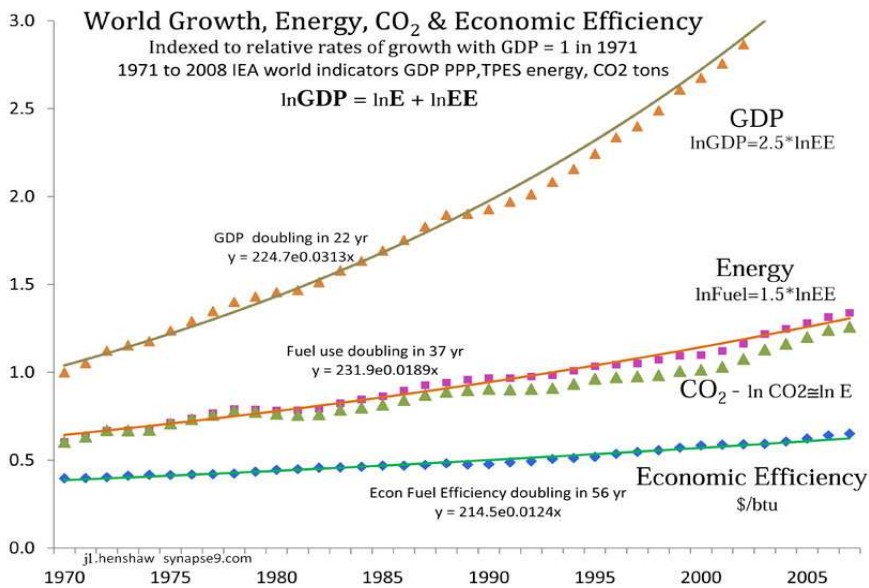
IEA Data for JLH Decoupling Model1 Links - Excel Model JLH Article

Recent World GDP & Energy Growth Constants

IEA World data from 1970 to 2008 shows "avg. natural economic growth constants" consistent with the recorded GDP growth rates, in records since the 1870's

"Growth Constants"** - GDP: **3.13 %/yr, -** Economic Energy use: **1.89 %/yr,
-** Energy Efficiency, as GDP/Energy: **1.24 %/yr
"Coupling Rate"** (the ratio of Energy and GDP growth rates) **1.89/3.13 = 60.4 %/yr



- These data curves are presented as if projected to the origin of growth (~1800), with constant scale relations in proportion to their growth rates, 2.5 : 1.5 : 1.0.

- The verticale scale is obtained by indexing the GDP curve to equal 1.0 in 1970 and the others in proportion to their relative growth rates, using the scaleing factors needed to put all three on the same scale. Data & other studies of it in:

for GDP, Energy & Energy Efficiency, consistent with the earlier recorded GDP growth rates, since early records began being kept in the 1870's

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Model 1

Steady GDP Growth --- w/o Decoupling

Initial GDP Growth	GDP start ~trillions 2010 $'s	Decoupling Rates	Initial Coupling Rate	Energy P & C Index to 2015
3.1%	5.9	0%	60%	50.0

Year	GDP Growth rate	GDP	Decoupling Rate	Coupling Rate	Energy Index to 2015 GDP
1935	3.1%	5.9	0.0%	60.0%	50.0
1945	3.1%	8.0	0.0%	60.0%	60.1
1955	3.1%	10.9	0.0%	60.0%	72.3
1965	3.1%	14.7	0.0%	60.0%	86.9
1975	3.1%	20.0	0.0%	60.0%	104.5
1985	3.1%	27.2	0.0%	60.0%	125.6
1995	3.1%	36.8	0.0%	60.0%	151.1
2005	3.1%	50.0	0.0%	60.0%	181.6
2015	3.1%	67.8	**0.0%**	60.0%	218.4
2025	3.1%	92.1	0.0%	60.0%	262.6
2035	3.1%	124.9	0.0%	60.0%	315.7
2045	3.1%	169.6	0.0%	60.0%	379.6
2055	3.1%	230.1	0.0%	60.0%	456.5
2065	3.1%	312.2	0.0%	60.0%	548.8
2075	3.1%	423.7	0.0%	60.0%	659.9
2085	3.1%	575.0	0.0%	60.0%	793.4
2095	3.1%	780.3	0.0%	60.0%	954.0
2105	3.1%	1058.8	0.0%	60.0%	1,147.1

This version shows the historic trend projected forward. Growing energy use has growing impacts of energry production & consumption (disturbing and polluting environments). Energy use also has growing impacts from altering the earth to deliver the GDP products people now prefer. Energy use and GDP have been "Coupled", growing together but using gradually less energy as improving efficiency sells more and more products too.

*"Decoupling" replaces that with **products people prefer not requiring energy to produce or consume**.*

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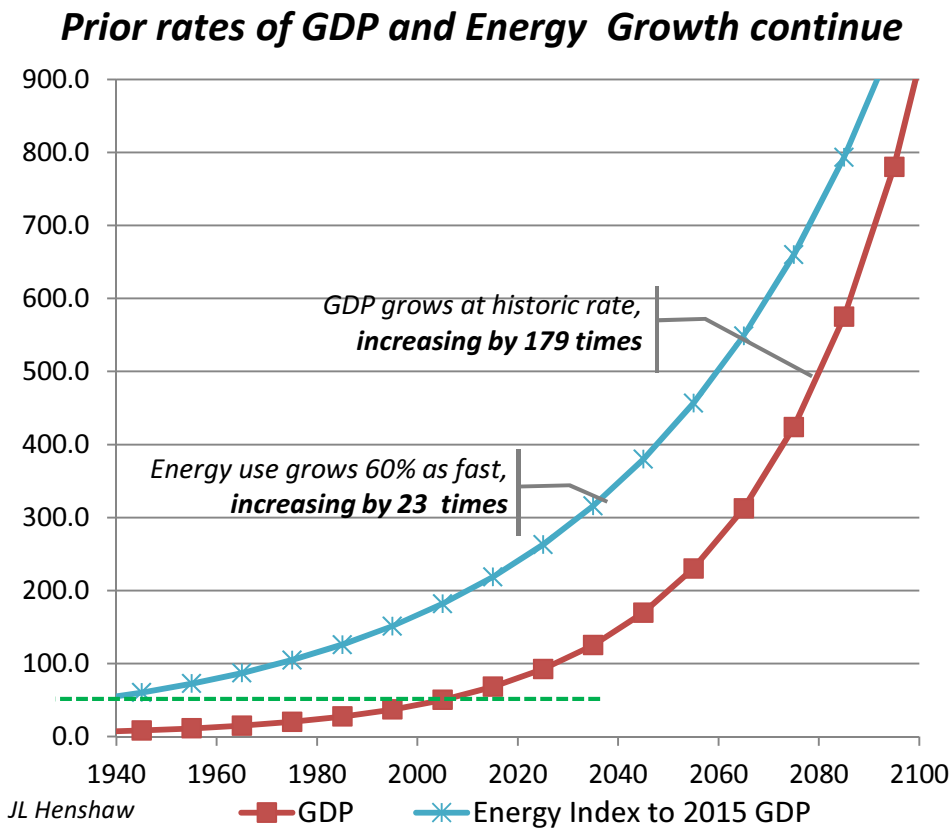
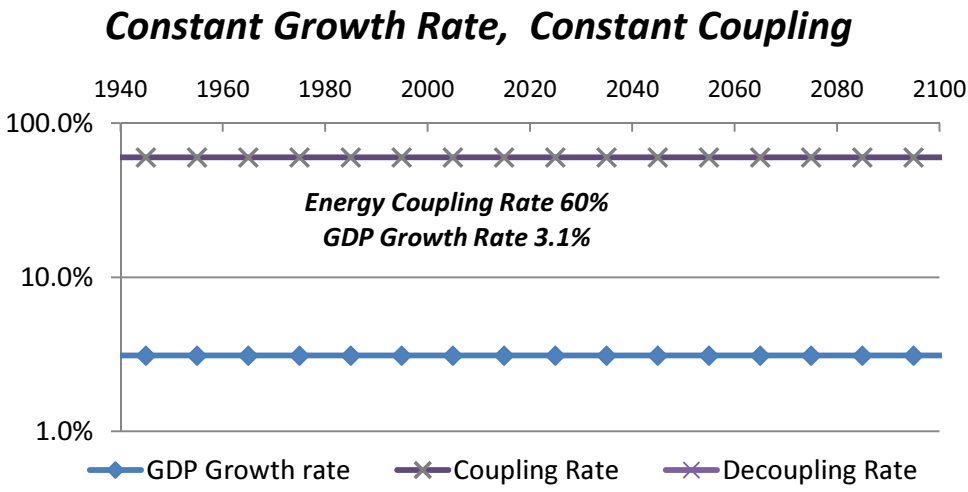
Model 1 Fig A



Model 1 Fig B



Model 2

B. Steady GDP Growth --- w/ Decoupling

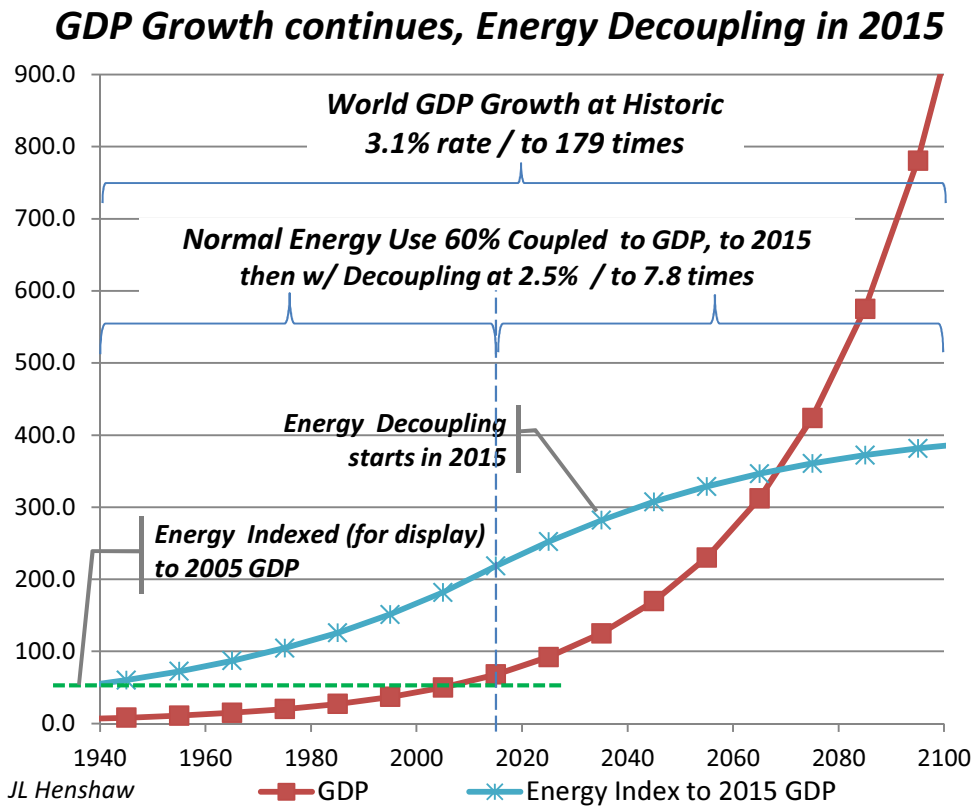
Initial GDP Growth	GDP start ~trillions 2010 $'s	Decoupling Rates	Initial Coupling Rate	Energy P & C Index to 2015
3.1%	5.9	0%	60%	50.0
		2.5%		

Year	GDP Growth rate	GDP	Decoupling Rate	Coupling Rate	Energy Index to 2015 GDP
1935	3.1%	5.9	0%	60%	50.00
1945	3.1%	8.0	0%	60%	60.12
1955	3.1%	10.9	0%	60%	72.28
1965	3.1%	14.7	0%	60%	86.91
1975	3.1%	20.0	0%	60%	104.50
1985	3.1%	27.2	0%	60%	125.64
1995	3.1%	36.8	0%	60%	151.07
2005	3.1%	50.0	0%	60%	181.64
2015	3.1%	67.8	**2.5%**	60%	218.40
2025	3.1%	92.1	2.5%	47%	252.07
2035	3.1%	124.9	2.5%	36%	281.79
2045	3.1%	169.6	2.5%	28%	307.30
2055	3.1%	230.1	2.5%	22%	328.70
2065	3.1%	312.2	2.5%	17%	346.36
2075	3.1%	423.7	2.5%	13%	360.72
2085	3.1%	575.0	2.5%	10%	372.29
2095	3.1%	780.3	2.5%	7.9%	381.52
2105	3.1%	1,058.8	2.5%	6.1%	388.85

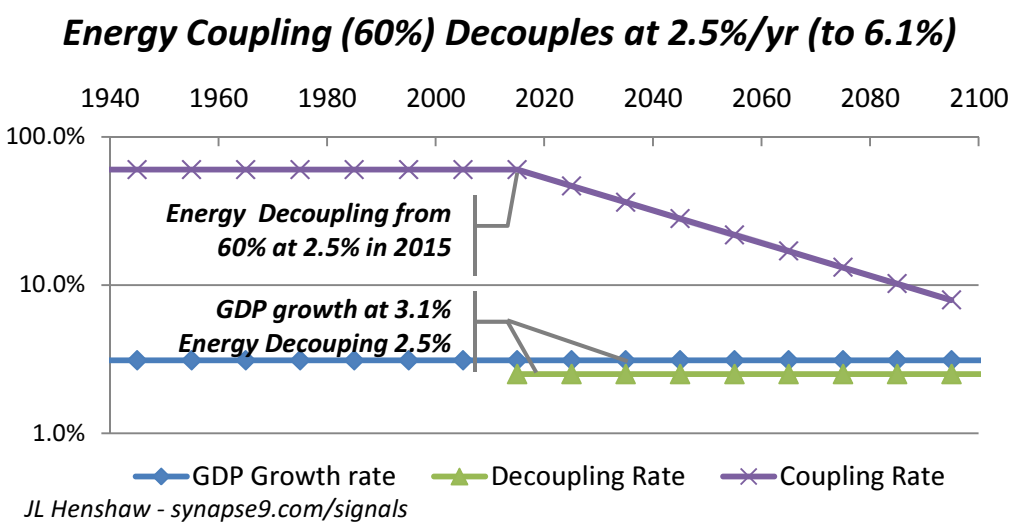
This version shows the hope for "Sustainable Development" and the UN's Post 2015 SD Goals, that GDP, and the future of the earth, can rely on people wanting products that that use less and less energy. That relies on 1) our inventing desirable products without energy needs, and 2) our trusting that as a way to relieve the earth of the our unsustainable impacts.

*It projects an unprecedented break from the past behavior of the economy, that could either be **"the solution" or "a signal"** that we've miscalculated.*

Model 2 Fig A



Model 2 Fig B



US Data, History of growth from 1874

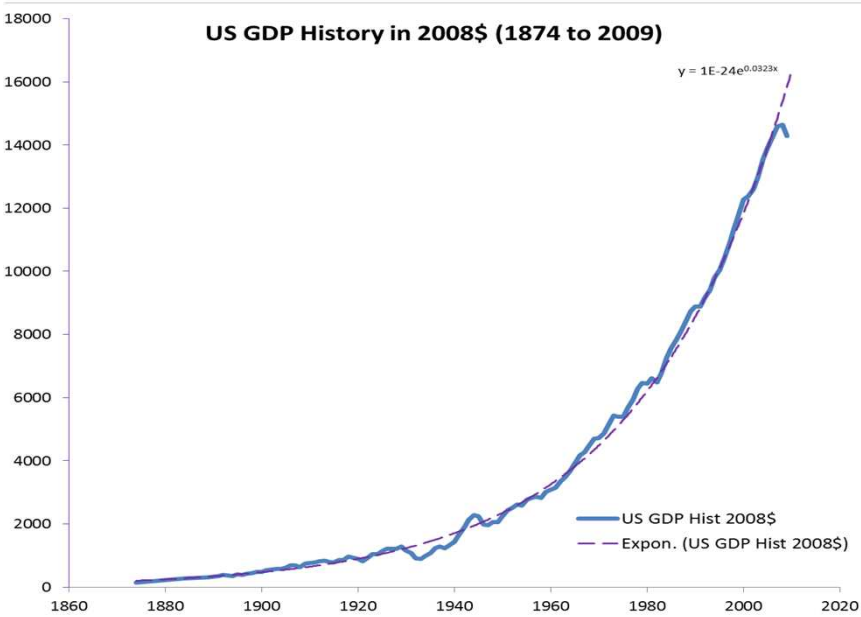
History of US GNP & GDP (spliced for continuity)

Based on historical data pieced together. Data from US NIPA sources were combined, scale adjusted for inflation and for aligning the growth constants of each.

"Growth Constant"** - GDP: **3.23 %/yr, -

***"Coupling Rate" - ??** - assumed to be as nominally constant as the growth rate*

(as evidence of continuity in the growth process and resource coupling from the start.)



*- The remarkable thing, of course, is **How small all other great events of the past century and a half appear**!!!*

- Naturally, a scientist who studies systems asks, "What's the system?", "What's it building? and "Where's it headed?"

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