OFF THE GRID: FUEL CELLS FOR RURAL ELECTRIFICATION

An interview with ***Andrew Hinkly*** *and* ***Angelin Maharaj***

Hinkly is the Executive Head of Marketing for Anglo American Platinum (Amplats) in London. Maharaj, in Johannesburg, is Amplat's Principal for Market Development

In August 2014, Anglo American Platinum and Ballard Power Systems launched the world's first "fuel cell mini-grid" field trial at the rural community of Naledi Trust, near Kroonstad in the Free State, providing power to the 34 households there. Fuel cells convert fuel, in this case methanol, into electricity and water, facilitated by platinum. The mini-grid is capable of supplying electricity for lighting, refrigeration and cooking, television and radio, and charging electronic devices.

Ben Turok (BT): Anglo American is very well known as a mining company, but you seem to be branching out into a new area of technological innovation. What is it all about?

Andrew Hinkly (AH): As you say, the primary business in Anglo American Platinum has always been, and will continue to be, the mining of platinum group metals. However, the future prosperity of the mining industry, and our company specifically, is dependent on developing new applications and future sources of demand for the metals that we mine. Fuel cells arise as an area that likely will provide future demand. However, it won't do so on its own. It requires innovation and nurturing and proactive work by ourselves and by others who have a vested interest in developing the platinum marketplace. Accordingly, we have a number of market development activities in place. One of them is associated with the rural electrification project that we've been involved with for the last couple of years, and most recently with the Naledi Trust community.

BT: This is a big shift. Don't you need to develop a research arm and even production capabilities?

AH: Our approach is to facilitate the development of an industry through engaging partners in South Africa and around the world who have the capabilities to deliver on the vision that we have created. Specifically for the rural electrification programme, which is a fuel-cell-powered mini-grid, we've engaged with Ballard Power Systems from Canada, who have some of the core technology capabilities and manufacturing expertise, as well as numerous partners in South Africa. So we don't believe that we have to be masters of the various technologies, but rather to have the vision, the planning capacity, and the will to drive the technology forward. To facilitate the growth of that sector globally, but with an opportunity to create a South African-based manufacturing and technology footprint.

BT: Does South Africa have the capabilities in this area? What has been your experience thus far?

AH: The purpose of the demonstration in Naledi Trust was far broader than simply putting a project on the ground in a particular location. It was intended to test the broader system of technology as well as the capabilities and the learning capacities of the region. It has been a huge success. We've seen, through the engagement of the university institutions as well as local suppliers and service providers, that there clearly is the capability today as well as the capacity to grow into this sector in the future.

BT: Some sceptical economists in South Africa argue that, just because we have iron ore, doesn't mean we can make pots and pans. I suppose they would also say that just having platinum doesn't mean we can produce fuel cells. It seems that you are really challenging that position.

AH: I think that, as with any argument, there is a kernel of truth. But, in addition, there are many reasons why South Africa can be competitive in this sector. First of all, it is a nascent industry, an emerging area of opportunity without any clear leaders presently: the field is wide open. Secondly, South Africa has invested heavily in its own capability in adjacent industries. You have a very capable automotive manufacturing industry, for example, where many of the core skills of volume manufacturing

The Anglo American Platinum and Ballard Power Systems fuel cell mini-grid in Naledi Trust in Kroonstad, Free State, South Africa.

have been developed and are very competitive. Furthermore, in terms of the core technology, there has been a large investment over many years into fuel cells through the Department of Science and Technology. On the manufacturing side and the technology side, South Africa is capable of participating in what is the beginning of a race.

BT: Is the intention only to produce for local use or is there export potential as well?
AH: The bedrock or foundation is domestic applications. However, there is clearly an opportunity to export to the rest of Africa, where there are similar needs for the product, but also further afield, to any geography where there is need for remote power that isn't easily serviced by the extension of an existing grid. So, yes, the initial focus should be on stimulating demand in South Africa, but that should be the stepping stone into exports to similarly situated locations, countries and communities with similar needs.

LOCAL SKILLS, LOCAL BENEFITS

BT: What is the level of local procurement of skills, goods and services?
AH: Again, the reason for the demonstration at Naledi Trust was to test the level of local procurement that is available today, and to also then project what may be available in the future. If we look at the types of activities: we had engineering, procurement and construction activities done by South African companies. We had system integration and assembly, including many of the electronic boards, done by South African companies. Much of the instrumentation was done locally. The electrical work, including the reticulation, the upgrading and the wiring of the homes, were all done in South Africa. The fuel storage system is sourced in South Africa. The methanol fuel is produced and sourced in South Africa. The downstream benefits – new demand for appliances from the availability of electricity – are sourced in South Africa. Many of the supporting systems, such as the meters that are used for measuring and controlling the load, are sourced in South Africa. We've had a huge level of participation already.

As we look further down the line, as volumes increase, some of the core technology – the actual fuel cell stacks – can be localised in South Africa. Our partner in this development, Ballard, have committed to localisation once a sufficient volume is reached. However, it shouldn't be underestimated that we have already demonstrated that approximately two-thirds of the value can be and has been sourced in South Africa. ➤➤

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Godfrey Oliphant, Deputy Minister of the Department of Mineral Resources, and Chris Griffith, Chief Executive Officer of Anglo American Platinum.

Naledi Trust community members receiving appliances during the fuel cell mini-grid field trial in Kroonstad.

BT: So we're not as backward as we think!

Angelin Maharaj (AM): Most certainly. As Andrew said, except for Ballard, all the companies that participated in making the field trial a success have been South African. That forms the cornerstone for creating a fuel cell value chain.

BT: Can you give me any idea of the job creation possibilities should this scheme go to the level you want?

AH: To expand on the trial through the balance of this decade could create, in direct employment, several hundred manufacturing and technology jobs. The multiplier effect of that is many times more.

But that's a fairly limited expansion of what we see as the first application, the rural electrification. We believe that putting that cornerstone in place will facilitate further development by others of additional fuel cell applications that can be manufactured in South Africa. One of the most closely associated adjacencies is the use of fuel cells for backup power in telecoms. We would expect that to create several hundred more jobs. Assuming that is successful, the automotive sector could also locate some of its global manufacturing of fuel cells in South Africa, which could be several hundred more direct jobs. It could conceivably be 1 000 or 2 000 jobs directly employed in the sector over the course of the next five to ten years. And each one of those will have a multiplier effect on job creation as well.

BT: Does the project include training, and at what level?

AH: The project that we have completed today included various aspects of learning and development. One highlight is the engagement with Wits University and their involvement in the monitoring and diagnostics of the performance of the rural electrification project.

AM: The field trial is generating data on a per second basis and that data is being communicated to Wits University. They are warehousing that data, processing it, and calculating the key performance indicators. To be able to collect this data, they set up a web-based portal. This has been done for the first time by Wits. It will be something that they would use for other projects, demonstrating their new capability to handle large volumes of data and to present it on a platform that is accessible to end users across the globe. Right now, the data generated and presented on this portal is visible on three continents. So the project certainly has created the opportunity to develop skills and to extend that.

BT: What about employees at a lower level – will they be trained?

AH: Yes, absolutely. The intention going forward is to create an industry that will require a certain level of skills in manufacturing and assembly in direct employment. But then, further downstream, in the application of the technology, there are additional roles that require training. As an example, the systems will need maintenance, which promotes similar types of roles that you might find today in home heating or cooling maintenance – a light level of diagnostics and repair. There will also

Naledi Trust community members receiving appliances during the fuel cell mini-grid field trial in Kroonstad.

be refuelling, and that requires a driver; meters need to be checked, and payments collected. So there are downstream roles as well as direct manufacturing roles, all of which likely will require some level of training. Clearly, as part of developing this sector, that will be provided.

AM: We've already experienced education, training and skills transfer through the field trial. We have created operating manuals and maintenance manuals – documents and training materials that will form the basis for training new companies. Ballard has also been instrumental in the transfer of skills into EPCM [engineering, procurement, construction management] companies to design an integrated fuel cell power system. That skills transfer would then be sustained when setting up a local manufacturing company in South Africa. It will enable the local manufacturer to produce these fuel cell power systems and deploy them, with these manuals and other technical data to support that deployment of the technology.

AN ALIGNMENT OF NEEDS

BT: Let's go back to the basic issue, which is the use of fuel cells to provide electricity for rural villages throughout South Africa. You are filling a major gap in these geographically remote places where there's no chance of Eskom feeding them into the national grid. Is that right?

AH: That is one of the needs that we are addressing. But we believe that we can at the same time address the need for employment opportunities and skills development – as well as, clearly, incremental future demand for platinum. It's an alignment of multiple needs that can be simultaneously addressed with this system.

BT: Are you also competing with other models of off-grid power generation?

AH: This particular application is designed for remote communities of 50–200 homes that require quality power that allows them to not only light their homes, but also cook and refrigerate food. For that particular use, this is the most competitive system available. There are diesel generators, which perhaps have had their day, or solar-powered systems, which tend to be for single homes and do not provide the quality of power that this fuel cell system can.

BT: Do you find the government is well disposed to this scheme?

We now need to move it further down the field and over the line, to convert good intentions and support into a firm commitment to develop the sector for the benefit of the rural communities who need the power, and, longer term, for the benefit of South African industry, which requires the employment opportunities and the skills creation that are a cornerstone of this.

AH: We have been working very effectively with various departments across government that have been, and continue to be, extremely supportive. We now need to move it further down the field and over the line, to convert good intentions and support into a firm commitment to develop the sector for the benefit of the rural communities who need the power, and, longer term, for the benefit of South African industry, which requires the employment opportunities and the skills creation that are a cornerstone of this. We now need to affirm a conclusion that allows everyone to progress in the direction that, I believe, they want to. NA