Net energy analysis: a policy analysis perspective

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by
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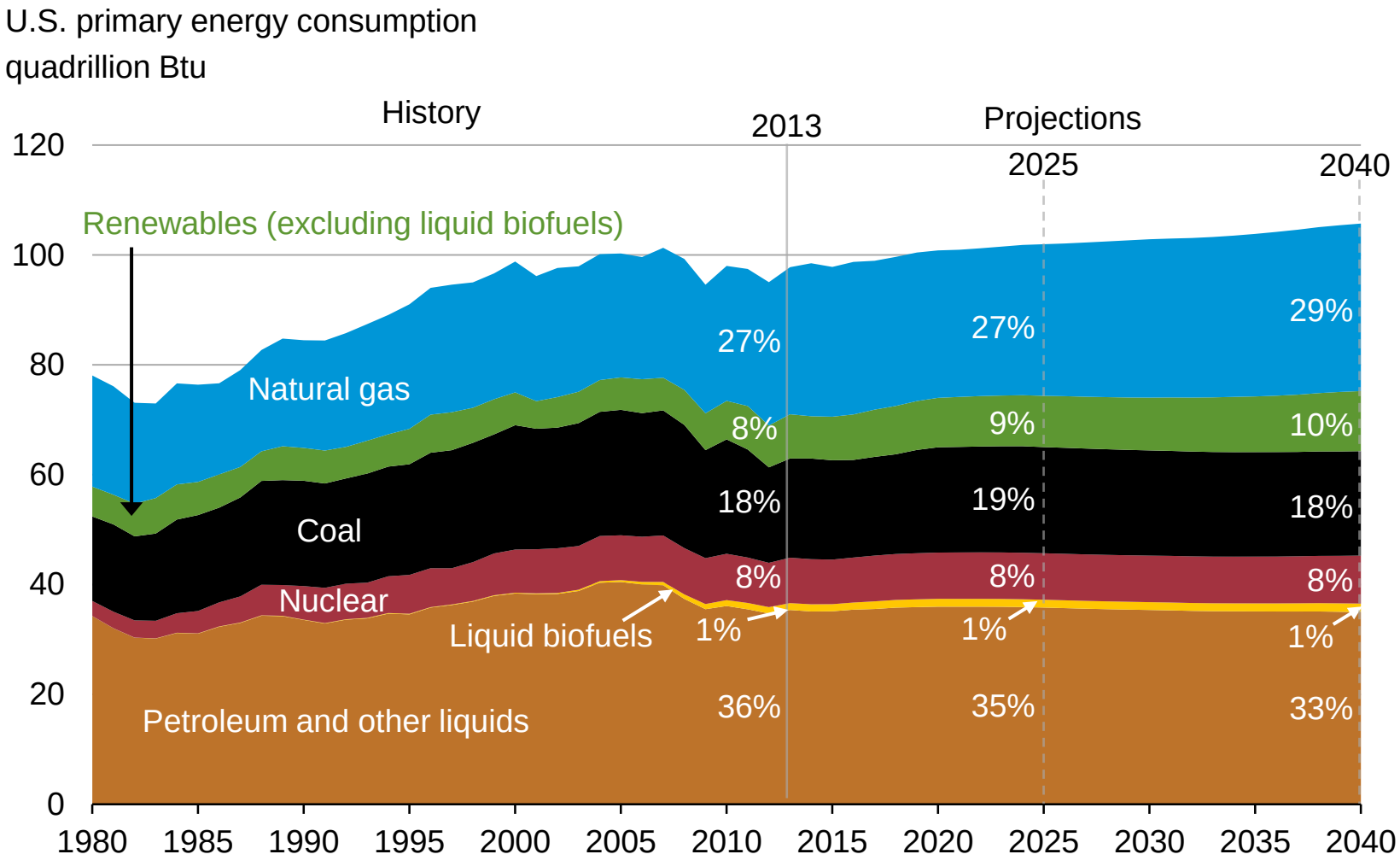
Improvements in energy intensity largely offset impact of growth in GDP leading to slow growth in energy use

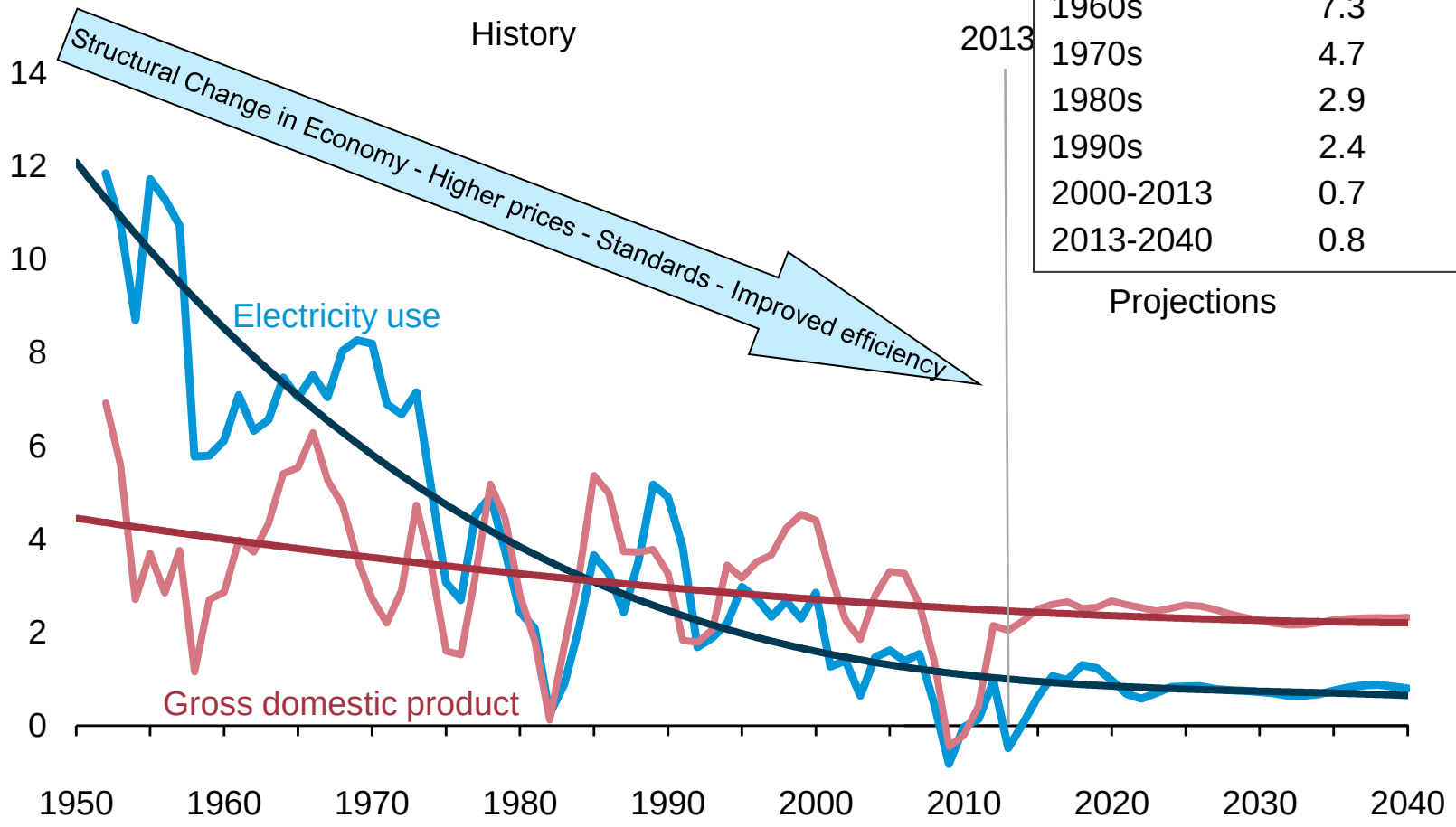


Source: EIA, current thinking

Growth in electricity use slows, but electricity use still increases by 24% from 2013 to 2040

U.S. electricity use and GDP

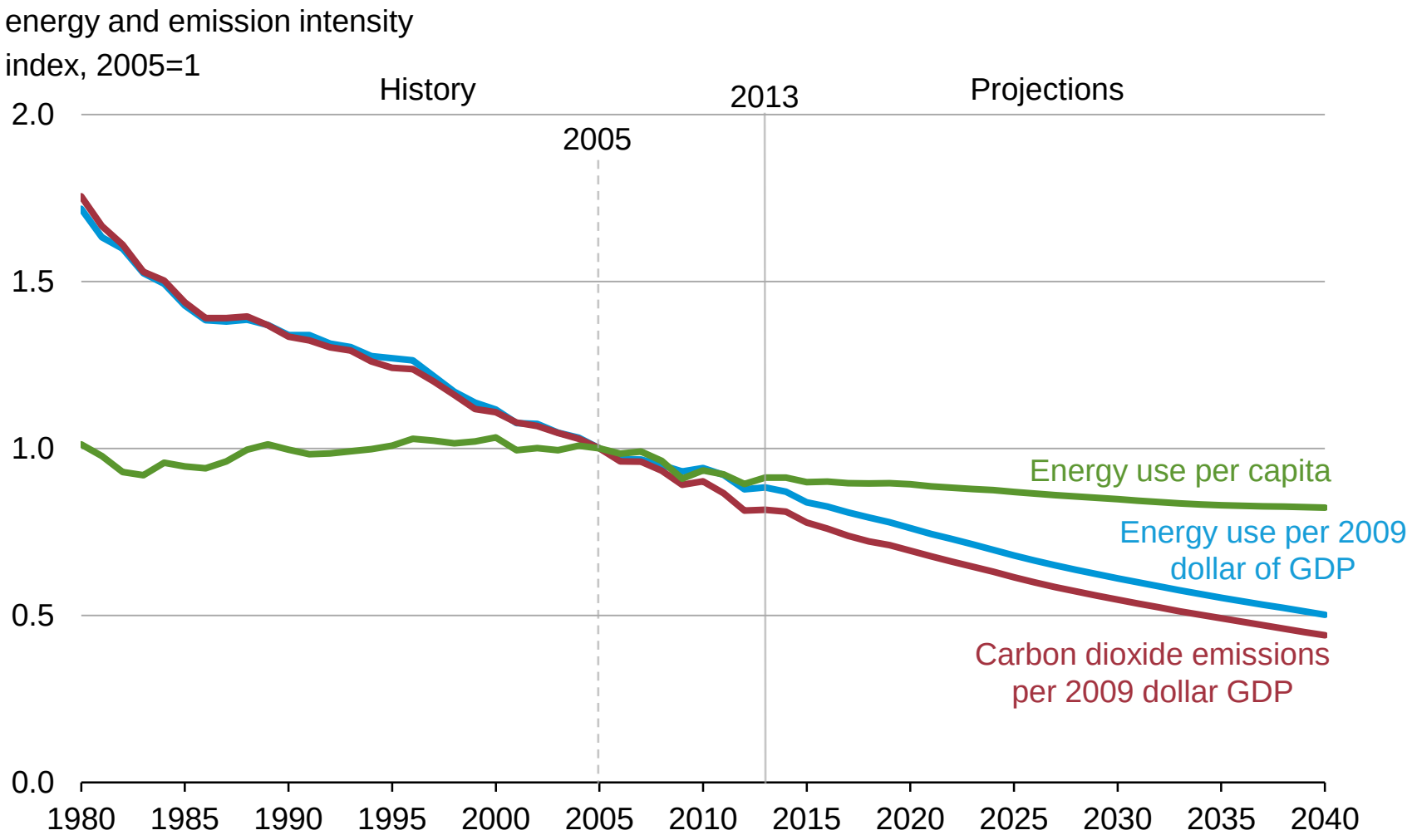
percent growth (rolling average of 3-year periods)



Period	Average Growth	
	Electricity use	GDP
1950s	9.8	4.2
1960s	7.3	4.5
1970s	4.7	3.2
1980s	2.9	3.1
1990s	2.4	3.2
2000-2013	0.7	1.9
2013-2040	0.8	2.4

Source: EIA, current thinking

CO_2 emissions per dollar of GDP decline faster than energy use per dollar of GDP reflecting the shift to lower carbon fuels



Source: EIA, current thinking

Exergy data from GCEP

Coal Mining

Extraction of coal from the lithosphere

Average Efficiency: 94.57%

LEGEND (EXERGY): CHEMICAL NUCLEAR GRAVITATIONAL E.M. RADIATION KINETIC AND WORK THERMAL ELECTRICAL GRAVITATIONAL/CHEMICAL

INPUTS

Carrier	Exergy Flux (J/s)	Carbon Flux (g/s)	Citations
Pipeline Natural Gas	5.185e+09	7.700e+04	IEA Energy Statistics
Gasoline, Diesel, Kerosine	5.285e+09	9.936e+04	IEA Energy Statistics
Electricity	6.984e+09	0.000e+00	
Unmined Coal	3.860e+12	1.158e+08	
TOTAL	**3.877e+12**	**1.160e+08**	

OUTPUT

Carrier	Exergy Flux (J/s)	Carbon Flux (g/s)	Citations
Atmosphere	0.000e+00	5.966e+06	
Mined Coal	3.667e+12	1.100e+08	IEA Energy Statistics
TOTAL	**3.667e+12**	**1.160e+08**	

Exergy data from GCEP

Coal-Fired Power Plants

...

Average Efficiency: 30.13%

LEGEND (EXERGY): CHEMICAL NUCLEAR GRAVITATIONAL E.M. RADIATION KINETIC AND WORK THERMAL ELECTRICAL GRAVITATIONAL/CHEMICAL

INPUTS

Carrier	Exergy Flux (J/s)	Carbon Flux (g/s)	Citations
Mined Coal	2.307e+12	6.921e+07	IEA Energy Statistics
TOTAL	**2.307e+12**	**6.921e+07**	

OUTPUT

Carrier	Exergy Flux (J/s)	Carbon Flux (g/s)	Citations
Atmosphere	0.000e+00	6.921e+07	
Electricity	6.950e+11	0.000e+00	IEA Energy Statistics
TOTAL	**6.950e+11**	**6.921e+07**	

For more information

U.S. Energy Information Administration home page | www.eia.gov

Annual Energy Outlook | www.eia.gov/aeo

Short-Term Energy Outlook | www.eia.gov/steo

International Energy Outlook | www.eia.gov/ieo

Monthly Energy Review | www.eia.gov/mer

Today in Energy | www.eia.gov/todayinenergy

State Energy Profiles | http://www.eia.gov/state

Drilling Productivity Report | http://www.eia.gov/petroleum/drilling/

Exergy data from GCEP

Ethanol Production

Currently, most ethanol is produced from biomass feedstocks (primarily corn and sugar cane), and some fossil fuel is used to drive the conversion and purification processes. However, ethanol could also be made from fossil feedstocks.

Average Efficiency: 37.69%

LEGEND (EXERGY): CHEMICAL NUCLEAR GRAVITATIONAL E.M. RADIATION KINETIC AND WORK THERMAL ELECTRICAL GRAVITATIONAL/CHEMICAL

INPUTS

Carrier	Exergy Flux (J/s)	Carbon Flux (g/s)	Citations
Pipeline Natural Gas	8.089e+09	1.201e+05	Ethanol can contribute to energy and...
Mined Coal	1.092e+10	3.276e+05	Ethanol can contribute to energy and...
Solid Biofuel	5.460e+10	1.365e+06	WEC Survey of Energy Resources
TOTAL	**7.361e+10**	**1.813e+06**	

Exergy data from GCEP

Agriculture

Farming. All aspects from primitive gathering of fruits and wood through major industrial crop and animal farms

Average Efficiency: 34.72%

LEGEND (EXERGY): CHEMICAL NUCLEAR GRAVITATIONAL E.M. RADIATION KINETIC AND WORK THERMAL ELECTRICAL GRAVITATIONAL/CHEMICAL

INPUTS

Carrier	Exergy Flux (J/s)	Carbon Flux (g/s)	Citations
Chemicals	2.060e+10	3.873e+05	
Electricity	3.000e+10	0.000e+00	IEA Energy Statistics
Gasoline, Diesel, Kerosine	1.057e+11	1.987e+06	
Plant Matter	5.468e+12	1.367e+08	Global patterns in human consumption...
TOTAL	**5.625e+12**	**1.391e+08**	

OUTPUT

Carrier	Exergy Flux (J/s)	Carbon Flux (g/s)	Citations
Atmosphere	0.000e+00	9.026e+07	
Textiles	1.359e+10	3.398e+05	Cotton and Wool Situation and Outloo...
Solid Biofuel	8.337e+11	2.084e+07	IEA Energy Statistics
Raw Food	1.106e+12	2.764e+07	The Biomass Metabolism of the Food S...
TOTAL	**1.953e+12**	**1.391e+08**	