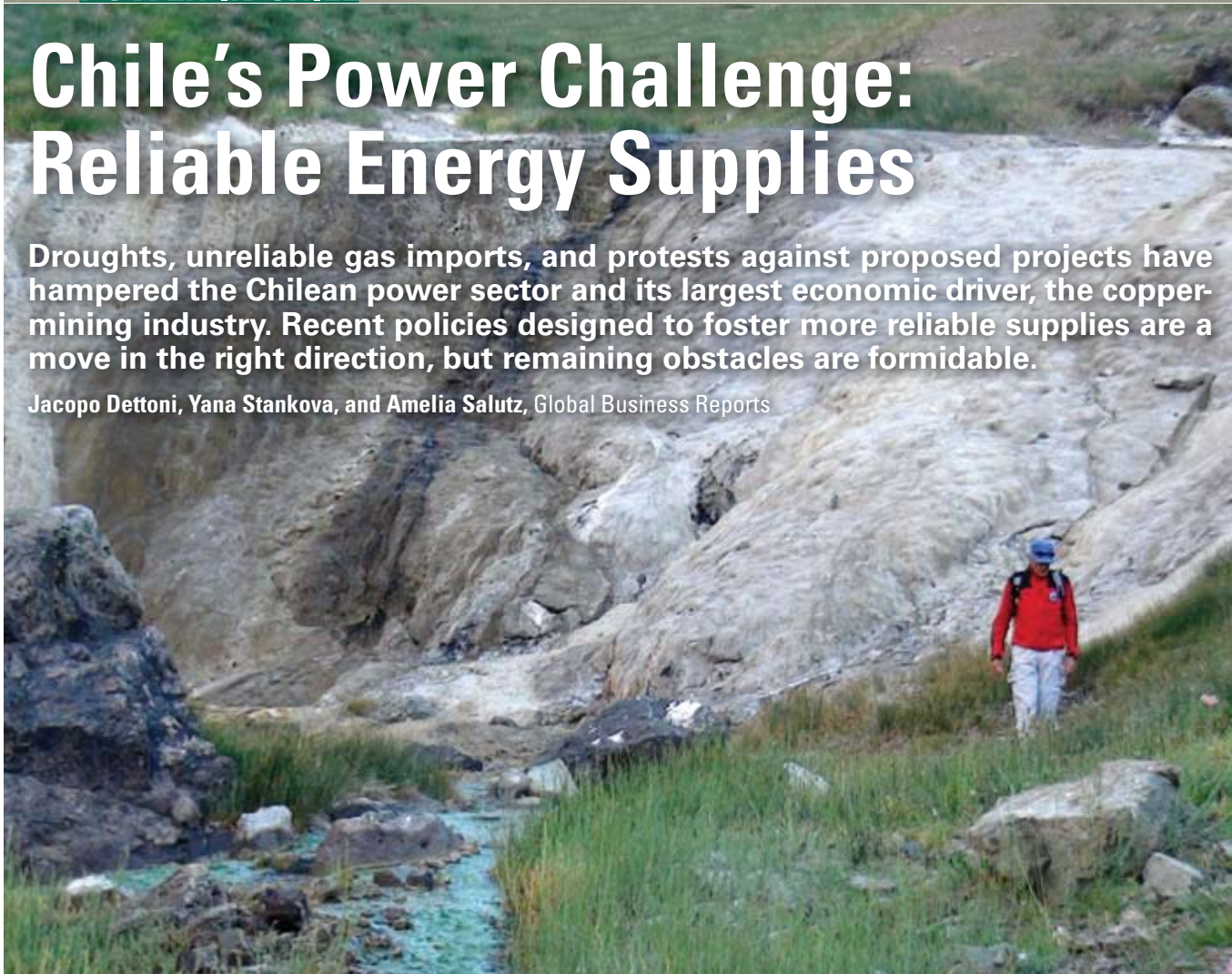


Chile's Power Challenge: Reliable Energy Supplies

Droughts, unreliable gas imports, and protests against proposed projects have hampered the Chilean power sector and its largest economic driver, the copper-mining industry. Recent policies designed to foster more reliable supplies are a move in the right direction, but remaining obstacles are formidable.

Jacopo Dettoni, Yana Stankova, and Amelia Salutz, Global Business Reports



Thermal spring deposit at Hot Rock's Calerías project. *Courtesy: Hot Rock*

Chile is a country in dramatic need of a secure power supply. Developments in generation and transmission have not kept pace with Chile's economic growth and only energy-saving measures are preventing the grid from another collapse. To address this issue, the government took an important step in February this year when it released a new energy master plan. Its goal is to increase Chile's installed capacity base to 25 GW from 17 GW by 2020.

As a result of market-driven policies, Chile has had rapid growth since a popular referendum put an end to Augusto Pinochet's dictatorship in 1988. Since then, the economy has posted average annual gross domestic product growth of 5.4%. The 2012 growth rate is forecast at 5.9%, and growth of 4.3% and 4.5% is expected in 2013 and 2014 respectively.

Mining, the engine of this economic success, is particularly affected by the lack of reliable power supply.

Mines and mineral processing are huge consumers of electricity, and they suck up one-third of the power generated in Chile. It is no wonder, therefore, that the supply of more reliable and more accessible energy is at the top of mining companies' agendas. "Mining companies operating in Chile suffer from two main problems: high prices of energy and the energy efficiency of their operations," said José Luis Fernández Bris, general manager of Foster Wheeler Chile, who recently signed a memorandum of understanding with GE Energy. "As a general reference, the higher initial capital expenditure in a more efficient process is counterbalanced by lower operating costs."

Chile's authorities have failed to spur adequate development of the power sector. Recurring droughts forced the government to change its focus from hydropower to natural gas. Gas-rich neighbor Argentina sent part of its production to Chile, until Argentinean President Néstor Kirchner cut

gas supplies in 2005, driving the Chilean market into chaos.

Since then, the country has relied on cheap (coal) or quick (diesel) generation sources to cope with the growing demand for power, without a clear long-term strategy. Eventually, President Miguel Juan Sebastián Piñera came out with an energy master plan aimed at defining principles for a renewed midterm energy strategy. This confirmed the country's commitment to thermal and hydropower while emphasizing the importance of generation from nonconventional renewable energy (NCRE) sources and showing willingness to connect Chile's two separate grids, the Sistema Interconectado Central (SIC) and the Sistema Interconectado del Norte Grande (SING). To date, no follow-ups have emerged.

According to Central Energía, a think tank, and Generadoras de Chile, the association of Chile's biggest power generators, only 11% of the projects that filed for

Environmental Impact Assessments (EIAs) since 2003 are under construction. One notable exception is the Angamos Power Plant, the 2012 *POWER* Plant of the Year, developed by AES Gener. This 520-MW coal-fired plant incorporates seawater cooling, a desalination plant, and battery energy storage to supply reliable power to mining companies in the Chilean desert. (See the profile of this plant in the August 2012 issue of *POWER* or in the archives at www.powermag.com.)

All these factors lead to a market where supply struggles to match demand. In Latin America, only Uruguay has higher electricity prices. Investments worth billions of dollars are lining up, waiting for political commitment to clear the way of bureaucratic headaches. The new energy master plan, the “National Energy Strategy,” has been a first step in this direction. In the field of renewable energy, approval of a proposed bill, the so-called “Ley 20/20” (Law 20/20), which sets a goal of 20% NCRE generation by 2020, will pave the way for further developments, although the government seems to be scaling down its ambitions on NCRE generation (see interview, p. 70).

The New Energy Master Plan

President Piñera unveiled the National Energy Strategy in February 2012. The plan rests on six pillars: energy efficiency, NCRE, traditional energy sources, transmission, market competition, and regional interconnection.

The industry is waiting for the government to follow up on the master plan, though uncertainties have slowed the agenda. Rodrigo Álvarez, the minister of energy who contributed to the strategy, resigned a few weeks after the master plan was an-

nounced, after being sidelined from negotiations with protesters over the HidroAysén project. Álvarez was the fourth minister to hold the position since 2010. The current minister, Jorge Bunster, is now tasked with implementing the strategy. The political risk perceived within the ministry casts a shadow over government ambitions.

No Country for Big Projects?

The release of the energy master plan comes at a crucial time. Energy projects crucial to meeting growing demand are bogged down by delays in permitting, EIAs, and legal processes.

“Chile is already running behind schedule because there are no big projects reaching the construction stage,” said René Muga, general director of Generadoras de Chile. “It can take five to six years for a project to be ready. Even once the EIA has been approved, in order to start building, you need to make sure that there will be no local opposition or appeals to the Supreme Court.”

The HidroAysén project has been hitting the headlines for years. A joint venture between Chile’s main power generators, ENDESA and Colbún, HidroAysén consists of five dams in the region of Aysén. It would provide the SIC with an additional 2,750 MW of installed capacity, representing 20% of the current generation base. Local communities, only partially involved in Chile’s economic development, felt abused by a project tailored for the needs of distant centers of consumption, causing them to protest and spurring new delays.

Uncertainties also remain about linking the project to the SIC. Originally, the plan was to build a transmission line up to Santiago, covering approximately 2,000 kilometers (km). However, a shorter option to the area of Puerto Montt (1,000 km) is now being assessed.

“We still have the uncertainty of where we can inject those five plants,” commented Julio Montero Montégu, HidroAysén’s technical director. “This doubt prevents us from moving forward quicker.”

A few weeks after our interview, Colbún put the whole project on standby by announcing the suspension of the EIA for



KAS
INGENIERIA

Regulation and Energy Markets
Electrical and Hydrologic Engineering
Environmental Management

Our company has adopted the System of Environmental Impact Assessment over 1000 MW Non-Conventional Renewable Energy.

KAS Ingenieria
Brown Norte 694, Ñuñoa, 7790569, Santiago, Chile
Tel/Fax: +56 2 223 23 46 E-mail: kas@kasing.cl
www.kasing.cl

1. Hydro in the Andes. Hatch provided owner’s engineering services to Pacific Hydro’s 111-MW run-of-river Chacayes project, which opened in October 2011. Even though run-of-river hydro projects do not cause inundation or require relocation of communities affected by the project, the companies considered community concerns about the way that construction and long-term operation of the project would affect the environment. *Courtesy: Hatch*



HidroAysén's transmission. According to the company, "as long as Chile lacks a shared energy strategy which details the characteristics of the country's future energy matrix, Colbún thinks that there is no room to develop such big and sophisticated projects."

In an interview with GBR, the secretary for energy of the Chilean government reaffirmed the government's commitment to follow the master plan with an "electric highway" that should clear the way for building the HidroAysén transmission line. Given the circumstances, in the best-case scenario, HidroAysén's five dams will not operate before 2020.

Equipment suppliers are following developments closely. "We are very close to some of the new projects, like HidroAysén and Energía Austral," said John O'Shea, executive director of RTHO, a company specialized in supplying the market with equipment for high-voltage lines. "Unfortunately, the schedule has changed from time to time; last week we had a meeting with ENDESA for the five hydro plants in the southern part of Chile, and the details were quite different from what we knew about three months ago. We are looking at that project anxiously, because it is important for us and for the economy of our country. With its delays, it is attracting a lot of interest from international contractors."

The scale of such projects provides both opportunities and challenges for service providers. Chilean engineering company Poch joined efforts with SWECO and EPS to shape the final EIA study for HidroAysén's five dams. "The study for HidroAysén's power plants, a document of over 10,000 pages, was one of the largest completed in Chile," said Miguel Sanchez, managing director of Poch. "Its undertaking required the management of over 200 specialists. It is risky to allocate more than 25% of your own resources on a single project, so when working on a project of such immense scale, we looked for partners to share the risk of investment and capital requirements. By working with SWECO and EPS, we were able to manage this risk and carry out all of the study's requirements."

On paper, there are no doubts that HidroAysén is a game-changing project. However, the actual timeline fosters doubts. "If it is going to be ready in 2020, HidroAysén cannot serve the needs of the demand in the short term," said Samuel Jerardino, associate director of KAS, a local engineering company. "At the same time, it is foreseeable that solar energy will be a much cheaper source of energy than HidroAysén will be in 2020."

HidroAysén is not the only project ex-

periencing difficulty. Soon after Energía Austral—a joint venture between the Swiss mining company Xstrata and Australian power generator Origin Energy that is planning to construct three additional dams in the region of Aysén for some 1,000 MW—received the green light for its project's EIA, the Supreme Court asked for additional studies to be carried out. Some 3,000 km north, the future of another massive project hangs in the balance. MPX, the Brazilian group chaired by

magnate Eike Batista, is experiencing delays at its Castilla project. The 2,100-MW coal-fired plant had received approval for its EIA when the appeals court of Antofagasta threw everything into jeopardy following an appeal by local communities.

The puzzle got more complex when Chile endorsed the International Labour Organization Convention No. 169, dealing with the rights of indigenous peoples. "That has been an important step for the country, but the fact that the government



HATCH™

**We take the full challenge,
we deliver assets that work**

- ▣ 65 countries – 11,000 people
- ▣ Engineering services
- ▣ Market, interconnection, and specific electrical studies
- ▣ Project implementation services (EPC/EPCM)
- ▣ Management consulting

HATCH CHILE
500 Avda. El Bosque Norte, Piso 12, Las Condes,
Santiago, 755-0092 Chile
Tel: +56 2 430 2600 Fax: +56 2 430 2699
E-mail: mmarchese@hatch.cl www.hatch.cl



A LEADING GLOBAL CLEAN POWER PRODUCER



Canada - Dokie 1 Wind



Iceland - Reykjanes Geothermal



Canada - Toba Montrose Hydro



Chile - Mariposa Geothermal

 **Magma Energy
CHILE Ltda**

TORONTO STOCK EXCHANGE : AXY

For more information
info@alterrapower.ca
T: 562 950 8600
or check our website at:
www.alterrapower.ca

Mario Marchese, Energy Director Latin America, Hatch



has not yet defined how to apply the convention creates much confusion,” said Mario Marchese, energy director Latin America of Hatch. “Companies have to interpret the scope of the convention all the time. Hatch can support them in the developing of specific activities with local communities to make them part of the project. Local communities have to be informed and supported through these specific actions” (Figure 1).

Despite unclear rules, good practice has allowed several projects to develop successfully. “Hidromaule’s Lircay project is unique because of our approach to

nel association to use their consumptive water rights. Hidromaule paid royalties to the association’s 3,600 members for the use of the water, which lowered their yearly expenses. We also performed the necessary repairs to the channel. We made sure to provide them with the solutions they required.”

Still, the costs of the aforementioned delays are impressive. *La Tercera*, a Santiago newspaper, has estimated the amount of investments destined for the Chilean power industry hanging in the hands of local communities and tribunals at over \$18 billion.

A Distorted Free Market

Chile’s economic growth has outpaced its ability to enhance generation, forcing a reliance on diesel generation. “The dispatch of different generating technologies is based on economic merit and demand,” said Rodrigo Cienfuegos, managing director of Energy Partners (EPC), a diesel backup generating company. “Because diesel is expensive, it is dispatched at the end of the demand curve, when there is very heavy demand or a shortage of cheaper generation like water or coal. When EPC started up, we expected to run the engines an average of 500 to 700 hours per year. But due to Chile’s energy crisis, the need for backup generation has greatly increased. EPC currently has an average dispatch of 3,500 hours, which is four to five times more than what was budgeted for.”

The combined cycle infrastructure developed when Argentina was exporting natural gas to Chile now runs on diesel and liquefied natural gas.

community and environmental issues,” says Carl Weber, managing director of Hidromaule.

The company’s Lircay project (a 20-MW run-of-river hydro plant) was listed as one of the 100 most important infrastructure projects worldwide in 2012 by *Infrastructure Journal*. “In Chile, hydro-power projects are normally awarded non-consumptive water rights, so Hidromaule made an arrangement with the local chan-

Alongside backup generators, the combined cycle infrastructure developed when Argentina was exporting natural gas to Chile now runs on diesel and liquefied natural gas (LNG) and accounts for one-third of SIC generation.

This is an expensive path to follow. Diesel and LNG must be imported at high prices. In Chile’s power market, based on the concept of marginal cost (where the last unit of energy dispatched determines

the price), this has resulted in prices spiking. According to figures published by the Organisation for Economic Co-operation and Development (OECD), electricity

José Ignacio Escobar, General Manager, Mainstream Renewable Power Chile



prices in Chile posted a four-fold increase between 1998 and 2011, reaching \$256.4/MWh, way above OECD countries' average price of \$159.4/MWh.

Given this, U.S. shale gas may prove a game-changer. With the U.S. possibly starting to export LNG in a matter of years and the Panama Canal soon ready to allow the transit of LNG ships, Chile can look at U.S. gas as a feasible alternative to Argentinian gas.

Gas Atacama, a company that runs a 370-MW combined cycle power plant in the Atacama region, recently announced investments of around \$400 million in an offshore LNG regasification terminal in the Mejillones Bay. "We have been negotiating contracts to have a liquefaction facility within the two U.S. terminals, Cheniere and Freeport, that are set to become exporters," said Rudolf Araneda, managing director of Gas Atacama. "The idea is to have the gas transported to Chile, to have the infrastructure to regasify in front of our plant, and connect the gas to our pipeline. All of this is subject to securing power purchase agreements (PPAs) with mines; our contracts for these are coming to an end and are based on previous fuel

supplies."

The timeline of the project, according to Araneda, is almost "perfect." "The first U.S. gas exports will probably be in 2016; the Panama Canal expansion will be completed around the end of 2014; the mines will require the power expansion in 2016 or 2017. We need 30 months to build the [floating storage and regasification unit], so it will be ready in time."

Renewables

High prices can be a blessing, especially for renewable energy developers. Generation from NCRE in Chile is stuck at 655 MW, evenly split among wind, biomass, and mini hydro. Also, taking into account the additional 364 MW under construction (315 MW in wind power and 49 MW in mini hydro), the contribution of NCRE to the generation portfolio does not go beyond 5.7%. However, with the costs of renewable energy falling, green energy pioneers increasingly look at spot markets to make their ventures competitive.

Hidromaule's Carl Weber was among the first developers to go on the market when he chose to take on risk for the 20-MW Lircay hydropower plant in 2008. That



Homologated products by Transelec, Dessau, Colbún & Endesa among others.

PROFESSIONALS AT SERVICE OF ELECTRIC ENERGY.

Since 1993, we seek to provide certificate products through a reliable service in high voltage projects. We are a full service supplier always looking for a "better than best" achievement, because **WE CARE**

Almirante Pastene 333 Of. 501, Providencia • Phone: +56 2 264 7700 • info@rtho.com

www.rtho.com 

choice paid off, and today the company turns over \$18 million and has reinvested part of the cash flow in another 14-MW run-of-river plant, Providencia, due online by September 2012. "Chilean small hydro potential is over 10,000 MW," said Pedro Matthei, president of Apemec. "In the next 12 months 1,000 MW of new mini-hydro projects will be filing for an EIA."

Others are following suit. Wind power developer Mainstream closed a deal with Chinese wind turbine producer Goldwind to go on the spot market with its Negrete (33 MW) and Ckani (240 MW) wind farms, planning to commission them by March 2013 and March 2014 respectively. Both are expected to show a capacity factor of over 32%. "There are no structural reasons that can determine a sudden drop in the electricity prices," commented José Ignacio Escobar, Mainstream's managing director for Chile. "The demand is growing more than the new capacity added to the system; hydropower generation suffers from serious droughts; all the big projects are being delayed for social and political issues; last but not least, Chile does not have indigenous fossil fuels, and this leads

the country to take on a big fossil fuel price risk. All in all, the spot market is the ideal marketplace for renewable power developers, at least for the moment."

Service companies are broadening their range of offerings to cope with the demands of these renewable players. RTHO,


although we have to remain interested," said O'Shea, the company's executive director.

Still, factors such as distant transmission lines can hamper profitability and increase risk. In these circumstances, developers must turn to Chile's big private

The desert of the Atacama region boasts world-class levels of irradiation, and solar developers coming from around the world are concentrating efforts in the area.

for example, brings its expertise in high-voltage line equipment and services to the wind sector. "We have been active in all the wind farms already constructed in Chile, but only in the area of pre-injection of power to the grid. It is a very small seg-

consumers to secure a buyer for the energy they produce. "Without a PPA renewable energy developers struggle to move forward because neither banks nor investors would endorse a strategy oriented at the spot market," said Alfredo Schilling, man-




PIONEERING ELECTRIC GENERATION FROM RENEWABLE SOURCES


Sustainability and respect for the environment are our main concerns. Under this guidelines we want to contribute in providing the energy that Chile needs.

Hidromaule S.A. has focused on developing renewable energy projects, using irrigation water from irrigators in the area of the Maule region. Among its projects is the Lircay hydroelectric powerplant of 20 MW currently in operation since October 2008, the Mariposas hydroelectric powerplant of 6 MW, in operation since December 2010, and the Providencia hydroelectric powerplant of 14 MW, currently under construction.


Hidromaule S.A.
 Avda. Presidente Kennedy 5757, Of. 802,
 Las Condes, Santiago – Chile
 Tel/Fax: (+56 2) 963-5200
 (+56 2) 245-3665
 Email: contacto@hidromaule.cl
 Web: www.hidromaule.cl




Lircay Hydroelectric Plant of 20 MW



Lircay Hydroelectric Plant (Aerial View)



Mariposas Hydroelectric plant of 6 MW



Mariposas Hydroelectric Plant (Aerial View)

aging director of Intervento, a wind power developer.

When it comes to securing PPAs, mining companies are the top choice. However, differences between the offer and demand make renewable PPAs difficult to structure. Mining companies have high load factors spread over 24 hours a day, which cannot be met by just wind and solar power. To overcome this challenge, developers are designing more sophisticated contracts. "We need to find a way to combine renewable energy generation with backup generation. In this way, we can back up our generation at any time."

Yet this risks making their offer less competitive. "Besides wind or solar energy costs, you have to add the cost of the diesel generator that is working 60% of the time, because they have a capacity factor that does not go beyond 30%," said Electroconsultores' executive director Francisco Aguirre.

Nonetheless, uptake of these hybrid options is increasing. "Hatch can leverage its experience and suggest blended solutions that take into account a combination of renewable energy with generation from conventional sources. Hybrid plants are more efficient in terms of diesel or gas consumption and show an environmental consciousness without compromising on the safety of the energy supply. As a reference, Hatch is working with Codelco for a 250-MW wind farm in Chuquicamata and with other mining clients looking for opportunities to implement renewable sources," explained Marchese.

Renewable energy developers may receive legislative support from the Ley 20/20. This law, already approved by the upper chamber of Congress and waiting for a green light from the lower chamber, aims to require 20% generation from NCRE by 2020 through a public/private mechanism that should guarantee a price for green energy over a 12-year period.

Regardless of their business model, solar power developers find an ideal setting in Chile. The desert of the Atacama region boasts world-class levels of irradiation, and solar developers coming from around the world are concentrating efforts in the area. So far, ambitions have not been matched by real breakthroughs, but developers are piling up projects, waiting for the right time.

Spanish Solarpack sealed a deal with Codelco to put up a 1-MW solar photovoltaic (PV) pilot plant in Calama. "Calama Solar 3 is going to be the first active power plant in the country," said Jon Segovia de Celaya, director of Solarpack. "With

a 31% capacity factor, it will be the most efficient solar PV plant in the world; secondly, it will work at grid parity, with an electricity price ranging from \$100/MWh to \$150/MWh. The sale of the electricity generated there has already been secured through a PPA with Codelco."

With this first project, Segovia de Celaya expects "to unleash a 'Calama effect'" and have more mining companies closing PPAs. Anglo American and Xstrata's cop-

per mine at Collahuasi is already in the process of tendering 60 GWh per year for supplies from renewable energy projects.

Geothermal's Untapped Potential

Chile has one of the largest underdeveloped geothermal resources in the world; its potential could go from zero to 16,000 MW over a 50-year period. However, only three developers have been granted an exploitation concession following success-

HR
hotrock

**Poised for major growth
Backed by world's largest
geothermal company**

The world is poised for a major expansion in geothermal generation. Geothermal uses natural heat from the Earth's crust to make electricity. It is the **ONLY** clean base-load energy capable of replacing fossil fuel power generation. Geothermal plants have been operating around the world for over 50 years. Hot Rock Limited is focused on developing high value conventional geothermal projects in supportive countries with demand for renewable power. We are active in Chile, Peru and Australia.

BENEFITS ARE:

- EDC has so far committed up to \$150m to be spent on Hot Rock's projects.
- Highly active timetable for 2012 and beyond.
- Outstanding growth potential targeting 3000MWe.
- High quality multiple development projects.
- Highly experienced and internationally regarded team that has been involved in 40% of the world's geothermal capacity.

Head Office +61 7 3212 6200
admin@hotrockltd.com | www.hotrockltd.com | ASX:HRL

bbosch

sustainable and competitive
SOLUTIONS



BBosch has contributed for over 50 years to the development of the power infrastructure in the latin american market. With several facilities, breakthrough technology applications and more than 1600 employees the company is able to provide fast and comprehensive solutions aimed at meeting the needs and requirements of the market. It's our commitment to quality and fulfillment that ensures our success as a services provider dedicated to:

ENGINEERING

Structural Design & Detailing

POWER INFRASTRUCTURE MANUFACTURING

Transmission Towers

Electrical Substations Structures

Solar Panel Support Structures

COATINGS

Hot Deep Galvanizing

Duplex Systems (Galvaplex®)

TRANSMISSION LINES AND SUBSTATIONS CONSTRUCTION

Civil Works

Structural and Electromechanical Assembly

Commissioning & Maintenance



Contact Us: www.bbosch.cl | bbosch@bbosch.cl | +56 2 620 8700
Av. Américo Vespucio 2150, Quilicura, Santiago, Chile

ful exploration campaigns: Enel Green Energy for its Cerro Pabellón development (inferred resources for 50 MW), GeoGlobalEnergy (GGE) for Tolhuaca (75 MW), and Magma Energy for Laguna del Maule (50 MW).

At the moment, GGE is the only company actively drilling and defining the geophysical and geochemical characteristics of its Tolhuaca development. "There is no geothermal development in Latin America," said Rüdiger Trenkle, GGE's managing director for Chile. "We are pioneering, which means that we are taking on additional risks because there is little experience on geothermal resources in the region." Trenkle plans to have two more seasons of drilling before getting to the construction stage and estimates the plant will be running by late 2016.

Magma Energy has a similar timeline for Laguna del Maule. At the moment, the company is looking for a partner to carry out further drilling, beginning in the summer.

"As yet, the country does not have service and drilling industries to support significant work, so one of the challenges is to ratchet up the activity here to sustain them," explained John Selters, Magma Energy's managing director for Chile. "In this sense, the U.S. and other countries have more going for them, because these supporting industries reduce costs. In the central part of Chile, all the necessary equipment is not available to be brought out on a day's notice by a service company. Instead, you have to have it standing by on your project, which is very expensive."

GeoEstrella, a joint venture of drilling companies Geotech and Estrella, is the only drilling company supporting geothermal developments. "Most of the players active in geothermal right now are the larger players," said Matthew Holdeman, managing director of GeoEstrella. "Those that we hope will start becoming active towards the end of this year and next year are more of the medium-sized companies, like Transmark Renewables from Europe; Ormat, based in the United States; EDC from the Philippines; and a number of companies based out of New Zealand."

Philippines' EDC is already active through a joint venture with Hot Rock, an Australian exploration company with six plays in Chile. "Hot Rock is a 30% partner with EDC in its projects in Chile and Peru," said Peter Barnett, managing director of Hot Rock. "The joint venture deal has brought \$1 million per project back into Hot Rock, so we are getting a cash receipt from EDC of \$3 million. We

2. Taking a dip. Bottlenecks in transmission infrastructure should provide good business opportunities for service companies as new projects are developed. According to the government, 200-kV and 500-kV lines worth \$900 million are being tendered this year. This image shows a large vat of hot-dip galvanizing used by Bbosch to cover steel parts with zinc, making them rust-resistant and increasing their useful lives. *Courtesy: Bbosch*



take a cooperating role in the joint venture through the drilling of these first six wells during which we will monitor progress, provide technical support, and co-manage each project.” Barnett added: “We are expecting to commence drilling in 2013.”

To unleash Chile’s geothermal potential, things must be developed on a legislative level. “Geothermal is a very attractive power source, but it has a high front-end risk, which is not usually built into a power company’s business model, and the private risk capital companies, like us, have not been very present until recently,” said Magma Energy’s Selters. “One explanation for this could be that there is some administrative discretion with regard to the development of concessions. After exploration, you theoretically prepare a production plan, which can be accepted or denied; it is possible that the plan of an investor who has spent a lot of money will be rejected by the authority of the time.”

Transmission Blues

Chile’s grid is its weakest link. Lines are overwhelmed and bottlenecks are often to blame for blackouts. Whereas the SING is

stabilizing around an equilibrium between demand and offer, the SIC still has a long way to go. “The real problem is to bring electricity from the south to the central part of the country, something the grid is not always able to ensure,” said Rodrigo Castillo, executive director of Empresas Electricas. “That implies exposure to blackouts and to very high prices.”

The government is tendering new lines: 200-kV and 500-kV lines worth \$900 million are being tendered in 2012. However, investors are cautious because the necessary legal setting is still under development, paperwork is complex, and local communities often affect outcomes. Last May a tender aimed at enhancing the system in the area of Santiago was ignored. The government is trying to address the problem and will present to the Congress the project of an “electric highway” next September.

This electric highway will pave the way for the interconnection of the two main grids. “It is necessary to link the SIC to the SING,” said Victor Hugo Flores, managing director of Bbosch, an engineering and manufacturing company specializing in transmission lines (Figure 2). “There is



Chile’s most progressive renewable energy developer

Mainstream is a leading developer of wind and solar plant in Chile. The company is presently developing over 1,000MW.

Mainstream’s core business is to develop and build superior quality onshore wind and solar plant and sell them to their natural owners – utilities, mines, energy intensive corporations and pension funds.

Working together with local communities, landowners, supply chain partners, government, municipal and provincial authorities, these projects will deliver significant benefits and value to all stakeholders. They will stimulate local manufacturing, create jobs, contribute to Chile’s climate change mitigation objectives and provide energy security for Chile.

For more information, please contact:

Apoquindo 4700,
Piso 10. Las Condes, Santiago, Chile.

Tel: +562 5923100

Email: info-chile@mainstreamrp.com



Interview with Sergio del Campo, Chile's Subsecretary for Energy

Global Business Reports (GBR) spoke with Sergio del Campo (SDC) in June 2012.

GBR: Big projects are increasingly delayed by bureaucratic and legal troubles. What is the government doing to smooth things over?

SDC: The government supports all those projects that comply with Chile's environmental regulations. What Chile needs is an internal electricity price that depends less on the global economy. At the moment, the country is importing 75% of the fossil fuels it needs to generate electricity. For this reason, the government endorses those big hydroelectric projects that have the potential to decrease Chile's dependency on imported fuels and also reduce CO₂ emissions. On the other hand, as thermoelectric generation does not depend on climate conditions, it balances out low hydroelectric generation in dry years in the [Sistema Interconectado Central]. It provides the country with a safe and controlled power supply. Emission rules in Chile are as severe as those in the European Union.

GBR: The government has announced an "electric highway" to speed up construction of new power lines. Can you give us some more details?

SDC: One of the most critical issues that Chile faces concerns the upgrade of its transmission grid. Heavy delays affect the delivering of new transmission lines. Projects that should last 150 working days are taking between 600 and 700 working days. This is why the government has already sent to Congress a bill that

aims to lessen the red tape on concessions and servitude rights.

On another note, we want investors to move forward their investment timeline. In order to do that, we are drawing up a bill that modifies the way investments in power lines are rewarded. Congress should be receiving it in September. At the same time, the industry authority CDEC-SIC is putting out to tender \$900 million worth of power line projects in 2012. That represents a steep increase from recent years, when tenders would not go beyond \$150 million. We can say that the sum of all these measures shape the concept of an electric highway.

GBR: What is the government doing to speed up the incorporation of renewable energy into Chile's energy matrix?

SDC: At the moment, renewable sources generate no more than 3.5% of Chile's electricity. Following the introduction of the law 20257 during the former legislature, power generators are obliged to introduce into the system increasing amounts of green energy. Its ultimate target is to reach 10% of electricity from renewable sources by 2024. The system is bearing some first fruits. On top of that, the government has given out around 80 concessions for geothermal exploration to high-profile geothermal companies. A reform of the geothermal law is also under way so that investors can enjoy a better legislative framework. With regard to solar energy, a public tender for a 50-MW solar pilot plant is due for September. On a broader level, we are thinking of tendering small amounts of renewable energy every year.

POCH
ENGINEERING-ENVIRONMENTAL

- Technical and Economic Feasibility
- Energy Market Studies
- Analysis of Transmission and Interconnection
- Basic Engineering
- Detailed Engineering
- Technical Inspection of Works
- Renewable Energy
- Multicriteria Analysis
- Mitigated Design
- Energy Management, Energy Efficiency and ISO 50.001
- Support Services to Developers and EPCM
- Strategic Environmental Studies
- Environmental Impact Statements, Environmental Impact Studies and Environmental Baselines
- Strategies for Businesses and Communities Relations
- Strategic Environmental Analysis
- Carbon Market

www.pochcorp.com - poch@pochcorp.com

CHILE - PERU - COLOMBIA - BRAZIL - MEXICO - UNITED STATES - AUSTRALIA

no doubt that this is going to determine a better equilibrium between generation and demand. Electricity generated in the north could be sent south and vice versa. This is definitely the way to move forward to serve the growing demand rising from the mining industry."

This will pose technical challenges. "SIC-SING interconnection would ensure a cleaner energy market overall, allowing mines in the north to buy hydro energy from the SIC, although this would come at the cost of a less clean energy matrix for the SIC," said Eric Ahumada, Transelec's vice president of business development. "In order to achieve interconnection, however, technology needs to be taken into account. The SING uses thermal energy and the SIC uses hydro, and the rules for their operation are different. The interconnection will need to be very strong to allow the transmission of power without oscillation in case of contingencies. If we opt for synchronous connection, it will have to be very strong. Otherwise, an asynchronous interconnection using HVDC technology can facilitate energy exchange, allowing the systems to remain separated and respond to their local dynamics." ■

—Written by **Jacopo Dettoni**, **Yana Stankova**, and **Amelia Salutz** of *Global Business Reports* (gbreports.com).