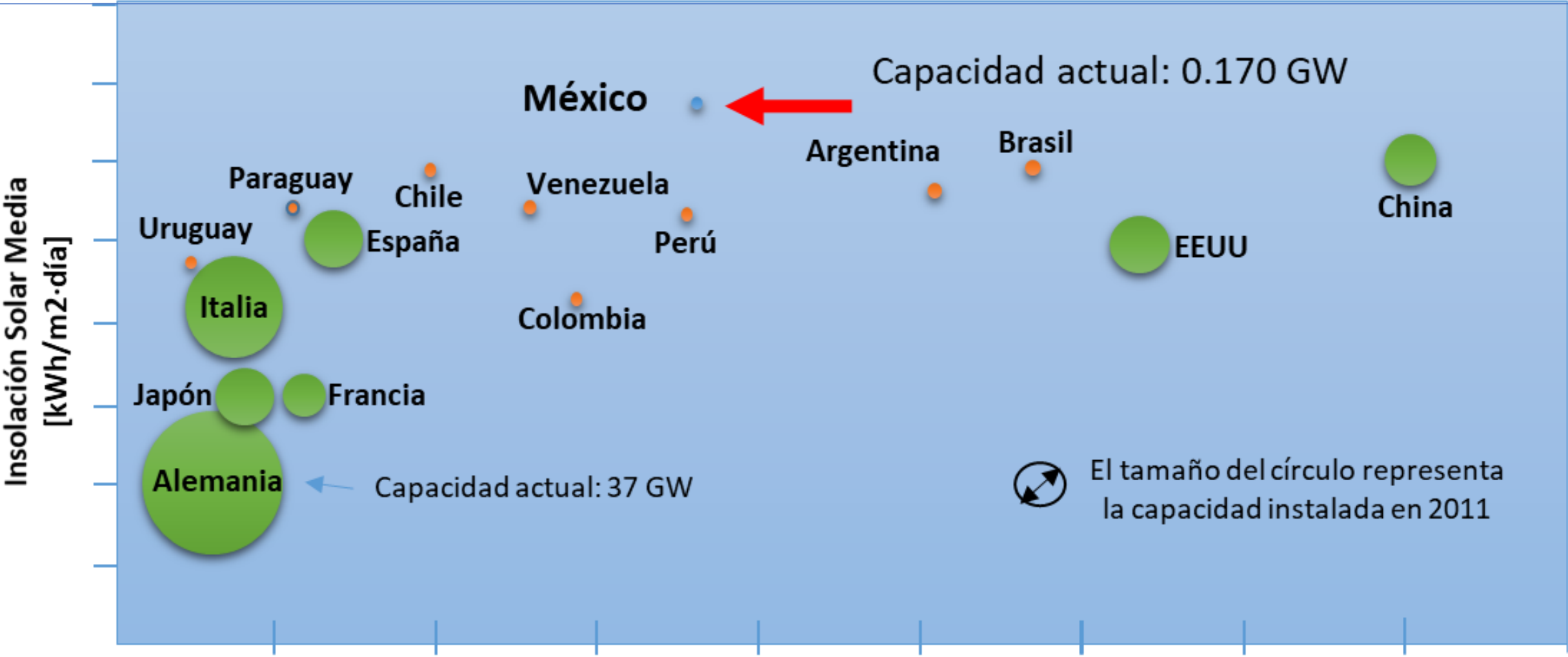


Para que tanto Gas Natural si hay Mucha Renovable



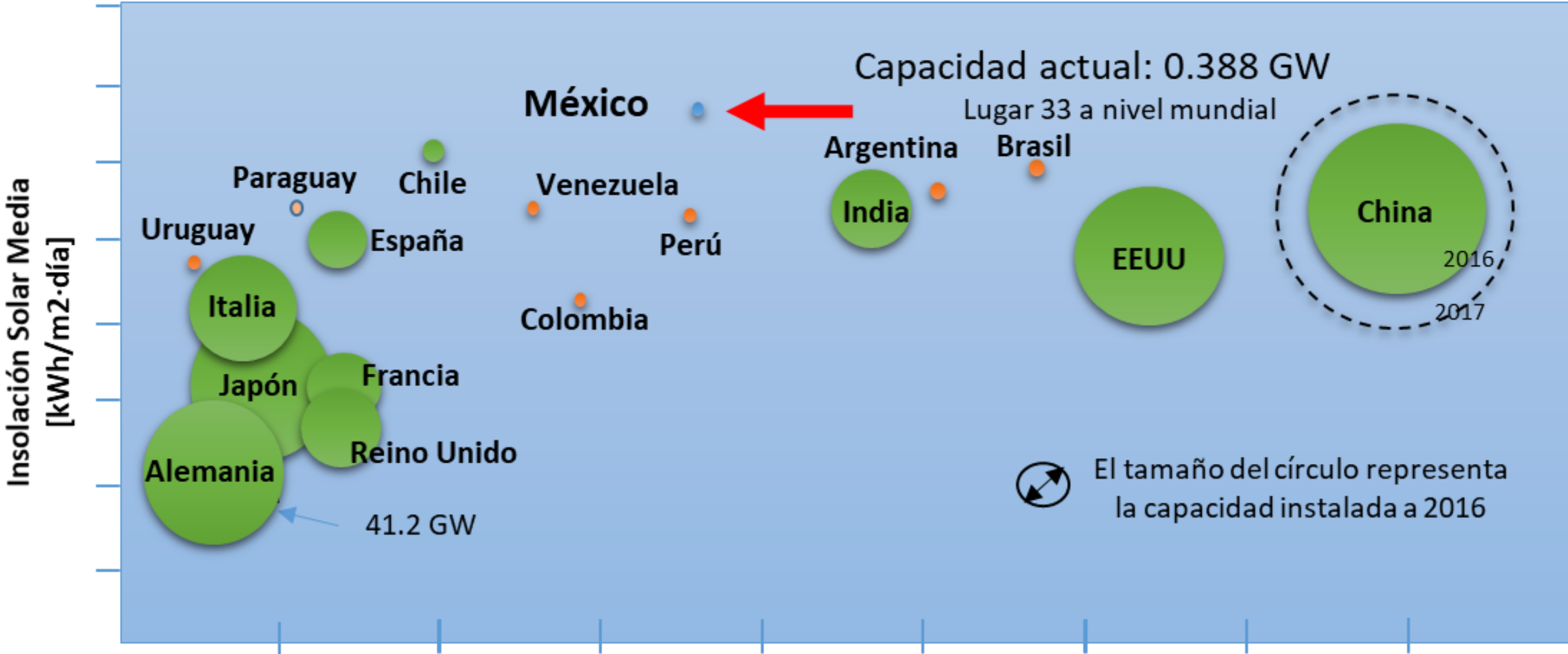
México en el Mundo 2013 (1)

Potencial Fotovoltaico, TWh/año



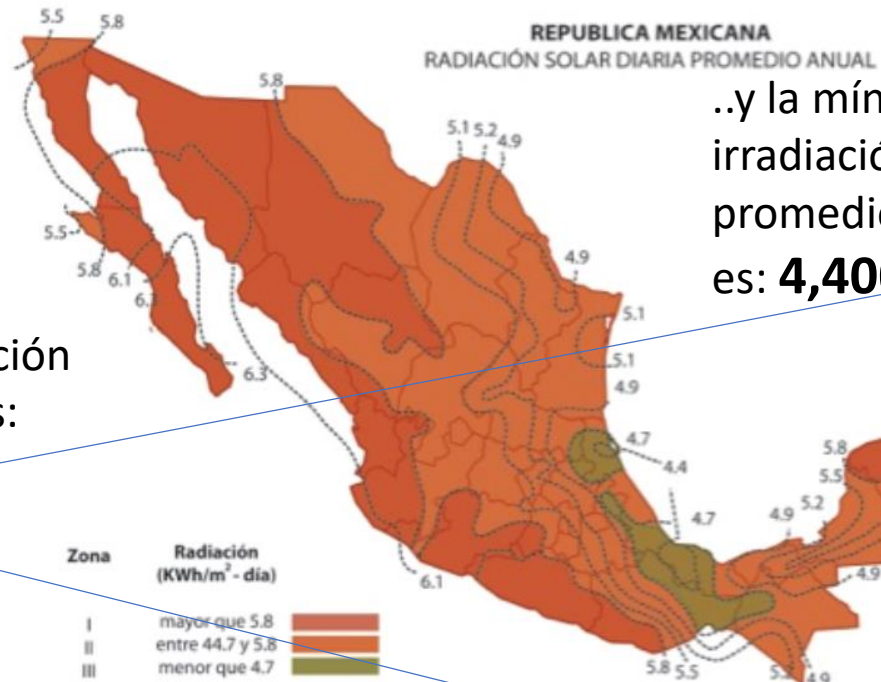
México en el Mundo 2017 (2)

Potencial Fotovoltaico, TWh/año

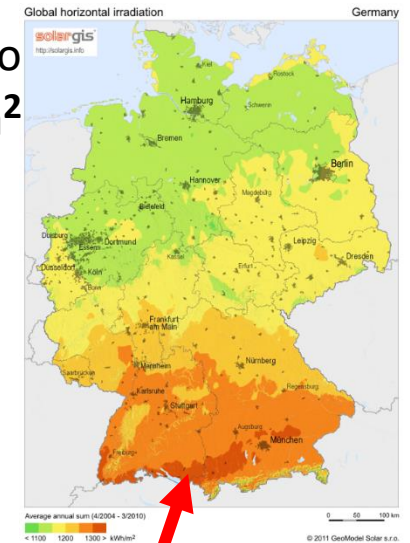


El Color de la Piel no Miente

La máxima irradiación solar en México es: **6,300 kWh/m²**



..y la mínima irradiación solar promedio en México es: **4,400 kWh/m²**



2 veces mayor que la máxima de Alemania **3,350 kWh/m² !!**

COMPARING CAPACITY BY TECHNOLOGY FORECASTS: SENER'S PRODESEN VS BNEF'S NEO

El Potencial

	2030 SENER'S PRODESEN	2030 BNEF'S NEO
Total capacity	57GW of capacity additions between 2016-2030, based on an average power demand growth of 3.4%	92.3GW between 2016-2030, given an average power demand growth of 2%
Natural gas	28.6GW of new build by 2030 (half of total).	13.1GW , as bulk of new build should come from clean energy projects

2030 SENER'S PRODESEN

2030 BNEF'S NEO

Utility-scale PV	6.8GW , almost 4x more compared to last year's PRODESEN	35.6GW , as PV project prices costs have fallen in Mexico, we expect strong build-up of new plants
Small-scale PV	Doesn't take into account distributed solar, although encourages this type of generation	19.6GW , we expect a boom of distributed solar in the coming years

Ojos

Geothermal	0.9GW	0.8GW
Biomass	0.1GW	0.9GW , given the use of potential available feedstock
Flexible capacity	Includes a 10MW battery transmission project	3.2GW , composed of batteries and demand response

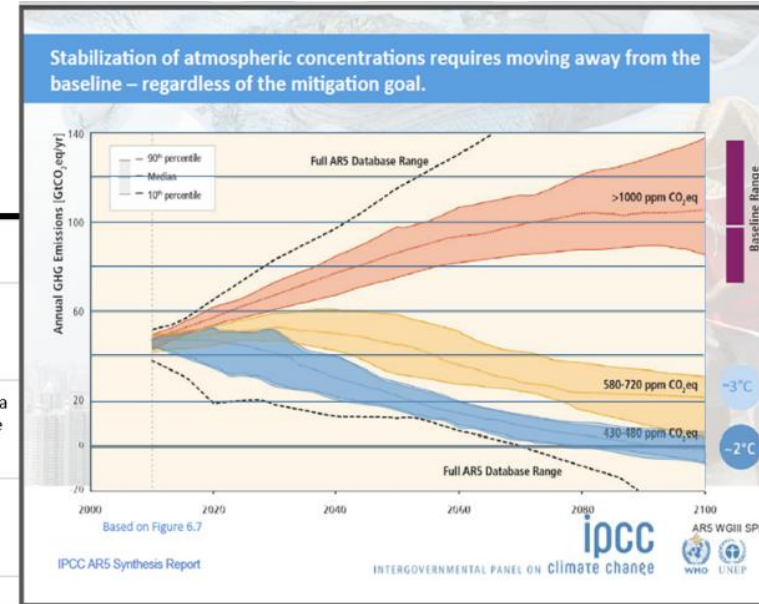
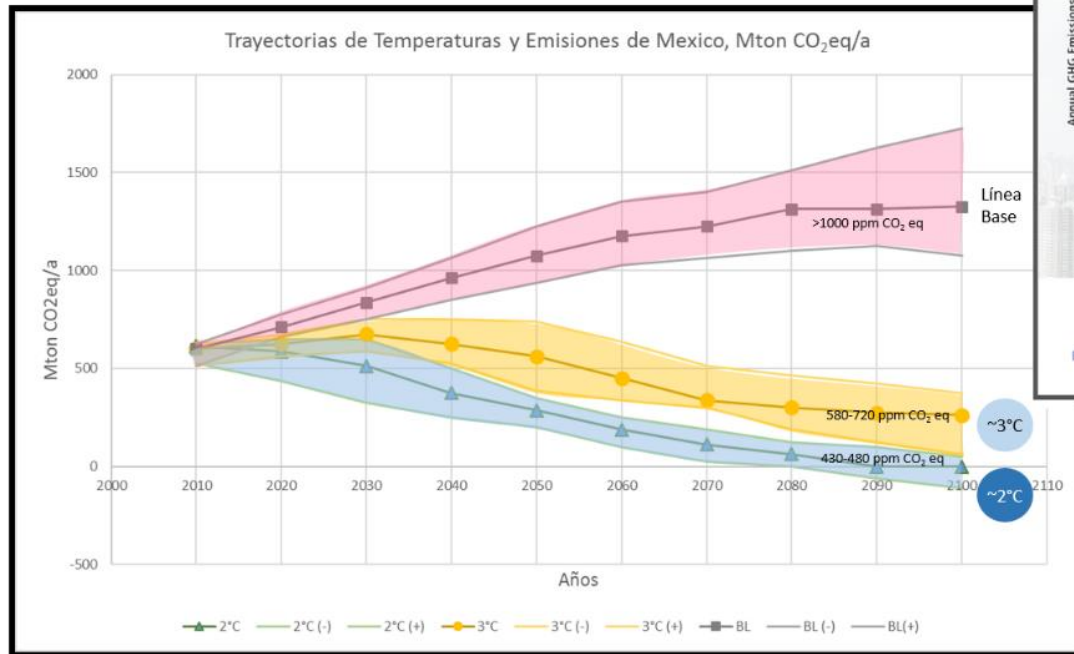
Conclusion

SENER's forecast takes into account higher power demand growth and strong build-up of gas plants in the next five years and nuclear power between 2028-2030. Its forecast for solar projects is significantly higher compared to the previous PRODESEN, but still fails to take into account small-scale and battery development. BNEF's outlook is based on lower power demand growth, but higher capacity build-up. This is due to the expected growth of utility- and small-scale solar, which have lower capacity factors compared to fossil plants.

Presupuesto CO₂eq: Global y México

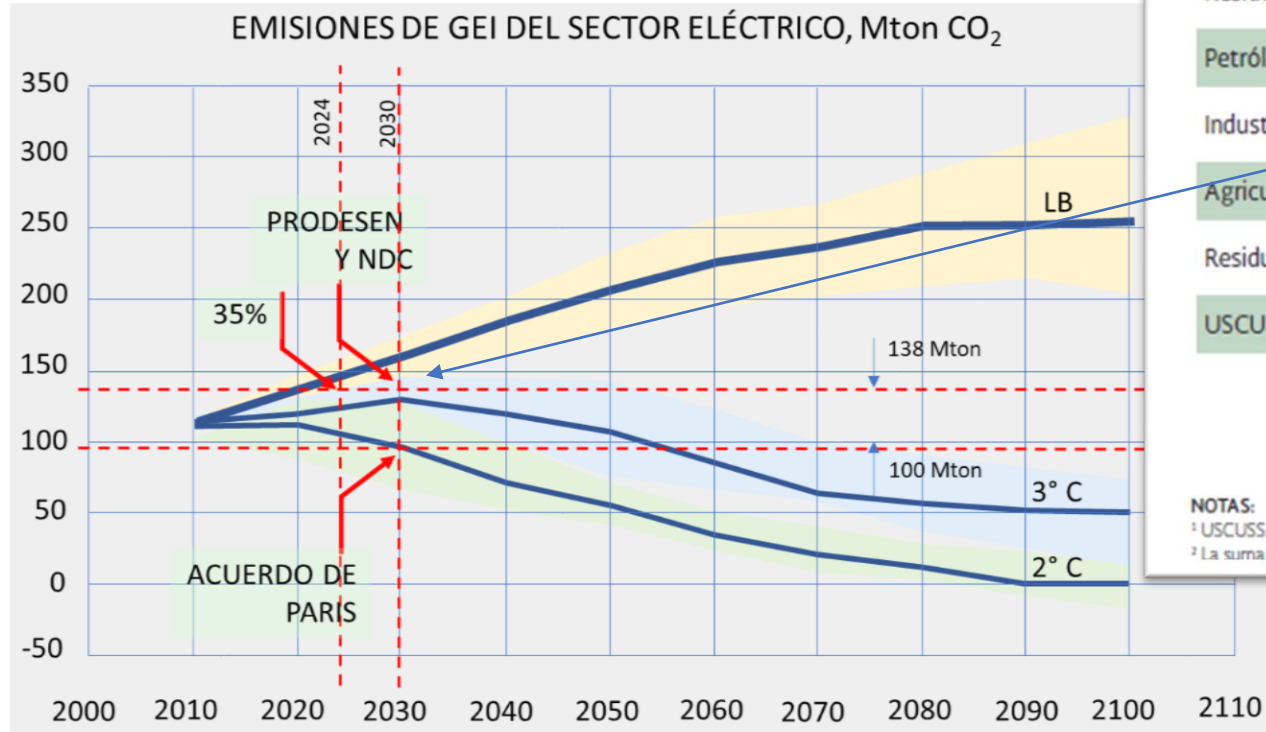
1.37%

Presupuesto de CO₂eq para México
 Límite de 2°C: ~23.6 GTonCO₂eq



Presupuesto de CO₂eq Global
 Límite de 2°C: 1,765 GTonCO₂eq

Los NDC de México



-22% GEI

	Línea base				Emisiones de GEI (MtCO ₂ e)
	2013	2020	2025	2030	Meta al 2030
Transporte	174	214	237	266	218
Generación de electricidad	127	143	181	202	139
Residencial y comercial	26	27	27	28	23
Petróleo y gas	80	123	132	137	118
Industria	115	125	144	165	157
Agricultura y ganadería	80	88	90	93	86
Residuos	31	40	45	49	35
USCUSS ¹	32	32	32	32	-14
EMISIONES TOTALES²	665	792	888	973	762

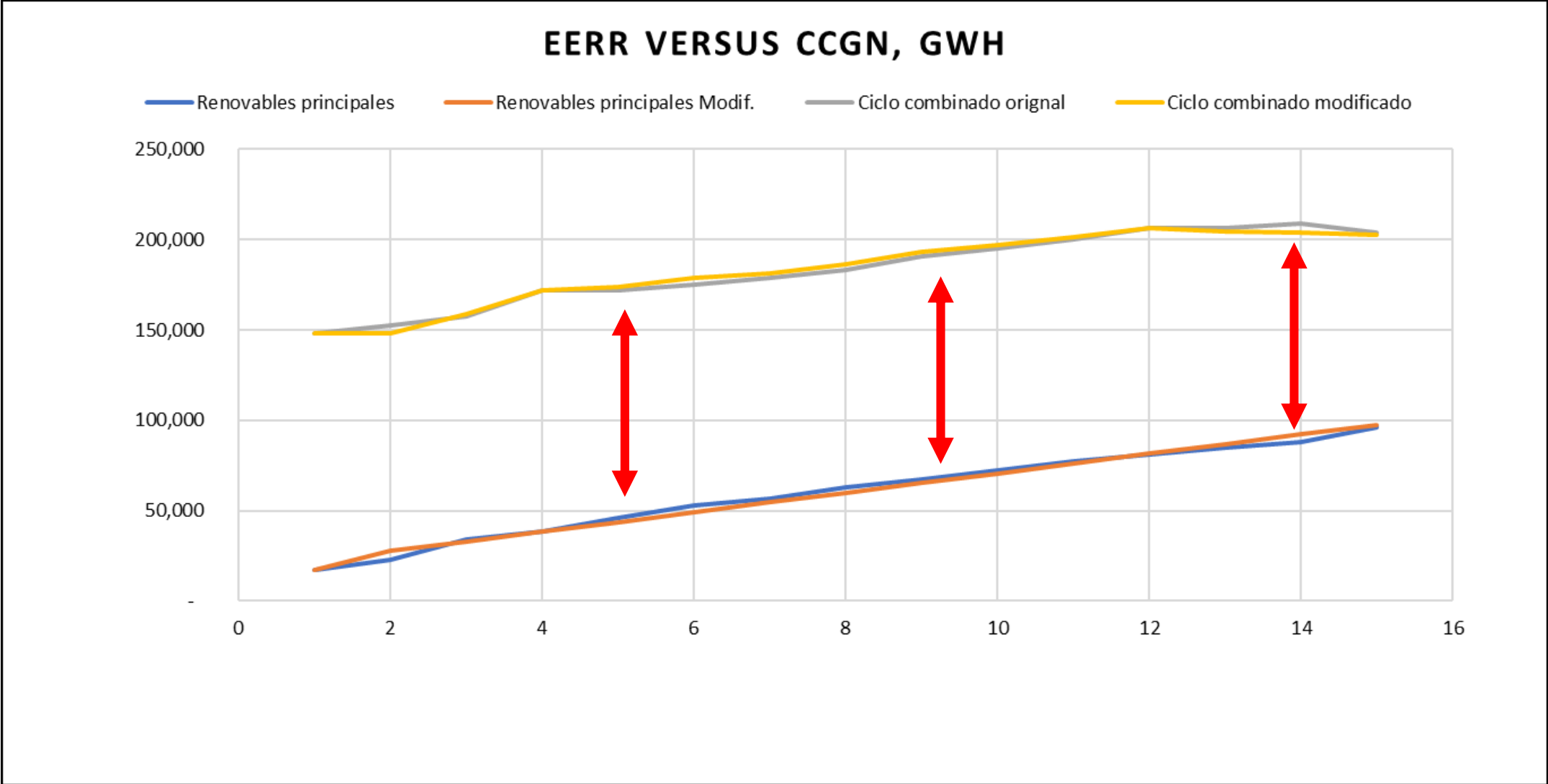
NOTAS:

¹ USCUSS: Usos del suelo, cambio de uso del suelo y silvicultura.

² La suma de los valores de los sectores puede no coincidir con el total por efectos del redondeo.

-22%

PRODESEN 2017-2031



PRODESEN 2017-2031

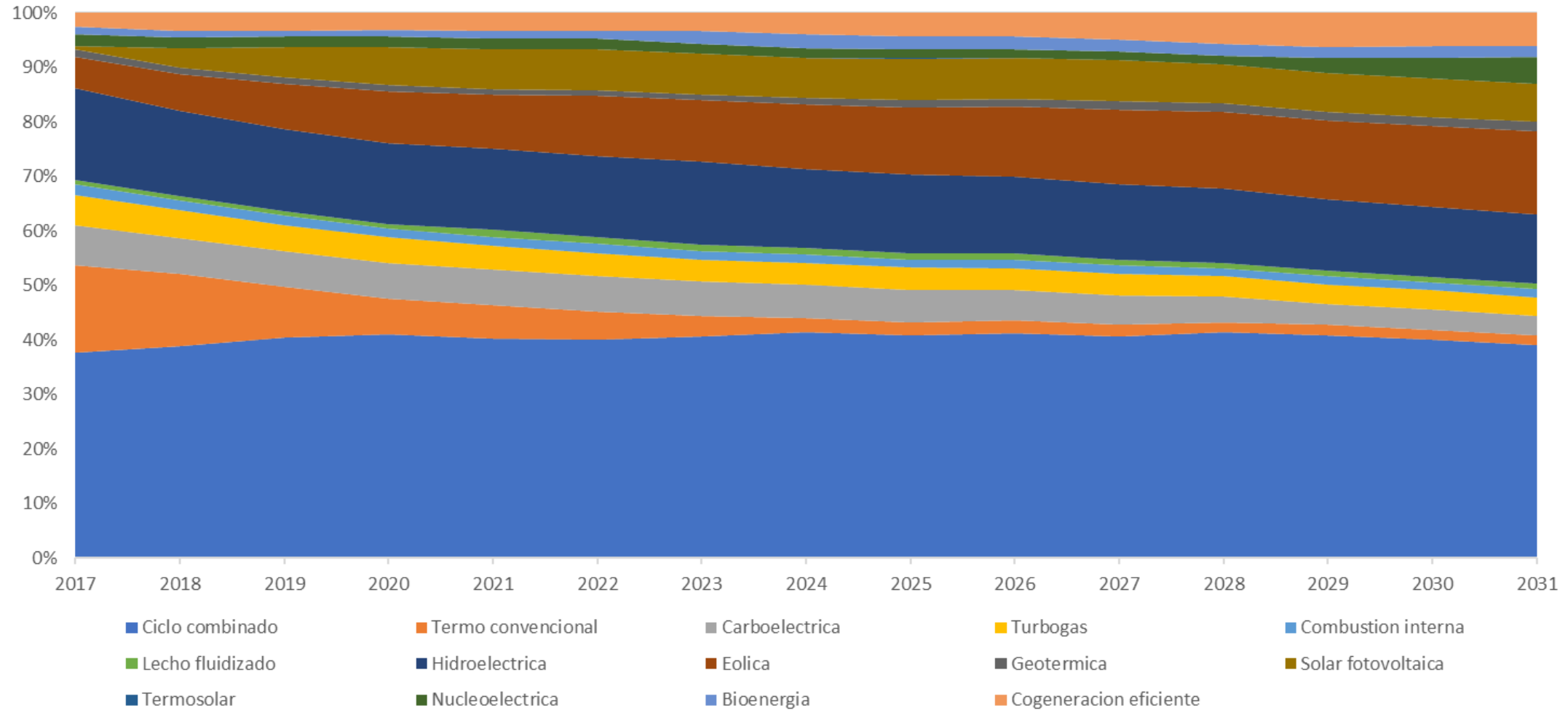
EVOLUCION DE LA CAPACIDAD INSTALADA 2017 - 2031, MW (pg 283)

Tecnologia	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Convencional	51,797	53,846	52,966	51,794	51,295	50,151	50,127	51,278	52,387	54,487	54,685	56,430	56,922	56,922	57,044
Ciclo combinado	28,094	31,498	33,697	34,714	34,404	34,173	35,400	37,432	38,202	40,165	40,704	43,107	44,181	44,181	44,181
Termo convencional	12,088	10,722	7,748	5,559	5,239	4,371	3,313	2,353	2,353	2,353	2,012	2,012	2,012	2,012	2,012
Carboelectrica	5,378	5,378									5,507	4,807	4,107	4,107	4,107
Turbogas	4,201	4,201									3,880	3,880	3,880	3,880	3,880
Combustion interna	1,456	1,467									1,541	1,583	1,701	1,701	1,823
Lecho fluidizado	580	580									1,041	1,041	1,041	1,041	1,041
Limpia	22,917	27,246									45,239	47,763	51,149	53,500	56,225
Renovable	18,406	21,985									36,503	37,987	39,138	40,128	41,493
Hidroelectrica	12,604	12,633									13,919	14,270	14,270	14,270	14,270
Eolica	4,329	5,505									13,640	14,581	15,602	16,388	17,233
Geotermica	920	930									1,589	1,671	1,701	1,731	2,146
Solar fotovoltaica	539	2,903									7,341	7,451	7,551	7,725	7,830
Termosolar	14	14									14	14	14	14	14
Otras	4,511	5,261									8,736	9,776	12,011	13,372	14,732
Nucleoelectrica	1,608	1,608	1,608	1,608	1,608	1,608	1,608	1,608	1,608	1,608	1,608	1,608	2,968	4,329	5,689
Bioenergia	956	956	956	956	1,256	1,256	2,076	2,209	2,239	2,239	2,239	2,239	2,239	2,239	2,239
Cogeneracion eficiente	1,940	2,690	2,690	2,690	2,842	2,842	2,842	3,596	3,996	4,302	4,882	5,922	6,797	6,797	6,797
Frenos regenerativos	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
TOTAL	74,714	81,092	83,391	84,617	85,277	85,289	87,117	90,301	93,700	97,571	99,924	104,193	108,071	110,422	113,269

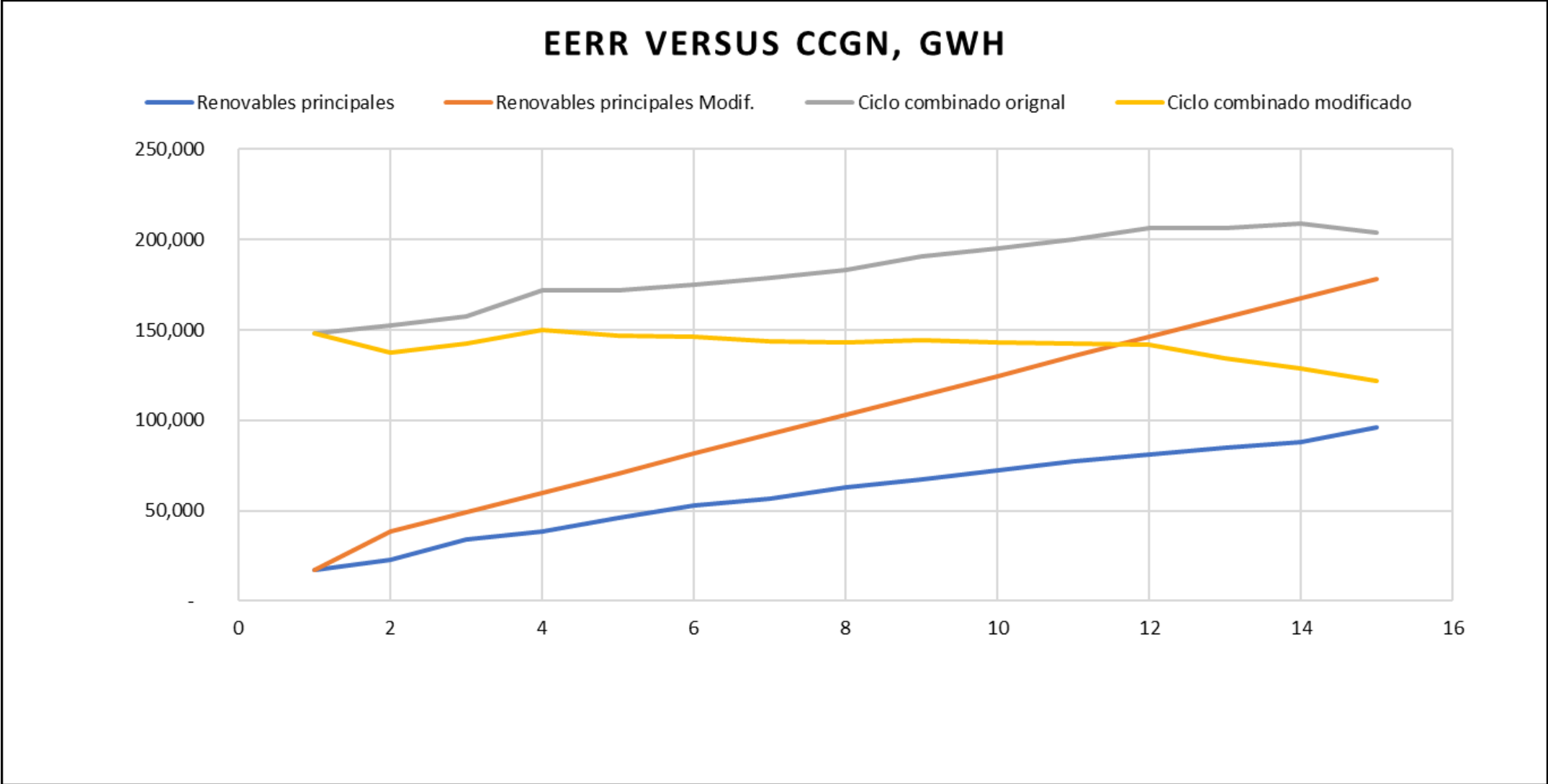
	2030	2031
Eolica	16,388	17,233
Geotermica	1,731	2,146
Solar fotovoltaica	7,725	7,830

PRODESEN 2017-2031

Capacidad PRODESEN, MW

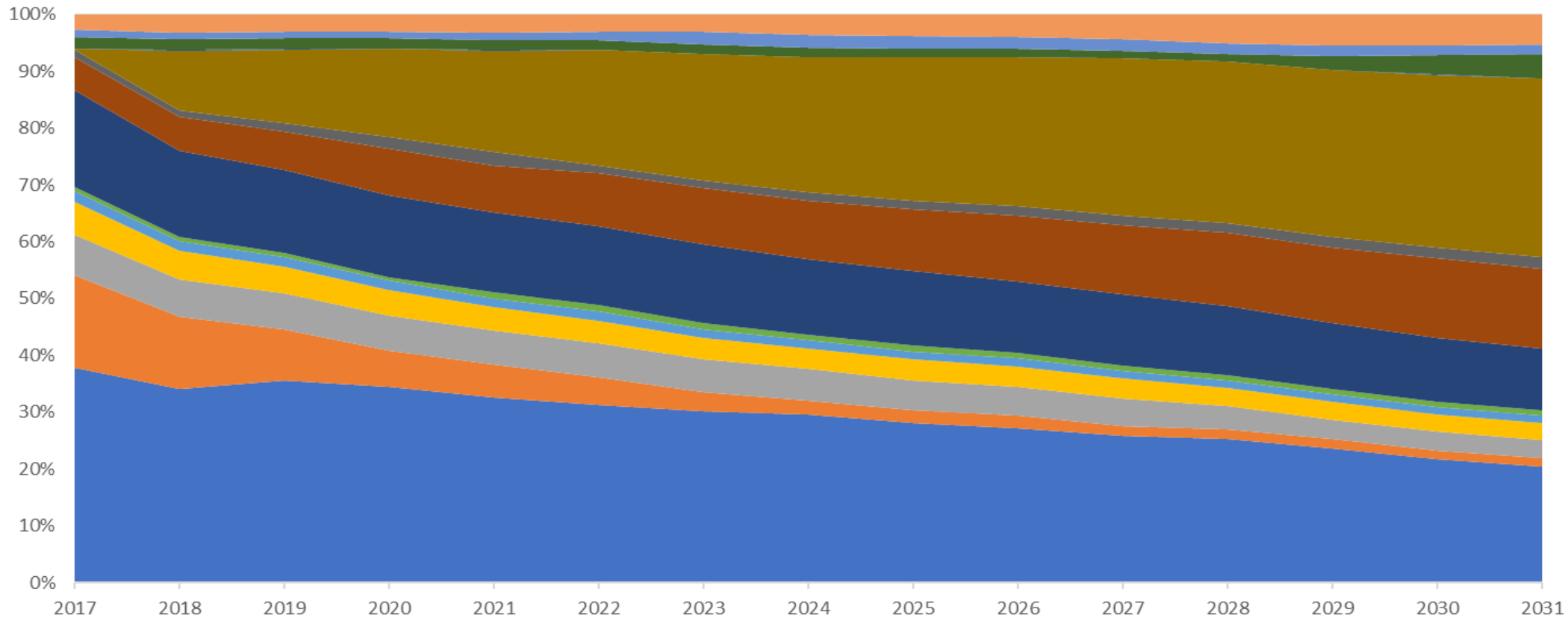


PRODESEN 2017-2031 Modificado



PRODESEN 2017-2031 Modificado

Capacidad Modificada, MW



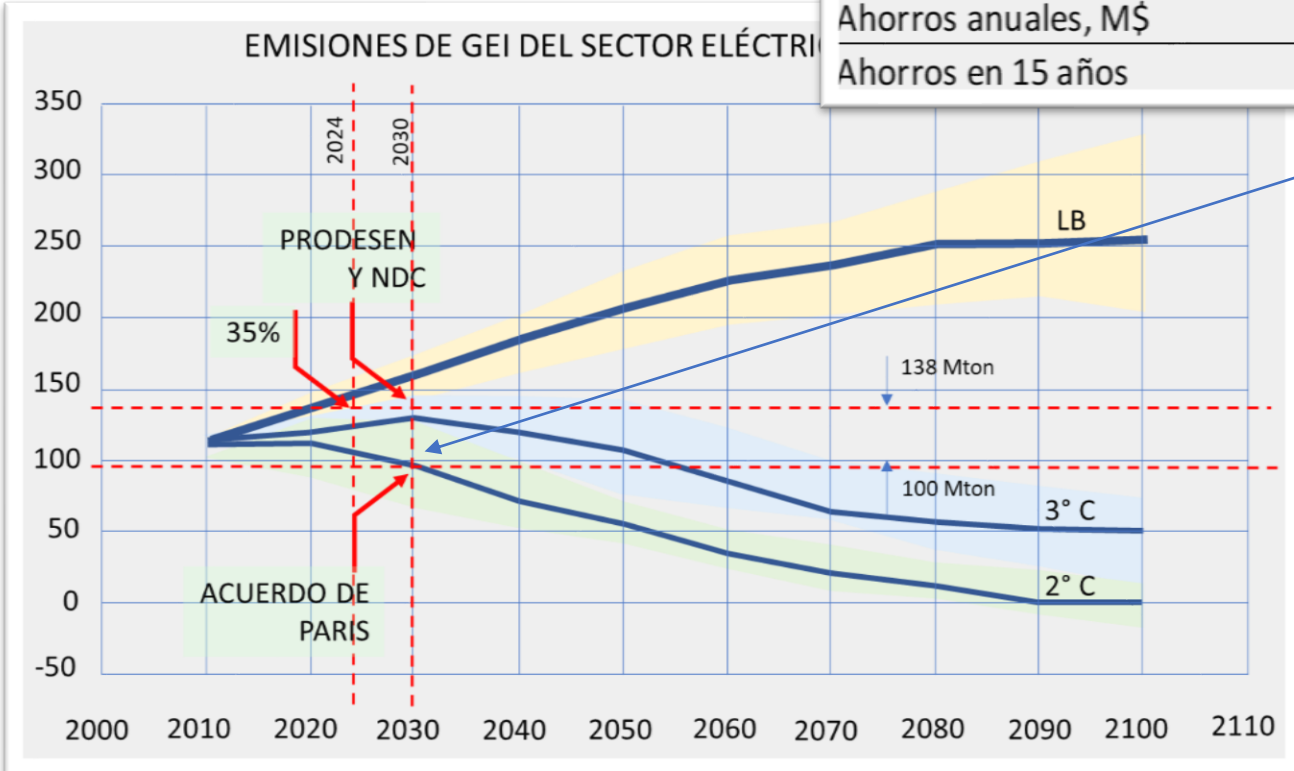
- Ciclo combinado
- Termo convencional
- Carboelectrica
- Turbogas
- Combustion interna
- Lecho fluidizado
- Hidroelectrica
- Eolica
- Geotermica
- Solar fotovoltaica
- Termosolar
- Nucleoelectrica
- Bioenergia
- Cogeneracion eficiente

PRODESEN 2017-2031 Modificado

	PRDSEN'17	2017	PRDSEN'24	2024	PRDSEN'31	2031
Ciclo combinado	28,094	28,094	37,432	29,265	44,181	26,362
Termo convencional	12,088	12,088	2,353	2,353	2,012	2,012
Carboelectrica	5,378	5,378	5,507	5,507	4,107	4,107
Turbogas	4,201	4,201	3,541	3,541	3,880	3,880
Combustion interna	1,456	1,456	1,404	1,404	1,823	1,823
Lecho fluidizado	580	580	1,041	1,041	1,041	1,041
Hidroelectrica	12,604	12,604	13,176	13,176	14,270	14,270
Eolica	4,329	4,329	10,710	10,083	17,233	18,191
Geotermica	920	920	1,121	1,444	2,146	2,525
Solar fotovoltaica gran escala	539	168	6,582	23,516	7,830	40,718
Solar fotovoltaica GD		-		-		-
Termosolar	14	14	14	14	14	14
Nucleoelectrica	1,608	1,608	1,608	1,608	5,689	5,689
Bioenergia	956	956	2,209	2,209	2,239	2,239
Cogeneracion eficiente	1,940	1,940	3,596	3,596	6,797	6,797
TOTALES	74,714	74,336	90,301	98,756	113,269	129,667
Capacidad adicional		(378)		8,455		16,398

PRODESEN 2017-2031 Modificado

Porcentaje de limpias	23.3%	23.3%	37.0%	47.7%	37.0%	63.9%
Porcentaje de renovables	5.8%	5.8%	16.8%	27.5%	16.8%	39.1%
Emisiones de GEI	131.0	131.0	135.0	118.2	138.0	103.7
Emisiones mitigadas		0.0		16.8		34.3
Ahorros anuales, M\$	\$	-	\$	8,246	\$	17,727
Ahorros en 15 años						\$ 131,446

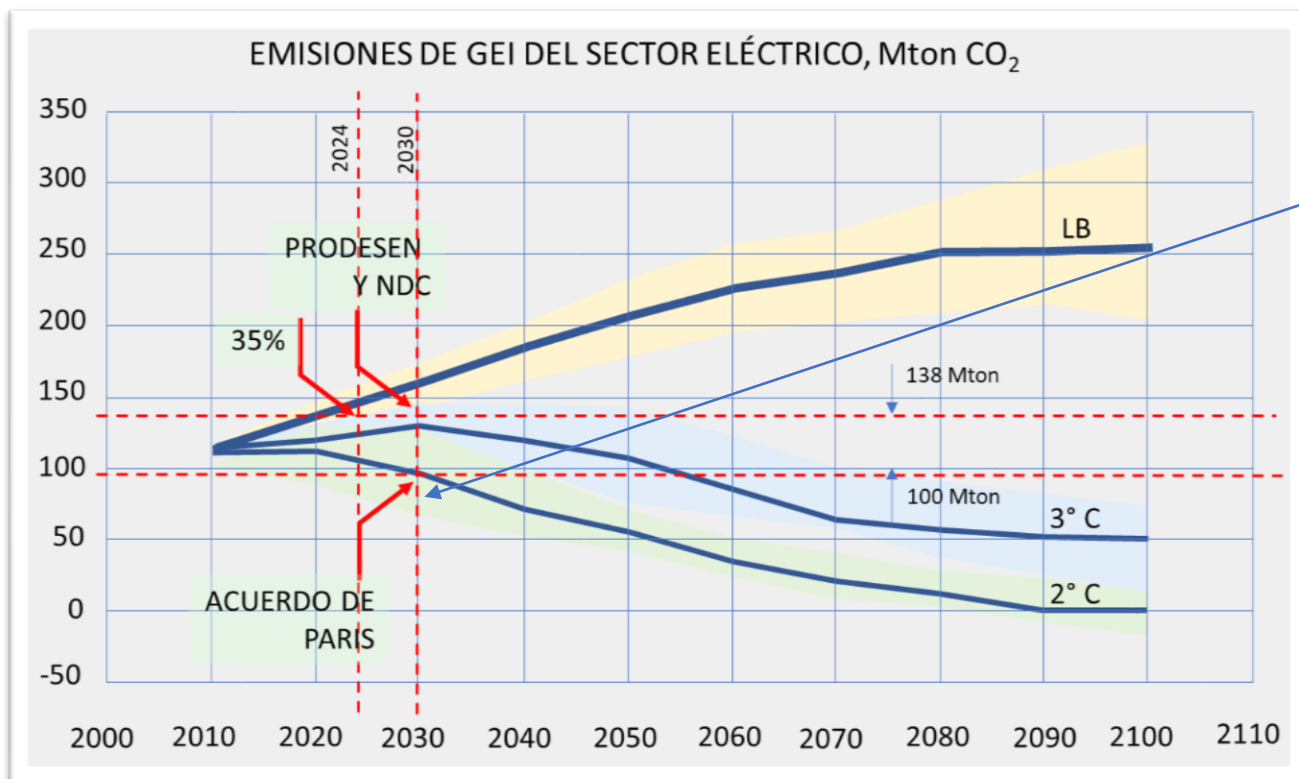


PRODESEN Modificado con Bono Solar

	PRDSEN'17	2017	PRDSEN'24	2024	PRDSEN'31	2031
Ciclo combinado	28,094	28,087	37,432	28,333	44,181	21,554
Termo convencional	12,088	12,088	2,353	2,353	2,012	2,012
Carboelectrica	5,378	5,378	5,507	5,507	4,107	4,107
Turbogas	4,201	4,201	3,541	3,541	3,880	3,880
Combustion interna	1,456	1,456	1,404	1,404	1,823	1,823
Lecho fluidizado	580	580	1,041	1,041	1,041	1,041
Hidroelectrica	12,604	12,604	13,176	13,176	14,270	14,270
Eolica	4,329	4,329	10,710	10,083	17,233	18,191
Geotermica	920	920	1,121	1,444	2,146	2,525
Solar fotovoltaica gran escala	539	168	6,582	23,516	7,830	40,718
Solar fotovoltaica GD		23		2,894		14,067
Termosolar	14	14	14	14	14	14
Nucleoelectrica	1,608	1,608	1,608	1,608	5,689	5,689
Bioenergia	956	956	2,209	2,209	2,239	2,239
Cogeneracion eficiente	1,940	1,940	3,596	3,596	6,797	6,797
TOTALES	74,714	74,352	90,301	100,719	113,269	138,926
Capacidad adicional		(362)		10,418		25,657

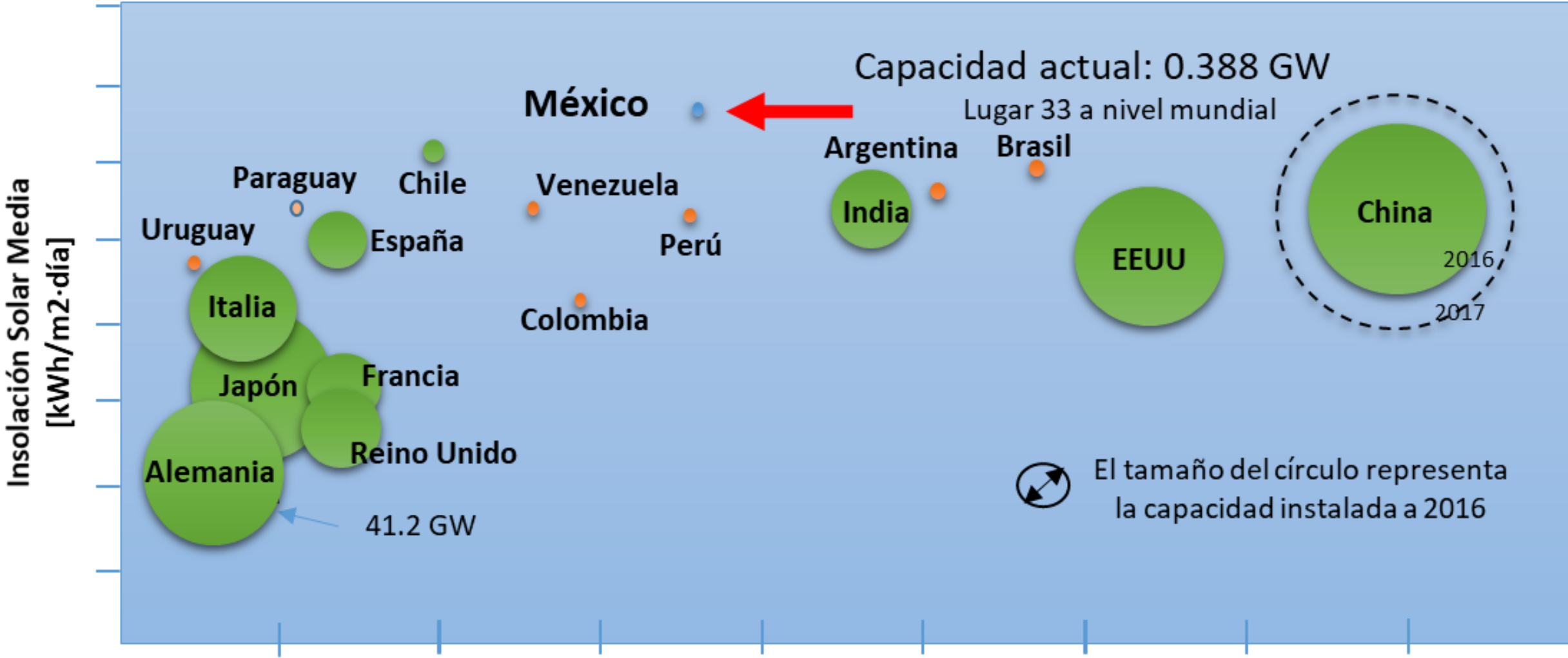
PRODESEN Modificado con Bono Solar

Porcentaje de limpias	23.3%	23.3%	37.0%	48.9%	37.0%	68.7%
Porcentaje de renovables	5.8%	5.8%	16.8%	28.7%	16.8%	43.9%
Emisiones de GEI	131.0	131.0	135.0	116.3	138.0	94.5
Emisiones mitigadas		0.0		18.7		43.5



México en el Mundo 2017 (2)

Potencial Fotovoltaico, TWh/año



Gracias

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