



RSM Geothermal Resource Validation

Beneficiary Manual

INNOVATION
BY EXPERIENCE



BENEFICIARY MANUAL



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Prepared by:
RSM Consultant JV

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1 Introduction

The Risk Sharing Mechanism for Resource Validation (RSM) is one of the components of the World Bank-financed Turkey Geothermal Development Project. The objective of the RSM is to **increase private sector investment in geothermal exploration drilling in Turkey by providing partial coverage of drilling costs in case of unsuccessful exploration wells**. The RSM has been capitalized with a contingent grant from the Clean Technology Fund (CTF) to the Government of Turkey. It is expected that a total of USD 38 million will be available for exploration drilling projects supported by the RSM. The implementing agency will be a dedicated unit (RSM Unit) within the Development Bank of Turkey (TKB).

This Beneficiary Manual contains all the relevant information needed by prospective beneficiaries to apply for coverage by the RSM. The document starts off with an introductory overview of the prerequisites to be met by applicants, followed by the application procedure, evaluation and success criteria, well design specifications, well testing procedures, and monitoring and reporting requirements.

1.1 Background

The energy policy of the Turkish government has the following priorities.

- Maximizing exploitation of domestic primary energy resources.
- Securing sufficient, reliable and affordable energy to a growing economy in an environmentally sustainable manner.

In this context, the government of Turkey has put in place a supportive legal framework to facilitate geothermal development. A critical milestone was the Geothermal Law of 2007. This set out the rules and principles for effective exploration, development, production and protection of geothermal and natural mineral water resources. In 2010 an amendment to the Renewable Energy Law established a feed-in tariff of 105 USD/MWh for geothermal power, for a 10-year period from the commissioning date, with an additional 27 USD/MWh to reward the use of locally produced equipment.¹

Geothermal resources in Turkey are used for power production, as well as for space heating and tourism related applications. The installed capacity of geothermal power plants in Turkey has grown rapidly in recent years. From some 15 MW in 2006 to 1,129 MW produced by 40 power plants as of April 2018. Moreover, power plants with a total installed capacity of 210 MW are currently under construction. This rapid growth has led the government to increase the target of developing 1,000 MW geothermal electric generation capacity by 2023 to a target of 4,000 MW by 2030². However, this growth has been restricted to Western Turkey; the vast majority of the capacity development has taken place in the Menderes and Gediz valleys.

Direct application of geothermal energy is more widely spread in Turkey than power production. While most of the direct application uses occur in the Western part of the country, significant direct applications are also found in the South-Eastern part and to some degree in the central part of the country. The total direct use of geothermal energy amounts to 5,000 MW_{th} as of December 2017³, while reported estimates range from 31,500 to 60,000 MW_{th} as the total geothermal potential of the country. Direct

¹ These FITs are valid until 31-12-2020. It is expected that the FIT will be lowered to 95 USD/MWh, whereas the local content incentive will be increased to 37 USD/MWh until 31-12-2030. This will keep the gross available FIT the same.

² See <http://www.thinkgeoenergy.com/turkey-remains-bullish-on-geothermal-development-setting-new-target-of-4000-mw-by-2030/>

³ See <http://www.enerji.gov.tr/tr-TR/Sayfalar/Jeotermal>



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application of geothermal energy in Turkey has not grown significantly in the last five years in contrast to the rapid growth of geothermal power production.

The RSM is a program designed to share the risk of exploration drilling of private investors acting as geothermal project developers (the Beneficiaries). After an exploration well is properly drilled, the RSM will compensate the Beneficiary in the case of an unsuccessful well as defined by the conditions in the Beneficiary's business plan. Conversely, the Beneficiary will pay a success fee to the RSM when an exploration well is properly drilled and is a successful well as defined in the Beneficiary's business plan. The purpose of the evaluation process, as set out in this manual, is to ensure that the public funds capitalizing the RSM are used responsibly and are allocated in a transparent way. The applications will be evaluated by using the criteria as set out in this Manual to ensure that potential Beneficiaries have carried out the appropriate surface exploration studies. Moreover, they should also have the necessary technical and financial capacity to complete the exploration drilling that they plan to undertake according to their geothermal energy based business plan.

1.2 Objective of the RSM

The RSM aims to promote private sector development of renewable geothermal energy projects in the early stages of geothermal exploration drilling by sharing the risk of the geothermal developer (i.e. the Beneficiary) failing to validate a geothermal resource capable of serving the Beneficiary's geothermal-based business plan.

1.3 Basic Terms and Conditions of the RSM

The RSM will cover a pre-defined percentage of actual acceptable well cost (i.e. eligible drilling expenditures) incurred by the license holder in the case of an unsuccessful well as defined by the conditions in the Beneficiary's business plan. The percentage of actual acceptable well costs that will be reimbursed to the Beneficiary for an unsuccessful well depends on the location. It will be 40 percent for projects located within the administrative boundaries of some districts in Aydın, Denizli and Manisa⁴ where geothermal development is already at an advanced stage, and 60 percent for projects located elsewhere in the country. Reimbursement for unsuccessful wells in any given drilling program will be capped at USD 4 million.

The Beneficiary will pay a 10 percent "Success Fee" of the actual well costs only when the well is successful. To avoid the risk of delays in recovering the success fees after drilling is completed, the Beneficiary will be required to provide a success fee guarantee upfront; either by providing a letter of credit or by establishing an escrow account that can be drawn in case of non-payment (see Figure 1).

The success fee will be calculated as 10% of the actual cost of the specific exploration well, after the well has been completed and tested. The success fee guarantees or escrow account to be provided up-front will, however, be based on the drilling costs proposed/estimated in the financial plan of the Beneficiary. If the first well is successful and the developer wants to drill a second well, a success fee guarantee for that second

⁴ All three provinces, Manisa, Aydın and Denizli have only been partially covered with geothermal explorations. Therefore, projects in regions outside the already explored geothermal basins, will be considered to be covered by 60% for the first three wells in the drilling programme, as elsewhere in Turkey. The five districts that qualify for 40% coverage in Manisa are Ahmetli, Gölmarmara, Salihli, Alaşehir, Sarıgöl. The twelve districts that qualify for 40% coverage in Aydın are Söke, Germencik, İncirliova, Koçarlı, Karpuzlu, Aydın Merkez, Köşk, Yenipazar, Sultanhisar, Nazılı, Buharkent, Kuyucağ. The six districts that qualify for 40% coverage in Denizli are Buldan, Sarayköy, Pamukkale, Babadağ, Merkezefendi, Serinhisar.



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well needs to be escrowed as well. The final settlement will be done at the end of the program.

After drilling of three wells has been completed, an option to extend the Beneficiary Agreement to a fourth and fifth well may be provided to the Beneficiary. The RSM would only cover 40 percent of actual acceptable well cost in case of failure of the fourth and fifth wells. If drilling of additional wells (wells 4 and 5) is accepted by the RSM Unit, the success fee for those wells will be 25% of the actual drilling costs.

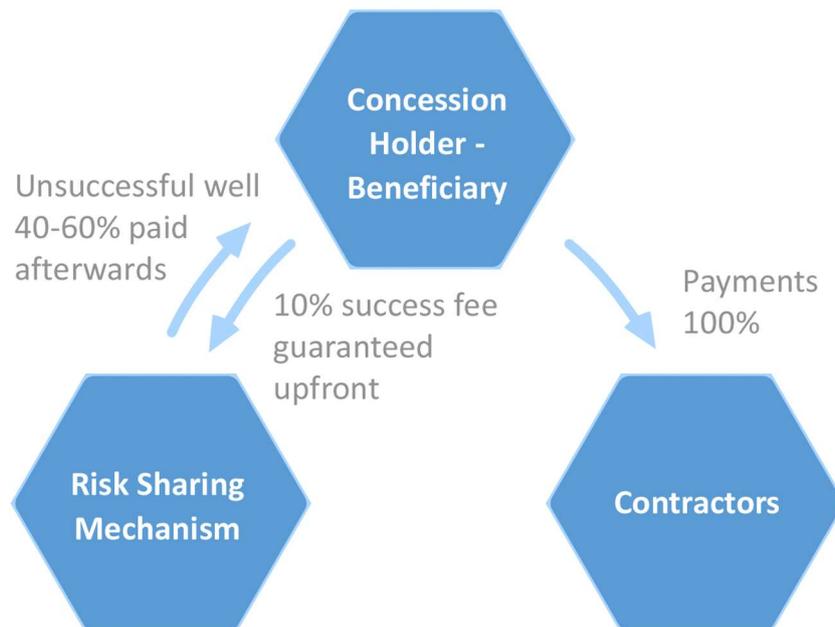


Figure 1 – Risk sharing parameters.

An agreed upon well testing protocol (see Sections 6 and 0) will be used to establish the output of the well which will then be compared to the pre-agreed output that the well must provide to meet the needs of the Beneficiary's business plan. What constitutes a successful versus an unsuccessful well will be based on an output threshold for each well that is contractually agreed between the RSM Unit and the Beneficiary pursuant to the needs of the Beneficiaries' Business Plan. The output criteria for each well will be established based on a combination of enthalpy and flow rate of the geothermal resource at a minimum well head pressure (for two phase wells) or drawdown (for liquid wells) at a maximum well depth. For slim holes drilled for temperature confirmation, temperature at specific depths will be the success criteria. The success criteria will be unique for each well. The Applicant's Business Plan will be presented to the RSM as part of the RSM application process.

The RSM pay-out, which reimburses the Beneficiary for a percentage of actual acceptable well costs in the event of an unsuccessful well will be limited to the failure of two wells. The RSM coverage for a particular Beneficiary will thus be discontinued after any two well failures. The maximum pay-out from the RSM for a single project will be USD 4 million.

The Beneficiary can terminate its RSM Program involvement after completion of the well currently being drilled and before the start of the next consecutive well identified in the program. Actual incurred costs based on acceptable well costs will be verified by the RSM based on the reports provided by the Beneficiary.



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The Beneficiary will account for the actual drilling costs through supporting documentation consisting of certified payments of invoices. This information will be provided to the RSM Unit within predetermined time frames as specified in the Beneficiary agreement. Payment certification requirements (i.e. proof of payment) and proof of physical receipt of goods and services will be established in the agreement between the RSM and Beneficiary.

Summary of RSM Terms and Conditions:

- Drilling program can include slim wells, production-size exploratory wells, or a combination thereof.
- Coverage for unsuccessful wells:

Table 1 – Pay-out scheme from the RSM

Well number	Selected regions in Aydin, Denizli, Manisa ⁵	Other provinces
1	40%	60%
2	40%	60%
3	40%	60%
4	40%	40%
5	40%	40%

- Beneficiary will pay a 10% “success fee” on actual well cost only when the well is successful. For wells 4 and 5, the success fee will be 25%.

Triggers for termination of RSM Beneficiary Agreement:

- Drilling of two unsuccessful wells.
- RSM pay-out reaches USD 4 million.
- CO₂ concentration in fluid of any well will result in emissions in excess of 583 g/kWh.
- Failure of Beneficiary to comply with terms and conditions of the Beneficiary Agreement.
- Failure of Beneficiary to comply with World Bank Anti-Corruption Guidelines⁶ and Turkish legislations.

1.4 Duration of the RSM

The RSM is anticipated to remain operative for a period of five years through the execution of three application rounds, but may be extended if available funds are not exhausted by the end of the period. The duration of the RSM may be shortened if funds are depleted faster than anticipated.

1.5 Parties of the RSM

The Development Bank of Turkey (TKB), through its Technology, Research and Business Development Department, is the Project Implementation Agency for the RSM. TKB’s RSM Unit will be supported by a Technical Consultant for management and

⁵ See footnote 4.

⁶ Available at:
<http://siteresources.worldbank.org/INTLAWJUSTICE/Resources/AnticorruptionGuidelinesOct2006RevisedJan2011.pdf>



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implementation of the RSM (RSM Consultant). The World Bank, as Trustee of the CTF, will be responsible for carrying out supervision of RSM implementation by TKB.

Figure 2 below shows the different parties involved in the implementation of the RSM:

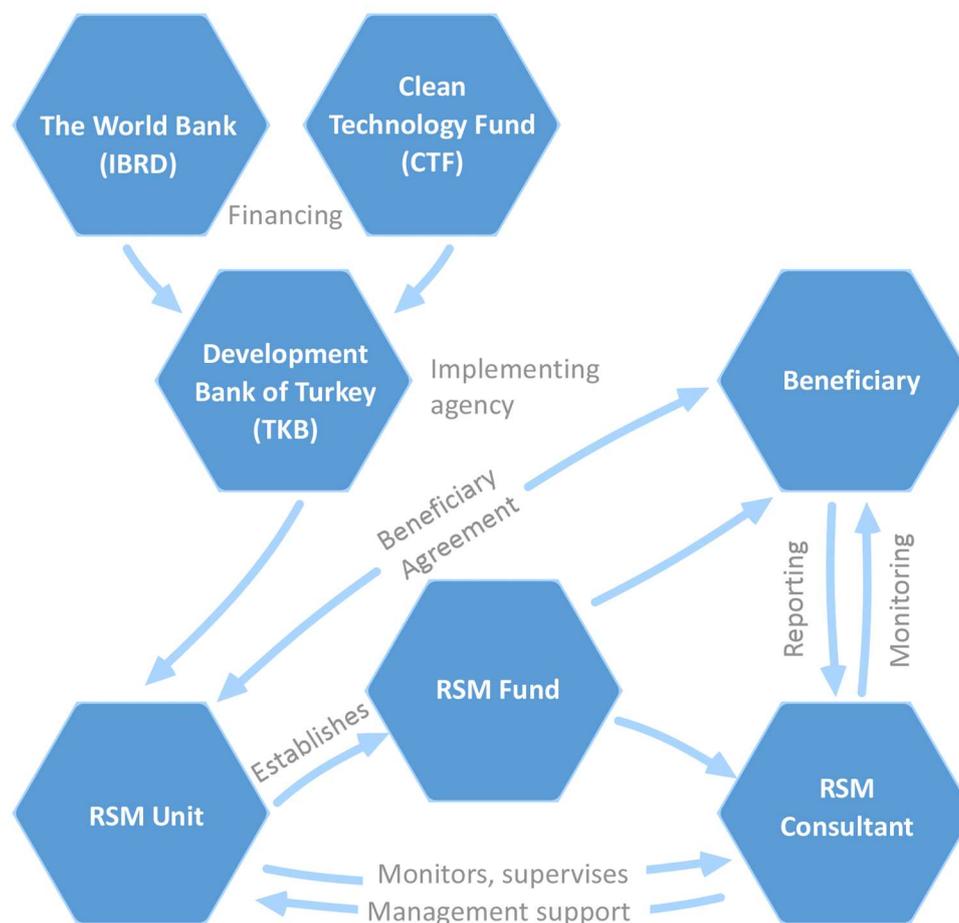


Figure 2 – Overview of RSM parties.

1.6 Eligibility

1.6.1 Eligible beneficiaries

In order for a firm to qualify for coverage under the RSM Program, a valid **exploration license** is required. This license should be valid until the end of the drilling program; however, a license that remains valid for 18 months from the application date will be accepted. The 18-month duration also includes the time necessary for the license holder to extend the exploration license by an additional year. Less than 18 months of remaining validity on the license may be acceptable in cases for which the drilling program can be completed in a shorter period.

A geothermal firm which has been active in Turkey and has undertaken exploration activities in the past and that holds an **operation license** (i.e. for direct use of geothermal hot water in greenhouses) will generally be allowed to participate in the RSM Program for these additional exploration activities.

The RSM Unit working with the RSM Consultant will screen applications of potential beneficiaries based upon a clear and predefined set of technical, financial, and corporate eligibility criteria. This process ensures that potential beneficiaries have carried out the



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appropriate surface exploration studies and have the necessary technical and financial capacity to complete the well drilling and testing program as set forth in their application.

1.6.2 Acceptable Drilling Costs used for Calculating RSM Pay-out

Applications for RSM coverage will be considered once the applicant has identified optimal locations for exploration wells and drilling targets at depth. Exploration drilling program supported by the RSM may include up to three full size production wells or up to three slim hole wells or a combination thereof. Acceptable drilling costs used to calculate the RSM pay-out when an unsuccessful well is drilled may include mobilization and demobilization of drilling rigs, cuttings analyses, well logging and well testing and environmental management costs. Infrastructure costs required for exploration drilling (e.g. access roads, water supply) will not constitute an acceptable well cost and will not be covered.

The RSM will only support acceptable well costs as described above and as stated in Section 5.2.

The same developer can submit multiple applications for drilling programs related to different license areas, as long as they constitute independent projects.

2 Application Procedure

Applications will be accepted **within 12 weeks (until 28th of September)** after the formal call for applications is published. The first application round will admit up to 18 valid applications for consideration into the program. The total number of RSM coverage agreements between the RSM and Beneficiaries⁷, will be capped by the total budget available to cover the anticipated number and value of unsuccessful wells that may occur (approximately nine (9) projects in the first round).



Figure 3 – RSM Cycle – One application round. The application workshops will be advertised about 3 weeks in advance.

⁷ The worst case RSM pay-out will be calculated for each additional qualifying applicant that could be allowed into the RSM after which new applications will be constrained based on the likelihood of depleting the RSM grant funding. In the first round, we allow for up to nine applications with up to USD 4 million each, which leads to a theoretical maximum pay-out of USD 36 million, which is within the size of the RSM fund.



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Applications will be made directly to TKB's RSM Unit and evaluations will be followed by the RSM Unit and RSM Consultant.

The RSM Cycle for one application round is illustrated in Figure 3 above.

2.1 Content of Applications

The following table identifies the content of applications that the applicant will be asked to provide to the RSM (Table 2). These requirements are further detailed in Section 3 Evaluation Criteria. These can be submitted in English (preferably) or Turkish.

Table 2 – Contents of the applications to RSM

Item	Requirement
1	Certificate of incorporation as evidence that the Applicant exists as a legal entity. In the case of joint ventures, all partners need to submit certificates of incorporation.
2	Proof of necessary permits, licenses (including exploration licenses) and unobstructed rights to the concession (see Appendix 1 for details).
3	Surface exploration information and data that meet RSM requirement for participation in the program (see Appendix 2 for details).
4	Conceptual model and resource capacity evaluation (see details in Appendix 3).
5	A professionally prepared business plan showing how the geothermal energy will be utilized and geothermal resource energy requirements necessary to meet such plan (see Section 3).
6	A professionally prepared drilling and testing program for the exploration wells, including cost estimates, and technical specifications for drill rigs to be used (see Section 5).
7	The financials and governing documents of the legal entity that will be the Beneficiary of RSM funds as well as clarification of any liabilities facing the legal entity.
8	Applicable environmental and social impact studies and management plans (see Appendix 9)
9	A well-documented statement of technical capacity of the legal entity as it pertains to the successful management of the project, including key personnel and references (see Appendix 6).
10	TKB Application Forms (as published on the website rpmjeoturkiye.com)

The data submitted to the RSM should be in digital form, such as PDF, Word, Power point, Excel format or as scanned figures and text. All documents shall be delivered through a link on the RSM website. Paper documents are not accepted, unless digitally scanned.

Tentative English translation of key documents in Turkish is appreciated.



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3 Evaluation Criteria

3.1 Content of Applications

In accordance with Table 1 above, the following section identifies the content of the applications to be submitted to the RSM for consideration of admission into the program and the process through which they will be evaluated.

TKB will also evaluate the projects in accordance with Turkish legislations and in terms of institutional capacity of the beneficiary. TKB will screen the applications for the demands which are not in compliance with the Bank's general rules and regulations. Legal, Financial and Commercial states of the companies for their adequacy in the concerned business. Past history in business life depending on various reliable information sources.

3.2 Evaluation process and evaluation criteria

RSM applications will be evaluated through a three-stage process. The first two stages of the evaluation will be used to determine if the applicant has effectively completed the application and if the drilling program in the context of the business plan is viable. If the first and second stages of the evaluation are not adequately fulfilled, the third stage of evaluation through which the applicants program is scored and ranked will not proceed.

The RSM Unit will also evaluate the projects in accordance with Turkish legislations and in terms of institutional capacity of the beneficiary.

3.3 Evaluation Stage 1: Screening based on completeness, licenses, permits and certificates.

In the first stage of the evaluation process, applications will be screened for completeness, including licenses, permits and certificates (items 1 and 2 in Table 2). Incomplete applications will be rejected at this stage (see Appendix 1 for details). In the case of missing or inadequate information, the applicant will be notified before rejection for clarifications or in the case the applicant had not delivered the required data by mistake.

3.4 Evaluation Stage 2: Screening based on probability of finding a viable resource

The second stage of the evaluation process will be used to assess the surface exploration and conceptual modelling included in the application based on the probability of finding a viable resource to support the needs of the applicant's business plan (items 3 and 4 in Table 2). The surface exploration data will be reviewed to confirm a positive indication of the presence of a viable geothermal resource in the license area. This step of the evaluation process will concentrate on two main aspects of the applicant's program which include: a) the credibility of the conceptual models based on the surface exploration data and b) the intended use of the geothermal energy as described in the business model. Applications for projects where the geoscientific exploration data does not support the existence of a viable resource that meets the intended use identified in the business plan will be rejected at this stage.

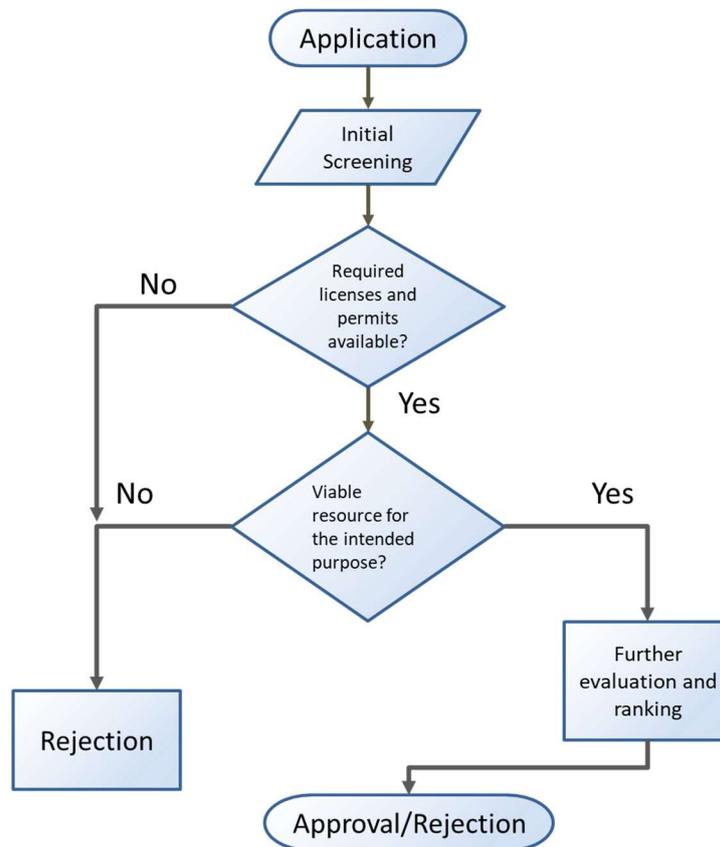


Figure 4 – Flowchart showing the firsts two steps in the evaluation process

3.5 Evaluation Stage 3: Scoring and ranking of viable projects

The third stage of the evaluation will utilize items 5 to 9 listed in Table 2 above. Applications will be given scores for each category as detailed below. At this stage, the applications will be ranked in priority order with highest priority being given to the application with the highest total score. In the first round of the RSM, the 9 highest priority applications with the highest total scores (above the minimum total score of 70) will be selected and invited for the negotiation of the RSM Beneficiary Agreement. The evaluation process is shown schematically in Figure 4 (above) and Figure 5 (below).

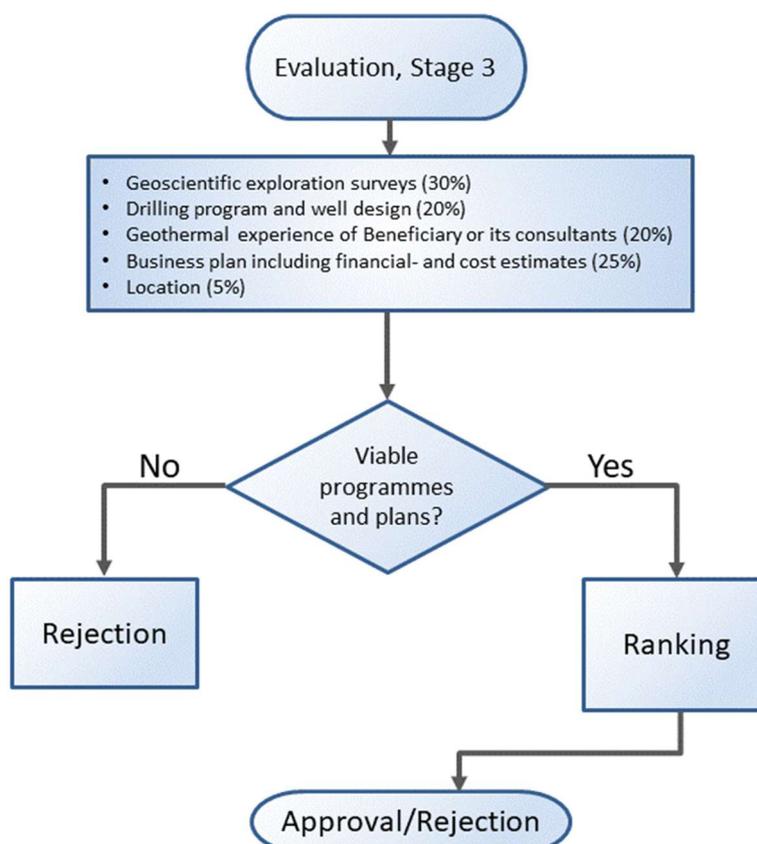


Figure 5 – Second phase of the evaluation process

In stage 3, applications will be evaluated using the scoring and ranking protocol described for each of the following categories of information:

- Geoscientific exploration data and the resulting conceptual model
- Drilling programs and well designs
- Geothermal experience of the Beneficiaries or its consultants
- Business plan, including financial- and cost estimates
- Locations

Each of the five categories of information will be evaluated separately and given a score from 0 to 100. **To proceed with evaluation, categories 1-4 in Table 3 must receive a score of 60 or higher.**

Table 3 – Evaluation and ranking of applications presenting viable geothermal resources will be based on the five categories listed in the table. Weight of each category in the evaluation process is also presented in the table.

Item	Category	Weight %
1	Geoscientific exploration surveys	30
2	Drilling program and well design	20
3	Geothermal experience of Beneficiary or its consultants	20
4	Business plan including financial- and cost estimates	25
5	Location	5

The total score for each application will be derived by taking the given score for each category of information (0 to 100), multiplying it times the weighted percentage as shown in Table 2 for the category in question and then summing the weighted scores of



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the five categories to obtain the total application score. Applications with a total score of 70 or greater will be priority ranked based on total score as compared to the other applications. The 9 highest ranked applicants will proceed to negotiations of the RSM Beneficiary Agreement, which will include negotiation of the energy output criteria that will be used to quantify a successful well. Applications rejected at this stage will remain eligible for future application rounds or to replace the position of applicants that for whatever reason do not enter into a negotiated Beneficiary Agreement.

The following sections identify the stage 3 evaluations for scoring and ranking each of the five categories of information identified in Figure 5 above.

3.5.1 Evaluation Stage 3 Ranking: Geoscientific exploration data and the resulting conceptual models (30% of total score)

As the RSM is eligible for developers holding licenses for different resources and different utilization approach, relevant exploration data may vary between projects. Thus, appropriateness of the methods used will be evaluated in each case. The items listed in Table 4 will be used to evaluate and score the geoscientific data and the resulting conceptual model. Item 2 in the table, "Completeness of surface exploration" will be used to evaluate, if important methods in one or more geoscientific disciplines is missing (see Appendix 2). Data quality (item 3) will be evaluated where possible. Quality of conceptual models (item 4) will be evaluated based on data interpretation and completeness of the models. The conceptual model shall address the items listed in and described further in Appendix 3. Evaluation of preliminary resource assessments will be based on the assumptions used.

Table 4 – Items to be evaluated within the section of geoscientific exploration and conceptual models.

No.	Items to be evaluated	Points
1	Appropriateness of exploration methods used	20
2	Completeness of surface exploration studies	20
3	Data quality	20
4	Quality of conceptual models and applicability of drilling targets	30
5	Preliminary resource assessments	10

3.5.2 Evaluation Stage 3 Ranking: Drilling programs and well designs (20% of total score)

Requirements for well design and drilling programs are specified in Section 5. Drilling programs need to be detailed and in line with industry best practices, i.e. *New Zealand Standard, 2015: Code of practice for deep geothermal wells* (Standards New Zealand, Wellington, NZ, 102 pp.). In addition, Applications shall present technical specifications for the drilling equipment. The items listed in Table 5 will be used to evaluate and score drilling programs and well designs.

Table 5 – Items to be evaluated within the section of drilling programs and well designs.

No.	Items to be evaluated	Points
1	Well design and applicability of the design	30
2	Rig requirements based on the well design	10
3	Drilling program (including estimated drilling time and drilling fluid program)	30
4	Well testing design and well testing program	30



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3.5.3 Evaluation Stage 3 Ranking: Geothermal experience of Beneficiary or its consultants (20% of total score)

Experience of Beneficiaries (and/or its key consultants) as a company engaging in geothermal exploration, drilling and utilization will be evaluated based on information in each application, see Table 6. Beneficiaries shall present a team of experts that will be responsible for the implementation of the requirements of the Beneficiary Agreement. The team will be responsible for the field activities, reporting and communication with the RSM Unit and the RSM Consultant.

The Beneficiaries team must consist of specialists relevant for the project. It is possible that one individual may be responsible for more than one of the required roles (see Appendix 6). Each application shall include a list of the experts proposed for the team, including CVs for key experts, demonstrating their relevant experience and providing details of their experience in similar projects. One of the experts shall be nominated as a team leader. Ideal team composition, experience and education is presented in Appendix 6.

Table 6 – The table presents how experience, applicability of drilling and testing programs and team composition will be evaluated.

No.	Items to be evaluated	Points
1	Specific experience of the Beneficiary (and/or its key consultant) in geothermal exploration	30
2	Experience of key experts	50
3	Team composition	20

3.5.4 Evaluation Stage 3 Ranking: Business plan including financial- and cost estimates (25% of total score)

In order to evaluate the applicant's business plan, criteria for two different types of business plans have been identified. The first type of business plan is based on the geothermal energy being used to supply an existing business energy requirement, while the second type is based on a new business energy requirement being created for the geothermal resource. For power generation, there is no distinction as the generated power is assumed to be supplied to the grid to receive the applicable FIT.

3.5.4.1 Geothermal Energy to Serve an Existing Business

In the case of the geothermal energy source replacing or supplementing an existing business's energy source the following information must be supplied at a minimum:

- Legal name, legal structure and ownership (including total registered / paid capital and share structure) of the existing business producing the geothermal energy.
- Financial statements (Balance Sheets as of December 31st; Profit and Loss Statements for the financial year) of the existing business over last 5 years (external Audit Reports must be provided, if available).
- Proposed contractual arrangements under which geothermal energy will be sold to the existing business.
- Minimum technical requirements of the geothermal resource in order for the geothermal energy source to meet the minimum business plan requirements. Basic technical information (estimates): enthalpy, flow (kg/s), well head (pressure) / drawdown, installed capacity of the plant (MW), production (kWh/year).
- Letter of commitment from an authorized representative of the existing business identifying acceptance of the proposed contractual arrangements and any



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conditions precedent that must be met prior to the proposed beneficiary agreement's effectiveness.

- A professionally prepared schedule identifying the activities necessary to develop the geothermal resource and to meet the requirements of the proposed energy agreement with the existing business.
- Budget and cash flow projections (throughout the whole project life cycle on annual basis including all assumptions and parameters used as open-source EXCEL file) for the CAPEX, OPEX and Revenue Stream for the project starting with the exploration of the geothermal resource through operation of the field and sale of energy to the existing business:
 - Preliminary Investment Cost Estimates (land acquisition, civil works, equipment, M&E works, engineering/design/consultancy) and Financing Plan (capital, equity, internally-generated funds) (replacements / reinvestments (especially for equipment / M&E) must also be taken into account) and Financing Plan (capital / loan / internally-generated funds)
 - NPV and IRR of the Investment Project (discount rate of opportunity cost of capital to be used in NPV calculations must be specified – e.g. 10% p.a. in real terms)
 - Pro-forma Profit (-Loss) Statements of the Investment Project
 - Pro-forma Cash Flow Statements of the Investment Project
 - Financial Performance Ratios of the Investment Project (profitability, liquidity, asset/debt management, debt service coverage)

3.5.4.2 Geothermal Energy to Serve a New Business

In the case of a new business being established as a result of the positive validation of the geothermal energy source, the following information must be supplied at a minimum:

- Proposed business structure, identification of proposed owners (including total registered / paid capital and share structure) and the proposed agreements (or bylaws) under which the rights and obligations of the owners are established.
- Financial statements (Balance Sheets as of December 31st; Profit and Loss Statements for the financial year) of proposed owners (in case they are companies not real persons) over last five years (external Audit Reports must be provided, if available).
- Minimum requirements of the geothermal resource (in terms of well outputs) in order for the geothermal development to meet the minimum business plan requirements. This is linked directly to the success criteria of exploration drilling and average expected output of wells clarified in Section 7.
- A professionally prepared schedule identifying the activities necessary to develop the geothermal resource and to meet the requirements of the proposed business plan.
- Budget and cash flow projections (throughout the whole project life cycle on annual basis including all assumptions and parameters used as open-source EXCEL file) for the CAPEX, OPEX and Revenue Stream for the business starting with the exploration of the geothermal resource through the ongoing operation of the business:
 - Preliminary Investment Cost Estimates (land acquisition, civil works, equipment, M&E works, engineering/design/consultancy) and Financing Plan (capital, equity, internally-generated funds) (replacements / reinvestments (especially for equipment / M&E) must also be taken into account) and Financing Plan (capital / loan / internally-generated funds)



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- NPV and IRR of the Investment Project (discount rate of opportunity cost of capital to be used in NPV calculations must be specified – e.g. 10% p.a. in real terms)
- Pro-forma Profit (-Loss) Statements of the Investment Project
- Pro-forma Cash Flow Statements of the Investment Project
- Financial Performance Ratios of the Investment Project (profitability, liquidity, asset/debt management, debt service coverage)

In addition to the requirements set out above and to support the business plan estimates, a short general description of the following items is requested:

- a. Preliminary power plant description, indicating the type of power conversion technique to be used. The description needs to take into account the likely inlet temperature and pressure, cooling techniques, NCG capturing, injection strategy, and possible mitigating measures during production, if foreseen; or
- b. Preliminary description of heating application or other direct use. This should include identification of the techniques and equipment that will be used to extract heat from the geothermal resource and supply it to the end user. Basic design parameters concerning the use of an open or closed loop system with reinjection must also be elaborated.

The components listed in Table 7 below will be used to evaluate the business plan, financial capacity and cost estimates.

Table 7 – Business plan requirements

Item	Requirement	Points
1	Legal name, legal structure and ownership (including total registered / paid capital and share structure) of the existing business producing the geothermal energy	7
2	Financial Statements (Balance Sheets as of December 31st; Profit and Loss Statements for the financial year) of the existing business over last 5 years (external Audit Reports must be provided, if available)	20
3	Proposed contractual arrangements under which geothermal energy will be sold to the existing business	7
4	Minimum technical requirements of the geothermal resource in order for the geothermal energy source to meet the minimum business plan requirements, namely basic technical information (estimates): enthalpy, flow (kg/s), well head (pressure) / drawdown, installed capacity of the plant (MW), production (kWh/year)	13
5	Letter of commitment from an authorized representative of the existing business identifying acceptance of the proposed contractual arrangements and any conditions precedent that must be met prior to the proposed agreement's effectiveness	7
6	A professionally prepared schedule identifying the activities necessary to develop the geothermal resource and to meet the requirements of the proposed energy agreement with the existing business	13
7	Budget and cash flow projections (throughout the whole project life cycle on an annual basis including all assumptions and parameters used as open-source EXCEL file) for the CAPEX, OPEX and Revenue Stream for the project starting with the exploration of the geothermal resource through operation of the field and sale of energy to the existing business:	
7a	Preliminary Investment Cost Estimates (land acquisition, civil works, equipment, M&E works, engineering/design/consultancy) and Financing Plan (capital, equity, internally-generated funds) (replacements / reinvestments (especially for equipment / M&E)	7



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	must also be taken into account) and Financing Plan (capital / loan / internally-generated funds)	
7b	NPV and IRR of the Investment Project (discount rate of opportunity cost of capital to be used in NPV calculations must be specified – e.g. 10% p.a. in real terms)	7
7c	Pro-forma Profit (-Loss) Statements of the Investment Project	6
7d	Pro-forma Cash Flow Statements of the Investment Project	6
7e	Financial Performance Ratios of the Investment Project (profitability, liquidity, asset/debt management, debt service coverage)	7

3.5.5 Evaluation Stage 3 Ranking: Location (5% of total score)

Proposed projects outside Aydin, Denizli and Manisa⁸ will be given 5% to expedite geothermal development in other regions than the already utilized geothermal areas.

4 Illustration of pay-out and success fees

The RSM program will cover a pre-defined percentage of actual acceptable well costs in case a well is not meeting the pre-agreed success criteria as stated in the Beneficiary Agreement. Conversely, a success fee of the actual well costs has to be paid by the Beneficiary, if the drilled well meets the pre-determined success criteria. The success criteria are described in detail in Section 7.

The application period for the first round opens on the 5th of July 2018 and will remain open until the 31st of August 2018. In the first round a maximum of nine projects will be supported.

In this section, the RSM pay-out for an unsuccessful well, the success fee for a successful well and the triggers for termination of Beneficiary Agreement are described. A table giving an overview of all possible combinations of successful and unsuccessful wells within the RSM program is then presented as an example.

4.1 Reimbursement process of the cost of an Unsuccessful Well

In case of an unsuccessful well, i.e. the success criteria are not fulfilled, the RSM program will cover a pre-defined percentage of the actual acceptable well cost incurred by the license holder. The RSM pay-out of said costs is based on the actual acceptable well costs which must be proven by the Beneficiary through documentation of certified expenditures. **For the documentation invoices, bank transfer vouchers and payment vouchers as well as bank transaction statements are acceptable documents. The time-limit for partial coverage payment by the RSM Unit is 10 business days from the receipt of a properly submitted payment request in compliance with the terms of this Beneficiary Agreement under approval of TKB's General Manager. The Success fee will be accumulated in a special account under TKB opened in a commercial bank.** The well costs will be monitored through reconciling the costs incurred with the documentation of certified expenditures by the RSM Unit. The acceptable well costs are described in Section 5. The pre-defined percentage of the actual acceptable well costs will be 40 percent for projects located within the administrative boundaries of Aydin, Denizli and Manisa⁹ and 60 percent in those located elsewhere in the country. The RSM program is based on a standard three

⁸ See footnote 4.

⁹ See footnote 4.



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well exploration program with an option to drill a 4th and a 5th well upon the RSM Unit's approval. The decision of the RSM Unit will be based on the results of the first three wells and the availability of funds. The RSM pay-out in the event of an unsuccessful 4th or 5th well is 40% of the actual acceptable well costs, regardless of where the wells are located in the country. The maximum reimbursement for each project is USD 4 million. The RSM Unit is responsible for the authorization of the RSM pay-out. Table 8 lists the details concerning coverage for a standard three well program, which has a provision for a 4th and 5th well. Figure 6 shows the geographical coverage of the RSM.

Table 8 – Pay-out scheme from the RSM

Well number	Selected regions in Aydın, Denizli, Manisa	Other provinces
1	40%	60%
2	40%	60%
3	40%	60%
4	40%	40%
5	40%	40%

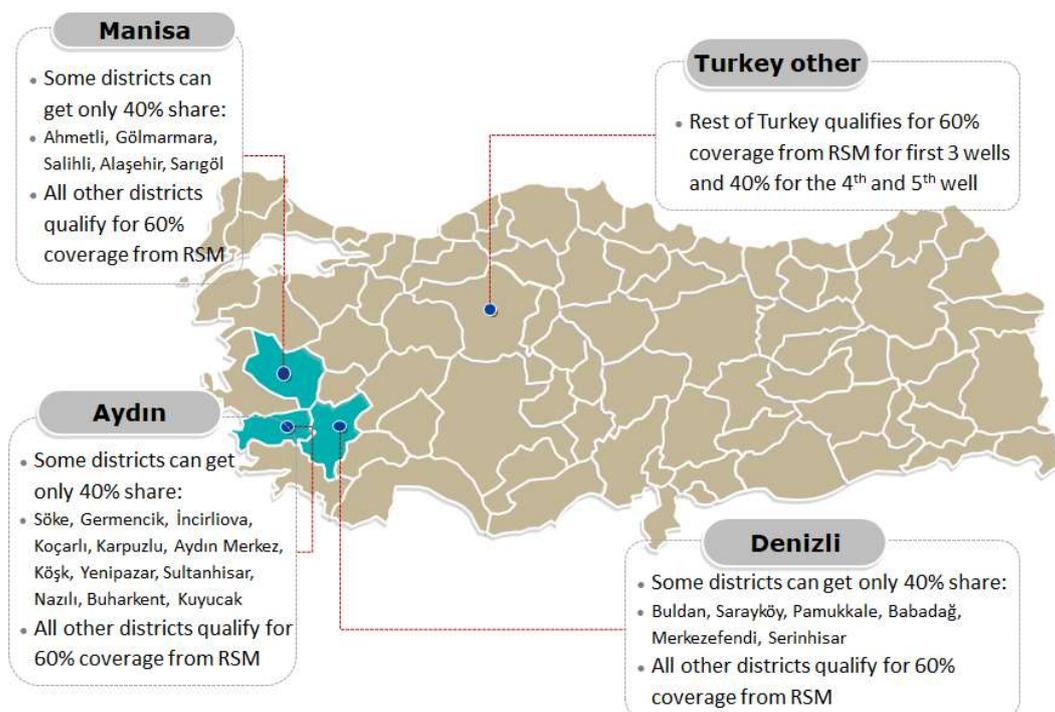


Figure 6 – Geographical coverage of the RSM.

In addition to the above stated criteria, the CO₂ emission from any given well shall not exceed 583 g/kWh based on the requirements of the Clean Technology Fund (CTF). This is further described in Section 0 on success criteria.

4.2 Administration Fee

Pursuant to the terms and conditions of the CTF Grant Agreement between the IBRD and TKB, the RSM Unit shall collect a onetime fee from the Beneficiary to compensate the RSM Unit for its administration costs of the RSM Program (Administration Fee). The Administration Fee shall be calculated as six per-mil (0.6%) of the estimated Acceptable Well Costs of the Beneficiary's Drilling Program. For more details, see appendix 8, Draft Beneficiary Agreement.



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Pursuant to the terms and conditions of the CTF Grant Agreement between the IBRD (acting as an Implementing Agency of the Clean Technology Fund) and TKB, the RSM Unit shall collect a onetime fee from the Beneficiary to compensate the RSM Unit for its administrative costs of the RSM Program (Administration Fee). The Administration Fee shall be calculated by multiplying the estimated Acceptable Well Costs of the Beneficiary's Drilling Program as set forth in Section 5.2 times the factor 0.006 (0.6%). The Administration Fee shall be paid by the Beneficiary into TKB Account VAKIFBANK KIZILAY USD IBAN:TR750001500158048011061847 within 30 days after the effective date of the Beneficiary Agreement. The Administration Fee shall not be corrected to the actual Acceptable Well Costs upon completion of the RSM Program.

4.3 Success fee

In case a well is deemed to be a successful well when judged against the success criteria set forth in the Beneficiary Agreement, the Beneficiary shall be obligated to pay a 10 percent "Success Fee" of the actual acceptable well costs. Thereupon, the Beneficiary needs to provide a success fee guarantee prior to signing the Beneficiary Agreement, either by providing a guarantee letter / letter of credit or by establishing an escrow account that can be drawn in case of non-payment. The amount of the success fee guarantee is based on the drilling costs proposed in the financial plan of the Beneficiary, and accepted by the RSM Unit. In case the success fee becomes payable by the Beneficiary to the RSM, the Beneficiary shall, within 10 business days from the date of a written notice from the RSM Unit, pay the success fee. The success fee will be accounted for in a separate escrow account of the RSM established for success fees only.

As already described above in Section 4.1, the Beneficiary agreement of a standard three well program has a provision that provides the option to have a 4th and 5th well. In the case of a successful evaluation of the Beneficiary's request by the RSM Unit, to extend its drilling program, the Beneficiary has to adapt its success fee guarantee. Therefore, the success fee for well 4 and 5 is 25% of the drilling costs proposed in the financial plan of the Beneficiary.

Table 9 lists the success fee for the successful wells the beneficiary has to pay.

Table 9 – Success fee scheme from the RSM

Well number	All provinces
1	10%
2	10%
3	10%
4	25%
5	25%

If flow testing leads to CO₂ emission higher than 583 g/kWh, then the success fee is waived and the program terminates (see Section 0 on success criteria for more details).

4.4 Triggers for termination of the Beneficiary Agreement

The following situations will trigger the termination of the Beneficiary Agreement:

- Drilling of two unsuccessful wells.
- RSM Pay-out reaches USD 4 million.
- CO₂ concentration in fluid will result in emissions in excess of 583 g/kWh (see Section 7).
- Failure of Beneficiary to comply with the schedule as established in the Beneficiary Agreement, unless reasons for non-compliance are well justified.



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- Failure of Beneficiary to comply with World Bank Anti-Corruption Guidelines¹⁰ and Turkish legislation.
- The Beneficiary has the right to terminate the RSM Beneficiary Agreement after completion of the well being drilled and before drilling begins on the next consecutive well.

Table 10 gives an overview of all potential outcomes of the RSM program, assuming that between two and five wells will be drilled. In total 28 possibilities were identified. Within the table a successful well is labelled as (S) and an unsuccessful well as (U). The red bars indicate that the Beneficiary Agreement stops due to two unsuccessful wells.

Table 10 – Detailed description of all potential combination of successful und unsuccessful wells that can occur within the RSM project.

Case ID	Well 1	Well 2	Well 3	Well 4	Well 5
1	S	S			
2	S	F			
3	F	S			
4	F	F			
5	S	S	S		
6	S	S	F		
7	S	F	S		
8	S	F	F		
9	F	S	S		
10	F	S	F		
11	S	S	S	S	
12	S	S	S	F	
13	S	S	F	S	
14	S	S	F	F	
15	S	F	S	S	
16	S	F	S	F	
17	F	S	S	S	
18	F	S	S	F	
19	S	S	S	S	S
20	S	S	S	S	F
21	S	S	S	F	S
22	S	S	S	F	F
23	S	S	F	S	S
24	S	S	F	S	F
25	S	F	S	S	S
26	S	F	S	S	F
27	F	S	S	S	S
28	F	S	S	S	F
S	Successful well				
U	Unsuccessful well				
	RSM contract stops due to two unsuccessful wells				

¹⁰ Available at:
<http://siteresources.worldbank.org/INTLAWJUSTICE/Resources/AnticorruptionGuidelinesOct2006RevisedJan2011.pdf>



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5 Well design and drilling programs

A professionally prepared and detailed Drilling Program and Well Design is an essential component of an RSM application. The well design and drilling program has to fit the actual situation in the field, the infrastructure, environmental aspects and the drilling license. The associated costs must be reflected in the business plan and the associated financial analysis (see business plan requirements, Section 3.5.4).

5.1 Well design and drilling program

The well design and drilling program need to be detailed and prepared according to industry best practices (e.g. the New Zealand Standard, 2015: Code of practice for deep geothermal wells. Standards New Zealand, Wellington, NZ, 102 pp.). The NZ Code of Practice is widely used around the world and is considered *the* industry standard in geothermal drilling. The code sets out standards for design and work practices necessary to ensure the safe drilling (both for personnel as well as environmental safety) and operation of wells that penetrate geothermal reservoirs, especially for high temperatures. It is based on long, world wide experience in geothermal development. The code offers guidance for designing of wells, drilling of geothermal wells as well as operation. This includes preparation of drill site, drilling equipment, tools and materials.

While carrying out the drilling program requires a drilling contract to be in place, a drilling contract does not need to be in place upon application to the RSM Program.

Appendix 4 includes a general list of items that should be addressed in a Drilling Program document, irrespective of the type of well to be drilled. There may be cases where some of the listed items do not apply, depending on the type of well to be drilled and the characteristics of the geothermal resource to be drilled.

5.2 Overview of Drilling Program Acceptable Well Costs.

Applicants shall estimate the costs for their proposed drilling program in line with the Well Cost Guidelines (WCG) provided in Appendix 4, which specify the distribution of the cost structure for standard drilling cost items.

The WCG outlines the estimated allowable percentage of cost for the listed items for different types of well diameters and depths. An agreement between the RSM Unit and the Applicant on acceptable cost of drilling will use the WCG percentages as a frame of reference and if there are significant deviations, the Applicant will need to explain and justify the cost variations. If the RSM Unit finds the cost estimate acceptable, it will be included as part of the Beneficiary Agreement. Any costs exceeding the maximum values agreed upon between the RSM Unit and Beneficiary will not be considered as an Acceptable Well Cost and will not be subject to partial reimbursement for an unsuccessful well. The WCGs will be periodically reviewed for indexation and cost adjustment purposes during project execution.

Variable costs for budget items which are included as an acceptable well cost and which are not specified in the WCG will be separately justified in the technical application and priced in the cost estimate as an acceptable well cost.

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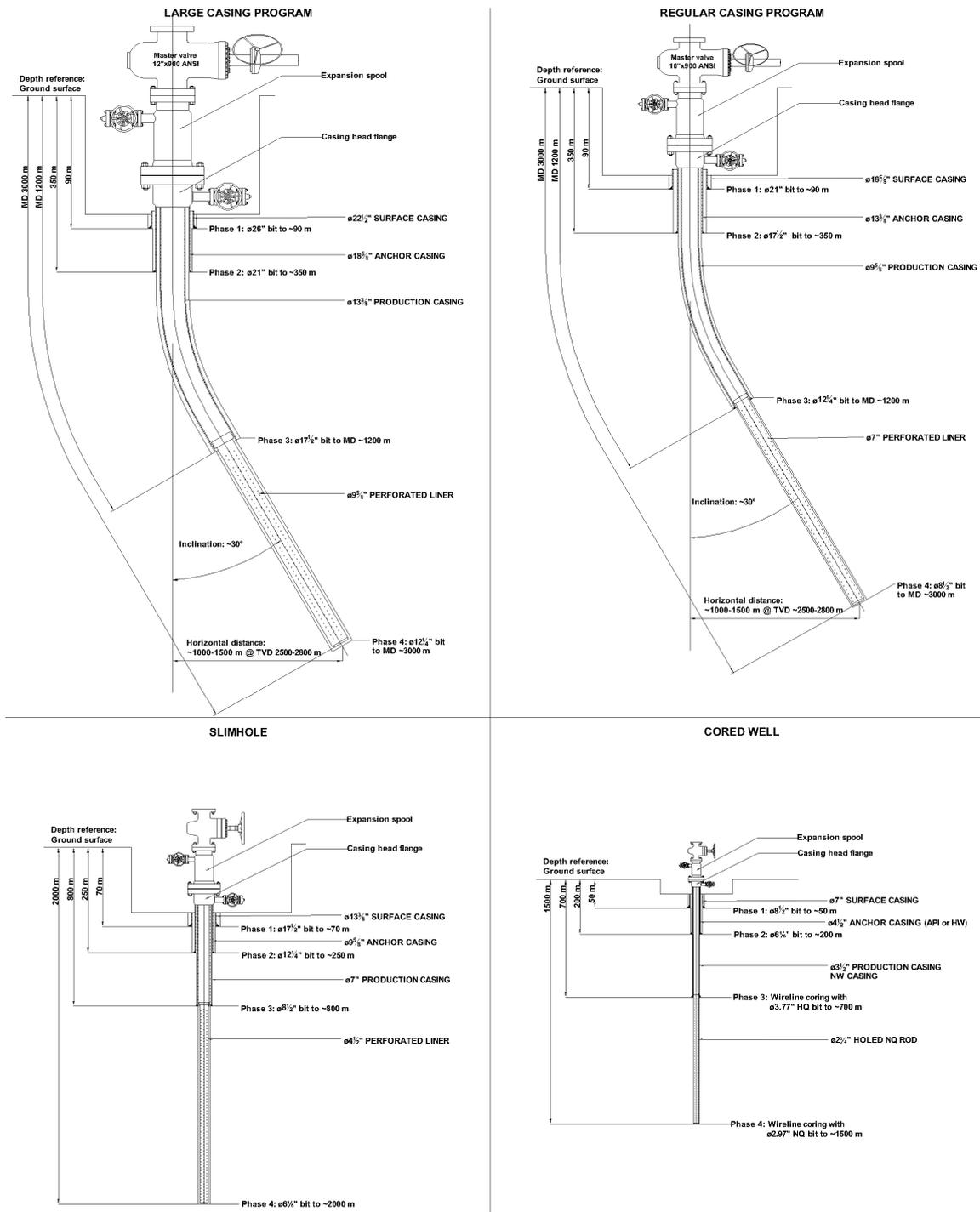


Figure 7 – Example of types of high temperature wells that may be considered as exploration wells. Low-intermediate temperature wells have often one less casing. In many cases the casings need to be deeper if the wells are very deep. The well design must take into account industry best practices, as seen in the New Zealand Code of Practice for Deep Geothermal Wells. From Sverrir Thorhallsson, ÍSOR.

Acceptable well costs include the following activities on the condition that they are directly associated with the drilling and testing program for the given well:

- Site preparation (well pads and sumps).
- Mobilization and demobilization costs.



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- Rental or provision of drilling rigs and associated equipment.
- Providers of specialist services (e.g. reservoir engineering, stimulation, directional drilling, underbalanced drilling, drill pipe inspections, mud logging, H₂S monitoring, cementing, mud engineering, wireline services, geophysical logging and post-drilling down-hole surveys, well site geology and follow-up research on the core or cuttings (e.g. XRD, thin sections, etc.), environmentally acceptable disposal of waste including hazardous material according to applicable regulations).
- Injectivity testing.
- Discharge testing.
- Personnel, on-site accommodation and transport including vehicle leasing or rental.
- Consumables (e.g. fuel, casing, wellheads, bits, cement, mud).
- Documentation and reports.
- Taxes, excluding VAT.
- Eligible and reasonable contingencies.

All costs which are not explicitly mentioned above or in Appendix 4, will be classified as unacceptable well costs and will not be covered by the RSM. Unacceptable well costs paid by the Beneficiary include but are not limited to:

- Infrastructure costs.
- All costs in excess of the amount stated in the drilling and testing program estimate.
- Developer overheads (e.g. office costs, general management costs).
- Costs of temporary or permanent abandonment of wells.
- Third party liability claims, including claims by the drilling contractor and environmental damage or clean-up costs.
- Debts and provisions for losses or debts.
- Interest.
- Purchases of land, buildings or vehicles.
- Currency exchange losses (compared to the USD).
- Cost of preparing applications or cost incurred during negotiations of the Beneficiary Agreement.
- Costs for participation at meetings and workshops.
- Training and capacity building.
- Costs incurred prior to contract signing (such as costs for studies, concessions, existing wells, etc.).

The WCG presented in Appendix 4, is based on the design parameters, presented in Figure 7, above, and in Table 14 – Table 17 in Appendix 4.

6 Well testing procedures

This section lists the requirements for well testing programs. The list applies for high-temperature wells discharging a mixture of liquid water and steam, but in general is equally applicable to lower temperature wells and slim exploration wells, with some items being optional or simply not applicable (see end of this section). In the case of lower temperature resources, the aid of pumps or airlifting may be needed to flow-test the wells. Each application shall include a well testing program relevant for the reservoir (temperature) and well type based on the items listed in this section. In the case of deep slim wells, flow testing may not be possible. Under these conditions, information



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gathering will be limited to stratigraphy, structures and downhole logging (such as temperature and pressure).

Background information on the different operational phases of well testing, logging and data interpretation is presented graphically in Appendix 5.

6.1 Logging at well completion

A detailed plan for logging at well completion is required, including a schedule for the logging and interpretation as well as information on instrumentation to be used. The following information is required:

- a) Proposed schedule (timing of logs, well section to be logged, staff involved and expertise)
- b) Required measurements:
 - Temperature and pressure vs. depth
- c) Instrumentation (logging unit, slick-line or wireline, logging tools, etc.)
- d) Interpretation (incl. feed-zone depth and first estimate of reservoir temperature and pressure)

The main results of this phase, including first indications of reservoir temperature and pressure, as well as feed-zone information, will be indirectly required for the drilling success criteria (Section 7), even though more direct information, e.g. on temperature and pressure will emerge later. Spinner logging (flow-rate vs. depth) is optional.

6.2 Step-rate injection testing

Short-term step-rate testing at the end of drilling is required. This is done by injection for high-temperature wells. A detailed plan for the testing is required, including a schedule for the testing, measurements and interpretation as well as information on instrumentation to be used. The following information is required:

- a) Proposed schedule:
 - Number and length of steps.
 - Pressure recovery (decline/loss for injection).
 - Staff involved and expertise.
- b) Required measurements:
 - Injection flow-rate.
 - Well-head pressure (if any) and down-hole pressure with time.
 - Temperature and pressure logs (see a) above), spinner log is optional.
- c) Instrumentation (pumps, flow measurements, pressure sensors, logging tools, etc.).
- d) Required interpretation, as far as data allows:
 - Well injectivity.
 - Transmissivity, permeability-thickness and skin (from pressure transient analysis).
 - Feed-zone depth and their relative contribution (optional).
 - Estimates of formation temperature (specifically at feed-zone depth).

The main results of this phase, including the estimate for injectivity as well as first indications of permeability and skin, will provide early indications relevant for the success criteria (Section 7), even though more direct information, i.e. on well productivity will emerge later.

6.3 Well warm-up phase

A specific warm-up phase after drilling is required. Specifying a universal length of the warm-up period is not possible due to variable well conditions, as well as constraints



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related to logistics and time. The reference length should be three months, while a shorter period may be acceptable in some cases. The number of warm-up temperature logs required is two logs per month. The warm-up period may in some cases be shortened if flow is initiated with airlifting or pumping. A plan for this phase is required, as before. The following information is required:

- a) Proposed schedule (length of warm-up period, number of logs, staff involved and expertise).
- b) Required measurements:
 - Temperature and pressure vs. depth.
- c) Instrumentation (same as in a) above).
- d) Interpretation:
 - Formation temperature at selected depths (e.g. by Horner-method with correction).
 - Feed-zone depth and pressure pivot point.

The main results of this phase are the estimated formation temperature with depth, which provides estimates of feed-zone temperature when linked with information on feed-zone depth, as well as the pivot point depth (also linked with feed-zone depth). The temperature information will provide direct input for the drilling success criteria (Section 7).

6.4 Flow, or output testing

High-temperature wells are tested through spontaneous discharge driven by boiling in the wellbore, while low-temperature wells are either tested by down-hole pumps (preferable) or air-lifting. A detailed plan for the testing is required, including a schedule for the testing, measurements and interpretation as well as information on instrumentation to be used. Information on the following is required:

- a) Proposed schedule:
 - Initiation of flow, method to be used.
 - Method to be used to measure flow and/or enthalpy:
 - i. water-flow and reservoir enthalpy (liquid dominated reservoir).
 - ii. lip-pressure (Russel James) and water-flow.
 - iii. TFT measurements of liquid and steam flow-rate (optional).
 - Monitoring (parameters, mode, frequency, etc.).
 - Length of test and need for variable opening (steps).
 - Logs, especially temperature and pressure, but also spinner (optional).
 - Down-hole measurements with time (mainly pressure).
 - Down-hole pressure recovery after flow-test.
 - Staff involved and expertise.
- b) Required measurements:
 - Well-head pressure.
 - Lip-pressure (critical pressure).
 - Water height in weir-box.
 - TFT concentrations in liquid and steam (if TFT method used).
 - Down-hole pressure with time.
 - Temperature and pressure logs (see A. above), spinner log is optional.
 - Chemical and gas content (see later in this section).
- c) Instrumentation:
 - Compressor(s) and weir-box.
 - Pressure and temperature sensors.
 - TFT instrumentation (if TFT method used).
 - Digital data logging system for recording parameters above, optional.
 - Downhole pressure sensor; either memory, wire-line (if possible) or capillary tube (N₂).



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- Logging instrumentation (see a) above).
- d) Interpretation:
 - Water-flow, steam-flow, and fluid enthalpy.
 - Productivity-index, i.e. total flow per unit change in reservoir pressure.
 - Production characteristics (simple plot of flow-rate vs. pressure, either well-head pressure or down-hole pressure).
 - Output capacity as total flow-rate and enthalpy, or steam-flow and water-flow, at a given well-head pressure.
 - Transmissivity (permeability-thickness) and skin.
 - Further improvement of formation temperature profiles and feed-zone location.

A key element in flow-testing of high-temperature wells is the length of a test. Ideally, such a test should last long enough for the well to have reached stable flow-conditions (well-head pressure, flow-rate and enthalpy), which may often take a few weeks or up to 2-3 months. Reaching fully stable conditions may often not be realistic so stability within $\pm 15\%$ (of total changes observed during the whole testing period) in these parameters should be sufficient. If local conditions and/or local regulations and permits involved do not allow testing long enough for stable conditions to be reached, a short term test may have to be implemented. That means that if the well has not reached stable or semi-stable conditions during the short term testing, the success or failure decisions needs to be postponed until the conditions for long enough testing has been met and a long term flow-testing has been carried out.

The main results of this key phase are firstly estimated long-term well-head pressure, enthalpy and well discharge (steam and liquid) and consequently well capacity (MW_e or MW_{th}). The capacity should be relative to a specific well-head pressure relevant for electricity generation, or over a range of well-head pressure values. This information will provide direct and essential input for the drilling success criteria (Section 7).

6.5 Chemical sampling

Applicants shall provide detailed sampling plan addressing the following:

- Sampling locations.
- Sampling equipment.
- Sampling- and analytical methods, including sampling preservation and determination of non-condensable gases (NCG).
- Timing.

A total two-phase sample includes determination of the following components:

- Liquid phase samples: pH, conductivity, Si, Na, K, Ca, Mg, Cl, F, B, SO_4 , Fe, CO_2 , H_2S , NH_3 , Li, As and stable isotopes of oxygen and hydrogen.
- Condensate: Na (or Cl), B, NH_3 and stable isotopes of oxygen and hydrogen.
- Steam phase: CO_2 , H_2S , O_2 , N_2 , CH_4 and Ar.

Samples collected from single-phase wells shall include the appropriate components listed above.

As previously addressed, the CO_2 emission from wells supported by the RSM shall not exceed 583 g/kWh. CO_2 concentrations shall be determined when a flowing well has reached stability according to definition in Section 6.4 above.



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6.6 Special provisions for wells other than high-temperature

Some flexibility regarding logging and testing is associated with the requirements listed above in the case of low-temperature wells (see Section 7) and deep slim-holes (> 1000 m). This is summarized in Table 11 below. This applies e.g. to discharge testing of low-temperature wells where the main required output parameters are flow-rate, water temperature and pressure (water-level) draw-down instead of flow-rate, enthalpy and well-head pressure. Different success criteria will therefore apply in such situations. Some additional flexibility may also apply depending on local conditions and well characteristics.

Table 11 – Summary of steps in well testing protocol

Phase	Low-temperature wells	Deep slim-holes
A. Logging at completion	Usually comparable to HT-wells, but may be scaled down	Usually just P and T logging
B. Step-rate testing	Often air-lift testing	Usually no testing
C. Stimulation	Same requirement	Not required
D. Warm-up	A shorter warm-up period may be acceptable + fewer T-logs; final warm-up during discharge testing	A shorter warm-up period usually required, and the use of Horner Plot Modelling can be used to predict the formation temperatures.
E. Discharge testing	Down-hole pump (preferred), air-lift or artesian flow Key parameters: Flow-rate, temperature, pressure or water-level drawdown	Usually no testing

7 Success criteria

As discussed in Section 3 on business model evaluation the success criteria for the exploration wells drilled under RSM coverage will be based on the business model for the development of the geothermal resource. In short, the success criteria in terms of well output¹¹ is to be defined as equal to or greater than the minimum average well output for the project to be economically viable. The formulas for calculations of success criteria, against which success will be measured, is described in Appendix 7. During evaluation of applications and prior to signing of the Beneficiary Agreement, the RSM Unit will scrutinize the assumptions in the financial model, from which the minimum viable well output is derived. If the RSM does not find the financial modelling assumptions acceptable, the RSM and the Beneficiary will enter into negotiations in order to agree upon the model inputs and the resulting minimum average output for wells drilled under the project. The agreed output values will be recorded as the success criteria in the Beneficiary agreement (Figure 8).

¹¹ This applies to wells that are drilled to assess reservoir productivity, i.e. can be flow tested, either two-phase or one-phase flow wells. Note that the RSM also allows risk sharing for holes drilled for the purpose of confirming temperature at a specific depth. For temperature confirmation holes the success criteria will need to be defined based on an agreement between the Beneficiary and the RSM on what temperature can "reasonably" be expected at a given depth based on the available exploration data.



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Determining success criteria parameters

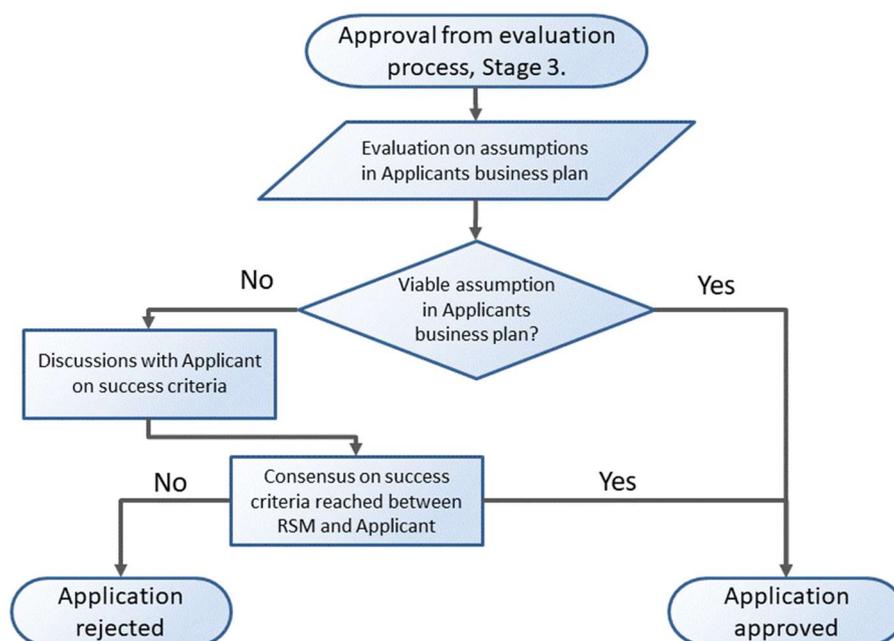


Figure 8 – Flowchart to clarify how success criteria will be determined between RSM Unit and Applicant

The success criteria will be kept as simple as possible and will be based on the following parameters and their threshold values (minimum) in terms of the business model:

- Enthalpy/temperature
- Flow rate
- Wellhead pressure or drawdown
- Only temperature at specific depth for slim holes

As noted in Section 1, exploration wells that can be drilled with coverage from the RSM fall into three main categories, each of them to be subject to their own distinct success criteria, see Table 12.

Table 12 – Success parameters for applicable drilling scenarios.

Scenario 1: Well drilled to explore productivity and fluid enthalpy where two-phase flow is expected	Scenario 2: Wells drilled to explore productivity and fluid enthalpy where single-phase flow is expected	Scenario 3: Wells drilled to confirm temperature
<ul style="list-style-type: none"> • Power output in terms of mass flow and discharge enthalpy • At minimum discharge enthalpy • At minimum well head pressure • At or below the agreed well depth and within the acceptable deviations stated in the drilling program (if well is directional) 	<ul style="list-style-type: none"> • Power output in terms of mass flow and discharge enthalpy • At minimum discharge enthalpy • At maximum drawdown • At or below the agreed well depth and within the acceptable deviations stated in the drilling program (if well is directional) 	<ul style="list-style-type: none"> • Temperature • At, or below the agreed well depth and within the acceptable deviations stated in the drilling program



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The success criteria for wells in Scenarios 1 and 2 will be constrained by the financial analysis of the business model. **The minimum power output for a well to be defined as successful will be equal to the minimum average well output for the project in order for the business plan to be economically viable as defined by the financial analysis of the business plan.**

Well testing will be done in accordance with a pre-agreed plan, between the Beneficiary and the RSM Unit, based on description of the flow test procedure in Section 6. Before signing of the Beneficiary Agreement, the Beneficiary and the RSM Unit must reach an agreement on the likely length of the flow test and how to define if stable or semi-stable conditions during flow testing have been reached in order to assess the likely long term output of the well. Moreover, the Beneficiary and the RSM Unit must agree on the likely thermal recovery time of each well before initiating flow test or if flow should be initiated before full thermal recovery has been reached. If flow from a well will not be initiated by airlifting or pumping shortly after the well has been drilled, the thermal recovery of the well shall be monitored as addressed in Section 6.

In the case where the success criteria does not consider well output (scenario 3), for exploration wells drilled mainly for conformation of reservoir temperature at depth, the criteria will be based on temperature at depth. Wells drilled for that purpose, should be allowed to recover thermally for at least 2-3 weeks. During the recovery period, downhole temperature shall be monitored regularly (at least 2-3 times) to allow evaluation of formation temperature by applying Horner Plot modelling or similar temperature estimations. If that does not suffice to determine reliably success or failure, full thermal recovery of the well will be needed.

If any dispute remains between the RSM Unit and the Beneficiary on the results of the flow test, the RSM Unit reserves the right to request a third party evaluation and/or flow test the well again before declaring success or failure for a given well. The cost of the third party evaluation/flow test will be borne by the RSM.

The success for each well will be determined based on comparison between the measured well output and the success criteria stipulated in the Beneficiary agreement (Figure 9).

Well drilling failure, which can be linked to technical problems during drilling rather than geological settings and resource characteristics, will not be considered as a failure that will trigger the RSM reimbursement. It is expected that the Beneficiaries make their own arrangements (such as insurance) regarding to reimbursement for technical failures of drilling that renders the well unsuccessful. This includes failure to reach the set-out drilling target or technical failures that result in an unfinished well.

An additional criterion is raised, which is based on the requirements from CTF, that the estimated CO₂ emissions during operation shall not exceed a threshold value of 583 g/kWh. In the case where only short-term flow-testing (couple of days) indicates that the well will have CO₂ emission factor in excess of the threshold value, it has to be estimated how likely it is that such results are representative for the long-term emissions. It is known that CO₂ output can be very high initially, but often decreases rapidly thereafter. Therefore, initial CO₂ estimates from short-term flow-testing (< 5 days) should be considered provisionally, until a long-term flow-testing (as stipulated in Section 6) is possible. This can mean that even though the criterium of less than 583 g/kWh is not met in the first well to be flow-tested, the program may proceed until the first well can be long term flow-tested for a more accurate estimation of long term CO₂ emission. The Beneficiary may decide to proceed to drill the next well, even if the long-



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term flow-testing of the first well has not been finished. He will need to provide bank guarantee for the success fee for the next well to be drilled after which the Beneficiary will proceed at his own risk. This means that the termination of the agreement will be retroactive (to the point in time that the well in question was completed) if the results from long-term flow test show an emission above 583 g/kWh of CO₂ (i.e. the second well will not be covered by RSM if it is a failed well).

A well measured with CO₂ emissions higher than 583 g/kWh will terminate the Beneficiary Agreement and will not trigger pay-out under the RSM, unless the well is considered unsuccessful based on the set success criteria in the Beneficiary agreement (see Figure 9).

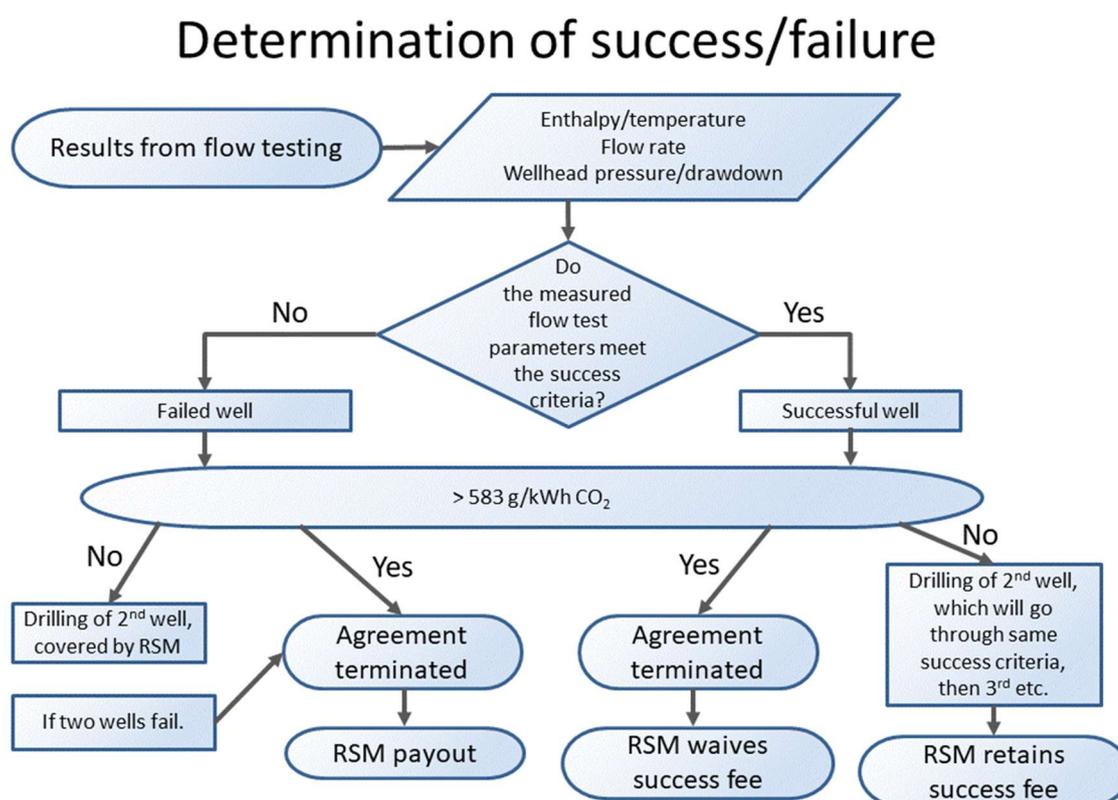


Figure 9 – Flowchart clarifying how determination on success/failure will be evaluated by the RSM Unit

8 Monitoring and reporting

The objectives of the RSM Program monitoring and evaluation activities performed by the RSM Unit and the RSM Consultant are as follows:

- Provide regular information on progress under the terms of the Beneficiary Agreement toward achieving planned results and facilitating reporting to the RSM Unit.
- Alert the RSM Unit to actual or potential problems in implementation of the project so that adjustments and required measures can be made.



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The Beneficiary will allow the RSM Consultant to closely monitor their activities. This will include three main components, namely site visits, reporting, well data and financial information.

- i. *Site visits:* Carried out intermittently during drilling and during all or some well tests. The objective of the site visits is to monitor the progress during drilling, verify that costs incurred correspond to activities on site and observe the well testing in order to ascertain the fulfilment of the conditions and stipulations of the Agreements. The Beneficiary will allow the RSM Consultant to make arrangements for such site visits on behalf of the RSM Unit.
- ii. *Reporting:* The Beneficiary will submit the following reports:
 - Daily drilling reports.
 - Daily mudlogging/onsite geological reports.
 - Well completion reports.
 - Well testing reports in which the performance of the well is measured against the success criteria.
 - Any other reports, as stipulated in the drilling program and flow testing procedures.

The daily drilling reports and mud logging/onsite geological reports will be sent directly to the contacts assigned by the RSM Unit.

The RSM Unit shall evaluate the validity of any claims presented in the well testing report by the Beneficiary.

- iii. *Well data and financial information:* Throughout the drilling and testing period the Beneficiary will share financial and technical data with the RSM Unit as specified in the RSM Beneficiary Agreement.

The Beneficiary will be obligated to submit invoices and proof of payment to the RSM Unit as expenses are incurred in the exploration drilling projects. The RSM Unit shall receive and verify this information.

The data shall be submitted in a standardized format as defined by the RSM Unit.

9 Information and communication

Information on the RSM will be disclosed and disseminated to the general public, including governments, civil society organizations and the private sector, unless there is a compelling reason not to do so. For this reason, a RSM website has been established:

www.rpmjeoturkiye.com and www.rsmgeoturkey.com

All relevant information on the RSM (including the Beneficiary Manual) are published on these websites.

After signing the Beneficiary Agreements in each application round, information on the total number of projects funded and the total amount of funds will be published on the webpage, including the list of sponsors and project locations.

Project data including information on the developer, the location, size and nature of resource; type and number of drillings and metadata on information sources will also be published in the RSM website unless the Beneficiary can justify that publishing the material will be detrimental to the right of the Beneficiary. In the case of non-



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acceptance, the information will still be stored in the database (see below) with access only for the RSM Unit, Beneficiary and other entities accepted and/or requested by the Beneficiary.

As part of the RSM, a database will be created (RSM Database) which will store all available information provided by the Beneficiary as well as data from wells drilled with support from the RSM within specific project sites.

Beneficiaries will need to provide the specified information to feed into the RSM database according to pre-established templates. The database will make use of GIS techniques and use layers for different information and allow for reporting and analysis. The database will also include project information data, as well as progress and any issues that need to be tracked and reported regarding the project progress. The data to be included in the database comprise at least the following: coordinates of well heads, well track in x, y, and z, final well designs (as is), lithological columns, rock alterations; well logs (temperature, pressure, etc.) collected during and after drilling, information about feeding aquifers, chemical analysis of fluid samples, completion test data and test parameters, discharge test data and test parameters, land use maps, geological layers, project information/progress layers.

The database will have restricted access. No information on specific projects will be made accessible or distributed to the public nor to other beneficiaries, unless with a written and signed permission from the Beneficiary.

The RSM Unit, however, does not need special permission to use the information for statistical analysis on the RSM program which may be published; as long as the information remains secured, and will not be linked to a specific project.

10 Standard legal agreement between RSM and Beneficiary

For an RSM project to take effect, an agreement between the Beneficiary and the RSM Unit must be fully approved and signed by the Parties. The Beneficiary and the RSM Unit have to reach a consensus on the success criteria as stipulated in Section 6. The success criterion will be included in the Beneficiary Agreement and will serve as the basis for deciding upon success or failure of the wells after being flow tested.

The draft Beneficiary Agreement between the RSM Unit and Beneficiary is presented in Appendix 8.

11 Compliance of Turkish Environmental Impact Assessment regulation and World Bank requirements

Geothermal exploration drilling and testing has temporary local adverse impact on the environment. In addition to that, access roads and well pads may have long-term negative visual impacts. For this reason, geothermal exploration drilling and well testing is subjected to Turkish Environmental Impact Assessment (EIA) Regulation. Geothermal exploration drilling projects are treated as Annex II projects in the Turkish EIA regulation (Official Gazette No. 29186, November 25, 2014). Annex II projects are projects that may or may not have significant effects on the environment. Preparation of Project



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Information File (PIF) containing information on (i) project characteristics, (ii) project site and environmental characteristics of the project and (iii) significant impacts of the project and measures to be taken is required for Annex II projects. The PIF shall be submitted to the Provincial Directorates of Environment and Urbanization (PDoEU) before exploration application. The PDoEU decides if Environmental Impact Assessment (EIA) is required or not.

World Bank classifies four categories, depending on the type, location, sensitivity, scale of the project, the nature and the magnitude of the potential environmental impacts. In most cases, geothermal exploration drilling and testing is expected to be classified in Category B projects according to Operational Policy (OP) OP 4.01. According to OP 4.01, a proposed project is classified as Category B project if its potential adverse environmental impacts on human populations or environmentally important areas are site specific, if only few of them are irreversible and mitigation measures can be designed readily. Although environmental impacts of Category B projects are expected to be less than in Category A projects, environmental assessment of Category B projects examines the project's potential negative and positive and recommends measures needed to prevent, minimize, mitigate or compensate for adverse impacts. For Category B projects, this can be assessed in Environmental and Social Management Plans (ESMP). An ESMP consists of set of mitigation, monitoring and institutional measures to be taken during construction, drilling and testing to eliminate adverse environmental and social impacts, offset them or reduce to acceptable levels. General contents of ESMP are presented in Appendix 11. Templates for mitigation plans are presented in Appendix 9, Environmental and Social Management Framework. Templates for Environmental and Social Monitoring Plans are found in Appendix 11.

Turkish EIA procedures are, with some exceptions, in line with the World Bank's Policies. The main exceptions are in project categorization, content of EA and public consultation. These key differences are discussed in the ESMF (Appendix 9). Due to the similarities of procedures to be carried out to fulfil World Bank's OP 4.01 requirements and the Turkish EIA process, the ESMF lays out a step-by step procedure to meet World Bank's requirements. This procedure is supplementary to the Turkish EIA process that should already be carried out. This process is shown in Figure 10.

An ESMF sets a technical guidance in handling and organizing environmental and social assessment and management for projects whose specific characteristics (e.g. dimensions, designs) are yet to be defined. The ESMF for the RSM project is presented in Appendix 9. The ESMF presents the necessary compliance requirements for prospective investments to achieve approval of national laws and provisions of the World Bank's OP 4.01 and OP 4.04. Furthermore, the ESMF addresses the key differences between the Turkish regulation and World Bank requirements.

Environmental and social safeguard screening according to a screening checklist in Appendix 10 is required for each proposed project to determine the appropriate extent and type of environmental assessment.



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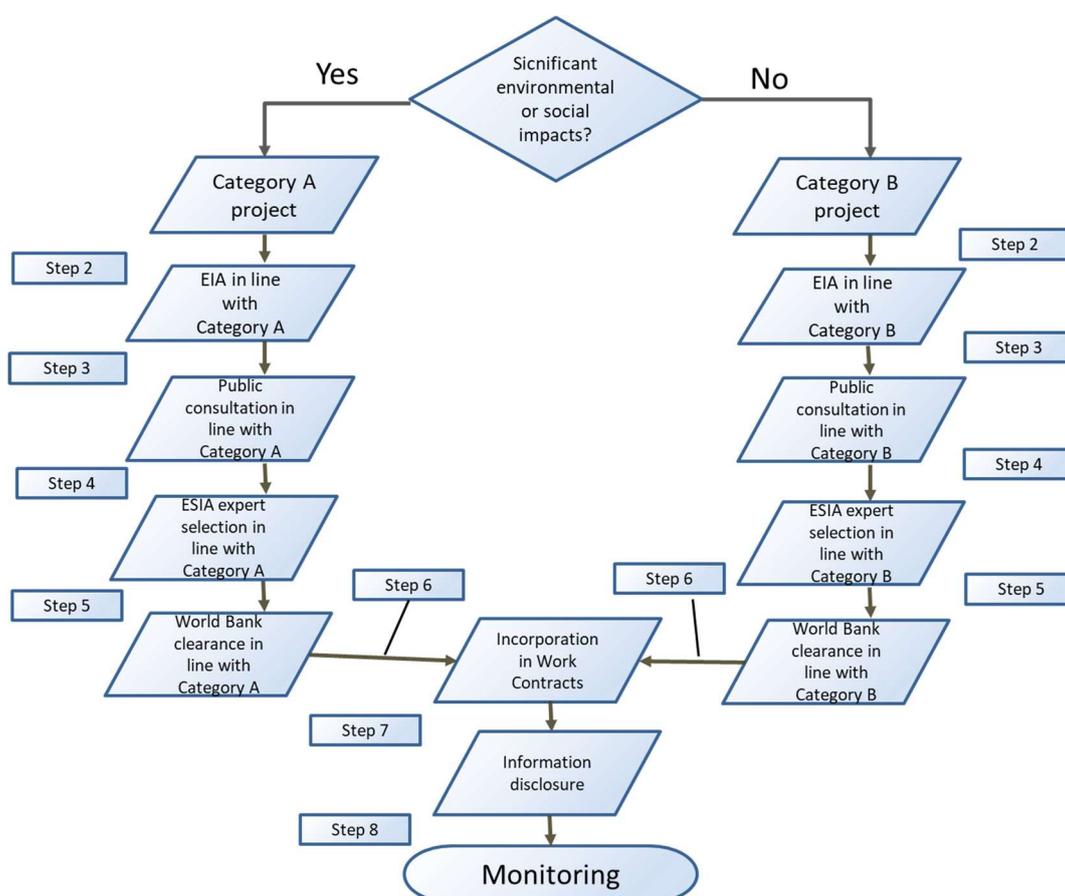


Figure 10 – Step-by-step process in meeting World Bank environmental requirements. This process is discussed in detail in Appendix 9, Environmental and Social Management Framework.

A Stakeholder Engagement Plan (SEP) shall be prepared by beneficiaries. Public consultations shall be widely announced at least two weeks in advance using local newspapers and other local means of information dissemination that are known to be effective. For both Category A and B projects, the developer will ensure that draft ESIA/ESMPs and other assessment or supplementary documents are available in public places and meeting announcement will point out the location. The minutes of public meetings will be recorded and included in the ESIA/partial ESIA/ESMPs of subprojects.

During these meetings, local people shall be informed about the methodology of land acquisition (expropriation, urgent expropriation, willing buyer – willing seller procedures, etc.). Moreover, the overall methodology of the land acquisition methods, the timeframe assumed for this phase and the contact point from sub-borrower site shall be presented.

Land acquisition/expropriation in the Turkish legal framework is based on the Expropriation Law No. 2942. Resettlement is regulated by the Resettlement Law No. 5543. The contents of these Laws are discussed in detail and compared to World Bank's Operational Policy on involuntary resettlement (OP 4.12) in Appendix 20, Resettlement Policy Framework.

OP 4.12 points out that involuntary resettlement may cause severe long-term hardship, impoverishment and environmental damage, unless appropriate measures are planned and carried out. Thus, as a mitigation plan, Resettlement Action Plan (RAP) shall be prepared where involuntary resettlement or expropriation is foreseen. Guidelines for preparation of RAP are presented in Appendix 15.



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Beneficiaries are required to ensure occupational health and safety in all projects by implementing Occupational Health and Safety Plan. Zero accident policy should be main vision of the Occupational Health and Safety Plans. General contents of an Occupational Health and Safety Plan is presented in presented in Appendix 14.

A list of WB Operation Policies triggered in exploration drilling projects are listed in Table 13. The same table lists safeguard documents that may be required, depending on the environmental and social safeguard screening (Appendix 10).

Table 13 – Overview of WB Operation Policies triggered in exploration drilling projects and overview of safeguard documents that may have to be prepared for each project depending on the foreseen impact. The column on the right shows in which step on Figure 10 each Policy and Safeguard document has to be taken into account. All the required Safeguard Documents shall be prepared on Step 2 as a part of either ESIA or ESMP.

WB Operation Policies triggered
OP 4.01 Environmental Assessment
OP 4.04 Natural Habitat
OP 4.11 Physical Cultural Resources
OP 4.12 Involuntary Resettlement
OP 4.36 Forest
Applicable Safeguards Documents
Screening Checklist for Environmental and Social Safeguards
Environmental and Social Impact Assessment (ESIA), Category A in accordance with WB OP 4.01
Environmental and Social Management Plan (ESMP), Category B in accordance with WB OP 4.01 and Appendix 11
Stakeholder Engagement Plan (Appendix 12)
Cultural Heritage Management Plan (including Change Find Procedure) (Appendix 13)
Occupational Health and Safety Management Plan (including Emergency Response Plan) (Appendix 14)
Resettlement Action Plan (Appendix 15)
Traffic Management Plan (Appendix 16)
Waste Management Plan (Appendix 17)
Effluent Management Plan (Appendix 18)
Hazardous Material Management Plan (Appendix 19)



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12 List of Acronyms

As:	Arsenic
Ar:	Argon
ARAP:	Abbreviated Resettlement Action Plan
B:	Boron
Ca:	Calcium
CAPEX:	Capital expenditure
CH4:	Methane
CHMP:	Cultural Heritage Management Plan
Cl:	Chlorine
CO2:	Carbon dioxide
CTF:	Clean Technology Fund
EA:	Environmental Assessment
EIA:	Environmental Impact Assessment
ESIA:	Environmental and Social Impact Assessment
ESMP:	Environmental and Social Management Plans
ESMF:	Environmental and Social Management Framework
F:	Fluorine
Fe:	Iron
FI:	Financial Intermediary
FIT:	Feed in Tariff
g:	Gram
GHG:	Greenhouse gas
H2S:	Hydrogen sulfide
HT:	High temperature
IBRD:	International Bank for Reconstruction and Development
IRR:	Internal rate of return
K:	Potassium
kWh:	kilo Watt hours
Li:	Lithium
Mg:	Magnesium



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M&E:	Monitoring and Evaluation
MSDS:	Material Safety Data Sheets
MW:	Mega Watt
MW _e :	Mega Watt electric
MW _{th} :	Mega Watt thermal
MWh:	Mega Watt hours
Na:	Sodium
N ₂ :	Nitrogen
NH ₃ :	Ammonia
NPV:	Net present value
NCG:	Non-condensable gas
NZ:	New Zealand
SO ₄ :	Sulphate
O ₂ :	Oxygen
OHSMP:	Occupational Health and Safety Management Plan
OP:	Operation Policy
OPEX:	Operational expenditure
P:	Pressure
PAP:	Project-affected people
PDoEU:	Provincial Directorates of Environment and Urbanization
PIF:	Project Information File
PIU:	Project Implementation Unit
PO:	Power Output
RAP:	Resettlement Action Plan
RPF:	Resettlement Policy Framework
RSM:	Risk Sharing Mechanism
RSM Unit:	Risk Sharing Mechanism, implementing Unit
RSM Consultant:	Consultant to the implementing unit
RSP:	Road safety plan
s:	second
SEP:	Stakeholder Engagement Plan
Si:	Silicon



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T:	Temperature
TFT:	Tracer Flow Testing
TKB:	Development Bank of Turkey
TO:	Thermal Output
TSKB:	Industrial Development Bank of Turkey
USD:	US Dollars
VAT:	Value added tax
WCG:	Well Cost Guideline
WB:	World Bank