



**BEFORE THE
HOUSE COMMITTEE ON NATURAL RESOURCES
SUBCOMMITTEE ON
OVERSIGHT AND INVESTIGATIONS**

**THE STATUS OF IVANPAH AND OTHER FEDERAL LOAN-GUARANTEED SOLAR
ENERGY PROJECTS ON BUREAU OF LAND MANAGEMENT LANDS**

JULY 14, 2016

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Introduction

The Obama administration has aggressively pushed the leasing of Bureau of Land Management land for solar leases. It is admirable that, at least for solar energy, the administration understands that federal lands are multi-use under federal law and that energy production is an important use of federal lands. It would be much better if the administration moved to cut red tape for all energy sources instead of discriminating against other sources of energy production.

The massive amount of loan guarantees and grants the federal government has given these solar facilities on federal lands shows why the federal government should make energy sources compete on equal footing instead of favoring one source above others. There is no reason the federal government should give hundreds of millions of dollars in subsidies from the American taxpayer to the billionaire owners of a facility like Ivanpah. If Google (and their billionaire founders) want to take risks on new energy systems, they should use their own money instead of risking taxpayer dollars.

When the Obama administration worked to expedite solar leasing they made a number of claims that require examination. The administration claimed that they support an “all-of-the-above

energy strategy,” and that solar power “increase[es] energy security.”¹ The reality is that increasing solar (and wind) production on federal land may actually increase energy imports, not decrease them.

Also, solar energy is an expensive source of electricity generation as revealed by not only data from the Energy Information Administration, but also by a forthcoming report from the Institute for Energy Research (IER). The IER report shows electricity from new solar is nearly 5 times more expensive than from existing nuclear and over 3.5 times more expensive than existing coal.

Lastly, the problem is that it is difficult to keep the lights on with solar power. Solar only produces electricity when the sun is shining, but peak periods of electricity demand frequently occur as the sun is setting or after it has set. This reduces the usefulness of solar for grid-connected electricity generation.

Kudos to BLM for expediting energy leasing on federal land

The Department of Interior and Bureau of Land Management should be applauded for working to expedite energy leasing on federal lands. The administration developed a roadmap for solar energy development² and tried to reduce the massive amount of red tape imposed on energy leasing on federal lands. This is laudable because under federal land laws, such as the Federal Land Policy and Management Act, BLM lands are supposed to be multi-use lands and energy is an important use of these lands.

That said, the problem with the administration’s actions with regard to solar leasing is that contrary to claims that the administration has an “all-of-the-above” policy,³ the administration has been antagonistic towards natural gas, oil, and coal production on federal lands.⁴

This antagonism shows up in the oil and natural gas production data. According to a new report from the Congressional Research Service, from 2010 through 2015, oil production on private and

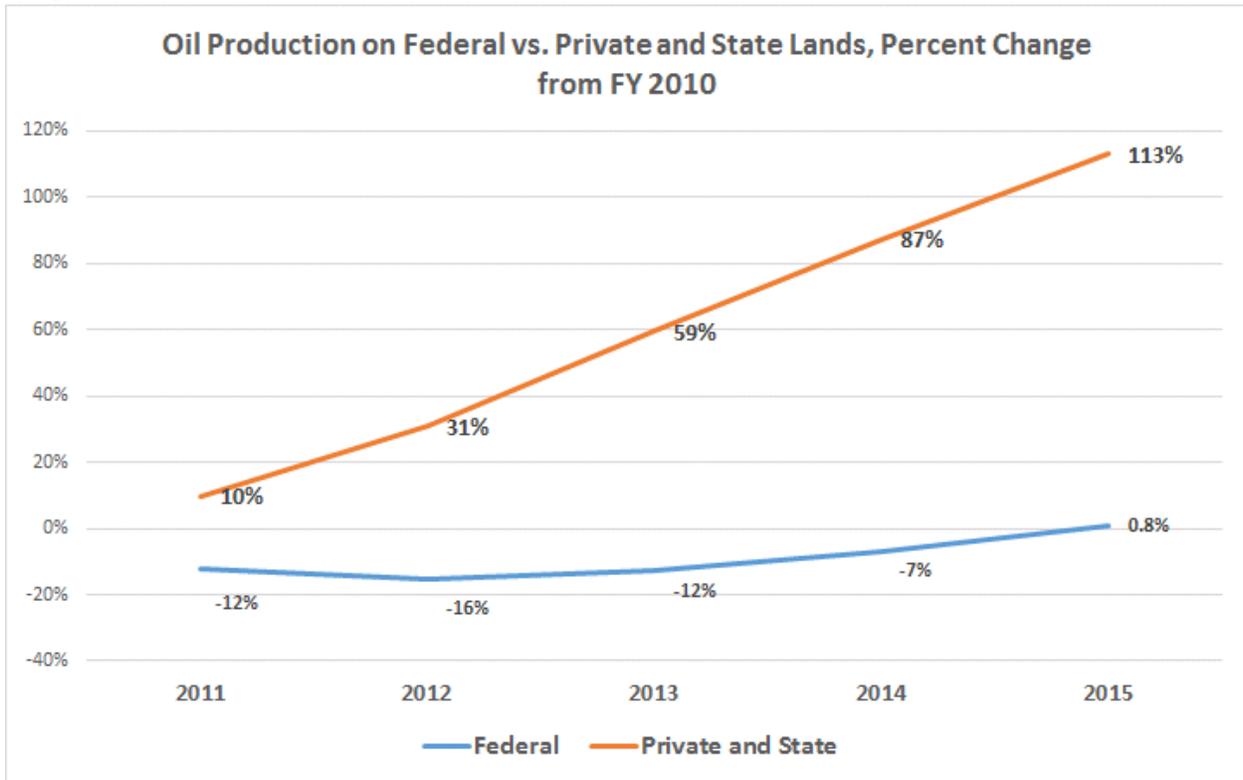
¹ Department of Interior, *Obama Administration Releases Roadmap for Solar Energy Development on Public Lands*, July 24, 2016, <https://www.doi.gov/news/pressreleases/Obama-Administration-Releases-Roadmap-for-Solar-Energy-Development-on-Public-Lands>

² Department of Interior, *Obama Administration Releases Roadmap for Solar Energy Development on Public Lands*, July 24, 2016, <https://www.doi.gov/news/pressreleases/Obama-Administration-Releases-Roadmap-for-Solar-Energy-Development-on-Public-Lands>

³ *Id.*

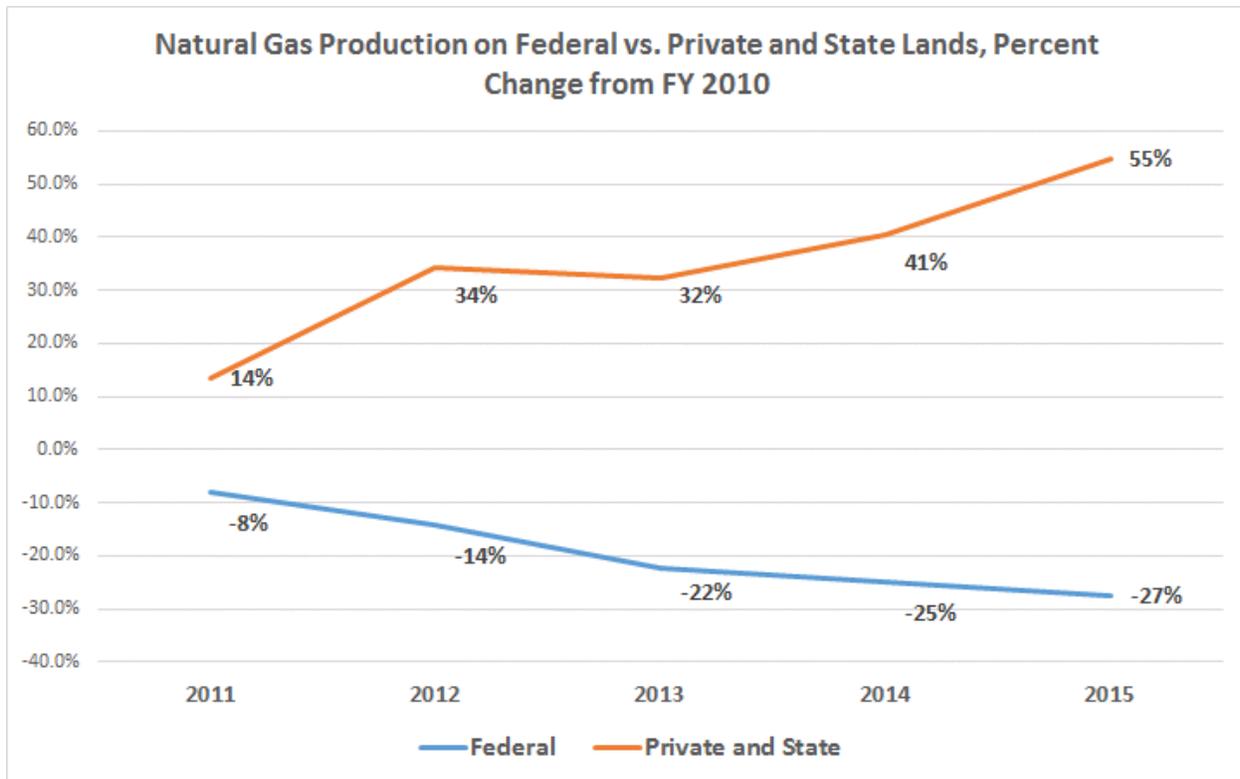
⁴ Institute for Energy Research, *Administration Actions Designed to Increase the Cost of Energy and the Cost of Using Energy*, Sept. 9, 2014, <http://instituteforenergyresearch.org/administration-actions-designed-increase-cost-energy-cost-using-energy/>

state lands was up 113 percent, however oil production on federal lands increased by a measly 0.8 percent.⁵



With natural gas production, there is a similar story. On private and state lands, natural gas production is up 55 percent, but natural gas production on federal lands is down 27 percent.

⁵ Marc Humphries, *U.S. Crude Oil and Natural Gas Production in Federal and Nonfederal Areas*, Congressional Research Service, June 22, 2016, <http://www.fas.org/sgp/crs/misc/R42432.pdf>



The Obama administration has issued less than half as many oil and gas leases as the Clinton administration⁶ and it still takes the administration 220 days to process a permit to drill.⁷ These are signs that while the administration has worked to expedite solar leasing and production, they have been antagonistic on oil and gas leasing and production on federal lands.

It should be noted that the situation with coal leasing is even worse with the administration imposing an indefinite moratorium on new coal leases. It would be much better to see the administration treat all sources of energy equally and work to reduce red tape for all.

Taxpayer-funded solar plants on BLM lands should serve as cautionary examples

The following chart shows the facilities that are on BLM land and have received federal loan guarantees. It should first be noted that loan guarantees are only one of many subsidies the facilities owners have used. The chart also shows that the owners of these facilities received more than \$1.2 billion in Section 1603 grants.

⁶ Institute for Energy Research, *Oil Production on Federal Lands Slightly Above its FY 2010 High*, July 7, 2016, <http://instituteeforenergyresearch.org/analysis/oil-production-federal-lands-slightly-fy-2010-high/>

⁷ Bureau of Land Management, *Average Application for Permit to Drill (APD) Approval Timeframes: FY2005 - FY2015*, http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/statistics/apd_chart.html

| Solar Facility | Size in MW | BLM Acentage | Loan Guarantee | 1603 Grants | Owners |
|-----------------|------------|--------------|----------------|-------------|---|
| Desert Sunlight | 550 | 4165 | \$1,460 | \$360 | NextEra Energy, General Electric, Sumitomo of America |
| Genesis | 250 | 4640 | \$852 | \$328 | NextEra Energy |
| Crescent Dunes | 110 | 1600 | \$737 | ???? | SolarReserve, ACS Cobra, Banco Santander |
| Ivanpah | 370 | 3472 | \$1,600 | \$539 | Brightsource Energy, NRG Energy, Google |

But that is not all. In 2010, Obama administration officials Larry Summers, Ron Klain, and Carol Browner wrote a White House memo about subsidies for the Shepherds Flat wind facility.⁸ Much of this analysis applies to these solar facilities. This chart shows the value of the subsidies for Shepherds Flat according to these Obama administration officials:

| Subsidy Type | Approximate Amount (millions) |
|--|-------------------------------|
| Federal 1603 grant (equal to 30% investment tax credit) | \$500 |
| State tax credits | \$18 |
| Accelerated depreciation on Federal and State taxes | \$200 |
| Value of loan guarantee | \$300 |
| Premium paid for power from state renewable electricity standard | \$200 |
| Total | \$1,218 |

One of the important subsidies that applies to these solar facilities is the premium for this solar power. According to the Wall Street Journal:

Power from the two Ivanpah units that serve PG&E last year fetched about \$200 a megawatt-hour on average during summer months, and about \$135 a megawatt-hour on average the rest of the year, according to sales data from the Federal Energy Regulatory Commission.

That compares to an average price of \$57 a megawatt-hour for solar power sold under contracts signed in 2015, according to Bloomberg New Energy Finance. Power from natural-gas plants went for \$35 a megawatt-hour on average in California's wholesale

⁸ Daniel Simmons, Corporate Welfare Masquerading Under an Environmental Rainbow, Institute for Energy Research, Sept. 29, 2011, <http://instituteeforenergyresearch.org/analysis/its-not-green-energy-its-corporate-welfare-masquerading-under-an-environmental-rainbow/>.

market last year, according to a Wall Street Journal analysis of data compiled by the Energy Department.⁹

\$135 to \$200 per MWH is very expensive electricity. Obviously this is a large subsidy for the owners of the Ivanpah plant, which raises the question why the facility was built and subsidized in the first place.

What makes this very unseemly is that there was never any reason for this facility to receive hundreds of millions of dollars in subsidies because the owners had the money to spare. The facility is owned by Google (currently called Alphabet with a market capitalization of over \$500 billion), NRG Energy (market capitalization of \$5 billion), and Brightsource Energy. If Google wants to build an expensive solar plant, they are free to do so. They have plenty of money as Google's "poorest" founder, Larry Page, is personally worth more than \$29 billion. There is, however, no reason the American taxpayer needs to subsidize a solar plant for billionaires.

Amazingly, NRG Energy only contributed \$300 million to the cost of the plant and Google contributed \$168 million. This is less than what the American people put in through the 1603 grant alone.

Making matters worse, PG&E buys the electricity from Ivanpah at very high electricity rates and passes those higher costs to California electricity ratepayers. California ratepayers pay for these facilities not only through higher federal taxes required to pay for the federal subsidies, but again when they pay their electricity bill every month.

Solar Power does not increase America's energy security nor does it reduce energy imports

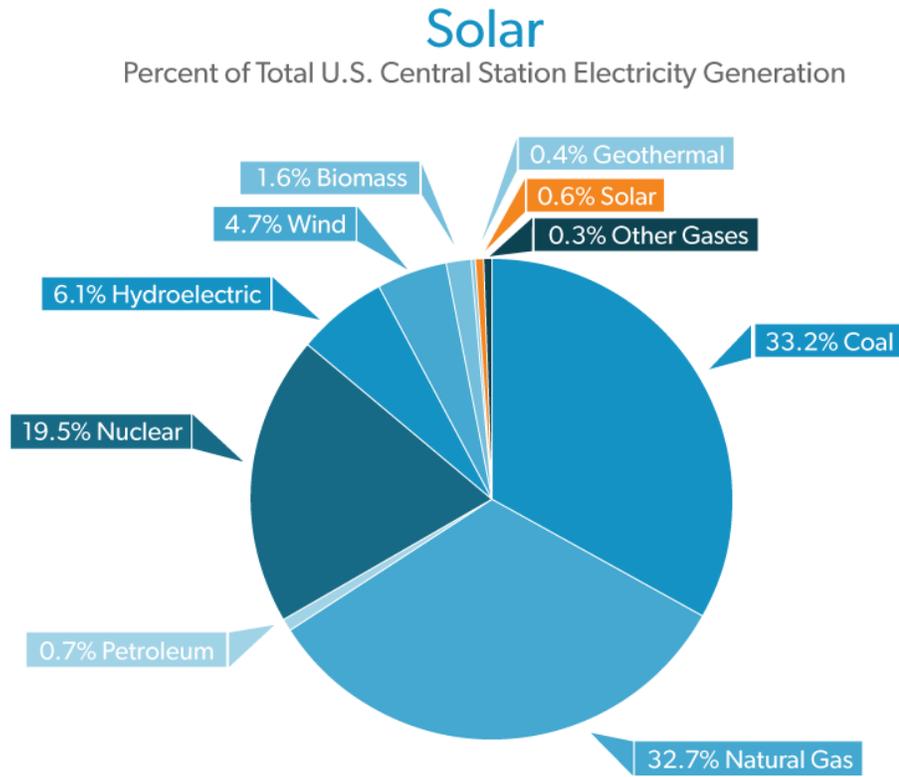
When the Department of Interior rolled out their Roadmap for Solar Energy Development on Public Lands, then-Secretary of Energy Chu stated, "Developing America's solar energy resources is an important part of President Obama's commitment to expanding American-made energy, increasing energy security, and creating jobs." This statement is incorrect and suspect in a number of ways.

First, almost 100 percent of America's electricity generation is already American-made. The following graphic, using data from the Energy Information Administration, shows that solar produced 0.6 percent of electricity in 2015. It also shows that petroleum produced a mere 0.7 percent of electricity in 2015. The U.S. imports about one quarter of the oil we use¹⁰ and the vast

⁹ Cassandra Sweet, *Ivanpah Solar Plant May be Forced to Shut Down*, Wall Street Journal, March 16, 2016, <http://www.wsj.com/articles/ivanpah-solar-plant-may-be-forced-to-shut-down-1458170858?cb=logged0.4268413656962808>

¹⁰ Institute for Energy Research, *Petroleum (Oil)*, <http://instituteeforenergyresearch.org/topics/encyclopedia/petroleum/>

majority of all of the other sources such as coal, natural gas, geothermal, hydroelectric, and nuclear are already domestic sources of energy.



Source: EIA, MER, March 2016

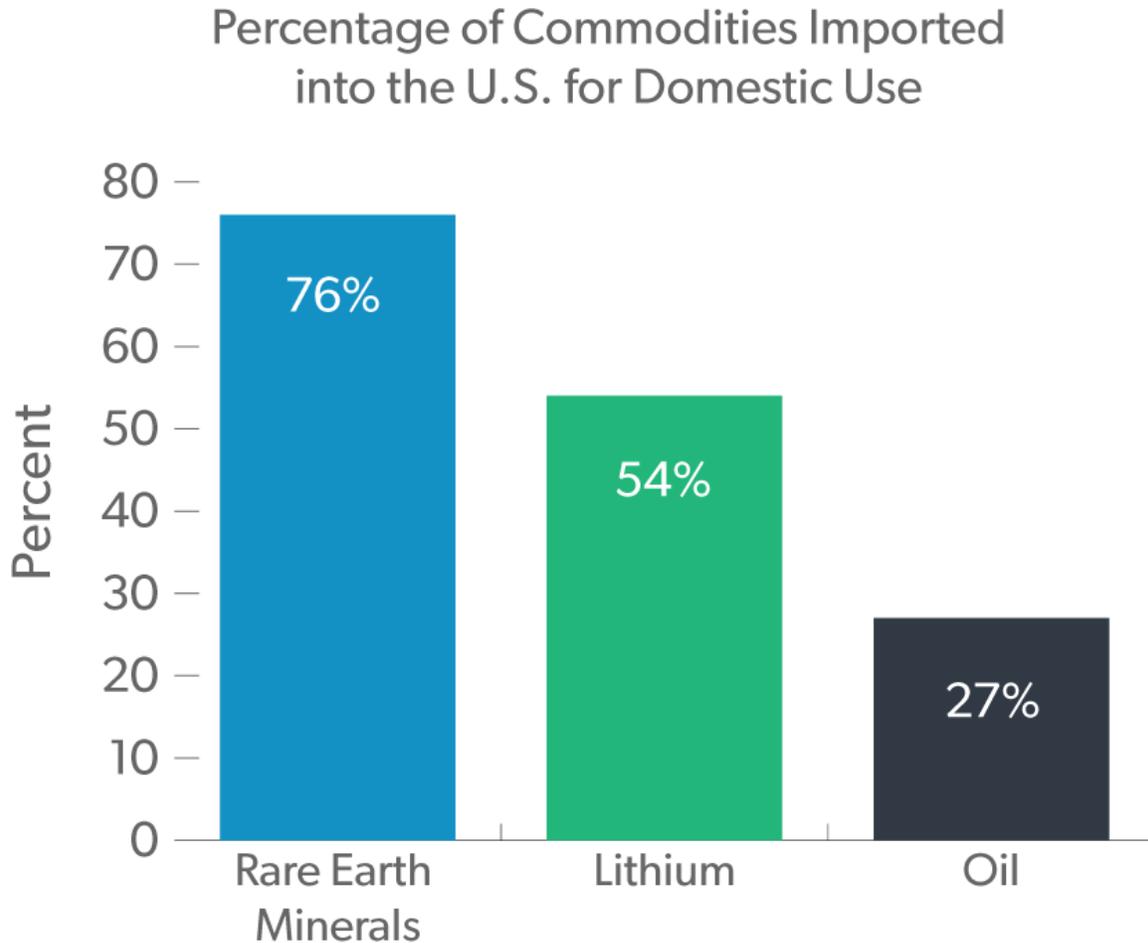
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Because solar produces electricity and because a very small percentage of electricity is generated from foreign sources of energy, solar cannot increase American energy security.

Furthermore, increasing the use of solar and wind may actually increase our use of foreign sources of energy. As we at IER have previously explained:

Green energy technologies are dependent on rare earth minerals and lithium for batteries—both of which are primarily imported into the United States. Most of the world’s rare earth minerals are produced in China (85 percent); and that country supplies the United States with most of its rare earth imports (71 percent). The United States only produces 24 percent of the rare earth minerals that it needs. In 2013, the United States imported 54 percent of the lithium it used, with Chile and Argentina supplying 96 percent of those imports. Some believe that lithium may be the “new oil”, eclipsing oil as a source for geopolitical and economic power. Clearly, Tesla, who is building a gigafactory in Nevada to produce lithium-ion batteries for its cars and Powerwall storage device, needs access to

low-cost lithium. In contrast to these figures, the United States now imports only 27 percent of the oil it uses domestically.¹¹



Sources: http://minerals.usgs.gov/minerals/pubs/commodity/rare_earths/mcs-2016-raree.pdf
<http://minerals.usgs.gov/minerals/pubs/commodity/lithium/mcs-2015-lithi.pdf>
<http://www.eia.gov/tools/faqs/faq.cfm?id=32&t=6>

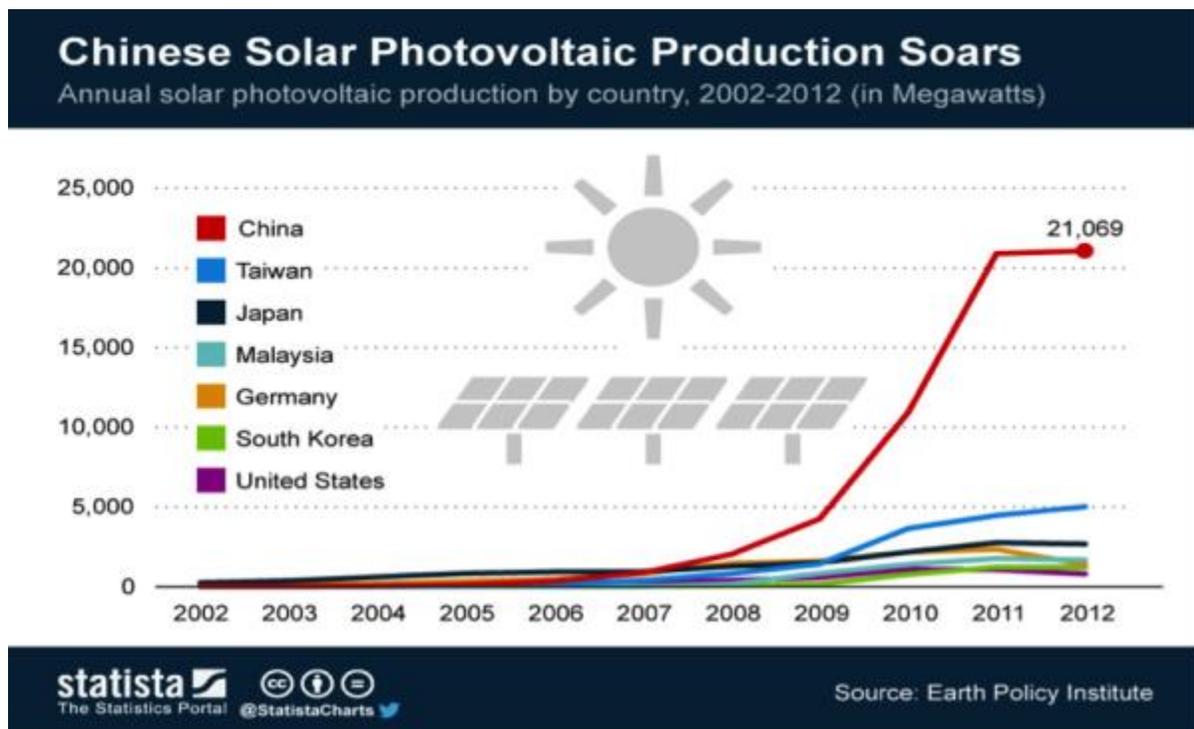
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When it comes to solar panel production, the vast majority of solar panels are produced in China. As we have explained:

It is clear from worldwide manufacturing data that China is taking over the production market for solar PVs. China has been the world's largest manufacturer of solar panels since 2008, and since 2011, has produced the majority of global photovoltaics on an annualized basis. By the end of 2017, China is expected to have enough manufacturing

¹¹ Institute for Energy Research, *Green Energy Actually Increase U.S. Dependence on Imports*, Feb. 29, 2016, <http://instituteeforenergyresearch.org/analysis/green-energy-actually-increases-u-s-dependence-on-imports/>

capacity to produce 51 gigawatts of photovoltaics per year, an amount over twice as large as the global production of 24 gigawatts in 2010.¹²



Therefore, using more solar power means more energy imports, not less.

Electricity from solar facilities is very expensive

The gold standard for comparing the cost of electricity from various sources is the Energy Information Administration's levelized cost data. These data show that electricity from new natural gas-fired power plants costs \$75 per megawatt-hour (MWH) while electricity from new solar PV costs \$125 per MWH and from new solar thermal costs nearly \$240 per MWH. In other words, when it comes to electricity from new plants, solar PV is 66 percent more expensive than new natural gas and solar thermal is 220 percent more expensive. To put this in context, Crescent Dunes, Genesis, and Ivanpah are solar thermal plants and Desert Sunlight is a PV plant.

¹² Institute for Energy Research, *Hillary's Solar PV Plan Aids Chinese Manufacturing*, July 31, 2015, <http://instituteforenergyresearch.org/analysis/hillarys-solar-pv-plan-aids-chinese-manufacturing/>

Table 1. Estimated levelized cost of electricity (LCOE) for new generation resources, 2020

U.S. average levelized costs (2013 \$/MWh) for plants entering service in 2020¹

| Plant type | Capacity factor (%) | Levelized capital cost | Fixed O&M | Variable O&M (including fuel) | Transmission investment | Total system LCOE | Subsidy ² | Total LCOE including Subsidy |
|--------------------------------------|---------------------|------------------------|-----------|-------------------------------|-------------------------|-------------------|----------------------|------------------------------|
| Dispatchable Technologies | | | | | | | | |
| Conventional Coal | 85 | 60.4 | 4.2 | 29.4 | 1.2 | 95.1 | | |
| Advanced Coal | 85 | 76.9 | 6.9 | 30.7 | 1.2 | 115.7 | | |
| Advanced Coal with CCS | 85 | 97.3 | 9.8 | 36.1 | 1.2 | 144.4 | | |
| Natural Gas-fired | | | | | | | | |
| Conventional Combined Cycle | 87 | 14.4 | 1.7 | 57.8 | 1.2 | 75.2 | | |
| Advanced Combined Cycle | 87 | 15.9 | 2.0 | 53.6 | 1.2 | 72.6 | | |
| Advanced CC with CCS | 87 | 30.1 | 4.2 | 64.7 | 1.2 | 100.2 | | |
| Conventional Combustion Turbine | 30 | 40.7 | 2.8 | 94.6 | 3.5 | 141.5 | | |
| Advanced Combustion Turbine | 30 | 27.8 | 2.7 | 79.6 | 3.5 | 113.5 | | |
| Advanced Nuclear | 90 | 70.1 | 11.8 | 12.2 | 1.1 | 95.2 | | |
| Geothermal | 92 | 34.1 | 12.3 | 0.0 | 1.4 | 47.8 | -3.4 | 44.4 |
| Biomass | 83 | 47.1 | 14.5 | 37.6 | 1.2 | 100.5 | | |
| Non-Dispatchable Technologies | | | | | | | | |
| Wind | 36 | 57.7 | 12.8 | 0.0 | 3.1 | 73.6 | | |
| Wind – Offshore | 38 | 168.6 | 22.5 | 0.0 | 5.8 | 196.9 | | |
| Solar PV ³ | 25 | 109.8 | 11.4 | 0.0 | 4.1 | 125.3 | -11.0 | 114.3 |
| Solar Thermal | 20 | 191.6 | 42.1 | 0.0 | 6.0 | 239.7 | -19.2 | 220.6 |
| Hydroelectric ⁴ | 54 | 70.7 | 3.9 | 7.0 | 2.0 | 83.5 | | |

Also, I’ll note that when EIA updates these data soon, the prices of solar will likely be lower, but that solar will still be substantially more expensive than building new natural gas plants.

While EIA’s levelized cost data is good, it contains an important caveat and states that “caution should be used when comparing” dispatchable and non-dipatchable sources of generation.¹³ Dispatchable sources are sources like natural gas, coal, and nuclear which are controllable where nondispatchable sources such as wind and solar depend on the weather. This is an important distinction because to avoid blackouts, the amount of energy generated on the electric grid must

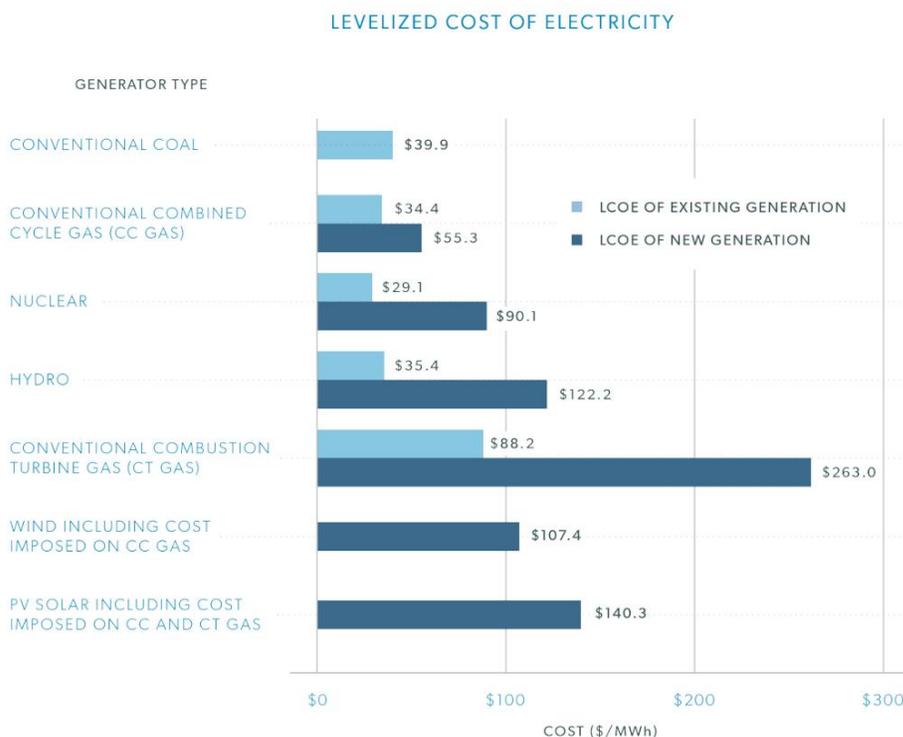
¹³ Energy Information Administration, Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2015, June 3, 2015, https://www.eia.gov/forecasts/aeo/electricity_generation.cfm

always equal the amount of energy used by all of the homes and business connected to the grid. This means that dispatchable sources are inherently more valuable than non-dispatchable sources.

Furthermore, the most important comparison that we can make with electricity generation is not new sources versus new sources, but our current sources of generation versus new generation.

To deal with the issue of dispatchability and to make an apples-to-apples comparison between different sources of electricity generation, as well as comparing existing sources to new sources, the Institute for Energy Research will soon release an update to our report on *The Levelized Cost of Electricity from Existing Generation Resources*¹⁴ which will include the levelized cost of solar PV compared to other existing sources of generation.

The report finds that electricity from new solar is nearly 5 times more expensive than from existing nuclear and over 3.5 times more expensive than existing coal. The summary data is in the chart below. Also, it should be noted that the solar we included in this report is solar PV, not solar thermal. Solar thermal would be even more expensive than solar PV.



Solar power struggles to help keeps the lights on

¹⁴ Thomas F. Stacy & George S. Taylor, *The Levelized Cost of Electricity from Existing Generation Resources*, June 2015, http://instituteforenergyresearch.org/wp-content/uploads/2015/06/ier_lcoe_2015.pdf

One of the biggest challenges in keeping the lights on and the electricity grid stable is making sure the electricity grid has sufficient electricity during times of peak demand. Because solar is non-dispatchable and dependent on the weather and time of the year, it cannot necessarily help meet times of peak demand.

For example, the best time of the year for solar is during the summer and the best day of the year should be the summer solstice. This year the solstice occurred on June 20th. In California on the summer solstice, peak electricity system demand occurred at 5:50 pm with demand of 44,550 MW.¹⁵ Solar peak production occurred at around 1 pm at 6,922 MW¹⁶ and by 6:00 pm near the time of peak demand solar production had fallen to 4,491 MW. By 7:00 pm, when system demand was still 44,000 MW, solar production had fallen to 2,629. By 9:00 pm solar production was zero while electricity demand was still nearly 42,000 MW.

It should be noted that this is pretty much the best case scenarios for solar power to help keep the lights on. During much of the year, there is little to zero solar production at times of peak system demand. For example, on the spring equinox this year system demand peaked at 7:43 pm,¹⁷ however, solar production was zero by 8 pm.¹⁸

Conclusion

The Obama administration should be applauded for aggressively trying to cut red tape for energy leasing on federal lands. However, the administration should have worked to reduce red tape for all kinds of energy production and not just renewable production.

Solar energy is an expensive source of electricity generation. It is a much better bet for Google's founders to spend their own money trying to make solar cost competitive rather than using billions in taxpayer dollars. It is unseemly that the American taxpayer has contributed billions of dollars to these facilities when the owners could have financed these projects without taxpayer dollars.

¹⁵ California ISO, *Renewables Watch*, June 20, 2016,
http://content.caiso.com/green/renewrpt/20160620_DailyRenewablesWatch.pdf

¹⁶ California ISO, *Hourly Breakdown of Renewable Resources*, June 20, 2016,
http://content.caiso.com/green/renewrpt/20160620_DailyRenewablesWatch.txt

¹⁷ California ISO, *Renewables Watch*, March 21, 2016,
http://content.caiso.com/green/renewrpt/20160321_DailyRenewablesWatch.pdf

¹⁸ California ISO, *Hourly Breakdown of Renewable Resources*, March 21, 2016,
http://content.caiso.com/green/renewrpt/20160321_DailyRenewablesWatch.txt