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PROSPECTS FOR CLEAN ENERGY IN INDIA

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Clean energy is India's pressing need. Pollution levels are rising and climate change threatens our hydrology and coastal areas. India, as a developing country, and also as a major polluter, must find alternatives to coal. At present, 60% of the power generation comes from coal. At the global climate conference in Paris, in December 2015, India has pledged to achieve the mammoth goal of 175 gigawatts of clean energy by 2022. To do so, India must not only expand its current base of clean energy alternatives, but also make them economically viable and marketable. This issue of the Law & Policy Brief, looks at plausible clean energy sources that are economical for India to pursue.

Introduction

In addition to what the Modi government offered at the Paris Summit, the Finance Minister, in the 2016 budget, vouched a tenfold increase in solar power to 100GW, trebling of wind farms to 60GW, plus 10GW from biomass and 5GW from small-scale hydro power by 2022. In the following discussion, the primary focus will revolve around the most marketable sources of clean energy, namely, solar, wind, geothermal and biofuels. We intentionally remove hydropower from the discussion as most major sites of hydropower have already been used. Additionally, hydro projects generate major public resistance because of their impact of local ecology and livelihood.

Solar Power

The first clean energy source is solar power. India gets direct sun for 300 days in the year across the seventh largest land area in the world. Moreover, India recently for the first time made it mandatory to include solar storage when tendering solar projects. However, currently, the cumulative installations of solar power provide only 4GW as of June, 2015. Therefore, the solar projection of the Modi Government has met with much skepticism. One may note however, that China achieved a tenfold increase in merely four years. It started stepping up its solar installations in 2011, with only 2GW of solar power. By 2012 it had 5GW and by 2015, 17.8 GW of solar power were installed. Thus, a rapid stepping up seems feasible for India.

SunEdison, a US based company, is due to develop 5GW of solar power in the state of Karnataka. Additionally, the company is set to invest another $4 billion in a joint venture with Adani Enterprise, an Indian firm. Solar Energy Corp. of India, the state run entity, is due to ask bidders to include 100 megawatts of storage components of the 750 megawatts tendered in Andhra Pradesh. Presumably, other bidders in other states will be asked to do the same.

India has long experience in research and development of solar power. Its research has led to a 70% decline in the cost of production of solar electricity over the last five years. In terms of cost per kilowatt hour, solar power is virtually at

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par with thermal power. This is a significant step if India seeks to harness its solar power potential to its fullest extent. In March 2015, revised documents by the Ministry of New and Renewable Energy (MoNRE) stated it would implement 15GW solar projects by 2019. In April, 2015, the Union Ministry of Power released a notification mandating that all new coal fired plants would have to be accompanied by a renewable energy source, equivalent to 10% of the new plants' total output. Again in May, 2015, MoNRE was planning to issue 10GW of solar tenders. The list goes on. Therefore, just within a couple months, the government is prepping up investments and plans designed to meet the 2022 deadline.

However, one technical difficulty arises through solar storages. The solar storages are intended to reduce fluctuations in the electrical supply. This would make it plausible to transfer the energy between states. Adding solar storage with the power plants would also mean that more power can be generated during the day, and also the stored power can be used after the sun has set. Storage and warehousing power is crucial if India is to approach its 2022 deadline. Also, storage would greatly bring down the costs. Anish De, a partner at KPMG was quoted as observing, that "once renewable capacity is large enough to start becoming a major problem for the grid, storage will come in a big way."[1] Moreover, global battery makers like Tesla and Samsung are quite optimistic about India's solar storage potential.

Additionally, the projects in Andhra Pradesh even though sanctioned, seem far from materializing as bankruptcy looms around SunEdisson Inc. Indian lenders have become increasingly reluctant to finance the largest producer of renewable energy. SunEdisson is under $1.4 billion of debt and is planning on selling 1GW of unfinished projects in India. Additionally, there are numerous financing hurdles in the country. The Reserve Bank of India (RBI) data shows that about 14% of the total loans to renewable energy companies have soured or been written off.

However, the renewable energy community in India is worried that the high cost of storage would increase the cost of solar power production. At present, the price paid for solar power in India fell to Rs. 4.34 per kilowatt-hour at the auction held in Rajasthan, in January, 2016. The price currently is at par with the thermal power, which was which saw purchase at approximately Rs. 4.5 per kilowatt-hour at the Andhra Pradesh coal bids in July, 2015. Sunil Jain, the CEO of Hero Future Energies, was quoted as saying: "It may be a good experiment but this is not the right time to push for storage in utility-scale projects as it will double the cost of clean energy"[2]. According to analysts, adding the cost of storage would increase the cost to as much as Rs. 14 per kilowatt-hour. A proposed solution for reducing the cost of production is that the government should absorb some amount of the cost. Presently, government funding is provided for a normal solar project. If subsidized funding is to be provided for storage facilities as well, solar energy costs would continue to approach the costs of coal energy. Even though much of the energy storage focus is in the U.S., Korea and Japan, recent policy changes by the Indian government suggest that both the government and the private sector companies are eager to take advantage of recent reductions in cost and performance improvements across the board.

A problem with solar power, principally, is that 100 GW of solar actually generates power equivalent to only 25 to 40 GW of Coal based thermal power. Firstly, the sun does not shine at night, so that takes a broad 50% slice off. Secondly, issues like clouds, dust, haze, rain or snow could render another 15% or so of daylight time useless. Solar Panels that do not move with the position of the sun have a smaller throughput than those that do. A large majority of PV panels today are fixed in position, as the tilting mechanism is considered cost-ineffective. Some experts place this at as much as 25% but this is a variable, which depends upon the location and the nature of the weather from time to time.

Another interesting aspect worth considering is electric cars. India is one of the top ten automotive markets in the world today. With its middle class population growing in size, its buying potential is bound to increase exponentially through the years. Low polluting and low energy consuming electric cars would seem to be attractive. A key problem, with electric cars is that they need charging stations and a requisite infrastructure. Charging locations combined with an acceptable charging time would definitely increase their functionality. Tesla has had a huge break-through with electric cars in the US, and China is promoting electric cars aggressively. The Indian government has made broad claims to have

100% electric cars by 2030, the Minister of Power, Piyush Goyal said at a meet organized by CII Young India. How this would actually be delivered is a question that remains unanswered. Additionally, BMI Research, a Fitch Group company, in its report released on 11th April, 2016 stated that growth rates for clean energy would slow even as costs of production are reducing.

Wind and Geothermal Energy

A second option for India is wind energy. Wind energy objectives are not as radical as the solar objectives. In the 2016 budget, the government proposed a target of 60GW of wind power. As of 2015, the cumulative capacity of all wind farms was 24GW. As a policy decision to promote wind power and make it economical, a tax exemption is the granted in form of a tax-depreciation allowance. Up to 80% tax-depreciation exemption is granted during the first year of installation. This means that 80% of the installation value can be removed from the income generated through selling wind power.

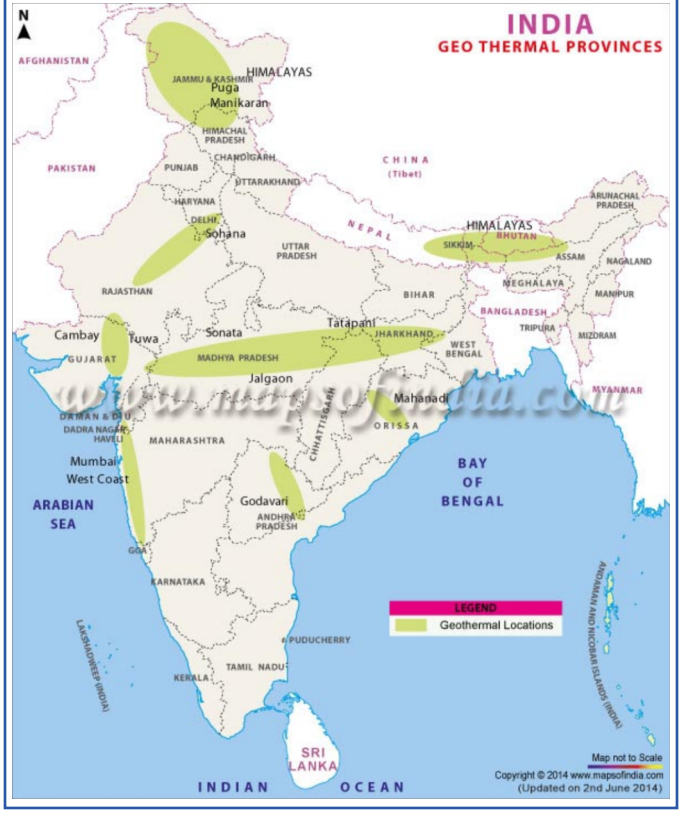
A key constraint to wind power is its weak national grid transmission structure. In 2014, the government announced its plans to make a separate corridor for all renewable energy resources, but the plan seems to be far from materializing. Another problem is that most wind turbines and mills currently in use have reached the end of their life and need replacement. Thus, there is huge scope for improvement. The old technology has undergone significant improvement through the use of taller towers and lighter blades. New state-of-the-art turbines could increase the present capacity by 300%.

A third viable option for India is geothermal energy. Geothermal energy in India is not at all harnessed. However, geothermal energy has a potential to generate at least 100MW, according to government records. Experts suggest that India's potential can be much more than that, and may reach to 10,600MW. A developing country that has shown potential for geothermal is Mexico. Therefore, it may be appropriate to analyse India's potential through Mexico's lens. Mexico has recently passed a law that allows private companies, for the first time, to competitively supply power to Mexico's grid. This has specifically boosted the geothermal energy sector.

Geothermal power plants use underground, heated water or steam that is trapped in the impermeable geologic rock. The process of developing a geothermal plant starts with the developers first identifying rare underground pockets, measuring the temperature and flow of the resource. In a successful site, the water or steam can be accessed and the heat is then used to generate power. The water is then circulated back again to repeat the process for the plant's next cycle of power.

Geothermal, for it to be economical, has to lower the large cost of drill bits through developing technology. There is also the need for new technology to make cheaper wells and clean the steam. For India, the U.S. Department of Energy could lead the way, considering the recent friendly relations shared by the two nations. Experts have noted that participation is limited in geothermal because of the experience curve. The lack of experience pertaining to geothermal technology is thus a primary deterrent against it. Countries are reluctant to invest money as the technology is not tried and tested. However, if India seeks to achieve its mammoth goal of 175GW of renewable energy, it needs to make bold decisions and invest in the research and development of geothermal energy.

Picture 1: Potential Geothermal sites in India[3]



Biofuels

The fourth option that India should consider is biofuels. The Ministry of New & Renewable Energy proposed in 2015, a national policy that targeted at blending 20% of transport fuels (diesel and petrol) with bio-diesel and bio-ethanol by 2017. Blending bio-ethanol has been in effect since 2008, but bio-diesel is a fresh addition.

The government looks to solve several problems in the environment, agriculture, and economic domain at the same time. Apart from curbing air pollution from the transportation sector, biofuel development would also provide employment to farmers and landless labourers, especially those with little financial means. A boost in bio-ethanol will also be a lifeline for the desperate sugar industry.

From a legal perspective, the above alternatives seem economical. A significant change in policy is evident from the proposed National Renewable Energy Act 2015. The Act, currently at draft stage, is intended to create an institutional structure with the objective of promoting renewable energy in the country. It seeks to create a National Renewable Energy Policy to focus on research and development.

Importantly, the government in its 2016 budget increased the cess charged to private coal block owners, naming it a Clean Energy Cess. The cess increases the cost of producing coal energy and makes renewable sources more competitive. The 2016 budget increased the royalty or cess that private coal block owners need to pay to the government from Rs 200 to Rs 400 per tonne of coal mined. In 2015, the government increased this cess from Rs. 100 to Rs. 200 per tonne of coal mined. The government promised that the proceeds of the coal cess would be used to promote renewables. By December 2014, the government had collected 16,000 crores (US$2.4 billion), most of which came from Coal India Limited, the world's largest producer of coal.

Conclusion

Lastly, India should consider nuclear energy as a viable option. Even though there are other renewable energy alternatives available, such as oceans and tides, they are riddled with problems from lack of advanced technology. It is true that setting up a nuclear power plant is a costly and a daunting task; however, most of its cost is only required upfront. After the plant is functioning, its costs are negligible. Moreover, nuclear plants last for at least 60 years, considerably longer than an average thermal or solar power plant. Additionally, the plant produces no harmful greenhouse gases. Additionally, uranium and thorium reserves are easily available and it only takes a few kilograms of uranium to power the plant. The new technology of small modular reactors lowers initial capital outlay. These reactors have the newest safety features and reprocess most of the produced waste. Increasing nuclear power should be closely looked at, if India is to catapult its clean energy production.

If India has to meet its 2022 objective, it will have to seriously look at all the above alternative economical sources. Additionally, it cannot only rely on foreign companies or technologies. It itself will have to innovate and develop technologies that work best for it. Research and development would greatly catapult India's clean energy production.

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