The health benefits of developing renewable energy in China towards 2030

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Introduction: Study objectives

- Estimate externalities from energy production of fossil fuels;
- Chinese flavour air-pollution simulation model.
- Human health impacts of air pollution from the Energy sector in terms of mortality and morbidity.
- Costs and benefits considering externality cost.
- To calculate the True costs of fossil fuels.

Method: Coupling Energy-Emission-Air quality-Health and Economic Models

- EDO and LEAP model from ERI
  - LEAP projects final energy consumption (excl. power) in China,
  - EDO projects power demand and SO2 & NOx in 30 provinces of China.
- Emission calculator calculates primary emissions in 30 provinces.
- GEOS-chem model simulates air quality (PM2.5 and Ozone concentration).
- Health model quantifies health impacts.
- Economic models (CGE and valuation) monetize the health impacts, which has been used widely for assessing China's climate mitigation at the
  - **national level**: [4, 5, 6], and
  - **provincial level**: [1, 2, 3, 7, 8, 9, 10, 11, 12].

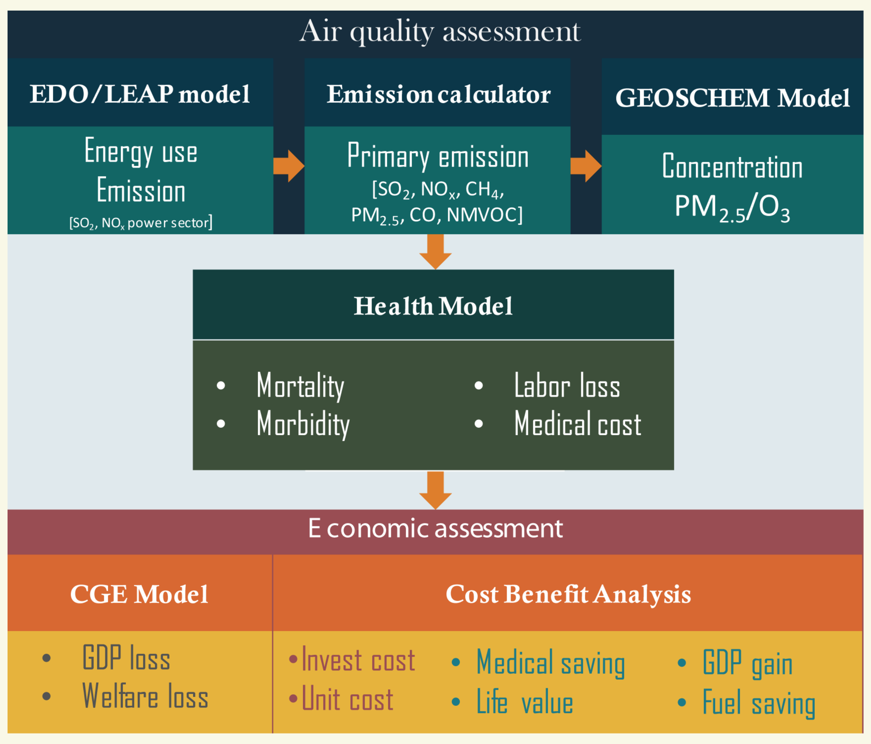


Figure: Scenario matrix.

Scenario

Two scenarios are constructed:

Stated Policy Reference scenario.

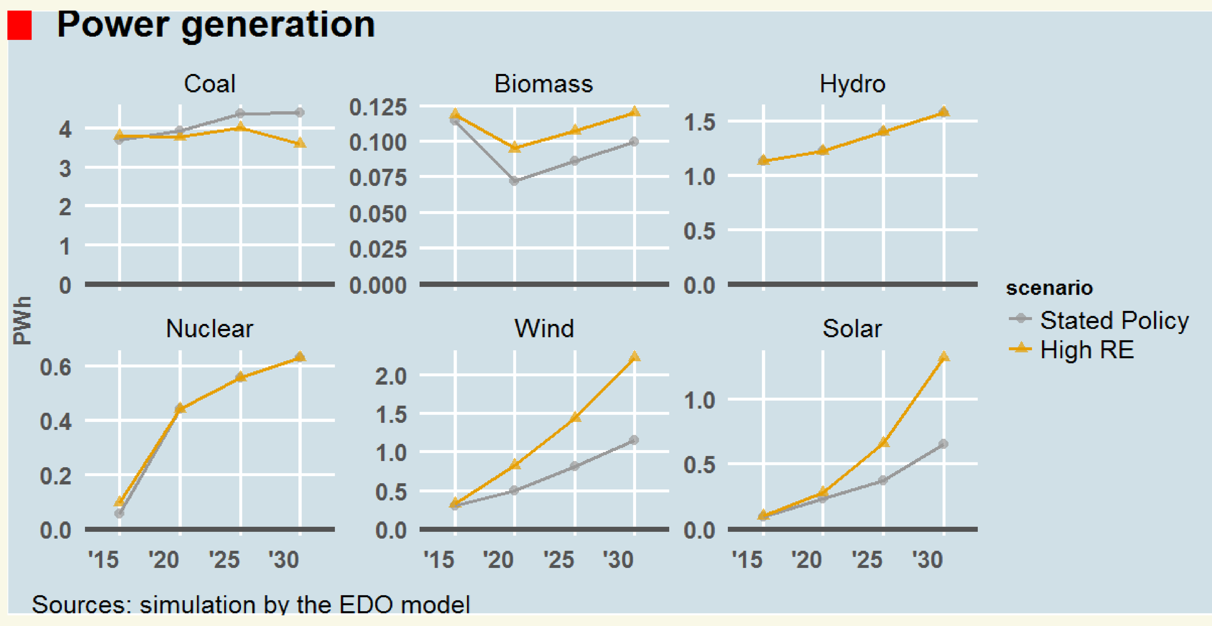
- The current ambitions for RE development correspond to minimum requirements for fulfilling the energy and environmental goals set for China to achieve by 2030.
- coal is still the dominant fuel.

High RE More renewables.

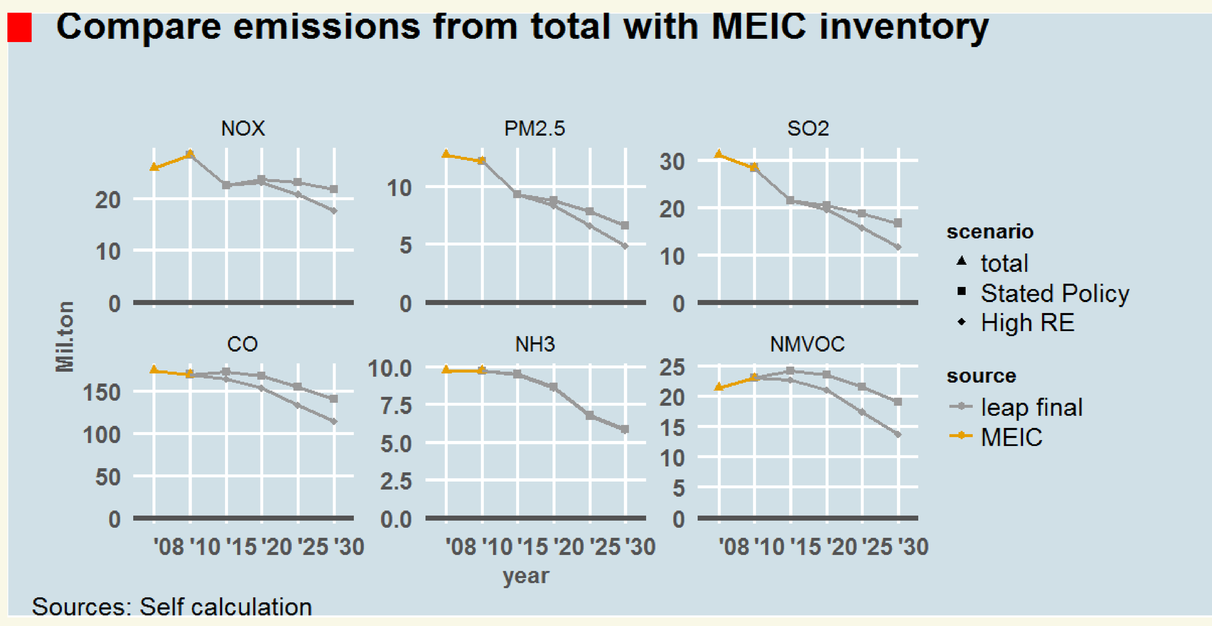
- Differs from the Stated Policy scenario with the amount of new wind and solar PV capacity and with the degree of electrification in the end-use sector.

The **core** message is **how RE development benefits air pollution control and health improvements**.

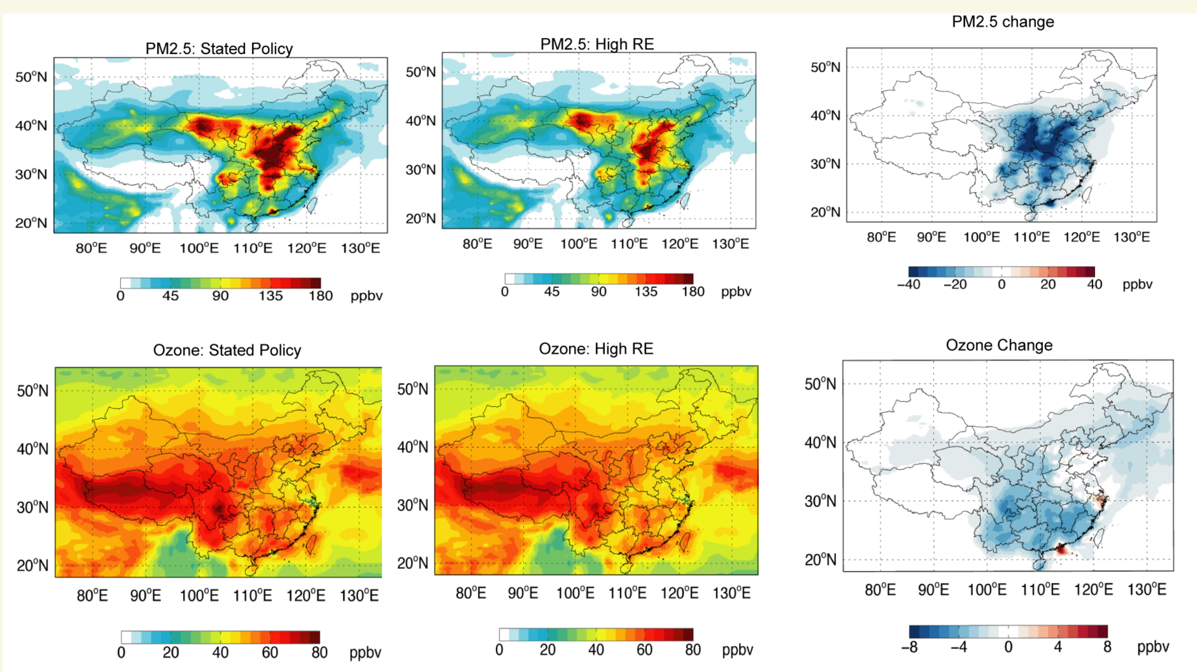
Results



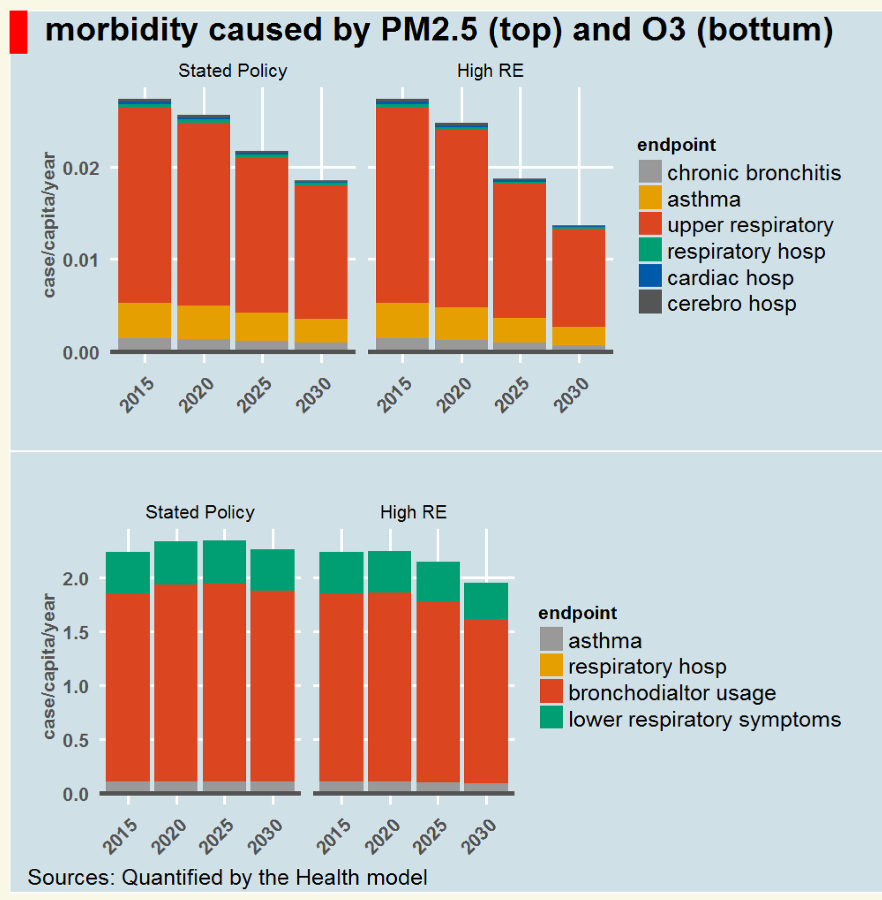
- **Power generation** under two scenarios.

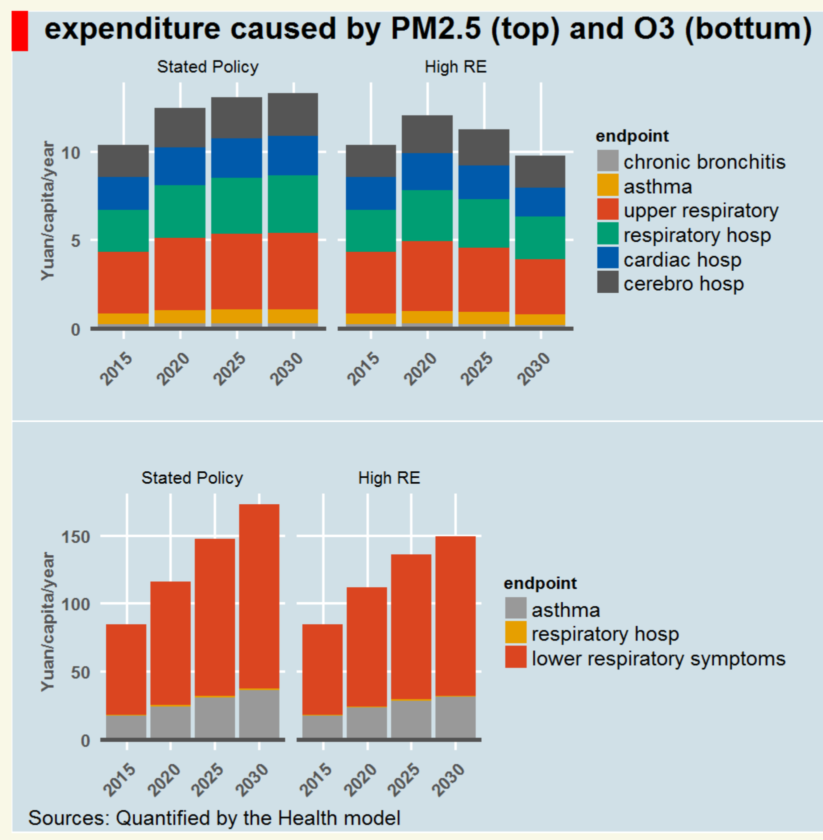


- **Emissions** of air pollutant under two scenarios.

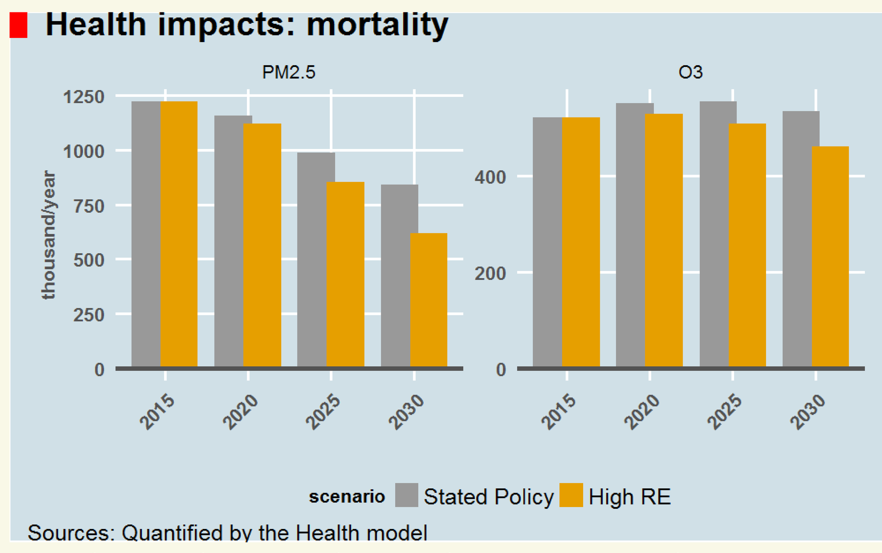


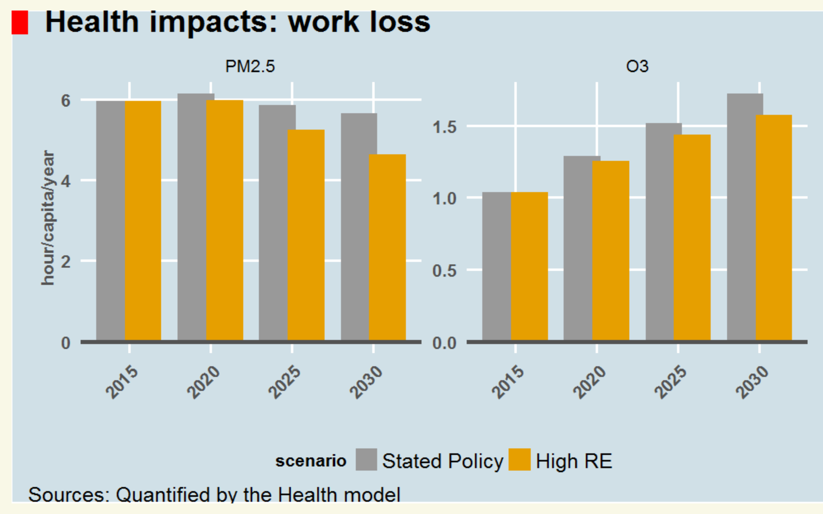
- **Concentration** of PM2.5 and ozone.



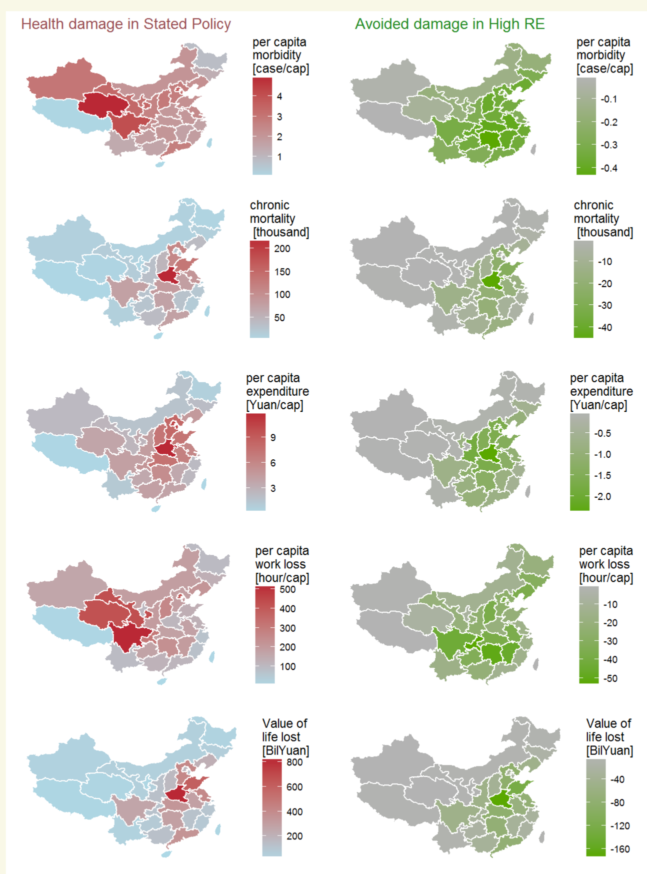


- The per capita expenditure in 2030 is about 185.7 in Stated Policy scenario and 158.7 thousand in High RE scenario

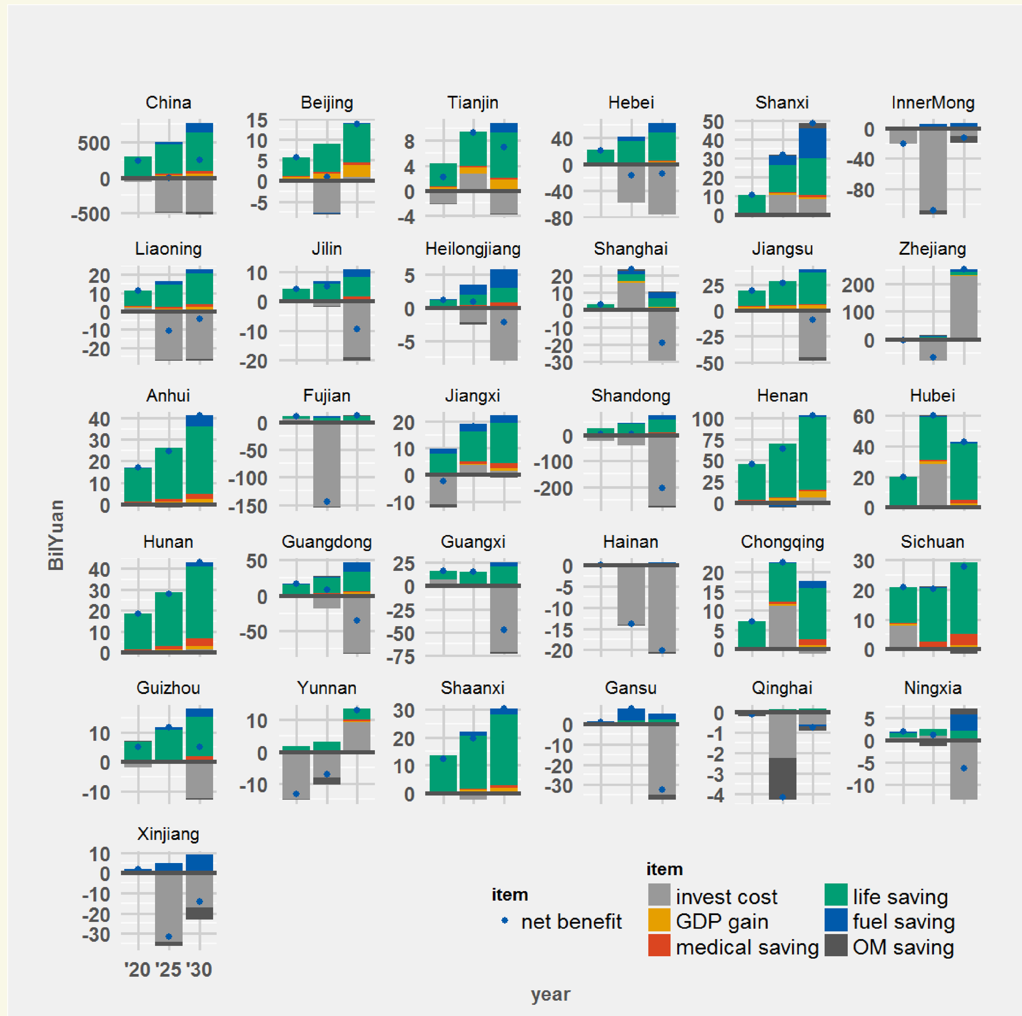




- The total national mortality in 2030 is about 1314.3 in Stated Policy scenario and 1027.8 thousand in High RE scenario



- **Provincial disparity** of health impacts.



- **Cost and benefits** of developing renewable energy.

Discussion and Conclusion

- We quantified the physical and monetary health benefits of developing RE in China.
- In 2030, RE development could:
  - Save 286 thousand people from pemature death.
  - Life value worths 1200 billion Yuan, 1.2% of GDP.
  - 1.16 hour more work time, increasing ca. 0.1% of GDP.
- When external cost of fossil energy is considered, RE could be cost competitive.

Acknowledgements

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