Role of Renewable Energy in De-growth Future

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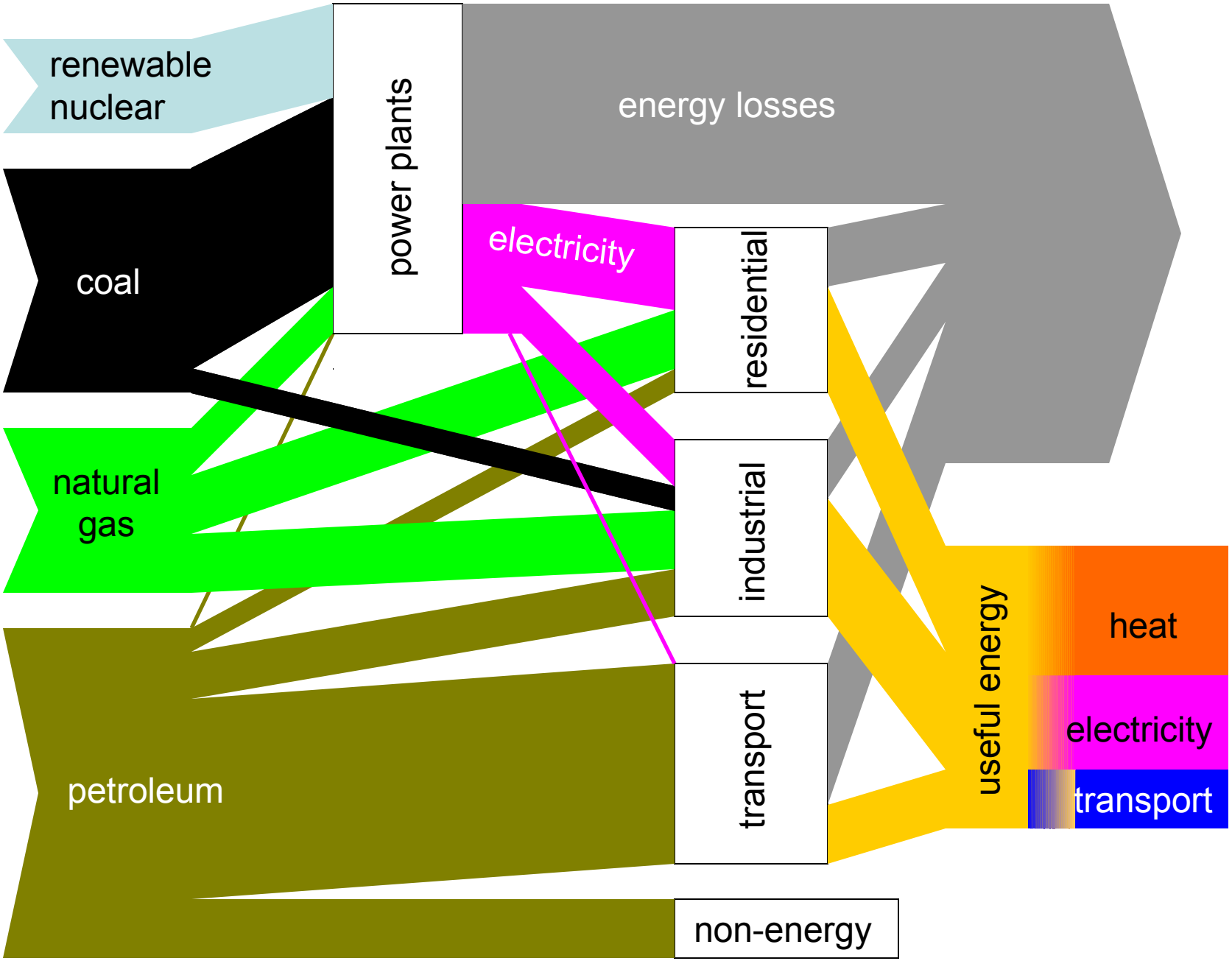
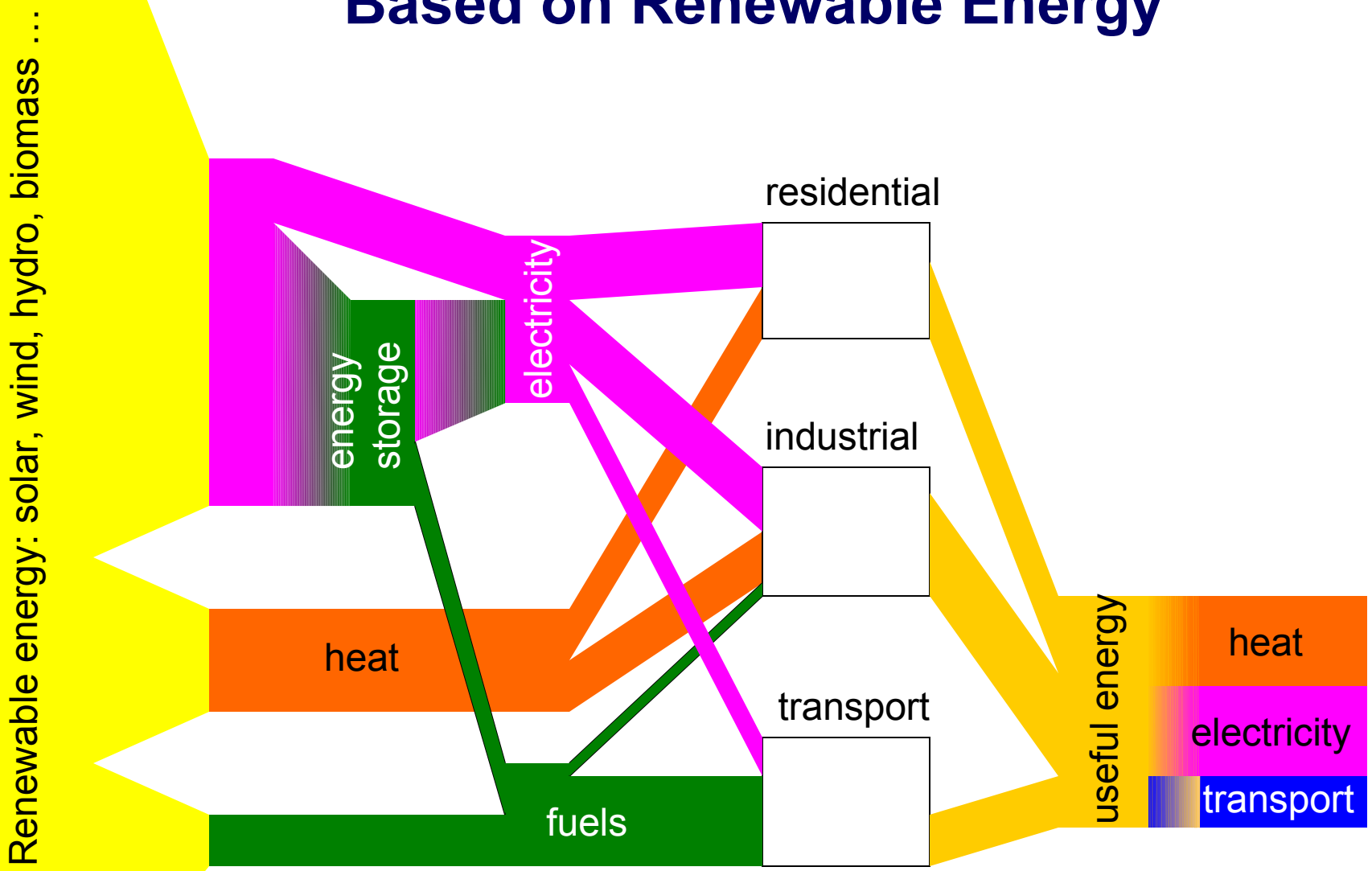
Abstract

It is relatively easy to envision a future based on renewable energy. Present day renewable energy technologies could technically replace the existing fossil fuel based technologies. Electricity could be produced by solar and wind power plants. Fuels could be produced from biomass or from electricity. Heat could be produced by solar panels or from electricity. There would be no pollutants and greenhouse gases emissions. However, energy in such a future would be far more expensive than it is today. This would have dramatic effects on global economy, social order and everyday life, and therefore on the patterns of energy use. The question is whether such a system would be still better than the clearly unsustainable present system continuing in the future with all its problems (such as volatile prices, global warming and climate change, wars over remaining scarce resources, etc.) which in the future would only get worse. Such a question could only be answered with a help of complex energy and economic models that attempt to simulate the future, and only with a great deal of uncertainty associated with such a complex task. Even if the results indicate that such a system would be better it would be impossible to impose and implement the transition to an energy system that should have such dramatic and unforeseeable consequences. This paper will evaluate the use of renewable energy technologies in a future where they do not simply replace the existing technologies in both quantity of energy and the type of services they provide, but in a future where they satisfy the basic needs of individuals and sustainable communities. Transition to such a system would be possible but only on individual and local levels.

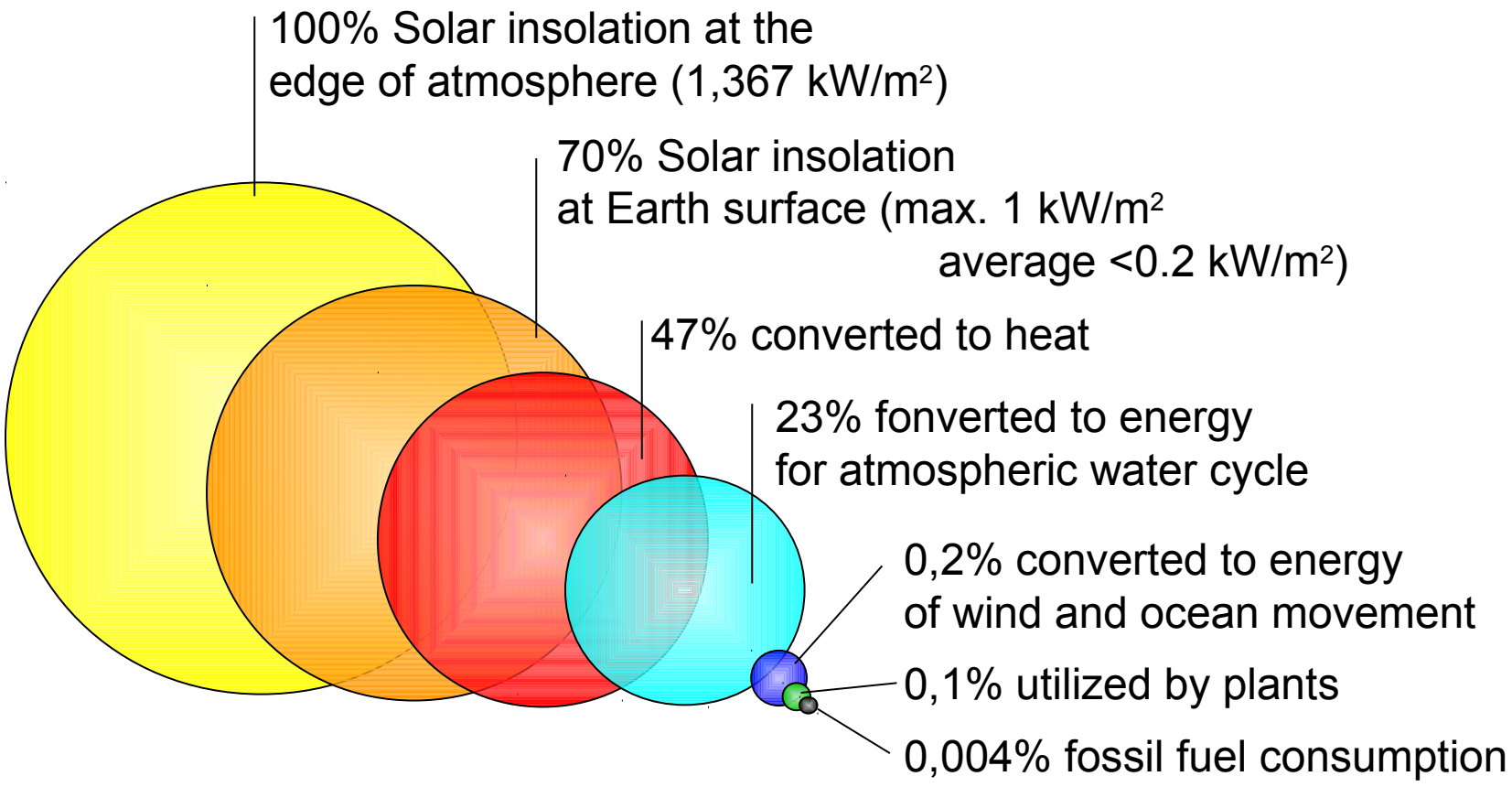
Present Global Energy System

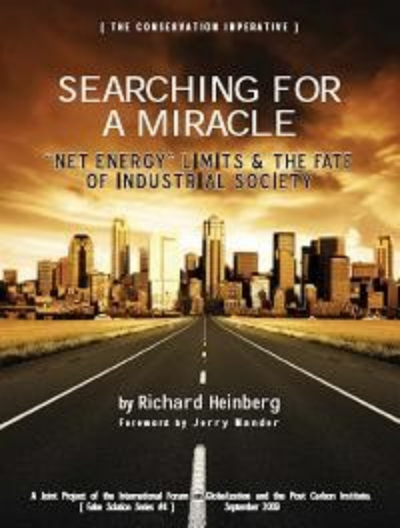


Hypothetical Future Energy System Based on Renewable Energy



Distribution of Solar Energy





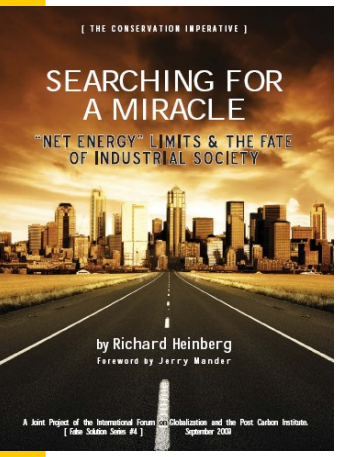
Comparison of Energy Sources

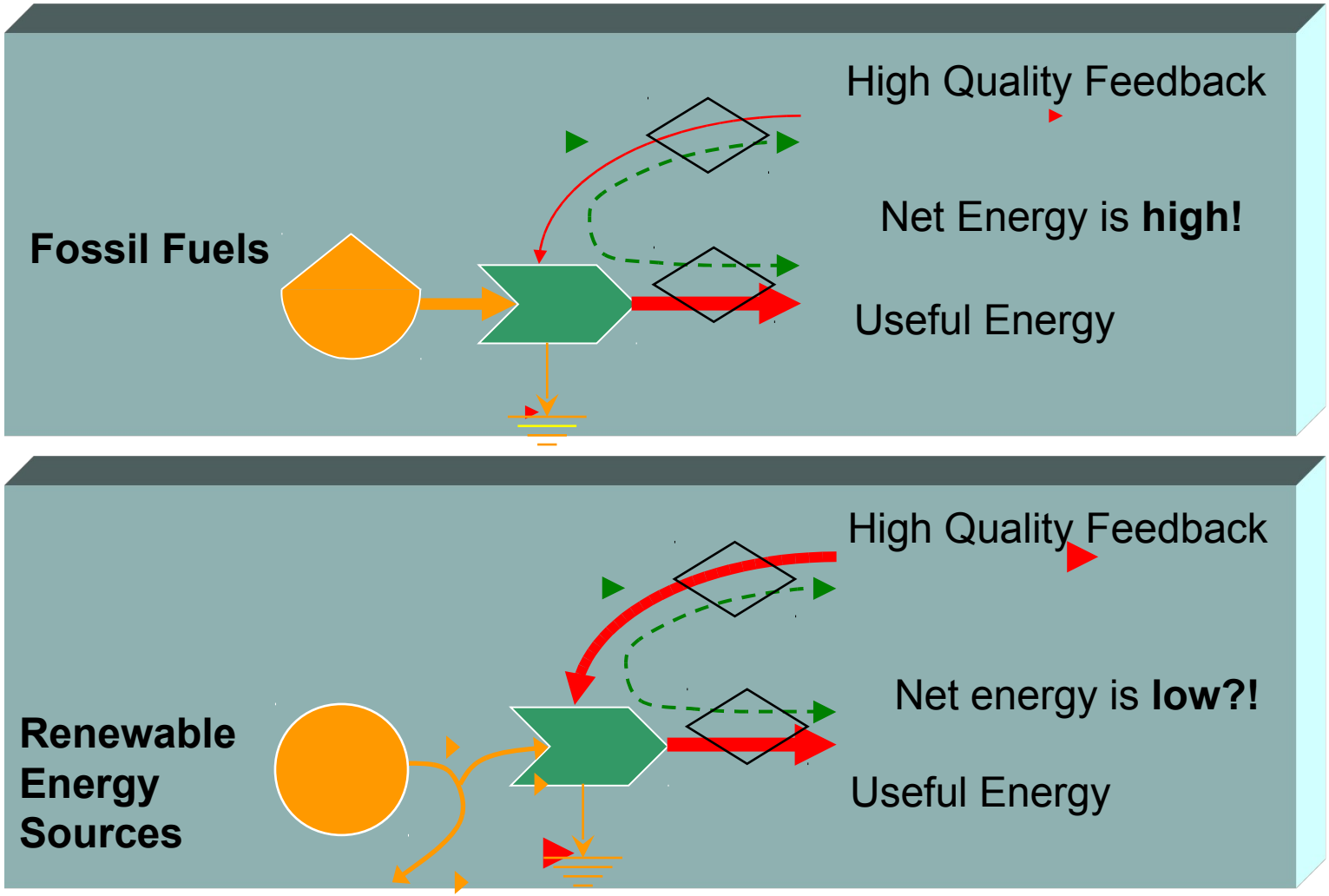
EROI – Energy Return on Investment

	Annual electricity produced (TWh)	Potential electricity production (TWh)	Energy return on investment
Nuclear	2626	5300	1.1 to 15:1
Hydropower	2894	8680	11 to 267:1
Wind	160	83000	18:1
Biomass power	218	NA	NA
Solar PV	8	2000	3.75 to 10:1
Solar Thermal	1	100000	1.6:1
Geothermal	63	1000	2 to 13:1
Tidal	0.6	450	6:1
Wave	~0	750	15:1
Fossil fuels	11455	Coal	50:1
		Oil	19:1
		Natural gas	10:1

The Key Problem with Renewable Energy Sources

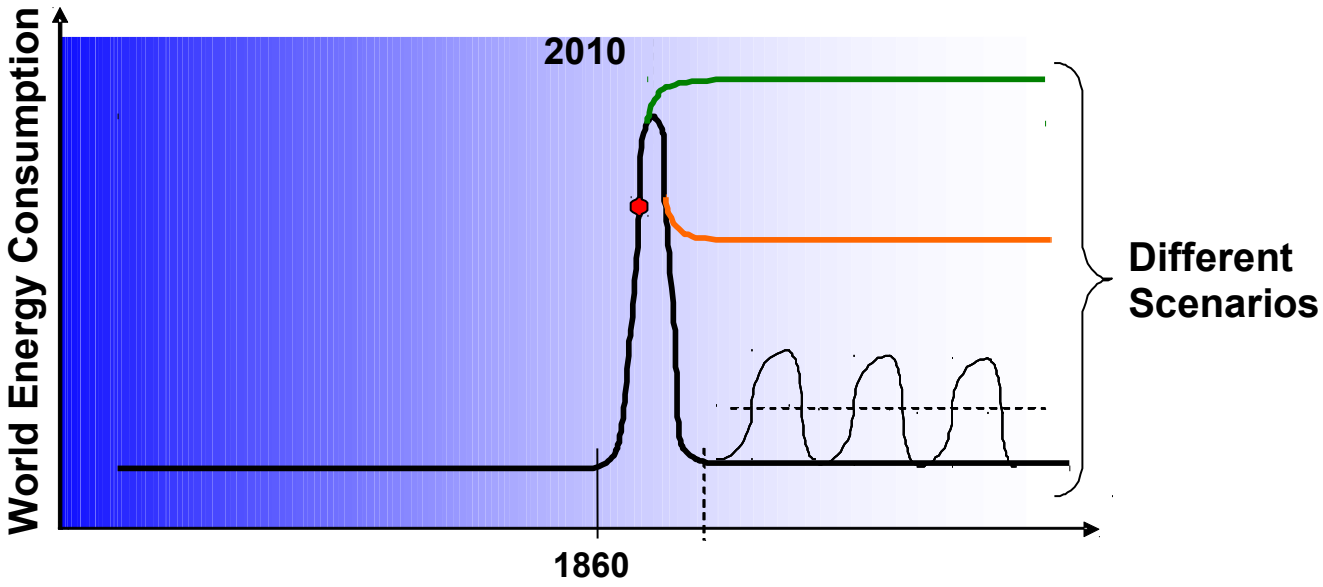
EROI – Energy Return on Investment





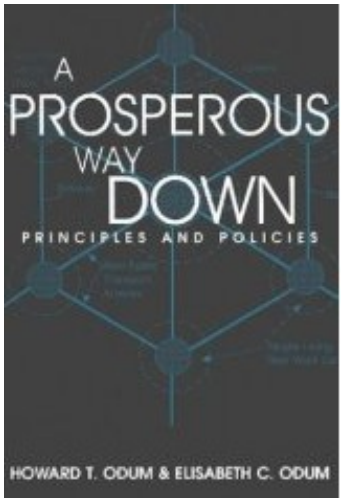
Fossil Fuel Era – A Short Interlude Between Solar Energy Past and Solar Energy Future?

- Fossil fuels enabled tremendous growth of economy!
- This growth would have been impossible if it was based on renewable energy
- Continuous growth is impossible on limited resources!
- What are the alternatives to growth:
  - Steady state
  - Fall
  - Pulsing

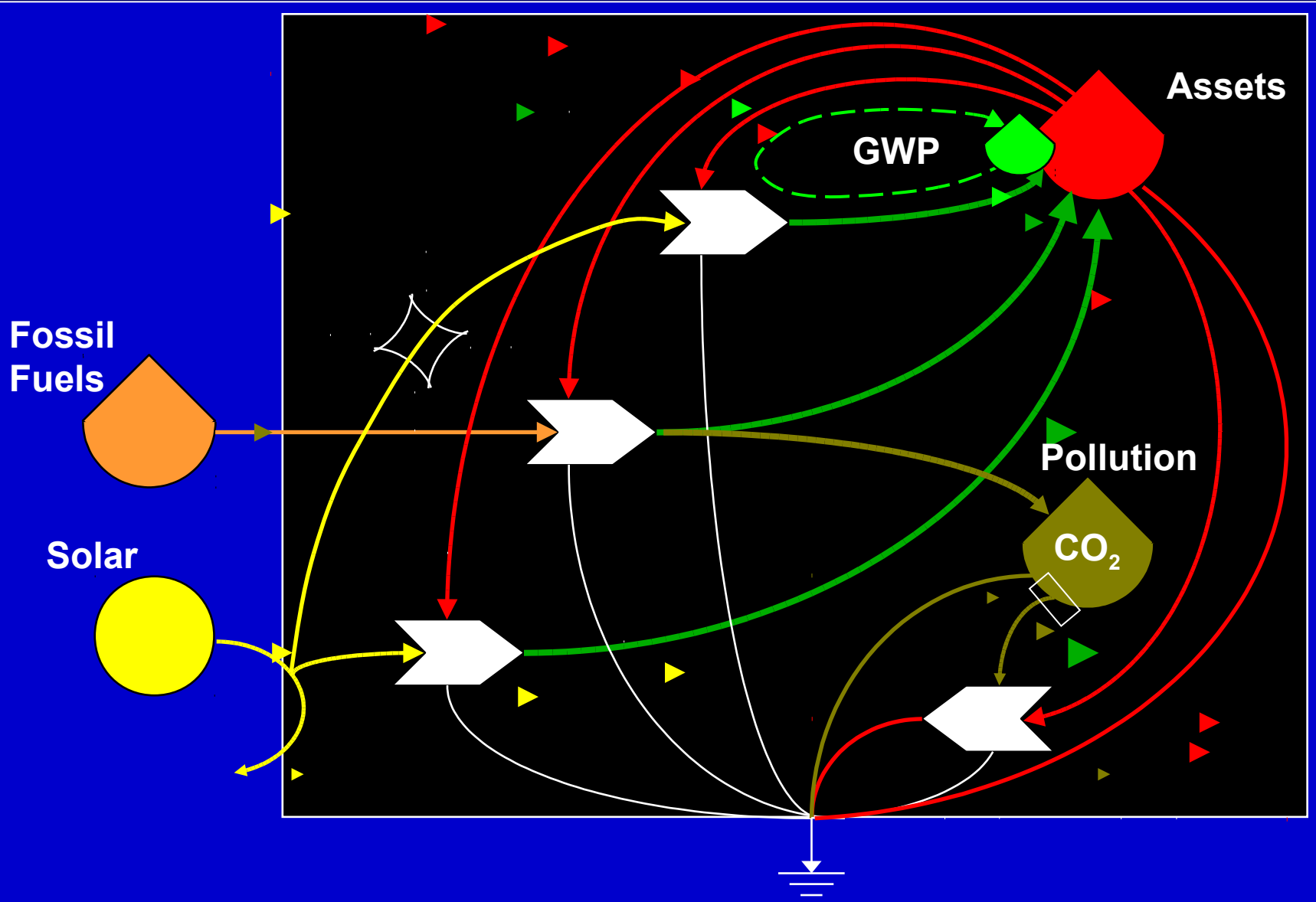


Questions with no easy answers

- Can the economy be maintained at a certain (hopefully high) level on renewable energy?
- Or is the “way down” unavoidable?
- Can we make a “prosperous way down”?
- Is introduction of renewable energy going to help or hurt?

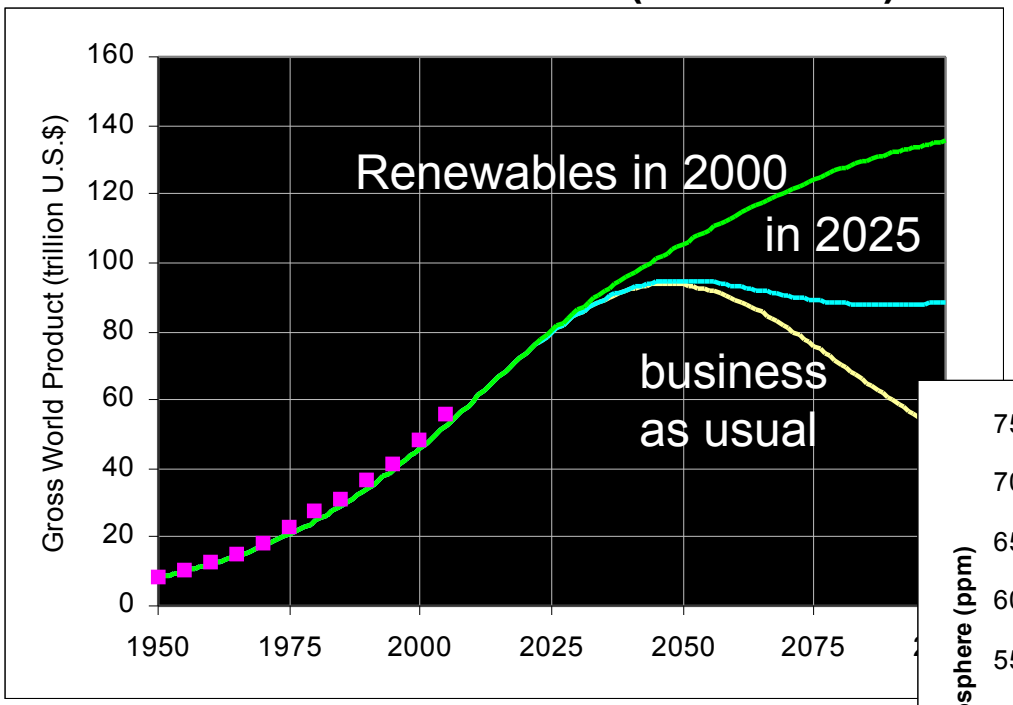


A Global Energy Model

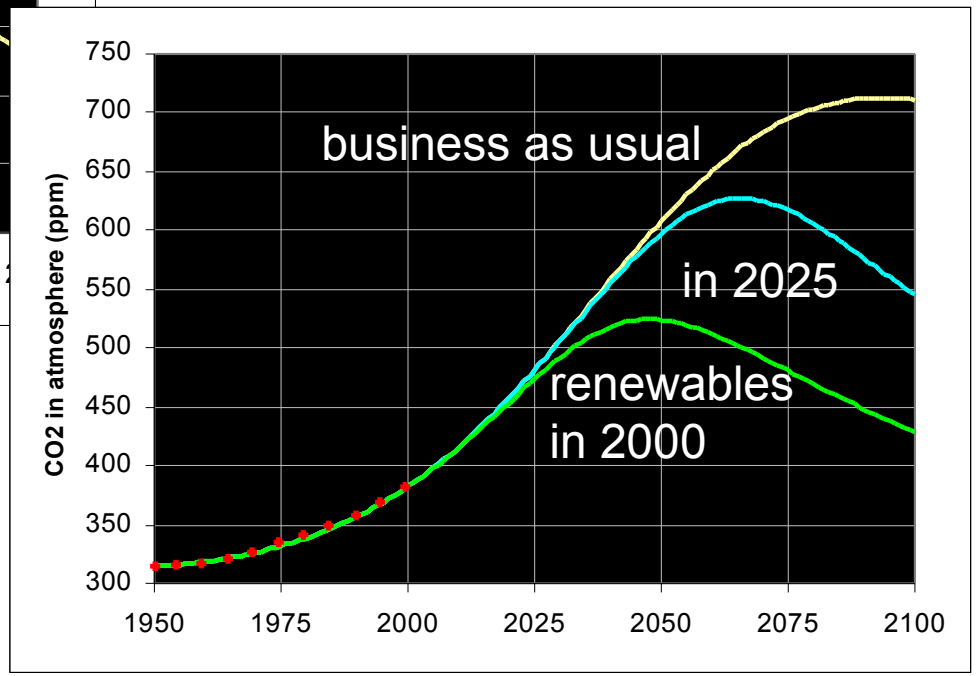


Modeling Results: The effects of timing

Gross World Product (2004 U.S.$)

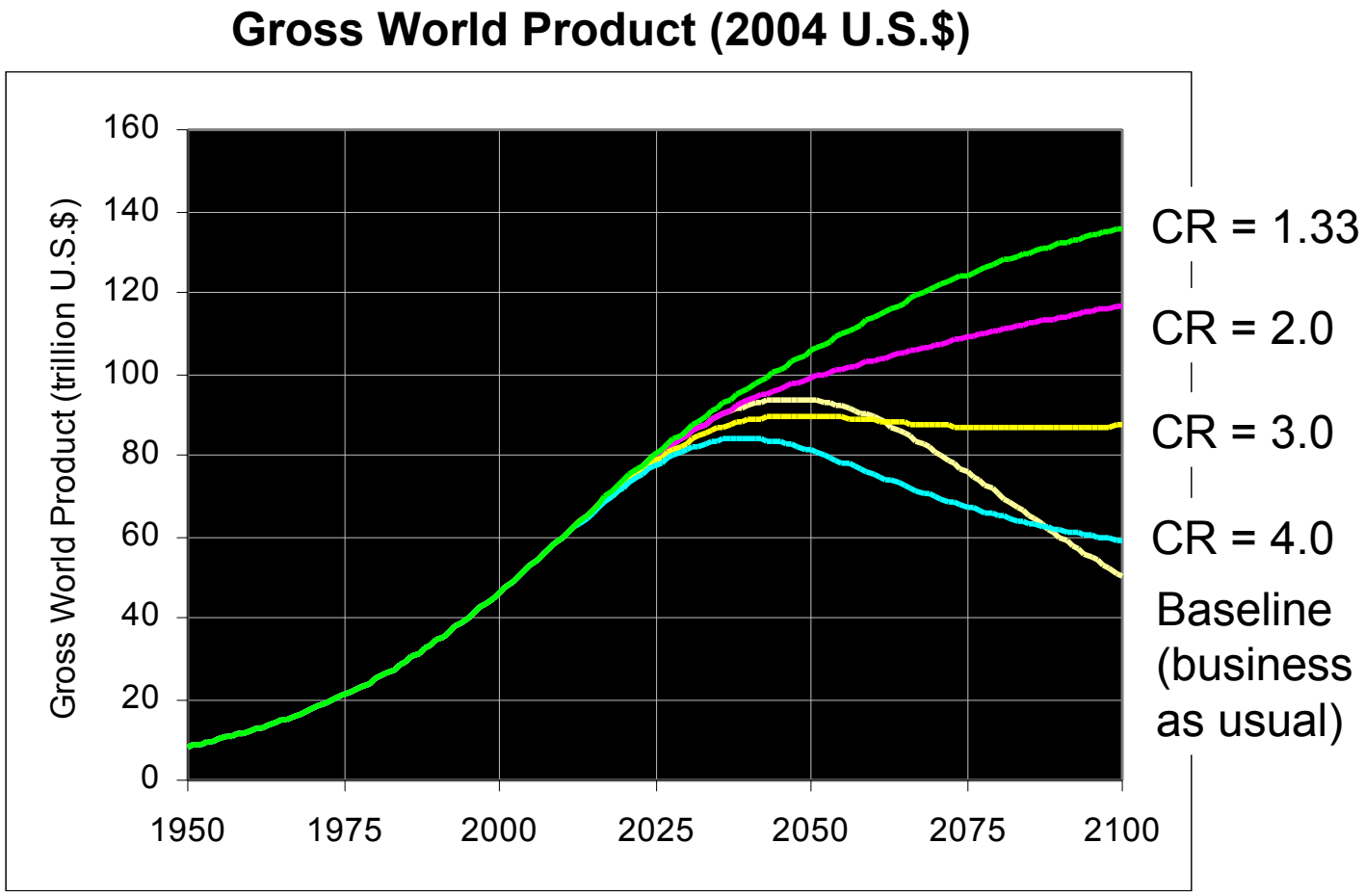


CO2 in the atmosphere (ppm)



The results of techno-economic analysis and simulation performed at University of Miami (1992); updates (2008)

Modeling Results: The effects of cost ratio



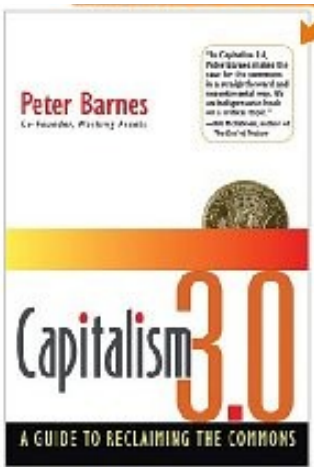
$$\text{CR} = \text{cost ratio} = \frac{\text{EROI fossil fuels}}{\text{EROI renewables}}$$

The results of techno-economic analysis and simulation performed at University of Miami (1992); updates (2008)

How to change an entire energy system?

- **There should be no competition – there should be transition**
  - Insisting on short term economic competitiveness favors "status quo," (especially without internalization of all (past, present and future) external costs)
- **Transition requires vision and commitment**
  - Massive use of renewable energy sources (and their carriers) could cause major disturbances in global economy
  - Those disturbances may be smaller than those that will be caused by continuing with present fossil fuels energy system

- **Shift to renewable energy sources will require a major shift in our mind sets, priorities, culture and life style**
  - shift from the goals of continuous growth to the goals of sustainable development **!**
  - promote energy and resources conservation **!**
  - give priorities to the protection of the environment **!**
  - new operational system – Capitalism 3.0 **!**
- **Transition will take a long time**



Values in Society are Changing!

In economy that is growing: **bigger, faster, competition**

During expansion:

growth is progress

Now:

sustainable is good

In economy that is stagnating or shrinking:

smaller, more efficient, cooperation

If a way down is unavoidable

- Big urban conglomerations are likely to be most vulnerable
- We have no other options but to reorganize our community's life to a more simple, more self-sufficient and more local way
- What makes life bearable in times of crises?
  SUBSISTENCE MINIMUM
  - Shelter
  - Reliable Food Supply (
  - Reliable Energy Supply (only locally produced will be reliable)
  - Reliable Water Supply (
  - Local governance responsive to local population's needs

Focus on SELF-SUFFICIENCY and RESILIENCE

Basic energy needs:

- Comfort (heating and cooling)
- Hygiene
- Cooking
- Refrigeration
- Some gadgets and tools
- Some transportation

How to satisfy basic energy needs:

- Passive solar architecture
- Energy conservation measures
- Renewable energy sources
- Energy storage
- Patterns of energy use

Visions of self-sufficient sustainable communities

http://aiacolorado.org/awards/

http://trendsupdates.com

Conclusions

The World is NOT Running out of Energy

But it is running out of …

- Cheap oil
- Environmental capacity
- Tolerance for inequity
- Money for better options
- Time for a smooth transition
- Leadership to do what is required

Transition to sustainabile energy may be possible

But only on individual and local levels.

Acknowledgment

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