Energy Sources for Road Transport in the Future

Yanhui Zhang[†,‡], Sukwon Cha[†], Wei Feng[‡] and Guoqing Xu[*,‡]

[†] Department of Mechanical and Aerospace Engineering, Seoul National University, Gwanak-ro 1, Gwanak-gu, Seoul, 151-744, Republic of Korea

[‡] Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, Shenzhen 518055, PR China.

*E-mail: zhangyh@siat.ac.cn; stghy608@163.com

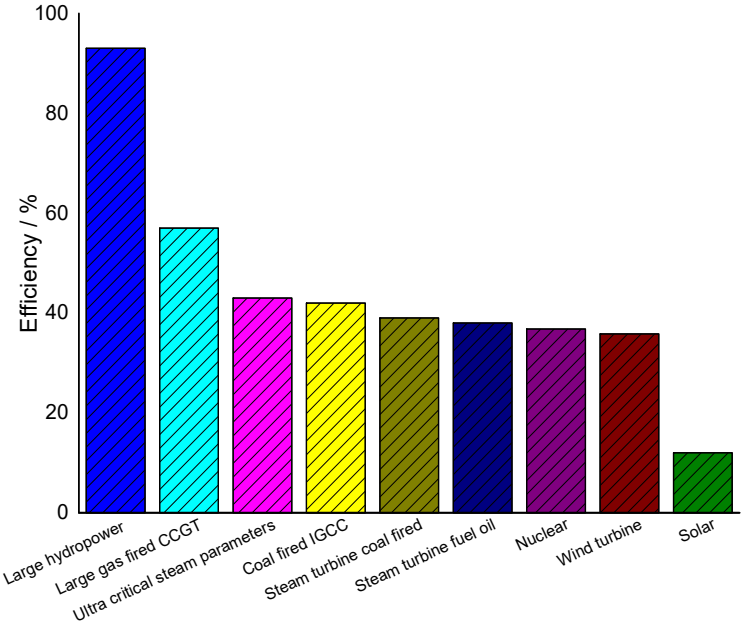

Figure. S1 Power conversion efficiency of major energy sources[1]

Lists the electricity conversion efficiency of major energy sources (including raw oil, natural gas, coal, nuclear power and other new energy). We can see that 90% of water energy can transform to electricity; 58% of natural gas energy can transform to electricity; and only 17% of solar energy can do. As for coal, oil and nuclear, they have similar transformation rate, which is within 40%-42%.

Table S1 World Development Indicators: Electricity production, sources, and access[2]

Country	Sources of electricity production					
	Coal	Nature gas	Oil	Hydropower	Renewable sources	Nuclear power
China	75.9	1.7	0.1	17.3	2.7	2.0
Japan	29.6	38.7	12.2	7.4	4.6	1.6
Mexico	11.7	51.4	18.9	10.8	4.2	3.0
Saudi Arabia	0.0	44.7	27.7	0.0	0.0	0.0
United States	38.5	29.6	0.8	6.5	5.5	18.8
Germany	46.1	12.5	1.2	3.4	19.5	16.0

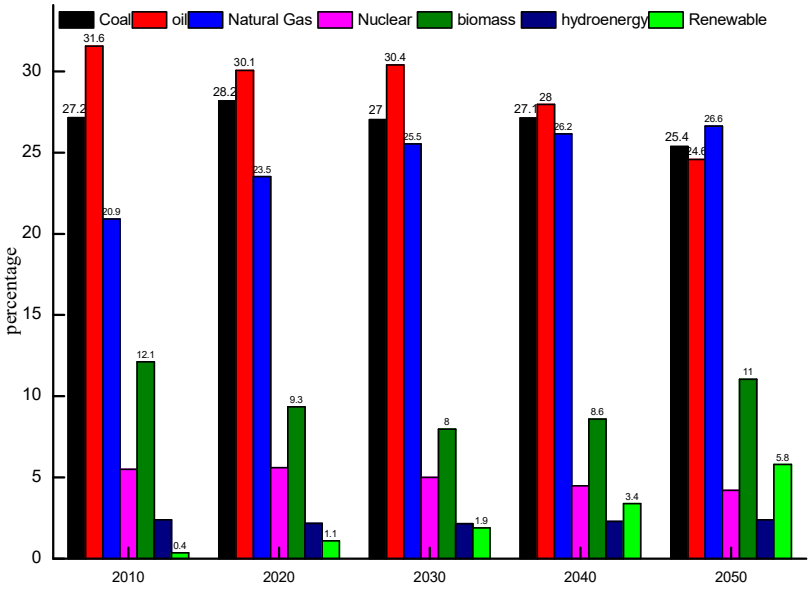

Figure.S2 World Energy Scenarios: Composing energy futures to 2050[3]

Composing energy futures to 2050 is described with the ratio change of various energy. The proportion of the oil will decline gradually, and will drop about 6% to 2050. The rise of natural gas and renewable energy will effectively make up the shortage of oil energy

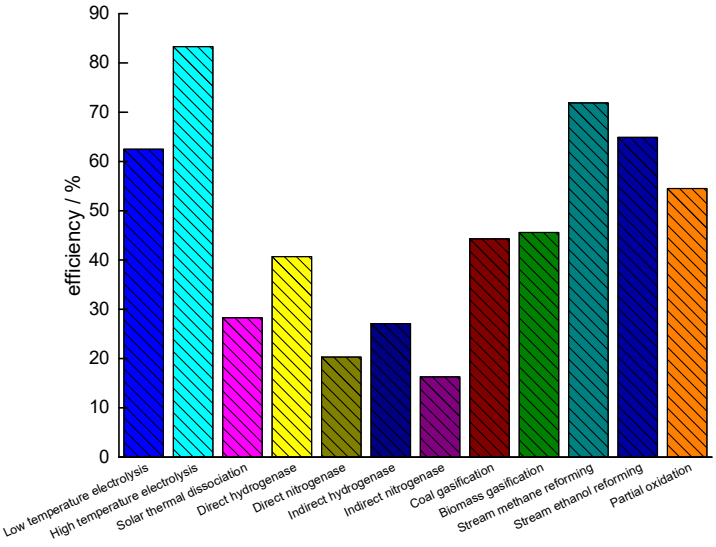

Figure. S3 The conversion efficiency of hydrogen production with various energy. The data is mainly from the reference [4,5]

REFERENCE

(1) The Efficiency in Electricity Generation is described online at Report drafted by:EURELECTRIC "Preservation of Resources" Working Group's"Upstream" Sub-Group in collaboration with VGB

(2) World Development Indicators, The World Bank.http://wdi.worldbank.org/table/3.7

(3) http://www.worldenergy.org/publications/2013/world-energy-scenarios-composing-energy-futures-to-2050/

(4) Joshi,S.A.; Dincer,I.;Reddy,V.B. Effects of various parameters on energy and exergy efficiencies of a solar thermal hydrogen production system. *Int. J. Hydrogen Energ.* **2016**, 41(19), 7997–8007.

(5) Yazdanie,M.; Noembrini,F.; Dossetto,L.; Boulouchos,K. A comparative analysis of well-to-wheel primary energy demand and greenhouse gas emissions for the operation of alternative and conventional vehicles in Switzerland, considering various energy carrier production pathways. *J. Power Sources*.**2014**, 249,333-348.