



中国科学院上海高等研究院
SHANGHAI ADVANCED RESEARCH INSTITUTE, CHINESE ACADEMY OF SCIENCES

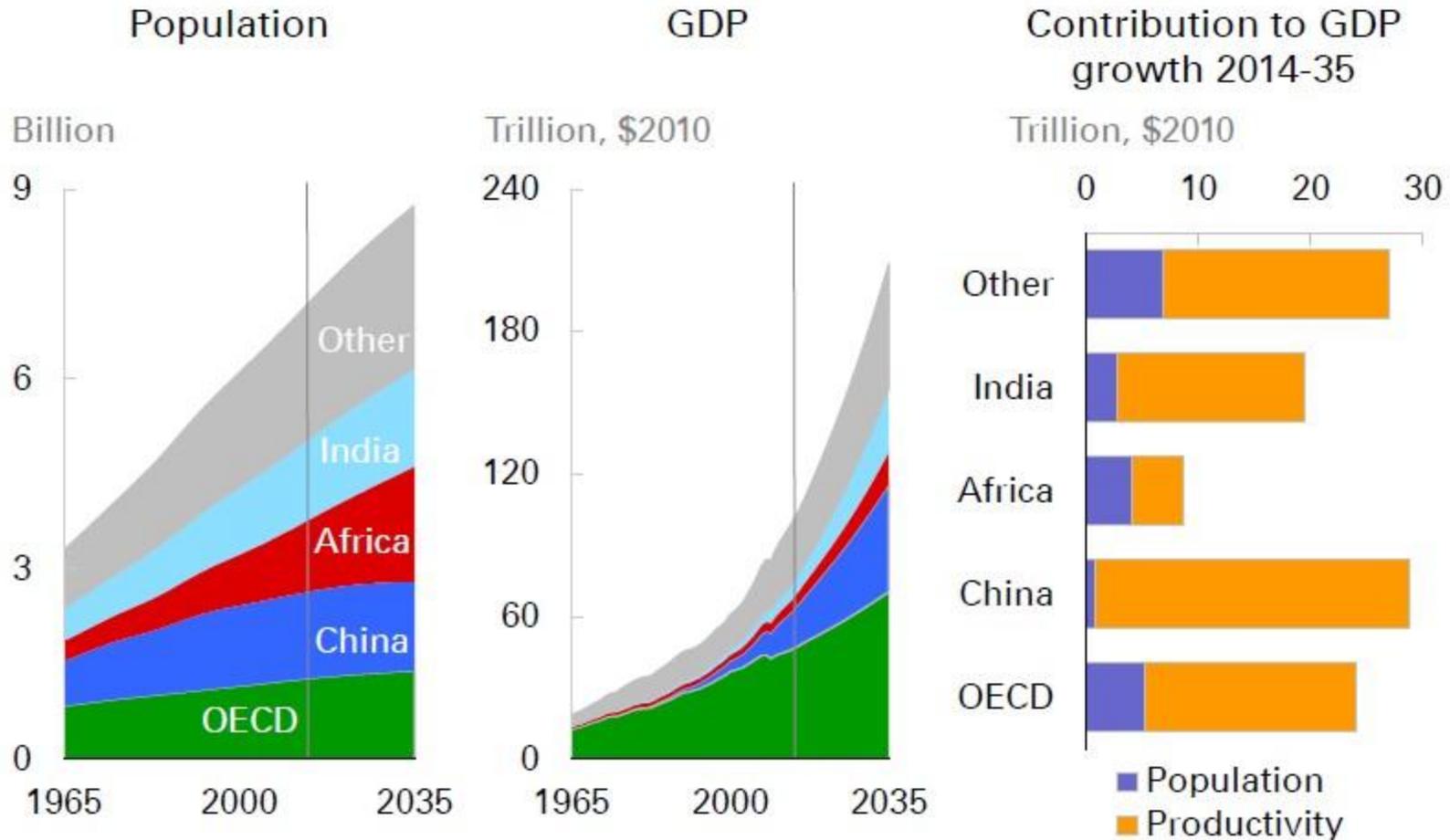
Golden Workshop160609

*Carbon Emission Reduction Potential of
Hybrid Energy System in China*

Yuhan Sun

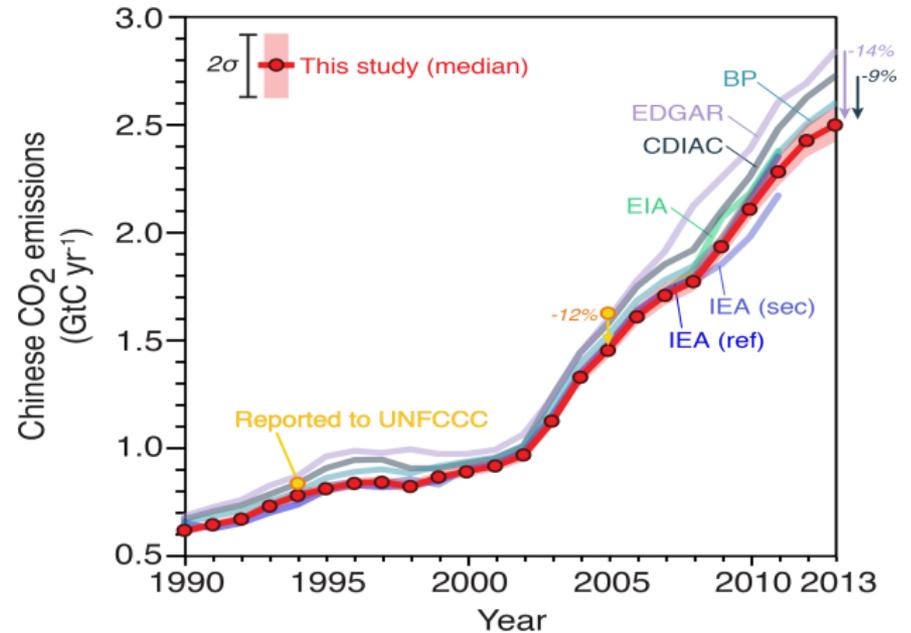
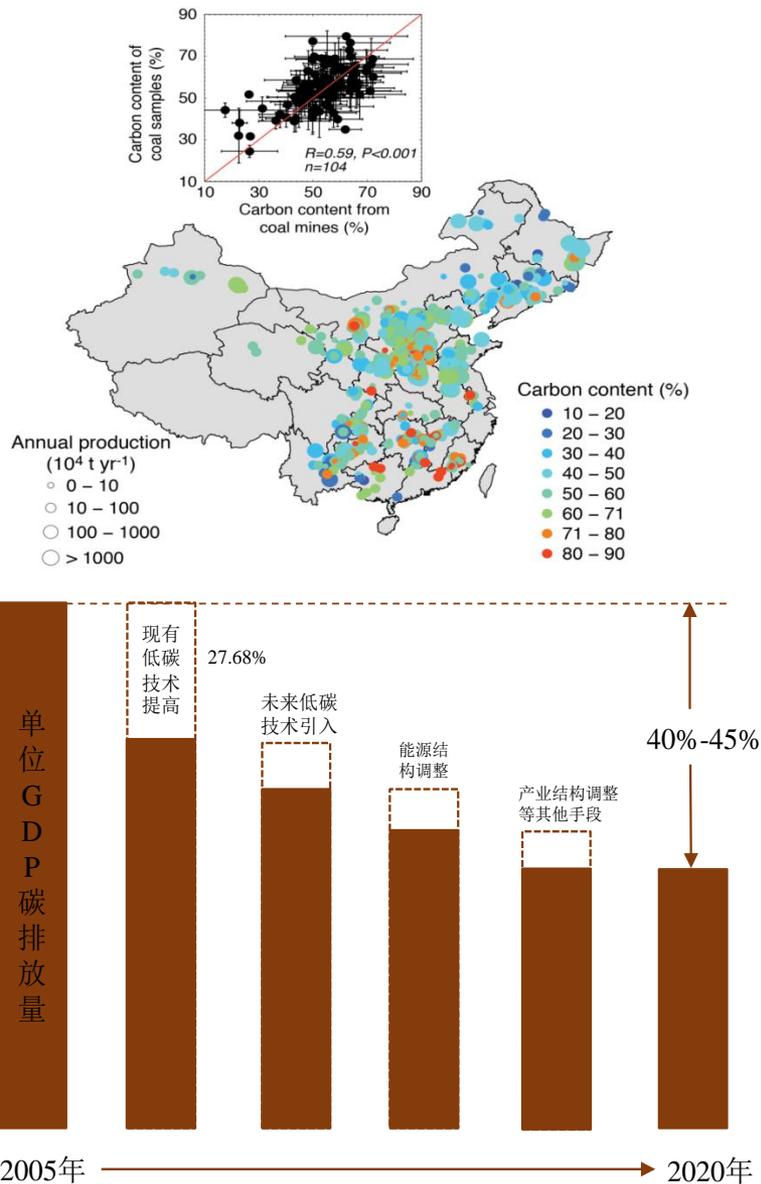


Global GDP is expected to more than double...



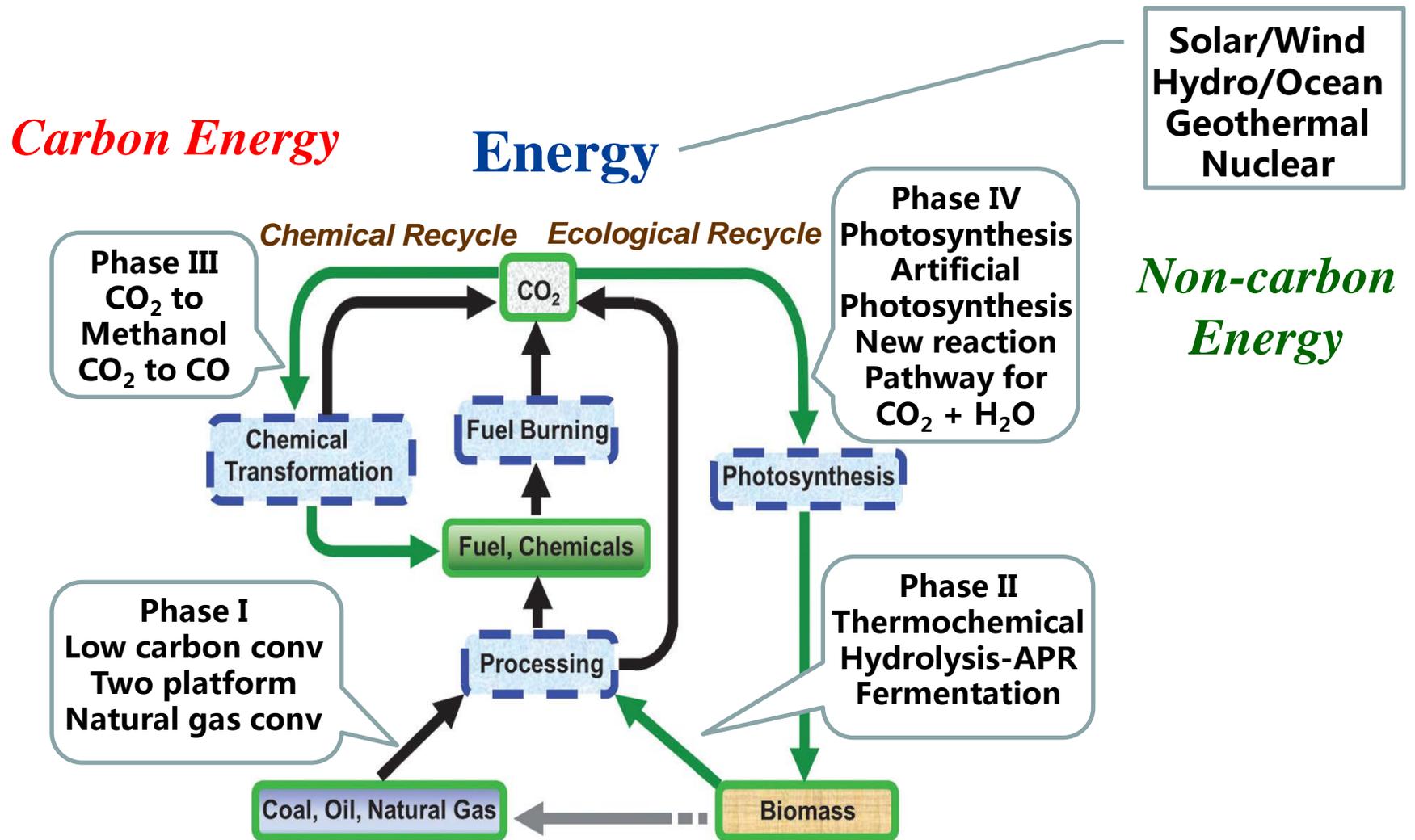
Population and income are the key drivers behind growing demand for energy.

China's economics limited by carbon emissions?

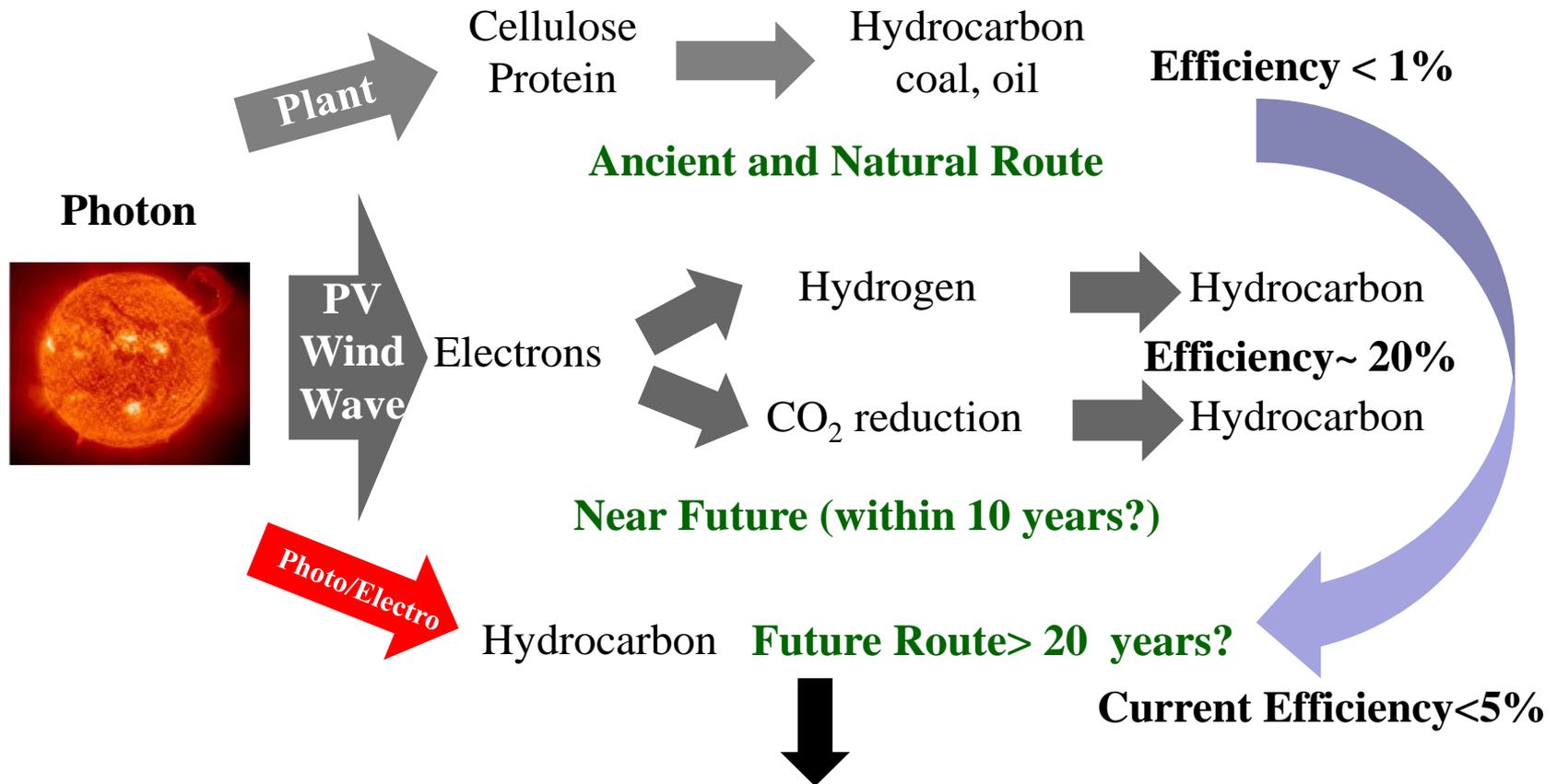


- With the increase in low-carbon tech such SSC power generation, carbon emission will be reduced but high cost?
- Based on current technology and structure adjustment, power supply hardly reaches the target of 40/45 in 2020, which must depend on the change of energy structure with advanced technology.

Carbon Conversion and Recycle Route

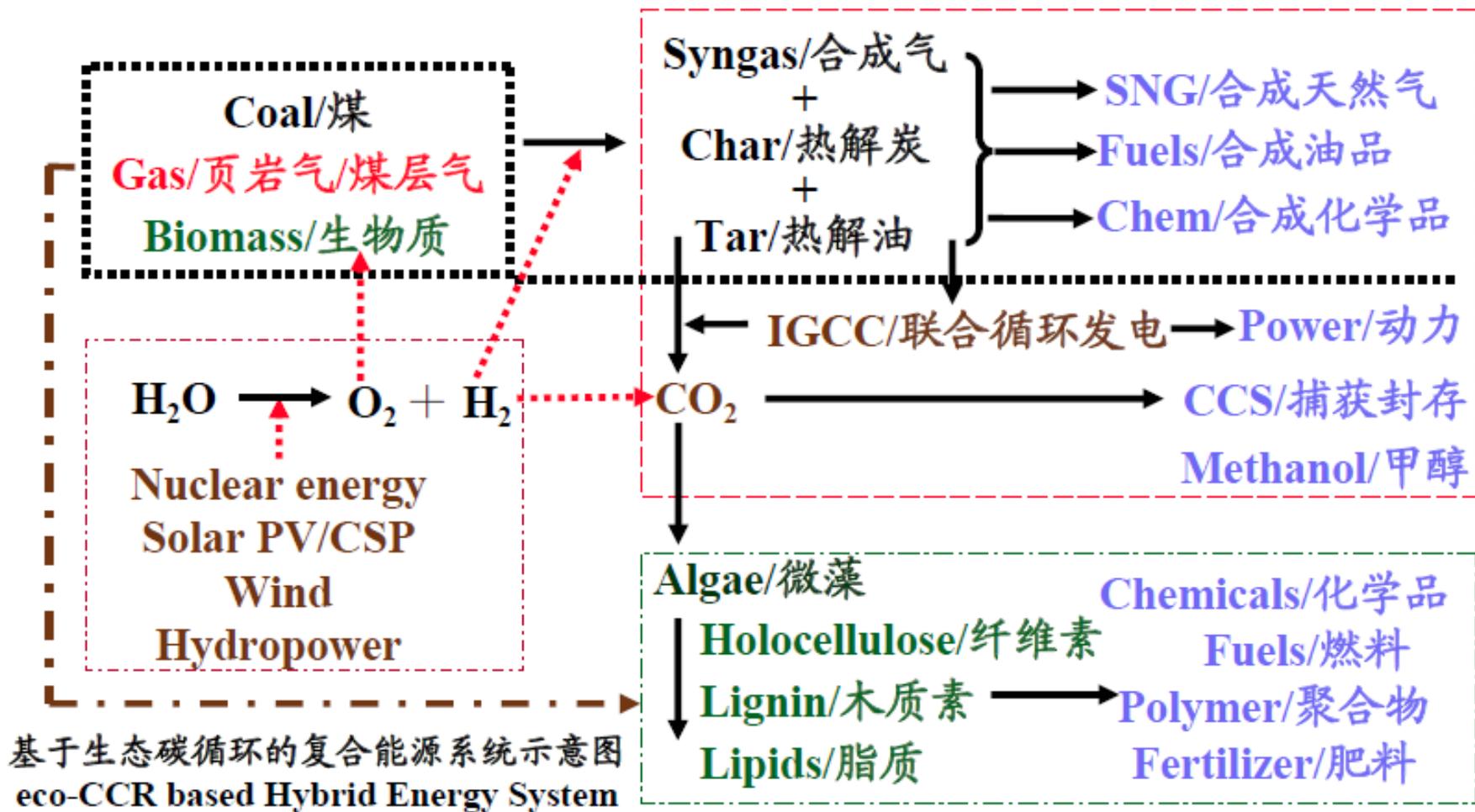


Energy Conversion and Utilization Technology

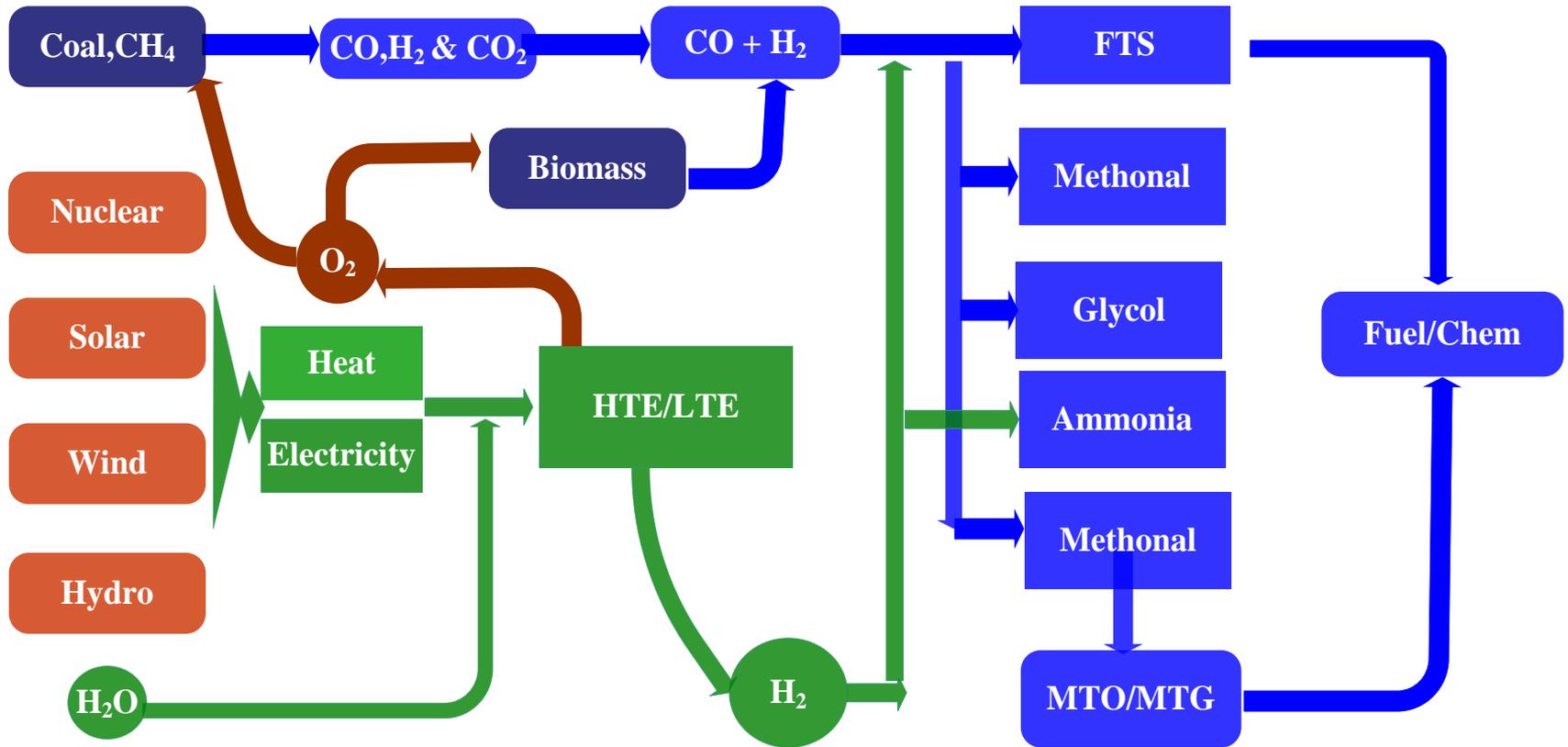


**“cold energy” for future carbon conversion?
(with “alternative feedstock” via nanotech or Biotech)**

Hybrid Energy System of different Energies

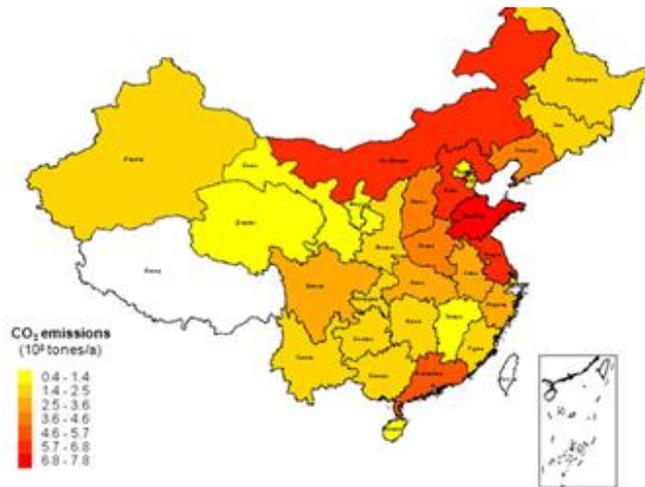


Hybrid Energy System of different Energies

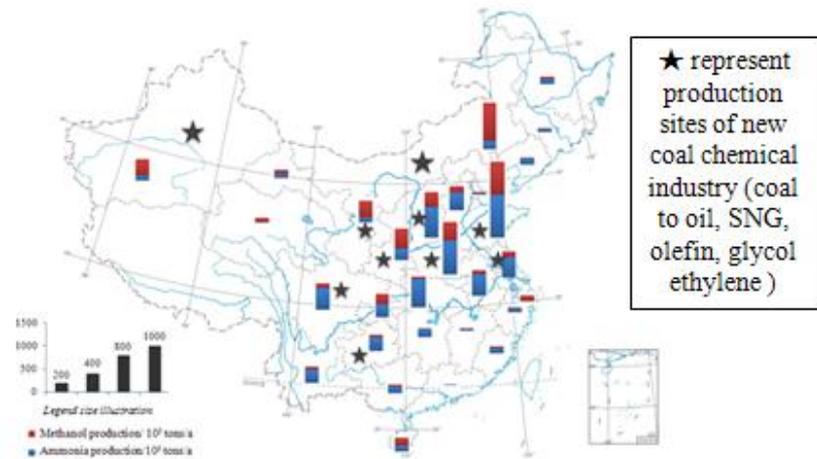


*Low carbon technology roadmap for fuel/chemical production
in coal-based chemical industry*

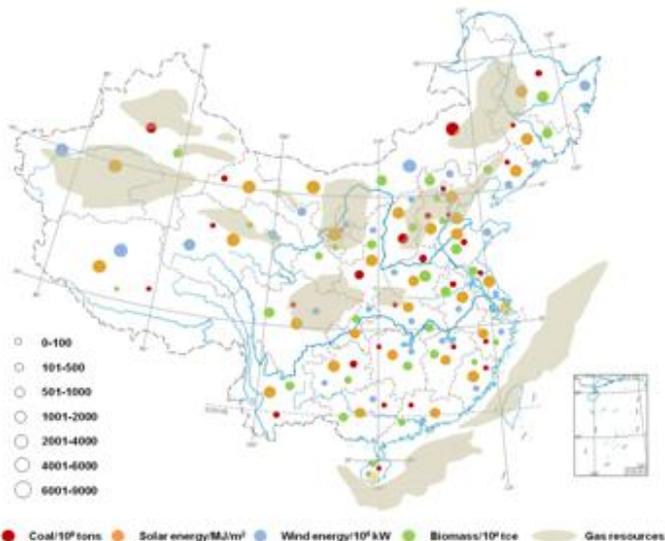
Possibility of Hybrid Energy System for CTL



a. Geographical distribution of China Carbon Emission.



c. Geographical distribution of coal chemical production sites.

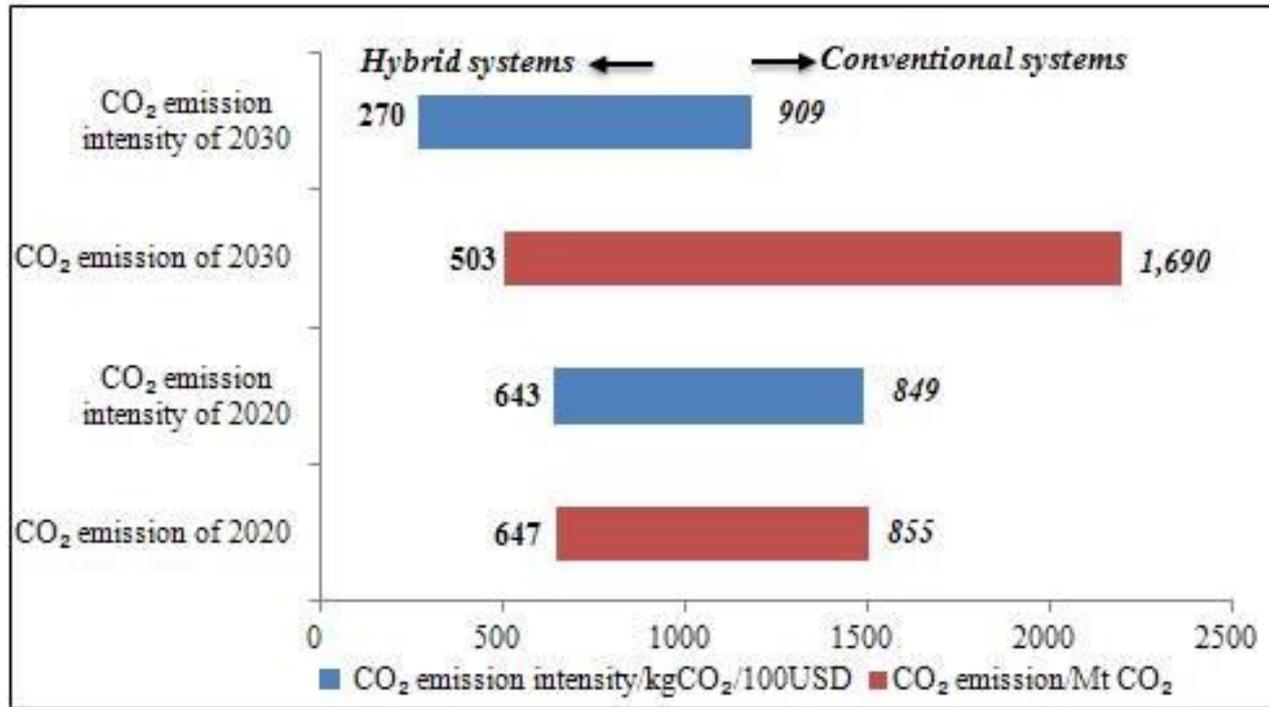


b. Geographical distribution of China major energy resources.



d. Feasible implementation of various hybrid systems based on the geographical distribution of energy resources.

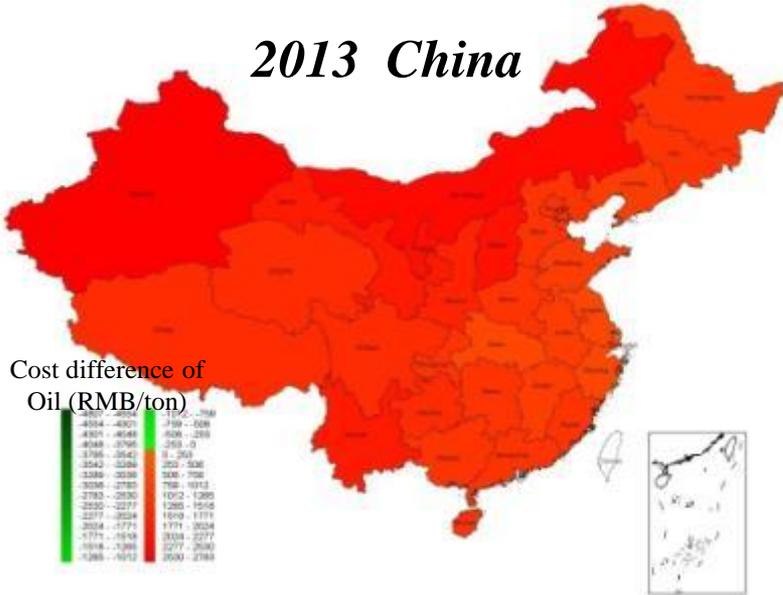
Carbon Emission for Hybrid Energy System



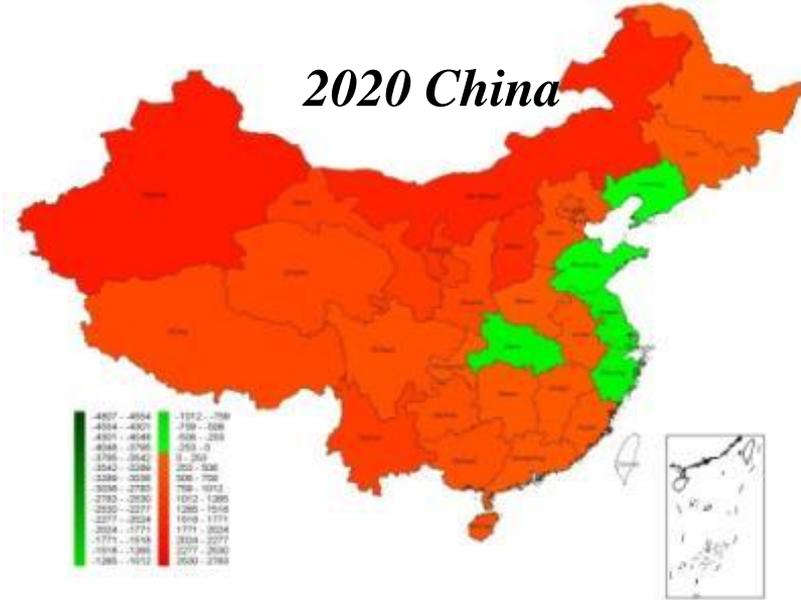
CO₂ emission with hybrid system is 647Mt with emission intensity per GDP of 6.43kg CO₂/USD in 2020, which is 24% less than the conventional system. In 2030, the reduction capacity of CO₂ emission from hybrid system is equivalent to 85% of the Japanese CO₂ emission in 2014 and 65% of the European CO₂ emission in 2014, respectively, and the emission intensity is 2.7kg CO₂/USD as well, which is 70% less than the conventional system. Both carbon emission and emission intensity will reach 22% and 59% less in 2030.

Prospects of Nuclear Energy integrated CTL System

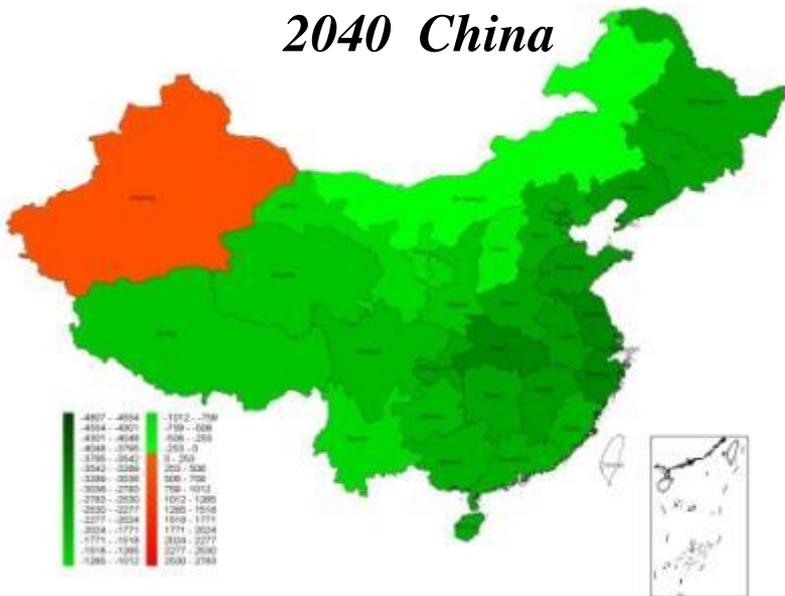
2013 China



2020 China



2040 China



Red indicates a higher cost with the HES over the conventional while green otherwise

	Electricity prices	Carbon tax
2013	0.3/k Wh	0
2020	0.26/k Wh	40 RMB/ton
2040	0.18/k Wh	150 RMB/ton

Oil cost from the HES becomes lower than conventional system in the green areas due to relative high coal prices



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Thank You!

