Proceedings World Geothermal Congress 2020+1
Reykjavik, Iceland, April - October 2021

An Alternative Drilling Contract Type (Non IPM) for Geothermal Exploration and Development Drilling

Boga Isa

Geothermal Drilling Consultant

E-mail: bogaisa@gmail.com

Keywords: Drilling, Business Strategy, Contracts, Explorations, Organizational Capability, Bundled Contract, Non IPM Contract.

ABSTRACT

One of the key elements of successful drilling campaign is the drilling procurement and contracting plan. Selecting the qualified reputable contractors is important. However, selecting the right contract type to engage the qualified reputable contractor is more than important.

There are at least three drilling contract types that have been used for geothermal exploration and development drilling in Indonesia: 1. Discrete contract; 2. Semi-IPM Contract and 3. IPM Contract. Based on recent data presented by Indonesia Directorate of Geothermal, Ministry of Energy and Mineral Resource, the Semi-IPM and IPM Contract have been dominating the contract type used by geothermal operators in Indonesia for geothermal exploration and development drilling for period of 2010 – 2018.

In 2014 a Bundled Services Contract Type, An Alternative Drilling Contract Type (Non IPM), was introduced by new geothermal operator in Indonesia. The main reason of introducing the Bundled Services Contract Type is lean drilling organization had by the geothermal operator to execute the exploration drilling program. The operator only had two drilling experts to run the procurement and contracting process and therefore the Bundled Services Contract Type was proposed to integrate drilling services as many as possible; to simplify the tender process, to simplify contract management and ultimately to simplify operations.

As a result of using a Bundled Services Contract, the cost per well of Bundled Services Contract is found to be cheaper compared to the cost per well of Semi-IPM and IPM Contract. Indonesia Directorate of Geothermal, Ministry of Energy and Mineral Resource has analyzed and has presented that the cost per well of Bundled Services Contract Type is categorized as top tier and very competitive together with Discrete Contract Type for geothermal drilling in Indonesia. The average cost per well of Bundled Services Contract Type is US$ 3,027 per meter compared to average cost per well of US$ 3,963 per meter for Semi IPM Contract Type and US$ 5,411 per meter for IPM Contract Type. The average cost per well for Discrete Contract Type remains to be the best with average cost per well of US$ 2,930 per meter. The used of Bundled Services Contract Type is increasingly in demand in Indonesia.

THE CONTRACT TYPES IN INDONESIA

Drilling geothermal wells are very high risks and require high investment. The total Capital Expenditure (CAPEX) to drill geothermal wells can be up to 40% of the overall project cost. The top management should be aware of drilling risks and cost related and also well integrity risks before discussing the drilling preparation in detail. Once the management approves the drilling AFE, drilling engineer will advise the well cost considering the drilling risks that may occur during drilling execution. This explanation is important for management and shareholder to understanding how high risks the drilling project is.

Having experience drilling personnel is very important for the success of the project. Geothermal operator shall have at least two key drilling personnel that have significant and extensive drilling experience on planning and executing drilling project in geothermal and in oil and gas industry.

Having procurement and contracting plan is also important to achieve the project goals and to deliver wells within the drilling AFE budget. There are at least four main reason in conducting tender process:

1. To get qualified and reputable contractor;
2. To get high standard performance to achieve the project objective;
3. To get competitive price; and
4. To comply with internal process and local regulation.

The tendering process shall also be executed fair, transparent and to promote healthy, orderly and competitive climate. The support from procurement, contract and legal personnel are required to aim the objective of tendering process.

Before 2014, there are at least three drilling contract types that have been used for geothermal exploration and or development project in Indonesia: 1. Discrete contract; 2. Semi-IPM Contract and 3. IPM Contract.

The discrete contract type is used when the operator has big and complete organizational capability to work on the drilling planning, to conduct procurement and contracting process (tender process), and to execute the drilling plan. The operator who selects this type of contract is also known as an active drilling operator who has continuous drilling program throughout the year. This contract type is also normally used for drilling a make-up wells (development well). Chevron Geothermal, acquired by Star Energy in 2017, is known as the operator that uses this contract type.

The IPM contract type is used when the operator has no organizational capability to work on the drilling planning and to execute the drilling plan. The operator usually only has a project manager type role who manages the IPM contract and deals with the contractor. This contract type is normally used for drilling exploration wells. However, this contract type is also used for drilling development wells recently. The scope of work for an IPM contract is not only focusing on the drilling aspect but also other aspect such as construction, permitting, community relation, security and etc.

The Semi-IPM contract type is used when operator has wide-ranging exploration areas that are difficult and challenging as a marginal business. The operator who selects this type of contract has the organizational capability but would like to simplify the procurement and tendering process by having one contractor as the IPM leader with the scope of work purely in drilling aspect. Pertamina Geothermal Energy is known as the operator that selects this type of contract. This type of contract can be used for development drilling or exploration drilling.

It is believed that key factor that makes real difference on each contract types is the organizational capability, the experienced drilling personnel. It is not only about how long the drilling personnel has been working in drilling but also real experience on planning and executing the drilling project in geothermal and oil and gas industry. Having strong and extensive drilling organizational capability will drive the success of executing the drilling project with the selected contract type.

DRILLING ORGANIZATION STRUCTURE

The Drilling Organization Structure comprised of a Drilling Planning and Drilling Operations Team. During early exploration stage, minimum number of drilling personnel is usually enough to plan the exploration program. Once the exploration program become firmed to drill exploration wells, the number of drilling personnel shall be increased but this subject to contract strategy that will be chosen by the operator to execute the exploration drilling. The Figure 1, 2 and 3 below shows some forms of Drilling Organizational Structure.

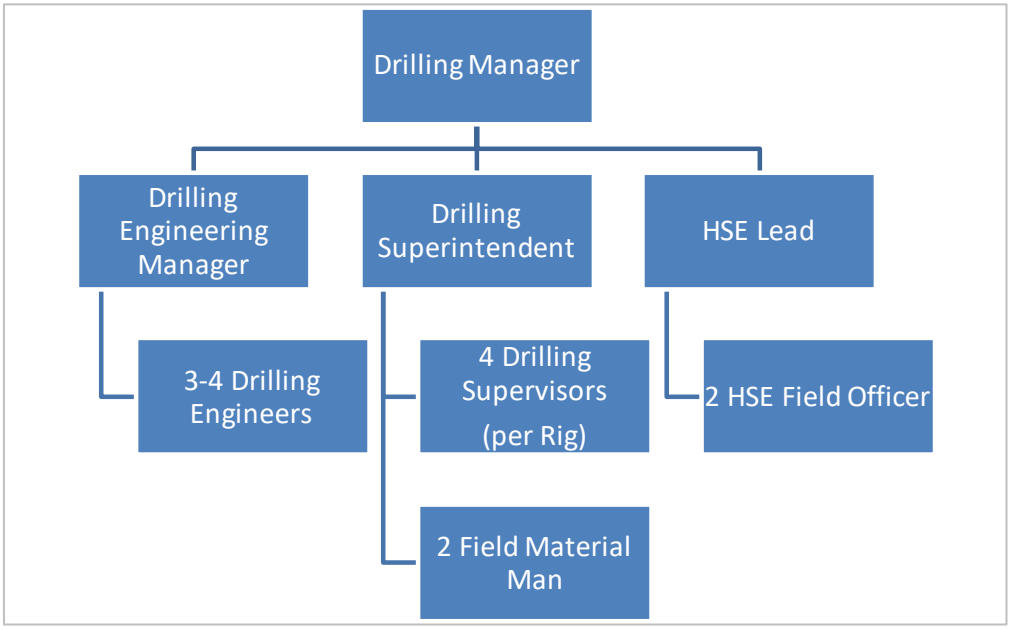


Figure 1 – Big Drilling Organizational Structure

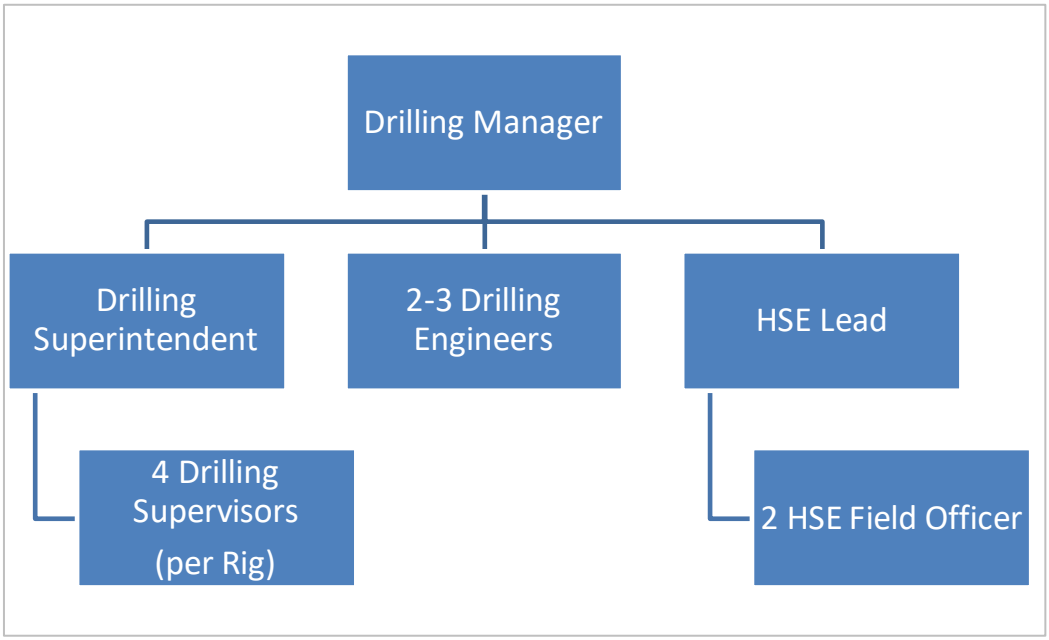


Figure 2 – Medium Drilling Organizational Structure

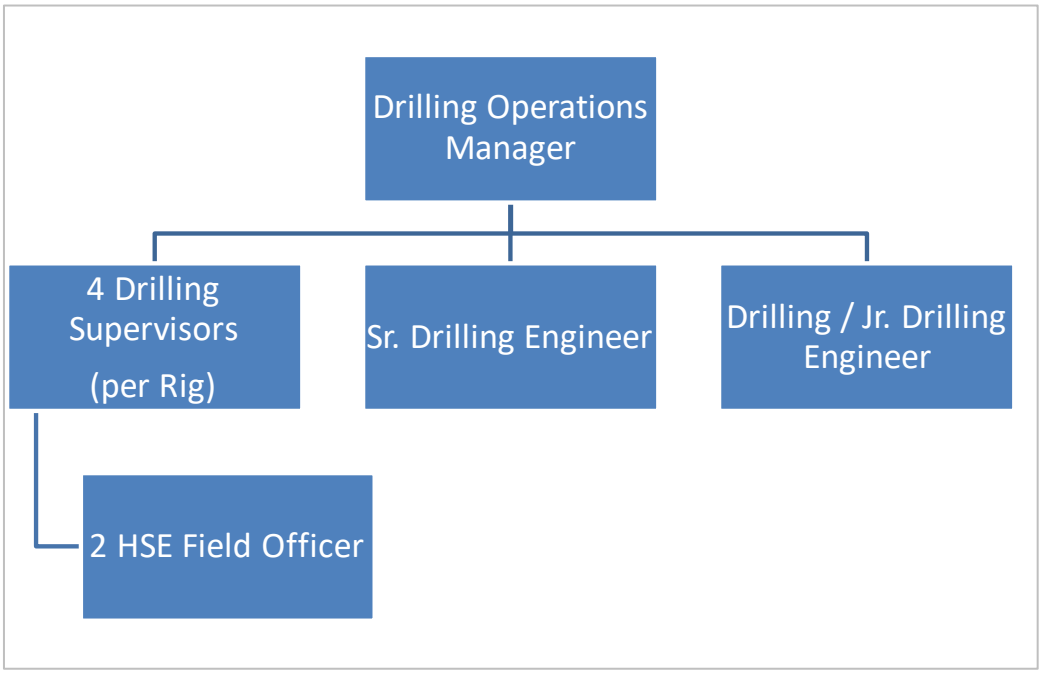


Figure 3 – Lean Drilling Organizational Structure

DRILLING PROCUREMENT AND CONTRACTING PLAN

There are at least three steps of drilling procurement and contracting plan:

A. Well Design and Contract Scope of Work

There are at least two geothermal wells design in the world: 1. Standard Well Design and 2. Big Hole Well Design. The well trajectory for both designs is usually a simple 2D model "J" type profile with hole inclination ranging from 0 deg up to 60 deg inclination with 1-5 deg/100ft Dogleg. The static reservoir temperature is up to 350 deg C with bottom hole pressure usually not exceeding 1000 psi at the surface. Multiple fractures are anticipated when drilling the reservoir section covered by perforated production casing liner where drilling with losses is anticipated.

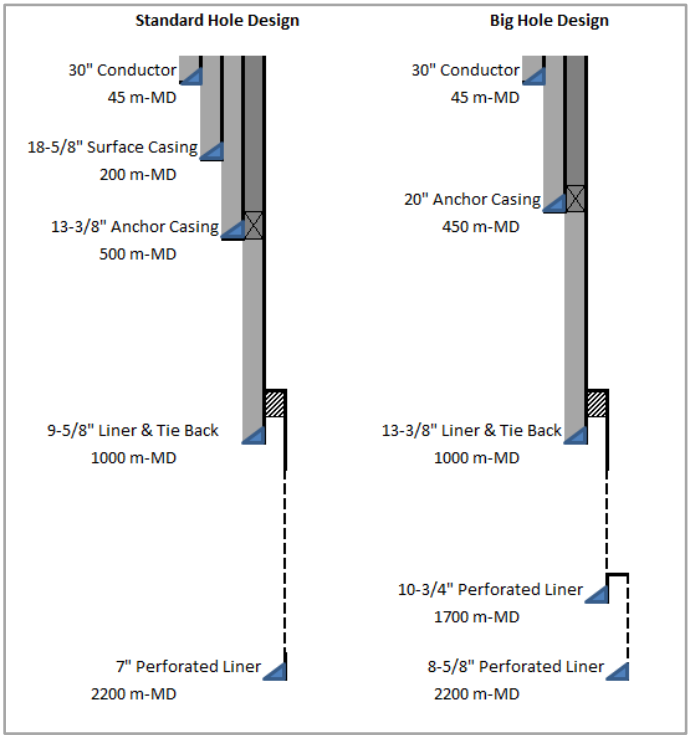


Figure 4 – Geothermal Well Design.

After finalizing the basis of well design, the procurement and contracting process will be executed based on the procurement and contract timetable which must satisfy the project schedule or target spud date of the first well. Figure 5 shown an example of procurement and contract timetable for

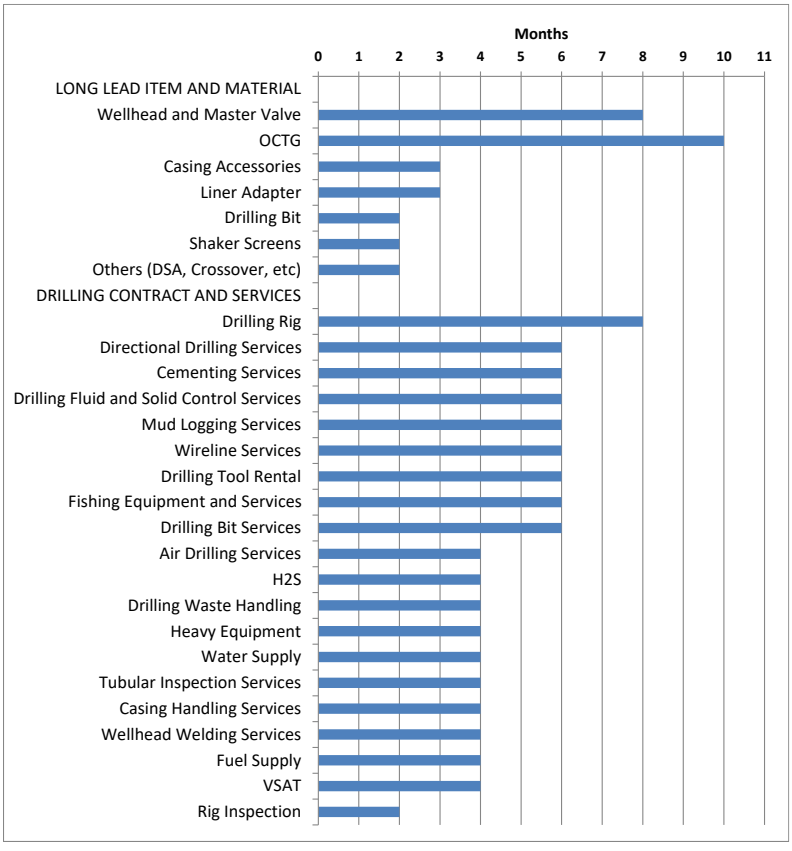


Figure 5 – Procurement and Contract Time Table.

B. Review of Drilling Contract Types

Selecting the qualified reputable contractors is very important. However, selecting the right contract type to engage the qualified reputable contractor is crucial.

Review of drilling contract types that have been used in Indonesia for geothermal drilling exploration project was conducted to understand the advantage and disadvantage of each contract types. Figure 6 has also shown the advantage and disadvantage of each contract types. The comparison between contract types is also made to understand the difference of each type. Figure 7 – Drilling Contract Types Comparison.

CONTRACT TYPES	ADVANTAGE	DISADVANTAGE
Discrete Contract	• Competitive Price • Qualified contractor for each services • Less risk of dispute in contract • Better contract ownership • Operator has organizational capability and technical expert to execute the contract • Technical personnel more familiar on the contract clauses • Contractor receive direct instruction from company	• Require more man hours to do tender process and contract monitoring for multiple contracts • Relatively longer time to complete procurement and contract process • Multiple contract representative • Non Productive Time (NPT) will be applicable to single contractor only • Excess in inventory
Semi IPM	• Less tender process • Less workload for the Operator • Operator has organizational capability and technical expert to execute the contract • Less contract representative	• High cost is expected • Medium-High risk of dispute in contract • Operator cannot control sub-contractors of the IPM Contractor
IPM	• Only one tender process • Require less personnel to complete the contract • Operator may not need technical expert team • Contractor to build organizational capability to deliver the project not the Operator • Drilling risk that associated with over budget from well cost will be contractor responsible • Non Productive Time (NPT) will be applicable to IPM Contractor including the Sub-contractor. • No excess inventory • Single contract representative • Operator will focus on the project goals not the detail	• High cost is expected • High risk of dispute in contract • Operator cannot control sub-contractors of the IPM Contractor • Operator still requires technical expert to tackle the technical aspect during planning and execution (double man power cost)

Figure 6 – Contract Types Advantage vs. Disadvantage.

Description	Discrete	SIPM	IPM
Scope of Work	Individual	Semi-Integrated	Integrated (Drilling and Non Drilling)
Operator Risk	Low	Medium	High
Project Manager	Company Rep	Contractor Rep	Contractor Rep
Well Cost	3.5-6 M	6-10 M	8-12 M
Resources	> 10 person	3-5 person	1-3 person
No of Contract	> 25	2-5	1
Dispute Risk	Very Low	Medium High	High
Procurment Time (Tender)			
Materials	6-9 months	6-12 months	6-12 months
Services	9-12 months	9-15 months	9-18 months
Interface	> 15 Reps	3-10 Reps	1 Reps
Penalty	Individual	All Services	All Services
Excess Material	Yes	Yes	None
Master List Facility	Company To provide	Company To provide	None
Tax Over Tax	None	Sub Contractors to SIPM	Sub Contractors to IPM
Double Profit	None	Sub Contractors to SIPM	Sub Contractors to IPM
Mob/Demob	Individual	Individual	Share
Lesson Learnt	Minimum	Available	Available
Vendor List	Lot	Adequate	Adequate
Charging Method	Direct to Company	To SIPM Leader-To Company	To IPM Leader-To Company

Figure 7 – Drilling Contract Types Comparison.

C. Selection of An Alternative Drilling Contract Type (Non IPM)

After review of drilling contract types, the discrete contract type is preliminary concluded very attractive compared to the Semi-IPM and IPM Contract. The full control from drilling planning stage to drilling execution stage, from procurement and contract process to drilling execution process, can be achieved with the discrete contract type. However, this contract type requires Big or Medium Organizational Structure to execute the contract process and to execute the drilling operations later.

For geothermal explorations drilling project, the discrete contract type may not be suitable since the geothermal resource has not yet been proven. A Semi-IPM or an IPM contract type seems to be more attractive since operator normally has limited organizational capability during the explorations phase.

For lean drilling organization structure An Alternative Drilling Contract Type (Non IPM) is introduced and called as a Bundled Services Contract Type. This contract type is not a semi IPM Contract nor an IPM Contract. This contract is a modified contract between discrete contract and Semi-IPM contract to fit the lean drilling organization, usually during explorations stage.

This non IPM contract type basically differentiates the drilling procurement and contract plan into four (4) categories:

1. Procurement of Long Lead Item and Material
2. Provision of Drilling Rig
3. Provision of Bundled Services
4. Provision of small discrete contract

With four categories mentioned above, the provision of bundled services contract reduces the number of contracts from 30 contracts for discrete contract type to less than 20 contracts. The comparison of the bundled services contract to other three contract types is also made to see the difference.

Description	Discrete	SIPM	IPM	BUNDLED SERVICES CONTRACT
Scope of Work	Individual	Semi-Integrated	Integrated (Drilling and Non Drilling)	Semi Integrated
Operator Risk	Low	Medium	High	Low
Project Manager	Company Rep	Contractor Rep	Contractor Rep	Company Rep
No of Resources	> 10 person	3-5 person	1-3 person	3-8 person
No of Contracts	> 25	2-5	1	< 20
Well Cost (in Million USD)	3.5 - 6	6 - 10	8 - 12	4-6 M
Dispute Risk	Very Low	Medium High	High	Low
Procurment Time (Tender)				
Materials	6-9 months	6-12 months	6-12 months	6-9 months
Services	9-12 months	9-15 months	9-18 months	5-8 months
Interface	> 15 Reps	3-10 Reps	1 Reps	3-10 Reps
Penalty	Individual	All Services	All Services	Hybrid
Excess Material	Yes	Yes	None	Yes
Master List Facility	Company To provide	Company To provide	None	Company To provide
Tax Over Tax	None	Sub Contractors to SIPM	Sub Contractors to IPM	None - Minimum
Double Profit	None	Sub Contractors to SIPM	Sub Contractors to IPM	None - Minimum
Mob/Demob	Individual	Individual/Share	Share	Individual-Share
Charging Method	Direct to Company	To SIPM Leader-To Company	To IPM Leader-To Company	Direct to Company

Figure 8 – Bundled Contract Comparison.

BUNDLED SERVICES CONTRACT

The idea of bundled services contract is to integrate drilling services as many as possible provided by qualified reputable contractor. There are minimum eight discrete contracts that can be bundled which are Directional Drilling, Cementing, Drilling Fluids and Solid Control, Mud Logging, Wireline, Fishing, Rental Tools and Drilling Bits.

It is expected by bundling the relevant services as many as possible, the bundled services contract will:

1. Focus on integration (big picture);
2. Create Synergies;
3. Reduce Interfaces;
4. Focus on planning;
5. Enhance Communications;
6. Optimize quality of services;
7. Reduce NPT and increase cost saving.

By bundling the services, operator will only communicate with one person from contractor and this enhances communication process. Contractor will focus on the big picture, not segmented objective, to create values for both operator and contractor.

Contractor usually appoints a Project Manager when deploying the bundled services contract for operator. Contractor Project Manager will work closely with operator drilling team and facilitate collaboration and integration for the success of the project. This creates synergies between operator and contractor when planning and executing the drilling project.

DRILLING COST EVALUATION

As a result of using a Bundled Services Contract, the cost per well of Bundled Services Contract is found to be cheaper compared to the cost per well of Semi-IPM and IPM Contract. Indonesia Directorate of Geothermal, Ministry of Energy and Mineral Resource has analyzed and has presented that the cost per well of Bundled Services Contract Type is categorized as top tier and very competitive together with Discrete Contract Type for geothermal drilling in Indonesia. The average cost per well of Bundled Services Contract Type is US$ 3,027 per meter compared to average cost per well of US$ 3,963 per meter for Semi IPM Contract Type and US$ 5,411 per meter for IPM Contract Type. The average cost per well for Discrete Contract Type remains to be the very best with average cost per well of US$ 2,930 per meter. Now, the used of Bundled Services Contract Type is increasingly in demand in Indonesia.

Drilling Contract Types	Number of Wells Drilled	Average Cost Per Well (US$ per meter)
Discrete	19	2,930
Bundled	18	3,027
Semi IPM	46	3,963
IPM	33	5,411

Figure 9 – Cost Per Well Comparison for Geothermal Wells in Indonesia.

CONCLUSION

1. Bundling relevant drilling services have proven very effective since it breaks the fragmented from each service (big picture).
2. Appropriate contract type or model that fits operator profile will help to benefit not only the operator but also the contractor and critical to the successful execution of the project.
3. Regardless exploration or development drilling project, having organizational capability, especially drilling team, will benefit the most for the operator during planning and execution phase.

ACKNOWLEDGEMENTS

The authors would like to recognize and highly appreciate to Directorate of Geothermal, Ministry of Energy and Mineral Resource, Indonesia and especially to Mrs. Ir. Ida Nuryatin Finahari, M. Eng (Director of Geothermal) and Mr. Eko Hari Purwanto. Special thanks to Steve D. Furry, Worldwide Geothermal Drilling Legend.

REFERENCES

Eko Hari Purwanto, Eko Suwarno, R. Fitrah Lukman and Budi Herdiyanto (2018). Geothermal Drilling in Indonesia: a Review of Drilling Implementation, Evaluation of Well Cost and Well Capacity. IIGCE 2018.

Isa, B., Hartono, Y., Jayanto, C., Putra, W.M. (2017). A non IPM Contract for Exploration Drilling in PT Sorik Marapi Geothermal Power. IIGCE 2017.

Pertamina Geothermal Energy Drilling Campaign, World Geothermal Congress 2015, Melbourne, Australia, 19-25 April 2015.