

Financial requirements of Geothermal exploration drilling in RSM, link between success criteria and the business plan

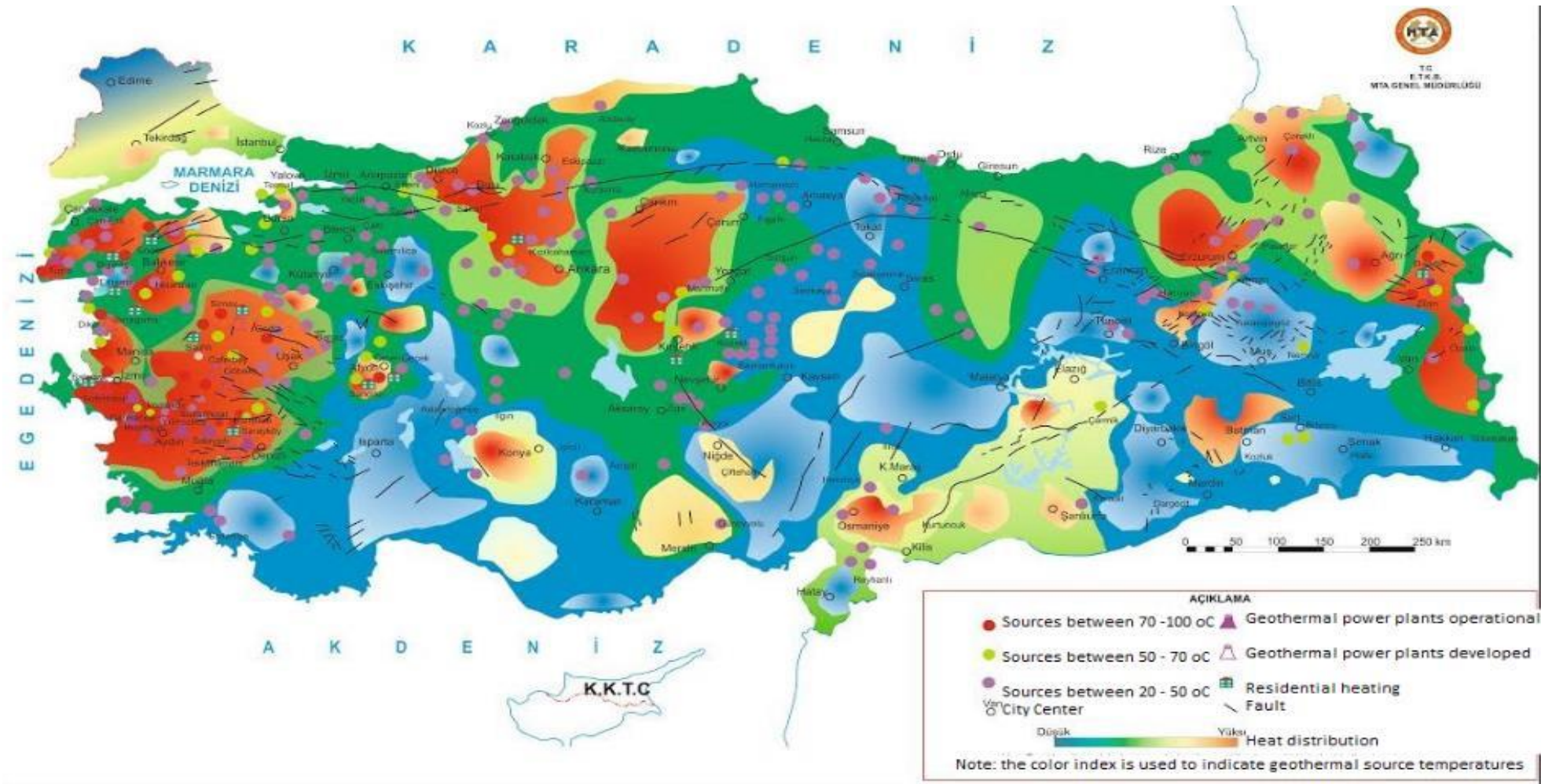
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Outline of the presentation

- Geothermal Energy Resources of Turkey
- Typical costs of geothermal power plant
- Financial Requirements
- Business Plan (BP)
- Determining success criteria
- Illustration of payout and success fees
- Details on the geographical coverage by number of wells
- 1-5 well drilling program
- Project application timeline

Geothermal Energy Resources of Turkey



Typical costs of geothermal power plant



Cost item	Steam plant	Brine plant
Preparation	2%	2%
Exploration	8%	5%
Geothermal well field development	50%	44%
Power plant	30%	39%
Indirect cost	10%	10%
Total installation cost, USD/kW Gross	3,650	5,300
Temperature oC	250	150
Installed capacity, MW	50	10

Source: HOW DO FINANCIAL ASPECTS OF GEOTHERMAL COMPARE WITH OTHER ENERGY SOURCES?
Carine Chatenay and Thorleikur Jóhannesson
Verkís

Financial Requirements

Business Plan:

1. The structure of the Beneficiary's consortium or Joint Venture
2. Feasibility of the drilling plan for direct use facilities or power plants
3. If any pre-feasibility study or socio-economic analysis are available, applicant should provide final reports



KEY DRIVERS OF THE

Business Plan

Estimated of the key data in the right table is requested from the Developer:

- Installed capacity of power plant or direct use facility
- Internal consumption
- Number of wells (under RSM, production and reinjection)
- Sales price of power or heat
- CAPEX and OPEX
- Results in terms of IRR and NPV

Indicator	Unit	Value
Total gross installed capacity aimed at	MWe or MWth	
Own consumption	MWe or MWth	
Annual duration of maximum power or heat	hour per year	
Number of wells under RSM	#	
Number of production wells	#	
Number of reinjection wells	#	
Average sales price year 1-10	USD/MWh	
Average sales price year 11-25	USD/MWh	
Estimated Drilling cost per well	USD	
Total capital cost of power plant or direct use facility	USD	
Total annual operating costs	USD per year	
Expected IRR	%	
Expected NPV (at 8% discount factor)	USD	

Business plan requirements

In addition, a short general description of the following items is requested:

- 1. 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
- 2. 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.

Determining success criteria

Method for BP sensitivity:

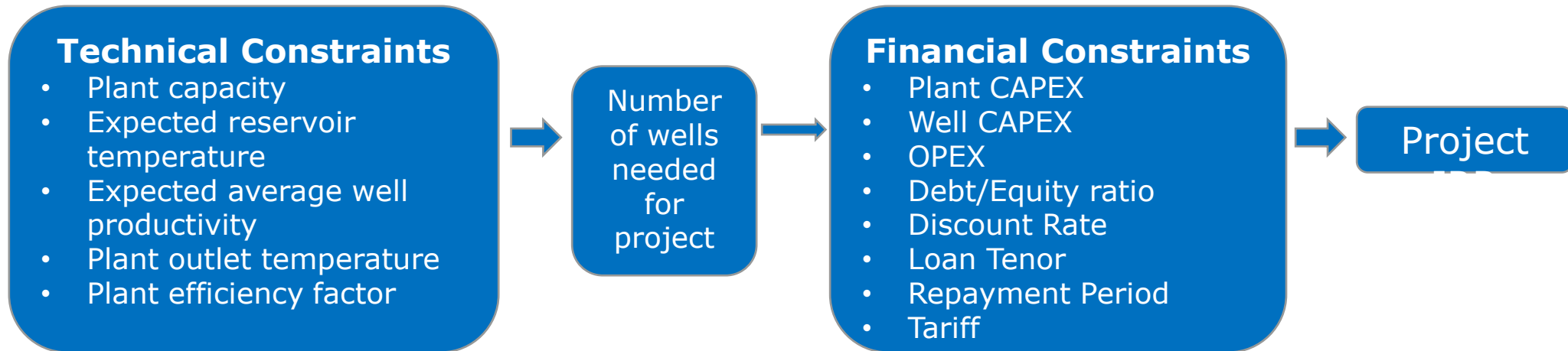
To determine success criterium, sensitivity analysis will be performed on BP in excel:

- Success criterium is expressed in **gross installed capacity** (in MWe or MWth)
- Derived by allowing for a number of **additional failed wells**, which will increase CAPEX of proposed project under which it remains **financially feasible**

Example of BP sensitivity:

Variables		
Number of Extra wells	#	2
Results		
IRR	%	8.19%
Installed capacity per well (gross)	MWe	1.43
Instructions		
Cells that can be changed in light yellow with blue text		0000000
Other cells should not be changed		

Key Input Parameters for Business Plan



Process for Defining Success Criteria

Business Plan Stress Test → Average Well Output Using Maximum Number of Wells at >8% IRR

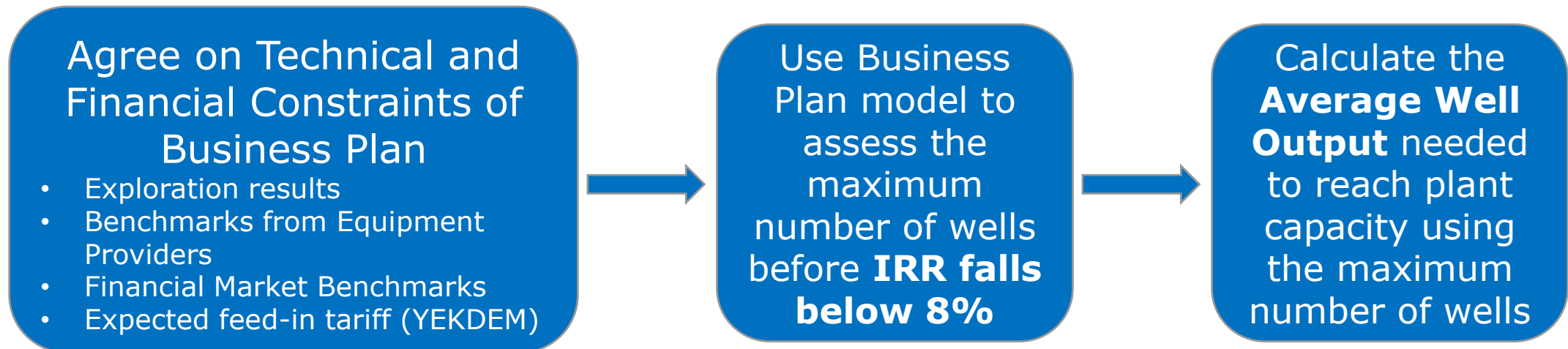
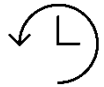


Illustration of payout and success fees



REIMBURSEMENT PROCESS

In case of an unsuccessful well, the RSM program will cover a pre-defined percentage of the actual acceptable well cost incurred by the license holder.



SUCCESS FEE

In case of a successful well when judged against the success criteria set forth in the Beneficiary Agreement, the Beneficiary shall be obligated to pay a 5% percent "Success Fee" of the actual acceptable well costs for the first three wells and 10% for the fourth and fifth well.



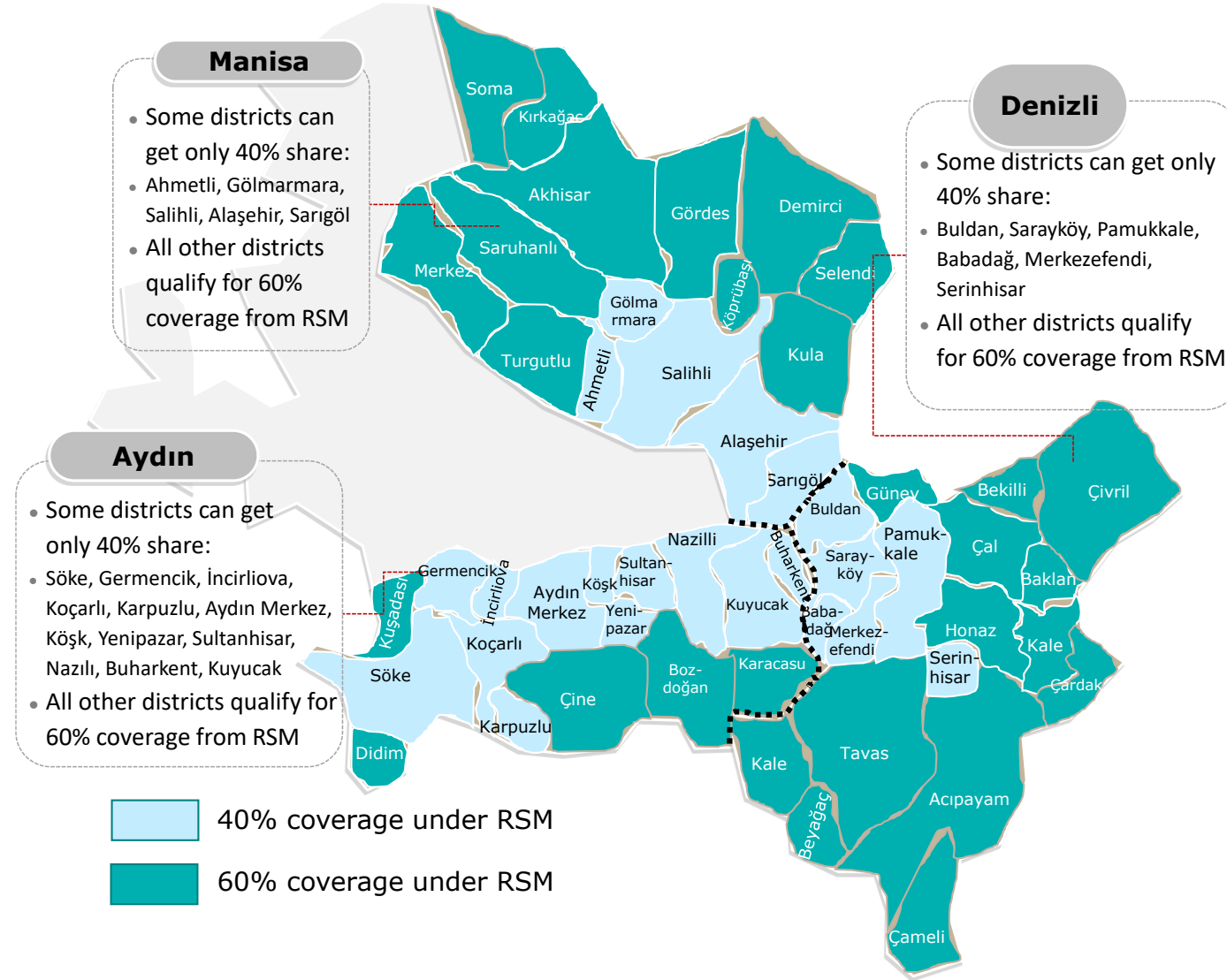
PAYOUT AND SUCCESS FEE

Details on the geographical coverage by number of wells

Success fee scheme from RSM

Payout scheme from RSM

Well No	Selected regions in Aydın, Denizli, Manisa	Other provinces	All provinces
1	40%	60%	5%
2	40%	60%	5%
3	40%	60%	5%
4	40%	40%	10%
5	40%	40%	10%



OVERVIEW OF ALL POTENTIAL OUTCOMES OF THE RSM PROGRAM

1-5 well drilling programme

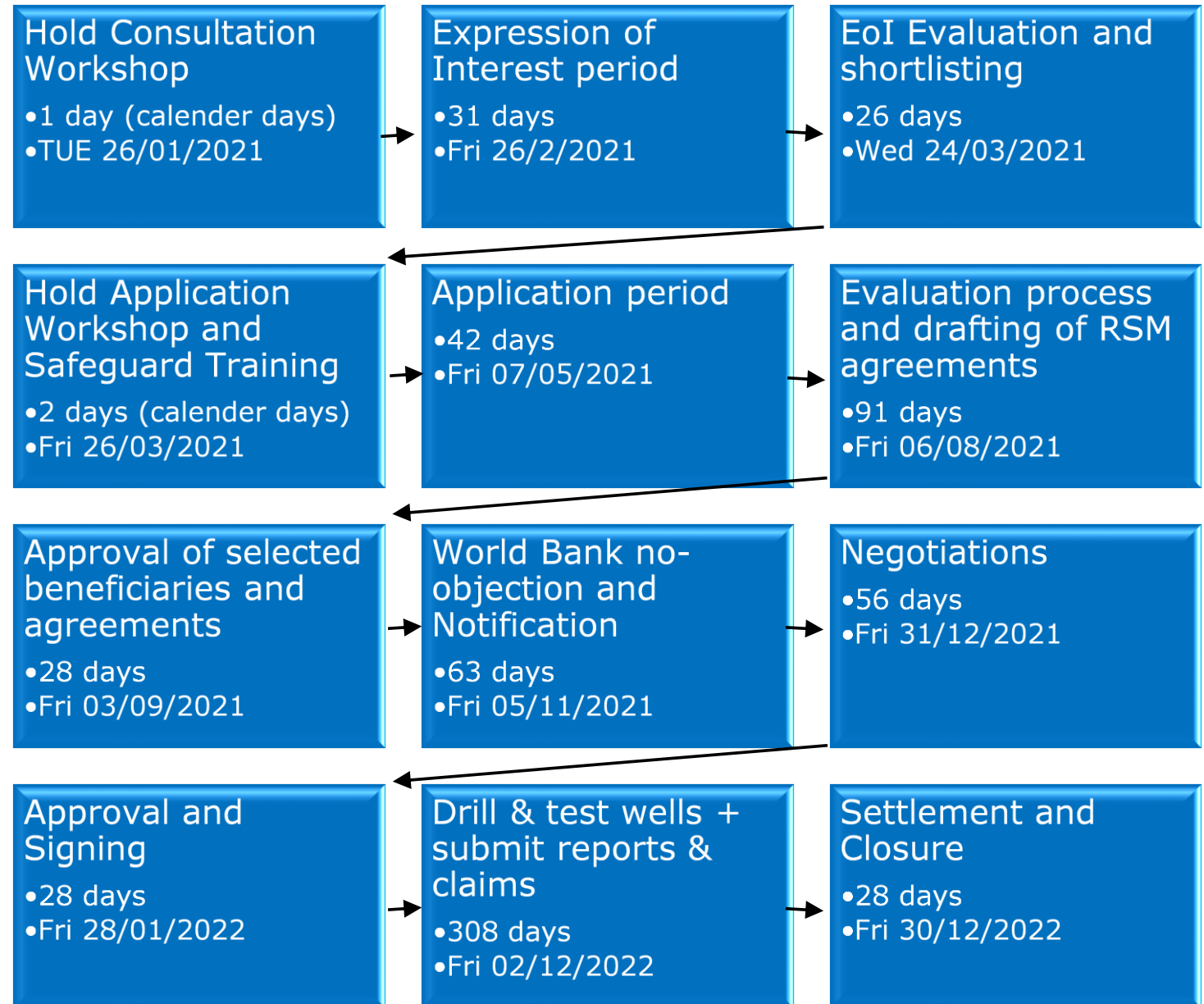
In total 30 possibilities were identified.

Within the table a successful well is labelled as (S) and an unsuccessful well as (U).

The red bars indicate that the RSM contract stops due to two unsuccessful wells.

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

Project application timeline



Thank you!

