

MARCH 2016



ABOUT THE AUTHOR

**DIANJUN ZHANG**

is the Operations Officer and Senior Technical Specialist for IFC's CHUEE Finance Program. He joined the program in 2006 and has 25 years of experience working on energy efficiency and renewable energy projects in many countries, including Bangladesh, China, England, Finland, Mongolia, Pacific Islands, Vietnam, and other frontier regions. He also has provided cross-technical services to IFC's Infrastructure and Natural Resources Department, to IFC's Manufacturing, Agribusiness, and Services Department, as well as to IBRD.

**APPROVING MANAGER**

Rachel Freeman, Manager, Financial Institutions Group Advisory Services.

# SmartLessons

*real experiences, real development*

## Gaining Wealth from a Neighbor's Waste: Synergy for Sustainable Development

*What if one company's waste can be another's treasure? Read and learn how the IFC China Energy Efficiency Program helps Chinese companies form mutually beneficial partnerships for efficiency improvements and better waste management.*

### BACKGROUND

Since 2006, the IFC China Energy Efficiency Program (CHUEE) has been partnering with banks to help increase their loan portfolios for energy efficiency (EE) and renewable energy (RE) investments through capacity building of bank staff and providing technical assessment support. To date, CHUEE has helped Chinese banks evaluate over 222 companies and has lent over \$900 million to fund EE and RE projects. This translates to 45.3 terawatt hours of energy savings and a reduction of 20 million tons of greenhouse gas (GHG) emissions annually.

A typical technical assessment means an evaluation of a company and its own operations for EE or RE investment potential. Through the years, CHUEE and its partner banks have seen value in "looking over the fence" and helping identify synergistic opportunities between neighboring companies. Such partnerships could result in more savings, increased operational efficiencies, and improved waste management.

The mutually beneficial partnership works this way: One company uses a neighboring company's wastes as input for production or other activities, which results in savings and a reduction of its carbon footprint. In turn, this saves the neighbor the burden

of discharging these resources! The strategy converts waste into something more useful, such as production materials or energy. This presents a triple win: good for the company, its neighbor, and the environment. For instance, blast-furnace slag, a byproduct of iron and steel production, can be used by a cement factory to produce high-quality concrete.

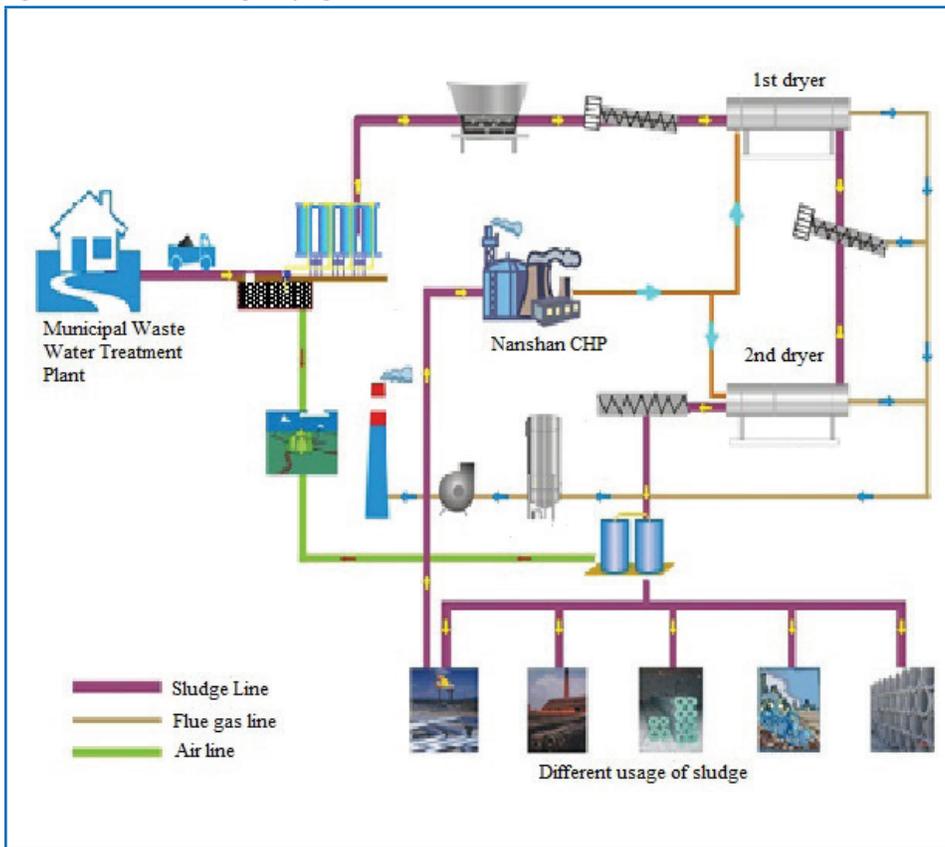
Below are descriptions of three real CHUEE projects where companies partnered with each other to maximize efficiencies and minimize waste. Each one includes concepts and approaches that can be replicated in other circumstances.

### LESSONS/EXAMPLES

**Example 1: Use exhaust gas from a power plant to dry sludge of a neighboring wastewater treatment plant.**

A municipal wastewater (MWW) treatment plant in Shenzhen produces 400 tons of sludge per day during its initial treatment phase. This sludge needs to be dried before it can be used for other purposes, such as landfill. Sludge treatment accounts for one-third of construction and operating costs of the whole wastewater treatment plant, and consumes 5 million cubic meters of natural gas a year. (See Figure 1.)

Figure 1: Process of Sludge Drying



plant for its flue gas waste energy use. Aside from the cost savings, the project helps the planet by avoiding 13,750 tons of GHG emissions and preventing groundwater and soil pollution by drying 140,000 tons of sludge.

**Example 2: Waste heat from sulfuric acid production produces steam for a neighboring tire factory.**

An industrial plant needs to subject imported sulfur to an extremely hot reaction process to produce sulfuric acid. The high-temperature gases must be cooled either by a seawater cooling system, which has a negative impact on the ocean ecology, or through installation of heat-recovery boilers to recover waste energy for steam generation.

The industrial plant, B1 Industrial, invested in the waste-heat recovery project to increase its production capacity and avoid seawater pollution.

Next to the MWW plant is a combined heat power (CHP) plant with a 4 x 180 megawatt natural gas-fueled power-generation capacity. Flue (exhaust) gas of one unit of CHP is enough to be used to dry sludge without deteriorating its organic ingredients.

The two companies talked and arranged for the CHP plant to use the flue gas to dry the sludge of the MWW plant. Four units of rotary dryers were designed and installed, with an investment cost of 149 million Chinese renminbi (about \$22.8 million). The project was financed in 2008 by Industrial Bank, a CHUEE partner bank.

The project enables the MWW plant to save millions of cubic meters of natural gas, which translates to 19 million renminbi in fuel cost savings. The CHP plant benefits from the annual 5.12 million renminbi income from the MWW



Waste energy recovery system.

A neighboring tire company needs 80 tons of steam per hour to meet its production targets. All steam needed by the company used to be supplied by a coal-fired power plant, priced at 200 renminbi per ton. Now the tire company purchases steam for its rubber production from B1 Industrial for 130 renminbi per ton.

Industrial Bank financed the project, leading to multiple wins for the stakeholders. The industrial plant now enjoys more efficient processes with a lesser negative impact to the environment, while earning 15 million renminbi annually from the sale of steam. The tire company now has a cheaper and more reliable supply of steam.

Most importantly, seawater thermal pollution is avoided, and the project is able to reduce at least 40,000 tons of GHG emissions by producing steam from waste heat and not from coal.

***Example 3: A chemical factory puts its neighbors' waste steam and nitrogen to good use.***

A chemical factory uses steam, water, nitrogen, and compressed air to produce its main product. Before the project, this factory produced these services within its operations. Steam was produced by a coal-fired steam boiler, while nitrogen was produced through a power-intensive process that consumed over 1,000 megawatt hours per year.

A neighboring iron and steel company, RZ Iron & Steel, has an abundant supply of surplus blast furnace gas (BFG), which could provide fuel for a new steam boiler for the chemical factory.

Also within RZ Iron & Steel is an industrial gas producer that produces surplus nitrogen as a byproduct of its oxygen production for steel processing. If not used, this nitrogen is considered waste and is vented into the atmosphere.

With technical support from the CHUEE team and the Bank of Rizhao, the stakeholders were able to understand the benefits of synergizing to improve efficiency and minimize waste. Using BFG from RZ Iron & Steel for steam production saves the chemical factory 100 renminbi per ton of steam and avoids consumption of over 12,000 tons of coal. The chemical factory

also saves 3 million renminbi a year by purchasing the surplus nitrogen from the industrial gases producer—which in turn gives the latter a potential income of up to 1.3 million renminbi per year.

Moreover, the project avoids flaring of excess BFG and venting of nitrogen into the atmosphere. Overall, the project is expected to avoid 28,420 tons of greenhouse gas emissions. The project was financed by the Bank of Rizhao in December 2015.



Coal-fired boiler to be closed.

## **CONCLUSION**

Conventional efficiency assessments cover only one company's operations and generate recommendations that would benefit that company. The project examples presented here showcase success stories of

companies that went beyond their walls to seek innovative solutions—solutions that generate maximum benefits for the stakeholders and enable a bigger contribution to climate change mitigation. This approach to client identification would help expand the partner banks' green portfolios, therefore enhancing the value that IFC climate finance products bring to financial institution clients.

By working with financial institutions, IFC plays a leading role in promoting sustainable development among industries in developing countries. For over nine years, the CHUEE team has helped partner banks in China do more for their clients by helping identify energy and resource efficiency investment opportunities that help improve businesses through better operations, maximized profits, and reduced negative impact on the environment.



The author visiting a plant.

*Photos in this SmartLesson are by the author.*



#### DISCLAIMER

SmartLessons is an awards program to share lessons learned in development-oriented advisory services and investment operations. The findings, interpretations, and conclusions expressed in this paper are those of the author(s) and do not necessarily reflect the views of IFC or its partner organizations, the Executive Directors of The World Bank or the governments they represent. IFC does not assume any responsibility for the completeness or accuracy of the information contained in this document. Please see the terms and conditions at [www.ifc.org/smartlessons](http://www.ifc.org/smartlessons) or contact the program at [smartlessons@ifc.org](mailto:smartlessons@ifc.org).