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Peaking Carbon Emissions in China's Power Industry from a Regional Perspective

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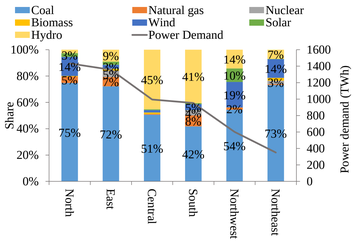
Background

China, the largest greenhouse gases (GHGs) emitter in the world, pledged to peak its carbon emissions by 2030. The power industry in China takes 40% of total carbon emissions (Li et al, 2016) and 26.7% of total consumed energy (CEPYEB, 2016) in 2015. The power industry is supposed to undertake the majority of abatement task.

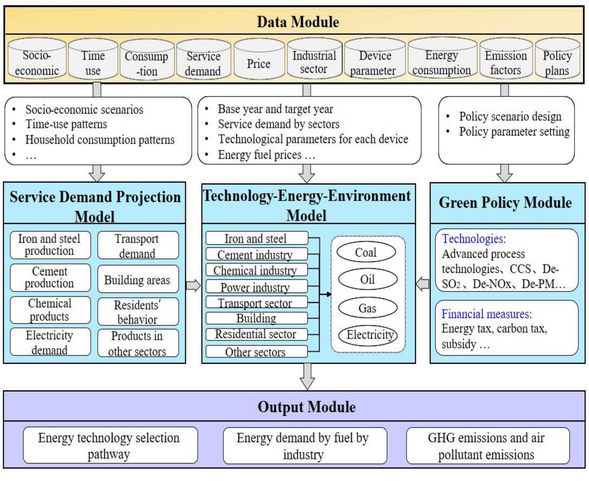
The power grid is divided into six regions in China, including Northeast, North, Center, East, Northwest and South regions based on the boundary of six power grids. Due to diverse geographical environment, resource endowment and economic development levels, there are substantial differences for the structure of electricity production and electricity demand among these six regions. Considering such diverse situations of power industry in different regions may require specific development pathway and result in different peaking time of CO_2 emissions, a focus from a regional perspective is necessary for representing the heterogeneous performance in the power sector. Only power industries in the six regions achieve carbon emissions peak prior to 2030, will carbon emissions in China's power industry peaks by 2030.

Research Objective:

This study aims to find out when the CO_2 emissions in China's power sector will peak and how to peak it before 2030, by investigating the diverse strategies for each region.



Methodology—NET Model

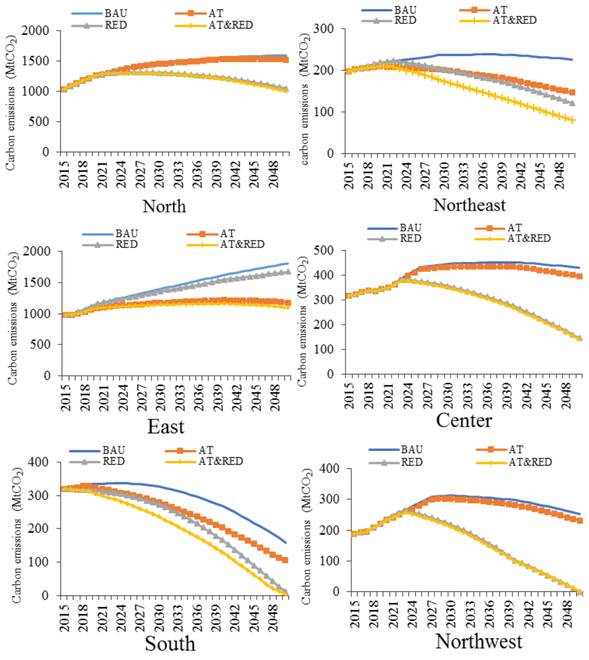


Scenario Design

Scenarios	Description
BAU	· Follow the existing green policies. · The share of renewable energy electricity generation maintains the same changing trends.
Advanced technology (AT)	· Follow the existing green policies. · The share of renewable energy electricity generation maintains the same changing trends. · Promote the technologies of SC, USC, CFB, IGCC and NP.
Renewable energy development (RED)	· Follow the existing green policies. · Increase the share of renewable energy electricity generation.
AT&RED	· Combination of AT and RED scenarios

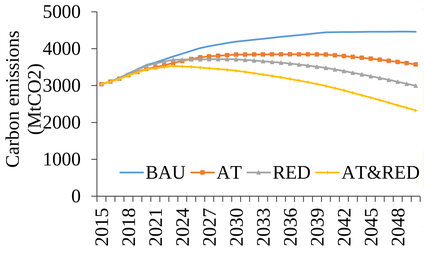
Result Analysis

- Six regions show different pathways with different peaking year and peaking amount of CO_2 emissions.
- Only in the AT and AT&RED scenarios, can all six regions peak their CO2 emissions.



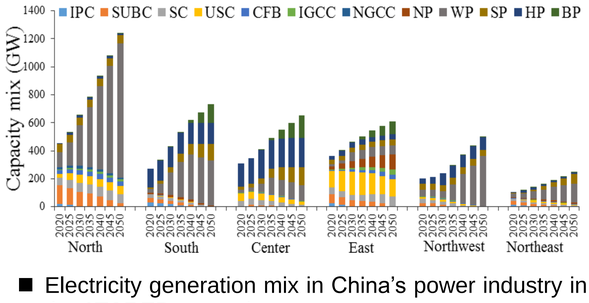
Region	BAU		AT		RED		AT & RED	
	Peak year	Emission ($MtCO_2$)	Peak year	Emission ($MtCO_2$)	Peak year	Emission ($MtCO_2$)	Peak year	Emission ($MtCO_2$)
North	-	-	2045	1534.5	2027	1308.9	2026	1296.0
Northeast	2036	238.2	2020	209.5	2022	222.2	2020	207.5
East	-	-	2040	1216	-	-	2040	1160.3
Center	2040	452.3	2036	433.8	2023	383.3	2023	377.7
South	2022	336.8	2019	327.8	2015	319.7	2015	319.7
Northwest	2030	312.8	2030	301.9	2023	263.9	2023	258.0

- Total CO_2 emissions in China's power industry could peak at 2023 when promoting advanced technologies and increasing the share of renewable energy.



Scenarios	Peak year
BAU	2048
AT	2036
RED	2028
AT&RED	2023

- Path for technology selection in the power industry in six regions in the AT&RED scenario.



- Electricity generation mix in China's power industry in the AT&RED scenario.