STUDY GUIDE

CAN WE RELY ON WIND AND SOLAR ENERGY?

KEY TERMS:

energy	compound	mass-scale
subsidize	renewable	"energy poverty"

NOTE-TAKING COLUMN: *Complete this section <u>during</u> the video. Include definitions and key terms.*	**CUE COLUMN:** *Complete this section <u>after</u> the video.*
What is the diluteness problem? What is the intermittency problem? What might likely make German energy user's bills go down in the future?	Why are wind and solar not a straightforward answer to our energy needs, considering that they are free? Why are fossil fuels still more cost effective than wind and solar?

DISCUSSION & REVIEW QUESTIONS:

- Mr. Epstein explains that: "For something to be cheap and plentiful, every part of the process to produce it, including every input that goes into it, must be cheap and plentiful." Do you think it will ever be possible for renewable energy sources such as wind and solar to be able to have 'every part of the process' be cheap and plentiful? Why or why not?

- In the video, we learn that: "The basic problem is that sunlight and wind as energy sources are both weak (the more technical term is dilute) and unreliable (the more technical term is intermittent). It takes a lot of resources to collect and concentrate them, and even more resources to make them available on-demand." Why do you think that this crucial point is often trivialized and mostly ignored by those who so fervently promote renewable energy sources as viable and worth pursuing? Do you think that it is for the same reasons or different reasons that the decision makers in government neglect to take this truth into account when dishing out taxpayer's money to subsidize renewable energy companies?

- Mr. Epstein informs us that: "The only way for solar and wind to be truly useful would be if we could store them so that they would be available whenever we needed them. You can store oil in a tank. Where do you store solar or wind energy? No such mass-storage system exists." Considering how much material and cost currently goes into physically making components to convert solar and wind energy into electricity (during the erratic occurrences when the sun shines and when the wind blows), do you think that a compelling case can be made that the trade-offs are worth it? Why or why not?

- Considering that in Germany electric bills have risen high enough to prompt the coining of the term 'Energy Poverty,' that "...less than 10% of their total energy is generated by solar and wind," and that "solar produces little in the winter months when Germany most needs energy," why do you think that so many people so strongly advocate for modeling this failed system in other parts of the world?

- Mr. Epstein begins the video with the question "Are wind and solar power the answer to our energy needs?" What is your answer?

EXTEND THE LEARNING:

CASE STUDY: Solyndra

INSTRUCTIONS: Read the article, "Why Did Solyndra Fail So Spectacularly?" then answer the questions that follow.

- Mr. Epstein explains that "...the process of turning sunlight and wind into useable energy on a mass scale is far from free." What type of challenges did Solyndra face in terms of production costs?

- Why do you think renewable energy companies need such heavy government subsidies?

- Where do you think that innovation needs to take place in order for solar power to be viable as an inexpensive energy source that could actually compete with fossil fuels? Would this type of innovation be worth pursuing? Why or why not?

QUIZ

CAN WE RELY ON WIND AND SOLAR ENERGY?

1. **What is the diluteness problem?**

   a. There is no diluteness problem.
   b. Sunlight energy is diluted and stored in batteries.
   c. Sunlight and wind as energy sources are both weak.
   d. Sunlight and wind as energy sources are both unreliable.

2. **What is the intermittency problem?**

   a. There is no intermittency problem.
   b. Wind energy is too strong to harness.
   c. Sunlight and wind as an energy source are both weak.
   d. Sunlight and wind as energy sources are both unreliable.

3. **Germany is the world's leader in "renewable" energy. What percentage of their total energy use is generated by solar and wind.**

   a. Less than 10%
   b. 20%
   c. 50%
   d. 85%

4. **Where do you store solar or wind energy?**

   a. Free-standing power plants.
   b. Specially designed batteries.
   c. In basements.
   d. No such mass-storage system exists.

5. **Are wind and solar power the answer to our energy needs?**

   a. Yes
   b. No

QUIZ - ANSWER KEY

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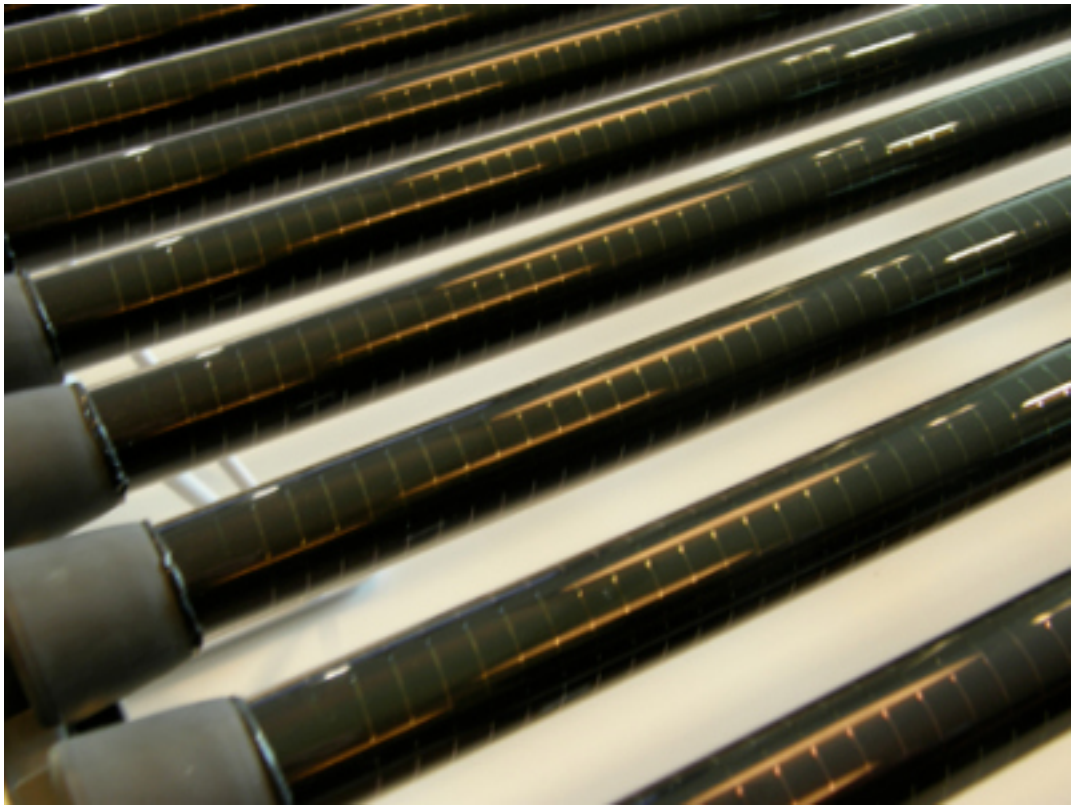
http://techcrunch.com/2011/10/04/why-did-solyndra-fail-so-spectacularly/

Why Did Solyndra Fail So Spectacularly?

Posted Oct 4, 2011 by Sarah Perez (@sarahintampa)



The spectacular failure of solar manufacturer Solyndra is being held up by some as a shining example of the Obama administration's failure to properly manage government subsidies after its collapse left taxpayers with $535 million in federally guaranteed loans. But Solyndra's failure on its own is not remarkable. There are always risks involved when you're introducing innovation into a commoditized market. The bigger, and still unanswered, question is why did it take this much capital before it failed, given the warning signs?

In commoditized markets, explains Brad Zangler of Pivotal Investments, a firm with numerous investments in the cleantech/greentech space, the challenge is to disrupt the cost of producing energy, not just to create a worthy innovation. In fact, in a business like solar, the go-to-market strategy is just as important as the technology a company is developing. In Solyndra's case, that technology was a new, unique type of tubular solar panel. The shape itself was an innovation. But the company was also benefitting from another advantage: it didn't use polysilicon, so it wasn't affected by the shortages which were hurting its competitors. In 2008, polysilicon was more than $400 per kilogram, but by the time the federal government issued Solyndra's loan, the prices had fallen to just over $50 per kilogram.

The earlier shortages were obviously going to be a temporary issue, given that new polysilicon plants were in the process of being built, explains Michael Butler, CEO of Cascadia Capital and managing director of the firm's Sustainable Industries practice group. He says, "any first year economic student knows the price goes down if the supply increases. Which raises the question: "what were they [the government] thinking?"

Zenger agrees, also noting, as did Butler, that the government has smart people working there, which leaves many wondering what happened. Did the due diligence stop? Did they miss key indicators that could have pointed to issues? Did they misinterpret the data they were seeing?

These questions get murkier, thanks to a report from the nonpartisan Congressional Research Service (CRS), which now says there were several factors that could have served as warning signs ahead of or shortly after the government investment. These included the price shifts in polysilicon (as noted above), the panels' inability to work with residential roofing systems or in large solar farms (a key part of the solar market) and increasing competition in manufacturing capabilities from expansions in China and Taiwan.

Solyndra, says CRS, was planning to drive down its costs by scaling up its operations with the government backing, but there was no guarantee that it would be successful. Clearly, it was not.

Perhaps the real issue with Solyndra is not its failure, the politics of how that loan was achieved or the government's possible oversights of the surrounding risks. Perhaps the failure is an indication of why the government isn't the best entity to be investing in markets where a winner or loser has to be chosen. The government's process is not driven by the same market considerations which drive private investors, Zenger explains, and the decision-making has "way more influencers." No argument there.

As for private investors, Solyndra's failure doesn't have much impact on their current investment plans – over the past year, they have been shifting money away from companies dependent on government subsidies, like solar, biomass and wind to other areas like smart grid technologies, energy efficiency technologies, battery storage and transportation.

And the solar stock declines? As Aaron Chew, an analyst with Maxim Group told CNN Money, they have nothing to do with Solyndra. "They'd be here even without that. Solyndra gets a lot of attention for symbolic reasons. But what's happening is you have oversupply and plunging prices and that's just being exacerbated by Europe."

Demand is lower in Europe than previously expected and some governments have cut down on solar subsidies, potentially limiting Solyndra's ability to sell there.

If anything, Solyndra's crash shows just how quickly the bottom can fall out in commoditized markets, how easy it is to underestimate how low the price needs to go to gain traction, and frankly, how hard it is to introduce innovation into markets that have existed for years, like energy. Solyndra had the innovations, but it didn't get to the price point where it could compete, not only with other energy sources, but even with the conventional solar panels it was trying to disrupt.

Private investors are not surprised or concerned by a solar failure – they price it in from the start. And by the time there's a public failure like Solyndra, investors will have already changed their course. But the bigger problem with the now-politicized Solyndra situation is that it sends out a message that says failure is unacceptable. "That is an absolute mistake," says Zenger. "We have to fail in order to succeed. We have to try new things."

Of course "we" should. But when the "we" is the U.S. taxpayer, debates about how much risk is too much risk is going to be hotly debated…for a long time to come.

As for smaller companies trying new things in solar, it may get worse before it gets better. Those with capital may have staying power – like the ones trading on the public market, for example. But more will go bankrupt, allowing survivors to swoop in and buy some interesting technologies and products in the meantime. The fittest will keep on innovating and be rewarded by the market.