Global Energy Transformation

Efficiency and Decarbonziation

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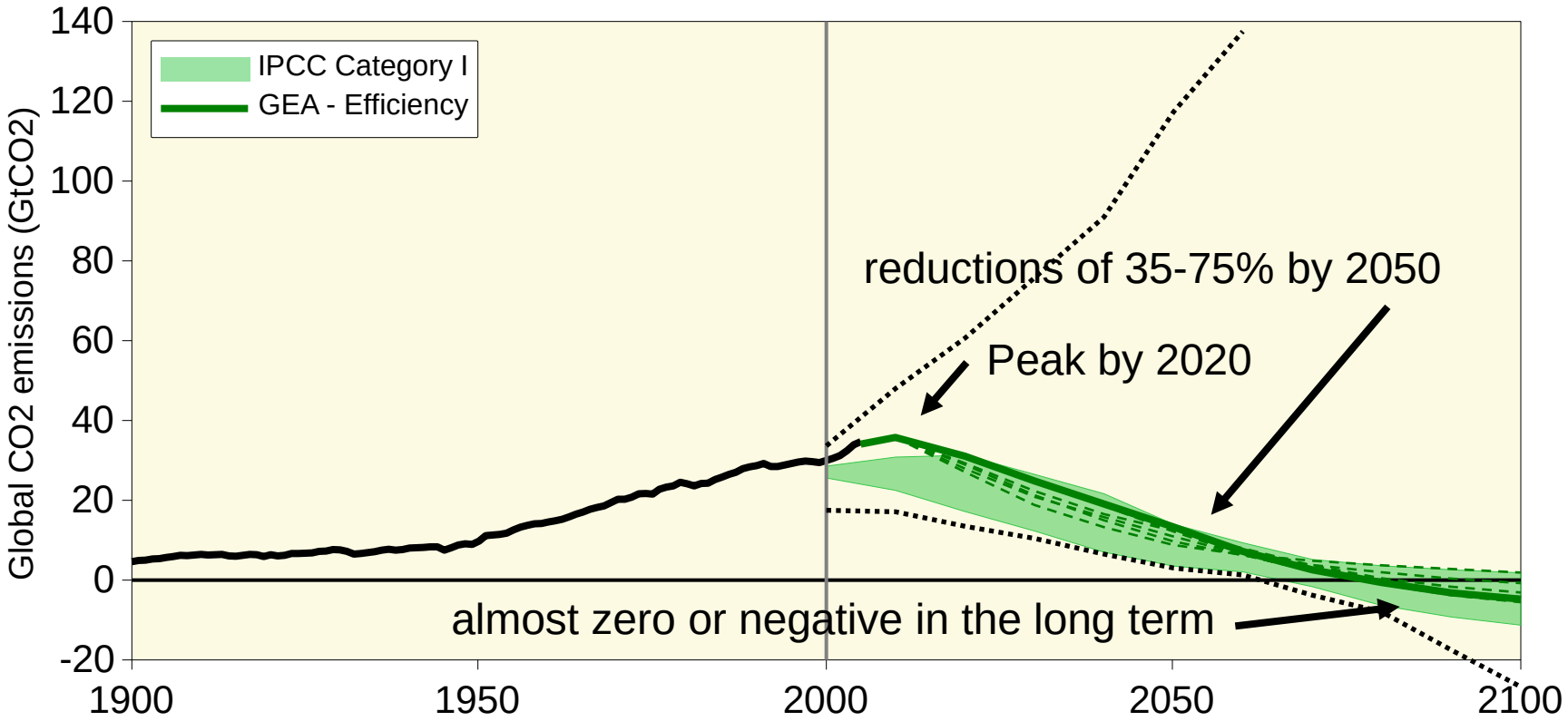
2012 INTERNATIONAL YEAR OF
SUSTAINABLE ENERGY
FOR ALL

2030 Energy Goals

- Universal Access to Modern Energy
- Double Energy Efficiency Improvement
- Double Renewable Share in Final Energy

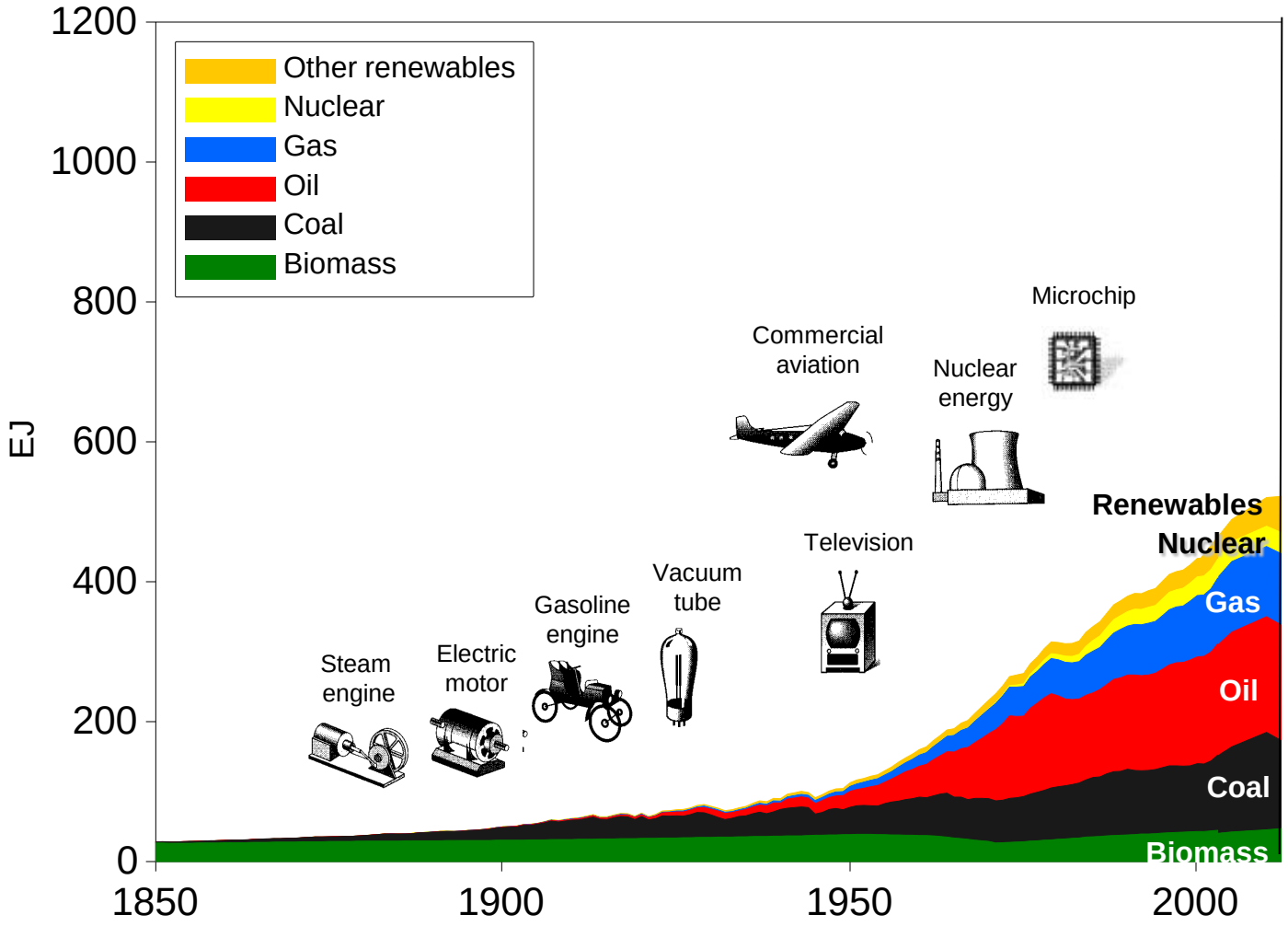
Aspirational & Ambitious but Achievable

Global Carbon Emissions

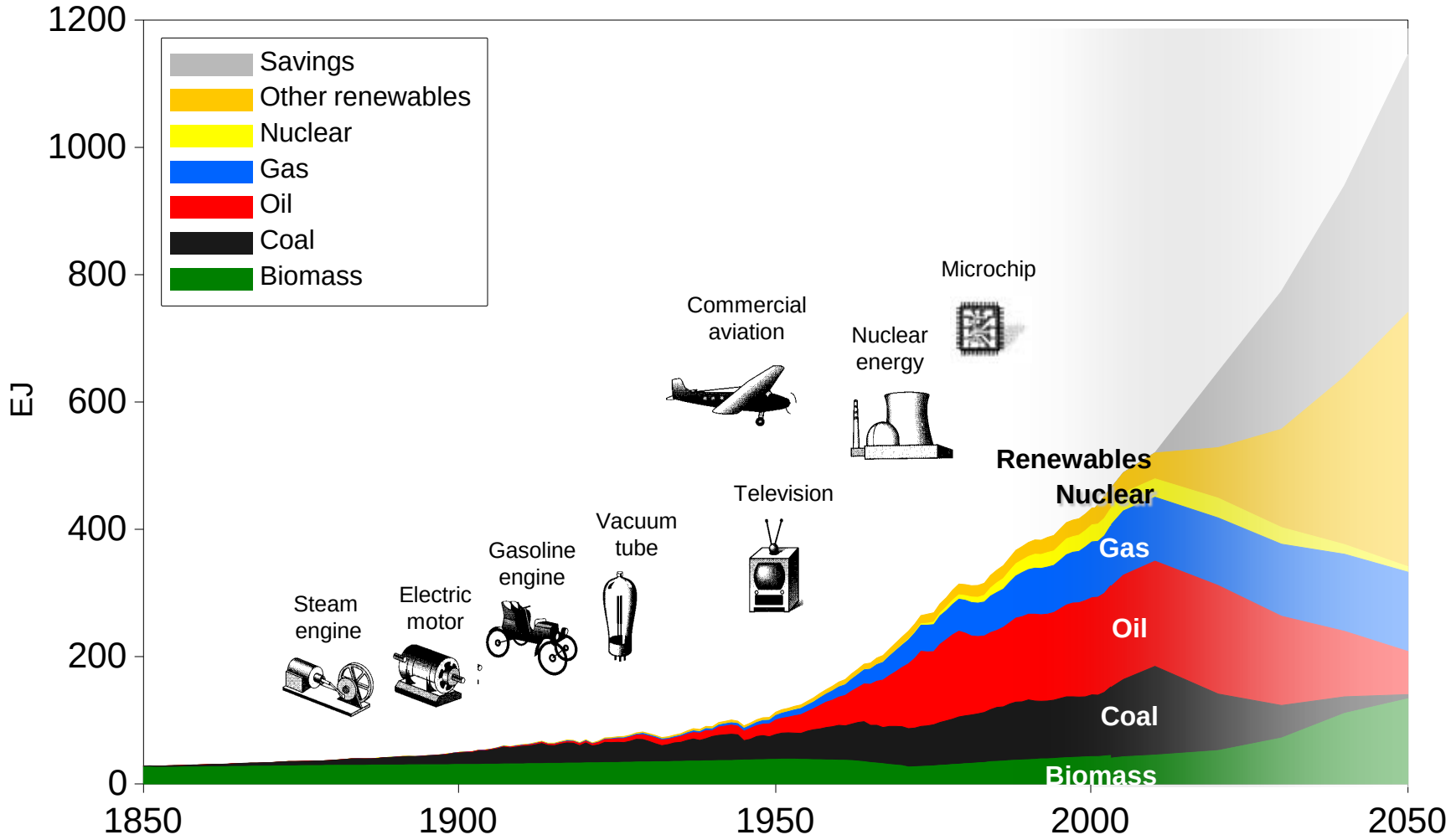


Source: Riahi et al, 2011

Global Primary Energy



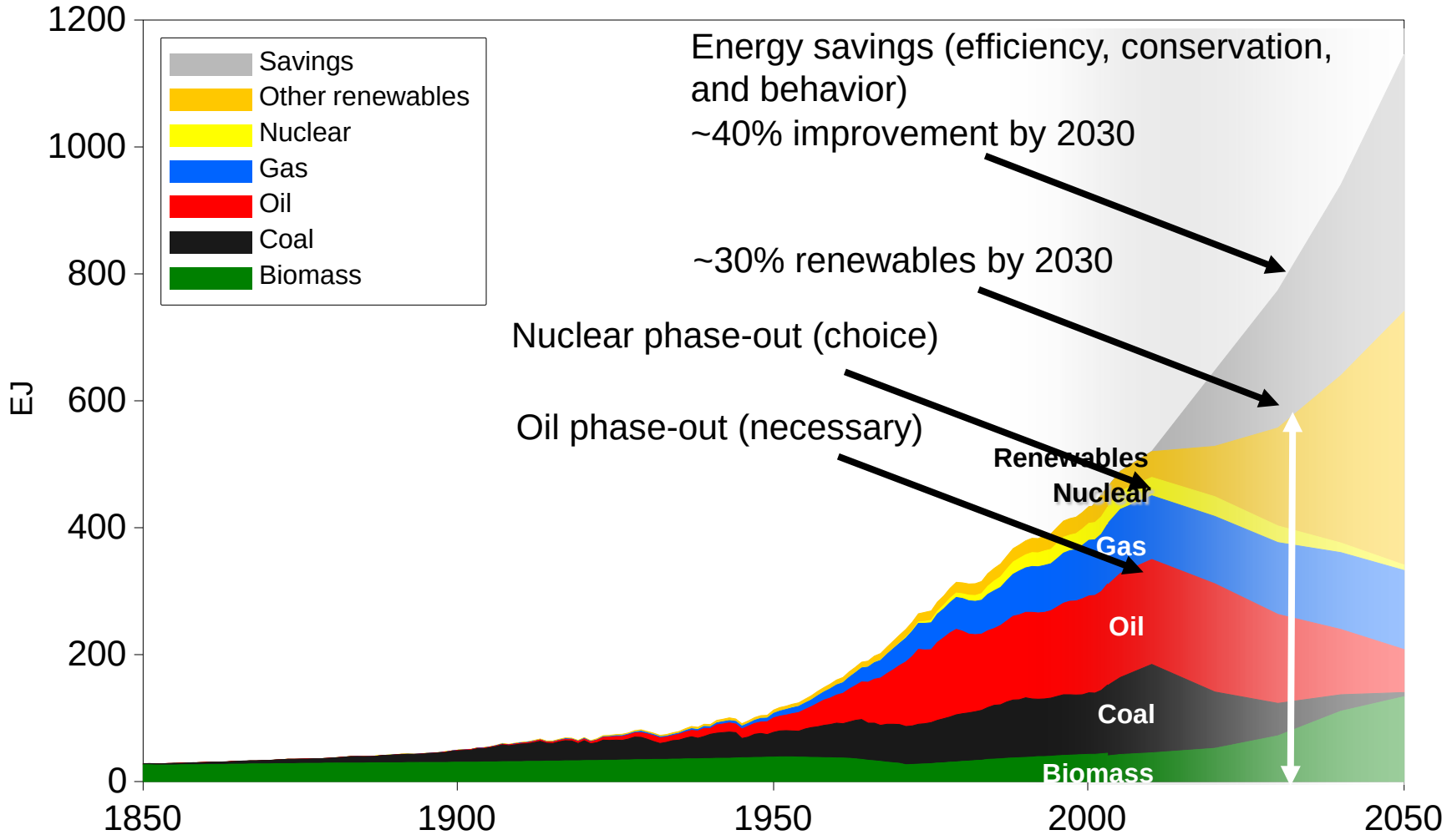
Global Primary Energy



Source: Riahi et al, 2011

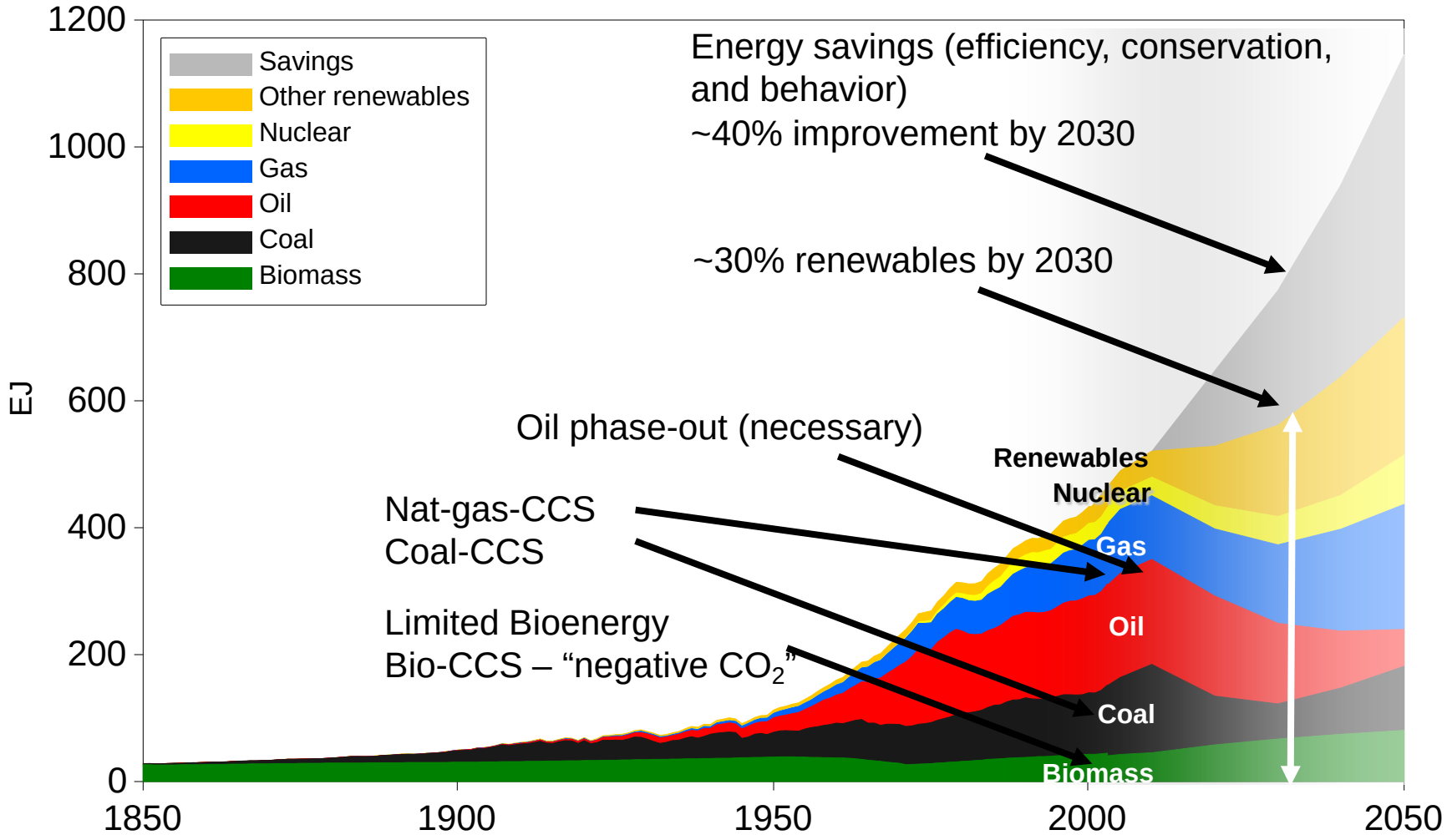
Global Primary Energy

no CCS, no Nuclear



Source: Riahi et al, 2011

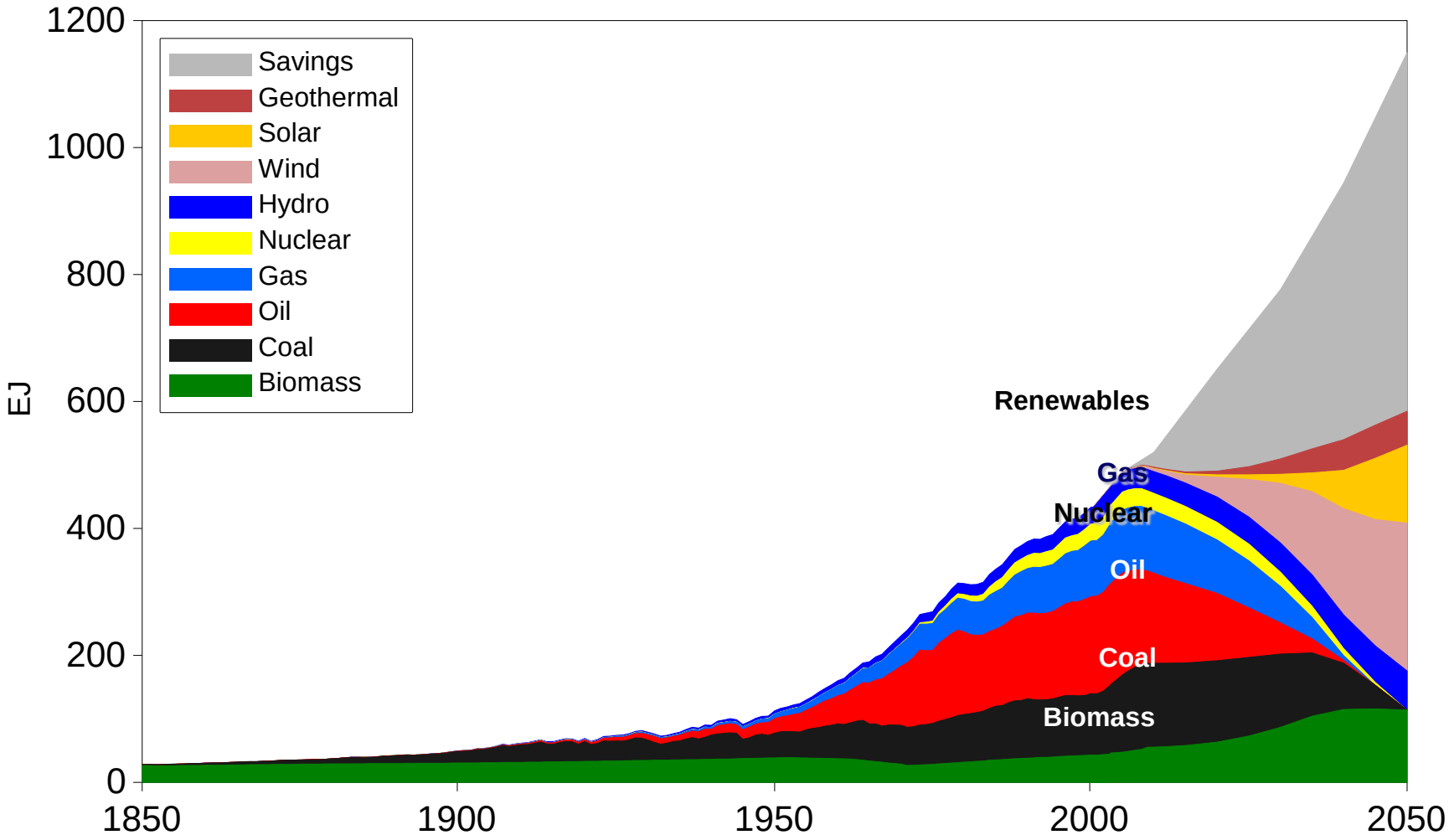
Global Primary Energy



Source: Riahi et al, 2011

Global Primary Energy

WBGU Exemplary Pathway



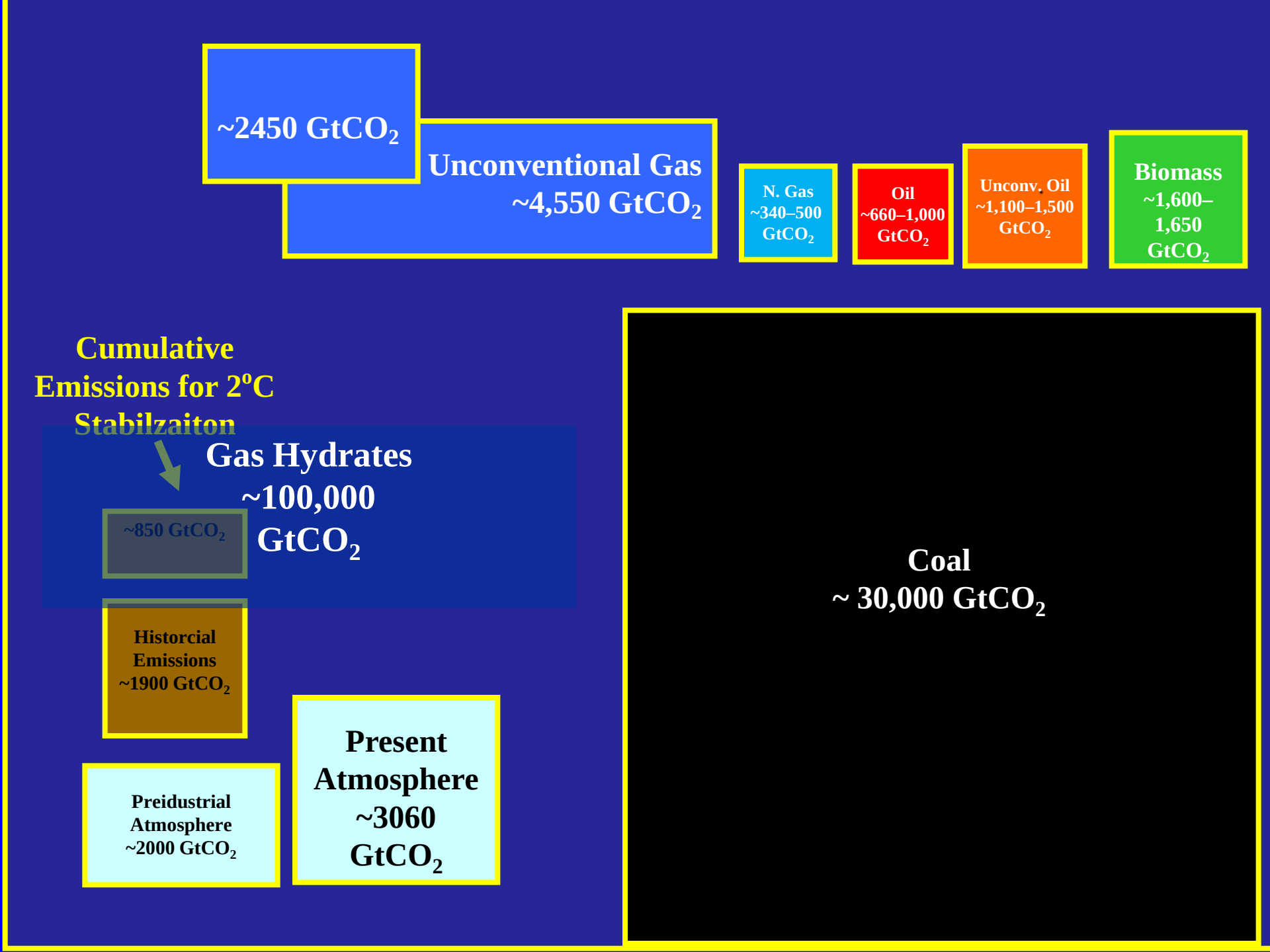
Cumulative Emissions for 2°C Stabilzaiton

~750 $GtCO_2$

Historcial Emissions ~1900 $GtCO_2$

Preidustrial Atmosphere ~2000 $GtCO_2$

Present Atmosphere ~3060 $GtCO_2$


~2450 GtCO2
Unconventional Gas
~4,550 GtCO2
N. Gas
~340–500
GtCO2
Oil
~660–1,000
GtCO2
Unconv. Oil
~1,100–1,500
GtCO2
Biomass
~1,600–
1,650
GtCO2
Cumulative
Emissions for 2°C
Stabilzaiton
Gas Hydrates
~100,000
GtCO2
~850 GtCO2
Historcial
Emissions
~1900 GtCO2
Preidustrial
Atmosphere
~2000 GtCO2
Present
Atmosphere
~3060
GtCO2
Coal
~ 30,000 GtCO2

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, 2011