

Can we invest our way out of an energy shortfall?

The world has many ideas for solving our energy shortfall, but they all seem to involve investment:

- Drill for more oil and gas;
- Develop alternative energy sources;
- Build more efficient gas-powered cars or electric cars;
- Fix homes and offices so they are more energy efficient.

I thought I would check through government data to see if we really have a chance of being able to invest enough money to solve our problems.

What I found was more than a little disturbing. United States' "Net Savings," as a percentage of Gross National Income has dropped greatly and is now below zero. This is a situation [one website described](#) as implying an "unsustainable path".

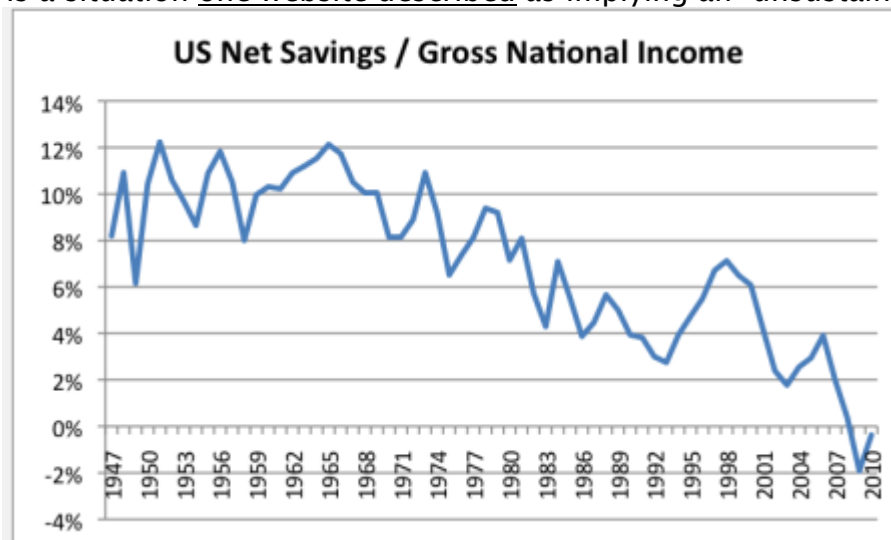


Figure 1. US Net Savings as a Percentage of Gross National Income, based on Bureau of Economic Analysis Data (Table 5.1)

Back in the 1950s and 1960s, when the Interstate Expressway System was built and the electric grid that we are still using today was built, Net Savings averaged close to 10% of Gross National Income. It has dropped since then, and is now negative.

Let me explain "Net Savings" by showing a second graph.

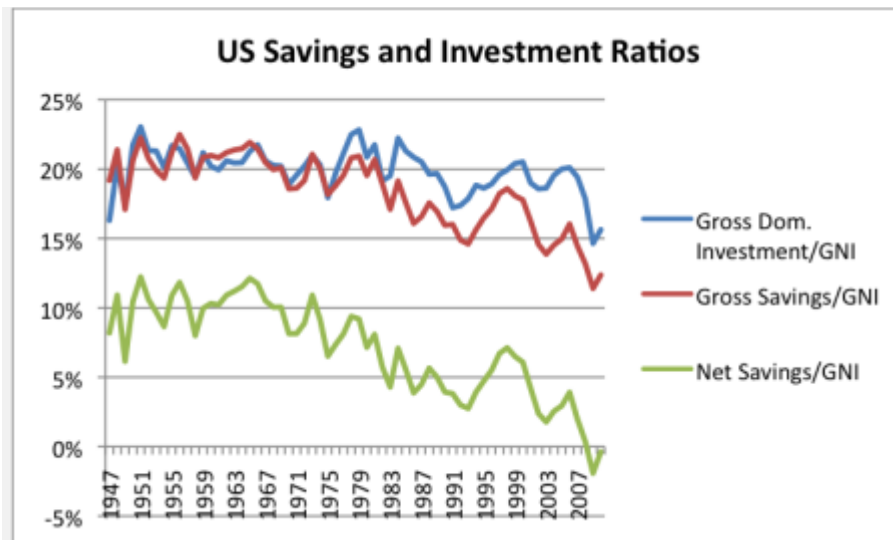


Figure 2. US Savings and Investment Ratios, based on US Bureau of Economic Analysis Data.

In the United States, investment is made in many kinds of long-lasting goods, including everything from buildings, to roads, to oil and gas drilling, to pipelines, to wind turbines, to equipment for factories. Gross Domestic Investment (blue) is the total of such investment made in a given year, shown as a percentage of Gross National Income.

Some of this Gross Domestic Investment comes from an increase in debt; some of it comes from savings. Gross Savings (red) is the portion that comes from savings (foregone consumption), rather than an increase in debt.

Each year, some long-term assets wear out or are destroyed. Net Savings (green) is what is left, after subtracting the portion that relates to these assets which are lost (“Consumption of Fixed Assets”). So basically Net Savings is the amount of investment during a given year in long-lasting goods that was not financed by an increase in debt, and is not simply a replacement for something that has worn out. If Net Savings is negative (as it is today), we are not even replacing things that wear out, except through the use of more borrowed money.

Quarterly data shows that Net Savings is still negative in 2011.

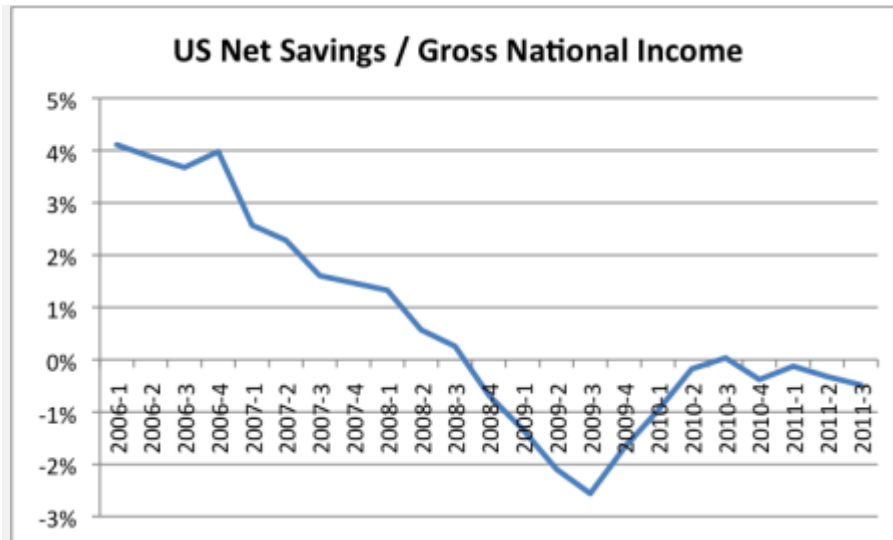


Figure 3. US Net Savings as a Percentage of Gross National Income on a Quarterly Basis, based on BEA Data.

When Does High Net Savings Occur?

High Net Savings occurs when companies in general are quite profitable—in other words, when invested capital can be expected to yield a high rate of return. In such an environment, most companies will be earning enough profit that they can invest in additional plant and equipment, if desired. In such an environment, real wages are likely to rise. Governments will have little difficulty obtaining enough taxes for schools and roads, and other governmental investment.

The term “bankable project” is sometimes used to describe a project with an expected high rate of return, since this is something that a bank might be willing to lend money on, if asked. An economy with high Net Savings will have many bankable projects.

Why would Net Savings Decline?

I can think of four reasons for the decline:

- 1. Declining EROI.** Much of the infrastructure of the United States was built in the day when oil was cheap because the Energy Return on Energy Invested (EROI) was very high. Over time, EROI has dropped, and as a result, the price of oil has risen. When the price of oil was inexpensive, new infrastructure could be added cheaply. Oil and gas companies made good returns, even with low oil prices. Now oil costs have risen but wages have not risen correspondingly, creating a mis-match. With the relatively lower wages now, it is harder for workers to afford oil-based products and goods manufacturers make.

2. Human Labor Has Been Mostly Replaced. At one point, it was possible to create substantial efficiency gains simply by replacing human labor by fossil fuel labor. For example, a ditch digger could be replaced by a machine that dug ditches, and the cost of digging ditches would go down quickly, creating a profit for the entrepreneur buying the machines and the company making the ditch digging machines. The biggest opportunities for efficiency gains have already been taken.

3. Decline in Protectionism / Rise of World Market. In the early days, domestic industries were protected with tariffs. As tariffs were lifted and world trade increased, there was increased competition from areas with lower wages. Capital was attracted to parts of the world where returns on capital appeared to be better, leading to a loss of investment in the US.

4. Limits to Growth. As we reach Limits to Growth (of the type described in the 1972 book by that name), completing claims for limited resources can be expected to raise costs for basic materials relative to wages. As a result, bankable investment projects can be expected to become less numerous. Herman Daly talks about a lack of bankable projects, not only in the US, but around the world, in this recent post. In his view, the low returns on projects today may be related to ecological limits to growth.

Will There be Enough Funds for the Investments that will be Required to Solve our Energy Shortfall?

It is difficult to see that there will be enough funds available for such investment.

At this point, we need increasing debt just to stay even in terms of replacing infrastructure. We cannot expect ever rising debt to continue, however. Instead, we should expect reduced debt, as I described in my post The Link Between Peak Oil and Peak Debt - Part 1. Private debt is already declining and is under further pressure, because of European banking problems and Basel III rules reducing the amounts European banks are able to lend. The US Government keeps increasing its debt level, but this continued growth in debt is unsustainable, and is the reason behind threatened governmental shut-downs.

With reduced debt levels in the future, Gross Domestic Investment will drop below Gross Savings in Figure 2, above, leaving even a smaller amount of funds available for investment than we have today. We may very well, in the aggregate, reach the point where we are not able to maintain current infrastructure with the funds that are available for investment. This means that will need to make choices on which things we maintain—schools or roads or oil distribution pipelines or electric grid or our housing stock. If we suddenly want to spend a lot more on new oil and gas drilling, or on an upgraded electrical grid and more wind turbines, this would seem to reduce funds available for investment in other things, which are also quite necessary.

If we think of investment as requiring the use of resources such as oil, steel, copper, and fresh water, it would stand to reason that there is an upper limit on how much we can invest each year. If we are in fact reaching “Limits to Growth,” or even “Peak Oil,” the total amount of these resources available in world markets will be declining. Even if the amount of resources extracted each year does not decline, but stays close to flat, the share of these resources that the US is able to obtain and use for infrastructure building is likely to decline, because of more-rapid growth of emerging market nations.

The Way Forward

The only way around this difficulty that I can see is adding high EROI, quick payback, energy projects such as oil wells from the 1930s. Unfortunately, there aren't any of these left (and of course, they have environmental issues as well).

We have deluded ourselves into thinking that projects that require government subsidies and that theoretically will produce an adequate return over a long period (20 to 60 years) are an acceptable way of replacing high EROI, fast payback projects. This might be true, if we still lived in a world in which fossil fuels would provide enough of a subsidy to the system that we could live without favorable cash flow returns from other investments.

The problem is that now, even fossil fuel investments require a lot of up front funding (think oil sands extraction in Canada, and fracking of oil and gas wells in the US), and don't necessarily have all that good a long-term return, regardless. This is especially the case if the government needs to take an increasingly large share of this return, in order to fund its infrastructure requirements.

And increased debt is less and less of a solution.

Somehow, we need to be looking at the overall picture. How can we get enough profitable **cash flow** to get the cash we need to buy the resources needed to maintain essential parts of infrastructure? If we are looking at energy-related investments, what do they really provide in terms of cash flow? They may supposedly have a high EROI, if viewed over a long enough period, but this in itself is not all that helpful, if cash flow is not positive in a fairly short time-period—probably seven years or less.

My expectation is that the majority of energy investments will be terrible in terms of cash flow, and thus make our “Net Savings” (and Gross Domestic Investment) even

lower over time. Installation of wind turbines and solar panels is likely to fail in terms of providing quick cash returns.

In fact, anything that requires a subsidy is likely to have serious cash flow issues. But even new nuclear power plants and new coal-fired power plants will have such issues. Adding scrubbers to coal-fired power plants without them is a great idea from an environmental point of view, but further adds to the need for additional infrastructure investment, without ever generating additional cash.

Perhaps we need to be figuring out which infrastructure investments we can eliminate, that won't bring down the whole system. Which roads do we turn from asphalt to gravel? Can we eliminate purchase of military jets? Do we stop building and upgrading schools and universities? Do we stop building new homes and office parks?

I will admit I do not fully understand this whole issue. If we could suddenly convince the world that US has more opportunities for profitable investments than anywhere else in the world, theoretically our problem could be solved. But I don't see this happening. Some have claimed that the recent improvements in oil and gas drilling make the US a more attractive place for investment, but I am doubtful that this is a true solution. Many of the assessments seem to be based on very optimistic estimates of future oil and gas production from "fracked" wells. And the amount of the effect is likely small.

I am afraid that the lack of cash flow funding for investment in infrastructure is what will eventually bring the system down. This is not an issue that researchers have looked at much, to my knowledge. This connection has the potential to pull the whole system down quite quickly—I would guess in 20 years or less.

Perhaps we need to be thinking more about what infrastructure investments can truly last beyond the system itself. The names "Renewables" were given to our current high-tech wind turbines and solar PV to give us the impression that they can last beyond the system themselves, but I am doubtful that this is really the case, since they depend on the availability of the electric grid and other support systems. Perhaps we need to be focusing more on lower tech applications that can be repaired with local materials and will truly provide lasting benefit.

Source: <http://ourfiniteworld.com/2011/12/19/can-we-invest-our-way-out-of-an-energy-shortfall/>