

Oil and Gas Exploration in Bangladesh: The Moment of Reckoning?

by Ahmed Badruzzaman

A year ago, with the bidding process on different gas and oil blocks under way, there was tremendous optimism over Bangladesh's economic future. The country looked set to emerge as South Asia's next success story. We appeared headed for unparalleled prosperity.

Now, a year later, the country is devastated by its worst flood of the century. Cries for help are ringing across the globe. The country has gone through huge power shortage, death and suffering—from an unusually cold winter, a heat wave, and then the flood. Prospects of escaping such a vicious cycle appear dim.

The only avenue that could get Bangladesh out of misery in the long run, namely exploitation of our vast gas resource, remains uncertain. The process to award production sharing contracts (PSCs) is almost a year behind schedule. Countless negotiating sessions have been held with small and large foreign companies. Several hitherto unheard of companies, with little resource or credibility, have surged ahead of their more well-heeled competitors. Some companies have made new proposals to improve their position. Outsiders from far and near have proposed pipelines, power plants, etc., to cash in on our national treasure. Many appear to be putting undue pressure.

Local experts and oil company have bemoaned exclusion from the process. Volumes have been written on the important issues for consideration. Bidders have expressed their frustration and the pronounced indecisiveness has had adverse impact on the country's investment image. The gas production that came on line recently, under a previous PSC, appears to be costing the country millions of dollars instead of making money. Indeed, it has been an interesting year.

Meanwhile, the price of oil in the world market has dropped by a half and the profits of oil companies have plummeted with less funds available to them for investment. The ability and willingness of foreign oil companies to invest is fast diminishing and the time to get the best deal for Bangladesh is drifting away. Indeed, the country, without appropriate and adequate means to address the issues, is hesitant lest it should commit a

blunder. However, a missed opportunity may prove to be a bigger blunder.

Many key issues in exploration and production (E&P) have been raised and remain largely unresolved.

Multiple Challenges

Financial, technological, environmental, institutional, and social challenges will be enormous as Bangladesh tries to harness its gas reserves. Environmental pollution, accident prevention, use of scarce agricultural land resource, etc., are of serious concern. However, these challenges offer the country an unparalleled opportunity for growth.

Utilisation or Export?

Whether the country should export gas to earn hard currency or utilise it internally has been a sensitive issue.

Bangladesh is not floating on gas, contrary to what some would have us believe. True, the reserve estimate of 13 to 50 Tcf is large compared to the current rate of consumption. However, this will dwindle quickly with economic expansion. For example, 13 Tcf will be used up in two years to sustain a GNP one-tenth the size of Japanese economy, with no growth in population. Bangladesh must utilise and conserve the gas to develop its own industries and infrastructure. Electric power, generated by gas-fired plants, should meet the load-shedding crisis the country faces perennially, will accelerate industrial growth, and can also be exported to neighbouring countries. Products, using gas as a raw material or a source of energy, can also be exported.

Foreign Partners

Bangladesh does not have the manpower and resources to meet the challenges of exploration and production on its own and needs foreign partners. What should be the profile of a desirable foreign partner? With so many different companies making bids, ranging from those with little or no financial resources to oil giants, with different track records in safety, environment, social impact, alleged propensity for political interference, it has become extremely confusing to make a choice. However, following considerations can help sort this out:

- Many foreign companies, especially the big ones, have the financial and technological resources Bangladesh needs. The

Decisions made now will determine the country's economic fate for generations to come. Thus, it is imperative that the country's leaders, both from political and bureaucratic ranks, public opinion makers, and Bangladeshi technical experts, at home and abroad, work as a team to make the right choices for the country.

large companies have net incomes in hundreds of millions to billions of dollars. They have often made long-term social commitment by building roads, schools, and hospitals in countries they have partnered with. Most of them have been quite willing to assist in transfer of technology.

• However, not all are equal in their record in safety and environment, and in their respect for the people and their institutions. Let us review the following antecedents of a few oil companies that are either already in Bangladesh or are bidding to enter.

The oil company operating at the 1997 Magurchara accident site in Srimangal was also the operator at the Piper Alpha platform in the North Sea that blew out in 1988 killing 167 workers and causing damage in billions of dollars. Allegedly, the company paid no compensation for that incident.

Recently, another medium-sized US oil company, bidding for a key block in Bangladesh, has been fined millions of dollars for ignoring environmental laws for years and causing massive pollution in California. The US Department of Labour has now established that this company and a French company (also bidding here) have been using forced labour in a country neighbouring Bangladesh to build a pipeline to transport gas to a power plant in a third country. Interestingly, news reports indicate that the same company is eager to build a pipeline to export gas from Bangladesh. The company was also recently accused in the media of using various less-than-desirable means to try and win oil contracts in a Central Asian country of the former Soviet Union.

In 1995, a major European oil company bidding here, one of the world's largest, admitted supplying guns to the army of an African dictator. Another major European company was recently implicated in a coup in one of the countries in the south-west Africa.

In India, the police, paid by a US natural gas company to guard a power plant, have been implicated by Amnesty International in violence against

protesters.

• Should the fear of interference and intrusion then cause one to prefer small foreign companies as the lesser "evil"? The answer is a clear no, if one considers the following:

Despite their claims, small companies do not have the financial and technological resource needed for routine exploration, let alone handle accidents or environmental pollution. According to news reports, in 1996 one small company, seeking to drill 10 wells, had only five million US dollars in net income. Another had over 600,000 US dollars in loss. It could cost six million to 20 million dollars to drill a single well depending on the conditions. Many of the gas reserves in Bangladesh are over-pressured and would require special equipment and procedures. Recently, a small company exploring in Bangladesh ran into financial difficulties when it drilled a dry hole.

None of the small companies currently bidding would be able to bear the cost of even the Magurchara accident, not to mention the much more devastating Piper Alpha disaster of 1988 in the North Sea that has required over eight billion (yes, billion) US dollars to put in new safety procedures.

None of these small companies would be able to pay for the hundreds of millions of dollars in clean-up that was ordered in California recently.

In addition to the lack of finances and technology, small companies are unlikely to have adequate policies, or practices to effectively prevent accidents or safeguard the environment, unlike large companies who, often by laws in their native countries, have had to develop such policies and procedures.

Besides, a small company, in its attempts to attract financing may get backers that are unsavoury or equally adept in intimidation, and take for granted a poor country like Bangladesh. It is worth noting that one of the small companies currently in favour had announced to its shareholders in 1996, months before even the bids were solicited, that it had secured two blocks in Bangladesh.

In view of the above discussion, Bangladesh needs to partner with companies with adequate finances, technology, environmental and social commitment, and an acceptable record on refraining from political meddling, of course, with a strict framework defined for them to operate within.

Current PSC-Award Process

Will the current multiple-block, multiple-company PSC-award process meet the country's needs?

As recent reports on a single PSC with a foreign company indicate, multiple PSCs will be unmanageable—the country simply does not have the regulatory and technical resources to do so. Besides, it does not appear to be the optimum way to harness the country's only significant resource. The concern expressed in local dailies on producing too much gas by giving out all blocks simultaneously is real. In addition, handling jurisdictional claims by a multitude of companies in marketing, transport, utilisation, etc., is likely to be a nightmarish and paralysing experience.

Consequently, the fragmented PSC-award process needs adjustment. One approach would be to form a consolidated joint venture (JV) for the whole country with a consortium (or two) of qualified oil companies, with attributes as discussed above. This will be easier to manage than multiple PSCs. The Bangladeshi exploration company should be an integral part of such an arrangement. JVs have been formed in other parts of the world and in some cases were particularly beneficial in developing internal utilisation where export of oil or gas was difficult for a variety of reasons. A JV with a consortium can also mitigate fears of intimidation by a single large company. However, whatever path is chosen for oil and gas exploration in Bangladesh, it must be done without delay. Time is of essence for the country as foreign companies are trying to make investment decisions in a declining world market for oil and gas.

Long-term Social Impact

Finally, a critical question that must be addressed a priori is: Will the country be able to withstand the inevitable pressure of the new-found wealth?

A sudden and massive influx of wealth can destabilise the country's social fabric, corrupt her institutions, and undermine the hard-earned democracy. Nigeria, with one of the world's largest oil and gas resources, is a classic example of the malaise that can befall if this issue is not addressed a priori. Over the last two decades, Nigeria has earned billions of dollars for its oil and yet the people have been increasingly impoverished as successive military regimes have plundered this wealth and sustained on it. Bribery and corruption are rampant. People living in the oil-rich Niger delta have little or no access to electricity or running water. In a country almost floating on oil, people line up for hours for gasoline and fuel. There is ongoing social unrest and agitation. In desperation some "vandals" earlier this month broke open a pipeline to siphon off gasoline, causing an explosion and fire that killed nearly one thousand people. The new government of Nigeria has just begun a discussion on this and it will take years to rectify the harm done. Bangladesh, with only an infant democracy, fragile law enforcement and legal institutions, and abject poverty, must be wary lest such a fate should befall her.

A Team Approach

Decisions made now will determine the country's economic fate for generations to come. Thus, it is imperative that the country's leaders, both from political and bureaucratic ranks, public opinion makers, and Bangladeshi technical experts, at home and abroad, work as a team to make the right choices for the country.

True, the country's leaders already face overwhelming challenges in the daily running of our unfortunate and troubled motherland. With a volatile political situation in the country, the Asian economic crisis, an ailing president in Moscow, an impeachment inquiry in Washington DC, etc., journalists and editors no doubt have more interesting issues to contemplate than exploration of natural gas in Bangladesh. However, the oil and gas sector, with a resource worth billions of dollars, remains the singular hope for deliverance from the pitiful condition we are in. Thus, we fervently hope that the leaders, including the Prime Minister, and opinion makers, such as key journalists, editors, and academics, will be able to pay attention to the oil and gas sector.

It is particularly important to be vigilant in these trying times when all eyes are on the

can be taken a step further by forming a commission to assess the issues discussed above in their totality before important decisions are made.

A Comprehensive Plan

From the above discussion it is clear that a complete long-term plan covering the whole country to explore, produce, and utilise the gas is critical. The plan must address key issues in the cycle such as safety, environmental safeguards, social impact, abandonment, and regulatory safeguards; develop strict regulations, establish regulatory bodies; and set up technical institutions to safeguard the public workers, and the environment. Mechanisms and oversight bodies need to be set up to guard against any propensity for meddling and intimidation by a foreign partner or attempts to corrupt the country's institutions. Eternal vigilance is the price the country must pay to move forward. Remember, once before we had lost our freedom to foreign traders. That bondage lasted nearly two centuries.

A Closing Query

With a precious and rare gift from nature we stand, once again, at the gates of our coveted destiny of Sonar Bangla for which millions gave their lives. Shall we ignore their sacrifice? Or, shall we come together as a nation, rich and poor, the learned and the ignorant, set aside our prejudices and temptations, and do what is best for our bleeding motherland? Shall we march on to a destiny of greatness? Or, shall we let this opportunity slip as we plunge into economic oblivion as a nation? At the call of a courageous leader twenty-seven years ago, we had beaten back a mighty army. Shall we now be defeated by our own follies? The choice is ours to make.

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Begin Right and End Right

by Joginder Singh

How is it that when it comes to brass tacks, we have drawn a blank even after 50 years of independence? Governing is a serious business and cannot be done if the chief minister of a state governs from the kitchen or if a central minister does not do his homework.

GOVERNING a country of the size of India is as complex as the problems faced by it. In a democracy the expectations of the people vary from removing a speed breaker on a busy road to providing cheap houses and credit on non-returnable basis, killing stray dogs to prevent rabies, restoring train services or making trains run faster with more halts, issuing of coins, banning smoking in buses, or asking film producers to stop depicting communities in stereotype images as well as taking care of the old and sick. Despite all such demands the show goes on.

George Bernard Shaw said, "Life does not cease to be funny when people die, any more than it ceases to be serious when people laugh." Such expectations are as many as people in our country. The government has to play juggling with the figures to show that all is well and then chuck along.

Once a person asked, "Can't the government bring out some kind of rule to enable people to build their own houses and to eat three proper meals a day and also ensure that their children get proper education?"

To make a complete picture he could have also asked "why could not the government ensure jobs for everybody, proper law and order, 24 hours of electric and water supply, good roads, cleanliness of the city and no humiliation from the government to the citizens? This is what governance is all about, that is managing the country."

According to Webster's Dictionary to manage something is to "succeed in accomplishing something." Governance is only about coordination in a comprehensive way within the budget it can muster.

There is "Something rotten about the state of Denmark," lamented Hamlet. One sometimes wonders whether he was also talking about the present conditions in our country. Before we recover from the debris of one scam, another stares on us. No scam is dead or buried. Ashes keep on smouldering forever.

This gives an impression that something which happened a decade back is buried under political pressure. The accused are known. The offence is known, the abettors and beneficiaries are known. Still often the investigating agencies get the flak. If the case ends in acquittal even after 20 years.

They are the only ones held accountable and blamed for so called "ruining of the reputations and putting up weak cases". As investigating agen-

cies are part of the government machinery they have to suffer the ignominy of being pilloried day in and day out. They become the favourite whipping boy of anybody, who would like to have a go at them.

Nobody apportions blame on others. It is not the job of the investigating agency to convict any accused. This is the function of the judiciary. Whatever evidence is available is put up to the court. The appreciation of evidence and to decide about the guilt of the accused or otherwise is within the purview of the court.

Unlike European countries, the confession made in any case is not admissible in any court of law. Unlike the French system, where the inquiring magistrate tries to find the truth for himself, in our system, the judicial officer decides on the basis of evidence put up to him. In our system, the witnesses are free to change their statement and give a go by the case.

Economic crime does not carry with it the odium normally associated with property crimes like theft, dacoity or robbery. This unfortunate resigned acceptance of the society to the scams and a kind of belief that nobody is going to be punished is a sad augury for the country.

But it is not without basis. The criminal justice system, which was designed in 1863, is such that a moneyed man can delay justice and nemesis to himself indefinitely. If there are three accused, each one of them, turn by turn go to one court after another on one or different points and this exhausting delay ensures that the case does not end during the lifetime of accused and witnesses.

It is also true that the number of cases of several kinds, to be handled by the investigating agencies and the courts, are as staggering as varied. Apart from the Indian Penal Code cases, which are about 50 lakhs a year, there are thousands of cases relating to deaths on roads. As many as 43,803 were killed in 1,40,037 accidents in the country on national highways during 1995-1997.

This does not include 1,58,181 persons who were injured in the above accidents. In all fairness, it is impossible to expect the disposal of 60 lakh cases per year. Even if the system were to be ready for such quick disposal, vested interests both of the parties and the lawyers would see to it, that it is not allowed to happen.

The beneficiaries from the delay are the accused who might have defrauded the common man of his hard-earned money by floating bogus finance companies.

According to a debate in parliament non banking financial companies defrauded the investors to the tune of Rs 15,000 crores in one year. The criminal justice system is not adequate to meet the needs of the modern time. It is only punishment-oriented and not compensation-oriented.

Various Chief Justices of the Supreme Court and the chairman of the Law Commission have admitted that the system is clogged. But de-clogging is to be done by us. Everybody is agreed on the need to do something.

How is it that when it comes to brass tacks, we have drawn a blank even after 50 years of independence? Governing is a serious business and cannot be done if the chief minister of a state governs from the kitchen or if a central minister does not do his homework.

It is within the ambit of the legislature and executive to frame laws and bring about changes in the legal system. Judiciary is the only agency

which under our system can render justice. But for judicial intervention, the mechanism for solving Cauvery water dispute would not have come into existence.

What system should replace the existing system is an urgent issue? No more time should be wasted in setting the ball rolling.

One thing is certain that we should have a kind of Commission and not only the Law Commission, which should constantly review the existing laws, functioning of the investigating agencies as well as judicial functioning.

It is only a composite and not a compartmentalised review which can evolve a system capable of meeting both the expectations and needs of those seeking justice promptly. Maybe we need a system where the accused before undergoing a jail term is required to make good the loss he caused to the victim.

The writer is a former CBI director. —PTI Feature

Energy Requirement for Food Production

by Kshirode C Roy

In order to increase the total agricultural production, the energy input in agriculture must be increased. Otherwise, the attainment of self-sufficiency in food will be confined to slogan only and will never be a reality.

ALTHOUGH modern agricultural sciences have developed technologies to food the fast-growing population of the 21st century, challenge of the environmental issues. Some people claim that we have won the Malthusian food-population race. But a recent study by the Johns Hopkins University predicts that there won't be enough food by 2025 for the world's projected 8 billion hungry mouths unless the population growth slows or agricultural production increases dramatically. Both these challenges are not easy to solve.

For food production, lot of energy is required. Major energy is spent in fertilizer production, farm machinery, irrigation and pesticides. Agriculture sector produces lots of energy like crops, fuel, wood and crop residues. Both men and animals get energy for their day to day work from food. Wood and crop residues are sources of energy. Thus agriculture sector is both producer and consumer of energy.

In the 21st century, government and people will be even more concern on environmental problem. Therefore, energy input to agriculture cannot be increased without taking proper account of the environmental issues. All the development activities including agricultural production must be environment-friendly. Food production needs to be increased in a sustainable way.

What is the relationship between food production and energy requirement? Food production and energy requirement intersect at nearly every step of the food system. For crop production, two different kind of energy is required. One is natural energy, i.e., the energy from the sun. The other energy is external energy—energy from human, animal, traditional fuel and commercial energy.

During the ancient time, agriculture was dependent fully on the energy of sun and humans. Land preparation by humans was the main energy input. To produce their own food, plants utilize the energy

from the sun. In the process, plants grow and ultimately render food for human and animal. In the ancient agriculture, one man could produce food for only a few people. Average man can produce only 75 watts of energy for 8 hours, which is very insufficient to achieve a reasonable standard of living. Later more and more energy has been applied to agriculture and food production has increased accordingly. When people learned the technique of domesticating animals and could use them for agricultural operations, that was a milestone in agriculture. This happened about 6000 years ago.

Draught animals can continuously produce only 500 watts. Human and animal energy together can produce only a bare subsistence standard of living. When more land with the aid of animals, next energy investment in agriculture occurred when internal combustion engine was used for land preparation as well as for other agricultural operations.

In the USA, 80 per cent of the population were farmers in 1855. In 1916 and 1973, this figure was reduced to 33 and 9 per cent, respectively. Today only 2 per cent people of the US are farmers.

Within a certain limit, agricultural production increases with the increase of energy input to agriculture. Farmers of the developing countries cannot afford to pay the price of the energy required for optimum crop production and depend mainly on human and animal energy. Therefore, the yield is low, thereby energy used to produce unit quantity of food is high. For example, in India, 5000 kilocalorie (Kcal) of energy is used to produce 1 kg of rice or 3460 kcal of food energy. For each kcal of energy input for rice production, 0.69 kcal of food energy output is obtained. In the US and Japan, 2000 kcal of energy is required to produce 1 kg of rice which means that for each kcal of energy invested for rice production, 1.73 kcal of food energy output obtained.

Agricultural production increases with the use of better inputs like seeds, fertilizer, water and pesticides. Modern varieties of crops require lot of fertilizers. The growing population of the past 50 years could never have been fed without an increasing reliance on chemical fertilizers. At the world level, chemical fertilizer is the largest consumer (58 per cent) of commercial energy in agriculture. In the far east, its share is about 85 per cent. It is use is increasing rapidly in the developing countries and is ahead of farm machinery in respect of its share in commercial energy in agriculture. In the developed countries, farm machinery manufacture and operation is the largest user of commercial energy in agriculture and account for more than 50 per cent of energy in agriculture.

Nitrogen fertilizer production is very energy intensive.

One kilogram of nutrient requires about two kilograms of fossil fuel for its manufacturing, packaging, transport, distribution and application. Phosphate fertilizer is much less energy intensive than nitrogen. The energy required to mine, concentrate, process, package, transport and distribute one kilogram of nutrient is estimated at 0.33 kilograms of fossil fuel. Similarly, for potash, 0.21 kilograms of fossil fuel is required for one kilogram of nutrient.

Irrigation has been used for crop production for a few thousand years. Many traditional varieties can sustain water stress to some extent. But the modern varieties, yielding two to three times more than the traditional varieties, cannot endure water stress. Also, their physiological characteristics are such that they need lot of water. Irrigation is very important for agriculture in the developing countries because it can produce 2-3 crop a year. At the world level, 65 per cent of the total commercial energy required for the manufacture and operation of irrigation equipment is used in the developing countries. However, only about 2 per cent of the total commercial energy in agriculture are used in irrigation at the global level.

Modern varieties of most crops are susceptible to insect pests and diseases. Therefore, pesticides are essential for production of modern varieties. Raw materials for pesticides come mostly from the petrochemical industries. Manufacturing, packaging, transport, distribution and application require further energy inputs. The total energy required to supply one kilogram of pesticide has been estimated at about 2.4 kilograms of petroleum equivalent, which means that pesticides are the most energy-intensive agriculture input.

Introduction of modern varieties made it possible to increase yield, hence the total production. For every input use, farm machinery is required. It has made it possible to increase the productivity of land as well as labour. For example, in the USA, in 1855 one person could produce food for only 5-6 persons. In 1955, this figure rose to 18. In 1963 and 1974, the figures were 30 and 55 respectively. It can be inferred that agricultural production depends on energy input. In Bangladesh, the energy use in agriculture is very low, and so is the yield. Agricultural sector contributes 35 per cent to the gross domestic product (GDP), but the energy input to this sector is only 2 per cent. In order to increase the total agricultural production, the energy input in agriculture must increase. Otherwise, the attainment of self-sufficiency in food will be confined to slogan only and will never be a reality.

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Found: A Way to Cut Charcoal Pollution

Reliance on charcoal as a solid fuel wreaks havoc with forests and adds to pollution levels. Now new technology has been developed in Zambia to cut charcoal consumption by one-third. And, reports Gemini News Service, several other countries want to buy the equipment. Wachira Kigotho writes from Nairobi, Kenya

RESEARCHERS in Zambia have developed new technology that might eventually cut charcoal consumption to 30 per cent of fuel needs.

It involves efficient clay cookstoves and coal briquettes, as an alternative smokeless solid fuel.

By encouraging people to use the briquettes, Zambia hopes to reduce the heavy deforestation blighting the country's land and its biodiversity. At present, Zambia obtains 90 per cent of its household fuel from charcoal and firewood, although it has large deposits of untapped coal.

The technology was developed by Industrial Minerals, and Energy Research, a laboratory of the National Council for Scientific Research (NCSR).

"By promoting coal and other biomass-based briquette technology, NCSR has taken a step towards sensitising other countries in sub-Saharan Africa to the need to protect fragile ecosystems," says Mitsuo Ishikawa, resident representative in Zambia for Japan International Co-operation Agency (JICA), which collaborated on the project.

Coal briquettes burn with a blue flame, are smokeless and emit no soot. They are also more dense and more porous than charcoal, and break less easily during handling and

transportation. They can be quenched with water, and lit again once dry.

As well as developing the briquettes, researchers have designed a new clay stove that should help revolutionise household fuel consumption.

The stove keeps fire much longer than the traditional mbumba metal one says Dr Julius Banda, an expert in ceramics who helped develop the stove with officials from JICA.

An aggressive campaign has taken off in Zambia to train local artisans in making the clay stoves by hand. Some artisans are trained at an NCSR plant while instructors visit other locations, such as Chipata and George Compound, to train workers on the ground.

And while the clay stove is more economical than other ordinary types of cookstove when using charcoal, it is even more efficient with coal briquettes.

NCSR and JICA's ceramics experts believe that the useful heating period is up to three hours with charcoal, but between six and eight hours with the briquettes.

The old mbumba stoves, similar to those commonly used in Tanzania, Uganda and Kenya, retain heat only for 30-45 minutes.

Zambia is on the way to marketing the briquette tech-

nology, as well as establishing a regional centre for training and testing the technology. It remains, according to Dr Kaoma, the only sub-Saharan country capable of commercialising it.

According to Dr Julius Kaoma, principal researcher on the project, the raw materials used to make coal briquettes are all available in Zambia. They include coal waste slurry, agricultural wastes such as bagasse and maize cobs, molasses, sawdust and lime.

The process consists of removing tarry and gritty substances from coal slurry and agro-waste through a carbonisation process. The products are then crushed and ground into powder, and mixed with water. Lime is added to remove sulphur, and molasses to bind it.

The mixture is then moulded into briquettes, passed through low pressure, and desmoked by curing. "We have the capacity to make coal briquettes of any shape, size or quality," says Kaoma.

Zambia Suga Company shows it is also possible to make smokeless briquettes from bagasse, a by-product of sugar processing. Bagasse is usually discarded, posing an environmental hazard to the area in which it is dumped.

To attain its goal of conserving Zambia's forests, NCSR

would like to make the briquette project, an income generator. Funds are needed to upgrade the mini-laboratory to a semi-commercial plant, capable of producing 10,000 tonnes of briquettes a year.

A request from one company in Johannesburg to supply 50,000 clay stoves has gone unfulfilled, because the NCSR lacked the capacity. Last year, the 8,000 stoves produced were all sold locally.

In the last two years, NCSR has also had requests from governments and private companies in neighbouring countries to help with coal briquette technology and with testing their coal.

Botswana and Malawi are both interested. Tanzania's Industrial Research Development Organisation sees it as a way to cut charcoal burning in the south of the country.

And in Zimbabwe the University's Institute of Mining Research has shown interest and visited the NCSR's lab, and the University Merchant Bank may finance coal briquette entrepreneurs across Central Africa.

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