

**IMPACT SHEET:** HP Cogen-PAK - high pressure cogeneration for the sugar sector in Pakistan

## Empowering Sugar mills and stakeholders in the sugar sector to adopt energy efficient technology in Pakistan



*The project implemented training to build capacity of the sugar sector, focusing on promotion of high pressure cogeneration technology in sugar mills and improving access to finance, leading to reduction of GHG emissions within the project's 4-year duration.*





## CHALLENGE

At the project's inception, Pakistan's sugar sector had an annual availability of 4.4 million metric tons of bagasse i.e. sugar mill waste. To generate heat and electricity for its energy needs, the sugar sector used inefficient low pressure cogeneration (LPC) systems, consuming 46% more bagasse compared to high pressure cogeneration (HPC). However, adoption of HPC was hampered by high upfront costs, technology risks, low capacity among technology providers, a non-responsive financial sector and a non-conducive regulatory regime.

## PROJECT BACKGROUND

In response to these obstacles and in support to Pakistan's shift to SCP, the European Union (EU) funded the collaborative project, under the SWITCH-Asia Grants Programme, titled "High Pressure HP cogeneration for the sugar sector in Pakistan (HP Cogen-PAK)".

The HP Cogen-Pak project, which operated for four years (2014-2018), worked towards enhancing resource efficiency of the sugar sector via adoption of resource and energy efficient technologies. It was implemented by a Consortium led by Iqbal Hamid Trust (IHT) along with its partners, The Energy and Resource Institute (TERI), Pakistan Sugar Mills Association (PSMA) and Sequa GmbH.

## PROJECT OBJECTIVES

The objectives of the HP Cogen-Pak project were to build the capacity of the sugar sector, focusing on promotion of high pressure cogeneration (HPC) technology among sugar mills classified as Small and Medium Enterprises (SMEs) and improving access to finance, leading to reduction of GHG emissions.

The specific objectives included:

- Promoting sustainable production of energy, and export surplus electrical power to the national grid, through replication of existing HPC technology in the sugar sector;
- Promoting sustainable consumption of bagasse by supporting sugar mills in the adoption HPC technology, through technology standardization, enabling access to finance, and mobilizing relevant public sector authorities for the formulation of a conducive regulatory regime for bagasse-based power projects.

## TARGET GROUPS

- **85 sugar mill SMEs** across Pakistan who benefited from increased financial opportunities.
- **Six Local Technology Providers** whose technology could be implemented throughout the course of the project.
- **The State Bank of Pakistan (SBP) and five Financial Institutions (FI)** who supported access to finance for SMEs.
- **The Ministry of Water and Power (MoWP)**, who was key in supporting the provision of services from participating SMEs.

## PROJECT ACTIVITIES

### Development of standardized technical specifications for HPC technology

Together with PSMA and technology providers, HP Cogen-Pak conducted an assessment of available designs and indigenous manufacturing capacity as a basis to formulate the standardized technical Specifications for HPC Technology. This served as the basis for the technology manufacturer's training programme, which was delivered to companies manufacturing HPC equipment in order to inform them about the standards developed and enable them to produce high performing systems.

### Training and capacity building of the sugar sector and technology providers

This training programme supported the growth of local knowledge, capital and availability of financial services for HPC, resulting in long-term sustainability of the action. The National Bagasse Power Support Cell at the Pakistan Sugar Mills Association acted as a one stop shop to offer technical, financial and regulatory assistance to members of PSMA. Based on the evaluation, a standard was developed for minimal requirements for HPC equipment and operation guidelines were shared to optimize efficiency and minimize environmental and health impacts.

### Training of technical staff of sugar mills on standardized design and technology selection

Sugar Mill technical staff was trained on the standardized design of HPC, its benefits, how to evaluate different technological offers and select the optimum system for their mill. National Bagasse Support Cell led the training activities and offered subsequent assistance to sugar mills in preparing tender documents and the selection of technology suppliers.

## Providing technical support and improving access to finance for SMEs

The transition of sugar mills from their traditional sugar business model to a more modern power business required large investments; not only in terms of mastering advanced technical skills, but also the availability of easy financing. As such, the action explored a business model for bagasse-based power business establishment, financing options through credit from banks and investment funds and support of the sugar mills in making the correct calculations and effective business plans to ensure a feasible return on investment.

## Training of sugar mill financial departments on toolkits and Clean Development Mechanism (CDM)

The HP Cogen-Pak project organised and delivered training of financial managers from the sugar sector in order to educate them on how to avail financing opportunities, prepare effective business cases, navigate financial negotiations and secure financial closure. Sugar mill financial departments were also trained on developing their bagasse based power projects under CDM and other voluntary carbon credit schemes e.g. VCS, Gold Standard.

## Developing a conducive regulatory regime

This action saw the revision of power purchase tariffs for bagasse-based electricity generation and a more streamlined power purchase policy through a transparent multi-stakeholder process, with ownership from the National Electric Power Regulatory Authority (NEPRA), the Ministry of Water and Power (MoW&P) and the Pakistan Sugar Mills Association (PSMA). This encouraged sugar mills to take the initiative to switch from LPC technology to HPC technology, which had an attractive rate of returns and reduced regulatory barriers.



## PROJECT ACHIEVEMENTS

- The project successfully developed an excel based model/study for determining the cost of power generation for bagasse-based cogeneration projects. The study was shared with NEPRA.
- The National Bagasse Power Support Cell (NBPSC) was created at the HP Cogen-Pak Project office in Lahore. The NBPSC reached out to the 85 sugar mills (the main beneficiaries of the project), providing them support in the adoption of the limited time option of an Upfront Tariff for Bagasse Cogeneration offered by NEPRA. Of the 85 sugar mills, 72 registered in the project.
- The NBPSC completed the development of the detailed bankable feasibility studies for HPC for 10 Sugar Mills. Furthermore, pre-feasibility studies (business cases) were developed for 50 sugar mills registered in the program.
- A total of EUR 8.38 million was saved per SME, per year on average.
- Compared to LPC technology, HPC technology consumes 45% less bagasse, thus, increasing resource and energy efficiency. HPC saves 60 m3 water per hour for 120 days of crushing season, which equals to 172 800 m3/year for a single 30 MW HPC plant.
- The HP Cogen-Pak project estimated a reduction of 2.125 million tonnes of CO2 equivalent per year once all the mills switch to HPC technology.



## LESSONS LEARNED

While the HP Cogen-Pak project had significant impacts on raising awareness on the benefits of HPC technology and electricity tariffs, more efforts are still to be made in this area in order to make this technology more viable. In the future, to maximise the impact of this project, activities should be scaled-up and mainstreamed to more regions in Pakistan. Moreover, more stakeholders working in the sugar industry should also be encouraged to join similar initiatives.

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The programme developed a conducive environment for sugar mills to export surplus energy to the grid with HPC technology. Given the energy constraints faced by Pakistan, promotion of this technology not only helped with energy security, it did so in a sustainable way, generating electricity from abundant fuels.

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**Mr. Omar Malik**  
Project Director

## Long-term project sustainability

In order to provide services to the sugar sector and ensure project sustainability even after its completion, HP Cogen-Pak mobilised its existing vast network of partners and major project stakeholders. These included: The Ministry of Energy (MOE), the National Electric Power Regulatory Authority (NEPRA), the State Bank of Pakistan, as well as the Pakistan Sugar Mills Association. The strong network and the active support received by the NBPSC guaranteed the institutionalisation and scaling-up of acquired knowledge and skills.

## Project contributions to Climate Change Mitigation and SDGs



The HP Cogen-Pak project contributed to the achievement of Sustainable Development Goals (SDGs), in particular, SDGs 7, 9, 12 and 13. Facilitating the use of HPC technology directly contributes to **SDG 7**: Affordable and Clean Energy; and **SDG 13**: Climate Action, working towards reduction of emissions and improved access to low cost energy. In addition, the work conducted with the MoWP on building the energy infrastructure of Pakistan, directly contributed to **SDG 9**: Industry, Innovation, and Infrastructure. **SDG 12**: Responsible Consumption and Production, was at the core of all HP Cogen-Pak's efforts, especially in terms of resource efficiency improvements.



# Impacts at a Glance

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|--------------------------------|--|
| <b>Economic Impact</b>         | <ul style="list-style-type: none"> <li>• An increased total share of HPC technology was realised through the improved capacity of 5 local technology providers and 85 small and medium-sized sugar mills.</li> <li>• EUR 8.38 million saved per SME per year on average.</li> <li>• The project predicts to have an annual impact on revenue growth of the 85 sugar mills by an average EUR 8 million per sugar mill from electricity export and a gain of EUR 494 million to the national exchequer from HFO (Heavy Fuel Oil) import savings annually.</li> <li>• Created business links for small local companies related to civil works, piping and utilities.</li> <li>• Due to increased uptake of HPC technology, bagasse is now considered a commercial product of sugar mills.</li> <li>• Business linkages were also established between local and Indian technology manufacturers, as HPC is a mainstream technology in the Indian sugar sector.</li> </ul>  |
| <b>Environmental Impact</b>    | <ul style="list-style-type: none"> <li>• HPC technology consumes 45% less bagasse, thus increasing resource and energy efficiency. HPC now saves 60 m<sup>3</sup> water per hour for 120 days of crushing season, which equals to 172 800 m<sup>3</sup>/year for a single 30 MW HPC plant.</li> <li>• After implementing HPC technology, there was an annual reduction of 2.1 million tonnes CO<sub>2</sub> equivalent.</li> <li>• HPC technology also reduces waste water discharge.</li> </ul>   |
| <b>Social Impact</b>           | <ul style="list-style-type: none"> <li>• Created 55 new jobs per sugar mill, on average. This opens up job opportunities for local communities.</li> <li>• Sugar mill staff has been trained on operation and maintenance aspects (including EHS) and HP systems.</li> </ul>   |
| <b>Climate Benefits</b>        | <ul style="list-style-type: none"> <li>• HP Cogen-Pak predicted a reduction of 2.125 million tonnes of CO<sub>2</sub> equivalent per year once all the mills switch to HPC technology.</li> <li>• Increased use of HPC technology by sugar mills, the saved bagasse can be used for electricity generation and grid export resulting in an overall reduction in GHG emissions.</li> <li>• The project provided Clean Development Mechanism (CDM) training and toolkits to sugar mills preparation of Project Design Document (PDD), emission reduction calculation and how to establish baseline on Clean Development Mechanism.</li> </ul>  |
| <b>Green Finance</b>           | <ul style="list-style-type: none"> <li>• The project supported the State Bank of Pakistan in revising its Resource Efficiency (RE) Financing Scheme which offers soft loans to sugar mills at 6% mark-up, compared to average rate of 10-12%.</li> <li>• At least 16 SMEs are benefiting from better access to finance.</li> <li>• Linkages have been established between 85 SMEs and five financial institutions.</li> <li>• International and local financial experts assisted in the revision of the Renewable Energy Refinance Facility offered by the State Bank of Pakistan, making it more attractive for sugar mills and commercial banks alike.</li> <li>• The project engaged the State Bank of Pakistan and at least eight financial institutions to identify new financing schemes for SMEs acquiring HPC technology.</li> <li>• The level of trust among the project financiers, i.e. State Bank of Pakistan, international development banks and commercial banks, on the financial and environmental benefits of HPC technology has increased, resulting in availability of streamlined and less costly project financing opportunities. This will further convince sugar mills to switch to HPC technology.</li> </ul> |
| <b>Target Group Engagement</b> | <ul style="list-style-type: none"> <li>• Engaged 60 SMEs and conducted assessments, resulting in 50 prefeasibility reports and 10 detailed feasibility reports for sugar mills.</li> <li>• Involved 16 stakeholder groups from the private and public sectors.</li> <li>• 2 capacity building programmes were organised and delivered to regulators (NEPRA) and other 2 training programmes were delivered to 6 local technology vendors.</li> <li>• Training of the sugar mills staff was conducted on preparation of project implementation tender documents based on consultation among technology providers and sugar mills.</li> </ul>  |
| <b>Policy Development</b>      | <ul style="list-style-type: none"> <li>• Conducted 2 dissemination seminars on the State Bank of Pakistan's revised RE Financing Policy</li> <li>• Involved policymakers in dialogues with the representatives from the State Bank of Pakistan, AEDB, NEPRA, DISCOs, boiler manufacturers, EPC contractors and sugar mills to create an enabling environment for an increased uptake of HPC technology.</li> <li>• Policy recommendations have been put forward: Revision of spread share between SBP and commercial banks; Revision of upper cap for single RE project (PKR 6 billion / EUR 55 million); Recommendation to increase the upper limit for capacity of RE projects to 50 MW.</li> </ul>  |
| <b>Europe-Asia cooperation</b> | <ul style="list-style-type: none"> <li>• The project published a joint publication with Climate and Development Knowledge Network</li> <li>• CDKN titled "Catalysing leadership on efficient bagasse processing" - A Case Study on Pakistan Sugar Industry.</li> <li>• The project improved HPC Policy Framework through a Multi-Stakeholder Platform.</li> </ul>  |



## FUNDING

EUR 2,161,785  
EU Contribution: 79.80%



## DURATION

February 2014 - January 2018



## PARTNERS



Iqbal Hamid Trust (IHT)



sequa gGmbH



The Energy and Resources Institute  
(TERI)



Pakistan Sugar Mills Association (PSMA)



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*This impact sheet is developed together with SWITCH-Asia SCP Facility*