (excl. pumped hydro)	GW	3	2	2
		Wind	GW	1	20	21
		Biofuels (solid, liquid, gaseous)	GW	0	0	1
		Solar PV	GW	0	1	21
		CSP	GW	0	3	14
		Geothermal	GW	0	0	0
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	21	31	19
	<b>Total electricity generation</b>	<b>TWh</b>	<b>147</b>	<b>285</b>	<b>289</b>	
	Renewable generation	TWh	15	86	158	
	Hydropower	TWh	13	9	9	
	Wind	TWh	1	69	71	
	Biofuels (solid, liquid, gaseous)	TWh	0	0	3	
	Solar PV	TWh	0	1	37	
	CSP	TWh	0	7	38	
	Geothermal	TWh	0	0	0	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	132	199	131	
DH	<b>Total district heat generation</b>	<b>PJ</b>	<b>0</b>	<b>0</b>	<b>0</b>	
	Biofuels (solid, liquid, gaseous)	PJ	0	0	0	
	Other renewables	PJ	0	0	0	
	Non-renewable DH	PJ	0	0	0	
Final energy use - direct uses <sup>1,1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	<b>PJ</b>	<b>777</b>	<b>1 061</b>	<b>981</b>
		Direct uses of renewable energy	PJ	65	126	166
		Solar thermal - Buildings	PJ	0	4	9
		Solar thermal - Industry	PJ	0	0	20
		Geothermal	PJ	0	0	0
		Bioenergy (traditional) - Buildings	PJ	32	38	1
		Bioenergy (modern) - Buildings	PJ	0	0	10
		Bioenergy - Industry	PJ	33	84	127
		Non-renewable - Buildings	PJ	246	377	343
		Non-renewable - Industry	PJ	456	544	457
	Non-renewable - BF/CO	PJ	10	15	15	
	Transport	<b>Total fuel consumption</b>	<b>PJ</b>	<b>623</b>	<b>921</b>	<b>896</b>
		Liquid biofuels	PJ	0	0	25
		Conventional biogasoline	PJ	0	0	0
		Advanced biogasoline	PJ	0	0	25
Biodiesel (conventional and advanced)		PJ	0	0	0	
Biomethane	PJ	0	0	0		
Non-renewable fuels	PJ	623	921	871		
<b>Total final energy consumption (electricity, DH, direct uses) <sup>2</sup></b>		<b>PJ</b>	<b>1 947</b>	<b>2 882</b>	<b>2 797</b>	
RE shares	RE share in electricity generation		10%	30%	55%	
	RE share in district heat generation		0%	0%	0%	
	RE share in Buildings - final energy use, direct uses (modern)		0%	1%	5%	
	RE share in Industry - final energy use, direct uses		7%	13%	24%	
	RE share in Transport fuels		0%	0%	3%	
Share of modern RE in TFEC <sup>3</sup>			4%	12%	25%	
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	2	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	3	8	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	4.0	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	1.9	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	2.7	
	CO <sub>2</sub> emissions from energy [Mt/yr]		159	240	187	

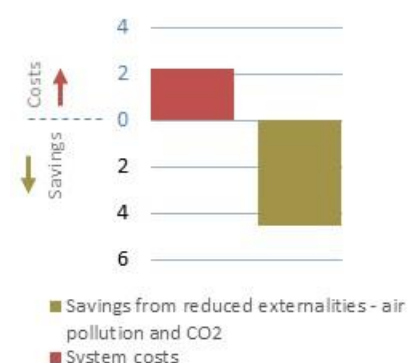
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



Final RE use by sector (%) and total (PJ/yr)



Costs and savings (USD bln in 2030)



**References for further consultation:**

- Lahmeyer International; Fraunhofer ISI; Fraunhofer ISE (2013). Sub-task Reports 5.1, 5.6, 5.7, 6.1.
- L'Observatoire Méditerranéen de L'Énergie (2011). 'Mediterranean Energy Perspectives'. OME, Nanterre.



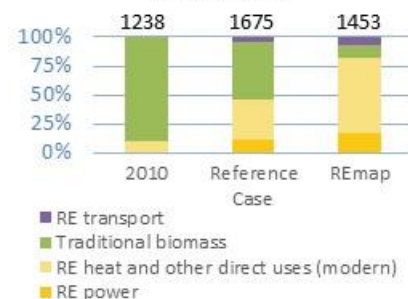
# REmap Country Results – Ethiopia

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	2	31	33
		Renewable capacity	GW	2	28	30
		Hydropower (excl. pumped hydro)	GW	2	17	17
		Wind	GW	0	1	1
		Biofuels (solid, liquid, gaseous)	GW	0	0	2
		Solar PV	GW	0	9	9
		CSP	GW	0	0	0
		Geothermal	GW	0	1	1
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	0	4	3
	<b>Total electricity generation</b>	TWh	5	105	117	
	Renewable generation	TWh	5	95	108	
	Hydropower	TWh	5	73	73	
	Wind	TWh	0	4	4	
	Biofuels (solid, liquid, gaseous)	TWh	0	0	12	
	Solar PV	TWh	0	12	12	
	CSP	TWh	0	0	0	
	Geothermal	TWh	0	6	6	
	Marine, other	TWh	0	0	0	
Non-renewable generation	TWh	0	10	9		
DH	<b>Total district heat generation</b>	PJ	0	0	0	
	Biofuels (solid, liquid, gaseous)	PJ	0	0	0	
	Other renewables	PJ	0	0	0	
	Non-renewable DH	PJ	0	0	0	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	1 253	1 724	1 344
		Direct uses of renewable energy	PJ	1 224	1 430	1 102
		Solar thermal - Buildings	PJ	0	0	0
		Solar thermal - Industry	PJ	0	0	0
		Geothermal	PJ	0	0	0
		Bioenergy (traditional) - Buildings	PJ	1 116	833	155
		Bioenergy (modern) - Buildings	PJ	108	597	890
		Bioenergy - Industry	PJ	0	0	57
		Non-renewable - Buildings	PJ	12	17	17
		Non-renewable - Industry	PJ	17	277	224
	Non-renewable - BF/CO	PJ	0	0	0	
	Transport	<b>Total fuel consumption</b>	PJ	37	458	246
		Liquid biofuels	PJ	0	60	97
		Conventional biogasoline	PJ	0	60	64
		Advanced biogasoline	PJ	0	0	3
Biodiesel (conventional and advanced)		PJ	0	0	31	
Biomethane	PJ	0	0	0		
Non-renewable fuels	PJ	37	398	148		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		<b>PJ</b>	<b>1 304</b>	<b>2 386</b>	<b>1 864</b>	
RE shares	RE share in electricity generation		99%	91%	93%	
	RE share in district heat generation		0%	0%	0%	
	RE share in Buildings - final energy use, direct uses (modern)		9%	41%	84%	
	RE share in Industry - final energy use, direct uses		0%	0%	20%	
	RE share in Transport fuels		0%	13%	40%	
Share of modern RE in TFEC <sup>3</sup>		9%	35%	70%		
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	1	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	4	5	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	3.3	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	3.5	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	1.2	
	CO <sub>2</sub> emissions from energy [Mt/yr]		5	65	41	

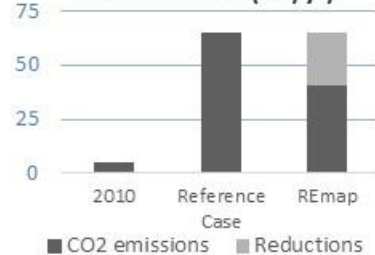
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



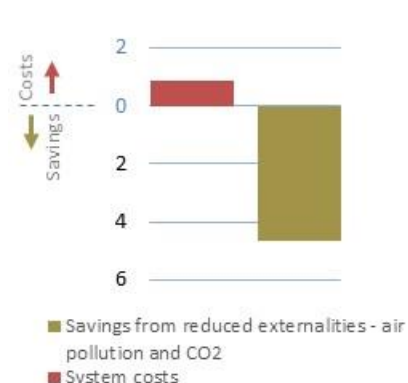
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



**References for further consultation:**

- Ethiopian Climate Resilient Green Economy Strategy (CRGE), Ministry of Environment and Forest (MEF), 2015.

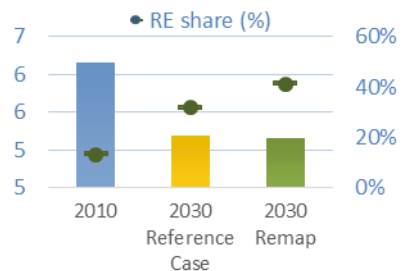




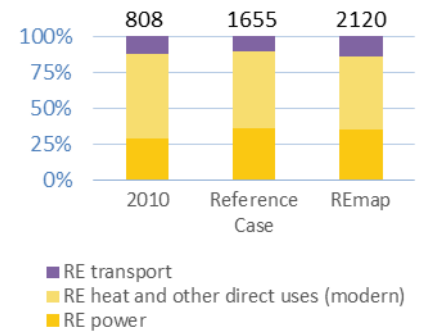
# REmap Country Results – France

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	<b>119</b>	<b>147</b>	<b>167</b>
		Renewable capacity	GW	33	94	121
		Hydropower (excl. pumped hydro)	GW	25	25	26
		Wind	GW	6	35	46
		Biofuels (solid, liquid, gaseous)	GW	1	3	5
		Solar PV	GW	1	32	44
		CSP	GW	0	0	0
		Geothermal	GW	0	0	0
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	86	53	46
	<b>Total electricity generation</b>	TWh	<b>569</b>	<b>529</b>	<b>532</b>	
	Renewable generation	TWh	85	224	284	
	Hydropower	TWh	69	72	74	
	Wind	TWh	10	91	121	
	Biofuels (solid, liquid, gaseous)	TWh	5	20	30	
	Solar PV	TWh	1	41	57	
	CSP	TWh	0	0	0	
	Geothermal	TWh	0	1	0	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	484	305	249	
DH	<b>Total district heat generation</b>	PJ	<b>153</b>	<b>248</b>	<b>293</b>	
	Biofuels (solid, liquid, gaseous)	PJ	23	49	94	
	Other renewables	PJ	0	6	6	
	Non-renewable DH	PJ	131	193	193	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	<b>2 631</b>	<b>1 668</b>	<b>1 569</b>
		Direct uses of renewable energy	PJ	451	749	823
		Solar thermal - Buildings	PJ	2	39	69
		Solar thermal - Industry	PJ	0	0	14
		Geothermal	PJ	4	21	21
		Bioenergy (traditional) - Buildings	PJ	0	0	0
		Bioenergy (modern) - Buildings	PJ	363	309	339
		Bioenergy - Industry	PJ	82	380	380
		Non-renewable - Buildings	PJ	1 347	284	127
		Non-renewable - Industry	PJ	723	523	508
	Non-renewable - BF/CO	PJ	111	111	111	
	Transport	<b>Total fuel consumption</b>	PJ	<b>1 808</b>	<b>1 444</b>	<b>1 445</b>
		Liquid biofuels	PJ	101	165	300
		Conventional biogasoline	PJ	17	25	44
		Advanced biogasoline	PJ	0	15	45
Biodiesel (conventional and advanced)		PJ	85	125	211	
Biomethane	PJ	0	0	0		
Non-renewable fuels	PJ	1 707	1 279	1 145		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		<b>PJ</b>	<b>6 164</b>	<b>5 188</b>	<b>5 150</b>	
RE shares	RE share in electricity generation		15%	42%	53%	
	RE share in district heat generation		15%	22%	34%	
	RE share in Buildings - final energy use, direct uses (modern)		22%	57%	77%	
	RE share in Industry - final energy use, direct uses		10%	42%	44%	
	RE share in Transport fuels		6%	11%	21%	
	Share of modern RE in TFEC <sup>3</sup>		13%	32%	41%	
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	2	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	11	14	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	1.4	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	2.4	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	1.4	
	CO <sub>2</sub> emissions from energy [Mt/yr]		316	191	162	

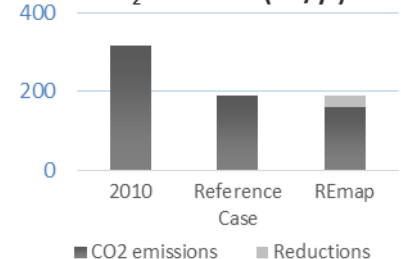
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



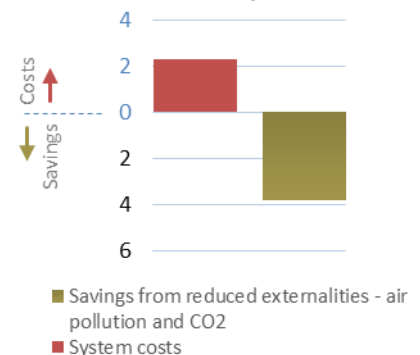
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln/yr in 2030)



**References for further consultation:**

- France Energy Transition Law, 2015.
- Vers un mix électrique 100% renouvelable en 2050, ADEME (2015).
- Roadmap for smart grid and electricity systems integrating renewable energy sources, ADEME (2013).





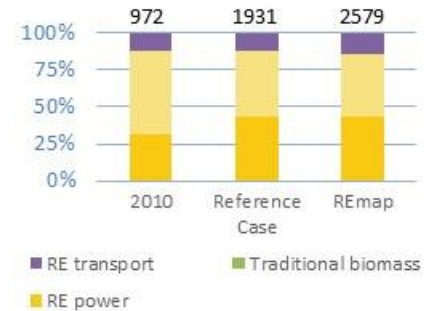
# REmap Country Results – Germany

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	161	222	256
		Renewable capacity	GW	63	146	189
		Hydropower (excl. pumped hydro)	GW	5	5	5
		Wind	GW	27	59	88
		Biofuels (solid, liquid, gaseous)	GW	11	20	20
		Solar PV	GW	20	62	75
		CSP	GW	0	0	0
		Geothermal	GW	0	0	1
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	98	76	66
	<b>Total electricity generation</b>	TWh	629	599	620	
	Renewable generation	TWh	103	286	378	
	Hydropower	TWh	21	19	23	
	Wind	TWh	38	143	214	
	Biofuels (solid, liquid, gaseous)	TWh	33	67	67	
	Solar PV	TWh	12	56	70	
	CSP	TWh	0	0	0	
	Geothermal	TWh	0	1	4	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	525	313	242	
DH	<b>Total district heat generation</b>	PJ	555	578	620	
	Biofuels (solid, liquid, gaseous)	PJ	52	191	216	
	Other renewables	PJ	0	0	84	
	Non-renewable DH	PJ	504	387	320	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	4 694	3 275	3 131
		Direct uses of renewable energy	PJ	495	741	878
		Solar thermal - Buildings	PJ	18	106	162
		Solar thermal - Industry	PJ	0	0	25
		Geothermal	PJ	19	86	86
		Bioenergy (traditional) - Buildings	PJ	0	0	0
		Bioenergy (modern) - Buildings	PJ	318	375	431
		Bioenergy - Industry	PJ	140	174	174
		Non-renewable - Buildings	PJ	2 435	1 207	976
		Non-renewable - Industry	PJ	1 510	1 242	1 193
	Non-renewable - BF/CO	PJ	254	85	85	
	Transport	<b>Total fuel consumption</b>	PJ	2 500	2 137	2 073
		Liquid biofuels	PJ	121	228	368
		Conventional biogasoline	PJ	33	49	49
		Advanced biogasoline	PJ	0	46	50
		Biodiesel (conventional and advanced)	PJ	88	133	269
Biomethane		PJ	0	0	5	
Non-renewable fuels	PJ	2 379	1 909	1 700		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		PJ	9 565	7 539	7 459	
RE shares	RE share in electricity generation		16%	48%	61%	
	RE share in district heat generation		9%	33%	48%	
	RE share in Buildings - final energy use, direct uses (modern)		13%	32%	41%	
	RE share in Industry - final energy use, direct uses		8%	12%	14%	
	RE share in Transport fuels		5%	11%	18%	
	Share of modern RE in TFEC <sup>3</sup>		10%	26%	35%	
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	3	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	15	23	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	2.9	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	6.0	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	4.8	
	CO <sub>2</sub> emissions from energy [Mt/yr]		746	518	421	

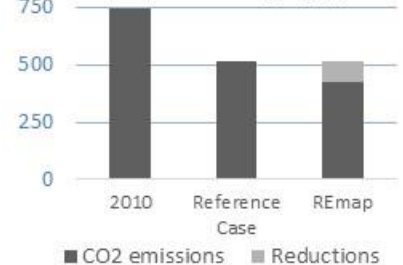
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



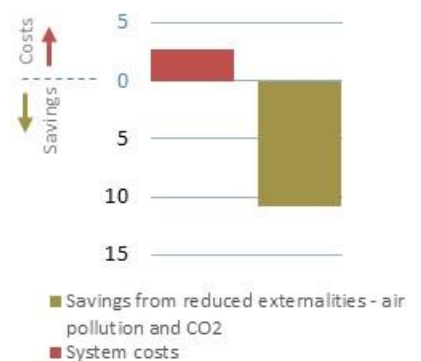
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



**References for further consultation:**

- REmap: Renewable Energy Prospects, Germany, IRENA (2015).
- Projektionsbericht 2015, BMU (2015).
- Entwicklung der Energiemaerkte – Energiereferenzprognose, BMWi (2014).



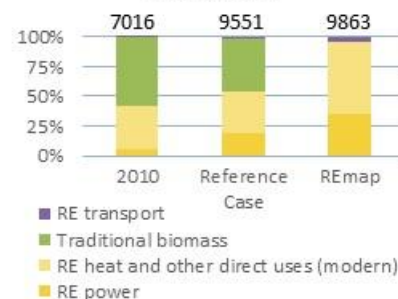
## REmap Country Results – India

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	<b>174</b>	<b>663</b>	<b>854</b>
		Renewable capacity	GW	56	252	521
		Hydropower (excl. pumped hydro)	GW	37	48	77
		Wind	GW	14	146	194
		Biofuels (solid, liquid, gaseous)	GW	3	11	28
		Solar PV	GW	1	48	209
		CSP	GW	0	0	11
		Geothermal	GW	0	0	2
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	118	411	333
	<b>Total electricity generation</b>	TWh	<b>946</b>	<b>3 428</b>	<b>3 490</b>	
	Renewable generation	TWh	136	592	1 186	
	Hydropower	TWh	104	131	230	
	Wind	TWh	21	345	458	
	Biofuels (solid, liquid, gaseous)	TWh	10	35	108	
	Solar PV	TWh	1	82	346	
	CSP	TWh	0	0	28	
	Geothermal	TWh	0	0	16	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	810	2 835	2 304	
DH	<b>Total district heat generation</b>	PJ	<b>0</b>	<b>0</b>	<b>0</b>	
	Biofuels (solid, liquid, gaseous)	PJ	0	0	0	
	Other renewables	PJ	0	0	0	
	Non-renewable DH	PJ	0	0	0	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	<b>13 055</b>	<b>27 567</b>	<b>25 256</b>
		Direct uses of renewable energy	PJ	6 639	7 638	5 966
		Solar thermal - Buildings	PJ	6	71	510
		Solar thermal - Industry	PJ	0	1	151
		Geothermal	PJ	9	9	19
		Bioenergy (traditional) - Buildings	PJ	4 063	4 259	0
		Bioenergy (modern) - Buildings	PJ	1 364	1 485	2 967
		Bioenergy - Industry	PJ	1 196	1 813	2 319
		Non-renewable - Buildings	PJ	1 023	4 740	4 740
		Non-renewable - Industry	PJ	5 116	14 553	13 914
	Non-renewable - BF/CO	PJ	278	636	636	
	Transport	<b>Total fuel consumption</b>	PJ	<b>2 214</b>	<b>5 718</b>	<b>3 351</b>
		Liquid biofuels	PJ	8	109	468
		Conventional biogasoline	PJ	7	42	108
		Advanced biogasoline	PJ	0	1	37
		Biodiesel (conventional and advanced)	PJ	2	66	323
		Biomethane	PJ	0	0	0
Non-renewable fuels		PJ	2 205	5 609	2 883	
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		<b>PJ</b>	<b>18 222</b>	<b>44 055</b>	<b>38 695</b>	
RE shares	RE share in electricity generation		14%	17%	34%	
	RE share in district heat generation		0%	0%	0%	
	RE share in Buildings - final energy use, direct uses (modern)		21%	15%	42%	
	RE share in Industry - final energy use, direct uses		19%	11%	15%	
	RE share in Transport fuels		0%	2%	14%	
Financial indicators	Share of modern RE in TFEC <sup>3</sup>		16%	12%	25%	
	System costs [USD bln/yr in 2030]		N/A	N/A	17	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	25	51	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	22.2	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	103.2	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	39.3	
CO <sub>2</sub> emissions from energy [Mt/yr]		1 560	4 570	3 783		

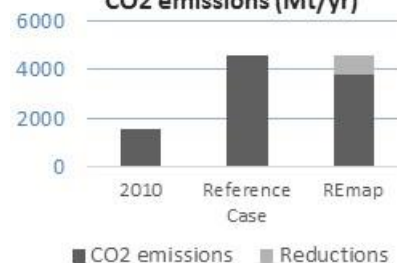
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



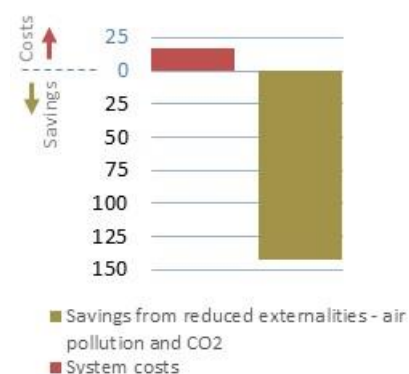
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



**References for further consultation:**

- Low Carbon Strategies for Inclusive Growth, Planning Commission of Government of India (2014).
- Report on India's Renewable Electricity Roadmap to 2030, NITI Aayog, Government of India (2015).
- Twelfth Five Year Plan (2012-2017), Planning Commission of Government of India (2013).



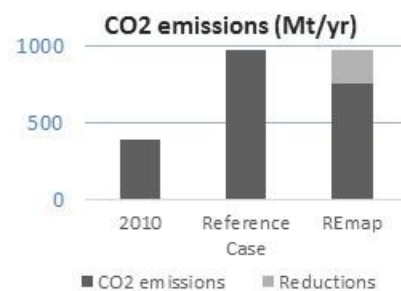
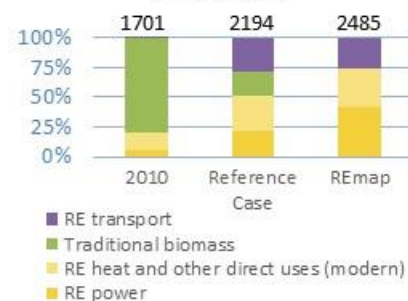
# REmap Country Results – Indonesia

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	<b>GW</b>	<b>36</b>	<b>196</b>	<b>239</b>
		Renewable capacity	GW	7	60	129
		Hydropower (excl. pumped hydro)	GW	4	16	25
		Wind	GW	0	2	11
		Biofuels (solid, liquid, gaseous)	GW	2	29	29
		Solar PV	GW	0	4	47
		CSP	GW	0	0	0
		Geothermal	GW	1	9	14
		Marine, other	GW	0	0	3
		Non-renewable capacity	GW	29	136	110
	<b>Total electricity generation</b>	<b>TWh</b>	<b>170</b>	<b>590</b>	<b>593</b>	
	Renewable generation	TWh	27	147	328	
	Hydropower	TWh	18	37	76	
	Wind	TWh	0	2	31	
	Biofuels (solid, liquid, gaseous)	TWh	0	61	61	
	Solar PV	TWh	0	2	62	
	CSP	TWh	0	0	0	
	Geothermal	TWh	9	45	84	
	Marine, other	TWh	0	0	13	
	Non-renewable generation	TWh	143	443	266	
DH	<b>Total district heat generation</b>	<b>PJ</b>	<b>0</b>	<b>0</b>	<b>0</b>	
	Biofuels (solid, liquid, gaseous)	PJ	0	0	0	
	Other renewables	PJ	0	0	0	
	Non-renewable DH	PJ	0	0	0	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	<b>PJ</b>	<b>3 568</b>	<b>5 524</b>	<b>5 173</b>
		Direct uses of renewable energy	PJ	1 608	1 110	791
		Solar thermal - Buildings	PJ	0	0	0
		Solar thermal - Industry	PJ	0	0	20
		Geothermal	PJ	0	0	10
		Bioenergy (traditional) - Buildings	PJ	1 352	461	0
		Bioenergy (modern) - Buildings	PJ	0	70	182
		Bioenergy - Industry	PJ	255	579	579
		Non-renewable - Buildings	PJ	317	654	654
		Non-renewable - Industry	PJ	1 644	3 760	3 727
	Non-renewable - BF/CO	PJ	0	0	0	
	Transport	<b>Total fuel consumption</b>	<b>PJ</b>	<b>1 492</b>	<b>3 601</b>	<b>3 577</b>
		Liquid biofuels	PJ	8	617	651
		Conventional biogasoline	PJ	1	417	433
Advanced biogasoline		PJ	0	0	0	
Biodiesel (conventional and advanced)		PJ	7	200	218	
Biomethane		PJ	0	0	0	
Non-renewable fuels	PJ	1 483	2 985	2 925		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		<b>PJ</b>	<b>5 590</b>	<b>11 289</b>	<b>10 923</b>	
RE shares	RE share in electricity generation		16%	25%	55%	
	RE share in district heat generation		0%	0%	0%	
	RE share in Buildings - final energy use, direct uses (modern)		0%	6%	22%	
	RE share in Industry - final energy use, direct uses		13%	13%	14%	
	RE share in Transport fuels		1%	17%	18%	
Financial indicators	Share of modern RE in TFEC <sup>3</sup>		6%	16%	23%	
	System costs [USD bln/yr in 2030]		N/A	N/A	4	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	5	13	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	4.2	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	6.9	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	10.5	
	CO <sub>2</sub> emissions from energy [Mt/yr]		391	971	761	

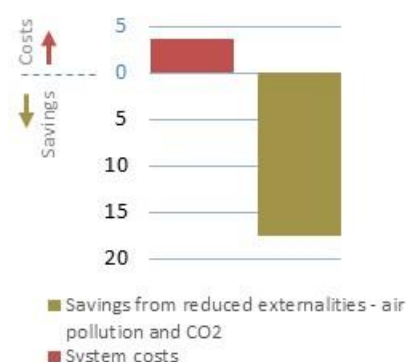
**TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)**



**Final RE use by sector (%) and total (PJ/yr)**



**Costs and savings (USD bln in 2030)**



**References for further consultation:**

- Outlook Energi Indonesia, MEMR (2014).
- Outlook Energi Indonesia, BPPT (2015).
- Peer Review on Low Carbon Energy Policies in Indonesia (2013).



## REmap Country Results – Iran (power sector)

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	<i>GW</i>	<b>67</b>	<b>98</b>	<b>108</b>
		Renewable capacity	<i>GW</i>	10	29	42
		Hydropower (excl. pumped hydro)	<i>GW</i>	10	21	21
		Wind	<i>GW</i>	0	6	12
		Biofuels (solid, liquid, gaseous)	<i>GW</i>	0	1	2
		Solar PV	<i>GW</i>	0	1	8
		CSP	<i>GW</i>	0	0	0
		Geothermal	<i>GW</i>	0	0	0
		Marine, other	<i>GW</i>	0	0	0
		Non-renewable capacity	<i>GW</i>	57	69	66
		<b>Total electricity generation</b>	<i>TWh</i>	<b>245</b>	<b>425</b>	<b>425</b>
		Renewable generation	<i>TWh</i>	13	63	93
		Hydropower	<i>TWh</i>	12	37	37
		Wind	<i>TWh</i>	0	16	30
		Biofuels (solid, liquid, gaseous)	<i>TWh</i>	0	7	12
		Solar PV	<i>TWh</i>	0	2	14
		CSP	<i>TWh</i>	0	0	0
		Geothermal	<i>TWh</i>	0	0	0
		Marine, other	<i>TWh</i>	0	0	0
		Non-renewable generation	<i>TWh</i>	233	362	331
<b>RE share in electricity generation</b>			5%	15%	22%	

### References for further consultation:

- Data provided by Iran Renewable Energy Organisation, based on output of the “MAED” and “MESSAGE” models.





## REmap Country Results – Italy

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	110	123	142
		Renewable capacity	GW	26	64	90
		Hydropower (excl. pumped hydro)	GW	14	14	17
		Wind	GW	6	19	20
		Biofuels (solid, liquid, gaseous)	GW	2	5	7
		Solar PV	GW	3	25	43
		CSP	GW	0	1	1
		Geothermal	GW	1	1	2
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	84	59	52
	<b>Total electricity generation</b>	TWh	302	352	364	
	Renewable generation	TWh	67	135	196	
	Hydropower	TWh	41	39	49	
	Wind	TWh	9	29	31	
	Biofuels (solid, liquid, gaseous)	TWh	9	22	40	
	Solar PV	TWh	2	37	63	
	CSP	TWh	0	2	0	
	Geothermal	TWh	5	7	13	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	235	217	168	
DH	<b>Total district heat generation</b>	PJ	205	126	126	
	Biofuels (solid, liquid, gaseous)	PJ	15	24	24	
	Other renewables	PJ	1	1	1	
	Non-renewable DH	PJ	189	101	101	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	2 166	2 142	2 116
		Direct uses of renewable energy	PJ	149	405	478
		Solar thermal - Buildings	PJ	5	44	90
		Solar thermal - Industry	PJ	0	0	20
		Geothermal	PJ	3	18	18
		Bioenergy (traditional) - Buildings	PJ	0	0	0
		Bioenergy (modern) - Buildings	PJ	131	304	304
		Bioenergy - Industry	PJ	9	39	45
		Non-renewable - Buildings	PJ	1 317	1 000	949
		Non-renewable - Industry	PJ	700	736	690
	Non-renewable - BF/CO	PJ	0	0	0	
	Transport	<b>Total fuel consumption</b>	PJ	1 703	1 677	1 590
		Liquid biofuels	PJ	55	105	255
		Conventional biogasoline	PJ	0	14	54
		Advanced biogasoline	PJ	0	25	64
Biodiesel (conventional and advanced)		PJ	54	65	136	
Biomethane		PJ	0	0	8	
Non-renewable fuels	PJ	1 648	1 572	1 327		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		PJ	5 200	5 317	5 246	
RE shares	RE share in electricity generation		22%	38%	54%	
	RE share in district heat generation		8%	19%	19%	
	RE share in Buildings - final energy use, direct uses (modern)		10%	27%	30%	
	RE share in Industry - final energy use, direct uses		1%	5%	9%	
	RE share in Transport fuels		3%	6%	17%	
Financial indicators	Share of modern RE in TFEC <sup>3</sup>		9%	20%	29%	
	System costs [USD bln/yr in 2030]		N/A	N/A	- 2	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	5	9	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	1.8	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	10.0	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	2.9	
	CO <sub>2</sub> emissions from energy [Mt/yr]		383	335	277	

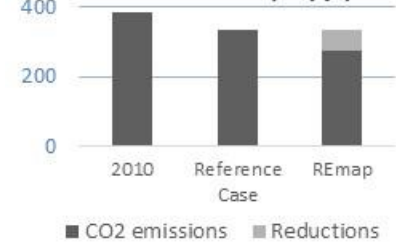
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



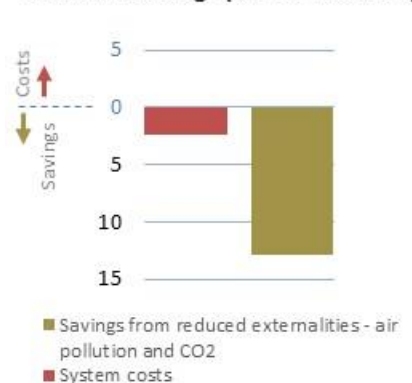
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



### References for further consultation:

- Italy's National Energy Strategy, Italian Ministry for Economic Development (2010).
- Rapporto Energia E Ambiente, Scenari E Strategie, ENEA (2013).
- Italian National Renewable Energy Action Plan, Italian Ministry for Economic Development (2010).

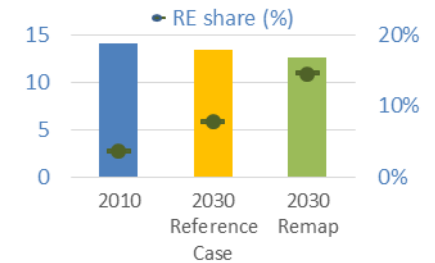




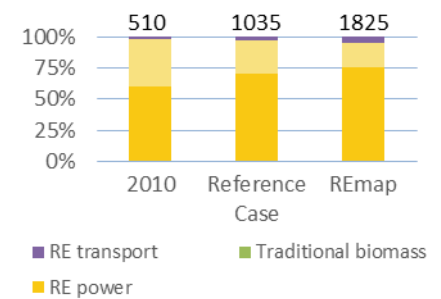
## REmap Country Results – Japan

		Unit	2010	Reference Case 2030	REmap 2030			
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	<b>262</b>	<b>266</b>	<b>388</b>		
		Renewable capacity	GW	31	105	250		
		Hydropower (excl. pumped hydro)	GW	21	23	23		
		Wind	GW	2	10	37		
		Biofuels (solid, liquid, gaseous)	GW	3	7	7		
		Solar PV	GW	4	64	179		
		CSP	GW	0	0	0		
		Geothermal	GW	1	2	2		
		Marine, other	GW	0	0	2		
		Non-renewable capacity	GW	231	161	139		
		<b>Total electricity generation</b>	TWh	<b>1 159</b>	<b>1 057</b>	<b>1 158</b>		
		Renewable generation	TWh	99	236	439		
		Hydropower	TWh	76	88	90		
		Wind	TWh	4	18	74		
		Biofuels (solid, liquid, gaseous)	TWh	12	44	49		
		Solar PV	TWh	4	75	212		
		CSP	TWh	0	0	0		
		Geothermal	TWh	3	11	11		
		Marine, other	TWh	0	0	4		
Non-renewable generation	TWh	1 060	821	719				
DH	DH	<b>Total district heat generation</b>	PJ	<b>21</b>	<b>20</b>	<b>20</b>		
		Biofuels (solid, liquid, gaseous)	PJ	4	4	4		
		Other renewables	PJ	0	0	0		
		Non-renewable DH	PJ	17	16	16		
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	<b>7 153</b>	<b>7 162</b>	<b>6 072</b>		
		Direct uses of renewable energy	PJ	190	275	364		
		Solar thermal - Buildings	PJ	18	21	52		
		Solar thermal - Industry	PJ	0	0	50		
		Geothermal	PJ	0	0	0		
		Bioenergy (traditional) - Buildings	PJ	0	0	0		
		Bioenergy (modern) - Buildings	PJ	0	0	0		
		Bioenergy - Industry	PJ	172	254	261		
		Non-renewable - Buildings	PJ	2 596	2 475	1 384		
		Non-renewable - Industry	PJ	3 566	3 611	3 523		
		Non-renewable - BF/CO	PJ	801	801	801		
		Transport	Transport	<b>Total fuel consumption</b>	PJ	<b>3 363</b>	<b>2 927</b>	<b>2 818</b>
				Liquid biofuels	PJ	8	27	76
				Conventional biogasoline	PJ	8	27	76
				Advanced biogasoline	PJ	0	0	0
				Biodiesel (conventional and advanced)	PJ	0	0	0
				Biomethane	PJ	0	0	1
Non-renewable fuels	PJ			3 355	2 900	2 741		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>	PJ			<b>14 132</b>	<b>13 381</b>	<b>12 549</b>		
RE shares	RE shares			RE share in electricity generation		9%	22%	38%
				RE share in district heat generation		20%	21%	21%
		RE share in Buildings - final energy use, direct uses (modern)		1%	1%	4%		
		RE share in Industry - final energy use, direct uses		5%	7%	8%		
		RE share in Transport fuels		0%	1%	3%		
Financial indicators	Financial indicators	Share of modern RE in TFEC <sup>3</sup>		4%	8%	15%		
		System costs [USD bln/yr in 2030]		N/A	N/A	1		
		RE investment needs [USD bln/yr (2010-2030)]		N/A	21	36		
		Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	8.6		
		Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	6.9		
		Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	6.5		
		CO <sub>2</sub> emissions from energy [Mt/yr]		1 192	1 053	923		

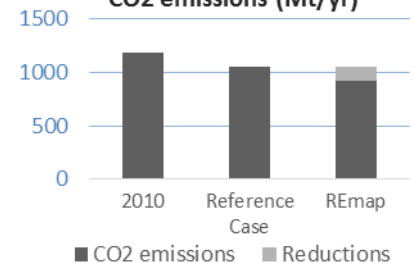
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



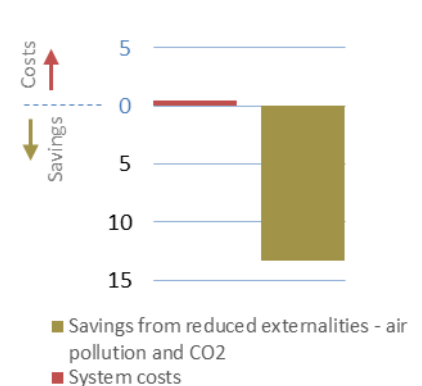
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



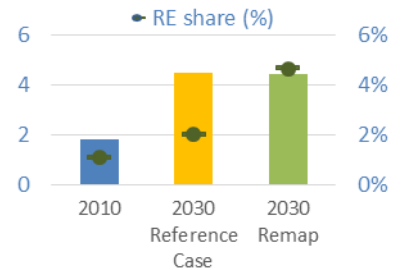
### References for further consultation:

- Long-term energy supply and demand outlook, METI (2015).
- Data Book on heat Pump & Thermal Storage System 2013, Heat Pump & Thermal Storage Technology Center of Japan (2013).
- FY 2013 Energy Supply and Demand Report, METI (2015).

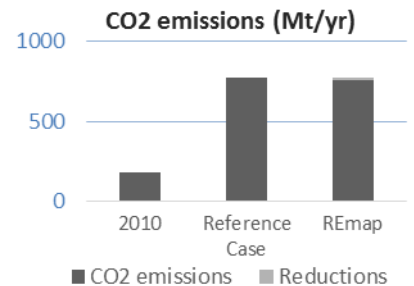
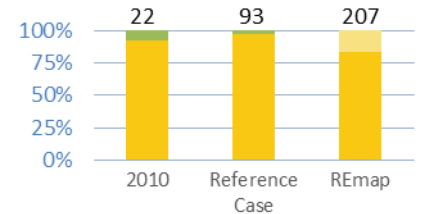
# REmap Country Results – Kazakhstan

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	<b>GW</b>	<b>20</b>	<b>34</b>	<b>41</b>
		Renewable capacity	GW	2	9	19
		Hydropower (excl. pumped hydro)	GW	2	4	4
		Wind	GW	0	5	11
		Biofuels (solid, liquid, gaseous)	GW	0	0	1
		Solar PV	GW	0	1	4
		CSP	GW	0	0	0
		Geothermal	GW	0	0	0
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	17	25	22
	<b>Total electricity generation</b>	<b>TWh</b>	<b>83</b>	<b>145</b>	<b>145</b>	
	Renewable generation	TWh	8	29	56	
	Hydropower	TWh	8	15	15	
	Wind	TWh	0	14	32	
	Biofuels (solid, liquid, gaseous)	TWh	0	0	3	
	Solar PV	TWh	0	1	7	
	CSP	TWh	0	0	0	
	Geothermal	TWh	0	0	0	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	75	116	90	
DH	<b>Total district heat generation</b>	<b>PJ</b>	<b>402</b>	<b>1 120</b>	<b>1 127</b>	
	Biofuels (solid, liquid, gaseous)	PJ	0	0	39	
	Other renewables	PJ	0	0	7	
	Non-renewable DH	PJ	402	1 120	1 081	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	<b>PJ</b>	<b>1 145</b>	<b>3 082</b>	<b>3 072</b>
		Direct uses of renewable energy	PJ	2	3	5
		Solar thermal - Buildings	PJ	0	0	0
		Solar thermal - Industry	PJ	0	0	0
		Geothermal	PJ	0	0	4
		Bioenergy (traditional) - Buildings	PJ	2	3	0
		Bioenergy (modern) - Buildings	PJ	0	0	1
		Bioenergy - Industry	PJ	0	0	0
		Non-renewable - Buildings	PJ	220	958	951
		Non-renewable - Industry	PJ	833	1 919	1 915
	Non-renewable - BF/CO	PJ	91	202	202	
	Transport	<b>Total fuel consumption</b>	<b>PJ</b>	<b>184</b>	<b>173</b>	<b>168</b>
		Liquid biofuels	PJ	0	0	0
		Conventional biogasoline	PJ	0	0	0
		Advanced biogasoline	PJ	0	0	0
Biodiesel (conventional and advanced)		PJ	0	0	0	
Biomethane	PJ	0	0	0		
Non-renewable fuels	PJ	184	173	168		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		<b>PJ</b>	<b>1 829</b>	<b>4 456</b>	<b>4 448</b>	
RE shares	RE share in electricity generation		10%	20%	38%	
	RE share in district heat generation		0%	0%	4%	
	RE share in Buildings - final energy use, direct uses (modern)		0%	0%	0%	
	RE share in Industry - final energy use, direct uses		0%	0%	0%	
	RE share in Transport fuels		0%	0%	0%	
Share of modern RE in TFEC <sup>3</sup>		1%	2%	5%		
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	1	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	1	2	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	1.0	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	8.4	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	0.9	
CO <sub>2</sub> emissions from energy [Mt/yr]		179	777	759		

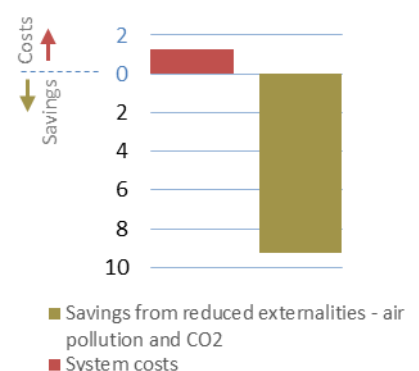
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



Final RE use by sector (%) and total (PJ/yr)



Costs and savings (USD bln in 2030)



**References for further consultation:**

- Concept for transition of the Republic of Kazakhstan to Green Economy, Republic of Kazakhstan (2013).
- Kerimray, A. et al. (2015), "TIMES Kazakhstan: from a national to a regional analysis and modelling", 1 June 2015, ETSAP Workshop. Abu Dhabi.

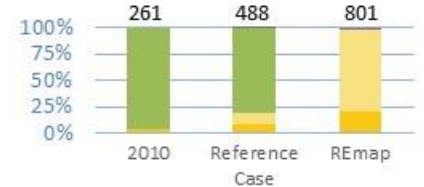
# REmap Country Results – Kenya

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	2	3	4
		Renewable capacity	GW	1	2	3
		Hydropower (excl. pumped hydro)	GW	1	1	1
		Wind	GW	0	0	1
		Biofuels (solid, liquid, gaseous)	GW	0	0	0
		Solar PV	GW	0	0	0
		CSP	GW	0	0	0
		Geothermal	GW	0	1	1
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	1	1	1
	<b>Total electricity generation</b>	TWh	8	20	20	
	Renewable generation	TWh	5	11	15	
	Hydropower	TWh	3	3	3	
	Wind	TWh	0	2	2	
	Biofuels (solid, liquid, gaseous)	TWh	0	0	0	
	Solar PV	TWh	0	0	1	
	CSP	TWh	0	0	0	
	Geothermal	TWh	1	7	9	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	2	8	5	
DH	<b>Total district heat generation</b>	PJ	0	0	0	
	Biofuels (solid, liquid, gaseous)	PJ	0	0	0	
	Other renewables	PJ	0	0	0	
	Non-renewable DH	PJ	0	0	0	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	441	548	279
		Direct uses of renewable energy	PJ	393	445	186
		Solar thermal - Buildings	PJ	0	2	3
		Solar thermal - Industry	PJ	0	0	1
		Geothermal	PJ	0	0	0
		Bioenergy (traditional) - Buildings	PJ	393	391	0
		Bioenergy (modern) - Buildings	PJ	0	51	171
		Bioenergy - Industry	PJ	0	0	12
		Non-renewable - Buildings	PJ	14	44	44
		Non-renewable - Industry	PJ	35	60	49
	Non-renewable - BF/CO	PJ	0	0	0	
	Transport	<b>Total fuel consumption</b>	PJ	71	136	136
		Liquid biofuels	PJ	0	1	3
		Conventional biogasoline	PJ	0	1	1
		Advanced biogasoline	PJ	0	0	3
Biodiesel (conventional and advanced)		PJ	0	0	0	
Biomethane	PJ	0	0	0		
Non-renewable fuels	PJ	71	135	133		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		<b>PJ</b>	<b>535</b>	<b>755</b>	<b>485</b>	
RE shares	RE share in electricity generation		70%	57%	74%	
	RE share in district heat generation		0%	0%	0%	
	RE share in Buildings - final energy use, direct uses (modern)		0%	11%	80%	
	RE share in Industry - final energy use, direct uses		0%	0%	21%	
	RE share in Transport fuels		0%	0%	2%	
Share of modern RE in TFEC <sup>3</sup>		3%	12%	50%		
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	0	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	1	1	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	0.4	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	1.3	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	0.1	
	CO <sub>2</sub> emissions from energy [Mt/yr]		11	21	19	

**TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)**

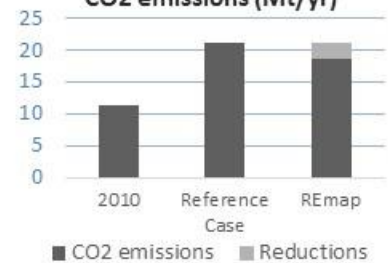


**Final RE use by sector (%) and total (PJ/yr)**

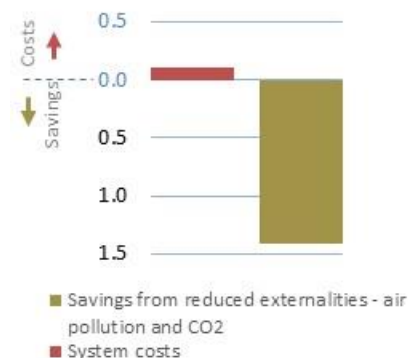


■ RE transport  
 ■ Traditional biomass  
 ■ RE heat and other direct uses (modern)  
 ■ RE power

**CO<sub>2</sub> emissions (Mt/yr)**



**Costs and savings (USD bln in 2030)**



**References for further consultation:**

- Kenya Vision 2030, Government of Kenya, (2007).
- Updated Least Cost Power Development Plan – Study Period: 2011-2031, Energy Regulatory Commission (2011).
- National Energy Policy (Draft), Ministry of Energy and Petroleum (2011).



## REmap Country Results – Kuwait (power sector)

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	<i>GW</i>	<b>14.7</b>	<b>43.6</b>	<b>45.5</b>
		Renewable capacity	<i>GW</i>	0.0	8.1	14.3
		Hydropower (excl. pumped hydro)	<i>GW</i>	0.0	0.0	0.0
		Wind	<i>GW</i>	0.0	3.7	3.8
		Biofuels (solid, liquid, gaseous)	<i>GW</i>	0.0	0.0	0.0
		Solar PV	<i>GW</i>	0.0	3.3	4.1
		CSP	<i>GW</i>	0.0	1.1	6.4
		Geothermal	<i>GW</i>	0.0	0.0	0.0
		Marine, other	<i>GW</i>	0.0	0.0	0.0
		Non-renewable capacity	<i>GW</i>	14.7	35.5	31.3
		<b>Total electricity generation</b>	<i>TWh</i>	<b>57.0</b>	<b>146.1</b>	<b>146.1</b>
		Renewable generation	<i>TWh</i>	0.0	15.9	29.2
		Hydropower	<i>TWh</i>	0.0	0.0	0.0
		Wind	<i>TWh</i>	0.0	7.5	7.6
		Biofuels (solid, liquid, gaseous)	<i>TWh</i>	0.0	0.0	0.0
		Solar PV	<i>TWh</i>	0.0	5.2	6.2
		CSP	<i>TWh</i>	0.0	3.2	15.4
		Geothermal	<i>TWh</i>	0.0	0.0	0.0
		Marine, other	<i>TWh</i>	0.0	0.0	0.0
		Non-renewable generation	<i>TWh</i>	57.0	130.2	116.9
<b>RE share in electricity generation</b>			0%	11%	20%	

### References for further consultation:

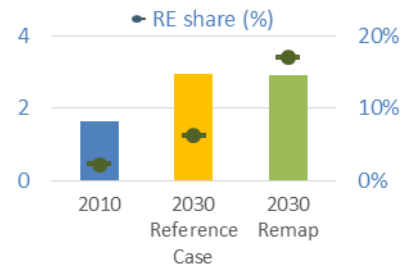
- Clean Energy Options, Modeling of Possible Deployment Scenarios, KISR (2015).



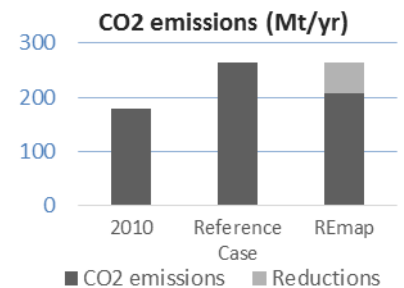
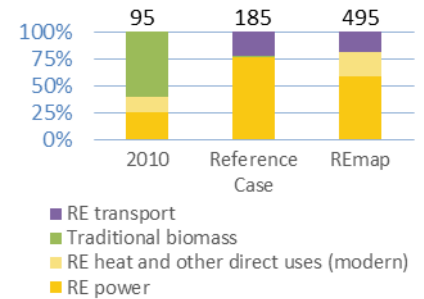
# REmap Country Results – Malaysia

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	27	60	69
		Renewable capacity	GW	3	14	29
		Hydropower (excl. pumped hydro)	GW	2	11	13
		Wind	GW	0	0	1
		Biofuels (solid, liquid, gaseous)	GW	1	2	6
		Solar PV	GW	0	0	9
		CSP	GW	0	0	0
		Geothermal	GW	0	0	0
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	24	46	40
	<b>Total electricity generation</b>	TWh	125	181	187	
	Renewable generation	TWh	8	45	93	
	Hydropower	TWh	6	34	41	
	Wind	TWh	0	0	2	
	Biofuels (solid, liquid, gaseous)	TWh	2	11	33	
	Solar PV	TWh	0	1	15	
	CSP	TWh	0	0	0	
	Geothermal	TWh	0	0	1	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	117	135	94	
DH	<b>Total district heat generation</b>	PJ	0	0	0	
	Biofuels (solid, liquid, gaseous)	PJ	0	0	0	
	Other renewables	PJ	0	0	0	
	Non-renewable DH	PJ	0	0	0	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	527	740	742
		Direct uses of renewable energy	PJ	71	2	115
		Solar thermal - Buildings	PJ	0	0	9
		Solar thermal - Industry	PJ	0	0	20
		Geothermal	PJ	0	0	0
		Bioenergy (traditional) - Buildings	PJ	57	1	0
		Bioenergy (modern) - Buildings	PJ	14	0	1
		Bioenergy - Industry	PJ	0	0	85
		Non-renewable - Buildings	PJ	83	52	43
		Non-renewable - Industry	PJ	373	686	584
	Non-renewable - BF/CO	PJ	0	0	0	
	Transport	<b>Total fuel consumption</b>	PJ	704	1 579	1 533
		Liquid biofuels	PJ	0	42	91
		Conventional biogasoline	PJ	0	30	30
		Advanced biogasoline	PJ	0	0	0
Biodiesel (conventional and advanced)		PJ	0	12	61	
Biomethane		PJ	0	0	0	
Non-renewable fuels	PJ	704	1 538	1 443		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		PJ	1 651	2 933	2 911	
RE shares	RE share in electricity generation		6%	25%	50%	
	RE share in district heat generation		0%	0%	0%	
	RE share in Buildings - final energy use, direct uses (modern)		9%	1%	18%	
	RE share in Industry - final energy use, direct uses		0%	0%	15%	
	RE share in Transport fuels		0%	3%	6%	
Share of modern RE in TFEC <sup>3</sup>		2%	6%	17%		
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	2	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	2	3	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	2.5	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	4.7	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	2.8	
	CO <sub>2</sub> emissions from energy [Mt/yr]		179	263	206	

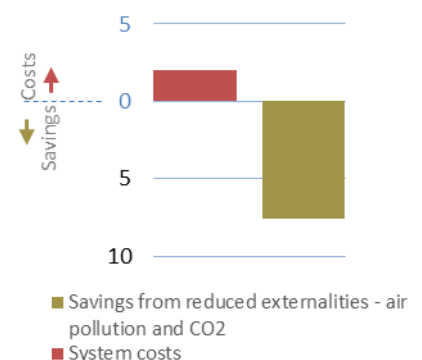
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



Final RE use by sector (%) and total (PJ/yr)



Costs and savings (USD bln in 2030)



## References for further consultation:

- 4th ASEAN Energy Outlook (AEO4), ASEAN Centre for Energy (ACE) (2016).
- MALAYSIA COUNTRY PROFILES: ENERGY DATA AND POLICY, ACE (2015).
- Study on Asia potential of biofuel market, ERIA (2013).
- Technology roadmap, Solar Heating and Cooling, IEA (2012).

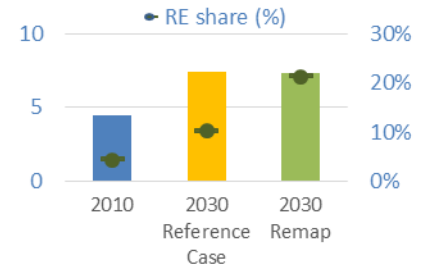




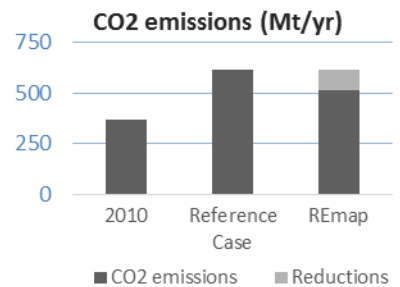
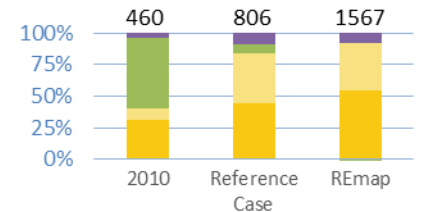
# REmap Country Results – Mexico

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	53	118	155
		Renewable capacity	GW	13	38	102
		Hydropower (excl. pumped hydro)	GW	12	19	24
		Wind	GW	0	11	29
		Biofuels (solid, liquid, gaseous)	GW	0	1	3
		Solar PV	GW	0	6	40
		CSP	GW	0	0	2
		Geothermal	GW	1	1	4
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	40	80	53
	<b>Total electricity generation</b>	TWh	259	602	603	
	Renewable generation	TWh	48	116	280	
	Hydropower	TWh	37	52	72	
	Wind	TWh	1	38	92	
	Biofuels (solid, liquid, gaseous)	TWh	3	4	15	
	Solar PV	TWh	0	13	66	
	CSP	TWh	0	0	4	
	Geothermal	TWh	7	9	32	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	211	486	324	
DH	<b>Total district heat generation</b>	PJ	0	0	0	
	Biofuels (solid, liquid, gaseous)	PJ	0	0	0	
	Other renewables	PJ	0	0	0	
	Non-renewable DH	PJ	0	0	0	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	1 491	2 133	2 109
		Direct uses of renewable energy	PJ	302	375	583
		Solar thermal - Buildings	PJ	5	70	80
		Solar thermal - Industry	PJ	0	13	59
		Geothermal	PJ	0	0	14
		Bioenergy (traditional) - Buildings	PJ	259	51	0
		Bioenergy (modern) - Buildings	PJ	0	216	230
		Bioenergy - Industry	PJ	38	25	200
		Non-renewable - Buildings	PJ	402	590	583
		Non-renewable - Industry	PJ	788	1 168	943
	Non-renewable - BF/CO	PJ	0	0	0	
	Transport	<b>Total fuel consumption</b>	PJ	2 134	3 266	3 258
		Liquid biofuels	PJ	17	75	128
		Conventional biogasoline	PJ	17	53	70
		Advanced biogasoline	PJ	0	0	17
		Biodiesel (conventional and advanced)	PJ	0	22	42
		Biomethane	PJ	0	0	0
Non-renewable fuels		PJ	2 118	3 190	3 129	
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		PJ	4 503	7 383	7 354	
RE shares	RE share in electricity generation		18%	19%	46%	
	RE share in district heat generation		0%	0%	0%	
	RE share in Buildings - final energy use, direct uses (modern)		1%	31%	35%	
	RE share in Industry - final energy use, direct uses		5%	3%	22%	
	RE share in Transport fuels		1%	2%	4%	
Share of modern RE in TFEC <sup>3</sup>			4%	10%	21%	
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	- 2	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	3	10	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	2.2	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	2.4	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	5.2	
	CO <sub>2</sub> emissions from energy [Mt/yr]		369	619	515	

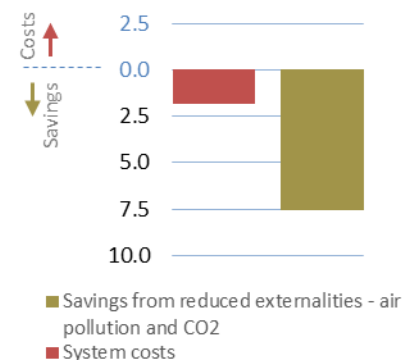
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



Final RE use by sector (%) and total (PJ/yr)



Costs and savings (USD bln in 2030)



**References for further consultation:**

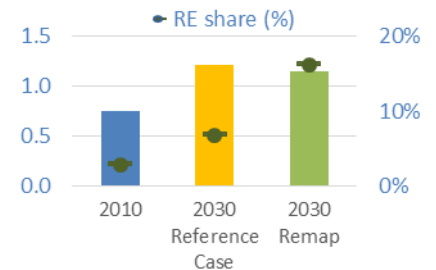
- Energy Demand and Supply Outlook 5th Edition, APEC (2014).
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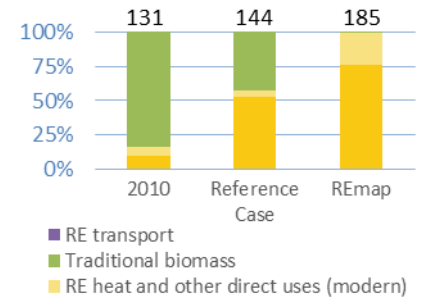
# REmap Country Results – Morocco

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	6.4	24.8	29.8
		Renewable capacity	GW	2.1	14.4	21.5
		Hydropower (excl. pumped hydro)	GW	1.8	3.3	3.4
		Wind	GW	0.3	5.2	10.1
		Biofuels (solid, liquid, gaseous)	GW	0.0	0.0	0.5
		Solar PV	GW	0.0	2.7	4.4
		CSP	GW	0.0	3.1	3.1
		Geothermal	GW	0.0	0.0	0.0
		Marine, other	GW	0.0	0.0	0.0
		Non-renewable capacity	GW	4.3	10.4	8.3
	<b>Total electricity generation</b>	TWh	25.0	78.8	87.4	
	Renewable generation	TWh	4.1	26.5	48.5	
	Hydropower	TWh	3.5	4.0	4.1	
	Wind	TWh	0.7	11.0	27.0	
	Biofuels (solid, liquid, gaseous)	TWh	0.0	0.0	2.8	
	Solar PV	TWh	0.0	4.5	7.6	
	CSP	TWh	0.0	7.0	7.0	
	Geothermal	TWh	0.0	0.0	0.0	
	Marine, other	TWh	0.0	0.0	0.0	
	Non-renewable generation	TWh	20.9	52.3	38.9	
DH	<b>Total district heat generation</b>	PJ	0.0	0.0	0.0	
	Biofuels (solid, liquid, gaseous)	PJ	0.0	0.0	0.0	
	Other renewables	PJ	0.0	0.0	0.0	
	Non-renewable DH	PJ	0.0	0.0	0.0	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	307.1	594.3	527.6
		Direct uses of renewable energy	PJ	117.5	68.0	45.0
		Solar thermal - Buildings	PJ	0.0	0.0	7.0
		Solar thermal - Industry	PJ	0.0	0.0	10.0
		Geothermal	PJ	0.0	0.0	0.0
		Bioenergy (traditional) - Buildings	PJ	108.9	60.8	0.8
		Bioenergy (modern) - Buildings	PJ	5.4	4.2	24.2
		Bioenergy - Industry	PJ	3.1	3.1	3.1
		Non-renewable - Buildings	PJ	66.5	293.3	260.8
		Non-renewable - Industry	PJ	123.1	233.0	221.9
	Non-renewable - BF/CO	PJ	0.0	0.0	0.0	
	Transport	<b>Total fuel consumption</b>	PJ	277.2	305.5	270.0
		Liquid biofuels	PJ	0.0	0.0	0.0
		Conventional biogasoline	PJ	0.0	0.0	0.0
		Advanced biogasoline	PJ	0.0	0.0	0.0
		Biodiesel (conventional and advanced)	PJ	0.0	0.0	0.0
		Biomethane	PJ	0.0	0.0	0.0
Non-renewable fuels		PJ	277	305	270	
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		<b>PJ</b>	<b>753</b>	<b>1 214</b>	<b>1 139</b>	
RE shares	RE share in electricity generation		16%	34%	55%	
	RE share in district heat generation		0%	0%	0%	
	RE share in Buildings - final energy use, direct uses (modern)		3%	1%	11%	
	RE share in Industry - final energy use, direct uses		2%	1%	6%	
	RE share in Transport fuels		0%	0%	0%	
Share of modern RE in TFEC <sup>3</sup>		3%	7%	16%		
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	-0.2	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	1	2	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	0.4	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	3.1	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	1.0	
	CO <sub>2</sub> emissions from energy [Mt/yr]		56	97	76	

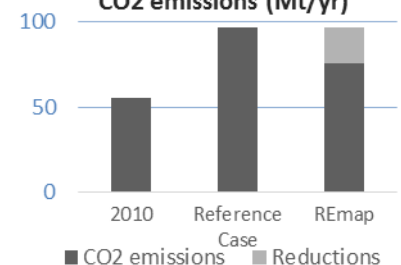
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



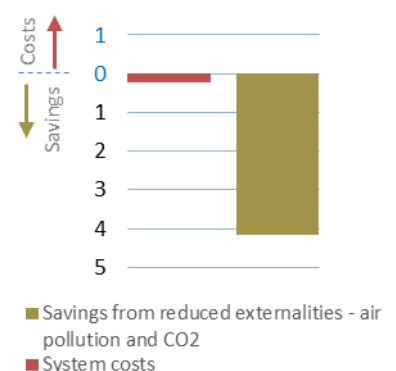
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



**References for further consultation:**

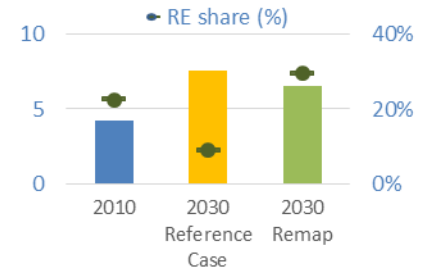
- Etude Prospective de la Demande D'Énergie à L'Horizon 2030, Ministry of Energy, Mines, Water and Environment (2013).
- Énergie 2030: Quelles options pour le Maroc, Planning Commission.
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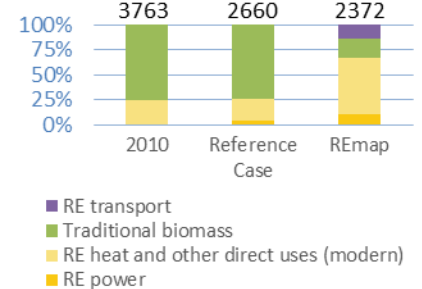
## REmap Country Results – Nigeria

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	6	29	40
		Renewable capacity	GW	2	11	28
		Hydropower (excl. pumped hydro)	GW	2	8	10
		Wind	GW	0	0	1
		Biofuels (solid, liquid, gaseous)	GW	0	0	0
		Solar PV	GW	0	4	16
		CSP	GW	0	0	2
		Geothermal	GW	0	0	0
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	4	18	12
	<b>Total electricity generation</b>	TWh	21	141	141	
	Renewable generation	TWh	6	39	74	
	Hydropower	TWh	5	33	43	
	Wind	TWh	0	0	3	
	Biofuels (solid, liquid, gaseous)	TWh	0	0	0	
	Solar PV	TWh	1	6	24	
	CSP	TWh	0	0	3	
	Geothermal	TWh	0	0	0	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	15	103	68	
DH	<b>Total district heat generation</b>	PJ	0	0	0	
	Biofuels (solid, liquid, gaseous)	PJ	0	0	0	
	Other renewables	PJ	0	0	0	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	3 821	5 097	4 130
		Direct uses of renewable energy	PJ	3 746	2 531	1 800
		Solar thermal - Buildings	PJ	0	159	170
		Solar thermal - Industry	PJ	0	64	343
		Geothermal	PJ	0	0	0
		Bioenergy (traditional) - Buildings	PJ	2 813	1 978	450
		Bioenergy (modern) - Buildings	PJ	554	331	830
		Bioenergy - Industry	PJ	379	0	6
		Non-renewable - Buildings	PJ	26	546	609
		Non-renewable - Industry	PJ	50	2 020	1 721
	Non-renewable - BF/CO	PJ	0	0	0	
	Transport	<b>Total fuel consumption</b>	PJ	341	1 941	1 946
		Liquid biofuels	PJ	0	0	327
		Conventional biogasoline	PJ	0	0	194
		Advanced biogasoline	PJ	0	0	0
		Biodiesel (conventional and advanced)	PJ	0	0	132
		Biomethane	PJ	0	0	0
Non-renewable fuels		PJ	341	1 941	1 619	
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		PJ	4 228	7 509	6 546	
RE shares	RE share in electricity generation		27%	27%	52%	
	RE share in district heat generation		19%	19%	19%	
	RE share in Buildings - final energy use, direct uses (modern)		16%	16%	49%	
	RE share in Industry - final energy use, direct uses		88%	3%	17%	
	RE share in Transport fuels		0%	0%	17%	
Financial indicators	Share of modern RE in TFEC <sup>3</sup>		22%	9%	29%	
	System costs [USD bln/yr in 2030]		N/A	N/A	- 3	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	3	6	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	0.1	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	6.4	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	2.5	
	CO <sub>2</sub> emissions from energy [Mt/yr]		40	361	312	

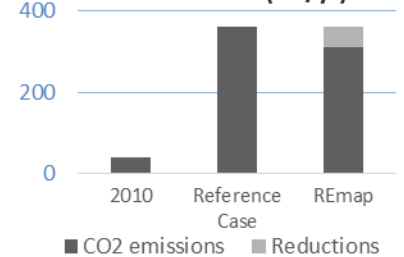
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



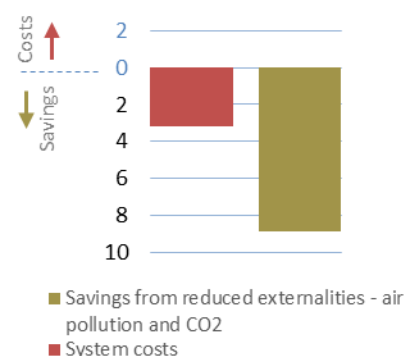
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



### References for further consultation:

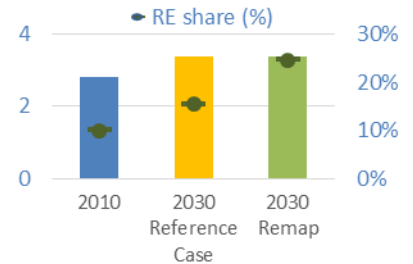
- Africa 2030: Roadmap for a Renewable Energy Future; Renewable Energy Zones for the Africa Clean Energy Corridor, IRENA (2015).
- The Nigerian Energy Sector, GIZ (2015).
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- Draft National Renewable Energy and Energy Efficiency Policy, Energy Commission of Nigeria (2014).



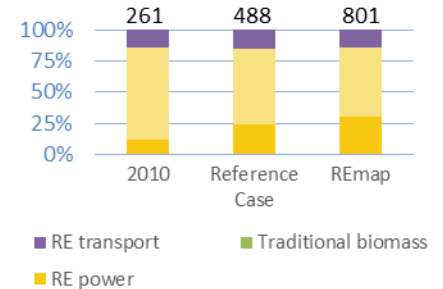
# REmap Country Results – Poland

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	36	54	63
		Renewable capacity	GW	5	16	31
		Hydropower (excl. pumped hydro)	GW	2	1	2
		Wind	GW	2	8	17
		Biofuels (solid, liquid, gaseous)	GW	0	5	8
		Solar PV	GW	0	3	5
		CSP	GW	0	0	0
		Geothermal	GW	0	0	0
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	31	38	32
	<b>Total electricity generation</b>	TWh	157	216	217	
	Renewable generation	TWh	11	42	84	
	Hydropower	TWh	3	3	5	
	Wind	TWh	2	18	43	
	Biofuels (solid, liquid, gaseous)	TWh	6	18	32	
	Solar PV	TWh	0	2	4	
	CSP	TWh	0	0	1	
	Geothermal	TWh	0	0	0	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	146	175	133	
DH	<b>Total district heat generation</b>	PJ	344	513	471	
	Biofuels (solid, liquid, gaseous)	PJ	13	41	93	
	Other renewables	PJ	0	14	17	
	Non-renewable DH	PJ	331	458	361	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	1 238	1 276	1 269
		Direct uses of renewable energy	PJ	184	253	356
		Solar thermal - Buildings	PJ	0	26	45
		Solar thermal - Industry	PJ	0	0	10
		Geothermal	PJ	1	0	0
		Bioenergy (traditional) - Buildings	PJ	0	0	0
		Bioenergy (modern) - Buildings	PJ	122	155	170
		Bioenergy - Industry	PJ	61	72	130
		Non-renewable - Buildings	PJ	627	428	375
		Non-renewable - Industry	PJ	342	491	434
	Non-renewable - BF/CO	PJ	85	104	104	
	Transport	<b>Total fuel consumption</b>	PJ	698	907	907
		Liquid biofuels	PJ	37	71	103
		Conventional biogasoline	PJ	12	11	14
		Advanced biogasoline	PJ	0	15	20
Biodiesel (conventional and advanced)		PJ	25	45	70	
Biomethane	PJ	0	0	6		
Non-renewable fuels	PJ	661	835	799		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		PJ	2 808	3 375	3 367	
RE shares	RE share in electricity generation		7%	19%	39%	
	RE share in district heat generation		4%	11%	23%	
	RE share in Buildings - final energy use, direct uses (modern)		16%	30%	37%	
	RE share in Industry - final energy use, direct uses		15%	13%	24%	
	RE share in Transport fuels		5%	8%	12%	
Share of modern RE in TFEC <sup>3</sup>			10%	15%	25%	
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	4	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	2	4	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	2.9	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	4.1	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	2.7	
	CO <sub>2</sub> emissions from energy [Mt/yr]		284	301	248	

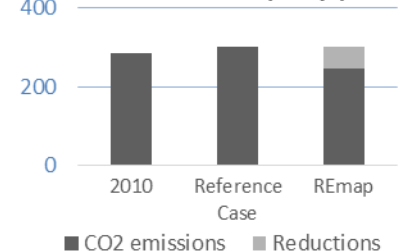
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



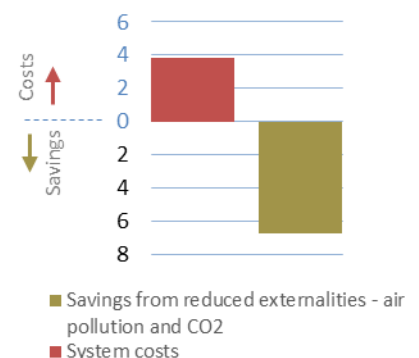
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



**References for further consultation:**

- Ministry of Economy (2010), National Renewable Energy Action Plan (NREAP).
- Krajowa Agencja Poszanowania Energii (KAPE) (2013), Prognoza zapotrzebowania na paliwa i energię do 2050 roku (Forecast of fuels and energy demand until 2050), KAPE, Warsaw.

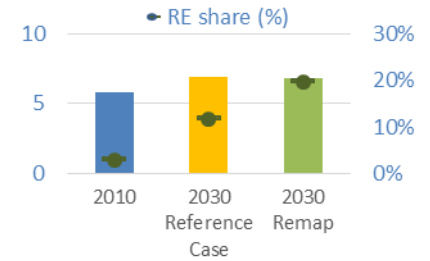




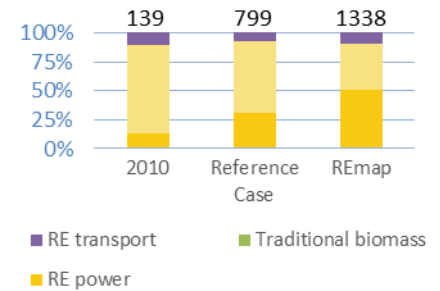
# REmap Country Results – Republic of Korea

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	<b>73</b>	<b>138</b>	<b>181</b>
		Renewable capacity	GW	7	41	101
		Hydropower (excl. pumped hydro)	GW	6	7	7
		Wind	GW	0	13	27
		Biofuels (solid, liquid, gaseous)	GW	0	5	5
		Solar PV	GW	1	17	61
		CSP	GW	0	0	0
		Geothermal	GW	0	0	0
		Marine, other	GW	0	0	1
		Non-renewable capacity	GW	67	97	79
	<b>Total electricity generation</b>	TWh	<b>480</b>	<b>738</b>	<b>748</b>	
	Renewable generation	TWh	6	76	207	
	Hydropower	TWh	4	5	5	
	Wind	TWh	1	27	89	
	Biofuels (solid, liquid, gaseous)	TWh	1	23	23	
	Solar PV	TWh	1	20	82	
	CSP	TWh	0	0	0	
	Geothermal	TWh	0	0	3	
	Marine, other	TWh	0	2	6	
Non-renewable generation	TWh	475	662	541		
DH	<b>Total district heat generation</b>	PJ	<b>172</b>	<b>305</b>	<b>305</b>	
	Biofuels (solid, liquid, gaseous)	PJ	20	22	22	
	Other renewables	PJ	0	20	20	
	Non-renewable DH	PJ	152	263	263	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	<b>2 526</b>	<b>2 889</b>	<b>2 809</b>
		Direct uses of renewable energy	PJ	97	477	517
		Solar thermal - Buildings	PJ	1	57	57
		Solar thermal - Industry	PJ	0	19	38
		Geothermal	PJ	2	85	107
		Bioenergy (traditional) - Buildings	PJ	0	0	0
		Bioenergy (modern) - Buildings	PJ	3	11	11
		Bioenergy - Industry	PJ	91	306	306
		Non-renewable - Buildings	PJ	831	912	843
		Non-renewable - Industry	PJ	1 136	1 037	987
	Non-renewable - BF/CO	PJ	462	462	462	
	Transport	<b>Total fuel consumption</b>	PJ	<b>1 539</b>	<b>1 436</b>	<b>1 409</b>
		Liquid biofuels	PJ	15	59	132
		Conventional biogasoline	PJ	1	0	13
		Advanced biogasoline	PJ	0	0	0
		Biodiesel (conventional and advanced)	PJ	14	59	119
		Biomethane	PJ	0	0	0
		Non-renewable fuels	PJ	1 524	1 378	1 277
		<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>	PJ	<b>5 787</b>	<b>6 910</b>	<b>6 839</b>
RE shares		RE share in electricity generation		1%	10%	28%
	RE share in district heat generation		11%	14%	14%	
	RE share in Buildings - final energy use, direct uses (modern)		1%	13%	13%	
	RE share in Industry - final energy use, direct uses		7%	25%	28%	
	RE share in Transport fuels		1%	4%	9%	
	Share of modern RE in TFEC <sup>3</sup>		3%	12%	20%	
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	0	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	6	14	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	2.3	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	4.9	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	5.7	
	CO <sub>2</sub> emissions from energy [Mt/yr]		504	493	378	

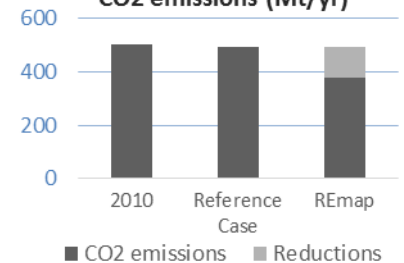
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



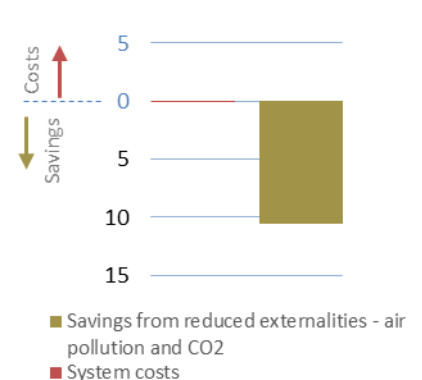
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



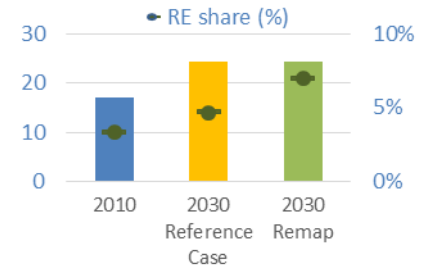
**References for further consultation:**

- Korea 2nd Energy Master Plan, Outlook & Policies to 2035, MOTIE (2014).
- The 4th Renewable Energy Scheme, MOTIE (2014).
- An Analysis of Long-term Scenarios for the Transition to Renewable Energy in the Korean Electricity Sector, Park, Yun, and Jeon (2013).

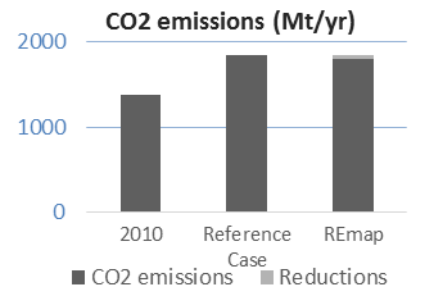
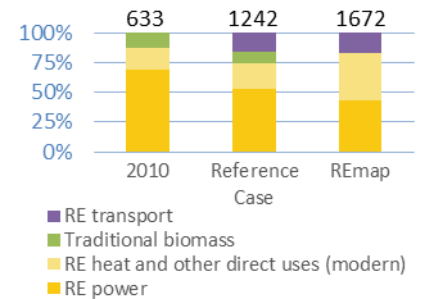
# REmap Country Results – Russian Federation

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	<b>GW</b>	<b>231</b>	<b>285</b>	<b>294</b>
		Renewable capacity	GW	47	66	76
		Hydropower (excl. pumped hydro)	GW	47	58	58
		Wind	GW	0	4	5
		Biofuels (solid, liquid, gaseous)	GW	0	2	7
		Solar PV	GW	0	2	5
		CSP	GW	0	0	0
		Geothermal	GW	0	0	1
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	183	220	218
	<b>Total electricity generation</b>	<b>TWh</b>	<b>1 036</b>	<b>1 352</b>	<b>1 379</b>	
	Renewable generation	TWh	170	243	276	
	Hydropower	TWh	166	227	227	
	Wind	TWh	0	8	11	
	Biofuels (solid, liquid, gaseous)	TWh	3	6	28	
	Solar PV	TWh	0	2	5	
	CSP	TWh	0	0	0	
	Geothermal	TWh	1	1	6	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	866	1 109	1 103	
	DH	<b>Total district heat generation</b>	<b>PJ</b>	<b>5 674</b>	<b>7 305</b>	<b>7 305</b>
Biofuels (solid, liquid, gaseous)		PJ	120	162	395	
Other renewables		PJ	0	0	0	
Non-renewable DH		PJ	5 554	7 143	6 910	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	<b>PJ</b>	<b>5 426</b>	<b>8 807</b>	<b>8 782</b>
		Direct uses of renewable energy	PJ	91	248	318
		Solar thermal - Buildings	PJ	0	0	0
		Solar thermal - Industry	PJ	0	0	0
		Geothermal	PJ	0	0	0
		Bioenergy (traditional) - Buildings	PJ	76	120	0
		Bioenergy (modern) - Buildings	PJ	0	0	190
		Bioenergy - Industry	PJ	15	128	128
		Non-renewable - Buildings	PJ	2 255	3 034	2 939
		Non-renewable - Industry	PJ	2 233	3 386	3 386
	Non-renewable - BF/CO	PJ	846	2 138	2 138	
	Transport	<b>Total fuel consumption</b>	<b>PJ</b>	<b>3 733</b>	<b>5 401</b>	<b>5 400</b>
		Liquid biofuels	PJ	0	200	288
		Conventional biogasoline	PJ	0	200	200
		Advanced biogasoline	PJ	0	0	0
Biodiesel (conventional and advanced)		PJ	0	0	88	
Biomethane	PJ	0	0	0		
Non-renewable fuels	PJ	3 733	5 201	5 112		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		<b>PJ</b>	<b>16 932</b>	<b>24 336</b>	<b>24 311</b>	
RE shares	RE share in electricity generation		16%	18%	20%	
	RE share in district heat generation		2%	2%	5%	
	RE share in Buildings - final energy use, direct uses (modern)		0%	0%	6%	
	RE share in Industry - final energy use, direct uses		1%	4%	4%	
	RE share in Transport fuels		0%	4%	5%	
Share of modern RE in TFEC <sup>3</sup>		3%	5%	7%		
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	- 1	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	13	14	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	2.2	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	1.5	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	1.7	
	CO <sub>2</sub> emissions from energy [Mt/yr]		1 384	1 843	1 810	

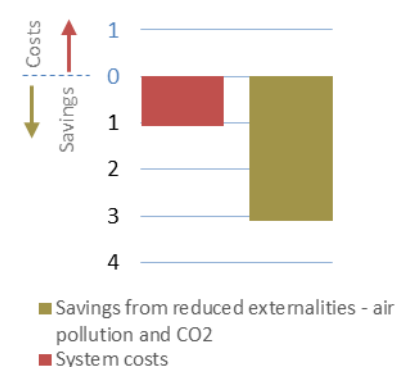
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



Final RE use by sector (%) and total (PJ/yr)



Costs and savings (USD bln in 2030)



**References for further consultation:**

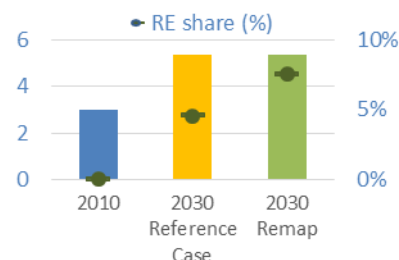
- Energy Strategy of Russia for the period up to 2035, Ministry of Energy of the Russian Federation (2010).
- Draft results of the Energy Strategy of Russia for the period up to 2030 (2016).



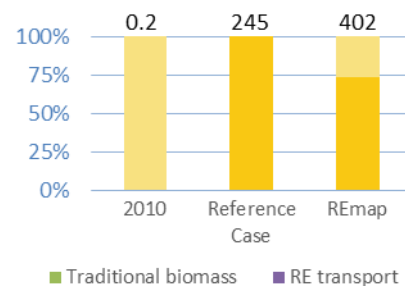
## REmap Country Results – Saudi Arabia

		Unit	2010	Reference Case 2030	REmap 2030		
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	55	137	140	
		Renewable capacity	GW	0	27	37	
		Hydropower (excl. pumped hydro)	GW	0	0	0	
		Wind	GW	0	5	5	
		Biofuels (solid, liquid, gaseous)	GW	0	2	2	
		Solar PV	GW	0	8	16	
		CSP	GW	0	13	14	
		Geothermal	GW	0	1	1	
		Marine, other	GW	0	0	0	
		Non-renewable capacity	GW	55	110	104	
		<b>Total electricity generation</b>	TWh	240	601	601	
		Renewable generation	TWh	0	85	106	
		Hydropower	TWh	0	0	0	
		Wind	TWh	0	15	16	
		Biofuels (solid, liquid, gaseous)	TWh	0	11	12	
		Solar PV	TWh	0	14	28	
		CSP	TWh	0	42	46	
		Geothermal	TWh	0	4	4	
		Marine, other	TWh	0	0	0	
Non-renewable generation	TWh	240	516	495			
DH	<b>Total district heat generation</b>	PJ	0	0	0		
	Biofuels (solid, liquid, gaseous)	PJ	0	0	0		
	Other renewables	PJ	0	0	0		
	Non-renewable DH	PJ	0	0	0		
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	824	1 020	1 073	
		Direct uses of renewable energy	PJ	0	0	107	
		Solar thermal - Buildings	PJ	0	0	59	
		Solar thermal - Industry	PJ	0	0	38	
		Geothermal	PJ	0	0	10	
		Bioenergy (traditional) - Buildings	PJ	0	0	0	
		Bioenergy (modern) - Buildings	PJ	0	0	0	
		Bioenergy - Industry	PJ	0	0	0	
		Non-renewable - Buildings	PJ	63	69	69	
		Non-renewable - Industry	PJ	761	951	897	
		Non-renewable - BF/CO	PJ	0	0	0	
		Transport	<b>Total fuel consumption</b>	PJ	1 476	2 629	2 594
			Liquid biofuels	PJ	0	0	0
			Conventional biogasoline	PJ	0	0	0
			Advanced biogasoline	PJ	0	0	0
Biodiesel (conventional and advanced)	PJ		0	0	0		
Biomethane	PJ		0	0	0		
Non-renewable fuels	PJ		1 476	2 629	2 594		
<b>Total final energy consumption (electricity, DH, direct uses) <sup>2</sup></b>	PJ		2 990	5 376	5 332		
RE shares	RE share in electricity generation		0%	14%	18%		
	RE share in district heat generation		0%	0%	0%		
	RE share in Buildings - final energy use, direct uses (modern)		0%	0%	46%		
	RE share in Industry - final energy use, direct uses		0%	0%	5%		
	RE share in Transport fuels		0%	0%	0%		
	Share of modern RE in TFEC <sup>3</sup>		0%	5%	8%		
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	- 8		
	RE investment needs [USD bln/yr (2010-2030)]		N/A	4	6		
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	0.3		
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	4.3		
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	1.1		
	CO <sub>2</sub> emissions from energy [Mt/yr]		360	488	465		

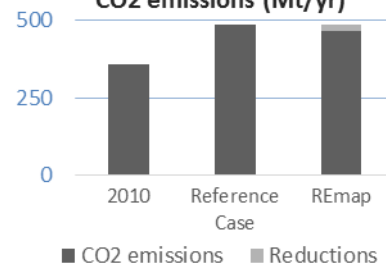
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



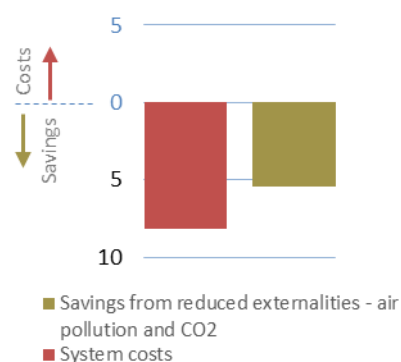
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



### References for further consultation:

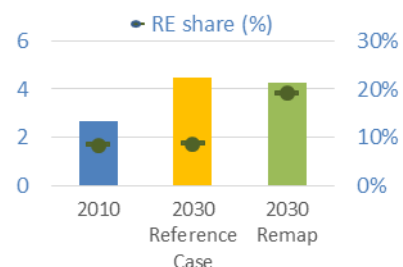
- Saudi Arabia's Renewable Energy Strategy and Solar Energy Deployment Roadmap, KACARE (2013).
- Geothermal Development Roadmap for the Kingdom of Saudi Arabia, Hashem (2012).
- Prospects of Renewable Energy to Promote Zero-Energy Residential Buildings in the KSA, Alrashed and Asif



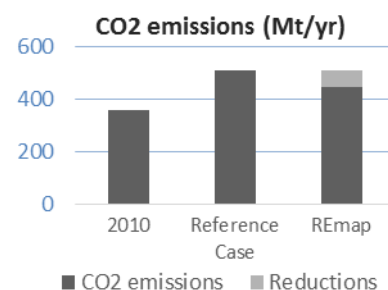
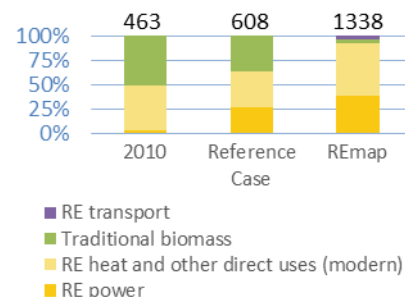
# REmap Country Results – South Africa

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	<i>GW</i>	<b>37</b>	<b>75</b>	<b>92</b>
		Renewable capacity	<i>GW</i>	1	19	43
		Hydropower (excl. pumped hydro)	<i>GW</i>	1	1	1
		Wind	<i>GW</i>	0	4	8
		Biofuels (solid, liquid, gaseous)	<i>GW</i>	0	1	3
		Solar PV	<i>GW</i>	0	10	25
		CSP	<i>GW</i>	0	3	5
		Geothermal	<i>GW</i>	0	0	0
		Marine, other	<i>GW</i>	0	0	0
		Non-renewable capacity	<i>GW</i>	36	57	50
	<b>Total electricity generation</b>	<i>TWh</i>	<b>259</b>	<b>438</b>	<b>440</b>	
	Renewable generation	<i>TWh</i>	4	48	98	
	Hydropower	<i>TWh</i>	4	4	4	
	Wind	<i>TWh</i>	0	11	22	
	Biofuels (solid, liquid, gaseous)	<i>TWh</i>	0	5	16	
	Solar PV	<i>TWh</i>	0	17	39	
	CSP	<i>TWh</i>	0	11	18	
	Geothermal	<i>TWh</i>	0	0	0	
	Marine, other	<i>TWh</i>	0	0	0	
	Non-renewable generation	<i>TWh</i>	255	390	341	
DH	<b>Total district heat generation</b>	<i>PJ</i>	<b>0</b>	<b>0</b>	<b>0</b>	
	Biofuels (solid, liquid, gaseous)	<i>PJ</i>	0	0	0	
	Other renewables	<i>PJ</i>	0	0	0	
	Non-renewable DH	<i>PJ</i>	0	0	0	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	<i>PJ</i>	<b>1 189</b>	<b>1 427</b>	<b>1 277</b>
		Direct uses of renewable energy	<i>PJ</i>	451	445	487
		Solar thermal - Buildings	<i>PJ</i>	3	4	75
		Solar thermal - Industry	<i>PJ</i>	0	0	26
		Geothermal (Buildings and Industry)	<i>PJ</i>	0	0	0
		Bioenergy (traditional) - Buildings	<i>PJ</i>	237	219	33
		Bioenergy (modern) - Buildings	<i>PJ</i>	133	123	170
		Bioenergy - Industry	<i>PJ</i>	78	99	184
		Non-renewable - Buildings	<i>PJ</i>	175	153	70
		Non-renewable - Industry	<i>PJ</i>	587	829	720
	Non-renewable - BF/CO	<i>PJ</i>	- 24	0	0	
	Transport	<b>Total fuel consumption</b>	<i>PJ</i>	<b>740</b>	<b>1 524</b>	<b>1 497</b>
		Liquid biofuels	<i>PJ</i>	0	0	31
		Conventional biogasoline	<i>PJ</i>	0	0	16
		Advanced biogasoline	<i>PJ</i>	0	0	0
Biodiesel (conventional and advanced)		<i>PJ</i>	0	0	15	
Biomethane	<i>PJ</i>	0	0	0		
Non-renewable fuels	<i>PJ</i>	740	1 524	1 466		
<b>Total finale energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		<i>PJ</i>	<b>2 682</b>	<b>4 490</b>	<b>4 239</b>	
RE shares	RE share in electricity generation		2%	11%	22%	
	RE share in district heat generation		N/A	N/A	N/A	
	RE share in Buildings - final energy use, direct uses (modern)		25%	25%	70%	
	RE share in Industry - final energy use, direct uses		12%	11%	23%	
	RE share in Transport fuels		0%	0%	2%	
Share of modern RE in TFEC <sup>3</sup>			8%	9%	19%	
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	0	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	2	5	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	3.5	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	16.6	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	3.1	
	CO <sub>2</sub> emissions from energy [Mt/yr]		361	509	447	

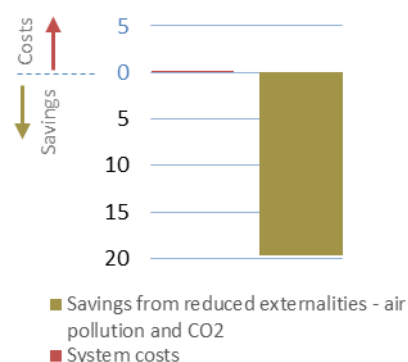
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



Final RE use by sector (%) and total (PJ/yr)



Costs and savings (USD bln in 2030)



**References for further consultation:**

- Draft 2012 on Integrated Energy Planning (2012).
- IRP 2010-2030, update report, DOE (2013).

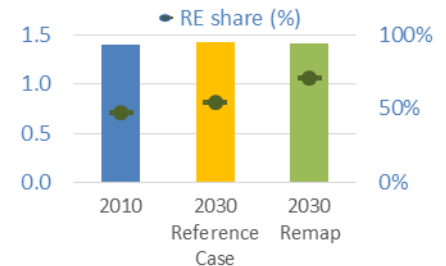




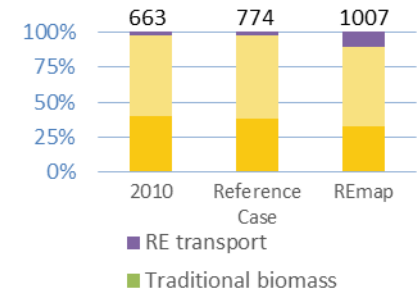
# REmap Country Results – Sweden

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	28	42	44
		Renewable capacity	GW	18	29	33
		Hydropower (excl. pumped hydro)	GW	16	17	20
		Wind	GW	2	7	7
		Biofuels (solid, liquid, gaseous)	GW	0	5	6
		Solar PV	GW	0	0	0
		CSP	GW	0	0	0
		Geothermal	GW	0	0	0
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	9	13	11
	<b>Total electricity generation</b>	TWh	148	194	198	
	Renewable generation	TWh	83	120	136	
	Hydropower	TWh	66	69	82	
	Wind	TWh	4	12	12	
	Biofuels (solid, liquid, gaseous)	TWh	13	39	42	
	Solar PV	TWh	0	0	0	
	CSP	TWh	0	0	0	
	Geothermal	TWh	0	0	0	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	65	74	62	
DH	<b>Total district heat generation</b>	PJ	204	170	194	
	Biofuels (solid, liquid, gaseous)	PJ	150	157	186	
	Other renewables	PJ	0	1	1	
	Non-renewable DH	PJ	54	12	8	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	398	482	453
		Direct uses of renewable energy	PJ	225	304	382
		Solar thermal - Buildings	PJ	0	0	0
		Solar thermal - Industry	PJ	0	0	0
		Geothermal	PJ	0	0	0
		Bioenergy (traditional) - Buildings	PJ	0	0	0
		Bioenergy (modern) - Buildings	PJ	31	55	55
		Bioenergy - Industry	PJ	194	248	326
		Non-renewable - Buildings	PJ	36	37	8
		Non-renewable - Industry	PJ	97	141	63
	Non-renewable - BF/CO	PJ	40	0	0	
	Transport	<b>Total fuel consumption</b>	PJ	319	297	297
		Liquid biofuels	PJ	17	10	99
		Conventional biogasoline	PJ	3	2	2
		Advanced biogasoline	PJ	0	3	25
		Biodiesel (conventional and advanced)	PJ	14	5	72
Biomethane		PJ	0	5	8	
Non-renewable fuels	PJ	302	282	190		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		PJ	1 400	1 423	1 417	
RE shares	RE share in electricity generation		56%	62%	69%	
	RE share in district heat generation		74%	93%	96%	
	RE share in Buildings - final energy use, direct uses (modern)		46%	60%	87%	
	RE share in Industry - final energy use, direct uses		67%	64%	84%	
	RE share in Transport fuels		5%	5%	37%	
Share of modern RE in TFEC <sup>3</sup>			47%	54%	70%	
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	- 1	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	2	3	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	0.4	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	0.3	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	0.8	
	CO <sub>2</sub> emissions from energy [Mt/yr]		41	38	22	

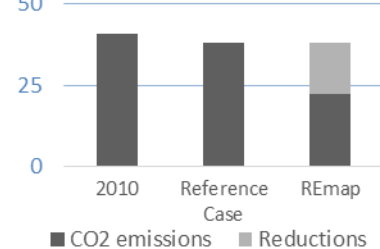
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



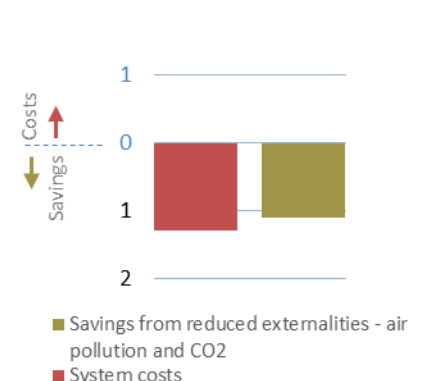
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



**References for further consultation:**

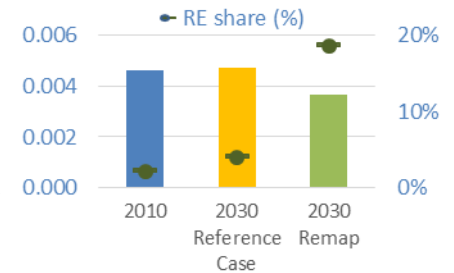
- Energy in Sweden 2015, Swedish Energy Agency (2015).
- The Advanced Energy [r]evolution, Greenpeace International, European Renewable Energy Council (2011).
- National Renewable Energy Action Plan (NREAP), Sweden submitted to EC (2012).



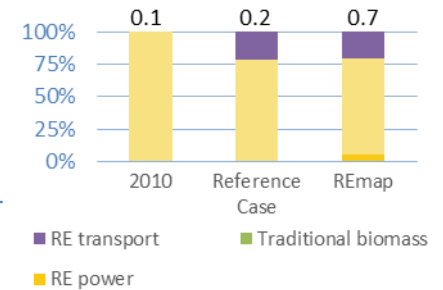
# REmap Country Results – Tonga

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	0.01	0.03	0.09
		Renewable capacity	GW	0.00	0.01	0.12
		Hydropower (excl. pumped hydro)	GW	0.00	0.00	0.00
		Wind	GW	0.00	0.00	0.00
		Biofuels (solid, liquid, gaseous)	GW	0.00	0.00	0.00
		Solar PV	GW	0.00	0.01	0.12
		CSP	GW	0.00	0.00	0.00
		Geothermal	GW	0.00	0.00	0.00
		Marine, other	GW	0.00	0.00	0.00
		Non-renewable capacity	GW	0.01	0.03	-0.03
	<b>Total electricity generation</b>	TWh	0.06	0.12	0.36	
	Renewable generation	TWh	0.00	0.01	0.14	
	Hydropower	TWh	0.00	0.00	0.00	
	Wind	TWh	0.00	0.00	0.00	
	Biofuels (solid, liquid, gaseous)	TWh	0.00	0.00	0.00	
	Solar PV	TWh	0.00	0.01	0.14	
	CSP	TWh	0.00	0.00	0.00	
	Geothermal	TWh	0.00	0.00	0.00	
	Marine, other	TWh	0.00	0.00	0.00	
	Non-renewable generation	TWh	0.06	0.11	0.22	
DH	<b>Total district heat generation</b>	PJ	0.00	0.00	0.00	
	Biofuels (solid, liquid, gaseous)	PJ	0.00	0.00	0.00	
	Other renewables	PJ	0.00	0.00	0.00	
	Non-renewable DH	PJ	0.00	0.00	0.00	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	2.60	2.65	2.59
		Direct uses of renewable energy	PJ	0.10	0.15	0.50
		Solar thermal - Buildings	PJ	0.00	0.00	0.25
		Solar thermal - Industry	PJ	0.00	0.00	0.10
		Geothermal	PJ	0.00	0.00	0.00
		Bioenergy (traditional) - Buildings	PJ	0.00	0.00	0.00
		Bioenergy (modern) - Buildings	PJ	0.05	0.07	0.07
		Bioenergy - Industry	PJ	0.05	0.08	0.08
		Non-renewable - Buildings	PJ	1.50	1.50	1.21
		Non-renewable - Industry	PJ	1.00	1.00	0.88
	Non-renewable - BF/CO	PJ	0.00	0.00	0.00	
	Transport	<b>Total fuel consumption</b>	PJ	2.00	2.04	0.97
		Liquid biofuels	PJ	0.00	0.04	0.14
		Conventional biogasoline	PJ	0.00	0.04	0.04
		Advanced biogasoline	PJ	0.00	0.00	0.00
Biodiesel (conventional and advanced)		PJ	0.00	0.00	0.10	
Biomethane	PJ	0.00	0.00	0.00		
Non-renewable fuels	PJ	2.00	2.00	0.83		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		<b>PJ</b>	<b>4.60</b>	<b>4.69</b>	<b>3.66</b>	
RE shares	RE share in electricity generation		3%	7%	39%	
	RE share in district heat generation		0%	0%	0%	
	RE share in Buildings - final energy use, direct uses (modern)		3%	4%	21%	
	RE share in Industry - final energy use, direct uses		5%	8%	17%	
	RE share in Transport fuels		0%	2%	14%	
Share of modern RE in TFEC <sup>3</sup>		2%	4%	19%		
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	0	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	0	0	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	0.0	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	0.0	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	0.0	
	CO <sub>2</sub> emissions from energy [Mt/yr]		0	0	0	

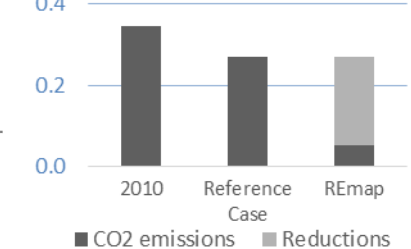
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



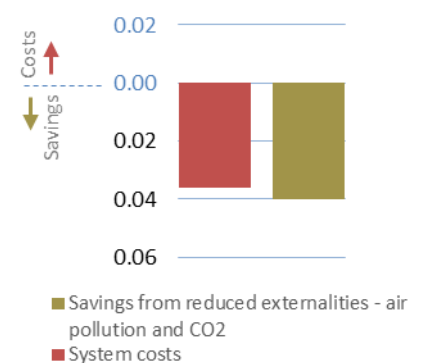
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



**References for further consultation:**

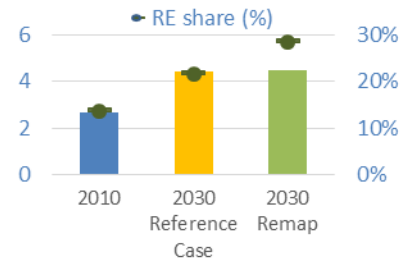
- Pacific Lighthouses, Tonga, IRENA (2013).
- Tonga Energy Road Map 2010-2020, Kingdom of Tonga (2010).



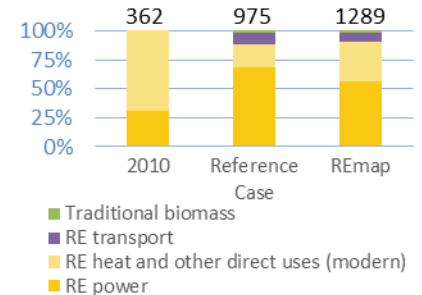
# REmap Country Results – Turkey

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	45	144	146
		Renewable capacity	GW	16	89	95
		Hydropower (excl. pumped hydro)	GW	15	44	44
		Wind	GW	1	33	33
		Biofuels (solid, liquid, gaseous)	GW	0	1	4
		Solar PV	GW	0	9	11
		CSP	GW	0	0	0
		Geothermal	GW	0	1	3
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	29	55	51
	<b>Total electricity generation</b>	TWh	187	543	544	
	Renewable generation	TWh	38	229	251	
	Hydropower	TWh	36	119	119	
	Wind	TWh	1	82	82	
	Biofuels (solid, liquid, gaseous)	TWh	0	7	18	
	Solar PV	TWh	0	14	18	
	CSP	TWh	0	0	0	
	Geothermal	TWh	0	8	13	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	149	313	293	
DH	<b>Total district heat generation</b>	PJ	0	0	0	
	Biofuels (solid, liquid, gaseous)	PJ	0	0	0	
	Other renewables	PJ	0	0	0	
	Non-renewable DH	PJ	0	0	0	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	1 456	1 598	1 630
		Direct uses of renewable energy	PJ	252	210	461
		Solar thermal - Buildings	PJ	13	37	54
		Solar thermal - Industry	PJ	5	0	23
		Geothermal	PJ	40	24	102
		Bioenergy (traditional) - Buildings	PJ	0	16	16
		Bioenergy (modern) - Buildings	PJ	192	124	244
		Bioenergy - Industry	PJ	2	8	23
		Non-renewable - Buildings	PJ	620	712	548
		Non-renewable - Industry	PJ	488	573	518
	Non-renewable - BF/CO	PJ	96	103	103	
	Transport	<b>Total fuel consumption</b>	PJ	623	1 220	1 205
		Liquid biofuels	PJ	0	100	100
		Conventional biogasoline	PJ	0	9	9
		Advanced biogasoline	PJ	0	0	0
		Biodiesel (conventional and advanced)	PJ	0	91	91
Biomethane		PJ	0	0	0	
Non-renewable fuels	PJ	623	1 120	1 105		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		<b>PJ</b>	<b>2 663</b>	<b>4 441</b>	<b>4 463</b>	
RE shares	RE share in electricity generation		20%	42%	46%	
	RE share in district heat generation		0%	0%	0%	
	RE share in Buildings - final energy use, direct uses (modern)		28%	20%	41%	
	RE share in Industry - final energy use, direct uses		2%	1%	11%	
	RE share in Transport fuels		0%	8%	8%	
Share of modern RE in TFEC <sup>3</sup>		14%	22%	29%		
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	0	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	10	12	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	1.4	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	4.3	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	1.3	
	CO <sub>2</sub> emissions from energy [Mt/yr]		235	316	290	

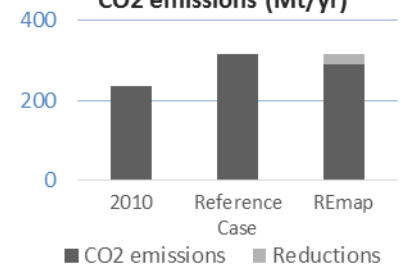
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



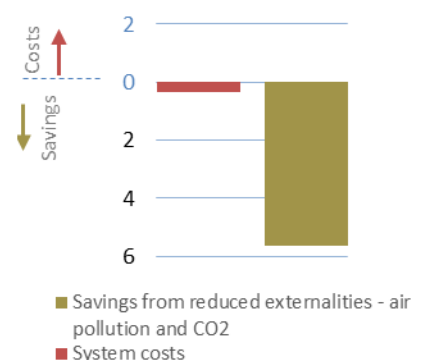
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



**References for further consultation:**

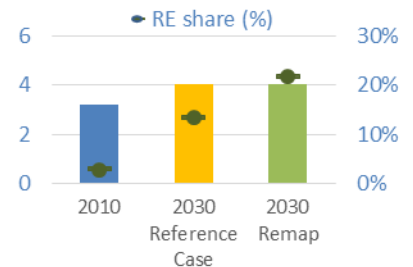
- National Renewable Energy Action Plan for Turkey, Ministry of Energy and Natural Resources (2014).



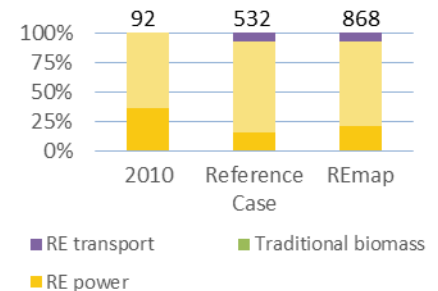
# REmap Country Results – Ukraine

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	54	80	85
		Renewable capacity	GW	6	11	27
		Hydropower (excl. pumped hydro)	GW	5	6	6
		Wind	GW	0	0	9
		Biofuels (solid, liquid, gaseous)	GW	0	3	4
		Solar PV	GW	0	3	8
		CSP	GW	0	0	0
		Geothermal	GW	0	0	0
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	48	69	58
	<b>Total electricity generation</b>	TWh	189	284	284	
	Renewable generation	TWh	13	32	71	
	Hydropower	TWh	13	15	15	
	Wind	TWh	0	8	35	
	Biofuels (solid, liquid, gaseous)	TWh	0	7	13	
	Solar PV	TWh	0	3	8	
	CSP	TWh	0	0	0	
	Geothermal	TWh	0	0	0	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	175	252	213	
DH	<b>Total district heat generation</b>	PJ	619	678	678	
	Biofuels (solid, liquid, gaseous)	PJ	11	116	137	
	Other renewables	PJ	0	0	0	
	Non-renewable DH	PJ	607	562	541	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	1 687	2 085	2 099
		Direct uses of renewable energy	PJ	48	312	502
		Solar thermal - Buildings	PJ	0	15	36
		Solar thermal - Industry	PJ	0	0	5
		Geothermal	PJ	0	4	10
		Bioenergy (traditional) - Buildings	PJ	0	0	0
		Bioenergy (modern) - Buildings	PJ	47	126	186
		Bioenergy - Industry	PJ	2	167	264
		Non-renewable - Buildings	PJ	636	689	611
		Non-renewable - Industry	PJ	628	679	581
	Non-renewable - BF/CO	PJ	375	406	406	
	Transport	<b>Total fuel consumption</b>	PJ	455	557	557
		Liquid biofuels	PJ	0	37	63
		Conventional biogasoline	PJ	0	25	30
		Advanced biogasoline	PJ	0	0	5
		Biodiesel (conventional and advanced)	PJ	0	12	27
Biomethane		PJ	0	0	0	
Non-renewable fuels	PJ	455	520	495		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		<b>PJ</b>	<b>3 207</b>	<b>4 039</b>	<b>4 053</b>	
RE shares	RE share in electricity generation		7%	11%	25%	
	RE share in district heat generation		2%	17%	20%	
	RE share in Buildings - final energy use, direct uses (modern)		7%	17%	27%	
	RE share in Industry - final energy use, direct uses		0%	20%	32%	
	RE share in Transport fuels		0%	7%	11%	
Share of modern RE in TFEC <sup>3</sup>			3%	13%	22%	
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	0	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	2	4	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	0.7	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	1.6	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	2.6	
	CO <sub>2</sub> emissions from energy [Mt/yr]		236	284	231	

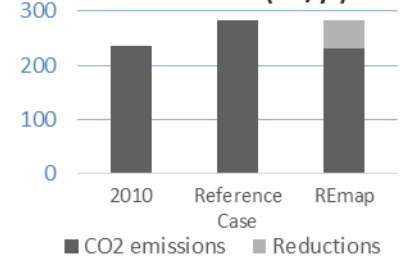
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



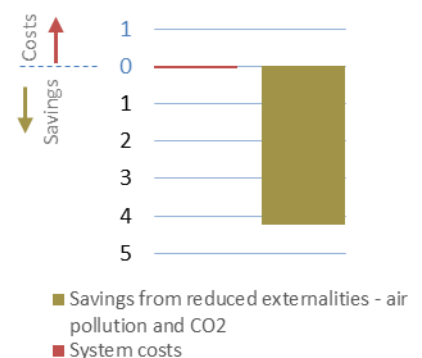
Final RE use by sector (%) and total (PJ/yr)



CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



## References for further consultation:

- National Renewable Energy Action Plan (NREAP) through 2020 DRAFT, State Agency on Energy Efficiency and Energy Saving of Ukraine (2012).



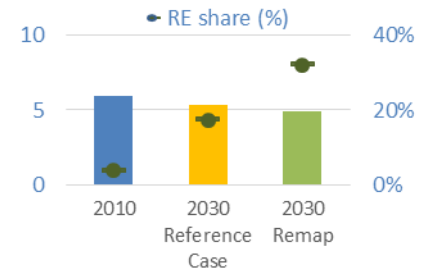




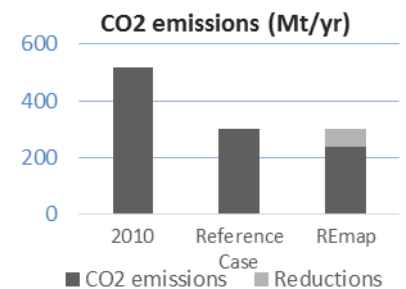
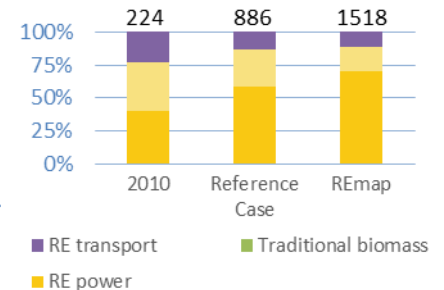
# REmap Country Results – United Kingdom

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	91	109	141
		Renewable capacity	GW	9	50	98
		Hydropower (excl. pumped hydro)	GW	2	2	4
		Wind	GW	5	27	60
		Biofuels (solid, liquid, gaseous)	GW	2	6	6
		Solar PV	GW	0	16	24
		CSP	GW	0	0	0
		Geothermal	GW	0	0	3
		Marine, other	GW	0	0	1
		Non-renewable capacity	GW	82	58	43
	<b>Total electricity generation</b>	TWh	366	346	397	
	Renewable generation	TWh	28	142	298	
	Hydropower	TWh	5	6	14	
	Wind	TWh	11	82	195	
	Biofuels (solid, liquid, gaseous)	TWh	12	39	39	
	Solar PV	TWh	0	15	25	
	CSP	TWh	0	0	0	
	Geothermal	TWh	0	0	19	
	Marine, other	TWh	0	0	4	
	Non-renewable generation	TWh	338	203	99	
DH	<b>Total district heat generation</b>	PJ	231	165	165	
	Biofuels (solid, liquid, gaseous)	PJ	8	25	48	
	Other renewables	PJ	0	0	0	
	Non-renewable DH	PJ	224	140	117	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	2 976	2 418	1 881
		Direct uses of renewable energy	PJ	82	246	281
		Solar thermal - Buildings	PJ	0	0	23
		Solar thermal - Industry	PJ	0	0	3
		Geothermal	PJ	0	0	0
		Bioenergy (traditional) - Buildings	PJ	0	0	0
		Bioenergy (modern) - Buildings	PJ	61	133	133
		Bioenergy - Industry	PJ	20	114	122
		Non-renewable - Buildings	PJ	2 059	1 593	1 034
		Non-renewable - Industry	PJ	726	480	467
	Non-renewable - BF/CO	PJ	110	99	99	
	Transport	<b>Total fuel consumption</b>	PJ	1 753	1 605	1 514
		Liquid biofuels	PJ	52	119	165
		Conventional biogasoline	PJ	17	90	100
		Advanced biogasoline	PJ	0	1	36
Biodiesel (conventional and advanced)		PJ	34	29	29	
Biomethane		PJ	0	0	0	
Non-renewable fuels	PJ	1 701	1 485	1 349		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		PJ	5 936	5 330	4 871	
RE shares	RE share in electricity generation		8%	41%	75%	
	RE share in district heat generation		3%	15%	29%	
	RE share in Buildings - final energy use, direct uses (modern)		3%	8%	13%	
	RE share in Industry - final energy use, direct uses		3%	19%	21%	
	RE share in Transport fuels		3%	7%	11%	
Share of modern RE in TFE <sup>3</sup>		4%	17%	32%		
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	- 3	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	7	16	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	1.6	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	2.0	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	3.2	
	CO <sub>2</sub> emissions from energy [Mt/yr]		516	300	237	

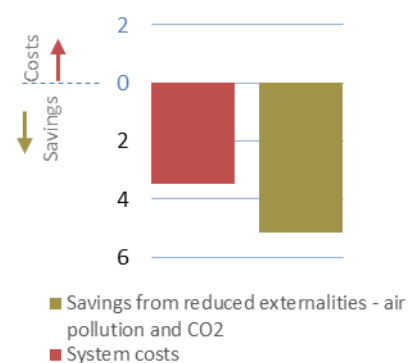
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



Final RE use by sector (%) and total (PJ/yr)



Costs and savings (USD bln in 2030)



## References for further consultation:

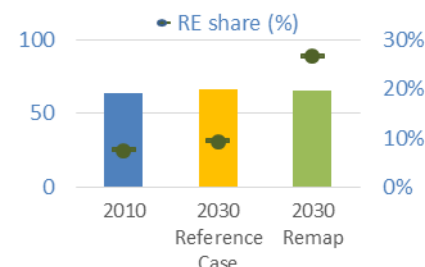
- 2015 energy and emissions projections: projections of greenhouse gas emissions and energy demand from 2015 to 2035, DECC (2015).
- Delivering UK Energy Investment, DECC (2014).
- UK Renewable Energy Roadmap Update 2013, DECC (2013).



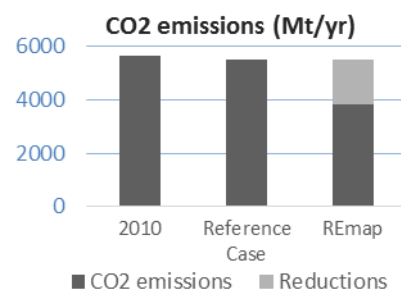
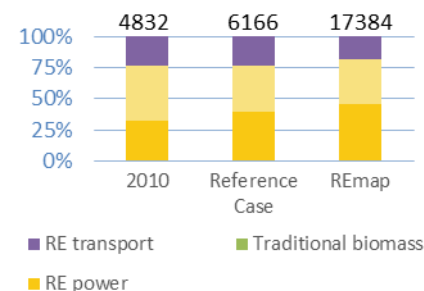
## REmap Country Results – United States

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	<b>GW</b>	<b>983</b>	<b>1 106</b>	<b>1 435</b>
		Renewable capacity	GW	133	227	792
		Hydropower (excl. pumped hydro)	GW	78	80	115
		Wind	GW	39	87	343
		Biofuels (solid, liquid, gaseous)	GW	10	13	66
		Solar PV	GW	2	37	237
		CSP	GW	1	2	6
		Geothermal	GW	2	7	25
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	850	880	643
	<b>Total electricity generation</b>	<b>TWh</b>	<b>4 129</b>	<b>4 679</b>	<b>4 887</b>	
	Renewable generation	TWh	470	756	2 450	
	Hydropower	TWh	260	295	429	
	Wind	TWh	96	245	1 099	
	Biofuels (solid, liquid, gaseous)	TWh	95	94	348	
	Solar PV	TWh	4	68	368	
	CSP	TWh	1	3	16	
	Geothermal	TWh	15	52	189	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	3 659	3 923	2 437	
DH	<b>Total district heat generation</b>	<b>PJ</b>	<b>455</b>	<b>516</b>	<b>516</b>	
	Biofuels (solid, liquid, gaseous)	PJ	91	154	154	
	Other renewables	PJ	0	0	0	
	Non-renewable DH	PJ	363	363	363	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	<b>PJ</b>	<b>23 098</b>	<b>24 802</b>	<b>23 763</b>
		Direct uses of renewable energy	PJ	2 114	2 228	6 065
		Solar thermal - Buildings	PJ	96	113	692
		Solar thermal - Industry	PJ	0	0	241
		Geothermal	PJ	11	29	59
		Bioenergy (traditional) - Buildings	PJ	0	0	0
		Bioenergy (modern) - Buildings	PJ	550	501	704
		Bioenergy - Industry	PJ	1 456	1 585	4 370
		Non-renewable - Buildings	PJ	9 556	8 789	6 644
		Non-renewable - Industry	PJ	11 090	13 481	10 750
	Non-renewable - BF/CO	PJ	339	304	304	
	Transport	<b>Total fuel consumption</b>	<b>PJ</b>	<b>27 264</b>	<b>26 196</b>	<b>25 462</b>
		Liquid biofuels	PJ	1 125	1 422	2 965
		Conventional biogasoline	PJ	1 060	1 227	1 465
		Advanced biogasoline	PJ	0	44	1 350
Biodiesel (conventional and advanced)		PJ	65	150	150	
Biomethane	PJ	0	0	261		
Non-renewable fuels	PJ	26 139	24 775	22 236		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		<b>PJ</b>	<b>64 150</b>	<b>66 370</b>	<b>65 462</b>	
RE shares	RE share in electricity generation		11%	16%	50%	
	RE share in district heat generation		20%	30%	30%	
	RE share in Buildings - final energy use, direct uses (modern)		6%	7%	18%	
	RE share in Industry - final energy use, direct uses		12%	11%	30%	
	RE share in Transport fuels		4%	5%	12%	
Share of modern RE in TFEC <sup>3</sup>		8%	9%	27%		
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	20	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	13	96	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	41.5	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	73.3	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	86.3	
	CO <sub>2</sub> emissions from energy [Mt/yr]		5 662	5 532	3 805	

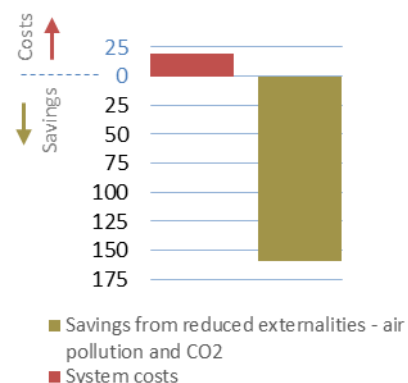
TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)



Final RE use by sector (%) and total (PJ/yr)



Costs and savings (USD bln in 2030)



### References for further consultation:

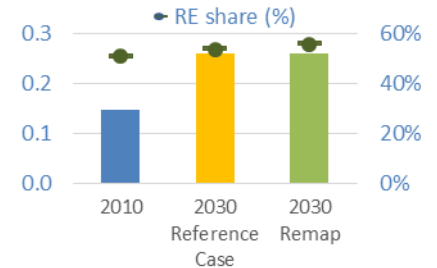
- Annual Energy Outlook 2015, US Energy Information Agency (2015).
- Clean Power Plan, US Environmental Protection Agency (2015).
- Transportation Energy Futures, National Renewable Energy Laboratory (2014).
- Renewable Electricity Futures Study, National Renewable Energy Laboratory (2012).



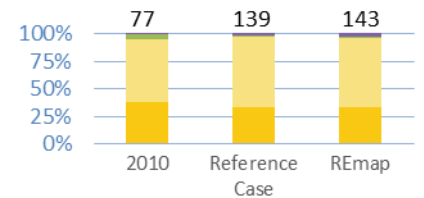
# REmap Country Results – Uruguay

		Unit	2010	Reference Case 2030	REmap 2030	
Energy generation and capacity	Power sector	<b>Total installed power generation capacity</b>	GW	3	5	5
		Renewable capacity	GW	2	4	4
		Hydropower (excl. pumped hydro)	GW	2	2	2
		Wind	GW	0	2	2
		Biofuels (solid, liquid, gaseous)	GW	0	1	1
		Solar PV	GW	0	0	0
		CSP	GW	0	0	0
		Geothermal	GW	0	0	0
		Marine, other	GW	0	0	0
		Non-renewable capacity	GW	1	1	1
	<b>Total electricity generation</b>	TWh	11	16	16	
	Renewable generation	TWh	10	15	15	
	Hydropower	TWh	8	10	10	
	Wind	TWh	0	3	3	
	Biofuels (solid, liquid, gaseous)	TWh	1	2	2	
	Solar PV	TWh	0	1	1	
	CSP	TWh	0	0	0	
	Geothermal	TWh	0	0	0	
	Marine, other	TWh	0	0	0	
	Non-renewable generation	TWh	1	1	1	
DH	<b>Total district heat generation</b>	PJ	0	0	0	
	Biofuels (solid, liquid, gaseous)	PJ	0	0	0	
	Other renewables	PJ	0	0	0	
	Non-renewable DH	PJ	0	0	0	
Final energy use - direct uses <sup>1</sup>	Buildings and Industry	<b>Total direct uses of energy</b>	PJ	64	116	116
		Direct uses of renewable energy	PJ	48	90	92
		Solar thermal - Buildings	PJ	0	1	1
		Solar thermal - Industry	PJ	0	0	2
		Geothermal	PJ	0	0	0
		Bioenergy (traditional) - Buildings	PJ	4	2	2
		Bioenergy (modern) - Buildings	PJ	10	11	11
		Bioenergy - Industry	PJ	35	76	76
		Non-renewable - Buildings	PJ	9	13	12
		Non-renewable - Industry	PJ	7	13	11
	Non-renewable - BF/CO	PJ	0	0	0	
	Transport	<b>Total fuel consumption</b>	PJ	43	82	81
		Liquid biofuels	PJ	0	2	4
		Conventional biogasoline	PJ	0	1	2
		Advanced biogasoline	PJ	0	0	0
		Biodiesel (conventional and advanced)	PJ	0	1	2
Biomethane		PJ	0	0	0	
Non-renewable fuels	PJ	43	80	77		
<b>Total final energy consumption (electricity, DH, direct uses)<sup>2</sup></b>		<b>PJ</b>	<b>148</b>	<b>260</b>	<b>259</b>	
RE shares	RE share in electricity generation		89%	94%	94%	
	RE share in district heat generation		0%	0%	0%	
	RE share in Buildings - final energy use, direct uses (modern)		44%	46%	47%	
	RE share in Industry - final energy use, direct uses		83%	85%	87%	
	RE share in Transport fuels		1%	2%	5%	
Share of modern RE in TFEC <sup>3</sup>			51%	54%	56%	
Financial indicators	System costs [USD bln/yr in 2030]		N/A	N/A	0.02	
	RE investment needs [USD bln/yr (2010-2030)]		N/A	0.3	0.3	
	Investment support for renewables [USD bln/yr in 2030]		N/A	N/A	0.05	
	Savings from reduced externalities - air pollution (average) [USD bln/yr in 2030]		N/A	N/A	0.1	
	Savings from reduced externalities - CO <sub>2</sub> (USD 50/tonne CO <sub>2</sub> ) [USD bln/yr in 2030]		N/A	N/A	0.02	
	CO <sub>2</sub> emissions from energy [Mt/yr]		5	10	9	

TFEC (EJ/yr) (left) and share of modern RE in TFEC (%) (right)

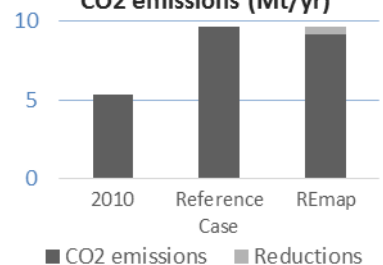


Final RE use by sector (%) and total (PJ/yr)

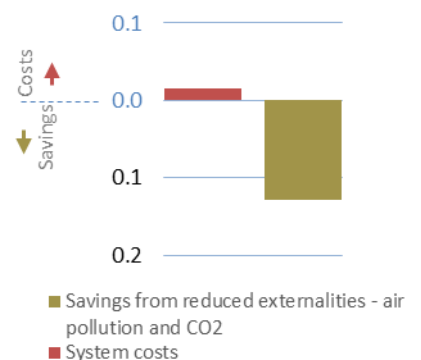


Legend for Final RE use by sector (%):  
 ■ RE transport  
 ■ Traditional biomass  
 ■ RE heat and other direct uses (modern)  
 ■ RE power

CO<sub>2</sub> emissions (Mt/yr)



Costs and savings (USD bln in 2030)



References for further consultation:  
 - Estudio de Demanda 2012-2035, MIEM (2014).





## NOTES:

<sup>1</sup> Final energy use/consumption from direct uses excludes electricity and district heat consumption.

<sup>2</sup> Total final energy consumption (TFEC) is the energy delivered to consumers, whether as electricity, heat or fuels that can be used directly as a source of energy. This consumption is usually sub-divided into that used in: transport; industry; residential, commercial and public buildings; and agriculture; and it excludes non-energy uses of fuels.

<sup>3</sup> Modern renewable energy (RE) excludes traditional uses of bioenergy (in countries that use traditional bioenergy); the share of modern RE in TFEC is equal to total modern RE consumption in end-use sectors (including consumption of renewable electricity and district heat and direct uses of renewables), divided by TFEC:

$$\text{Share of modern RE in TFEC} = \frac{\text{Total modern RE use}}{\text{TFEC}}$$





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