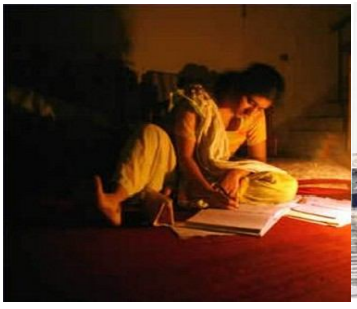
# RH TECH

## Rice Husk Technology Systems Philippines

Giving Power to the People

*"In the right light, at the right time, everything can become extraordinary."*
*-Aaron Rose*





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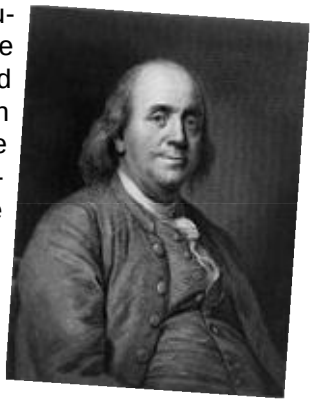
# I. Introduction



When taking a glimpse throughout history, there have only been a few revolutionary technologies that have dramatically impacted our lives. Perhaps one of the most important of these is the invention of electricity. People from all over the world benefit from this innovation everyday. Its use has improved our productivity, health and safety, and has provided comfort for many people. Industries throughout the world have evolved because of the birth of electricity. Everything ranging from satellite communications, lighting, the internet, and the computer industry in general are all by-products of electricity. Indeed, it can be regarded as the backbone and the influential force to the so-called second industrial revolution (Morris 182). In fact, without electricity, the likelihood of holding a global competition where college students from around the world work together cohesively and propose a feasible business would have been thought impossible.

The role of electricity has expanded over the years as it has uplifted the quality of lives of people, sparked the emergence of many small businesses, and allowed for many big dreams to become realities. However, in certain parts of the world, there remain cities and villages who have not been granted access to this form of technology. As a result, the inhabitants of these areas have remained in the dark, possibly losing hope altogether for a brighter future.

# II. The Business Concept

## RH TECH

Hence, we are proposing the establishment of Rice Husk Technology Systems, Philippines (RH Tech, Phils.), a company that will provide electricity at a very affordable price to less fortunate communities in cities in the Philippines. This system will make use of rice husks, a by-product of the harvest of rice, which is very abundant in the country. This development will most certainly improve the living conditions in the poorest areas of the Philippines, allowing them to experience better standards of living, and possibly giving them the chance to develop better sources of livelihood.

They are in need of the right light. Now is the right time to give it to them.

# III. The Technology: Rice Husk Technology

The utilization of rice husks to generate electricity was pioneered by Husk Power Systems, a startup company established by UVA's Darden School of Business students Charles Ransler and Manoj Sinha. The company is already providing electricity to nearly 10,000 rural Indians utilizing rice husk generators that run on piles of rice mill waste product. The proprietary technology and business model is brilliant because it provides three solutions to critical problems in India: 1) A lack of reliable electricity, which is a huge obstacle in rural India; 2) a reduction of carbon emissions that amounts to nearly 200 tons per village annually, and 3) the ability to bring new technology to remote villages that are struggling to keep up with the industrialized world.

The idea for rice husk generators was conceived by Sinha and his friend Gyanesh Pandey. Their main motivation was the many years they spent growing up in the rural areas of India where they had to make an effort to live without electricity. Sinha and Pandey first intended to polish the concept of this method and raise enough money to donate rice-husk generator to several villages where they had a sentimental attachment. But after some investigation they found out that they could turn their concept into a viable business model.

Before HPS was ever created, all villages, houses, water purification units, small business, and irrigation pumps were working with intermittent power which had a functional use for only an hour a day. The consumers were going to spend more to wire the village using double-insulated wire preventing an easier access to steal the electricity. "Husk Power will instead use a $1 circuit breaker to distribute electricity to a branch line serving four or five households."

A rice husk fluidized bed firing system will be used to convert the husks into electricity. It will consist of a vertical pipe with an air distribution plate, which is covered with bed material mixed with the husks. Fine coal dust

# IV. The Location

## Geographic Description

*Rice husk technology can be well adapted by the Philippines because of the rich agricultural industry in the country. The resources needed to produce the husks are more than sufficient, and the equipment necessary for operations can be easily procured. This makes the Philippines a perfect location for the expansion of rice husk technology.*

### The Country

The Philippines is the world's 8th top rice producer. The country, with its 7,107 islands, is located in Southeast Asia, with Manila as its capital. The Philippines is the world's 12th most densely inhabited country, with a population of approximately 90 million people.


Having an economy based on agriculture, specifically rice as a main staple, rice husk is a potential source of energy for the Philippines. Rice is the principal food crop, currently grown on around one-third of the cultivated area. The introduction of higher-yielding strains and an expansion in the supply of fertilizer and pesticides has increased the Philippines' output of rice over the years.

With the country belonging to the top 10 rice producers of the world, it can provide a sufficient amount of discarded husks needed to generate electricity. Being a renewable form of energy, rice husk technology will yield minimal environmental damage, hence making the business environmentally and economically sustainable.

In 2007, the Philippines' GDP growth reached 7.3%, the highest level reached in 30 years (Kramer 2). It has maintained fiscal discipline and recently increased spending in the social sectors, agriculture and infrastructure (Kramer 2). These facts are further proofs that the Philippines is a viable location in which to develop this business.

### The Province

Northern Samar is one of the poorest provinces in the whole of the Philippines (Peace and Equity Foundation), making it the first target area of RH Tech. The province experiences intermittent electricity everyday, with no secure supply of this necessity. Moreover, Northern Samar is home to hundreds of thousands of Filipino farmers harvesting rice daily, which ensures the steady supply of rice husks to generate electricity. This makes the province a great location for the operations of RH Tech.

## Target Market

A significant amount of the population can benefit from alternative and efficient energy. For the first wave of operations, RH Tech is targeting to reach at least 1/5 of the entire population of Northern Samar, or 100,000 out of a total of 500,000 inhabitants. This number will increase as the business becomes more profitable and sustainable. The market will consist mainly of rural farmers living below poverty line, each earning around Php 42 a day (less than USD 1). They are those who have been experiencing interruptions in electricity supply and a lack of investment in energy due to the slow pace of power privatization and delays in the introduction of a new regulatory framework in the Philippines. They are those in most need of an efficient, dependable, and low cost provider of energy and electricity for use in their homes and workplaces.

# IV. Competitive Advantage

RH Tech offers the Filipino people multiple benefits in terms of (1) price, (2) sustainability, (3) reliability, (4) environmental protection and (5) useful by-products.

First, the resources used for RH Tech are mainly by-products that result from cyclical rice production, prevalent in large parts of the Philippines. This enables the people to make use of this residue of rice husks, which is abundant in the Northern Samar region, instead of leaving it on their fields to rot. There is minimal cost for the raw materials in electricity production because husks otherwise would have been discarded. Distribution costs will also be lessened because the rice husks, the meso-power plant that will be used to convert them, and the towns that will be served are all in the same proximity of Northern Samar.

Second, using rice husks as a source of energy is strategic in the long-run because it matches the demand for electricity in the region with the sizeable supply of disposable husks. Having this secure source of raw materials supports the Philippines to become more energy-independent, and lessens the importation of non-renewable resources. RH Tech is also more strategic than other forms of biofuel because it does not take away materials that are still edible, unlike in corn or wheat fuel.

Third, RH Tech is dramatically more reliable than the recent wave of alternative energy sources. It harnesses electricity on a more continuous basis than wind turbines, and is not dependent on geographic proximity to elevated water, unlike hydroelectricity. Solar energy can theoretically yield more electricity, but the panels and cells needed for solar power entail high levels of investment and expertise to be reliable.

Fourth, the process of generating energy itself is more environmental friendly than most of the conventional electricity production with non-renewable resources like coal, oil and gas. As shown below, the RH emission of $CO_2$, the main cause of climate change, is almost non-existent compared to conventional power plants. This would reduce carbon dioxide emissions by 200 tons per year, per village. An added benefit is that carbon credits that arise from this reduction could be sold due to the Kyoto Protocol gas emissions trading program (Cannon, 2008). This gives even more funds to sustain and expand RH Tech.

| Item | Emission (kg/MWh) | | | |
|---|---|---|---|---|
| | HPS | Coal | Oil | Gas |
| $CO_2$ | nearly zero | $1.26 \times 10^3$ | $8.1 \times 10^2$ | $5.7 \times 10^2$ |
| $SO_2$ | 0.32 | 2.8 | 1.3 | $3 \times 10^{-4}$ |
| $NO_X$ | 2.5 | 5.8 | 2.9 | 1.4 |
| CO | 0.71 | 0.2 | 0.27 | 0.2 |
| TSP (dust) | $8 \times 10^{-2}$ | $3.7 \times 10^{-3}$ | $9.7 \times 10^{-2}$ | $3.6 \times 10^{-3}$ |

Taken from (Chungsangunsit, Gheewala, & Patumsawad, 2004)

Fifth, another source of revenue is the sale of ash, a waste- product that emerges by using rice husk technology. This ash could be sold as a valuable ingredient for cement production because of its high concentration of silica. Thus, RH Tech is not just using waste products as resources but on the other hand, it is also generating a sizeable profit through its own byproducts, for the participating villages wherein normally the personal average incomes are very low. The ash residue will just be donated to the local communities as a gesture of good will, and will not be used to generate profits for RH Tech itself.

Aside from all these, the introduction of electricity on its own yields multiplier effects for the local economy. As seen in India, "[...] a lack of reliable electricity is one of the biggest obstacles to small business growth in rural India, so providing a village with rice-husk power can be the enabler of a dozen other small businesses." (Cannon, 2008). RH Tech could be a boost for the local economy, not just for the primary sectors of those served with electricity, but those that they in turn employ or sell to now that they have electricity.

# V. Operations Strategy

## Plant and Distribution

Our main objective is to form a partnership with Husk Power Systems (HPS), a for-profit company that converts rice husks into electricity, to adapt their technology in the Philippines and to achieve the results they accomplished in India. In the Philippines, this enterprise will be known as RH Technology Systems Philippines. We intend to utilize their developed technology, as it is a cheap and efficient way of energy production.

The business model is quite simple and straightforward. HPS will provide RH Tech with the technical knowledge for the latter to successfully run a rice-husk electricity plant. In the first year, RH Tech, through the help of donors and raised capital, will put up a meso-power plant in the province of Northern Samar, with a second plant to be established in the adjacent province of Samar in the third year. Transmission grids will likewise be put up to reach consumers, but this will not be particularly costly because the plant will be near the places it will generate electricity to. Rice husks will be bought from farmers on a monthly basis, depending on how much electricity is forecasted to be bought by the provincial residents who are connected to an RH Tech transmission grid. Consumers will also be billed and asked to pay every month, based on the metered reading of their electricity consumption.

After three years of operation in the Philippines, we intend to export the technology to other Asian countries. To facilitate this, we will have a tie-up with the United Nations (UN), specifically with the Economic and Social Commission for Asia and the Pacific (ESCAP), which is the regional development arm of the United Nations for the Asia-Pacific region. RH Tech will be a boon to those countries that really need to cut down on energy expenses, and the United Nations can collaborate to finance the project and give logistical support.

## Marketing

The basic marketing challenge is to come up with a cohesive campaign to entice Northern Samar residents to subscribe to electricity from RH Tech. This can be achieved by a giving them a solid value proposition, that they can get reliable energy for substantially lower rates. We will make them see the comparison of prices between rice husk electricity and the alternatives that they have, and commit to them the low prices of RH Tech. Getting residents to use RH Tech will be even easier in the demographic that do not have access to electricity at all, as we will give them benefits that they did not have before. Another advantage of RH Tech that can be used for marketing purposes is the fact that the power plant will be located in the province itself. Since the province is quite small, the mental correlation between seeing the facility and knowing it will give them electricity will be strong for a lot of residents.

There is a sizeable gap in the market in Northern Samar and Samar, because electricity is either inaccessible or terribly expensive. For example in the town of San Jose, many farmers are tied to expensive diesel-fed water pumps to irrigate their rice fields. Thus, a sizable part of their harvest goes to irrigation expenses when the ideal is to minimize costs. It is in those regions where we want to develop our venture to help them with their expenses and management of costs. Thus, farmers could replace their diesel water pumps with rice husk technology, which is cheaper and more environmentally-friendly.

## Human Resources

Since there is a lot at stake in delivering electricity to the poorest rural communities in the Philippines, the people who will be running this enterprise are as important as the technology itself. Thus, the Human Resources strategy will center on getting the most capable people on board. This centers around two important components of running the business. First, technology experts affiliated with HPS will be invited to help set-up the plants, and if possible, to stay on with RH Tech to troubleshoot initial difficulties with the system. Second, local experts who know the Philippines, and in particular the two provinces, will be asked to join as consultants, to optimize RH Tech, and help it reach hundreds of thousands of people.

# VI. Pricing

## Pricing Strategy

This venture aims to address concrete problems in the Philippines with regard to the lack of electricity in a lot of areas. Thus, any endeavor that will successfully let people access electricity should have competitive pricing, ideally lower than all the other alternatives that residents of a particular area have. At the same time however, the pricing still has to be set at a level wherein costs will still be recouped and the company will be self-sustaining in the long-run. We can reconcile these two considerations in the pricing because of the fact that the price mark-up is not as high as those of private corporations that care most about return on investment. In RH Technology, the profits will be invested back in the projects, to further expand our reach year after year.

## Cost per Kilowatt Hour

| **Variable Costs (in US dollars)** | Year 1 | Year 2 | Year 3 |
|---|---|---|---|
| Cost of husks and water per kilowatt hour | 0.021 | 0.022 | 0.023 |
| Cost of production per kilowatt hour | 0.018 | 0.019 | 0.020 |
| Cost of labor per kilowatt hour | 0.015 | 0.016 | 0.016 |
| Total variable costs per kilowatt hour | 0.054 | 0.057 | 0.059 |

The floor amount for the price charged to customers per kilowatt hour is determined by the variable costs that go into the production of each kilowatt hour. We surveyed the different biomass energy plants, and computed for how much their variable costs are. The company pegged target costs to the best-in-class amounts in the developing world, and factored in inflation over the years to come up with the cost structure shown.

## Price Index

As mentioned earlier, the goal of this company is to provide Filipino citizens with the option of using husk-powered electricity, and to make the option particularly enticing by making it the cheapest source in the market. Taking this into account, and referring to research about average selling prices of other energy sources in the Third World, we came to the following pricing scheme over three years. Inflation will also be taken into account, yielding a slight price increase per year to ensure sustainability of the business venture.

| **Pricing in year 1** | RH | Mega-powerplant | Hydroelectricity | Wind |
|---|---|---|---|---|
| Per kilowatt hour (in US dollars) | 0.08 | 0.09 | 0.38 | 0.11 |
| Price index | 100 | 110 | 451 | 129 |

Noticeably, the RH Tech selling price will be lower than megapowerplants, which use conventional energy derived from fossil fuels. It will also be lower than the alternative energy sources of hydroelectricity and wind energy. We can afford to price at this amount because the raw material of discarded rice husks is cheaper than fossil fuels, and the technology is more efficient at producing electricity than hydroelectricity and wind energy.

# VII. Financials

## Breakeven Analysis

Having established the target selling price and the expected variable costs, it is instructive to look at the resulting break-even volume, or how many kilowatt hours should be generated and sold to recoup the fixed costs expected for the year. This is arrived at by dividing the total fixed costs for the year by the variable profit per kilowatt hour, which is the selling price per kilowatt hour less the variable costs incurred to produce a kilowatt hour of electricity. The break-even volume is the minimum peg for the target volume to be sold by the company, reflected in the projected financials.

The fixed costs will deliberately decline over the three years, as the initial investment for the plant and facilities will be heavier in the first year. In the subsequent years, there will still be investments in fixed assets, but this will be to expand the territory covered by RH Tech. Even as the number of kilowatt hours to break even goes down, the target number of kilowatt hours produced will increase, because there is a long-term goal of increasing profits to sustain the company.

## Finance Strategy

| Sources of Capital | Target Amount | | |
|---|---|---|---|
| | Year 1 | Year 2 | Year 3 |
| Foundations and Grants (Skoll, Ford) | 520,833 | 520,833 | - |
| UNDP | 208,333 | 104,167 | 52,083 |
| ADB/World Bank | 104,167 | 104,167 | 104,167 |
| Government investments | 62,500 | 62,500 | 41,667 |
| Metro Pacific | 312,500 | 125,000 | - |

The funding strategy of RH Tech will be one that relies heavily on grants from foundations and low-interest capital from multinational lending agencies (World Bank, ADB), the Philippine government, and Metro Pacific, a Philippine-based conglomerate that heavily invests in public infrastructure. We decided on this approach because we believe in the potential of our technology, and we are confident that these investors will see the merit in our ability to deliver electricity to poor rural communities. As seen in the table below, the amount from external investors will decline over the years because RH Tech will become self-sufficient, in that it will use internally-generated resources from profits to sustain and expand operations.

## Projected Financials

| Income Statements | | | | | |
|---|---|---|---|---|---|
| Year 1 | | Year 2 | | Year 3 | |
| Donations | $ 729,167 | Donations | $ 625,000 | Donations | $ 52,083 |
| Capital | 479,167 | Capital | 291,667 | Capital | 145,833 |
| Sales | 3,214,167 | Profits from previous year | (339,375) | Profits from previous year | 958,115 |
| | | Sales | 5,062,313 | Sales | 8,859,047 |
| Total revenue and generated capital | 4,422,500 | Total revenue and generated capital | 5,639,604 | Total revenue and generated capital | 10,015,078 |
| Meso power plant | 2,500,000 | Meso power plant | 1,250,000 | Meso power plant | 833,333 |
| Raw materials | 799,583 | Raw materials | 1,259,344 | Raw materials | 2,203,852 |
| Plant operations | 688,750 | Plant operations | 1,084,781 | Plant operations | 1,898,367 |
| Distribution | 125,000 | Distribution | 125,000 | Distribution | 125,000 |
| Wages | 562,083 | Wages | 885,281 | Wages | 1,549,242 |
| Marketing | 62,500 | Marketing | 62,500 | Marketing | 62,500 |
| Loan Interest | 23,958 | Loan Interest | 14,583 | Loan Interest | 7,292 |
| Total expenses | 4,761,875 | Total expenses | 4,681,490 | Total expenses | 6,679,586 |
| Profit | $ (339,375) | Profit | $ 958,115 | Profit | $ 3,335,492 |

| Break-even Analysis | Year 1 | Year 2 | Year 3 |
|---|---|---|---|
| Fixed costs | $2,711,458.33 | $ 1,452,083.33 | $ 1,028,125.00 |
| Variable profit per kilowatt hour | 0.03 | 0.03 | 0.03 |
| Number of kilowatt hours to break even | 88,537,415 | 45,157,110 | 30,450,275 |

Some of the noticeable parts of the projected financials are: (1) sales are increasing over the three years because more towns will be served by RH Tech and people will be more aware of RH Tech in the provinces, (2) meso power plant, the cost item reflecting investments in the plant, will decrease because of increasing efficiency brought about by the learning curve, (3) distribution and marketing expenses will remain stable over the years, because even as the reach of RH Tech increases, the need for sustaining marketing will decrease and distribution will also become more efficient, (4) there is a decreasing amount of loan interest payments because less capital will be procured from external sources over the years.

Clearly, RH Tech is a business endeavor that will prove to be profitable and very much beneficial to Filipinos who have been deprived of the right to live a comfortable life.

No longer will they live in the dark. With the help of this light, they can start making their lives extraordinary.

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