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The Geopolitics of Energy: International Politics in a Shifting Energy Landscape

Tufts Energy Conference Energy Policy Challenge:

Solar Investment Tax Credit

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1. Introduction

The Solar Investment Tax Credit (ITC) is a 30% federal tax credit for owners or long-term lessees of solar energy projects on commercial and residential properties. The amount of the ITC is calculated over the total cost of the solar property including equipment and labor. In this way, the ITC helps to lower the costs of owning or financing solar energy systems, creating a positive impact on solar development, which is now more cost-competitive than conventional electricity generation.

On one hand, this incentive increases financing certainty for project developers and investors. It drives both growth in the industry and job creation across the country. Moreover, the recently announced Clean Power Plan and the United Nations 2015 Paris Climate Conference (COP 21) at the end of last year increased pressure to keep this incentive. U.S. Energy Secretary Ernest Moniz summarizes the dilemma: "The solar industry in the U.S. can grow and survive without the need for subsidy support, but as a tool for addressing climate change, an extension of the ITC will prove valuable."[1]

On the other hand, solar energy costs have been decreasing on their own, raising some doubts regarding the necessity of incentives. Moreover, the incentive tax credit decreases tax revenue for the federal government, which affects all Americans.

This paper introduces three policy options for the ITC, and evaluates them through qualitative and quantitative economic data: 1) let the ITC expire, 2) extend the ITC, 3) gradually reduce and customize the ITC by adapting it to each state's market conditions. This paper initially introduces some economic issues surrounding the ITC policy. Next, the paper presents relevant qualitative and quantitative consequences of each ITC policy option. Finally, a conclusion summarizes the relevant facts and data that support or oppose each policy option.

2. The economics of solar ITC policy

The key role of this tax credit is to fix a market failure, by which fossil fuel—and even nuclear—electric power plants are allowed to socialize pollution costs from extraction, combustion, and long-term waste storage[2]. The ITC intends to internalize the positive externality of the clean, renewable solar PV energy.

[1] http://www.pv-magazine.com/news/details/beitrag/itc-extension-will-assist-solar-growth--says-us-energy-secretary_100020902/#ixzz3pXoaDRde

[2] http://cleantechnica.com/2015/09/09/federal-solar-tax-credit-extension-can-win-lose/

Since the ITC was passed, more than 170,000 American solar jobs have been created and $72 billion has been invested in solar installations nationwide. It has created more market certainty for investors, which has encouraged the creation of more than 8,000 companies across the 50 states, injecting $15 billion a year into the economy[3]. Environmentally, tons of carbon dioxide have been offset by generating clean energy.

The ITC has helped annual solar installations grow by over 1,600% since 2006, with an annual growth rate of 76%. The following graph shows solar capacity growth, which has been substantial since 2008, when the tax credit was extended and expanded to utility scale solar:

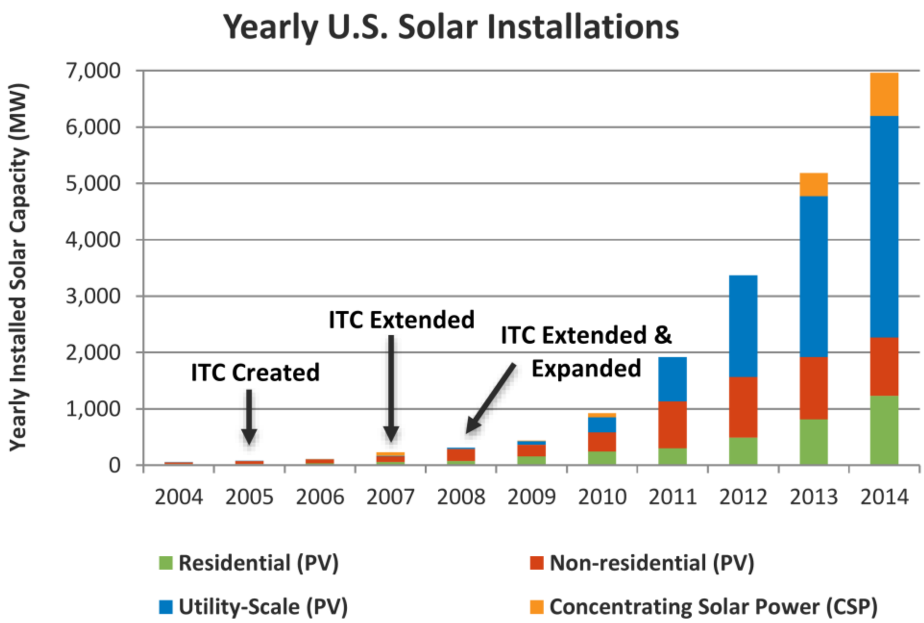

Fig.1. Solar Capacity Growth with ITC

The ITC decreases the cost of solar energy, which increases the demand for solar investments. This means that the demand will actually perceive a lower price of solar energy (Pd), that virtually shifts the supply curve to the right (S1 to Sd), increasing the solar deployment quantity. However, the supply curve remains the S curve and the price for the new quantity Q2 is increased (Ps). On the other hand, demand creates lower price (Pd). This difference in prices and the disequilibrium operation of the supply demand curve is sustained by the tax amount that the government is redistributing as a subsidy. In other words, it is sustained by taxpayers that would otherwise benefit from the federal government spending if the ITC didn't exist. This amount corresponds to the gray area of the graph below and by the equation below it.

[3] Solar Energy Industry Association (SEIA). "The Case for the Solar Investment Tax Credit". June 9, 2015.

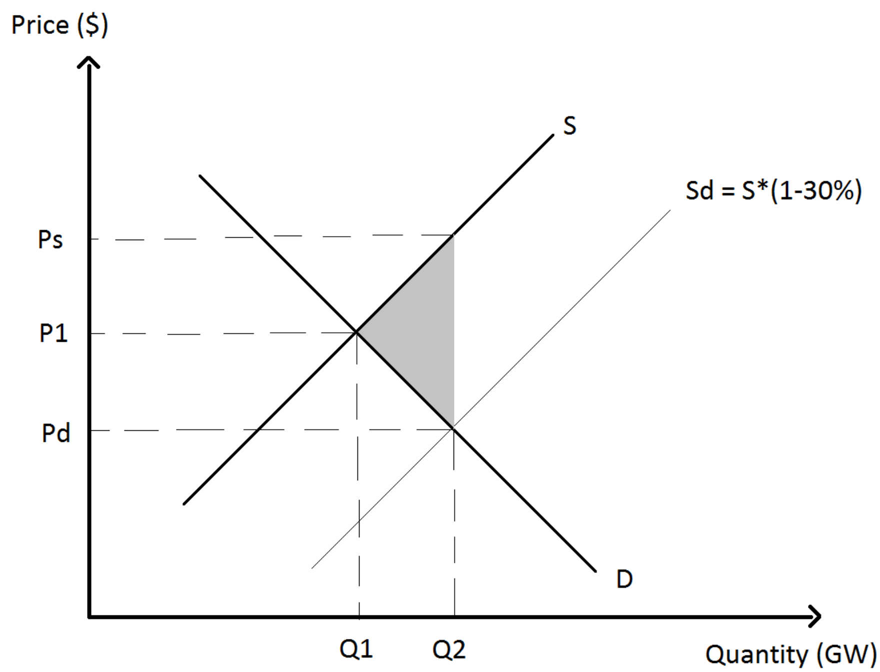

Fig.2. Supply x Demand Curve Considering the Solar ITC

$$\text{TAX LOSS} = Q2*Ps - Q2*Pd \quad (1)$$

According to Taxpayers Protection Alliance[4], ITC and other federal policies have harmed taxpayers an average of $39 billion per year over the past 5 years. The Alliance argues that taxpayers are paying too much for an energy source that represents less than 1% of electricity consumed by Americans. They oppose the ITC, arguing that just a few people are enjoying the benefits of the solar policy, while the majority of the population pays for it.

However, over the lifetime of a solar PV asset, the initial cost of federal expenditures associated with the ITC are more than offset by tax revenues generated in third-party financing scenarios through Power Purchase Agreements (PPA) and leases. Both mechanisms create a fixed payment structure and provide a positive financial return on investments to the federal taxpayer[5]. These financing schemes correspond to a large share of solar installations. For example, since Q2 2013, more than 90% of New Jersey's residential solar market has consisted of third-party owned systems[6].

[4] Taxpayers Protection Alliance. "Filling the Sollar Sinkhole: Billions of Bucks Have Delivered Too Little Bang
[5] U.S. Partnership for Renewable Energy Finance (US PREF). "An analysis of the Return to the Federal Taxpayer for Internal Revenue Code Section 48 Solar Energy Investment Tax Credit (ITC)". July 12, 2012.
[6] http://www.seia.org/policy/finance-tax/third-party-financing

3. ITC Expiration

The first policy option assumes that the ITC residential credit will expire as planned on December 31, 2016 and the commercial credit will drop to 10%. If that happens, the price perceived by demand will increase and the supply curve Sd will shift back closer to S in Fig. 1. Therefore, the quantity of solar installations will drop. The following graph shows the impact of this quantity, in GW, of expected annual solar installations. As shown, the drop is significant[7].

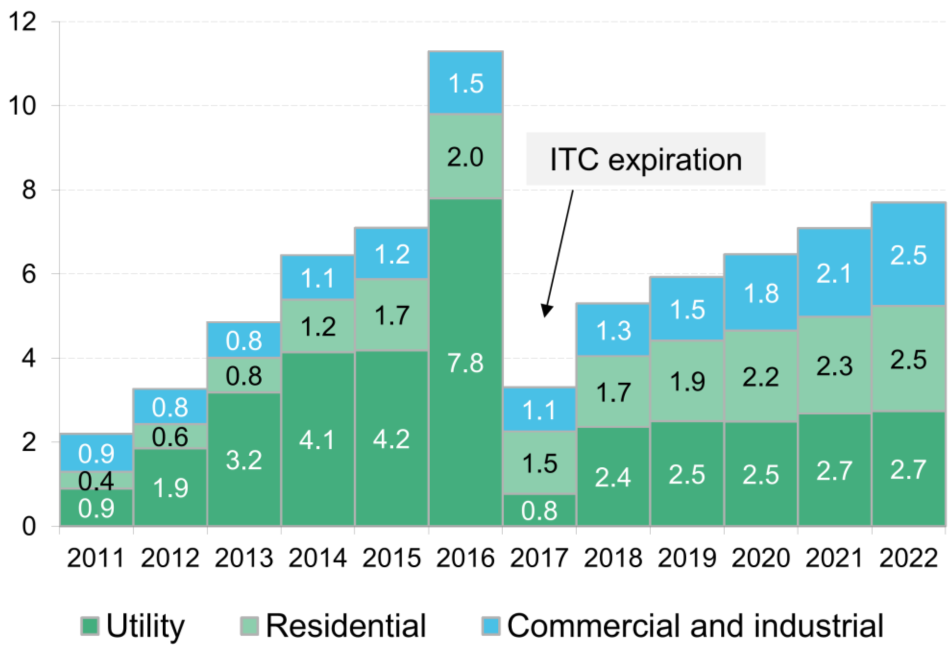

Fig.3. US solar build by customer segment – ITC expiration

With such a decrease in solar deployment, the solar industry could lose 80,000 jobs, plus 20,000 in related affected industries in 2017. That's a total of 100,000 jobs lost in one year[8].

Tax revenue collected will increase because there will be some of the solar market that can be sustained without the ITC. However, it will be a small increase since it is expected that supply will shift closer to S in Fig.2 and the gray area that represents the tax collection will be less than the area showed in the figure.

[7] BNEF_SEIA Solar Forecast_15 September 2015
[8] Solar Energy Industry Association (SEIA). "Solar ITC Impact Analysis".

Eventually, the supply curve will shift to the right (closer to Sd) due to technological advances, which decreases the price of solar panels. International competition, technology innovations, and new investment have lowered project costs 45% since 2012, according to the Solar Energy Industries Association. The National Renewable Energy Laboratory forecasts that double-digit annual declines will continue for several more years.

4. ITC Extension

Some oppose the ITC extension because it implies tax that the federal government is not collecting, negatively impacting American taxpayers. Investors in other sources of energy complain because of this unfair advantage for the solar market.

A 5-year extension of the ITC will continue increasing solar deployment and jobs in the industry. After this period, the solar market will be more mature and self-sustained and therefore, the harm of ITC expiration will have much less impact in 2022 than in 2017. This difference can be observed when comparing Fig.4 with the previous Fig.3.

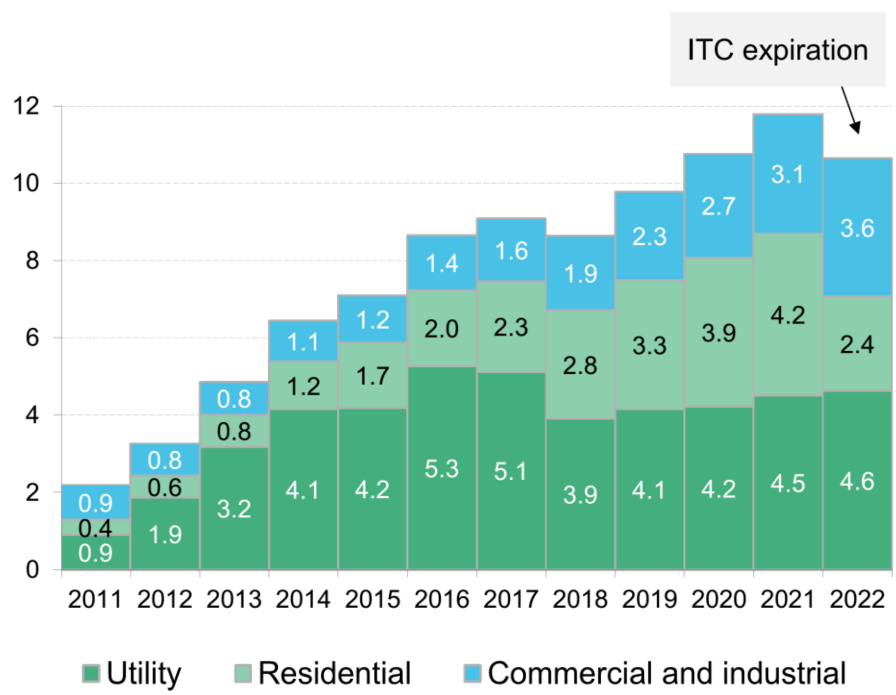

Fig.4. US solar build by customer segment – ITC extension

The ITC extension would yield 61,000 more solar jobs in 2017. It is expected that solar industry employment would be 32% higher than without the ITC extension. Additionally, total investment between 2016 and 2022 is expected to be $39 billion more than without the ITC.

Moreover, with the ITC extension, by 2022 more than 95 GW of solar power will be installed in the United States, generating 144 TWh of electricity per year, offsetting 100 million metric tons of carbon dioxide[9].

5. Customized solar ITC for each state with a gradual reduction

This option is an intermediary solution that attempts to balance the two previous policy options. The solar ITC represents a lack of tax collection and these incentives should not continue indefinitely. However, the expected ITC expiration is too abrupt and will strongly impact the solar market.

A different approach to this policy issue could use the California Solar Initiative as an example. In California, a gradual incentive decrease didn't decrease market growth; rather, the market continued to grow, as seen in the figure below:

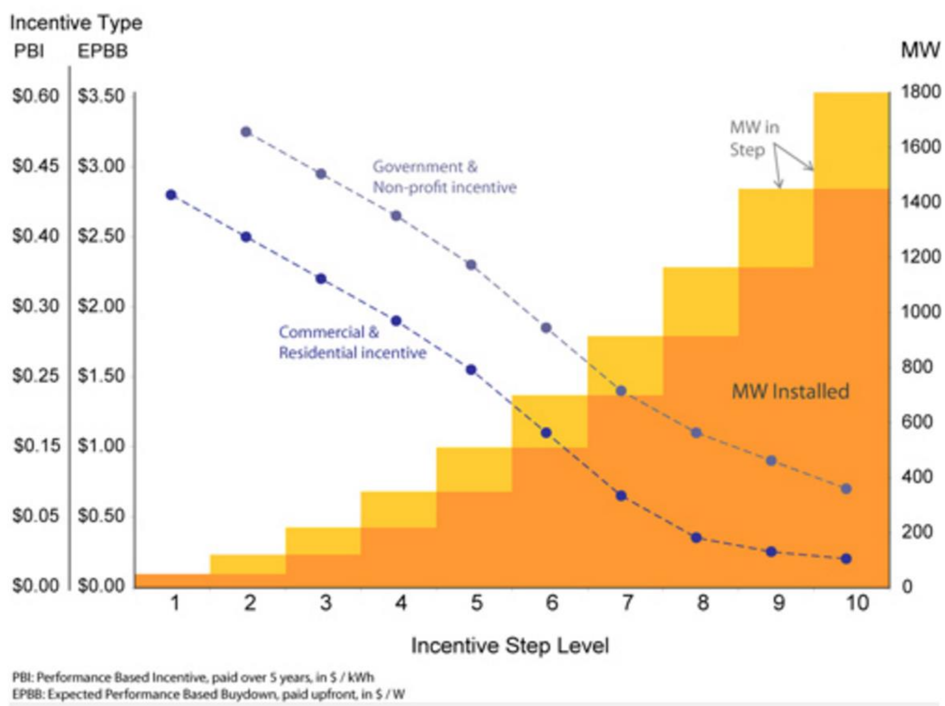

Fig.5. California Solar Initiative[10]

[9] Solar Energy Industry Association (SEIA). "Solar ITC Impact Analysis".
[10] http://cleantechnica.com/2015/09/09/federal-solar-tax-credit-extension-can-win-lose/

Therefore, a gradual reduction based on the solar market improvements in each state will remove the ITC incentive over time without harming the solar market, which will be able to stand on its own by the time the tax credit expires.

Moreover, because each state has its own solar irradiance levels and utility electricity costs, the viability of solar systems varies state by state. In other words, the distance to grid parity will vary, which makes the impact of a 30% ITC different in each state. Grid parity means that the levelized cost of solar electricity is equal to the price of purchasing electricity from the grid. Obviously, state and municipal policies may create different impacts but only solar ITC policy is analyzed here. The following figures show how far the distance to grid parity is for some states, both with and without ITC

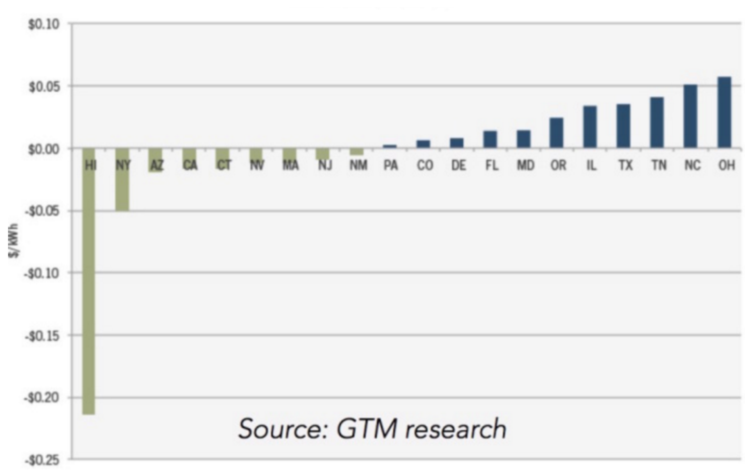

Fig.6. Distance to Grid Parity by States with ITC

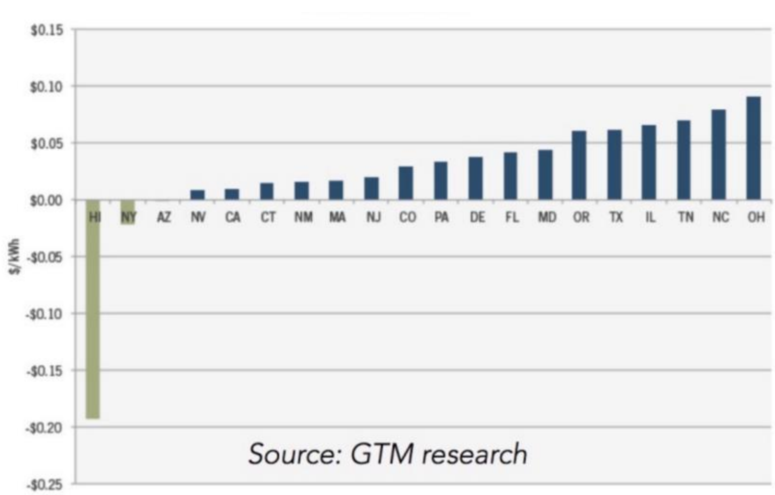

Fig.7. Distance to Grid Parity by States without ITC

As shown, even without ITC, there are some states that reached grid parity. Therefore, they don't need the solar ITC. Other states crossed grid parity with the 30% ITC, therefore they need a solar ITC lower than 30%. Each state will receive a customized ITC percentage, lowering the tax collection impact and partially maintaining the incentive.

6. Conclusions

As seen in section 2—the economics of solar ITC—solar development is highly correlated with the Solar Investment Tax Credit. This incentive was created to fix a market failure by internalizing the positive externalities of a clean, diversified and distributed energy. It also represents a lack of tax collection, which harms Americans.

The expiration of the solar ITC will decrease solar deployment and cause massive job losses. The solar market will significantly shrink with a slight increase of tax revenue, since the supply curve perceived by the demand will shift closer to S in Fig.2.

The extension of the solar ITC will continue strengthening the solar market by continuing growth in solar deployment and jobs. However, a lack of tax collection will persist and even the states that can sustain the solar market by themselves will benefit from this incentive.

To balance the advantages and disadvantages of extending the ITC or allowing it to expire, a third policy option was introduced. A customized federal ITC for each state would reflect that state's unique solar market conditions. States that can sustain the solar market by itself will no longer receive the ITC, while others will keep receiving the ITC, but the percentage of the credit will be annually decreased reflecting actual market conditions. In that way, there will be no abrupt change harming the market and tax collection will be closer to the ITC expiration policy option. However, a more detailed study of each state's solar market will be required to determine a fair ITC percentage, which will increase the costs for implementation of this particular ITC policy.

It is difficult to conclude that one ITC policy is better than the others, and this memo presents just a few policy options. With occasionally distorted data and facts published by self-interested institutions, it is hard to make a fair judgement of each policy. A transparent and unbiased study should be performed to better address the costs and benefits of solar development driven by each ITC policy option that considers the perspectives of all affected parties, including American taxpayers.