Catalysing leadership on efficient bagasse processing

Case Study on Pakistan Sugar Industry

Description/Summary:

According to World Alliance for Decentralized Energy (WADE) report on Bagasse Cogeneration, bagasse-based cogeneration1 could deliver up to 25% of current power demand requirements in the world's main cane producing countries. Learnings from Pakistan's sugar industry, as to how developing country producers can tap into this opportunity, are presented below.

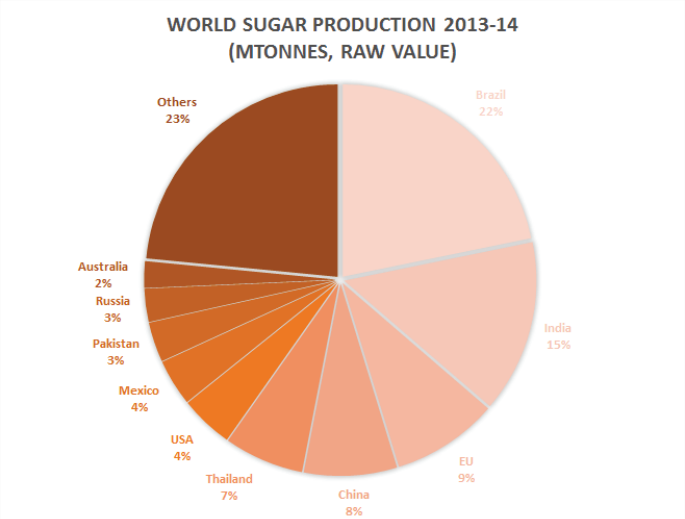
Sugar production – Aiming for efficiency

While sugarcane is traditionally grown and processed for its sugar content, the milling process also generates large amounts of bagasse. For every 3 tonnes of sugarcane processed, about 1 tonne of bagasse (a biomass based renewable energy resource) is produced. Bagasse is burned at high temperatures in large boilers which heat up water, turning it into steam, which then drives a turbines that generate electricity. However, conventional low-pressure cogeneration technology currently used in Pakistan is inefficient and cannot ensure reliable electricity production to change the energy balance and attract the interest of industrialists for export to the electric power grid.

An efficient alternative is high pressure cogeneration (HPC) technology which can substantially increase the level of exportable electricity, thus providing an opportunity to generate significant revenue through the sale of electricity and carbon credits. Additionally, HP cogeneration of heat and power allows sugar producers to meet their internal energy requirements and drastically reduce their operational costs. With an average annual availability of 4.4 million metric tonnes of bagasse, Pakistan has the potential of generating 1000 MW of electricity. With the current electricity shortfall of 4000MW, sugar industry is a promising sector for electricity generation.

Agriculture: An Integral component of Pakistan's economy

Domestic Product (GDP) and employing half of country's labour, agriculture is the largest source of foreign exchange earnings in Pakistan. The export of agriculture products such as rice and cotton bring about sixty-five percent of total foreign earnings.[1] The sector's place in the economy is paramount also because it serves the large population of the country through provision of food and raw materials for industries including textiles and sugar industry.



Sugar is the second largest agro-based industry in Pakistan with 86 operational mills producing 6.1 million tonnes of sugar annually. It ranks 8th in world sugar production, steadily rising every year. Its place in national and global agriculture outlook is significant, presenting an opportunity for transition to sustainable and efficient crop production and processing.

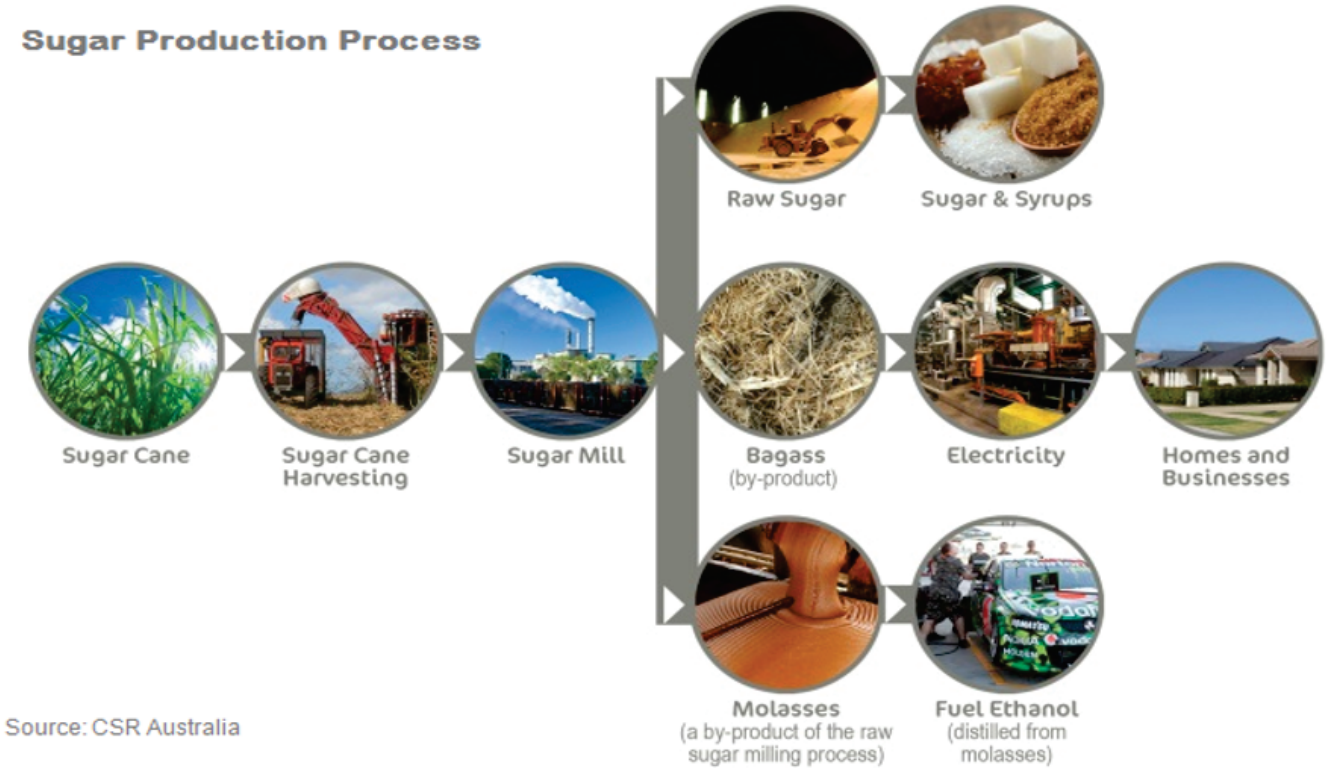
Enabling environment

The uptake rate of efficient HPC technology is not ideal, with only three sugar mills having switched to HPC in Pakistan. Pakistani sugar producers are hampered by high upfront cost, technology risks, lack of technical skillset to operate and maintain the HPC technology, a non-responsive financial sector and an unconducive regulatory regime. However, leadership catalysed by the three sugar mills, despite harsh circumstances, has spurred other sugar mills to follow suit. Things are changing at the domestic, regulatory and financial front.

High Pressure co-generation technology

- **HPC consumes 46% less bagasse for the same amount of electricity production compared to conventional low pressure technology (23 bar vs. 66 bar)**
- **HPC can generate up to 1 MW of electricity using 5.5 tons of steam compared to 11 tons of steam consumed by low pressure technology**

1. Cogeneration is the use of a heat engine or power station to generate electricity and useful heat at the same time



Regulatory Regime	Access to Finance	Government Interest
National Electric Power Regulatory Au thority announced a new, attractive upfront tariff in 2015 for Bagasse Based cogeneration interventions for 30 years	A Switch Asia project launched by EU is providing support to sugar sector through capacity building, technology standardization, enhancing access to finance and mobilization of public authorities for a conducive regulatory regime	Ministry of Climate Change has issued possible interventions which qualify for carbon credits or NAMA ; High Pressure Cogeneration Technology uptake has been included as one such option
Both *Policy for Development of Renewable Energy for Power Generation* (2006) and *Framework for Power co - generation 2013* by Alternative Energy Development Board as well as National Policy for Power Co - generation by Ministry of Water and Power set out policies and strategies to attract investments and promote electricity generating projects including Bagasse based electricity production	In 2009, State Bank of Pakistan introduced a scheme for financing power plants using renewable e nergy. This scheme initially provided financin g for the procurement of new local and imported machinery for new projects up to 10MW. This was subsequently increased to 20MW in 2012. Currently the Scheme provides for a maximum of Rs . 3 billion for any single renewable energy project	

One step back, two steps forward - Almoiz

Almoiz Sugar Mills is the first example of HPC system installed in a Sugar Mill in Pakistan. However, Almoiz faced a lot of problems with the equipment design and its fabrication, and even more so in the operation of the technology. It lost two crop cycles in downtime, and incurred huge losses. This created mistrust amongst the rest of the sugar sector with respect to the capacity of local technology providers and their capabilities to design and fabricate high pressure technology solutions. Because of this lukewarm interest in the technology, local manufacturers were subsequently passive in developing their expertise.

However, Almoiz sugar mill is operating normally now and they are in the process of implementing a 41MW High Pressure Cogeneration System in one of their units (M/s Layyah Sugar Mills ltd).

Leading by example - JDW

In 2014, JDW ventured into the power sector. The company successfully completed two bagasse-based, high-pressure cogeneration power plants with total capacity of approximately 53 MW.

Both power plants are fully operational and supplying affordable and renewable electricity to the national grid under long-term Energy Purchase Agreements executed with the Central Power Purchasing Agency of the National Transmission and Despatch Company Limited.

The plants efficiently utilize indigenous bagasse as fuel, which besides being environmentally friendly, also has the major benefit of saving precious foreign exchange for the country compared to imported fuels such as furnace oil or imported coal.

Lessons learned

- The business of power generation for export to the grid does not happen to be the core business of sugar mill operators; they lack the capacity to deal with issues of power generation such as tariff determination, establishment of mini grid on site and its interconnectivity and synchronization with the national grid.

- It is essential to catalyse leadership to scale up low emission development strategies. The sugar industry is taking action in silo and on their own. Drive in leaders (associations) and champions (role models/change makers) can secure buy-in of the majority for adopting efficient processing.

- Low profits (low interest rate) and high risks (industries' performance) are among the reasons for disinterest of investors in HPC technology in Pakistan. Risk profiling and covering credit risk from other sources will help mobilize investment.

- Industries have expressed interest for Clean Development Mechanism (CDM) benefits which can be tied to technology uptake through NAMA and related tools. Relevant regulatory authorities and industries need to include relevant capacity to ensure tech friendly regulations are produced.

About this document

This document is based on content presented at the Regional Workshop on Mobilizing Investment in Low Emission Development Strategiesin Agriculture: Crop Production and Processing, in a session entitled 'Leadership by Investors and Businesses'. The session was organized by the Asia Low Emission Development Strategies (LEDS) Partnership with support from the Climate & Development Knowledge Network (CDKN) and the US Agency for International Development (USAID) among other organizations.

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