

Schlumberger Commitment to Geothermal Energy in Indonesia

**Schlumberger**



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[www.slb.com/services/additional/geothermal.aspx](http://www.slb.com/services/additional/geothermal.aspx)

**Schlumberger**

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# Geothermal Energy in Indonesia: An Unparalleled Opportunity

Covering a vast part of Southeast Asia between the Indian and Pacific Oceans, Indonesia is a magnificent country with beautiful landscape, diverse cultural assets, and prosperous natural resources. The archipelago is blessed with fertile soil for vegetation, huge mineral deposits, and abundant renewable energy. Yet, Indonesia is still struggling toward energy independence, and about 5% of the Indonesian population (13 million people) do not have the access to electricity.

Located in the Ring of Fire, Indonesia is home to 147 volcanoes (of which 120 are classified as active) stretching from Sumatra, Java, Nusa Tenggara, Sulawesi, to Maluku. This represents nearly 40% of world's geothermal potential reserves, equivalent to 29 GW<sup>1</sup>. As of March 2018, Indonesia is producing approximately 1,925 MW of geothermal power, a small fraction of its total potential capacity. With the rapid growth of Indonesia's population and economy, domestic energy demand is expected to double over the next decade. Thus, Indonesia must expand and develop its geothermal energy resources to fulfill the national electricity needs.

Recognizing the eminent potential for geothermal energy development, beginning in 2014, the Government of Indonesia (GoI) has reformed and implemented several regulations to accelerate geothermal energy development. Moreover, the GoI is promoting potential geothermal sites for development, building new power generation plants, and upgrading the electricity grid, demonstrating its strong commitment to achieve an ambitious plan to generate more than 7,000 MW of geothermal power by 2025.

As a renewable and environmentally friendly source of electricity, geothermal is one of the key resources that can provide Indonesia's future electricity supply. This will require drilling more than 600 production and injection wells at many locations throughout Indonesia. Schlumberger, as the world's leading service provider for the oil and gas industry, is already supporting the implementation of geothermal projects in Indonesia with its integrated innovative solutions, global technical expertise, local resource and experience, and unparalleled service quality. Schlumberger is committed to the development of geothermal resources as a pillar of Indonesia's energy independence and sustainable future.

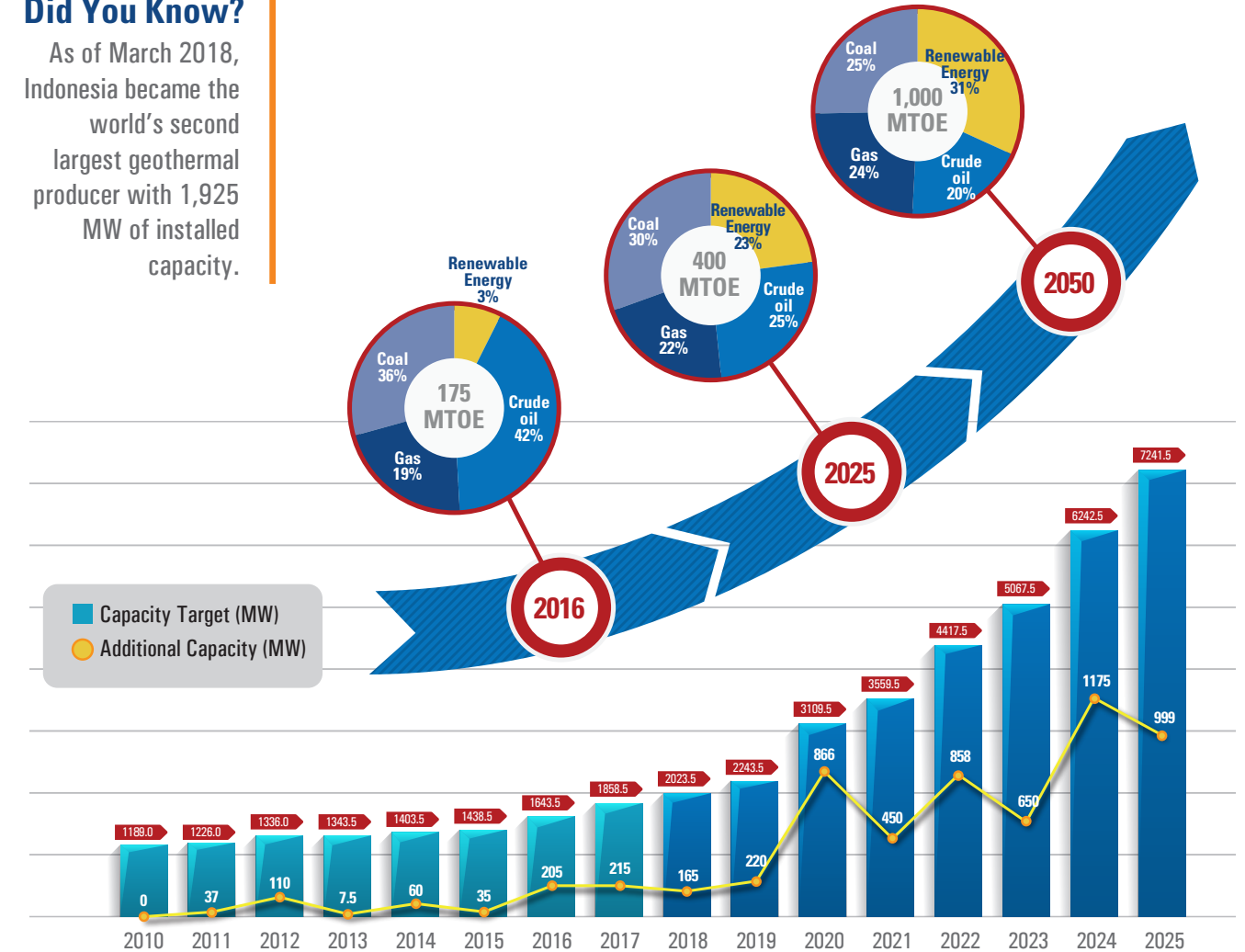


<sup>1</sup> DGNREEC, "Doing Business in Geothermal", August 2017 on <http://igis.esdm.go.id/igis/>



## Did You Know?

As of March 2018, Indonesia became the world's second largest geothermal producer with 1,925 MW of installed capacity.



## Indonesia Geothermal

Total Potential	28,589 MW	or ~ 40% of world reserves
Total Reserves	17,506 MW	
Total Resources	11,083 MW	
Installed Capacity	1,800 MW	or ~ 6.3% of Indonesia total potential

Source: "Power in Indonesia" – PriceWaterhouseCoopers

# Who We Are



Schlumberger is the world's leading provider of technology for reservoir characterization, drilling, production, and processing to the oil and gas industry. Founded in 1926, the company takes its name from Conrad and Marcel Schlumberger, brothers who transformed the industry through the revolutionary idea using of electrical measurements to map subsurface rock formations.

The pioneering attitude of the founders has been the foundation of Schlumberger's success for over 90 years. With a history and culture of science, engineering and innovation, today Schlumberger provides the industry's most comprehensive range of products and services through its various subsidiaries and operating entities, from exploration through production, and integrated "pore-to-pipeline" solutions for reservoir recovery. Our technical solutions in reservoir characterization, well construction and reservoir production management reduce subsurface uncertainty and increase production and recovery, thus optimizing reservoir performance and financial returns.

Working globally, we invent, design, engineer, apply, and maintain technologies that help our customers to work more efficiently and safely-often in remote and challenging locations.

*"Schlumberger always held the conviction that research is an investment in its future and an essential part of the company's culture."*

## The Schlumberger Team

**140**  
Nationalities

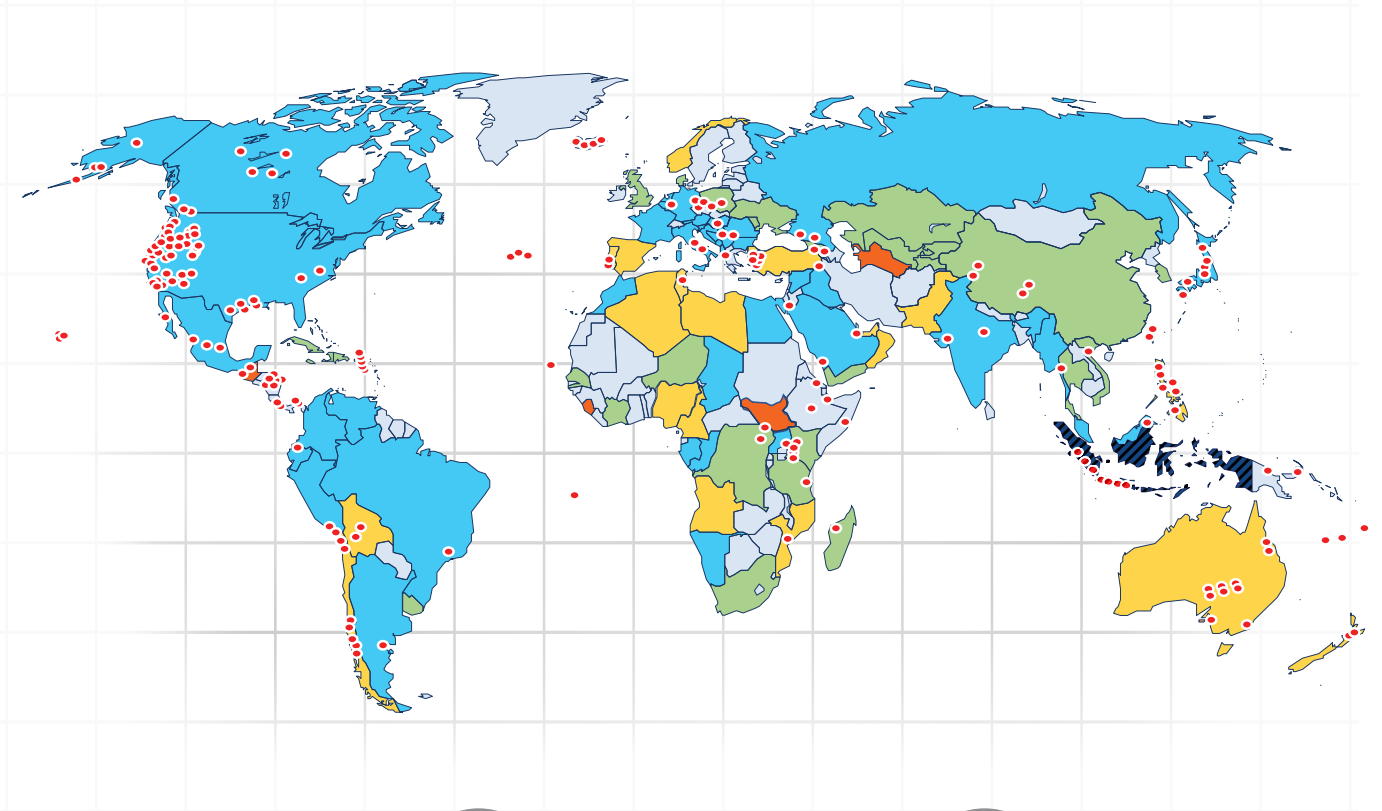
**100,000**  
People

**95**

Research, Engineering and  
Manufacturing Centres

**85**  
Countries

## Schlumberger Global Geothermal Experience



### Years of Schlumberger Presence

- More than 75 years
- 50 to 75 years
- 25 to 50 years
- Under 25 years
- No presence
- SLB Geothermal Projects

**56** Geothermal Countries

**300+** Geothermal Fields

**\$14** Billion in Project Finance

**8,000** MW on Line

# Schlumberger Footprint in Indonesia



**Di mana Bumi Dipijak, Di situ Langit Dijunjung**  
*"Wherever you stand on earth, there you hold up the sky."*

The renowned proverbs of Indonesia carry a particular wisdom that has been distilled over generations. A few offer common-sense observations on human behaviors that reflect the way Schlumberger does business in the country. The proverb above is particularly relevant to Schlumberger because it entreats everyone - regardless of where they come from or find themselves living - to behave and act by showing respect, commitment, dedication, and passion for the place where they abide. This universal insight is at the heart of Schlumberger's culture.



Since Schlumberger started its business in Indonesia in 1930, we have been expanding our footprint with dedicated personnel, leading-edge technologies, and fully capable facilities. Schlumberger Indonesia has employed 4,000 people and contractors and operates 30 supporting facilities that occupy a total area of 400,000 m<sup>2</sup>, including 1 Integrated Office in Jakarta and 4 Oilfield Services Bases in Cikarang, Duri, Rumbai, and Balikpapan.

**Duri Base**

**Rumbai Base**

**Balikpapan Base**

**Cikarang Integrated Base**

**Jakarta Integrated Office**



# Integrated Solutions for Geothermal Project Development

With its intrinsic complexity, the exploration and development of geothermal resources requires an informed, interdisciplinary approach that combines innovative science and engineering with significant experience and hands-on project management. The traditional relationship between operator and multiple service providers results in fragmented, inefficient and low service quality. A scalable and flexible integrated geothermal solution helps address these challenges and allows Schlumberger to leverage its project management expertise and draw on the breadth of its services, to improve the efficiency of our clients project execution.

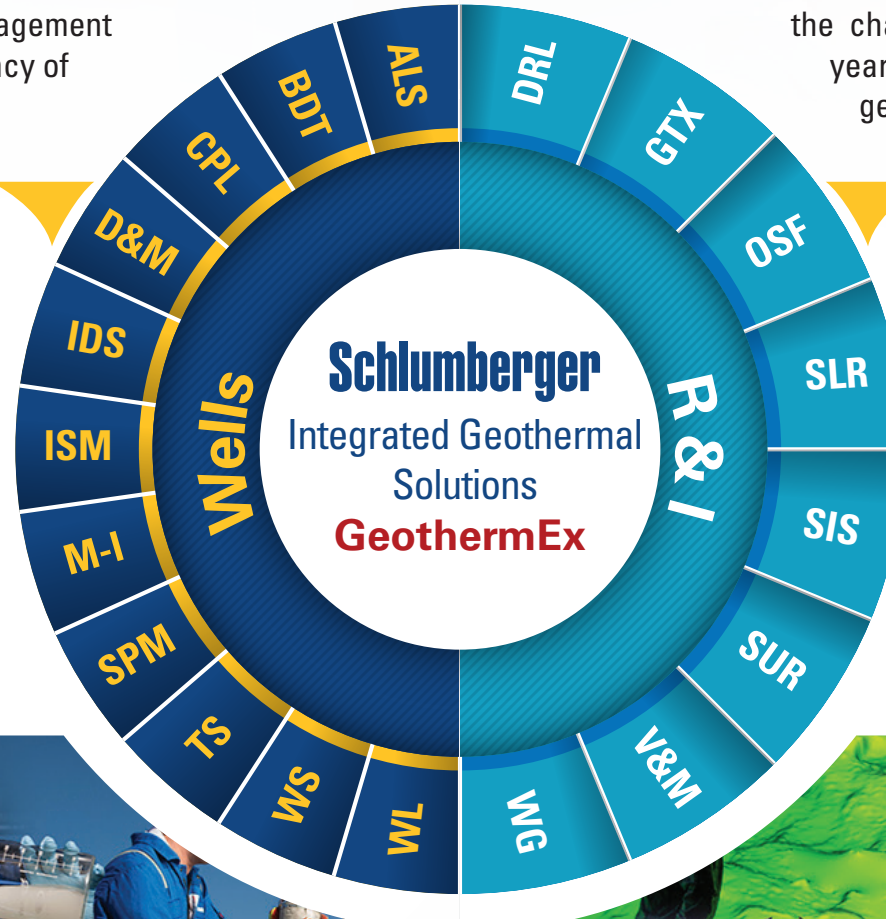
Since its founding in 1973, GeothermEx has provided geothermal consulting and services to a diverse client base. Having evaluated and developed hundreds of geothermal projects in more than 56 countries worldwide, GeothermEx has participated in the successful installation of nearly 8,000 MW of geothermal power generation (about 70% of all operating geothermal projects), enabling more than \$14 billion in project financing. In Indonesia, we have provided solutions to the challenges of geothermal resource development and operations for many years, enabling deals to be closed and projects to be developed, bringing more geothermal power to the grid.

## Wells:

- Artificial Lift Solutions (ALS) ■
- Bits & Drilling Tools (BDT) ■
- Completions (CPL) ■
- Drilling & Measurements (D&M) ■
- Integrated Drilling Services (IDS) ■
- Integrated Services Management (ISM) ■
- M-I SWACO (M-I) ■
- Schlumberger Productions Management (SPM) ■
- Testing Services (TS) ■
- Well Services (WS) ■
- Wireline (WL) ■

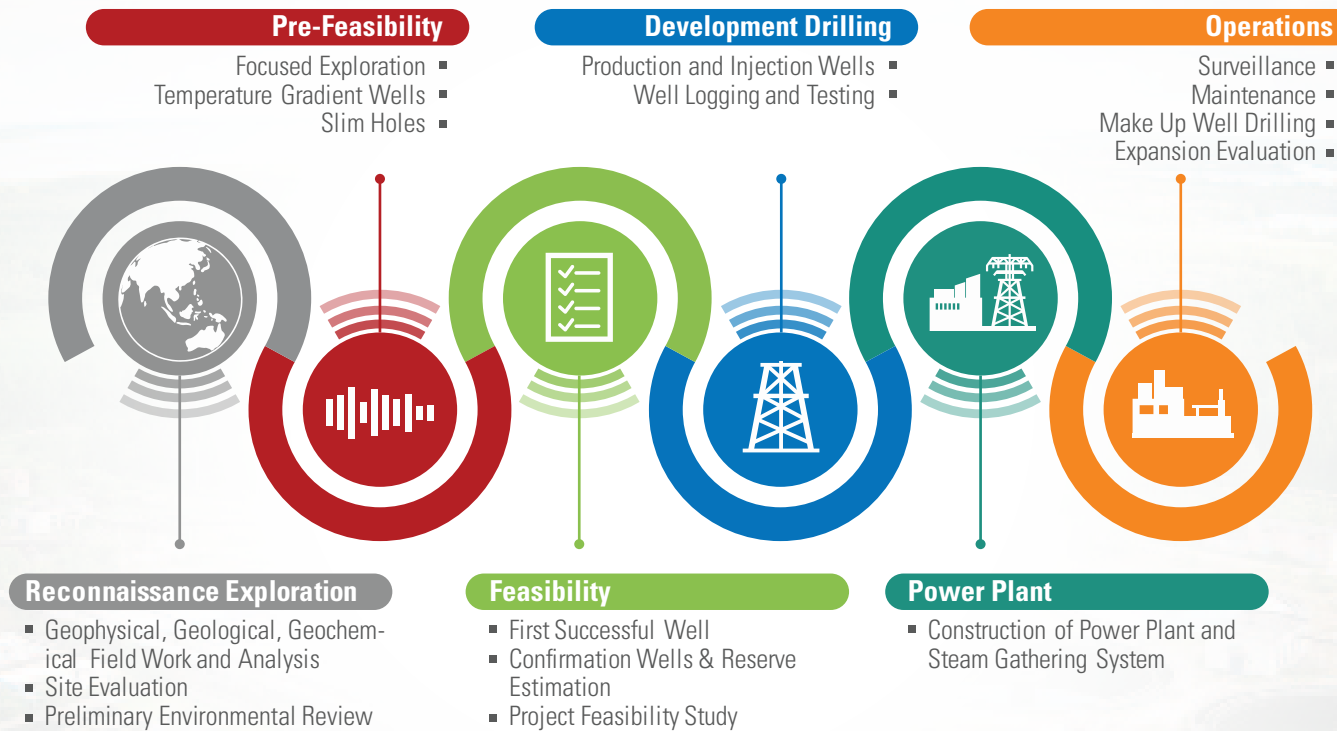
## Reservoir and Infrastructure:

- Drilling Systems (DRL) ■
- GeothermEx (GTX) ■
- OneSurface (OSF) ■
- Schlumberger Land Rigs (SLR) ■
- Software Integrated Solutions (SIS) ■
- Surface Systems (SUR) ■
- Valves and Measurements (V&M) ■
- WesternGeco (WG) ■



Schlumberger and GeothermEx have been collaborating as technical partners for the delivery of geothermal projects all around the world. Together, we offer decades of experience and best-in-class technologies to support the full spectrum of the geothermal resource life cycle -- from reconnaissance exploration and drilling through analysis, project management, financial modeling, operational support, and expansions. Our comprehensive range of services and technologies enable cost-effective geothermal development through increased drilling efficiency and improved success rates of geothermal wells.

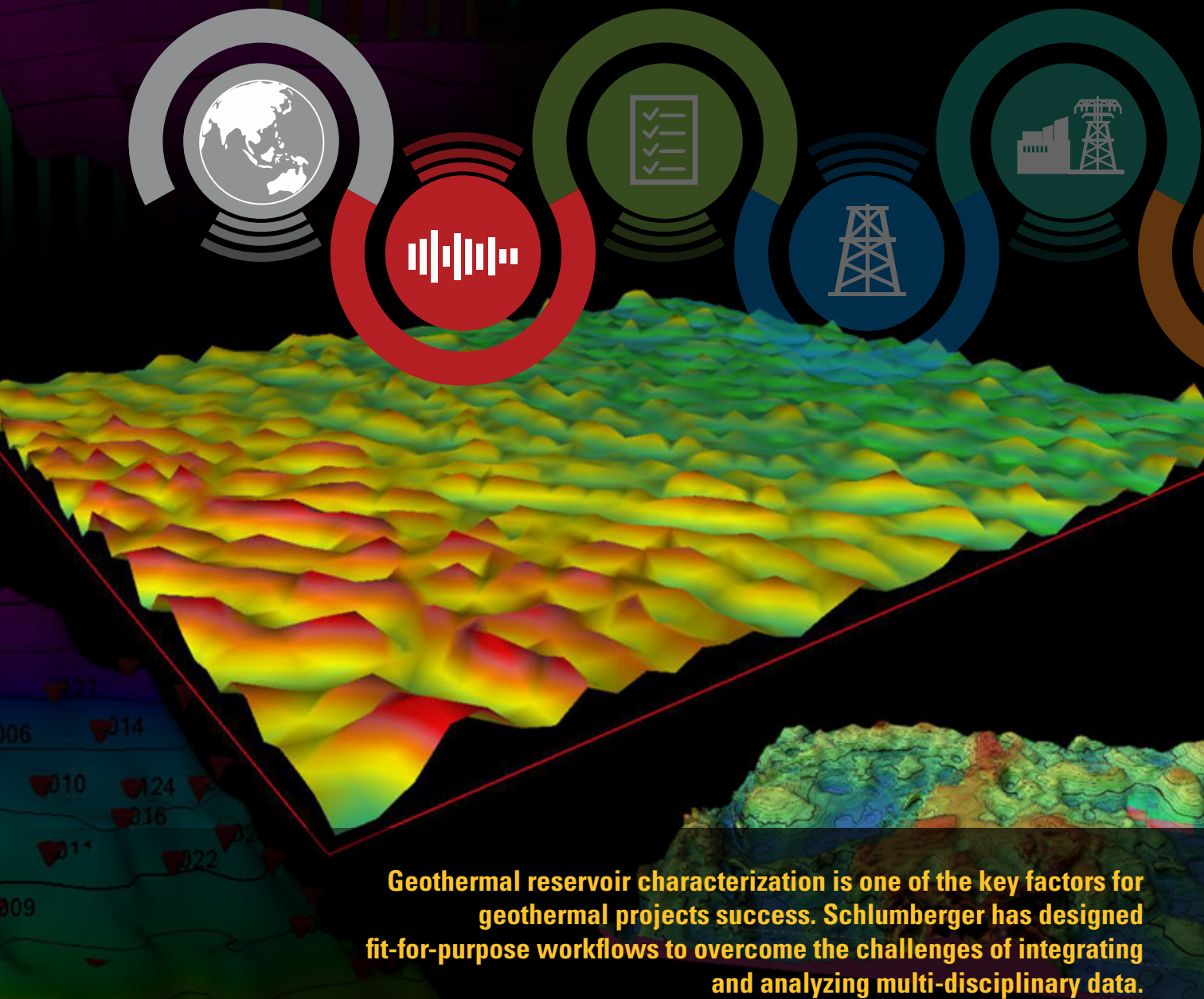
## Geothermal Project Development Stages



Together, Schlumberger and GeothermEx provide geothermal project management services over the full spectrum of exploration and production ventures -- from single-well projects all the way to full-field management. We integrate technology, people, local and global knowledge with the technical teams of our customers to maximize return on geothermal project investment.



## Reconnaissance Exploration and Pre-Feasibility Stage



**Geothermal reservoir characterization is one of the key factors for geothermal projects success. Schlumberger has designed fit-for-purpose workflows to overcome the challenges of integrating and analyzing multi-disciplinary data.**

Before drilling operations begin, subsurface conditions are inferred mainly from surface-collected data (geology, geochemistry and geophysics) collected in the Reconnaissance Exploration stage. GeothermEx analyzes these data to develop a comprehensive conceptual resource model as an integral part of its well targeting process. Importing geoscientific and site data into Schlumberger's Petrel\* E&P Platform initiates the data analysis workflow, facilitating resource visualization, well targeting and well planning.

When additional data from drilling, logging and testing are available, Petrel facilitates geomechanical analyses and development of mechanical earth models (MEMs) to characterize naturally fractured geothermal reservoirs. In addition, Petrel is particularly useful for developing and calibration of numerical reservoir models using Schlumberger's Eclipse\* simulation software, which has been fully adapted to handle the physics of geothermal reservoirs. This allows geothermal reservoir modelers to take advantage of Eclipse's robust parallel processing algorithms that significantly reduce run times, improve model calibration and enables the investigation of multiple well placement scenarios.



When a geothermal well is drilled during the pre-feasibility phase, the formation rock type is updated on the basis of drill cuttings. However, a successful geothermal well might not have a continuous record of the cuttings due to total loss or air drilling operations. The integration of FMI\* borehole image, XL Rock\* sidewall core and Litho Scanner\* geochemical logs can ensure that there is a continuous record of detailed textural and mineralogical information of the reservoir formations. This type of formation characterization provides the foundation for understanding drilling results and targeting subsequent wells.

Because permeability and productivity depend on them, fault and fracture occurrences play an important role in geothermal reservoirs. Surface-collected data provide an initial basis for well targeting. As more wells are drilled, the fault and fracture systems become better characterized and uncertainties are reduced through integrated fracture interpretation with FMI borehole image, sonic and Temperature/Pressure (TP) and spinner logs to improve the conceptual model, understand the geomechanical setting and improve the fracture model, allowing upcoming wells to be planned and targeted with improved formation knowledge.

Together, Schlumberger and GeothermEx offer a unique combination of geothermal experience and leading-edge technologies that have been proven to solve many technical challenges faced during the early phases of geothermal projects.



## FMI-HD – High-Definition Formation Microimager Unveiling the True Potential of Your Reservoir

The FMI-HD\* takes high-definition imaging to a new level of clarity. The visibility and interpretability of small features is significantly increased for all environmental conditions – even across extreme resistivity variations - so environments that cannot be clearly imaged with conventional microresistivity imaging technology can now be seen in great detail. The physics of the FMI-HD measurement makes it a highly versatile reservoir characterization tool that produces complete and reliable answer products.

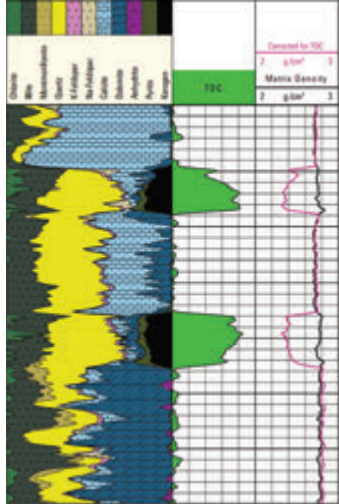
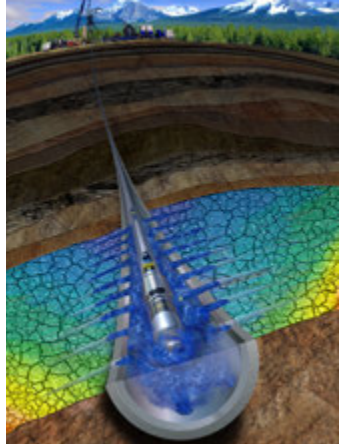
**Case Study:** An operator drilled a well with high Rt/Rm ratio exceeding 4,000:1, posed a challenging logging environment for conventional microimaging. FMI-HD which can acquire images with Rt/Rm contrast as high as 200,000:1 was run and it delivered a clear representative image. Natural fractures, drilling-induced fractures indicating maximum horizontal stress and structures are all readily interpreted from the HD images.

## Litho Scanner – High-Definition Spectroscopy Service Unlocking the Key Elements of Your Reservoir

Litho Scanner\* revolutionizes gamma ray spectroscopy to enable detailed description of complex reservoirs. In addition to measuring key elements in a wide variety of rock formations with higher precision and accuracy than previously possible, Litho Scanner service provides a stand-alone quantitative determination of total organic carbon (TOC).

**Case Study:** Litho Scanner\* service was run to help client determine total organic carbon (TOC) to define reservoir quality in unconventional plays. It accurately and quantitatively determined the TOC weight fraction for numerous formations, as confirmed by measurements on core sample.

Technical Papers: SPE-166284-MS, SPE-166297-MS, and EAGE TH E103 16.



## XL-Rock – Large-Volume Rotary Sidewall Coring Service Uncovering the Secrets of Your Reservoir, Core by Core

Retrieving up to fifty 1.5-in-OD by 2.5-in-long sidewall core samples from a single descent into a well, the XL-Rock\* service closes the gap between continuous conventional core and wireline-conveyed rotary sidewall cores. XL-Rock core samples deliver a rock volume equivalent to conventional core plugs, matching the industry's standard sample size for SCAL measurements and enabling key answers in less time and at lower cost than conventional coring.

**Case Study:** XL-Rock\* service was used while drilling unconventional resource. The resulting sample volume was more than 300% of that retrievable by previous-generation sidewall coring, resulted in improved measurement precision by enabling tight rock analysis (TRA) to be conducted on a single sample instead of having to combine multiple small samples. The holes on borehole wall where sample was extracted are vividly shown up in FMI-HD image, greatly improving the interpretation of well logs and understanding of the reservoir.



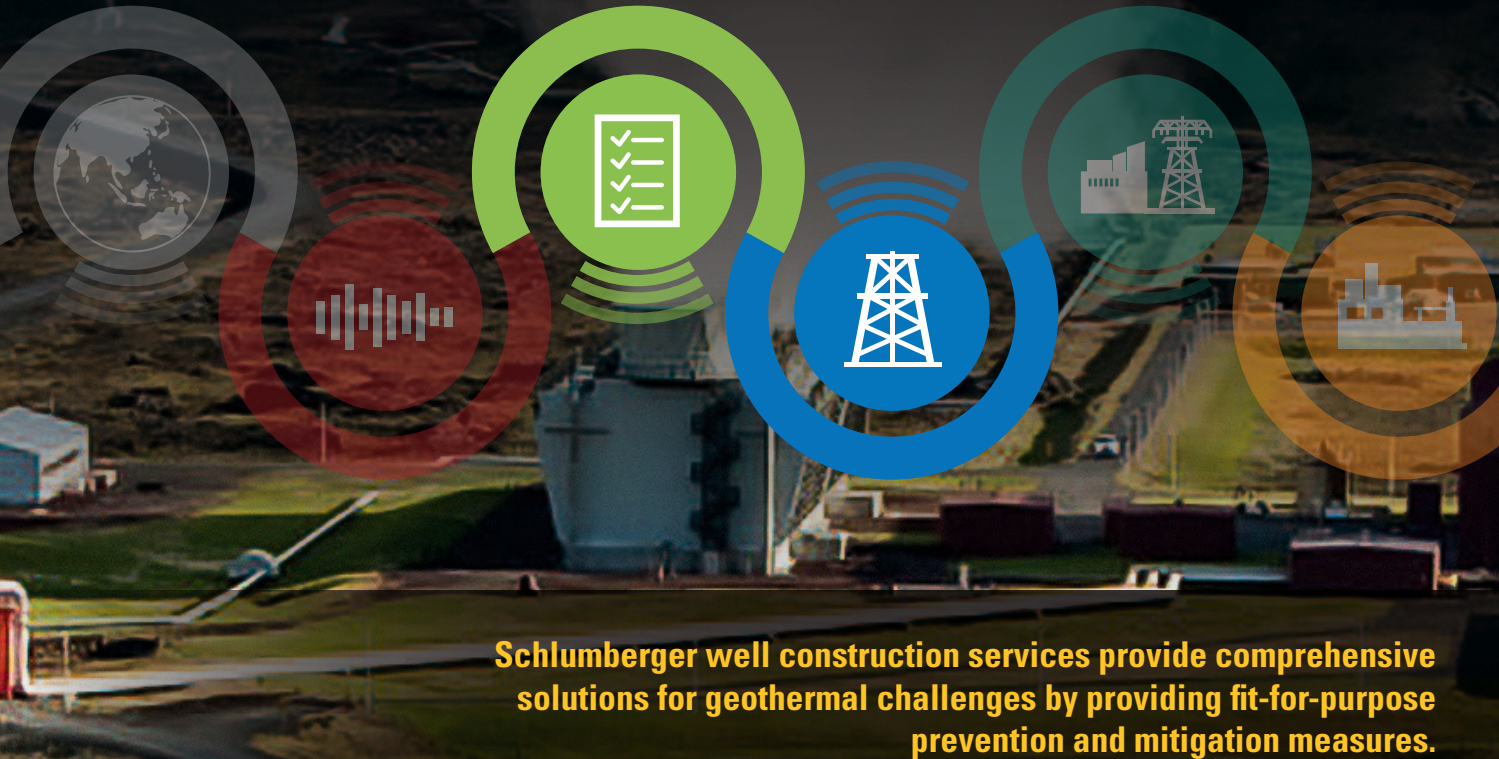


# Feasibility and Development Drilling

Geothermal drilling success can be defined in many ways, but fundamentally refers to the timely completion of a fit-for-use, successful well that has been drilled in a safe manner using the best available technology, while minimizing the overall cost. Managing drilling risks is therefore critical to geothermal drilling success.

The majority of risks affecting geothermal drilling projects are technical risks that are commonly related to the geologic formations being drilled. These risks include (but are not limited to) lost circulation, stuck pipe, high temperature, low rate of penetration, and unstable formations.

Schlumberger's Integrated Drilling Services provides a comprehensive drilling system to evaluate and mitigate these risks.

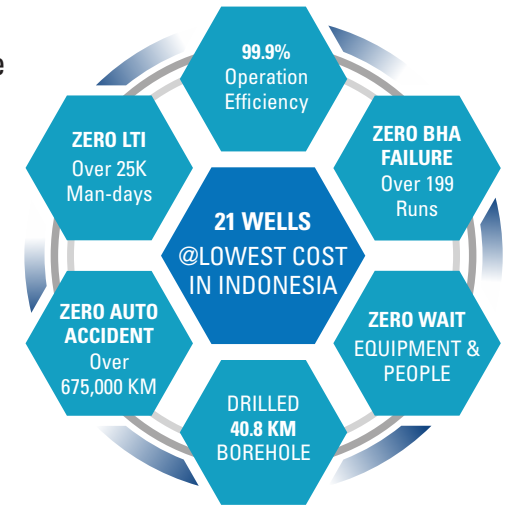


**Schlumberger well construction services provide comprehensive solutions for geothermal challenges by providing fit-for-purpose prevention and mitigation measures.**

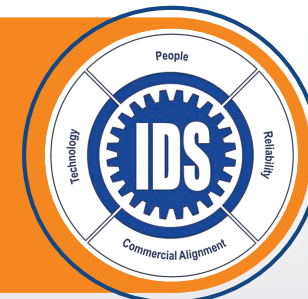
## Integrated Drilling Services (IDS) Increases Overall Geothermal Drilling Efficiency

IDS has an established track record in well construction, where innovative processes, new ways of thinking and application of the latest technology has resulted in increased drilling efficiency in terms of safety and reductions in the cost per foot, total well cost and non-productive time. Since 1995, a major investment in the development of best-in-class processes and systems along with a comprehensive technology solutions has made Schlumberger an industry leader in well construction and interventions. IDS long experience in oil and gas projects has been leveraged for the benefit of the geothermal industry.

Statistics of Ongoing Geothermal Projects in Indonesia



### 20 Years Integrated Project Experience

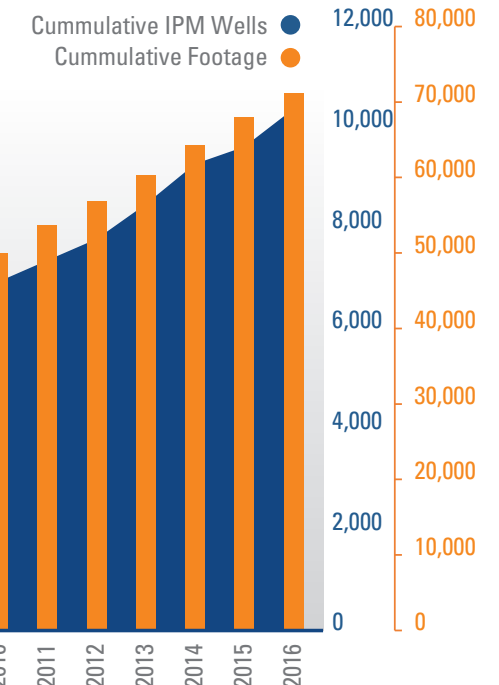


Total Projects: > 350

Total Wells Drilled: > 10,300

Total Footage Drilled: > 70 Million

- 7 Regions
- Average of 50 Rigs Operated Over Last 5 Years
- 86 Active Projects/ Assets
- > 500 3rd Party Suppliers





## IDEAS – Integrated Drillbit Design Platform

IDEAS\* provides 4D, time-based simulations that capture the entire drillstring and wellbore geometry, ensuring accurate modeling of cutting interface designs for drilling rock and milling metal applications. By integrating a suite of solid mechanics and programs that simulate bit-to-rock and mill-to-metal interaction, you can quickly customize your material design in real time, eliminating costly trial-and-error field tests so you can achieve the desired results on the first run.

**Case Study:**  
IDEAS\* software was utilized on the Star Energy geothermal campaign in West Java, to compare drilling dynamics behavior of various BHA configurations in harsh conditions. It supported the collaborative engineering approach, resulted in successful drilling operations, enabling Star Energy to achieve production levels exceeding the plan.

Technical Paper: A Collaborative Engineering Approach to Achieve Success in Geothermal Drilling Application. Presented at the 4<sup>th</sup> IIGCE, Jakarta, Indonesia, 10 – 12 August 2016 and 5<sup>th</sup> IIGW, Bandung, Indonesia, 28 March – 02 April 2016.

## StingBlade – Conical Diamond Element Bit

Leveraging superior impact and wear resistance of Stinger elements, StingBlade\* bits improve footage drilled and rate of penetration while maintaining greater toolface control and minimizing shock in challenging drilling applications that can cause impact damage to conventional bits.

In Indonesia, StingBlade bits have proven to eliminate additional bit runs, additionally reducing exposure time to swelling shales prior to casing.

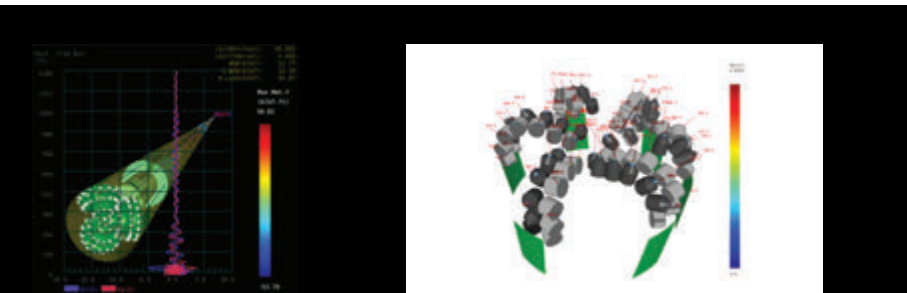
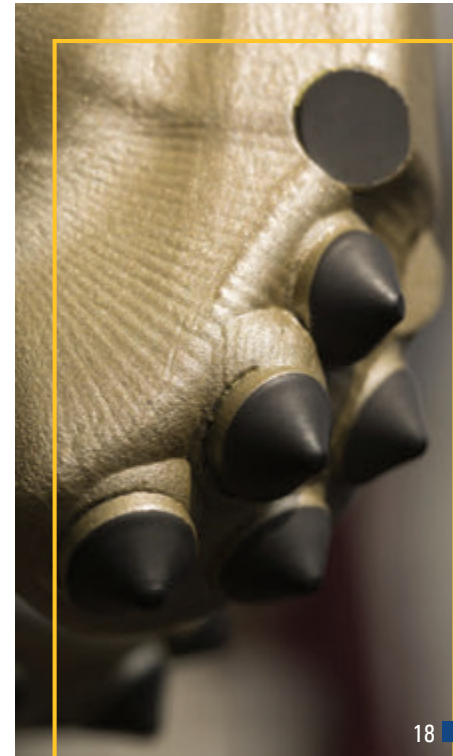
### Case Study:

On a geothermal project in Indonesia, StingBlade\* was offered as the solution to effectively drill hard and abrasive formation. This innovative PDC-based bit leveraged the unique 3D geometry of Conical Diamond Element (CDE) for superior impact and wear resistance. Ran in 12.25" and 9.875" sections, both were drilled to TD in one run with massive ROP improvement. The CDE bits were pulled out of hole in excellent and re-runnable conditions (1-1 and 0-0 cutters dull grade), thus completing a great success story.

Technical Paper: The First Conical Diamond Element Bit in a Geothermal Application in Indonesia. Presented at the 5<sup>th</sup> IIGCE, Jakarta, Indonesia, 02 – 04 August 2017.

StingBlade\* was proposed as a means of more efficient drilling in Offshore Mahakam developed by Total E&P Indonesia. The area has challenging drilling conditions consisting of hard, thick, and interbedded formations, which naturally pose a risk of high-impact damages to PDC cutters. Stingblade\* bits were utilized on 7 wells in three different areas: M, P, and J, resulting excellent ROP improvement of 101.4%, 82%, and 41.3% respectively. The sections were drilled to TD in one run, eliminating two unnecessary bit trips which offset wells had experienced.

Technical Paper: OTC-28314-MS



## GT Motor High-Performance Drilling Motor

PowerPak GT Motor\* provides the highest torque at bit with proven reliability in geothermal drilling applications. Motor failures in geothermal drilling cause operation delays, contributing to cost overruns and ultimately the integrity of the well. To date, Schlumberger PowerPak motors have had superior operational efficiency in all geothermal projects across Indonesia due to the rigorous and robust maintenance processes implemented.

**Case Study:** The Schlumberger drilling system including PowerPak Motor set back-to-back world records for the longest single run by drilling 4,650 m and 5,258 in one run in the first and second well with downhole temperatures up to 150 degC. This performance reduced the number of trips, saving time and money for the operator.

Technical Paper: Integrated Drilling System Sets Back-to-Back Single-Run Records for Encana, Horn River Basin.

## Extreme Electromagnetic (EM) Telemetry MWD

Lost circulation resulting in aerated drilling is a common environment observed in geothermal well construction, creating telemetry problems with mud-pulse MWD. Extreme\* is designed and constructed using the most advanced engineering, design and manufacturing processes to withstand geothermal drilling conditions, modulating signal with Electromagnetic propagation.

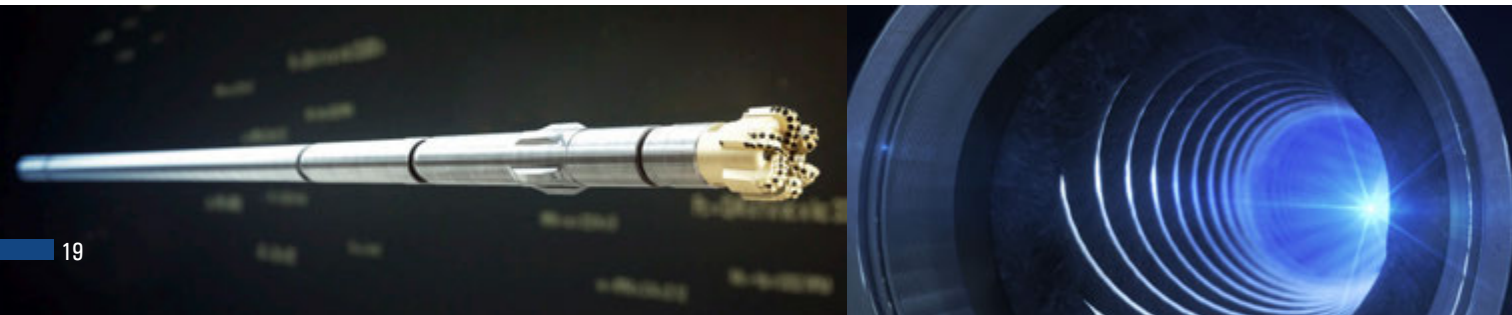
**Case Study:** Extreme\* was utilized in Sorik Merapi Geothermal Power campaign with 100% success rate. From 8 wells drilled, Extreme\* has accumulated a record of 1030 operating hours and 7338 meters footage on 27 runs without a single failure.

Technical Paper: A successful Integrated Services Contract for Exploration and Development Drilling in PT. Sorik Merapi Geothermal Power.

## HydraGlyde High-Performance Water-Base Drilling Fluid System

HydraGlyde\* provides a fast, trouble-free, flexible drilling fluid solution that fits within rigid AFE constraints. Its novel cost-effective chemistry reduces torque and drag in addition to shale swelling and dispersion commonly found in geothermal operations.

**Case Study:** HydraGlyde\* drilling fluid system improves ROP 16% by reducing torque up to 5,000 ft.lbf in challenging interbedded shale formation, making the well as one of the operator's fastest-drilled well in the area.



Extreme downhole conditions in geothermal wells can cause failure within the set cement, posing well integrity risks including metal fatigue, steam breakthrough and loss of zonal isolation. ThermaSTONE\* offers economic solutions for effective wellbore isolation under extreme dynamic thermal and pressure conditions.



### ThermaSTONE Thermally Responsive Cement

Extreme downhole conditions and thermal cycling in geothermal wells can cause failure within the set cement, posing a well integrity risk. ThermaSTONE\* offers an economic solution for the effective cementing under extreme dynamic thermal and pressure conditions. Designed with optimal mechanical properties, ThermaSTONE is able to withstand the extreme pressure and temperature conditions that exist when operating geothermal wells. The ability of set cement to expand and contract in response to the well's fluctuating temperatures reduces stress on the cement sheath, thus maintaining well integrity.

**Case Study:** ThermaSTONE\* was applied for zonal isolation in Canada. This system is designed to have excellent strength, flexibility and thermal properties. It minimizes the mechanical stresses exerted on the cement sheath during extreme temperatures. The applied cement had not leaked even after multiple heating and cooling cycles.

Technical Paper: SPE-157892

# Power Plant and Operations



After drilling operations finish, the next challenge is to produce the well effectively with extreme downhole conditions. Schlumberger provides robust, high-temperature, electric submersible pumps (ESP) to lift geothermal fluids from production wells.



Realizing a consistent, long-term revenue stream requires excellence in operations. This includes surveillance, vigilant monitoring and regular analysis of the resources that supply the power plant. Schlumberger provides Phoenix xt150\* digital well monitoring systems to accurately monitor the reservoir behavior.

## REDA Hotline High-Temperature ESP Systems and Power Cables

Schlumberger's market-leading REDA\* Hotline\* high-temperature ESP systems are based on field-proven, high-performance REDA technology, the recognized world leader in ESP systems for over 80 years. Featuring abrasion-resistant bearing systems and special, durable materials with various coating options, the pumps withstand bottomhole temperatures up to 250°C, and are supported with exceptionally strong cables that utilize patented insulation materials suitable for the same temperature.

## Phoenix Multi-Sensor xt150

The Phoenix xt150\* digital well monitoring system incorporates state-of-the-art, robust high-temperature microelectronics for continuous, accurate surveillance of key downhole parameters. Downhole pressure, temperature, current leakage, and vibration data are monitored and collected to protect ESP system integrity and optimize well performance.

**Case Study:** Schlumberger installed the Hotline ESP system with downhole monitoring gauge. The integrated motor features a full protector and compensation system configured for immediate deployment in the well, eliminating human error and saving rig time during installation. The Hotline system increased run life by an average of 445% and is still running. This improved the customer's total cost of ownership by eliminating unnecessary workovers and deferred production.





Schlumberger and Cameron provide total fluid control for virtually any type of geothermal reservoir, including vapor dominated, liquid dominated, dry hot rock and geopressure. In addition, our systems can be used on thermally enhanced (steam injection) recovery, waste disposal, and hot water wells. No matter where in the world, we provide geothermal systems to meet your needs.

### FOSTER Conventional Geothermal Wellhead System

The FOSTER\* system has earned a worldwide reputation for reliable service. It incorporates years of proven design, static sealing elements, and an array of design configurations which are cost-effective, safe, and dependable.

### WKM Pow-R-Seal Geothermal Gate Valve

WKM Pow-R-Seal\* gate valve have been successfully employed for over 40 years in geothermal steam service; in flow lines; and as master, wing and casing head valves on wellheads. These valves meet API 6D and 6-A requirements and are ideal for manifold, processing, steam and hot water applications. The Pow-R-Seal geothermal steam valve has all the inherent advantages of the through-conduit design, which make it ideal for a hot, abrasive service.



# Local Experts with Global Reach



*The large geothermal energy potential in Indonesia is a great opportunity for the nation, clean energy businesses and investors. Schlumberger's approach to geothermal development is creating value based on experience, innovation and commercial alignment with geothermal operators. Working closely with geothermal operators to create such value has always been the highlight of my professional career.*

*Schlumberger Integrated Drilling Services (IDS) product line has over 20 years of experience in project management, technology application and effective / flexible business models. We are in a unique position to integrate geothermal subsurface characterization knowledge into well construction with the focus of reducing project risks. This is enabled through involvement of Schlumberger various subsurface products lines such as GeothermEx, SIS, WesternGeco, and Wireline.*

*To date, Schlumberger has successfully implemented integrated business models on several major geothermal development across Indonesia.*

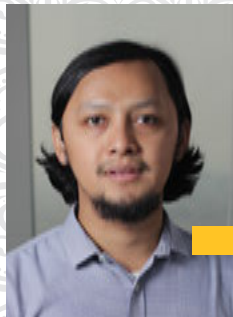
## Mousa Namavar

Geothermal Business Manager  
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*Successful geothermal projects require proper and in-depth planning from all aspects, starting with social community all the way to managing downhole drilling risks. Schlumberger's vast experience in project management will benefit geothermal operators to execute projects in the most cost effective and efficient way. Having the biggest portfolio, SLB delivers not only products and services to our customers, but also takes the operations on an extraordinary journey through seamless integration of different product lines unmatched by others in the industry.*



**Febra Sakti Dewa**  
Geothermal Project Manager  
[FDewa@slb.com](mailto:FDewa@slb.com)



*Using the IDS model, Schlumberger has been engaging with major geothermal operators in Indonesia starting in 2013, bringing a value proposition of expertise, performance and cost efficiency through integration of drilling services. As part of that big group, Schlumberger's Drilling & Measurements (D&M) experts in Indonesia have entered the geothermal business with a vision of applying the techniques and workflows that have been effective for more efficient oil & gas wells to the geothermal environment. Because the geothermal environment is very different from the oil & gas environment, IDS and D&M are meeting this challenge by adapting and systematically using tools (such as PERFORM Tool Kit, PTK) to continuously improve drilling performance for geothermal wells.*

**Agus Ziyad Kurnia**  
Senior Drilling Engineer  
[AKurnia2@slb.com](mailto:AKurnia2@slb.com)



*Having worked more than 16 years characterizing O&G reservoirs, one of the things that drew my attention towards geothermal was the renewable aspect of it, how much potential there is in Indonesia, and especially the many technical challenges involved in exploring and developing geothermal resources.*

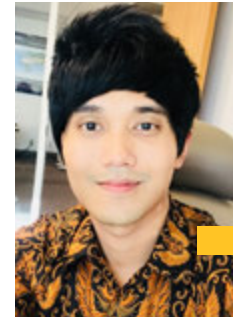
*During the last 5 years, the Software Integrated Solutions (SIS) team in Indonesia has developed bespoke geothermal workflows that seamlessly integrate data from a wide range of disciplines (e.g., geology, geophysics and wellbore image logs). At the center of the solution is a living model, which can be used from initial exploration through to operations, allowing geoscientists and reservoir engineers to understand and resolve the uncertainties throughout the project life cycle, and make more informed decisions.*

**Paul Hultzsch**  
SIS Geoscience & Integrated Consulting Business Owner  
[PHultzsch@slb.com](mailto:PHultzsch@slb.com)

*Indonesia's progress over the past decade has created a geothermal momentum that cannot be ignored and deserves to be recognized. There has been a remarkable series of legislative decisions that balance three important factors: preserving the position of state-owned enterprises; protecting Indonesia's unique and fragile environments and ecosystems; and encouraging private participation in the geothermal sector. In itself, this is a great achievement. Still - as in any country - more can be done in Indonesia to continue to accelerate the pace of geothermal development. For example, the regulatory process can be further streamlined by intense coordination to align the goals of ministries and departments, and technologies can be applied to increase the efficiency of exploration, drilling and power plant construction. Having worked on Indonesian geothermal projects since the early 1990s, I am in awe of Indonesia's geothermal potential and look forward to the day when Indonesia takes its rightful place as the world's most pre-eminent geothermal country.*



**Ann Robertson-Tait**  
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*My Schlumberger career began in Balikpapan, working as a Borehole Geologist doing detailed formation evaluation for the oil and gas industry. This work continued with projects in Kuwait, Canada and the United States. In early 2016, I joined GeothermEx in California and began characterizing geothermal reservoirs in Indonesia, The Philippines, Iceland and Turkey. I have recently transferred back to my home country to participate more directly in Indonesia's dynamic geothermal development environment. My geothermal objective is to apply the worldwide experience of Schlumberger and GeothermEx to identify, characterize and develop Indonesia's geothermal reservoirs, and provide clean electricity to more people in the Republic of Indonesia.*

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