

Toward U.S. Energy Independence

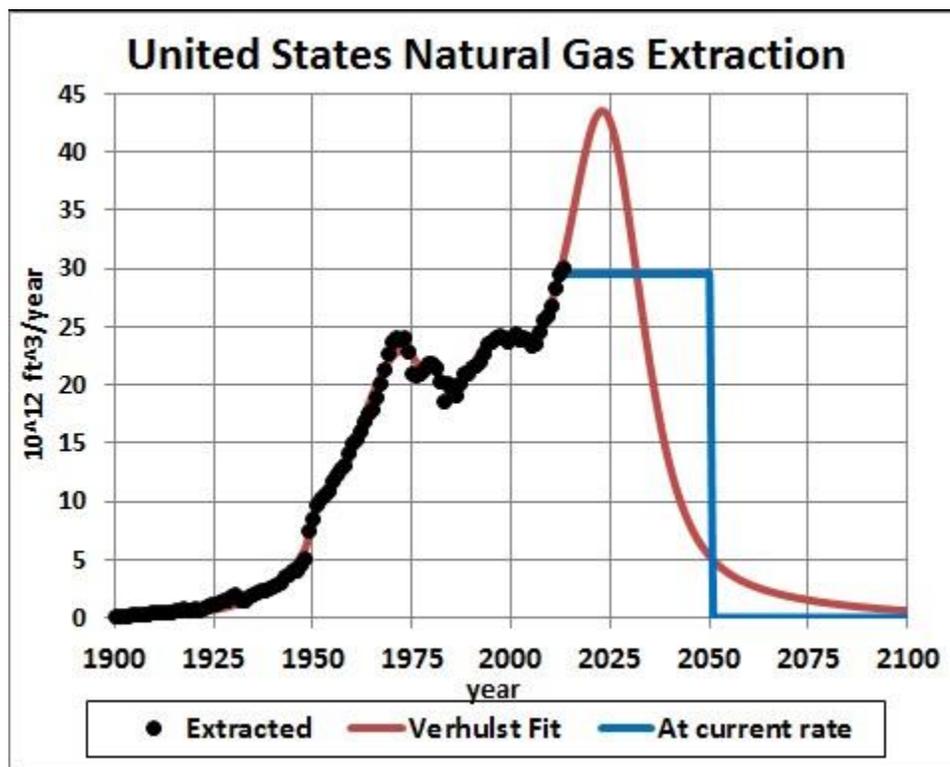
Introduction

There is no way long-term energy independence can be achieved for the United States based on fossil fuels or uranium. The only way is by renewable energy, mainly solar and wind energy.

“Long-term” is much sooner than most people realize. For crude oil and natural gas it is within the next two decades. For coal it needs to be now in order for humanity to escape the disasters due to global warming; the rapidly falling U.S. coal extraction data indicate that is happening. For uranium it happened decades past. The rapid switching from fossil-fuels energy to renewable energy is a very positive event; it is more centralized which makes it more secure and democratic and it is much less air, soil and visual polluting, as well as not emitting greenhouse gases that increase global warming.

Natural Gas

The most desirable fossil fuel for electrical or transportation energy is natural gas, a powerful global-warming gas. It is the most desirable because when burned it releases much less carbon dioxide, a powerful global-warming gas, than do coal and crude-oil fuels. However, natural-gas extraction in the U.S. will peak within the next decade:

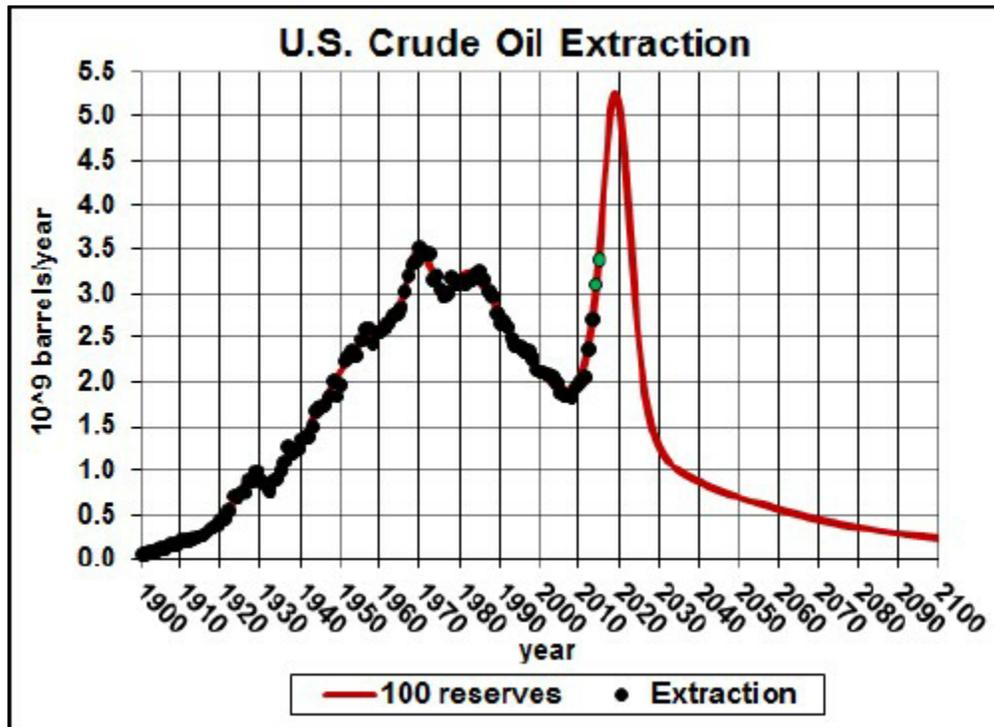


http://www.roperld.com/science/minerals/USGasBoom_Bust.htm

It does not make good sense to build massive natural-gas infrastructure, such as natural-gas pipelines and fueling stations for vehicles, because within slightly more than a decade natural-gas extraction in the U.S. will be on a fast decline. Also, natural-gas pipelines and fueling stations inevitably leak methane into the atmosphere, which greatly increases global warming.

Crude Oil

The most used fossil fuels, gasoline and diesel, for transportation are refined from crude oil. However, crude-oil extraction in the U.S. will peak within the next decade:

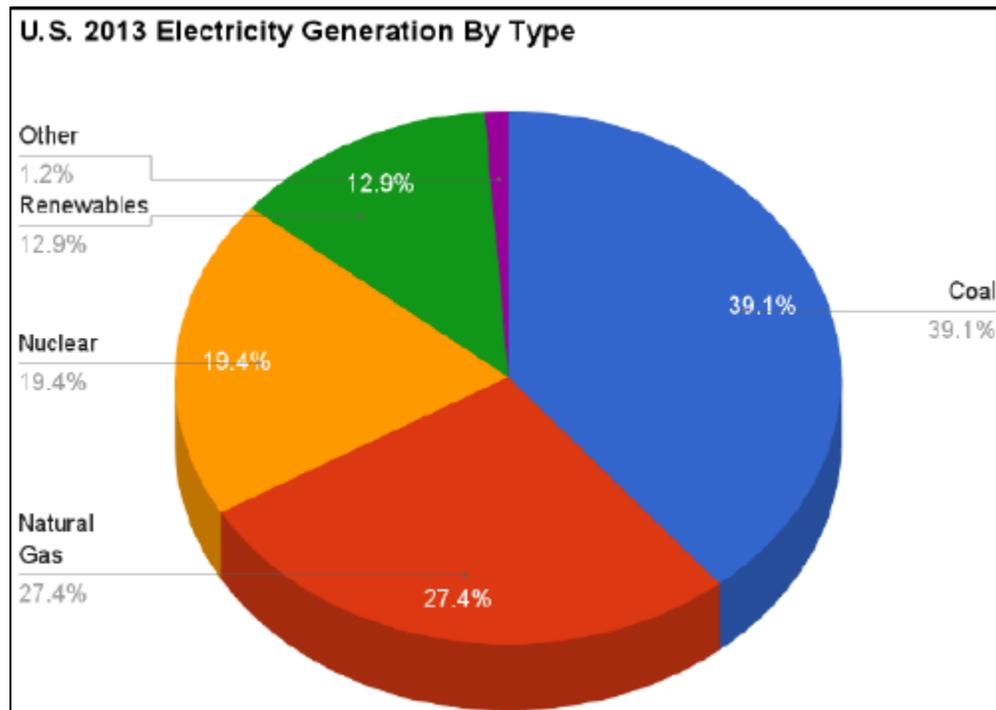


http://www.roperld.com/science/minerals/USOilBoom_Bust.htm

Therefore, the U.S. must move from gasoline and diesel transportation to electricity and biodiesel (made from algae) as quickly as possible. The federal and state subsidies now given to fossil fuels must be quickly transferred to renewable electricity, mostly wind and solar, and biofuels.

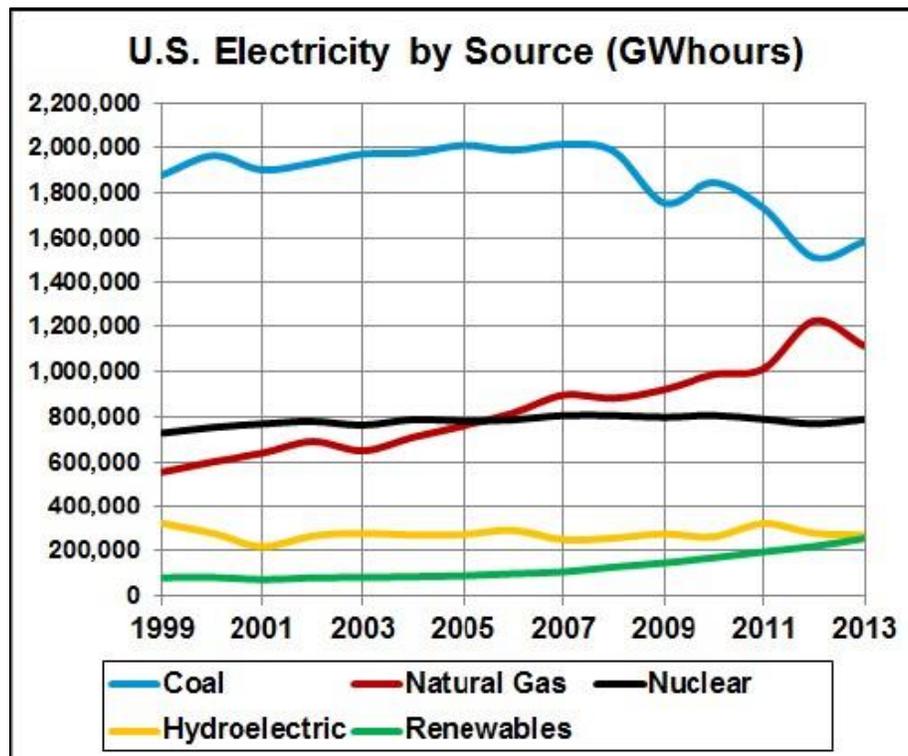
Coal

In 2013 about 39% of U.S. electricity was generated by burning coal.



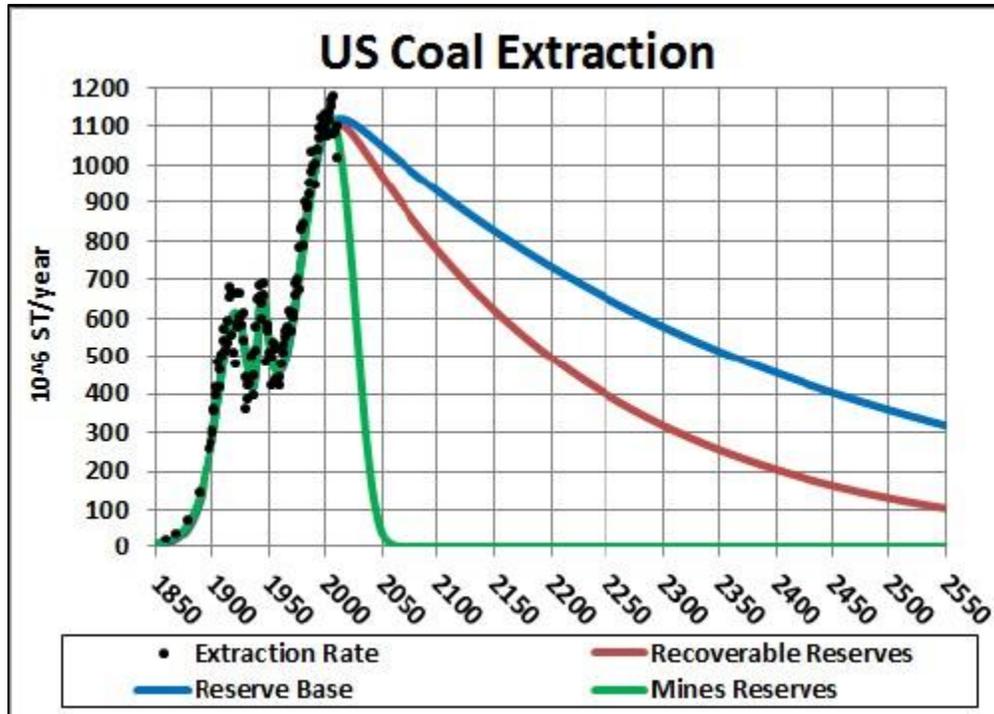
http://en.wikipedia.org/wiki/Fossil-fuel_power_station#mediaviewer/File:U.S._2013_Electricity_Generation_By_Type_crop.png

Coal is a main contributor to global-warming gases released into the atmosphere in the U.S. Thankfully, its use for electricity generation has been declining:



<http://www.roperId.com/Science/electricityus.htm>

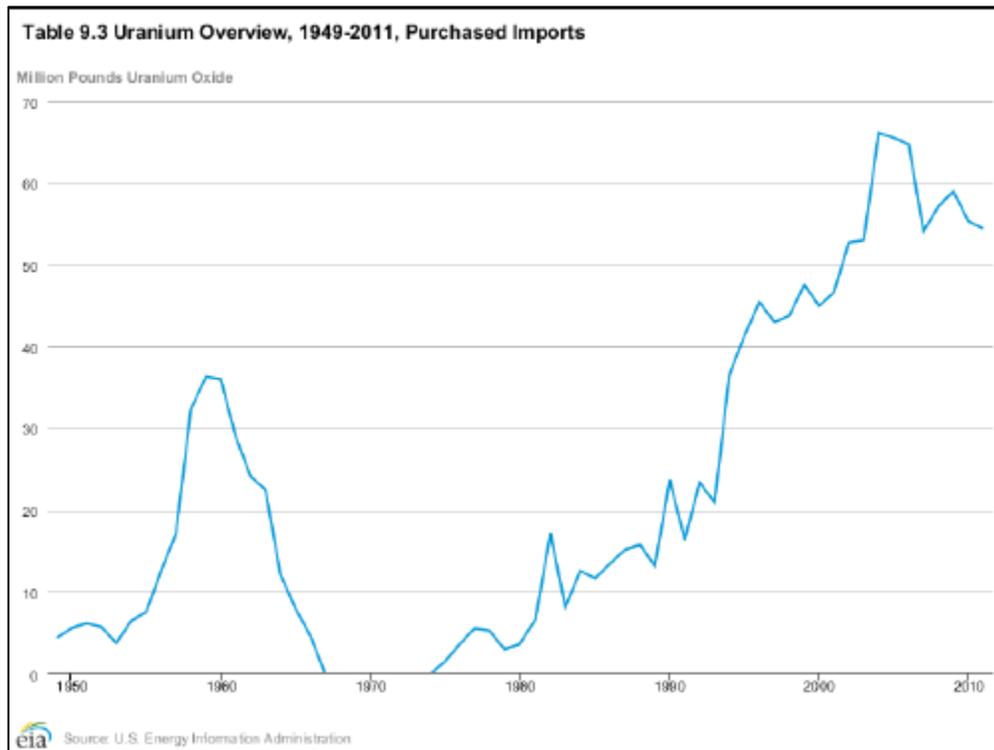
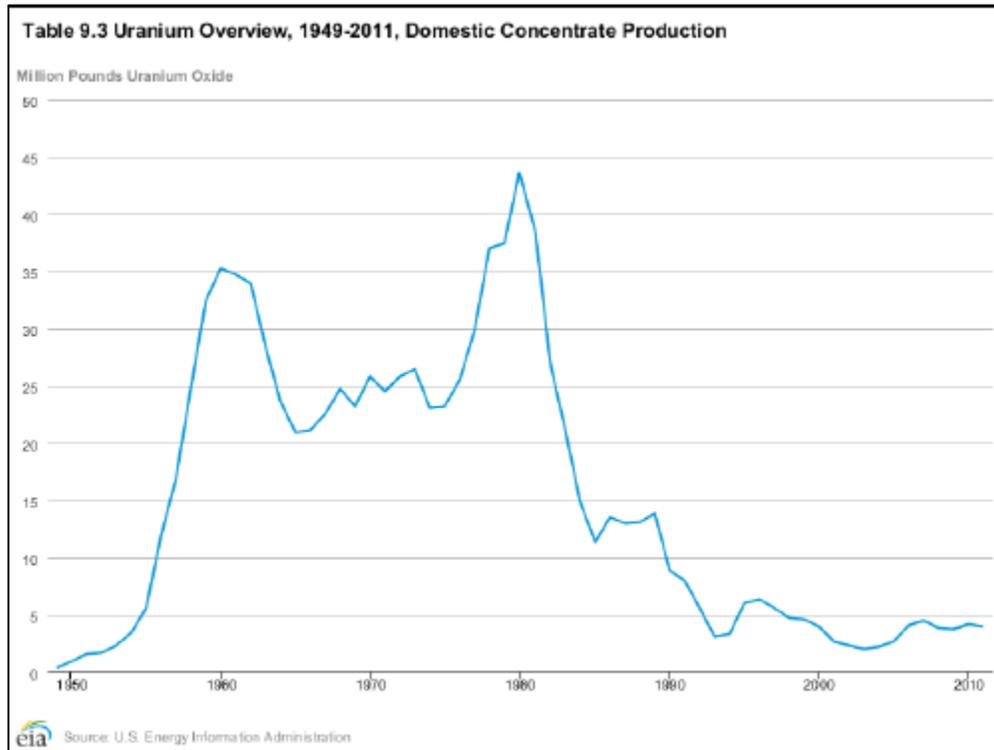
Fortunately, coal extraction in the U.S. appears to be have peaked:



Three possible futures for U.S. coal extraction are shown. The best future is for no new mines to be initiated so that the fastest declining green curve using current-mines reserves are all that are available.

Uranium

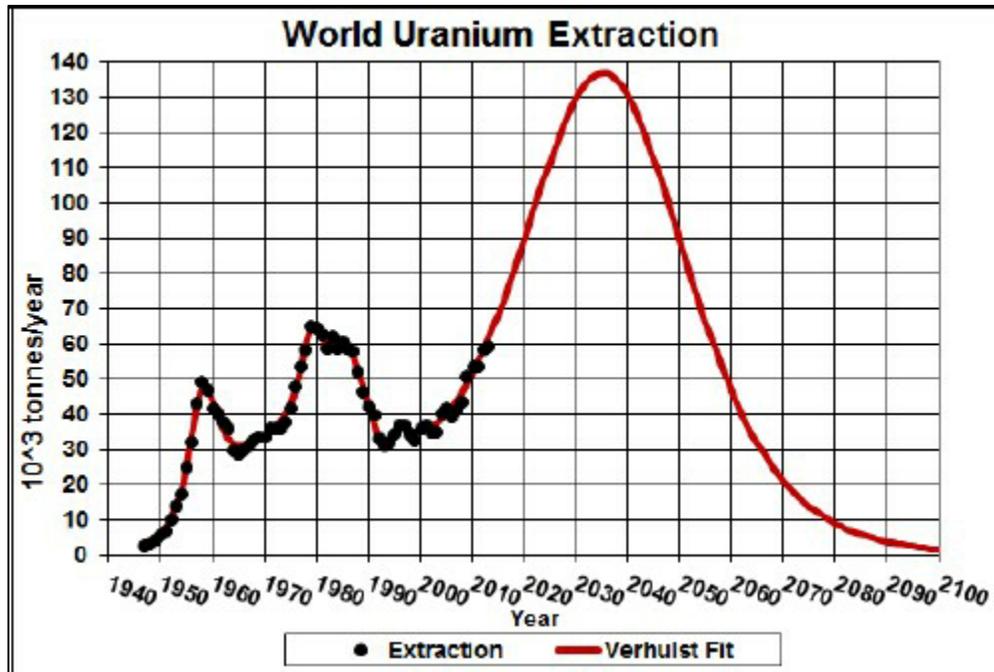
Nuclear energy in the U.S. has long been dependent on uranium extracted in other countries:



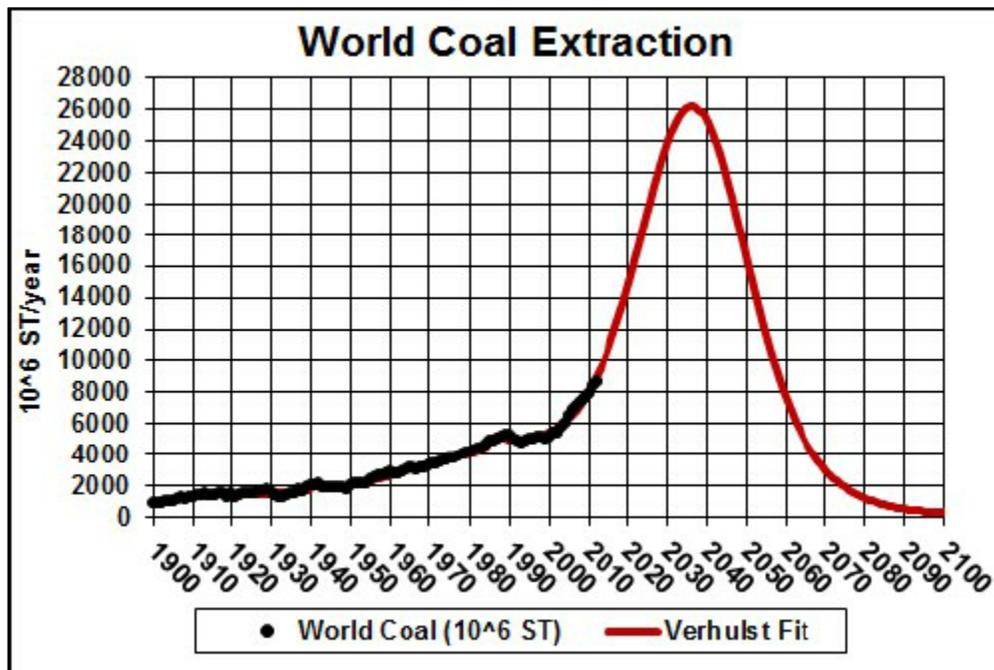
http://en.wikipedia.org/wiki/Uranium_mining_in_the_United_States

These two curves show that U.S. imports of uranium have exceeded U.S. extraction since about 1980.

Many people think that nuclear energy is sustainable. It depends on minerals extraction the same as do energy from crude oil, natural gas and coal. Here is a world depletion curve for uranium, the fuel for nuclear energy:



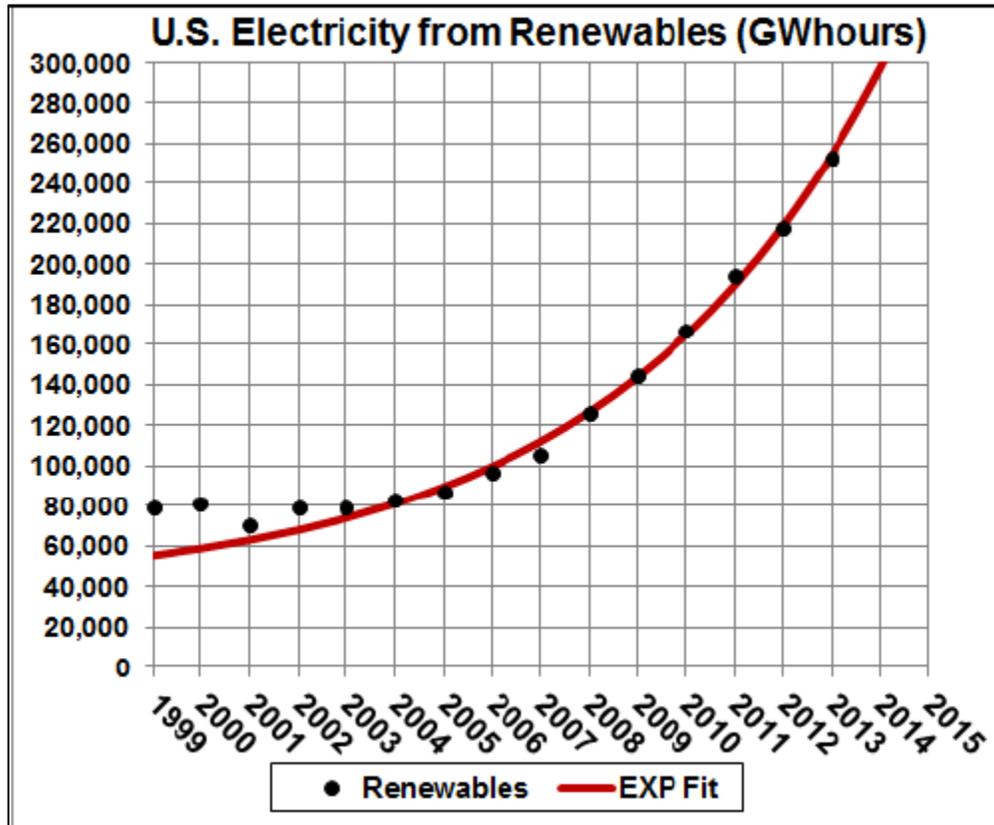
Its longevity is similar to the case for world coal:



Renewable Energy

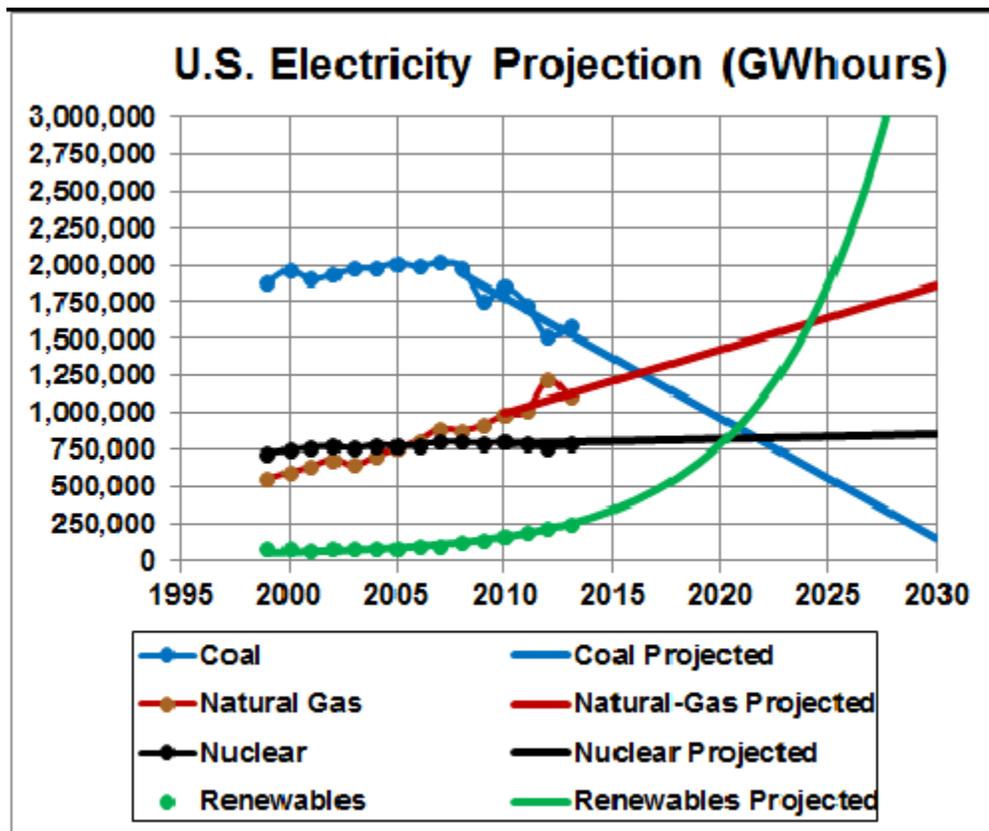
The graphs above show that neither fossil fuels nor uranium can provide energy independence for the United States. The only way is by renewable energy, chiefly solar energy and wind energy and biofuels not at the expense of food production.

Electricity generation by renewable energy has been increasing exponentially with an increasing time constant since the early years of the 21st century:



<http://www.roperId.com/Science/electricityus.htm>

Assuming that this rapid rise of renewable electricity continues along with reasonable protections into the future for electricity generation by fossil fuels and uranium, projecting into the next few decades shows that electricity generation by renewable sources will surpass the other three by about year 2025.



<http://www.roperId.com/Science/electricityus.htm>

Actually, the natural gas projection will probably peak before 2030 and then decline rapidly.

It is possible that the U.S. could cause its electricity generation by renewable sources to increase faster than shown in the graph. In fact, it is imperative that it do so because of the terrible consequences of increasing global warming by continuing to burn fossil fuels.

Electricity

Electricity is the future of energy for the world, and it has to be generated from renewable sources. Every possible thing must be done to convert most energy use to renewable electricity. When absolutely necessary to use energy fluids or gases, they must be made by renewable means; e.g., from algae but not using land that is needed for food production.

A major conversion necessity is for transportation. Electric cars are becoming viable ways to travel up to medium-long distances. Other countries have shown that very fast electric trains are the best way to travel very-long distances. The U.S. needs to make a massive effort to increase travel by electricity.

How to Get to Renewable Energy with Minimal Disruption

A major political concern in the U.S. is how to rapidly move from burning coal to renewable sources for generating electricity with minimal societal disruption. Also of importance is how to help areas that will experience the coming bust in extraction of crude oil and natural gas. Here are some possible ways to do that.

Where Coal is Strip Mined

- Institute massive federal and/or state programs to cover the mined areas with solar panels and build factories and residential communities nearby to use the energy. The solar panels could be solar farms on the ground or on the roofs of buildings built on the ground.
- Where wind studies show that wind speeds are sufficient for large wind turbines, institute massive federal and/or state programs to build wind farms and build factories and residential communities nearby to use the energy. This might work very well in mountain coal areas, such as Kentucky, West Virginia and southwest Virginia where mountain-top removal has been used to extract coal and where wind speeds are sufficient.
- In some cases, such as Montana and Wyoming, both solar farms and wind farms together might work. Large wind turbines sharing space with solar panels might be possible.

Where Oil and Gas Wells Were Drilled

Institute massive federal and/or state programs to install large wind turbines at disturbed well sites that have sufficient wind speeds.

The recommended programs would not only provide energy but would also provide jobs to replace the lost jobs due to declining extraction of fossil fuels.

Electricity Grid

A massive national program needs to be instituted to greatly upgrade the national electricity grid to a very smart grid (http://en.wikipedia.org/wiki/Smart_grid) that can balance electricity generation by renewable energy with electricity consumption. The program needs to promote distributed energy generation (solar and wind) to reduce transmission losses.

The smart grid needs to be made resistant to electromagnetic disturbances from outer space or man-made (http://en.wikipedia.org/wiki/Electromagnetic_pulse) and from extreme storms, which will increase as global warming increases.

Conclusion

Rapidly moving from burning fossil fuels for energy to renewable energy has many positive features:

- In addition to not emitting global-warming gases into the atmosphere, renewable-energy sources do not emit other air pollution that harms human health.
- Renewable-energy sources do not pollute soil, water tables and waterways.
- Renewable-energy sources are more visually attractive.
- Renewable-energy sources are not centralized, which makes them more secure and democracy enhancing.
- Renewable-energy sources enhance citizen morals because people are happier when they know that the way they live does not degrade the future of their descendants; instead it enhances it!

References

- [*Snake Oil: How Fracking's False Promise of Plenty Imperils Our Future*, Richard Heinberg](#)
- [*Drill, Baby, Drill: Can Unconventional Fuels Usher in a New Era of Energy Abundance?*, J David Hughes](#)
- [*Drilling Deeper: A Reality Check on U.S. Government Forecasts for a Lasting Tight Oil & Shale Gas Boom*, J. David Hughes](#)

<http://www.roperld.com/science/USEnergyIndependence.pdf>

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<http://arts.bev.net/roperldavid/>

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