China's Move and Modeling for Next 5 years

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Zero-Carbon Energy Development

- Solar PV: 2010-2019 205GW newly increased capacity; 2020-2022, 195GW; 2023, 210GW; 2024, 277GW; 2025 by end of May, 198GW, estimated by State Grid to be 380GW in 2025
- Solar Thermal: 838MW by end of 2024
- Wind, 120GW in 2025
- Offshore wind: 43.5GW by May 2025
- Nuclear: 10units approved by State Council in 2022, 2023, 11 in 2024, 10 in March 2025

Zero-Carbon transport

- New energy car could be more than 16million sale in China in 2025, accounts for 55% to 60% of total vehicle sale
- Heavy duty truck sale in 1st quarter in 2025 increased 380%, and it maybe much more faster than car for fully electrified, because more than 70% of heavy duty truck owned by family based small companies
- Lower income family is buying electric car and truck

Zero-Carbon Industry

- Green hydrogen based ammonia, methanol are developing rapidly
- Hydrogen based steel making pilot projects are operating
- Demand for green methanol, and bio-jet fuel is increasing quickly
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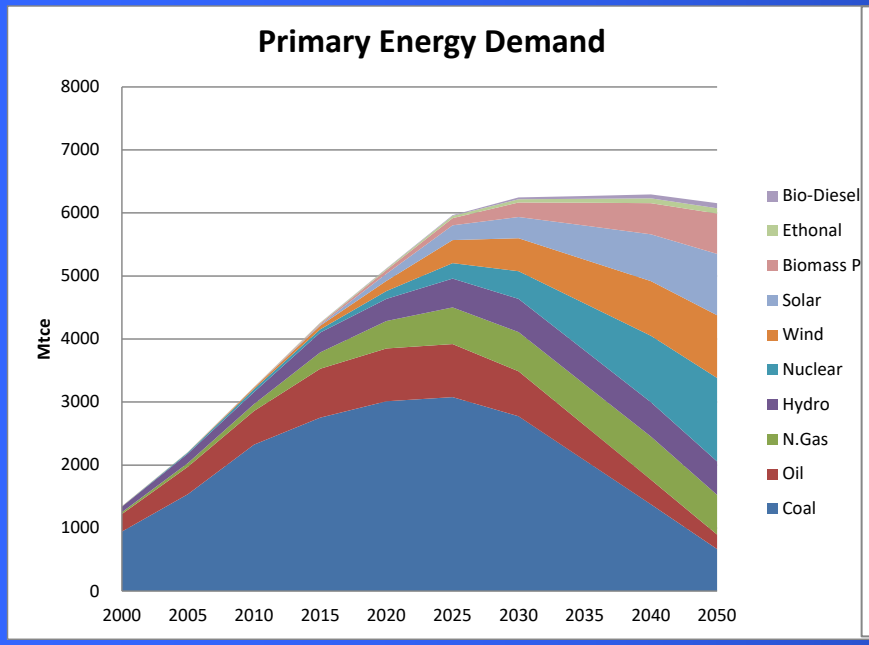
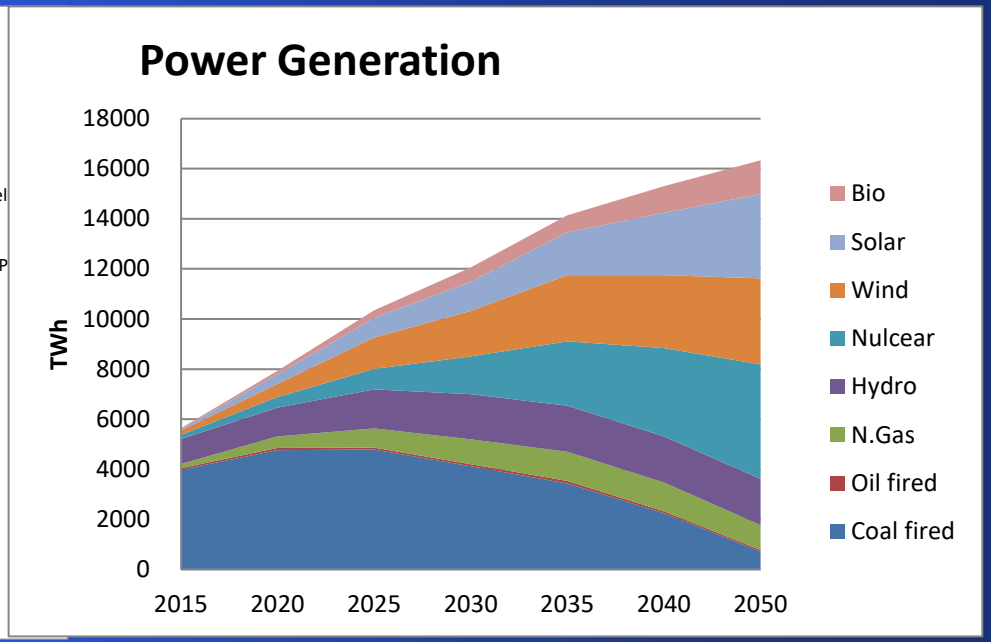
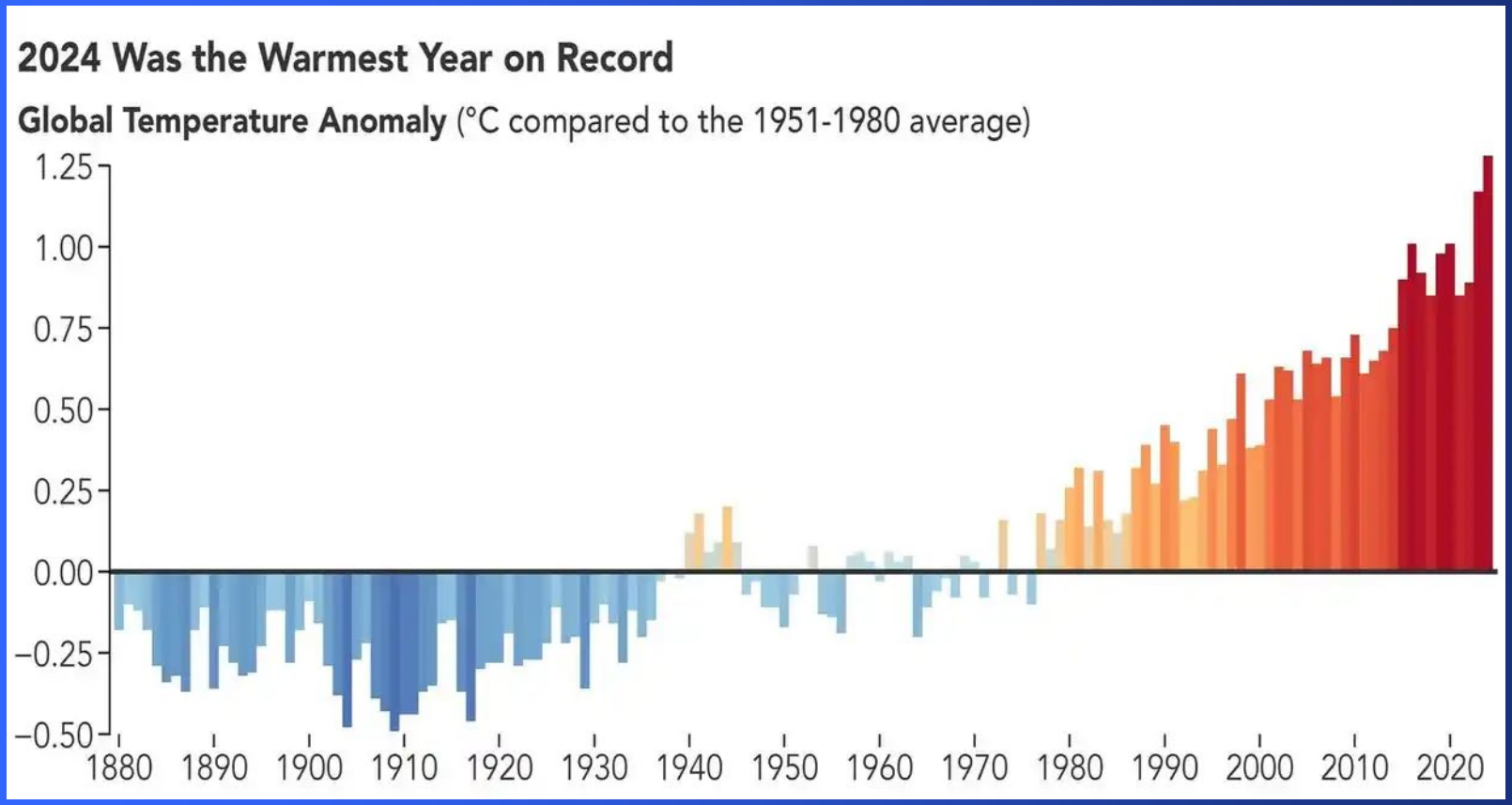
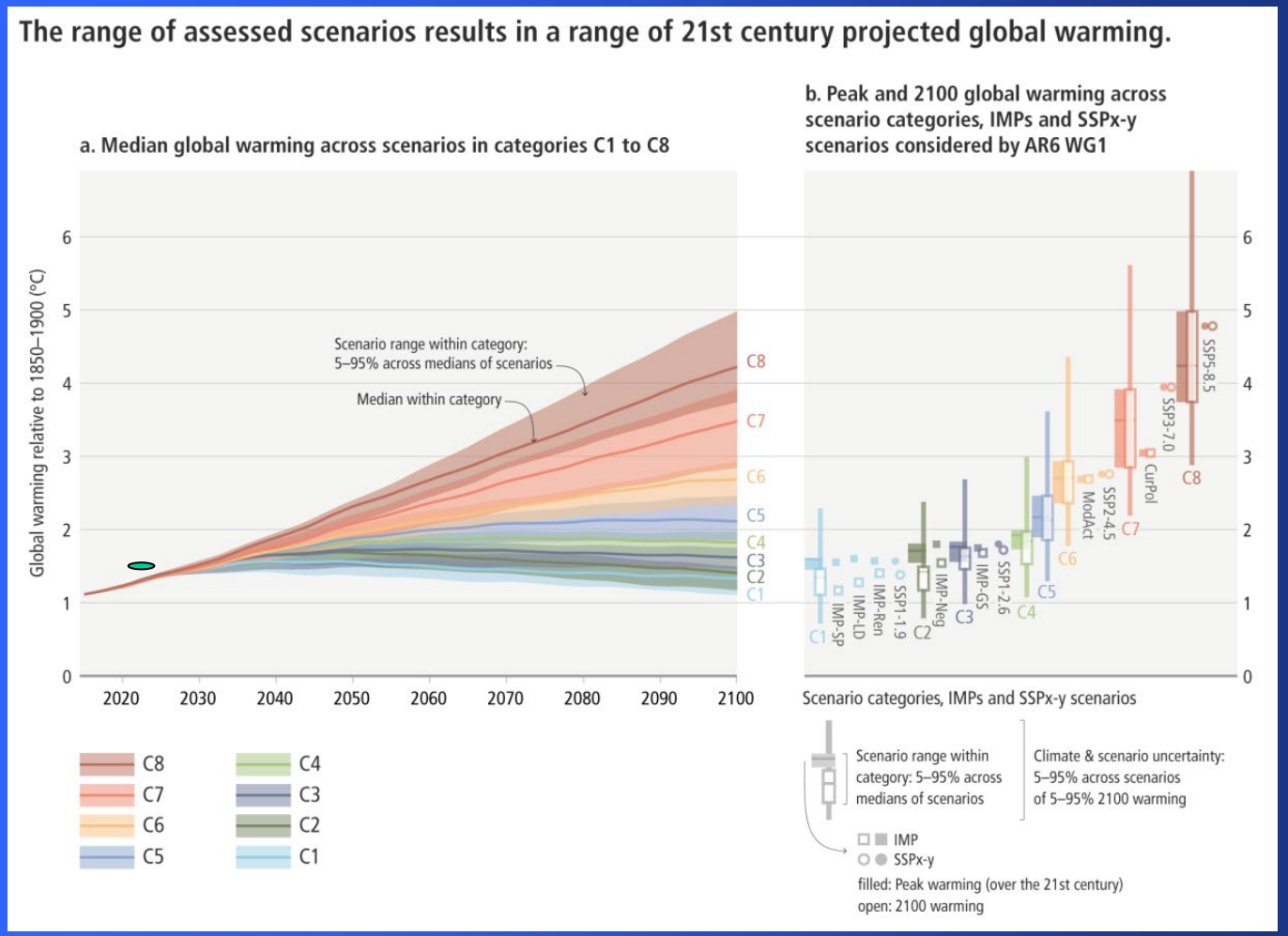
It is good for low income families

Energy Transition in the Carbon Neutrality Target

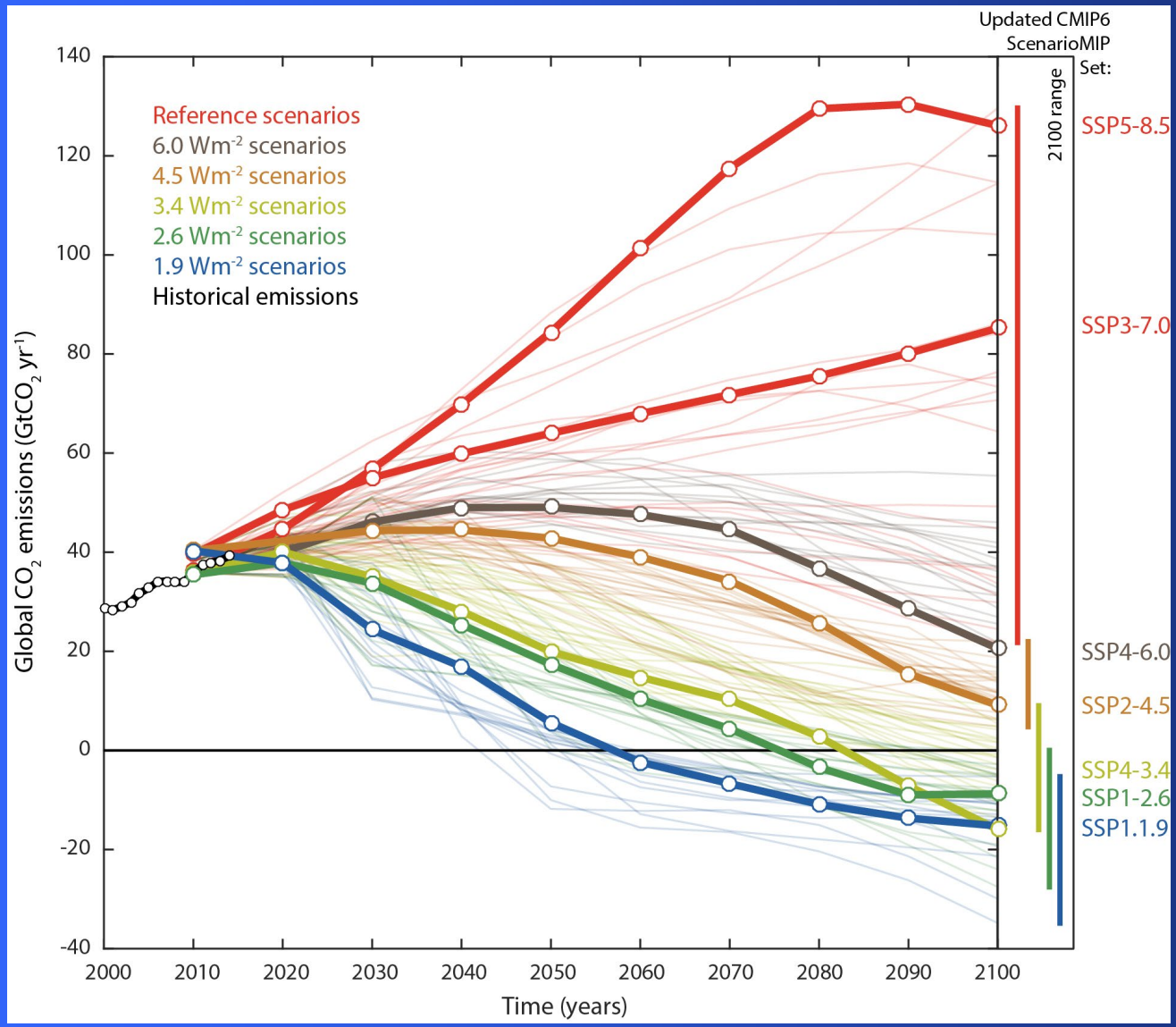





2024 Was the Warmest Year on Record
Global Temperature Anomaly (°C compared to the 1951-1980 average)
1.25
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020


The range of assessed scenarios results in a range of 21st century projected global warming.
a. Median global warming across scenarios in categories C1 to C8
b. Peak and 2100 global warming across scenario categories, IMPs and SSPx-y scenarios considered by AR6 WG1
Global warming relative to 1850–1900 (°C)
Scenario range within category: 5–95% across medians of scenarios
Median within category
C8
C7
C6
C5
C4
C3
C2
C1
2020
2030
2040
2050
2060
2070
2080
2090
2100
IMP-SP
IMP-LD
IMP-Ren
SSP1-1.9
IMP-Neg
IMP-GS
SSP1-2.6
ModAct
SSP2-4.5
CurPol
SSP3-7.0
SSP5-8.5
Scenario categories, IMPs and SSPx-y scenarios
Scenario range within category: 5–95% across medians of scenarios
Climate & scenario uncertainty: 5–95% across scenarios of 5–95% 2100 warming
IMP
SSPx-y
filled: Peak warming (over the 21st century)
open: 2100 warming

Global CO2 Emissions, IPCC 1.5C Report



Policy Progress After Carbon Neutrality Target Setting

- After Sep. 22, 2020, more than 10 times meetings in top leading committee on carbon peaking and neutrality
- Jan. 24, 2022, study session of the Political Bureau of the CPC, solid implementation of decisions, arrangements on carbon peaking, neutrality
- Oct. 27, 2021, The State Council realized Action Plan for Carbon Dioxide Peaking Before 2030
- 1+N policy package: National action plan, and 7 sectoral action plan on carbon peaking

20th Studding session of CCP: strong promote new energy high quality development

- Strongly promote new energy is the way to facing challenges
- Integrate energy security and new energy development
- Need planning, top framework design
- develop energy infrastructure including electricity grid
- China is becoming the driver of global energy transition and response to climate change

Key energy policies

- Green electricity market established in May 2021
- Pricing regulation for peak/off-peak load power generation: 4 fold for peak load power generation
- Additional renewable energy outside the mandated amount for provinces could be outside the duel-control on energy use
- Promote green-hydrogen based industry(2022)
- Power generation capacity based electricity pricing(2023)

Key energy policies in 2025

- Direct transition line to users
- Green electricity sale to next door
-
- Zero-carbon industry zone development

Provinces with peak load and off peak load price

中午执行谷段销售电价的省份			
序号	省份	低谷时间段	时长(h)
1	青海	9:00~17:00	8
2	宁夏	9:00~17:00	8
3	甘肃	10:00~16:00	6
4	山东（3-5月、9-11月）	10:00~15:00	5
5	蒙东	11:00~14:00	3
6	新疆	13:00~17:00	4
7	河北（6、7、8月份除外）	12:00~14:00	2
8	河南（3-5月、9-11月）	11:00~14:00	3
9	浙江（2-6月、9-11月）	11:00~13:00	2
	浙江（重大节日）	10:00~14:00	4
10	山西	11:00~13:00	2
11	湖北	12:00~14:00	2
12	辽宁	11:30~12:30	1
13	陕西（征求意见）	11:00~15:00	4
14	江苏（重大节日）	11:00~15:00	4
15	江西（重大节日）	12:00~14:00	2
16	贵州（重大节日）	13:00~15:00	2

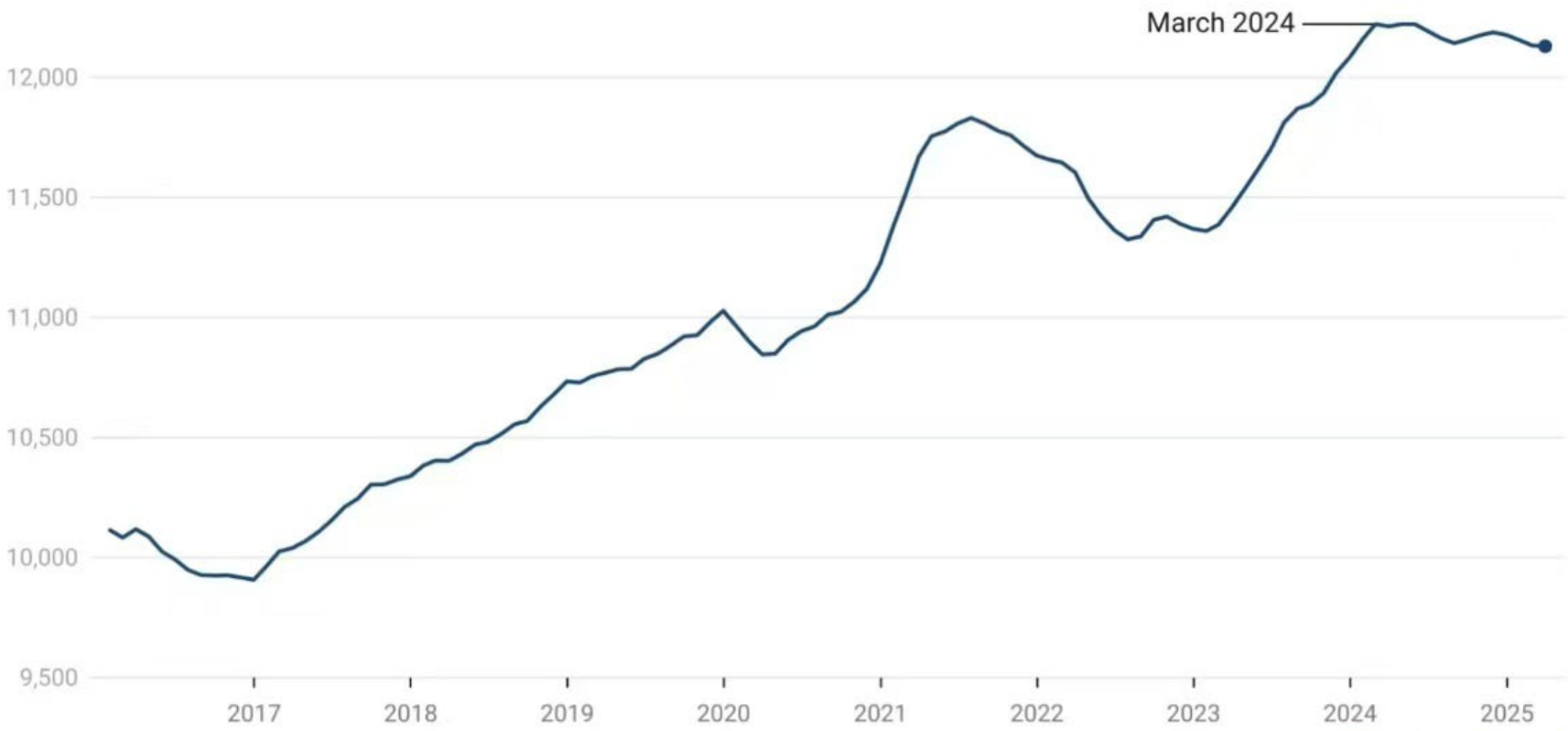
Prices of electricity in different province

2024年7月份各地电价（10千伏两部制电价）
元/kWh

区域	省市	尖峰	高峰	平时段	低谷	深谷
华北	北京	1.05778	0.92684	0.68134	0.43583	
	冀北	1.03370	0.89145	0.59857	0.30569	
	河北南	1.08085	0.93944	0.64831	0.35718	
	山西	0.89662	0.77930	0.55933	0.35768	
	山东	1.15877	1.01237	0.67017	0.32827	0.23057
	天津	1.18617	1.01067	0.71817	0.40237	
华中	江西	0.98091	0.98091	0.67054	0.36017	
	湖北	1.09240	0.86050	0.63770	0.38760	
	河南	1.32824	1.12883	0.71146	0.39263	
	湖南	1.32391	1.11097	0.71170	0.31243	
	四川	0.82328	0.69089	0.44267	0.19445	
	重庆	1.29196	1.09321	0.72053	0.33544	
华东	上海	1.60730	1.30110	0.75660	0.34820	
	浙江	1.35080	1.12570	0.68220	0.25930	
	江苏	1.35920	1.13270	0.65870	0.27570	
	安徽		1.15400	0.66520	0.30690	
	福建	0.98029	0.88318	0.62717	0.34909	
东北	内蒙古东	1.02528	0.92823	0.73183	0.58163	0.55390
	黑龙江	1.08256	0.91237	0.62873	0.34508	
	吉林	1.16448	0.98467	0.68498	0.38529	
	辽宁	1.03458	0.84217	0.58563	0.32908	
西北	宁夏		0.59879	0.41659	0.30449	
	陕西-陕西电网	1.09267	0.91813	0.58083	0.24352	
	陕西-榆林电网	1.04750	0.87930	0.55420	0.22910	
	新疆	0.65735	0.59432	0.38838	0.22494	0.19200
	青海		0.45653	0.32290	0.18503	
	甘肃		0.57898	0.43562	0.29348	
南网	广东-珠三角五市	1.41687	1.13887	0.68137	0.27617	
	广东-惠州	1.36067	1.09397	0.65497	0.26607	
	广东-江门	1.40867	1.13237	0.67757	0.27467	
	广东-东西两翼地区	1.23517	0.99357	0.59587	0.24367	
	广东-粤北山区	1.13117	0.91037	0.54697	0.22507	
	云南	0.55820	0.50008	0.40322	0.30636	
	广西		0.86996	0.64492	0.41988	
	贵州		0.95644	0.60727	0.25811	
	海南	1.41914	1.20143	0.75320	0.36900	

China's CO2 emissions drop due to clean energy for first time

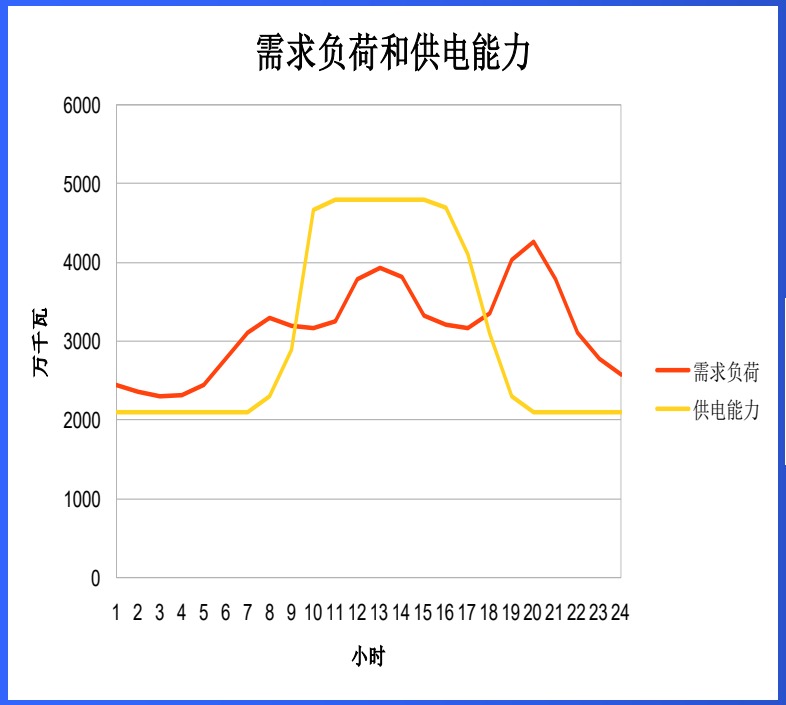
Emissions from fossil fuels and cement, MtCO2, rolling 12-month totals



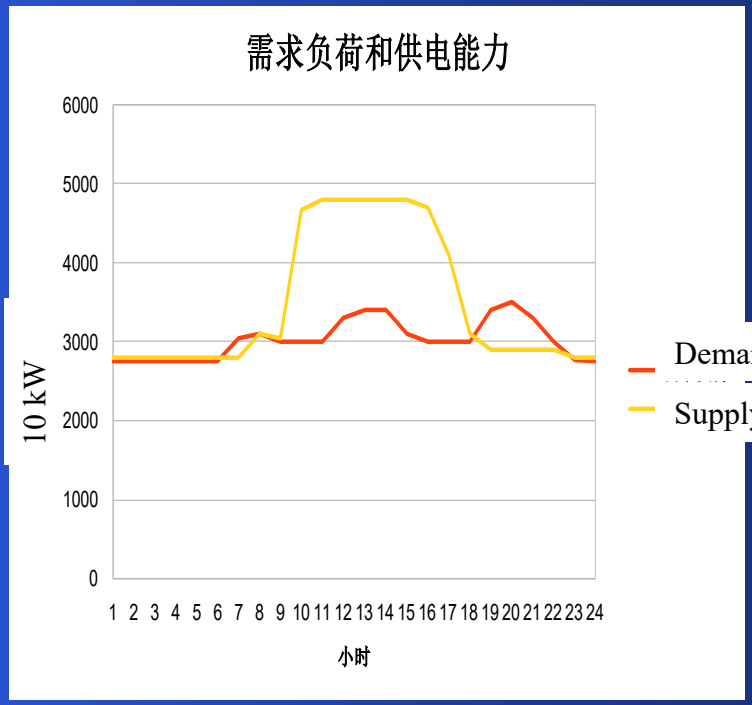
Source: Analysis by Lauri Myllyvirta for Carbon Brief

CarbonBrief
CLEAR ON CLIMATE

Power supply and demand load curve in Beijing for selected two days in 2050



Summer day



Winter day

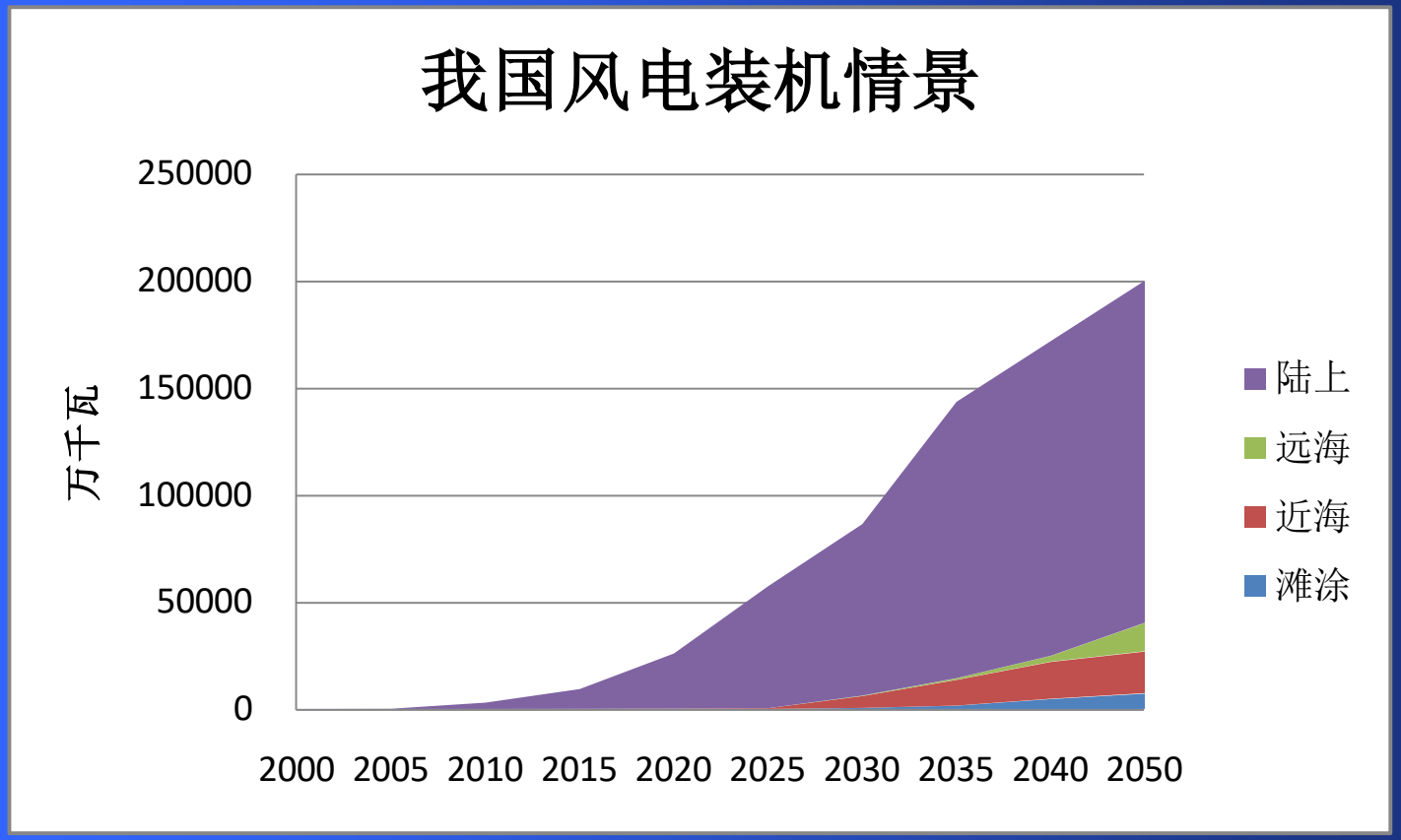
Off-shore Wind Resources

	Technical Potential	In which low cost
Tidal flat	120GW	100GW
Near shore	670GW	180GW
Deep sea	1400GW	500GW

Off-shore wind Fixed Cost, yuan/kW

	Type of turbine	2035	2050
Tidal flat	10MW	5100	5000
	22MW	5000	4200
Near shore	16MW	7300	6200
	26MW	7100	5700
Deep sea	16MW	9300	8200
	26MW	9300	7400
	35MW	10300	6600

Wind power scenario in China, 10MW



Off-shore wind Cost and price, yuan/kW

Cost	Type of offshore wind	2035	2050
LCOE	Beach	0.073	0.063
	Near sea	0.088	0.083
	Far sea	0.101	0.079
Cost with pay back period	Beach	0.182	0.159
	Near sea	0.157	0.147
	Far sea	0.178	0.140

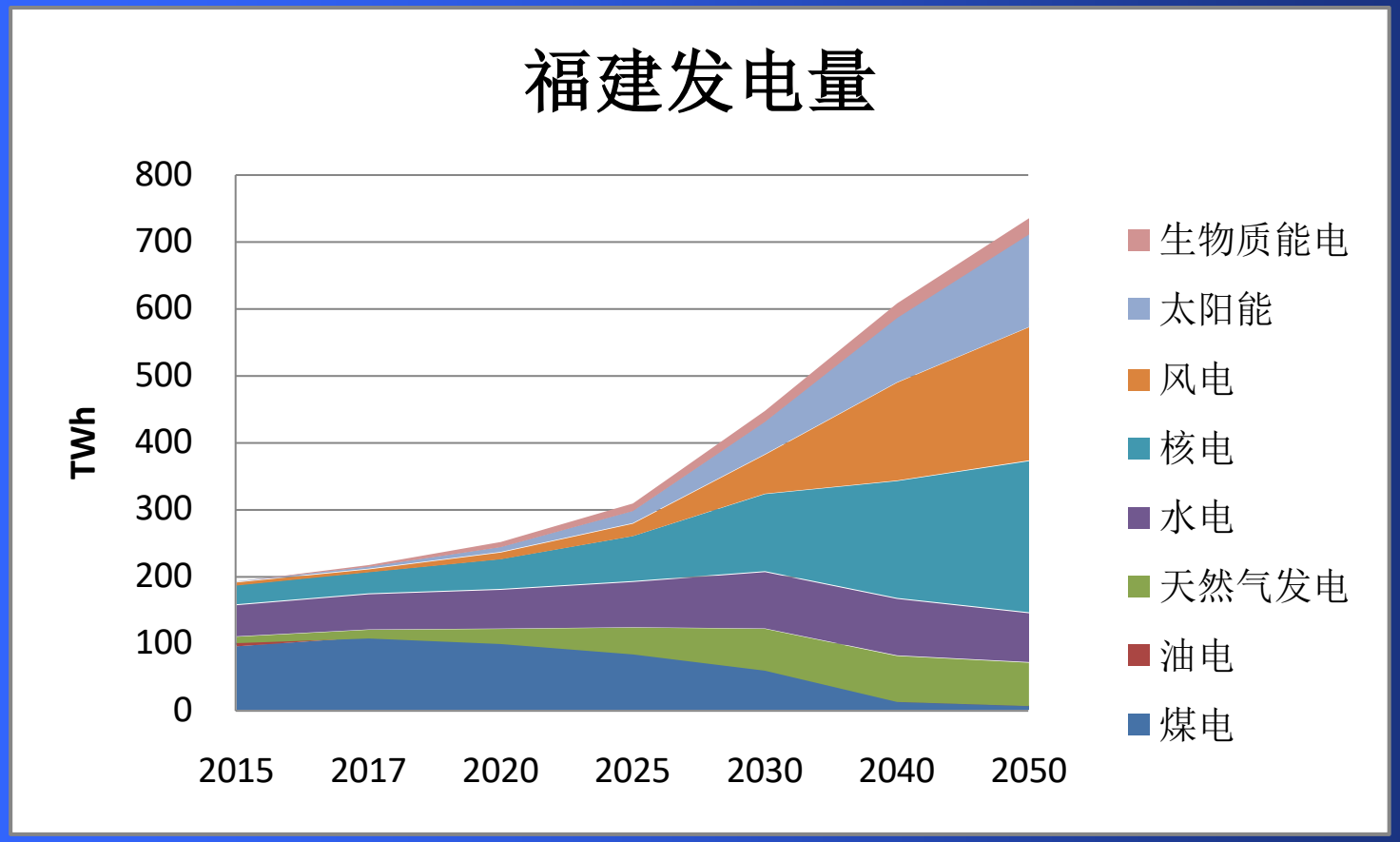
Cost of Green Hydrogen and Price, Yuan/kg

	2025	2035	2050
均化成本（LCOH）	16.5	7.04	6.60
收益价格	21.1	10.71	10.06

Green Ammonia Cost and Price, yuan/t

	2025	2035	2050
LC	2960	1350	1267
Price	4480	2113	1990

Power generation in Fujian Province



Electricity price scenario in Fujian Province Yuan/ kWh

	2025	2030	2035	3040	2050
Nuclear	0.42	0.41	0.38	0.35	0.37
Hydro	0.35	0.35	0.35	0.35	0.35
Off-shore wind	0.31	0.27	0.25	0.23	0.20
On shore wind	0.39	0.36	0.32	0.31	0.30
Solar PV	0.36	0.32	0.28	0.27	0.26
Coal fired Power	0.42	0.42	0.43	0.52	0.62
Gas fired power	0.51	0.51	0.51	0.54	0.57
Biomass power	0.75	0.75	0.75	0.75	0.75
Pumped hydropower	0.79	0.71	0.63	0.59	0.56
Chemical battery storage	0.89	0.81	0.72	0.68	0.64
Average grid price	0.43	0.42		0.37	0.34
Average industry electricity price	0.67	0.66		0.61	0.58
Contribution of off-shore wind on the reduction				0.02	0.05

A perfect electricity supply

- Electricity price will be given by grid one day before with 15minutes step, to consumer
- Consumer side device or equipment will have the price and will adjust their operation load

What's our plan?

IAM: what if temperature increase very fast? Need to work together with GCM on new scenarios

Whether the world can do 40%+ reduction by 2030? 65% by 2035?

What is the role of China?

What's our plan?

Impact & Damage assessment

Scenario of Short life climate forcings

New energy system: independent grid, green hydrogen industry, energy prices, industry reallocation etc.

Air pollution scenarios: with IPAC output

What's our plan?

Case study for Guangdong: fighting with fossil fuel energy

Global scenarios for IPCC

Africa scenarios: raising Africa

New agriculture future

Future IAM

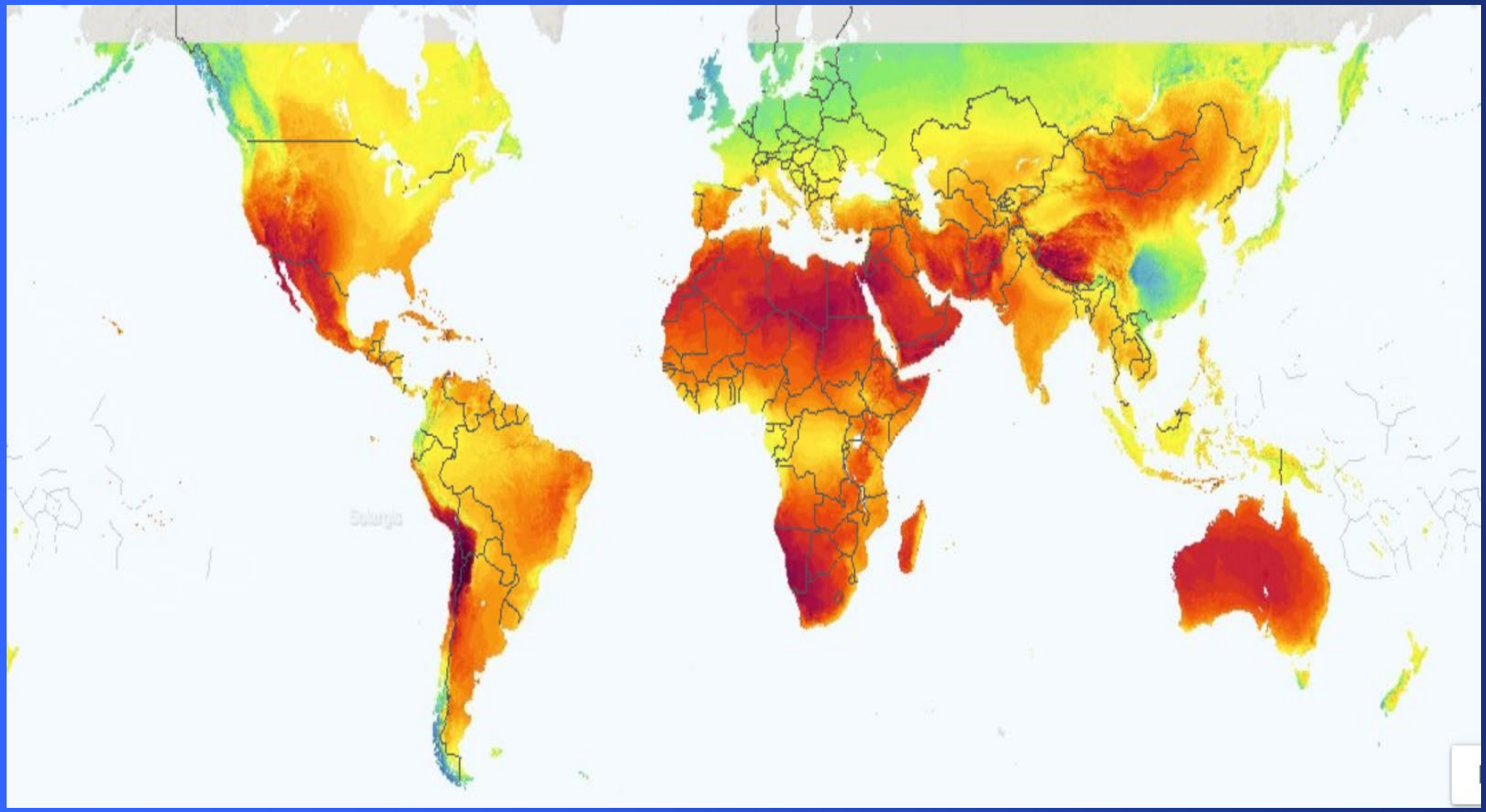
Near term temperature raising related pathways

More regional analysis

Sector or technologies focused analysis

Closing the loop study

Global Solar Resource
全球光伏资源



Thanks !