Global Energy Assessment
Toward a Sustainable Future

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Global Energy Challenges

- From 7 bn people, 3 bn cook with solid fuels and 1.5 bn lack access to electricity
- Efficiency and decarbonization bring multiple benefits for health, security, climate change
- Financing requirements are huge, but achievable with right and sustained policies

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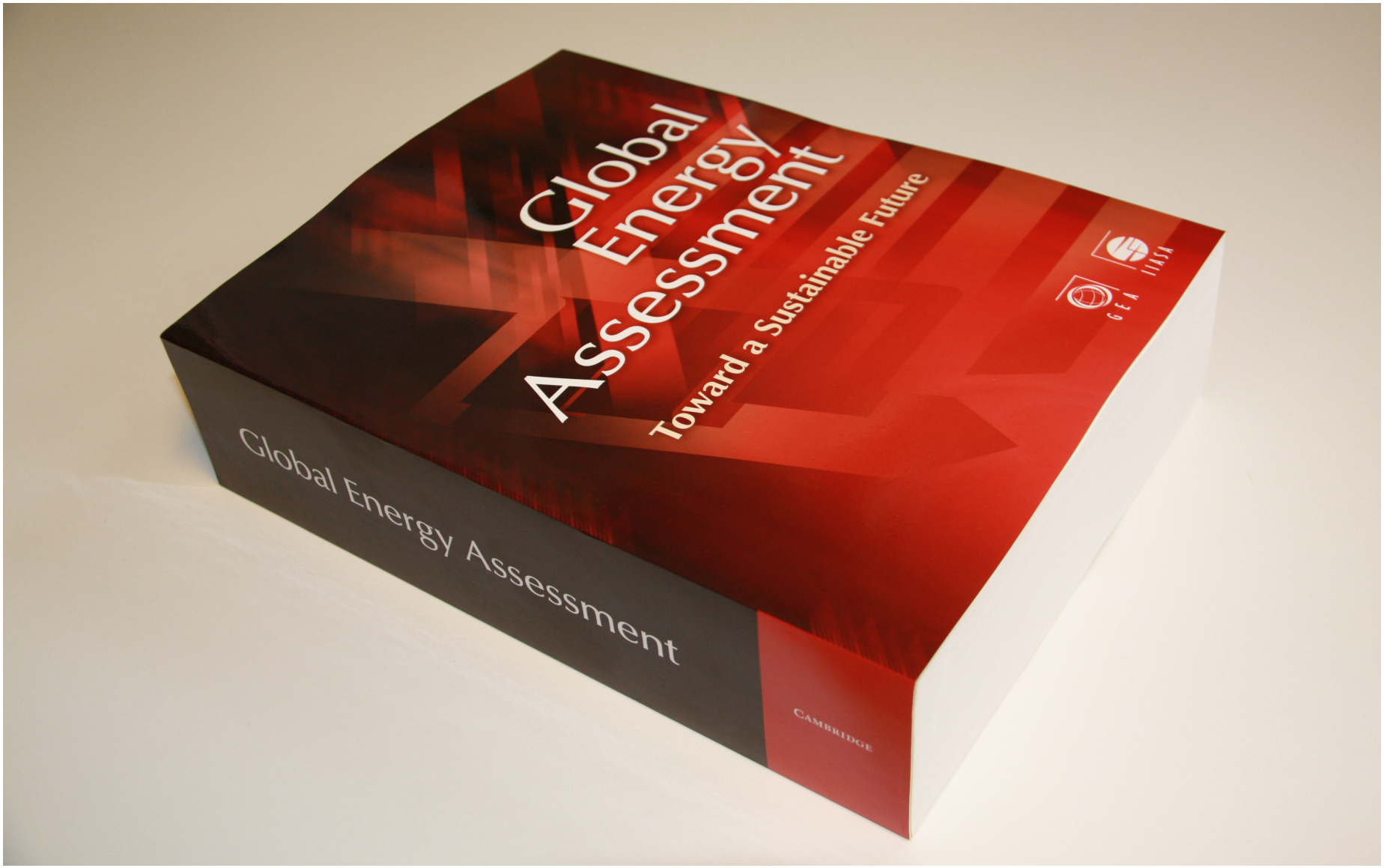
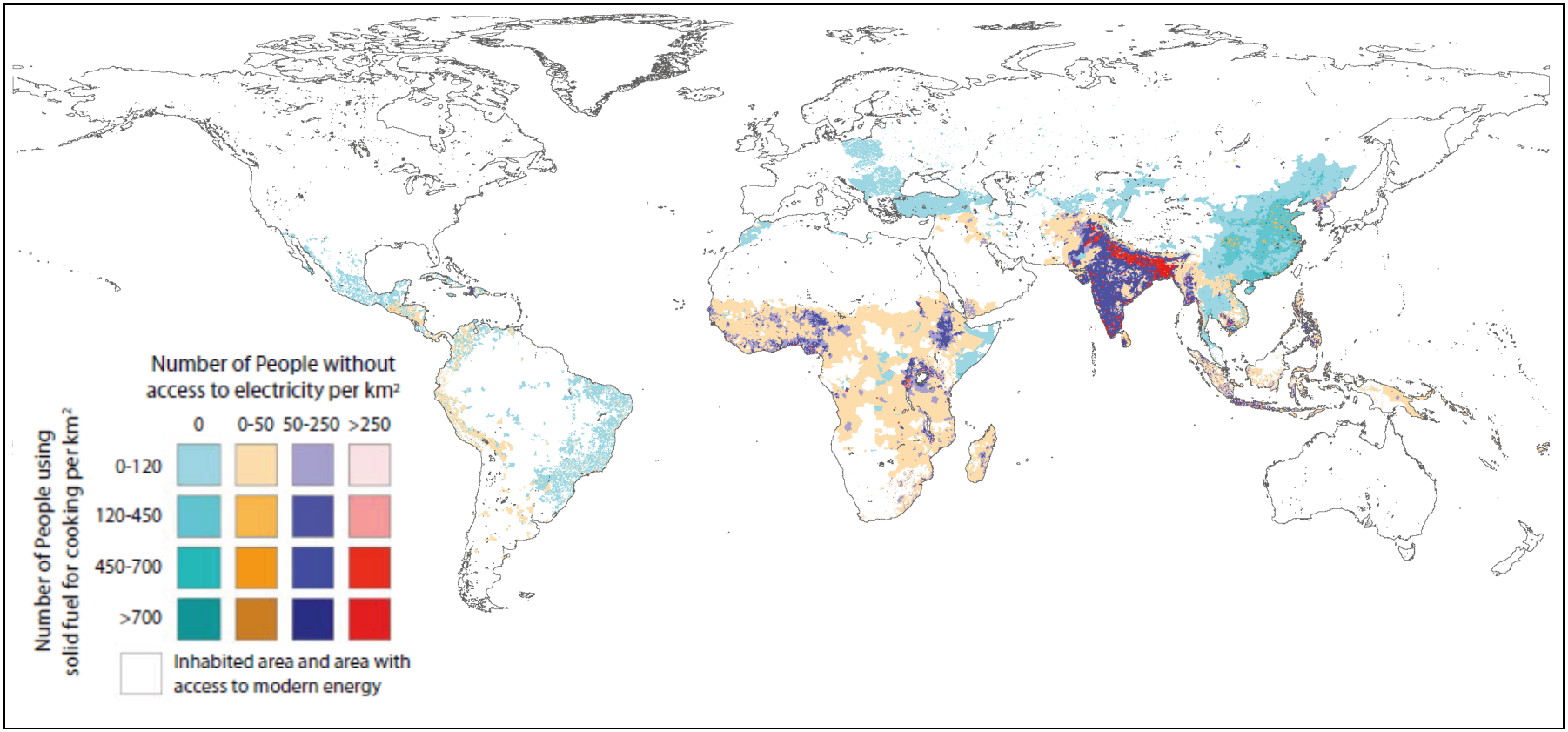


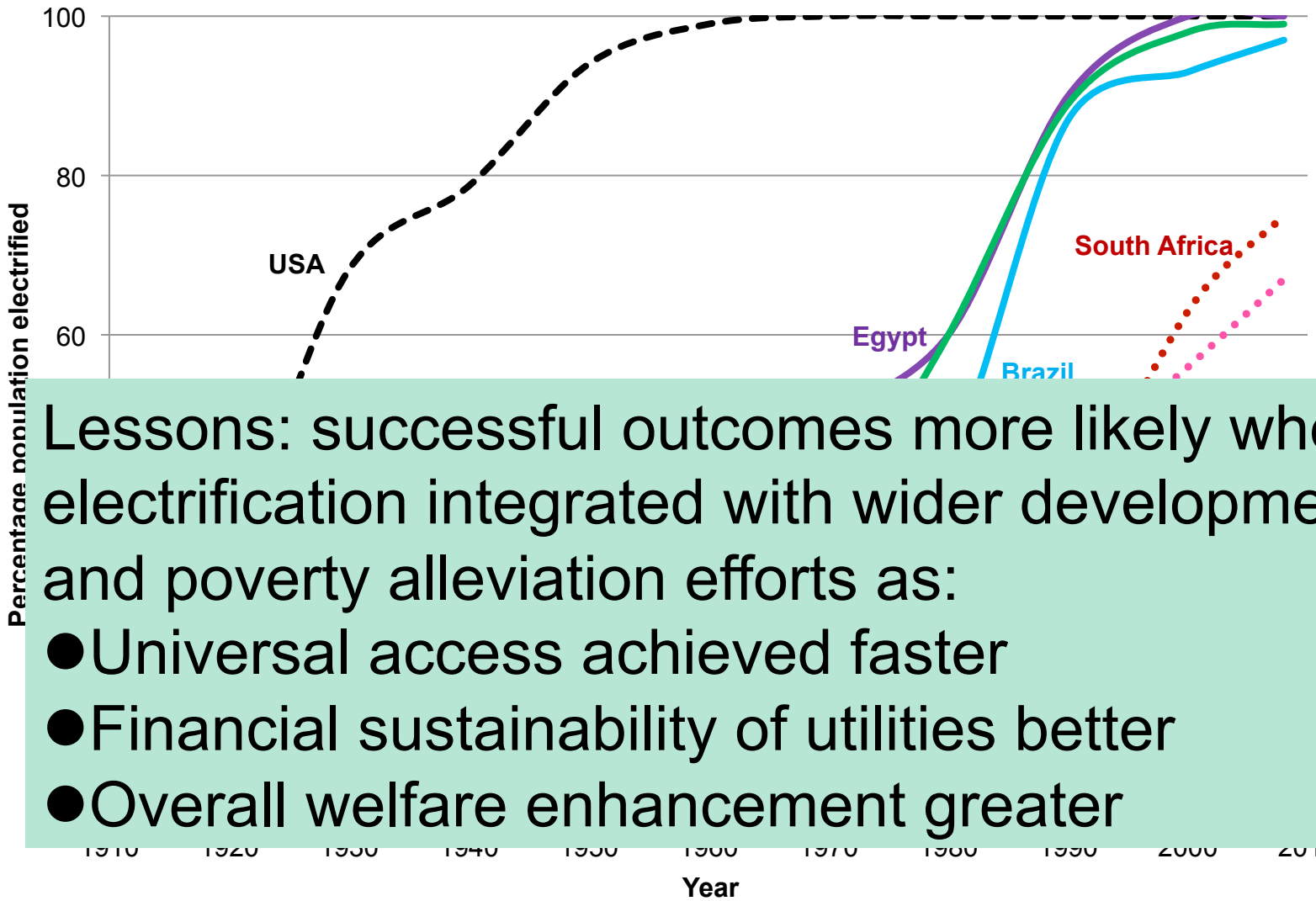
Mapping Energy Access

Final energy access (non-commercial share) in relation to population density



Source: Pachauri et al, 2012

Historical Household Electrification



Lessons: successful outcomes more likely when electrification integrated with wider developmental and poverty alleviation efforts as:

- Universal access achieved faster
- Financial sustainability of utilities better
- Overall welfare enhancement greater

Source: Pachauri et al, 2012

~2450 $GtCO_2$

Unconventional Gas
~4,550 $GtCO_2$

N. Gas
~340–500
$GtCO_2$

Oil
~660–1,000
$GtCO_2$

Unconv. Oil
~1,100–1,500
$GtCO_2$

Biomass
~1,600–
1,650
$GtCO_2$

Cumulative
Emissions for 2°C
Stabilzaiton

Gas Hydrates
~100,000
$GtCO_2$

~850 $GtCO_2$

Historcial
Emissions
~1900 $GtCO_2$

Present
Atmosphere
~3060
$GtCO_2$

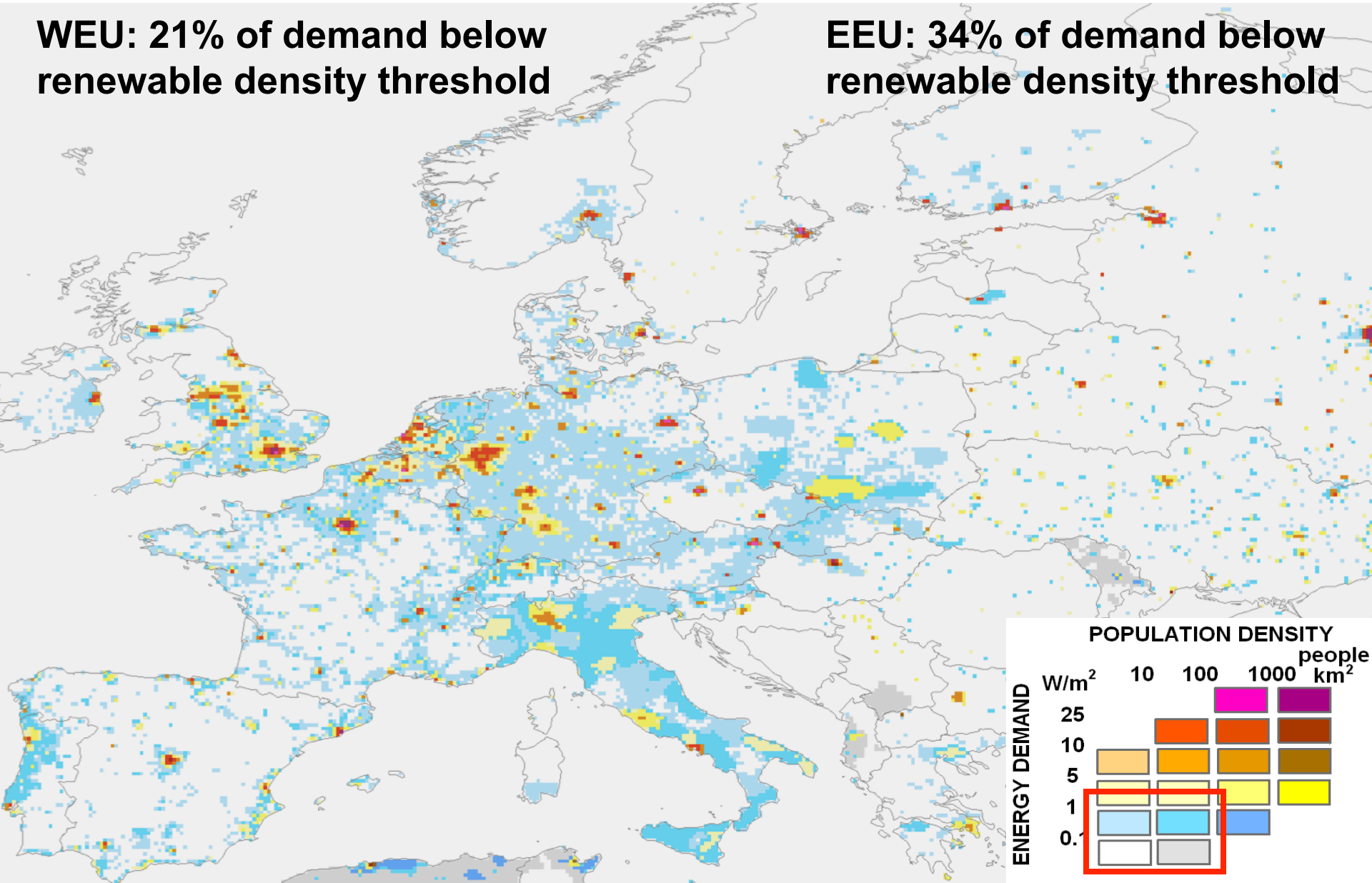
Preidustrial
Atmosphere
~2000 $GtCO_2$

Coal
~ 30,000 $GtCO_2$

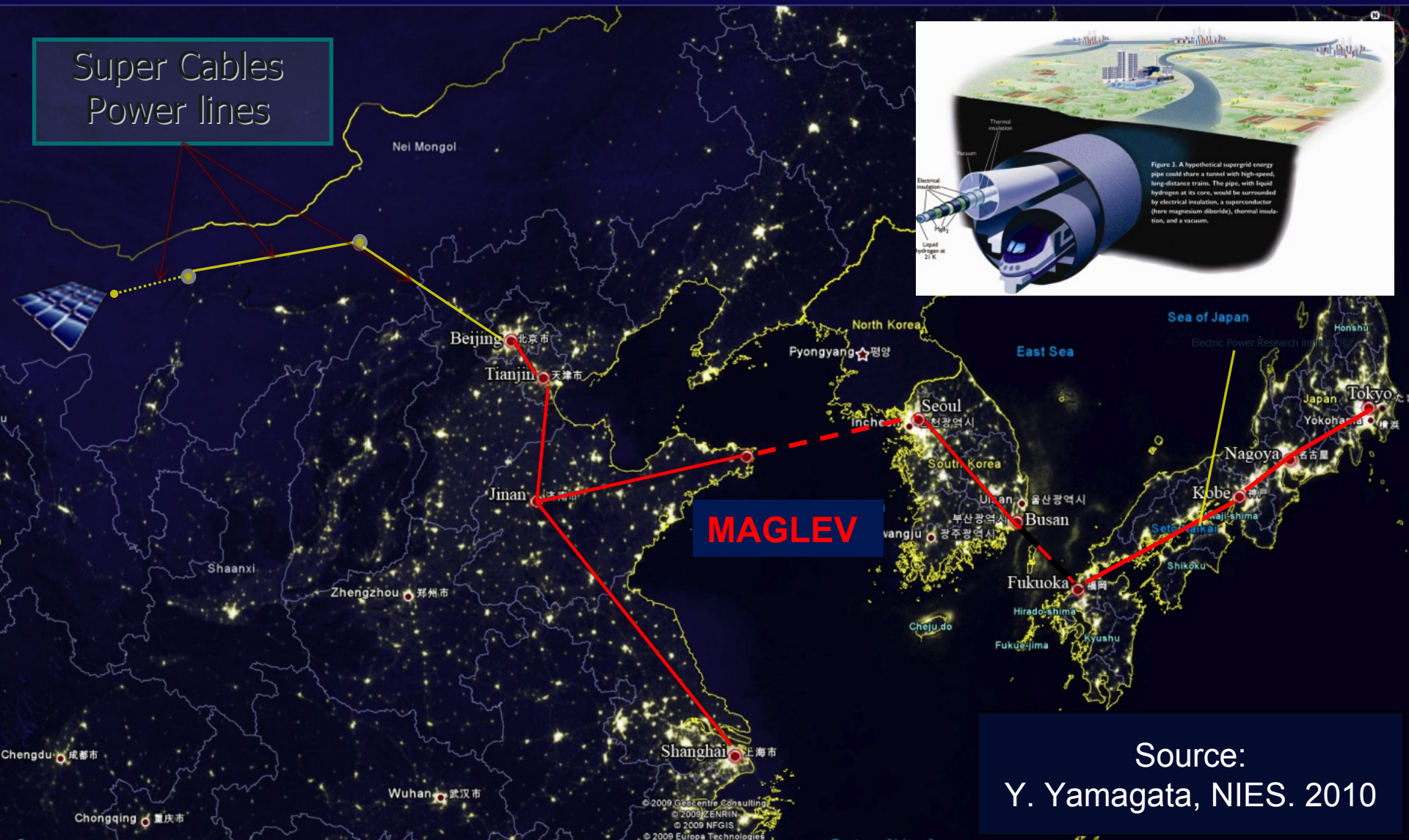
Europe Population vs. Energy Demand Density

WEU: 21% of demand below renewable density threshold

EEU: 34% of demand below renewable density threshold

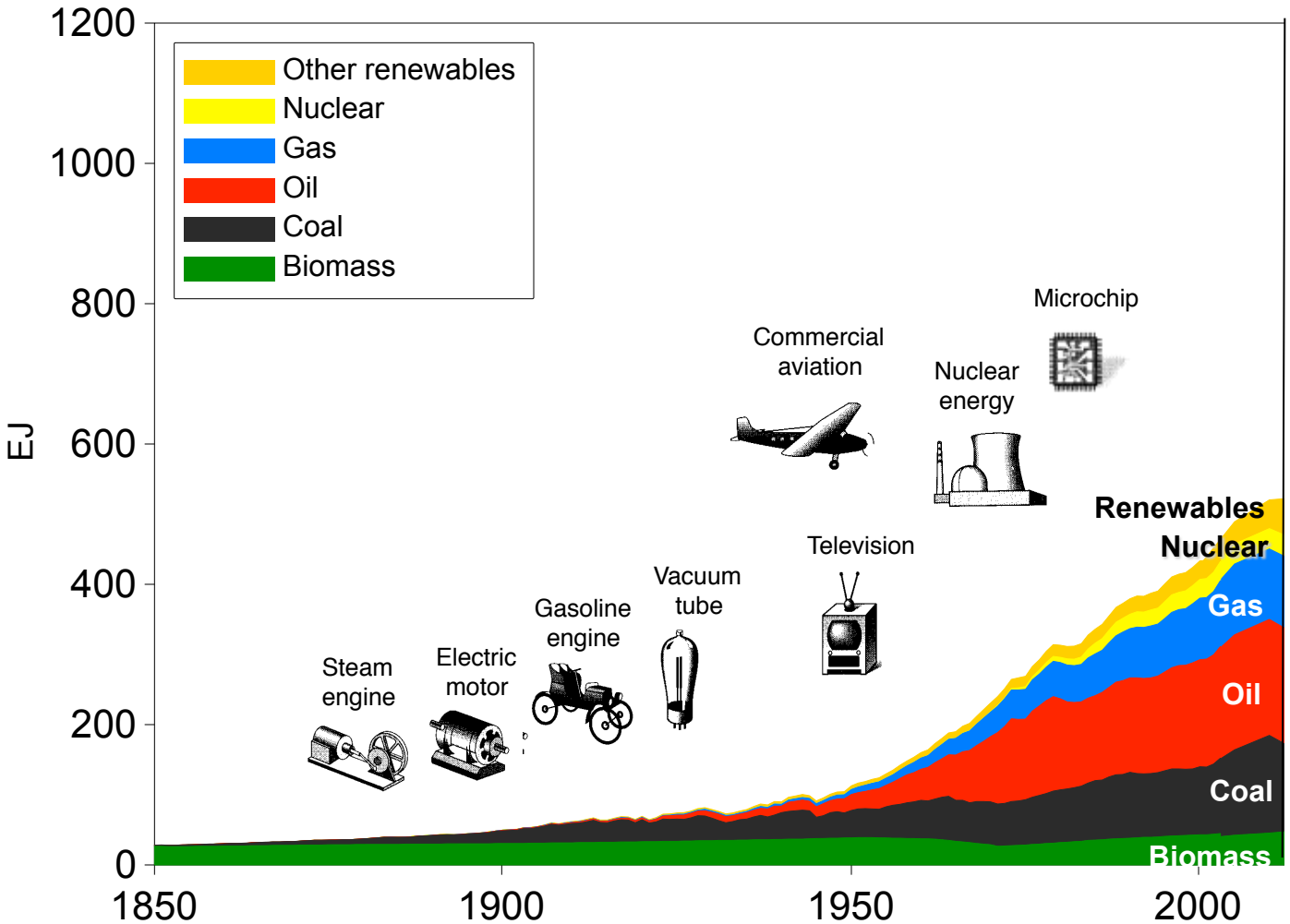


Potential Synergies between New Energy and Transport Infrastructures: Asian "Supergrid"



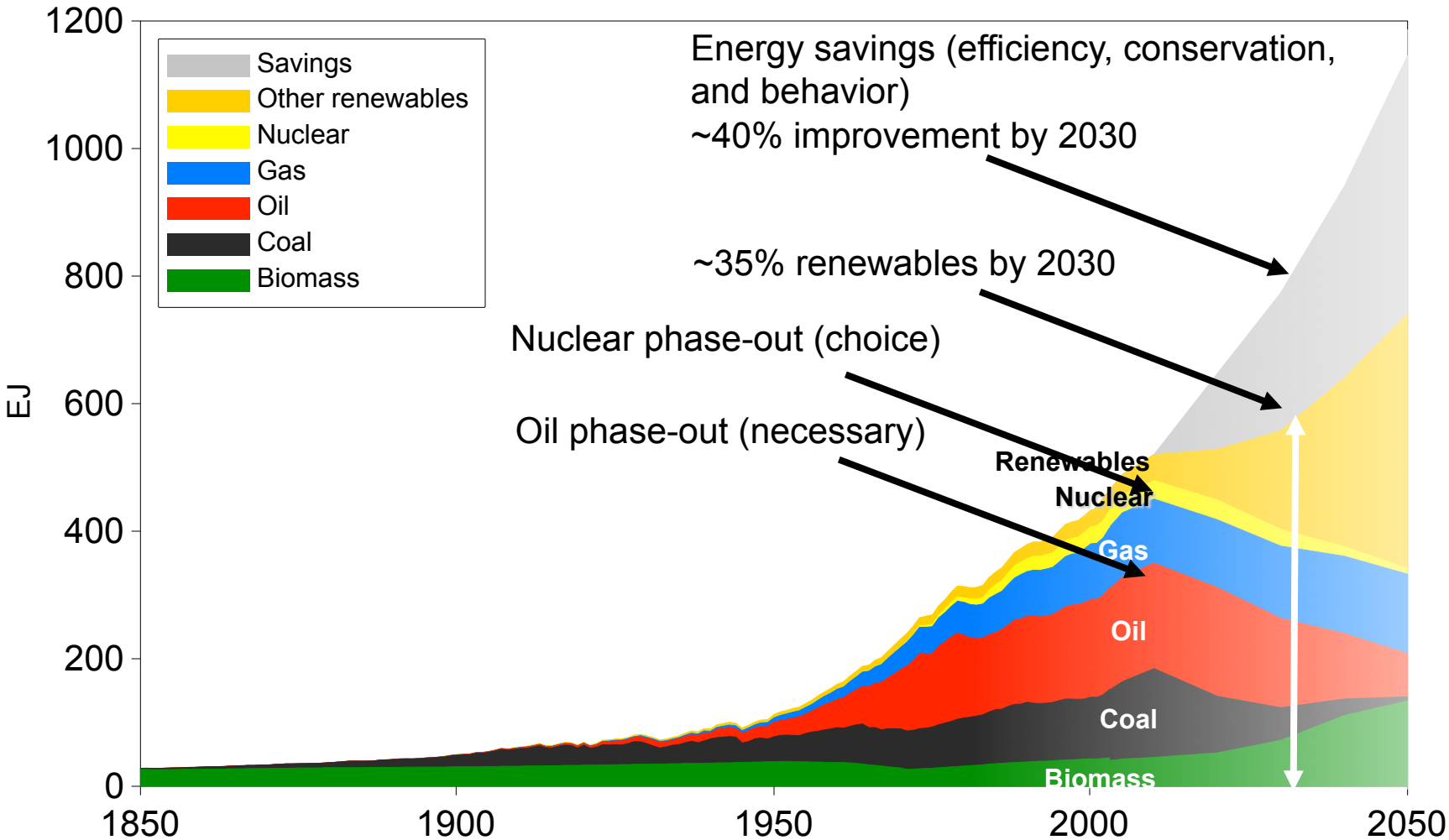
Source:
Y. Yamagata, NIES. 2010

Global Primary Energy



Global Primary Energy

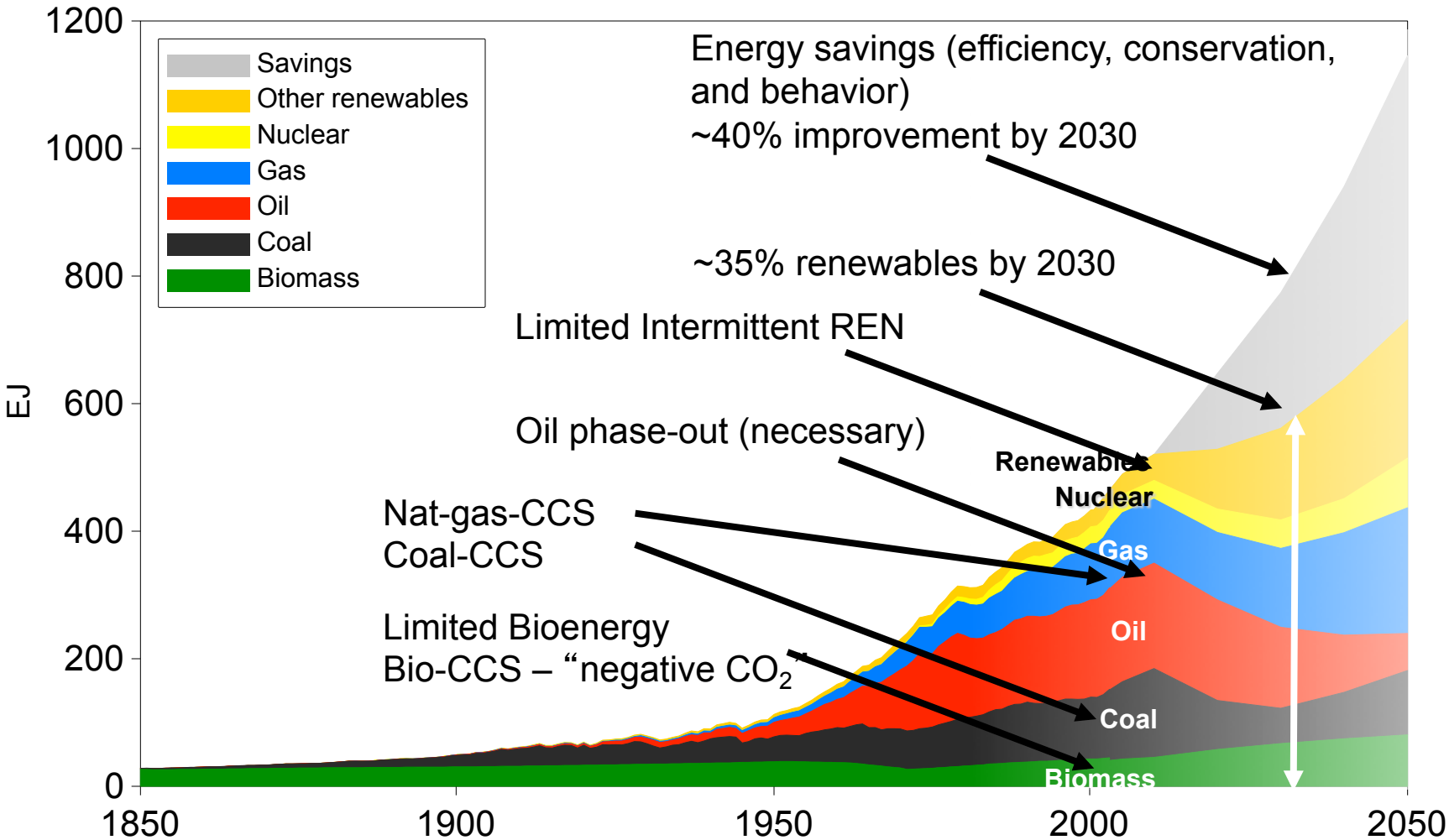
no CCS, no Nuclear



Source: Riahi et al, 2012

Global Primary Energy

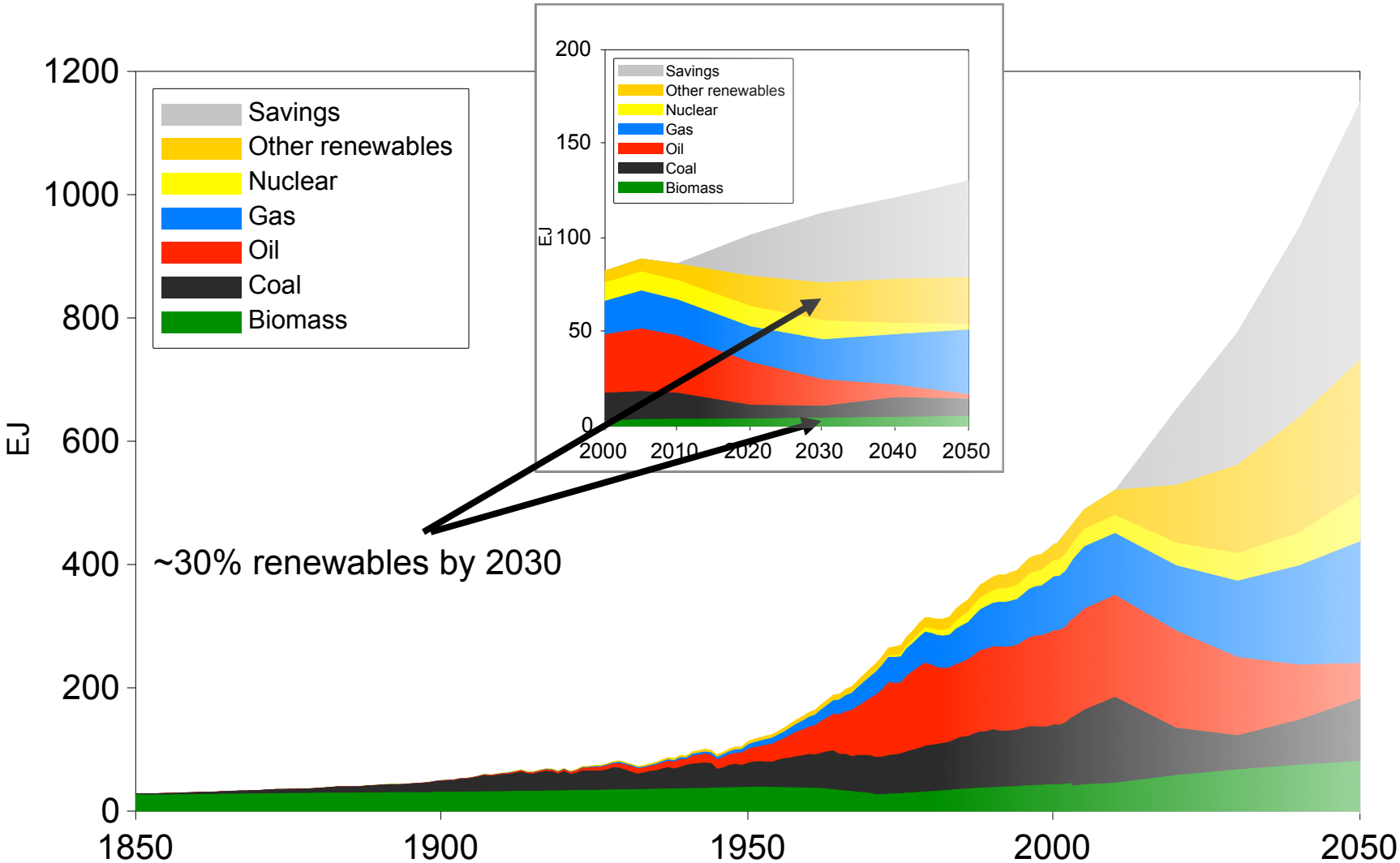
lim. Bioenergy, lim. Intermittent REN



Source: Riahi et al, 2012

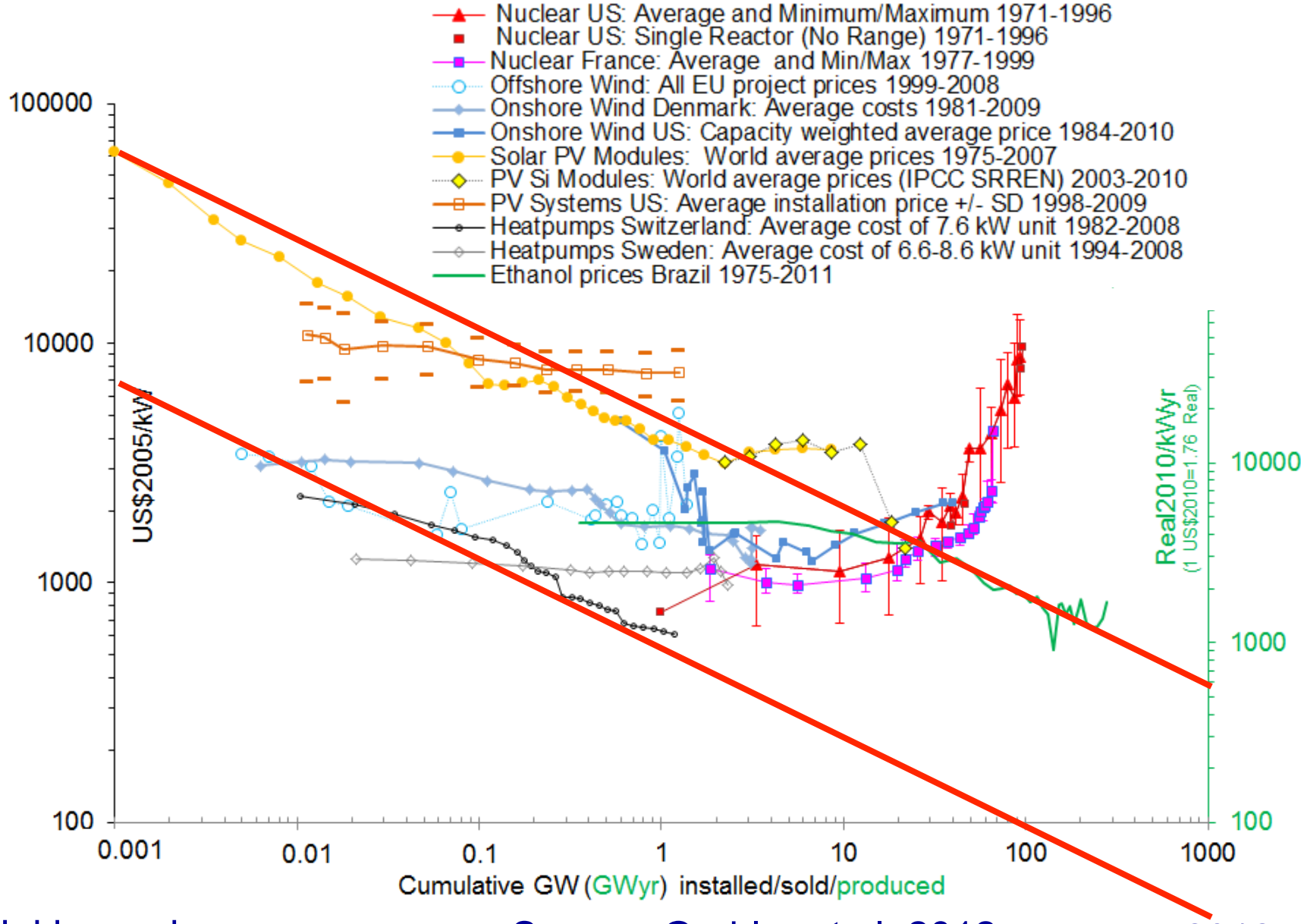
Global Primary Energy

Europe



Source: Riahi et al, 2012

Supply Technologies Cost Trends



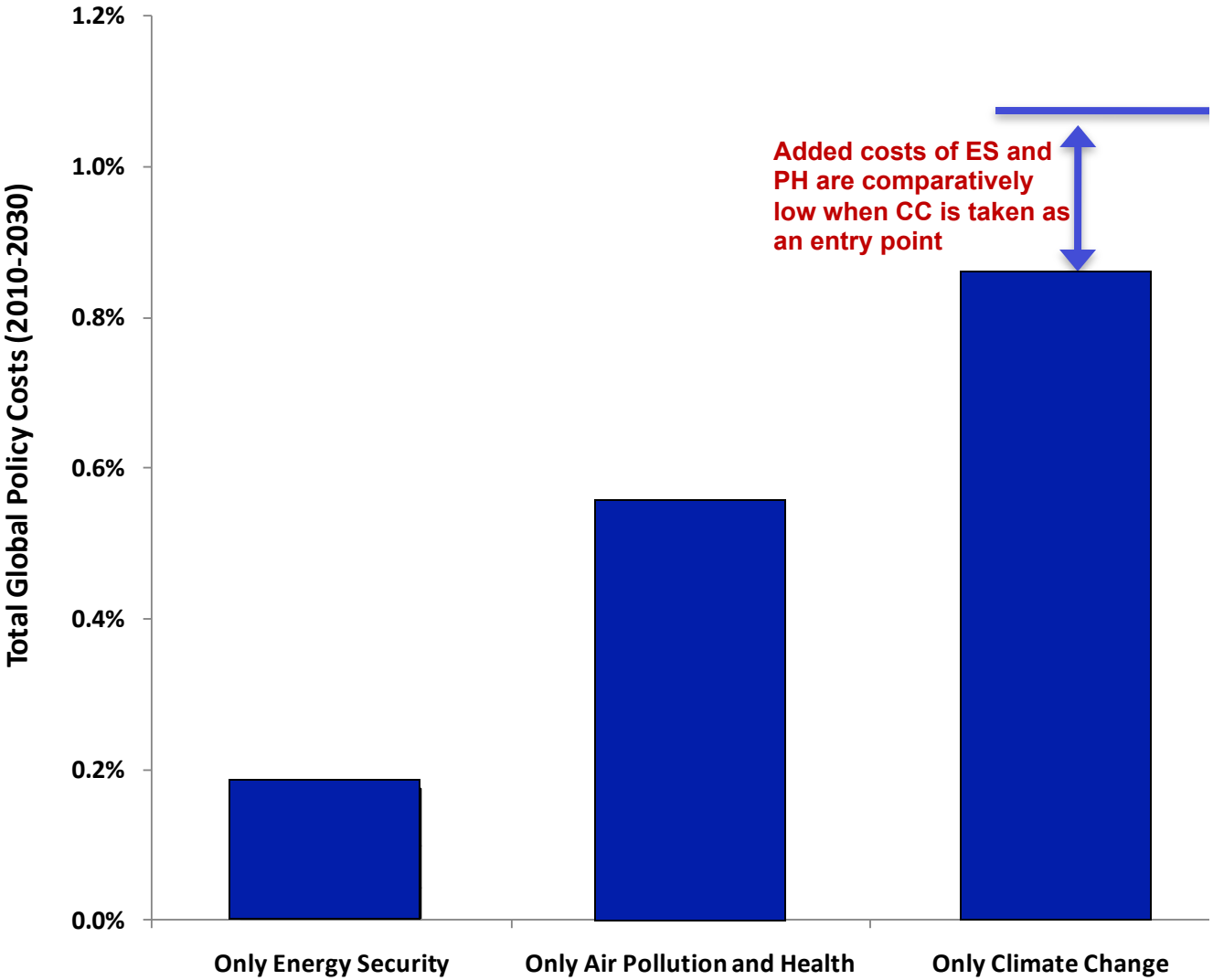
Source: Grubler et al, 2012

Global Energy Investments

Annual Energy Investments	Innovation RD&D [billion US$2005]	Markets Formation [billion US$2005]	Present Investments [billion US$2005]	Future Investments [billion US$2005]
	2010	2010	2010	2010 - 2030
Efficiency	>> 8	~ 5	300	~400
Renewables	> 12	~ 20	200	~400
Access	< 1	< 1	~ 9	~40
Total	> 50	< 150	1250	~1750

Source: Grubler et al & Riahi et al, 2012

Energy Policy Costs (% GDP)



Source: McCollum, Krey, Riahi, 2012