**Shifting to Thar lignite**

Syed Akhtar Ali

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Pakistan has 180 billion tonnes of lignite coal deposits, which have the potential of firing 1800 power plants of 1000 MW for 30 years or 500 power plants for 100 years. These deposits are more than the combined oil and gas resources of Iran and Saudi Arabia – although I haven’t personally verified this claim.

Unfortunately, the world has turned against coal and even gas and oil. Last year, China announced that it would not finance coal-based power plants abroad anymore, although it would continue to do so within its country. What can we do? We do not have enough money or technology. Insensitive and unrealistic targets regarding the adoption of renewable energy have already created instability in the oil, gas and coal markets, resulting in unaffordable high prices; no end appears in sight. Poor countries and the poor are suffering great enormous difficulties, and even people from rich countries are facing financial inconveniences.

We have installed only one or two Thar coal-based small power plants, and a few are in the pipeline, which may not exceed 5000 MW in total. There are three big 1100 MW coal power plants based on imported coal which are draining our foreign exchange reserves even though they are producing relatively cheap electricity. Thar coal had the potential for supplying a significant portion of our energy needs and saving our foreign exchange. Oil and gas resources are also dwindling, and no new resources could have been found in reasonable quantities. Our energy future does not appear to be bright in these circumstances.

But there is some good news as well: identifying the possibilities of making some other high-value products from Thar coal. Besides producing electric power, Thar lignite coal has been producing synthetic natural gas (SNG), fertilisers (urea and others), ammonia and other chemicals. Limitations on coal use will restrict the production of all these products.

Products that will be discussed are those that cannot possibly be restrained from production through coal. Another important aspect is that although lignite coal is considered to be inferior – as it has high moisture and low energy content – recent discoveries suggest that this coal is more useful than other types of coal.

Lignite can be used for making graphite. Researchers in North Dakota recently found out that lignite coal is much more amenable to graphitisation than the more expensive Bituminous and Anthracite coal – these coal types do not lend themselves to graphitisation at all. Graphite is a high-value product used in nuclear power as a neutron moderator, electrodes in arc steel making, electrodes in both conventional and EV batteries, graphite lubricant roads, plates, tubes, etc. The selling price of graphite is around $16,000 per tonne and the price of lignite – used as a raw material – is around $30 per tonne.

Also, lignite coal may contain trace elements called rare earth elements (REEs). Lithium is one of such REEs. Li-ion batteries are the most popular EV batteries whose demand is expected to grow exponentially in the future. Battery-grade LiOH has been trading at $46,000-65,000 per tonne, as compared to $7,000-10,000 per tonne of copper.

At present, only China is supplying lithium, but its lithium resources are not expected to continue for long – unless new resources are discovered. Other countries are also in their exploration phases for this natural resource. It has been found that North Dakota lignite contains up to 500 ppm of lithium, leading to a total of 3,600 tonnes as against the total global production of 70,000 tonnes per year. Thar lignite may not necessarily contain lithium, but since lignite coal’s geographical location does not affect its properties, it may be possible that Thar lignite coal contains lithium.

Serious geological studies should be commissioned, possibly involving the geological agencies of North Dakota, which have experience in such research. There are other foreign agencies, especially in China, which may be helpful.

Humic acid and leonardite are well-known. Leonardite is naturally oxidised lignite and rich in humic acid. It is found close to the surface of lignite mines. Humic acid is used as a soil conditioner in agriculture and leonardite is used in oil and gas drilling mud. India is exporting leonardite at $1,400 per tonne. These are final products for markets, and the authorities must pay attention to them.

Pakistan imports 19 million tonnes of coal per year – half of which is likely to be consumed by imported coal power plants – and the other half by cement plants. International coal prices and shipping costs have quadrupled –$400 per tonne as opposed to the previous $80 per tonne. Cheaper imports from Afghanistan and some local production from Balochistan saved Pakistan’s cement and construction industries. Afghanistan’s coal sector is not integrated with international markets yet and sells its product at much lower prices. It is in the interest of the local cement industry to develop local coal supplies, which would be cheaper and stable.

While converting imported coal power plants to Thar coal-run plants may be a difficult and time-consuming job, Thar lignite can be easily introduced in cement plants. Dewatering technologies are readily available and have been used in Germany. More than a billion dollars of foreign exchange can be saved per year. Many countries are using separated municipal solid waste (MSW) to fire cement kilns. In Pakistan, too, some companies have tried it. There shouldn’t be too many problems for cement industries in converting to Thar coal. It would also be difficult for the powers that be to stop or discourage this activity, as it is only converting from one coal type to another.

Coal gasification and the associated products and chemicals like urea, DAP or even diesel have been indicated to be economical – if compared with LNG – but they may be opposed by even friendly countries due to pressure from international climate forces. Therefore, we should take the step that is possible and does not involve a lot of money or high technology. Our cement companies are highly organised to undertake the challenge. Government policies and facilitation would be required. Near-monopolies in Thar coal mining may have to be removed and new parties should be inducted and awarded mining licences.

Thar lignite coal can be used for the production of both high- and low-value products. High-value coal products are required for the production of electrical vehicles, and they are likely to be accepted by the international climate lobby – which may oppose energy products. Let us try out this low-hanging fruit as the windows of opportunity are closing one by one.

The writer is a former member of the Energy Planning Commission and author of ‘Pakistan’s Energy Issues:

Success and Challenges’.

He can be reached at: akhtarali1949@gmail.com

Email: akhtarali1949@gmail.com