

Document of
The World Bank
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Report No: ICR00005401

IMPLEMENTATION COMPLETION AND RESULTS REPORT

IDA-52620, TF014757, TF014765
ON A

IDA CREDIT
IN THE AMOUNT OF SDR4 MILLION
(US\$6 MILLION EQUIVALENT)

AND
A GRANT FROM THE
GLOBAL ENVIRONMENT FACILITY TRUST FUND
IN THE AMOUNT OF US\$6.04 MILLION

AND
A GRANT FROM ESMAP IN THE AMOUNT OF US\$1.10 MILLION

TO THE

MINISTRY OF FINANCE

FOR THE

DJIBOUTI GEOTHERMAL POWER GENERATION PROJECT

March 2021

Energy and Extractives Global Practice
Middle East and North Africa Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective December 31, 2020)

Currency Unit =

SDR 1 = US\$1.44

US\$1 = SDR 0.69

FISCAL YEAR

July 1 - June 30

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ABBREVIATIONS AND ACRONYMS

AFD	French Development Agency (<i>Agence Française de Développement</i>)
AfDB	African Development Bank
Bbl	Barrel
CAS	Country Assistance Strategy
CERD	Djibouti Research Center (<i>Centre d'Etudes et de Recherche de Djibouti</i>)
CO2e	Carbon Dioxide Equivalent
CPF	Country Partnership Framework
CPS	Country Partnership Strategy
EDD	Djibouti Electricity Company (<i>Electricité De Djibouti</i>)
ESIAF	Environmental and Social Impact Assessment Framework
ESMAP	Energy Sector Management Assistance Program
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GoDJ	Government of Djibouti
GWH	Gigawatt Hour
HFO	Heavy Fuel Oil
ICR	Implementation Completion and Results Report
ICT	Information and Communication Technology
IDA	International Development Association
IFC	International Finance Corporation
IPP	Independent Power Producer
ISR	Implementation Status and Results Report
MENA	Middle East and North Africa
MERN	Ministry of Energy and Natural Resources
MIGA	Multilateral Investment Guaranty Agency
MTR	Mid-Term Review
MW	Megawatt
M&E	Monitoring and Evaluation
NDC	Nationally Defined Contribution
NPV	Net Present Value
ODDEG	Djibouti Office for Geothermal Development (<i>Office Djiboutien de Développement de l'Energie Géothermique</i>)
OFID	OPEC Fund for International Development
ORAF	Operational Risk Assessment Framework
PAD	Project Appraisal Document
PDO	Project Development Objective
PIU	Project Implementation Unit ("Unité de Gestion de Projet")
PPA	Power Purchase Agreement
PPP	Public Private Partnership
PV	Photovoltaic
REI	Reykjavik Energy International
SCD	Systematic Country Diagnostic
SEFA	Sustainable Energy Fund For Africa
SMEs	Small and Medium Enterprises
TTL	Task Team Leader
UNFCCC	United Nations Framework Convention on Climate Change
WBG	World Bank Group

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DATA SHEET

BASIC INFORMATION

Product Information

Project ID	Project Name
P127143	DJ Geothermal Power Generation Project
Country	Financing Instrument
Djibouti	Investment Project Financing
Original EA Category	Revised EA Category
Partial Assessment (B)	Partial Assessment (B)

Related Projects

Relationship	Project	Approval	Product Line
Supplement	P127144-DJ (GEF) Geothermal Power Generation Program	05-Jun-2013	Global Environment Project

Organizations

Borrower	Implementing Agency
Ministry of Economy and Finance	EDD, EDD/PIU

Project Development Objective (PDO)

Original PDO

The objective of the Project is to assist the Recipient in assessing the commercial viability of the geothermal resource in Fiale Caldera within the Lake Assal region.



FINANCING

	Original Amount (US\$)	Revised Amount (US\$)	Actual Disbursed (US\$)
World Bank Financing			
P127143 IDA-52620	6,000,000	5,980,194	5,569,945
P127143 TF-14757	6,036,364	6,031,166	6,031,166
P127143 TF-14765	1,100,000	1,001,482	1,001,482
Total	13,136,364	13,012,842	12,602,593
Non-World Bank Financing			
Borrower/Recipient	500,000	0	0
African Development Bank	2,340,000	0	0
African Development Fund	5,000,000	0	0
FRANCE: French Agency for Development	3,250,000	0	0
OPEC FUND	7,000,000	0	0
Total	18,090,000	0	0
Total Project Cost	31,226,364	13,012,841	12,602,592

KEY DATES

Project	Approval	Effectiveness	MTR Review	Original Closing	Actual Closing
P127143	05-Jun-2013	02-Jul-2014	11-Dec-2017	31-Dec-2018	31-Dec-2019

RESTRUCTURING AND/OR ADDITIONAL FINANCING

Date(s)	Amount Disbursed (US\$M)	Key Revisions
20-Oct-2014	0	Reallocation between Disbursement Categories
22-Sep-2015	.01	Reallocation between Disbursement Categories
26-Jun-2018	7.78	Change in Loan Closing Date(s)
20-Dec-2018	11.43	Change in Results Framework Change in Loan Closing Date(s)



KEY RATINGS

Outcome	Bank Performance	M&E Quality
Moderately Unsatisfactory	Moderately Satisfactory	Substantial

RATINGS OF PROJECT PERFORMANCE IN ISRs

No.	Date ISR Archived	DO Rating	IP Rating	Actual Disbursements (US\$M)
01	07-Dec-2013	Moderately Satisfactory	Moderately Unsatisfactory	0
02	06-Jun-2014	Moderately Unsatisfactory	Moderately Unsatisfactory	0
03	13-Dec-2014	Moderately Unsatisfactory	Moderately Unsatisfactory	0
04	09-Jun-2015	Moderately Unsatisfactory	Moderately Unsatisfactory	0
05	20-Jan-2016	Moderately Unsatisfactory	Moderately Unsatisfactory	.05
06	29-Jun-2016	Moderately Satisfactory	Moderately Satisfactory	.13
07	12-Jan-2017	Moderately Satisfactory	Moderately Satisfactory	.20
08	18-Jun-2017	Moderately Unsatisfactory	Moderately Unsatisfactory	.26
09	15-Nov-2017	Moderately Satisfactory	Moderately Satisfactory	4.23
10	05-Jun-2018	Moderately Satisfactory	Moderately Satisfactory	7.08
11	28-Dec-2018	Moderately Satisfactory	Moderately Satisfactory	11.43
12	09-Jun-2019	Satisfactory	Satisfactory	12.50
13	02-Jan-2020	Moderately Satisfactory	Moderately Satisfactory	12.59

SECTORS AND THEMES

Sectors

Major Sector/Sector	(%)
Energy and Extractives	100
Renewable Energy Geothermal	100



Themes

Major Theme/ Theme (Level 2)/ Theme (Level 3)	(%)
Private Sector Development	10
Public Private Partnerships	10
Environment and Natural Resource Management	100
Climate change	100
Mitigation	100

ADM STAFF

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I. PROJECT CONTEXT AND DEVELOPMENT OBJECTIVES

Overview

1. As a project focused on deep exploratory drilling to confirm energy resources, the Djibouti Geothermal Power Generation Project is a high-risk high-reward project. It seeks to assist Djibouti in assessing the commercial viability of the geothermal resources located in Fiale Caldera within Djibouti Lake Assal region (Annex 6 locates the project site and shows the site layout). The commercial assessment was to lay out the basis for the development, in a subsequent operation, of a geothermal base load electricity generation capacity using this local renewable resource, which would replace EDD's ageing thermal base load generation capacity running. The project's main component finances the drilling of geothermal exploration wells and the technical, economic, and financial assessment of a future geothermal power generation project.
2. As of end December 2020, a significant part of the agreed drilling program has been completed. The three exploratory wells have been drilled at depths of up to 2,500 meters, and the related information collected and analyzed, with some preliminary tests conducted. In view of the initial results however, to increase the chances of a commercially viable power project, additional testing and stimulation was considered necessary before the feasibility study is initiated. In March 2020, Covid 19 led to a suspension of this additional work.
3. The World Bank Board of Executive Directors approved the project in June 2013. This is a multi-donors project in which the World Bank financial participation included a Credit of US\$6 million from the International Development Association (IDA), a grant of US\$6.04 million from the Global Environmental Facility (GEF), and a grant of US\$1.1 million from the Energy Sector Management Assistance Program (ESMAP). Other donors were the African Development Bank (AfDB) (US\$5.0 equivalent), AfDB Trust Funds (US\$2.34 million equivalent), AFD (US\$3.25 million equivalent), OFID/OPEC Fund (US\$7.0 million) and the Government of Djibouti (US\$.5 million).
4. As the World Bank financial contribution **of US\$13 million** fully disbursed (about 99% disbursement at project close), the World Bank project closed in December 2019. The financing required to complete the project is now being provided by the African Development Bank (AfDB) and by the Republic of Djibouti.
5. The initial project cost was US\$31.32 million, and the financing plan included other partners. However, the most recent estimate expects the project costs to be US\$56.82 million. To finance the additional costs, additional financing has been provided by AfDB and the Government of Djibouti. Because of the expected financing shortfall due to cost increases, the number of exploration wells to be drilled was reduced from four in the initial project design to three, when the bids from the drilling contractors were assessed. As of December 2020, two wells have been fully completed and one well needs additional work to resolve some technical issues (clogging due to debris which requires further cleaning of the well to ensure proper production tests and some wells stimulation).
6. Project implementation has been impacted by delays in mobilizing the project implementation unit, procurement problems due in part to financing sources with different **procurement policies and procedures** and by delays in issuance of no-objections, drilling problems, the need to secure additional financing, and since March 2020, by Covid-19.
7. It is now expected that the project will be completed in early-mid 2022. While this timetable appears feasible, it is conditioned by the impact of the Covid-19 pandemic on remobilizing contractors, by the Project Implementation Unit (PIU) obtaining some key no-objections from AfDB in early 2021, and the completion of the drilling work.



A. CONTEXT AT APPRAISAL

Context

Country Context

8. At the beginning of project preparation (in 2011), Djibouti had a population of about 900,000, was poorly endowed with natural resources that could be commercially harnessed and had limited arable land, rainfall, and potable water. Over the 2011-2015 period, the country leveraged its strategic geographic location between the Red Sea and the Gulf of Aden and became a maritime and international business hub in Eastern Africa. The economy was largely based on the commercial activities of Djibouti harbor. Landlocked Ethiopia, with a population of about 75 million, was the primary user of Djibouti's port, generating about 85 percent of the trade transiting through the container terminal.

9. Since 2005, Djibouti experienced a fiscal expansion and a surge in Foreign Direct Investments (FDI) that helped transform the economy and generate a rapid economic growth of 5.2 percent per year. The port benefited from investments that contributed to a marked increase in activity. The creation of the Djibouti Free Zone in 2004 for instance, enabled the import, storage, transformation, and re-export of goods without being subject to tariff or non-tariff barriers.

10. Djibouti's high growth and infrastructure expansion did not however significantly reduce poverty or unemployment as economic activity was largely confined to the free trade zone and port; positive spillover to the rest of the economy was minimal. The development of domestic companies and benefits of foreign investments have been hampered by high production costs stemming in part from high energy costs. A survey of Small and Medium Enterprises (SMEs) conducted in 2008 by the World Bank revealed that the lack of reliable, secure, and low-cost energy supply was considered by more than half of the interviewees as the single most important constraint to doing business in Djibouti. Harnessing the national geothermal resources could address this issue.

Sectoral and Institutional Context

11. At project appraisal, Djibouti's electricity sub-sector was regulated by the Ministry of Energy, Water, and Natural Resources (MERN). In this capacity, the MERN oversaw the state-owned utility, *Electricité de Djibouti* (EDD), which had a monopoly over generation, transmission, and distribution of electricity.

12. EDD electricity tariffs were very high at an average of US\$0.32/kWh, mainly as a result of high oil prices and technical and non-technical inefficiencies. EDD's 2012 tariffs ranged from a social price of US\$0.153/kWh (life-line tariff), to US\$0.426/kWh paid by construction sites. Shops and government buildings were charged US\$0.397/kWh.

13. Electricity demand. In 2012-2013, only around 50 percent of the population had access to electricity, as electricity consumption was constrained by high tariffs, high connection costs, and an electricity grid covering only Djibouti City and its outskirts. Load data from 2009 showed that the national grid demand ranged from a low of 15 MW in the cool season to a high of 63 MW in the hot season. 54 percent of the demand originated from large consumers. The first Ethiopian interconnection completed in 2011 helped meet part of the increased demand. A Parsons Brinckerhoff feasibility study of the electricity interconnection with Ethiopia foresaw a 5.2 percent annual increase in electricity demand till 2025. These forecasts were more conservative than those of EDD as the utility also considered the additional demand from the large projects planned for Djibouti.

14. Electricity supply. At Appraisal electricity supply consisted of EDD's thermal generating capacities and hydroelectricity-based imports from Ethiopia. EDD relied primarily on ageing diesel generation capacity running on expensive imported fuel oil to produce base load electricity. The utility had 18 generating units running on imported Heavy Fuel Oil (HFO) in the Boulaos and Marabout power stations of Djibouti. 14 generators - equivalent to 78 MW- were between



5 and 15 years old and the remaining capacity (but for one generator) was 20 years and older. Owing to the unreliability of older generators, EDD's effective generation capacity was limited to 57 MW out of the 119 MW installed.

15. Electricity Imports from Ethiopia. Since 2011, a new high voltage interconnector between Addis Ababa (Ethiopia) and Djibouti City provided the country with low cost energy supply when Ethiopia's hydroelectric resource is available. Under the terms of the Power Purchase Agreement (PPA), 180 to 300 GWh were to be sold to Djibouti annually. The PPA, which excludes energy sales during Ethiopia's dry season peak hours, represents 22.35 to 37.24 MW of continuous generation.

16. The energy supply from Ethiopia was not however provided under a firm capacity agreement, meaning that electricity was not necessarily to be available when needed most by Djibouti. A firm capacity agreement with Ethiopia would have created a better level of security of supply. At the time of project appraisal, based on the existing information available, only generating capacity installed in the country, such as based on domestic geothermal resource, was expected to truly ensure a secure supply of electricity.

17. Least cost option for future electricity supply. In 2009, the Bank commissioned a Least Cost Electricity Master Plan for Djibouti to determine the best option to bridge the growing gap between electricity demand and supply. According to this Master Plan, *"the difference in cost between the fossil fuel fired generation in Djibouti and the hydroelectric generation in Ethiopia is so large that Djibouti is likely to import most if not all the energy that is available. This situation would continue until Djibouti installs some form of low-cost generation utilizing indigenous resources, most probably geothermal ..."*.

18. The Geothermal Project aimed therefore at supporting the development of a least cost geothermal base load electricity generation capacity, relying on this clean national resource (substituting from imported fossil fuels).

19. Given that high electricity prices and electricity unreliability were considered major impediments to business development in Djibouti, the electricity cost reduction potentially achieved through the use of domestic geothermal resources would likely play a key role in bolstering the business environment and the role of the private sector, in line with the pillar, *"accelerating sustainable growth,"* of the Bank's MENA Regional Strategy.

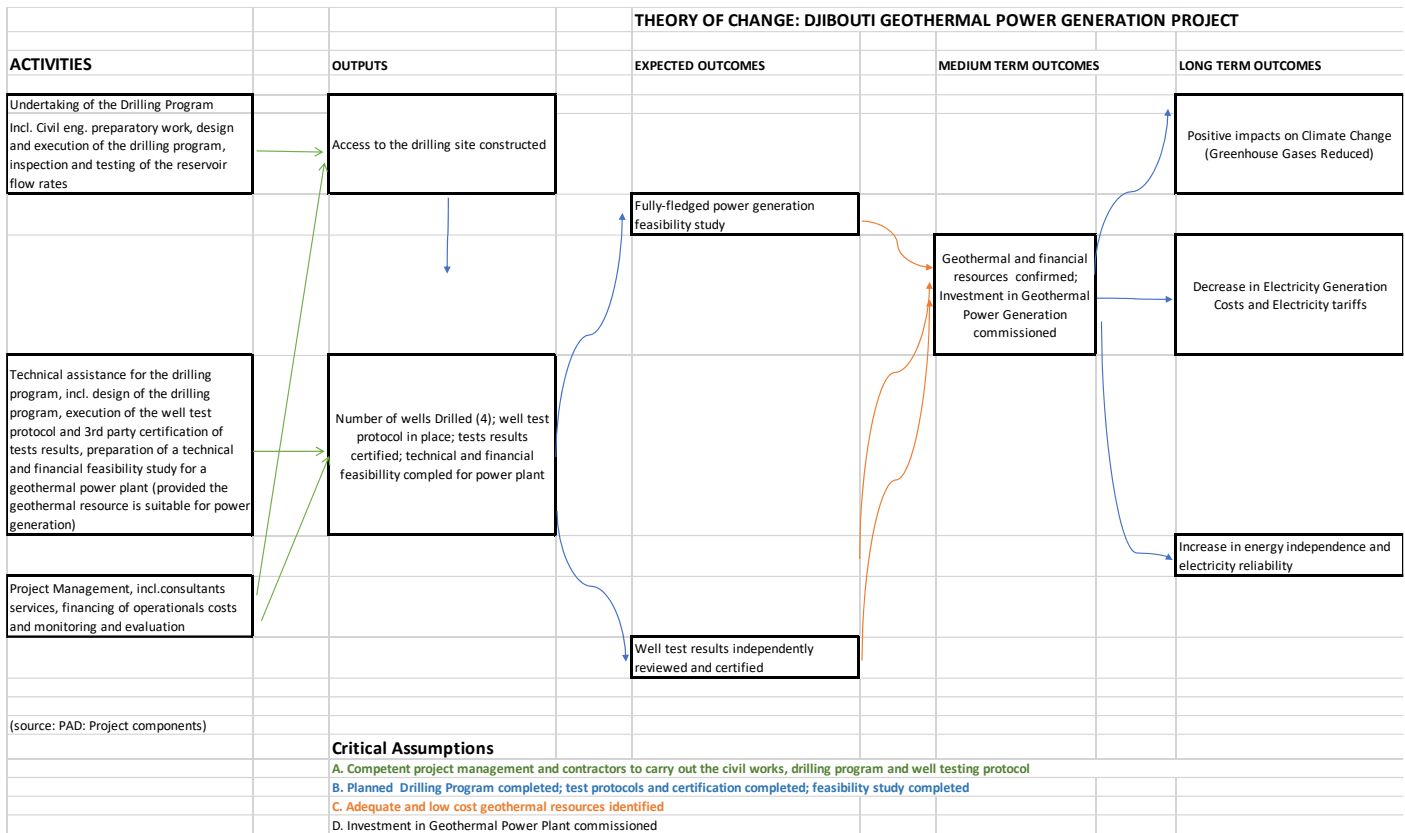
Theory of Change (Results Chain)

20. The project supports a geothermal exploratory well drilling program. Provided that the geothermal resource is proven to be commercially viable, and that a follow-on power generation project is undertaken, electricity costs and electricity tariff could be significantly reduced, addressing one key issue constraining Djibouti economic and social development.

21. The PAD at appraisal did not include a specific section on Theory of Change. The satisfactory implementation of four geothermal exploration wells drilled in Fiale Caldera within the Lake Assal region (See Annex 6 - project site layout) followed by the preparation of a feasibility study on power generation using the geothermal resource identified through the drilling program, were expected to assist Djibouti in deciding the technical and commercial viability of the geothermal resource in Fiale Caldera for power generation. Unlocking this geothermal potential would reduce domestic electricity generation costs, increase the country's energy security of supply, foster private sector participation in the energy sector particularly in generation, and contribute to Djibouti mitigation plan against climate change.



22. The Results Chain could then be as shown as below:



Project Development Objectives (PDOs)

23. The World Bank Group’s FY09-12 Country Assistance Strategy (CAS) stated that “the World Bank will support the Government of Djibouti’s (GoDj) efforts to strengthen the business environment, with a focus on reducing constraints and costs to private sector development, especially in the power, telecommunications and financial sectors”. The proposed geothermal power generation project was incorporated in the 2013-2017 Country Partnership Strategy (CPS) which itself built on the results of the “New Growth Model for Djibouti” that underlined that electricity was considered by the majority of companies operating in Djibouti as the main impediment to private sector development and economic diversification.

24. As per the Legal Agreements the Project Development Objective (PDO) was to “assist the Recipient in assessing the commercial viability of the geothermal resource in Fiale Caldera within the Lake Assal region”. The PAD stated the same PDO formulation.

25. The PDO, as stated, considered activities financed by not only the WB (IDA and ESMAP; and GEF and OFID as their financing were managed by the WBG), but also activities financed by AfDB and AFD. Throughout project implementation, this PDO remained unchanged despite a project restructuring in December 2018 (See Section Revised PDOs below).



Key Expected Outcomes and Outcome Indicators

26. As per the PAD, the Outcomes Indicators were as follows: The expected outcome was the assessment of the commercial viability of the geothermal resource; and the outcome indicators were (a) Greenhouse Gas Emission Avoided as a clean energy resource would substitute to a polluting fossil fuel; (b) Develop a fully-fledged power generation feasibility study; (c) Publish periodic updates of project implementation; (d) Geothermal well test protocol developed and in place; and (e) Well test results independently reviewed and certified.

Components

27. The project had three components: (i) Drilling Program (US\$ 27.18 million, of which SDR equivalent to 6 million IDA 1, US\$ 6.04 million GEF and US\$ 1.1 million ESMAP); (ii) Technical Assistance for the Drilling Program (US\$ 1.75 million financed by AfDB through its Trust Funds); and (iii) Project Management (US\$ 1.6 million financed by AfDB and GoDJ). The table of Project Financing Plan at Appraisal can be found in Annex 3.

B. SIGNIFICANT CHANGES DURING IMPLEMENTATION

Revised PDOs and Outcome Targets

28. The PDO was not changed during project implementation.

29. Following the Project Restructuring in December 2018, among the outcome targets, only the initial target of “Number of wells drilled” was revised from four to three to adjust to the target of the drilling contract, due to insufficient funding.

Revised PDO Indicators

Following the Project Restructuring in December 2018, the indicator “Grievances registered related to delivery of project benefits addressed” was added in response to new World Bank corporate requirements. Owing to changes in the operations portal system, the Bank team was requested to align the PDO indicators with the project’s outcome and the intermediate indicators with the project’s components.

Rationale for Changes and Their Implication on the Original Theory of Change

30. The Project underwent multiple Level 2 restructurings during the course of its implementation. The changes for each of these restructurings are listed below.

31. On October 7th, 2014, the project was restructured to: (a) create a new category for consultant services to support project management; and (b) reallocate funds (US\$600,000) from the ‘Goods, works, non-consulting services, and consultants’ services under Part A (ii) of the Project’ category to the newly created ‘Consultant services for project management under Part C of the Project’. The restructuring also aimed at addressing a correction in reflecting the actual amount of the GEF grant allocated for the project. While the GEF Grant was approved for US\$6,036,364, the amount was rounded up to US\$6,040,000 in the Project Appraisal Document and in the GEF Grant Agreement.

32. On June 2015, the project was restructured to (a) increase the IDA Credit disbursement percentage for expenditures under Part A (ii) of the Project (i.e. Drilling Service Company contract) from 32% to 34.1%; (b) increase the GEF Grant disbursement percentage for expenditures under Part A (ii) of the Project (i.e. Drilling Service Company contract) from 32% to 38.3%; and (b) increase the IDA Credit disbursement percentage for expenditures under Part C of the Project (i.e. Consultants’ services for Project management) from 40% to 100%. These changes would allow to finance (a) 100% of

¹ The IDA Credit was 4 million SDRs. Because of the exchange rates fluctuations this has been equivalent to US\$5.027 millions.



the cost of the Drilling Service Company with the current available co-financiers: 38.3% GEF, 27.6% OFID and 34.1% IDA, and (b) 100% of consultant's costs to support the Project Implementation Unit (PIU).

33. On December 2018, the project was restructured to: (i) extend the closing date of the IDA credit (IDA-52620) and the GEF grant (TF-14757) from December 2018 until December 2019. The extension was to allow the project to complete: (i) the final production tests (expected, at that time, by March 18, 2019), (ii) the feasibility study on a geothermal power plant (expected, at that time, by June 26, 2019), (iii) the tender package for the selection of a private geothermal power plant developer (expected, at that time, by August 21, 2019), and (iv) the final PIU project activity report (expected by September 30, 2019). The Bank team was requested to align the PDO indicators with the project's outcome and the intermediate indicators with the project's components.

34. All these changes did not impact the Original Theory of Change, and the PDO remained unchanged.

II. OUTCOME

A. RELEVANCE OF PDOs

Assessment of Relevance of PDOs and Rating

35. The relevance of PDO is rated *High*.

During Project Implementation and at Project Closing

36. CPS covering FY2014-2017. This first CPS assumed an indicative IDA envelope of US\$25 million. It was anchored in the GoDJ's Vision 2035, a long-term development plan focused on economic integration, governance, and human development. The overarching objective of the CPS was to support the government's vision, work to reduce extreme poverty and build the foundations for shared growth by harnessing the country's human and economic potential. The CPS rested on two pillars: reducing vulnerability and strengthening the business environment while focusing on institutional strengthening and gender as cross-cutting themes. To address key development challenges regarding the exploration of investment opportunities in growth sectors, the CPS included a joint strategy for the World Bank, IFC and MIGA.

37. In addition to implementing on-going energy projects (the Geothermal Power Generation Project and the Power Access and Diversification project) the CPS 2014-2017 program included a Rural Electrification Study, a Governance for Private Sector Development and support to the legal and institutional PPP framework.

38. The Systematic Country Diagnostic (SCD) of October 2018 of the World Bank Group (WBG) and the Country Partnership Framework for Djibouti (CPF) for 2020-2025. The SCD noted that in its Nationally Defined Contribution (NDC), submitted to the UNFCCC in August 2015, Djibouti stated that it has a "green economy strategy, the aims of which are to encourage the use of low carbon technologies that are resilient to climate change, and to promote green jobs". Djibouti has significant renewable energy resources, particularly solar, wind, and geothermal, relative to the size of its population and scale of its economy. Renewable energy could play a central and multi-dimensional role in economic growth. By investing in renewable energy, Djibouti could reduce the burden on its budget and on consumers. Reliable access to power would also help the development of Djibouti's ICT sector and assist the country in taking advantage of the fact that Djibouti is the landing site for two major underwater fiber optic cable. The proposed 2020-2025 CPF aims also at "reducing the cost of doing business". Djibouti's competitiveness is still hindered by high input costs and low connectivity of utilities. The cost of electricity remains among the highest in the MENA and Sub-Saharan Africa regions at 31 US cents per kWh for



businesses. By providing a low-cost option for base load electricity generation, the project is expected to contribute to the WBG's twin goals of eliminating absolute poverty and increasing shared prosperity.

39. Reducing the high cost of electricity and developing base load generation using domestic clean renewable energy resources in particular through tapping into Djibouti geothermal potential is still today an important objective pursued by the GoDJ. The relevance of the PDO to the 2014-2017 CPS and the 2020-2025 CPF is therefore rated as **high**.

B. ACHIEVEMENT OF PDOs (EFFICACY)

Assessment of Achievement of Each Objective/Outcome

40. **Efficacy is rated as Modest.** For the purpose of the ICR, Efficacy is defined as the extent to which the PDO was achieved at the time of project closing or is expected to be achieved due to the activities supported by the operation. As mentioned, the PDO was to assess the commercial viability of the geothermal resource in Fiale Caldera in the Lake Assal region, through the drilling of geothermal production wells and the preparation of a technical and commercial feasibility study. The efficacy analysis of the project to achieve that outcome focused on the following:

- Greenhouse Gas Emissions Avoided (expected with the commissioning of a geothermal power plant)
- Fully-fledged power generation feasibility study developed
- Geothermal well test protocol developed and in place
- Well test results independently reviewed and certified

41. As stated earlier as of end CY2020, some of the key activities such as drilling of the three wells (at depth of up to 2,500 meters) and the power generation feasibility study are not yet completed. Project closing is now expected in early-mid 2022, with some risks of additional slippages. The status of expected outcome is discussed below.

Greenhouse Gas Emissions Avoided: Not yet completed.

42. The PAD indicated that 11,710,750 tons of CO₂e emissions will be offset assuming a 50MW geothermal generation facility operating over a 30-year life cycle (and corresponding to 390,358 tons of CO₂e avoided per year). As the feasibility study – which will inter alia propose the installed power generation capacity and the power plant operating regime – has not yet been carried out, **it is therefore not possible at this stage to ascertain if this objective will be met.**

Development of a fully-fledged power generation feasibility study: Not yet completed.

43. As of end December 2020, the power generation feasibility study had not been initiated because the drilling program has not been completed. This study will include an assessment of the geothermal resources of the Fiale Caldera site, the resource development costs, the size of the power plant, whether a commercially viable geothermal plant could be developed and under which conditions the private sector could invest in and operate the facility. The feasibility study is now expected **to be completed by early 2022.**

Geothermal well test protocol developed and in place: Fully completed.

44. Well testing includes water-loss (injection) testing during or after drilling, short-term flow testing after completion of one or more wells (1 or more tests), and one long-term test of one or more well(s) with interference testing. The objective of testing during drilling is to characterize a permeable zone that may be put behind casing before the short-term test or to provide information to guide decisions about the next step in drilling, the potential capacity of the reservoir and hence, confirm the viability of the geothermal resources for future use.



45. Well test protocols have been developed by the contractor (Geologica) and applied to each of the three wells drilled. This **expected outcome has been met**.

Well test results independently reviewed and certified: Met partially.

46. The reviews and certifications of the well test results for the 3 wells were carried out by the independent expert financed through ESMAP. In order to unclog the Fiale 2 well, additional work was proposed but has not yet been completed. Wells stimulation has also been proposed to increase output. **This expected outcome has been partially met.**

Justification of Overall Efficacy Rating

47. **Overall Project Efficacy i.e. the extent of achievement of the PDO is rated as Modest.** The rationale for this rating is as follows:

48. The activities expected to be financed by the IDA Credit have been completed. The three wells have been drilled, which represent not only the lengthiest activity of the project, but also the most costly and challenging part due to the geological diversity, the depth and the inherent exploration risks, and initial tests conducted showed potential resource viability for 2 wells. Preliminary stimulation tests conducted on the three wells confirmed availability of the geothermal resource.

49. According the report from the Independent Evaluator on July 31, 2019, the current status of the project regarding the information required for the execution of a feasibility study for its commercial exploitation can be summarized as follows: (i) The 3 deep wells have confirmed the existence of a deep, hot reservoir of potentially commercial interest. They have consistently confirmed the existence of a high temperature (>290°C) geothermal resource at depths below about 2000 meters; (ii) Fiale-1 initial production tests confirmed rather low results, high enthalpy (high steam fraction), with partly unreliable measurements; (iii) Fiale-2, still undergoing production testing, confirmed a rather low productivity, with high enthalpy (similar to Fiale-1). However, there is evidence of an existing obstruction in the well, that probably limits the production potential of the well in a significant way; and, (iv) Fiale-3 exhibited low injectivity, and no discharge attempts have been carried out, therefore the well was considered as non-producing. However, the well appears a good candidate for an attempt of long-term stimulation.

50. The evaluation concluded that in view of a better definition of the well deliverability characteristics, which would represent a sound basis for the feasibility study, it is recommended to perform the following additional activities: (i) Carry out a cleaning of the obstruction in Fiale-2, through the use of a coil-tubing unit, and repeat the production testing of the well; (ii) Perform an additional attempt to discharge Fiale-1, to confirm the productivity of the well: this would demonstrate that the well can still be produced, and potentially with a better deliverability induced by the short-term stimulation; (iii) If possible, perform a long-term stimulation of Fiale-3, in order to evaluate the potential impact this procedure might have on the deliverability characteristics of this and other (existing and future) wells.

51. Of course, such interventions and testing require additional expenditures, beyond the original project budget already very limited due to substantial cost overruns incurred during project implementation (mainly because of the market responses to the different bids launched). Such investment is necessary, justified, and is a necessary step to obtain crucial information required for the further development of the project, mainly to carry out the expected feasibility studies. However, the Counterpart, very committed to the development of the geothermal resource, and with the WB support, has secured additional AfDB financing to clean Fiale 2 and therefore complete the feasibility studies. Those remaining activities financed by other donors have not been carried-out by WB Financing close date due to delays not necessarily attributable to the Counterpart. The project **objective of assessing the commercial viability of the geothermal resource in Fiale Caldera** through exploration drilling is very likely to be achieved in the near future (early/mid 2022). This conclusion is



based on the facts that: i) a significant part of the drilling work – by far the most complex and challenging part of the project - has been completed and geothermal resource has been confirmed at high temperature; (ii) additional financing has been provided by AfDB and GoDj to fully complete the assessment work (cleaning of Fiale 2 and feasibility study); (iii) the project infrastructure and in particular the drilling equipment necessary for the cleaning is already available on the project site, and importantly; the (iv) very high level of commitment from GoDj to the geothermal development (other exploration activities are on-going and, in February 2021, a contract of US\$ 6.45 million was signed between the Kenya Electricity Generating Company (KenGen) and ODDEG to drill additional wells) in addition to its much increased financial contribution to this project. As indicated in the project documentation, in particular the PAD, this is a high risk-high reward geothermal resources exploration project, with possibilities of positive or negative outcomes, and a 50% estimated probability of a successful outcome for the project ².

C. EFFICIENCY

Assessment of Efficacy and Rating

Efficiency

52. **The Efficiency is rated Negligible.** Efficiency measures how economically resources and inputs are converted or are expected to be converted into the expected results. The following section reviews whether: (i) the costs involved in achieving the operation’s objectives are reasonable in comparison with standards for this type of operation; and (ii) the expected benefits will outweigh the costs (Project Economic Analysis).

Project Design and Implementation

53. Project design and implementation, particularly with respect to the most important component – the drilling component – was reviewed by a well-qualified and experienced geothermal firm and modified accordingly.

Project Costs

54. At appraisal, total project cost for 4 wells was estimated to be US\$31.23 million. Drilling and site preparation accounted for US\$28 million, about 90 percent of the project costs. The drilling costs were estimated based on previous experiences and industry benchmarks, with however no specific market sounding during project preparation and analysis of the potential for higher costs in undertaking such activities in the Djibouti setting, taking into account of the limited successful geothermal drilling experience of Djibouti, its geographic location, the potential security risks within the region and the size of the drilling program. This could have led to increasing the contingencies. Despite a reduction from 4 wells to 3 wells drilled, the latest estimates (and the revised financing plan) expect total project costs for 3 wells to be in the order of US\$57.7 million, indicating that the costs were substantially underestimated.

55. By industry standards, these drilling costs are very high. Even though competitive bidding was undertaken in compliance with the WB and AfDB prequalification and bidding procurement guidelines, only 2 offers were received in July 2016 out of the 9 candidate firms that in April 2016 received the bidding documentation. The draft bidding documentation and the draft contract reflected industry practice and was prepared by a competent consultant. The main reasons for receiving only 2 bids appears to be the concerns related to the costs estimates and the funding available, the small size of the activity (2 wells, possibly three) and the perceived country risks.

56. Only one of the 2 firms that bid met the bidding documents requirements. While the financial proposal was way above the PAD budget, following extensive discussions and consultations amongst the key project stakeholders, a

² Annex 7 para 232 Economic Analysis of the PAD describe the methodology for estimating the probability of project success building up from assumptions of each well success values. -



consensus decision was taken not to reject the offer and negotiate. Negotiations started in August 2016 and a contract was signed in May 2017. The rationale for the decision was that the (only) offer was from a reputable and experienced firm in geothermal drilling, that in the Djibouti context rebidding was unlikely to lead to a better outcome, and that additional time would have been lost for a project already significantly behind schedule. The alternative was to abandon the project.

57. The strategy adopted by the Government, the Bank and the other project stakeholders was to scale down the activities (from 4 wells to 2 wells firm and one or two optional wells as financing was not secured at that time for drilling 3 or 4 wells), and to negotiate the costs down with the only responsive bidder. Negotiations led to some design changes as it was considered that some aspects were overdesigned leading to costs reductions, but costs remained substantially above the initial budget.

58. The decision made by the WB in August 2016 to negotiate with the only compliant bidder appears the right one considering that: (i) the bidding process and the bidder was complying with the Bank procurement guidelines; (ii) the proposed contract had been vetted in February 2016 (following the pre-qualification process launched since April 2014) by an experienced geothermal consulting firm and by the Bank own advisors; (iii) the only responsive bidder was considered one of the world best in the geothermal business; and (iv) rebidding would only entail additional delays (in July 2016, at the time of the bids assessment, the project was significantly behind schedule, and some potential bidders have desisted upon reception of the RFP document) and additional costs, with better outcome quite uncertain. Subsequently, additional financing was provided by AfDB allowing the drilling of a third well, as a third well was considered important for assessing the Fiale Caldera resource potential.

59. As highlighted in previous geothermal projects, the drilling component can face a certain cost increase depending on the nature of geological region where the projects are being implemented. In this specific project, the cost increase is due to a series of interdependent factors, such as: (i) foremost the higher than expected drilling cost, even though the number of wells to be drilled was reduced, reflecting unforeseen challenges encountered on the site selected due to: geology components founded up to a depth of 2,500 meters, additional work required to unblock the Fiale 2 well, the additional stimulation proposed by the technical advisor, and the well tests; (ii) implementation delays related to the slippages in mobilizing the PIU project director, advisors, and contractors; (iii) delays in mobilizing additional financings required to complete the project, specifically the drilling component based on the recommendations of the Independent Evaluator recruited, during which time the project still had to pay for the mobilization of the equipment on site as they were being rented, compared to a much higher cost that would have incurred if such foreign equipment (as they were not available locally in Djibouti) were to be demobilized and then remobilized subsequently; iv) worldwide restrictions caused by the COVID 19 and still impacting project implementation; and (v) the lack of harmony among Donors procedures with different response timeframes, which further impacts project timeline and caused delays and additional costs. Annexes 4 and 7 present comparisons between the initial budget and project schedule at appraisal and at project closing.

Economic Analysis

Project Expected Economic Benefits at Appraisal

60. At appraisal, the net economic benefits of the project were assessed by estimating the expected reduction in the net present value (NPV) of the costs of the electricity generation expansion plan made possible by the insertion of a 50MW geothermal plant in Djibouti generation expansion program, assuming a successful drilling program in Fiale Caldera. This expected cost reduction was estimated by comparing the NPVs of a generation expansion program with and without a geothermal power plant made possible by the information obtained from the drilling program and the feasibility study. The costs of undertaking the exploratory drilling program was weighted by the probability that the drilling program would identify geothermal resources adequate for a 50MW base load power supply.



61. The NPV for the least cost generation expansion plan without a geothermal plant was based on the study undertaken in 2009 by Parsons Brinckerhoff for the World Bank. In the with-the-project case i.e a successful drilling project, it was assumed that a 50MW geothermal plant would be part of Djibouti generation expansion plan. In the without-the-project case i.e. no project undertaken or -an unsuccessful drilling scenario, it was assumed that generation expansion would take place using diesels units fueled by imported and expensive Heavy Fuel Oil (HFO). Probabilities were assigned to individual well and drilling program success as well as for an unsuccessful drilling.

62. **Key assumptions of the Economic Analysis.** For the economic analysis, the PAD assumed that: (i) the cost of the program was to be the Appraisal cost of US\$31 million; (ii) to reach a generation level of 50MW about 15 production wells each producing about 3.35MW would be needed; (iii) world prices for crude oil would rise steadily between from 2009 to 2020 to reach US\$119/barrel and more slowly thereafter, reaching US\$130/barrel by 2025; and that (iv) the long run electricity generation cost in Djibouti would about US\$0.20/kWh.

63. **Results of the Economic Analysis at Appraisal.** The Economic Analysis concluded that if the success criterion was taken as requiring at least 2 successful wells, then the exploratory drilling project (followed by a 50MW geothermal power plant) would make a substantial positive net benefit to the economy over a wide range of probabilities of well drilling outcome. Only with a project drilling success probability of as low as 0.18 (considered unlikely), the net economic benefit would be zero. When the criterion of project success was assumed to be three well successes out of the four planned, net economic benefits were substantially smaller at the same well success probabilities, and the breakeven project success probability corresponded to a well success probability of 0.4. Overall, it was considered that the economic benefits from the project exceeded its costs.

64. **Sensitivity to Oil Prices.** Because the geothermal power plant was then the only viable alternative to diesel and HFO base-load electricity generation, a crucial assumption in the estimation of the project net present values was the outlook expected for world oil prices.

Project Economic Benefits at Project Close

65. As mentioned earlier, as of end December 2020, the project is yet to be completed with further drilling work (with the cleaning of Fiale 2) and stimulation and the feasibility study using the results of the drilling program has not yet been carried out.

66. Furthermore, some key facts and assumptions impacting the revised estimate of the project NPV significantly changed since 2012-2013. These key assumptions are: (i) the costs of the drilling program are significantly higher; (ii) the oil prices are significantly lower (in the order of US\$50-60/bbl. of crude oil); and (iii) a significantly different generation plan for Djibouti is under implementation, as a second interconnection with Ethiopia is currently appraised, and expected to be submitted to the World Bank Board within the first part of CY2021, a wind IPP contract has been signed and is expected to be commissioned by 2021, and discussions are ongoing regarding solar PV generation. Importantly the size of a geothermal power plant has not yet been assessed (at Appraisal it was assumed to be an installed capacity of 50MW) as the technical and economic/financial feasibility study taking into account the geothermal resources available based on the conclusion of the drilling program has not yet been initiated.

67. A revised project economic analysis should however include a detailed and comprehensive technical and economic analysis of two generation programs: i) without a geothermal power project; and ii) with a geothermal project using the Fiale resource. Such analysis should also include the benefits of increased security of electricity supply in a context factoring: i) the availability of a second interconnector with Ethiopia; ii) the complementarity between geothermal base load power and intermittent wind and solar generation, as a geothermal power project may increase penetration of abundant renewable resources; ii) the benefits of a clean renewable resource substituting for fossil fuels; and iv) other difficult to quantify benefits .



68. Based on the initial - somewhat lower-than expected results of the drilling program, the substantial cost overrun, the facts that the planned drilling of the three wells is not yet completed considering the need to clean the Fiale 2 well, that key parameters impacting on the project economics (such as new and cheaper power generation alternatives, lower-cost of alternative fossil fuels generation), a revised project efficiency rating at project close is **Negligible**.

D. JUSTIFICATION OF OVERALL OUTCOME RATING

69. As some key activities of the project are not yet completed and for all the previous justifications, the Overall Outcome Rating is *Moderately Unsatisfactory*. The following table 4 summarized the Project Overall Outcome rating.

Table 4: Summary of Project Overall Outcome Rating

AREA	RATING
Relevance	High
Efficacy	Modest
Efficiency	Negligible
Project Overall Outcome Rating	Moderately Unsatisfactory

E. OTHER OUTCOMES AND IMPACTS

70. In the PAD, the estimates of project benefits reflected only the economic benefits of using the geothermal resources of the Fiale Caldera site for power generation (an installed capacity of 50MW was assumed). However in the case of Djibouti and for the purpose of assessing the economic impact of the project, other benefits should be assigned to the project even if there are there are difficult to quantify, such as development of information on geothermal drilling in Diibouti, capacity strengthening in geothermal exploration for Djibouti staff, development of regulations and best practices regarding geothermal exploration.

Body of Information on Geothermal Drilling in Djibouti

71. The project has accumulated valuable data that could be accessed and will be useful for the development of other geothermal sites and implementation of other exploration projects, as well as for the management of similar projects.

Institutional Strengthening

72. Djibouti created the Office for Geothermal Development (*“Office Djiboutien de Développement de l’Energie Géothermique”* – ODDEG) whose main objective is to carry out research, studies and development required for Djibouti to take advantage of the country geothermal resources. ODDEG currently works on other promising sites, at Artam, Lac Abbé and Hanlé-Garrabyis. The Fiale Caldera project provided a vehicle for the Djibouti Research Center (*“Centre d’Etudes et de Recherche de Djibouti”* – CERD) and ODDEG staff to develop their technical and project management capacities. Three CERD and ODDEG staff are on the Fiale Caldera drilling site.

73. **Drilling experience.** Drilling on the Fiale Caldera project is providing direct specific experiences for the other geothermal exploration and production projects underway or planned areas in Djibouti, including private sector projects, thereby reducing costs and risks. The IFC *“Success of Geothermal Wells: A Global Study”* states that there appears to be a strong learning-curve effect. While the rate of success for the first well drilled in a field averages 50 percent, for the first five wells it is 59 percent and 74 percent in the development phase. Unit cost per well also tend to decrease with the number of wells drilled. For Djibouti, drilling costs for Fiale 2 and Fiale 3 were lower than for Fiale 1.



Mobilizing Private Sector Financing

74. A key rationale for the project public investment in geothermal exploration in the drilling program and in the preparation of a full-fledged feasibility study (including the preparation of the bidding document) was for Djibouti to improve the likelihood and the terms of mobilizing private sector expertise and financing through a geothermal IPP, by providing potential investors with site specific and drilling information, by reducing investment risks in geothermal projects. The assessment of the prospect for private sector investment in power generation using the Fiale Caldera geothermal resources is expected to be carried out by the feasibility study included in the project. The GoDJ is committed to carry out this study upon completion of the on-going drilling program. (The feasibility study is now expected to be initiated in the second part of CY2021 and completed early CY2022).

Poverty Reduction and Shared Prosperity

75. The proposed project seeks to mobilize geothermal resources for electricity generation, leading to a decrease in the high electricity tariffs still prevalent in Djibouti. Electricity tariffs are considered a major impediment to economic activities development and a drain on household budgets, especially the poor households. If the conclusions from the feasibility study confirm that commercially extractable geothermal resources are available in Fiale Caldera, the project would impact poverty reduction and shared prosperity

Other Outcomes and Impacts

76. **Environmental and Social Management.** The Fiale Caldera geothermal project constitutes a reference/best practice project regarding the management of the environmental and social issues pertaining to geothermal development as well as other energy projects in Djibouti. Best practices have been developed in particular with respect to site management and drilling operation and also regarding consultations and activities with local communities. A series of community projects have been/are implemented with the participation of the communities: health consultations and basic care for neighboring villages residents, support to women associations including on local handicrafts, purchase of fishing equipment for young fishermen, and employment preference given to local communities resident.

77. **Geothermal Development Regulations.** The project contributed to the development of specific geothermal development regulations regarding geothermal development in other areas of Djibouti (Geothermal Law/Decrees). The GoDJ, through ODDEG, is working on new legislation to attract private geothermal developers and regulate the use of such resources.

III. KEY FACTORS THAT AFFECTED IMPLEMENTATION AND OUTCOME



A. KEY FACTORS DURING PREPARATION

Project Objective

78. The PDO was realistic, clear, and at the right level of ambition given this is a resource exploration project and the current institutional capacity and experience in Djibouti in implementing such a high-risk high-reward project. Results/Outcomes Indicators were appropriately selected to reflect the key actions that would lead to the achievement of the main outcome: the undertaking by the private sector of a geothermal power generation investment that would significantly reduce the costs of electricity in Djibouti. The targets were also realistic given that many baselines were non-existent at the time of project appraisal.

Result Framework

79. Two of the five PDO indicators were not aligned with the project operational objectives. The “Greenhouse Gas Emissions Avoided” and “Publish Periodic Updates of Project Implementation” should have been listed as “intermediate indicators”. The results targets were appropriate.

Project Design

80. During preparation, lessons learned from the two previously IDA financed geothermal projects in Djibouti, approved respectively in 1984 and 1989, were incorporated into the project’s design. These lessons were mainly the following: i) Responsibilities must be clearly defined and agreed early on in project implementation; ii) In situations with many different participants, the project implementation unit must take the central role of coordination and communication; iii) a clear consultation process needs to be defined and fully utilized to take appropriate and timely decisions and resolve disputes; iv) the risks should be clearly identified including the possibility of a failure in the institutional arrangements; v) IDA should provide funding services for consultancy services in the critical areas it finances.

81. Project design was structured logically with three complementary components: (i) The drilling program, the most important in terms of complexity and financial resources requirements; (ii) Technical Assistance to the drilling program including preparation of the bidding documents, review/agreement on the drilling protocol and confirmation and certification of the drilling test results; and (iii) Project management, encompassing support to the PIU, compliance with the environmental and social safeguards, and with the fiduciary requirements. At this specific stage, responsibilities were clearly identified among all stakeholders, with specific set of activities being financed by each donor. Responsibilities of the Counterpart were clearly highlighted, with the project design insisting on the set up of a capable PIU, including an international project director based in Djibouti and geothermal experts from Djibouti involved in previous geothermal drilling, under the supervision of EDD general manager. Project risks based on previous experiences in Djibouti as well as best practices were well identified at this stage.

82. Due to financing constrains and in particular Djibouti small IDA 2013 allocation, the implementation of the WB key component - drilling of the wells- was however contingent upon the implementation of other components financed by other agencies such as AFD and AfDB. However, no memorandums of understanding were signed with these two co-financiers to align the procedures and procurement processes to be used during project implementation, as well as project timeline, which could have eased project implementation and facilitated on-time decision making processes.

83. As a result, the project faced some delays in project’s effectiveness, as Components 2 and 3 were to be fully financed by AfDB, and furthermore in the procurement process for the drilling contract. However, based on the previous lessons learned from the 1894 and 1989 WB financed projects, as previously highlighted by the previous geothermal lessons learned (IDA should provide funding services for consultancy services in the critical areas it finances), the Project was restructured on October 2014 to allow provisions for necessary consultancy works (see para 31) and accelerate project



implementation. The late contracting of the geothermal consultant (only in September 2015) delayed the development of the bidding documentation and the launch of the bids for the selection of the drilling contractor. This delay ultimately led the Bank requesting a one-year project extension (till end CY2019) even though the number of wells to be drilled was reduced from 4 to 2 with an option for a 3rd well (if additional financing could be mobilized).

Monitoring Plan (M&E)

84. An appropriate M&E plan and the human expertise was put in place to collect, assess the information collected, monitor project implementation, act and adjust as needed.

Risks

85. This is a drilling exploration project with inherent exploration risks, and relatively little drilling experience in Djibouti. The documentation, in particular the PAD, described the project as a high risk-high reward undertaking. The project site was selected based on previous projects, studies and drilling carried out in project areas where previous work and data collected in 2008 by a well-known firm in geothermal development. Djibouti negotiated the release of the REI drilling information to the project. Resources were also included in the project financing plan to recruit geothermal advisors and an independent consultant to review and certify the test results.

86. Regarding project management, during project preparation the risks were appropriately identified. The Bank insisted on the appointment as head of the PIU of an international expert. This expert was recruited albeit with some delays. As mentioned in the PAD, most of the identified risks were manageable due to the team experience and the contracting of firms experienced with geothermal exploration.

87. However, the risks related to the number of financiers involved in the project with their specific requirements particularly regarding procurement may, in retrospect, have been underestimated. The requirement of separate procurement rules and the lack of adequate procurement experience by the PIU, at least in the early stage of project implementation, led to implementation delays. An early agreement among donors on the procurement rules to be used would have potentially eased some procurement processes and reduce delays.

88. Similarly, the project would have benefited from (i) an early market assessment to analyze the markets dynamics and the interests of potential international firms to work in Djibouti, which could have potentially identified some procurement related risks and reduce some delays in contracting those firms; and (ii) early procurement processes of the main contracts (PIU arrangements and the geothermal advisor) during project preparation and before appraisal, also suggested within previous lessons learned, which could have reduced the delay in project's effectiveness.

Readiness for Implementation

89. Annex 8 provides the Project Implementation schedule provided in the PAD. Despite commitments from all the parties involved, the project suffered from start-up delays in setting-up the PIU and initiating the activities. Project Effectiveness took about one year (July 2, 2014). The international project director arrived in Djibouti only in December 2015 as the initial procurement was not successful and was relaunched, and due to disagreements amongst Donors on procurement processes. The geological consultant was only contracted in September 2015 in spite of its critical role in the preparation of the bidding document for the drilling contract. Twelve to eighteen months were lost in this project inception phase.

B. KEY FACTORS DURING IMPLEMENTATION

Factors subject to the control of government and/or implementing entities



90. Despite commitments from all the parties involved, the project suffered from significant start-up delays, mainly in setting-up the PIU and hiring drilling contractors and consultants. Project Effectiveness took about one year (July 2, 2014). ESMAP, GEF and IDA financing agreements were signed on October 13th, 2013, and effectiveness was scheduled 180 days after to allow the recipient to fulfill the following effectiveness conditions: (i) Execution and delivery of all joint co-financiers financial agreements; (ii) Execution of the MoU with OFID; and (iii) Execution of the Subsidiary agreements on behalf of the recipient. AfDB was in charge of financing the first steps of activities (such as civil engineering for the preparatory works and the recruitment of the firm in charge of designing the drilling program based on existing studies), and by June 2014, AfDB had not yet confirmed that the Government of Djibouti has satisfied all conditions for disbursement. Moreover, during the first year of project execution, EDD was supposed to have recruited a Project Director and a Project Team, who would, in turn, appoint a geothermal consulting company and a civil engineering contractor. The limited capacity of the Counterpart during the first year led to the first restructuring of the WB. Thus, the international project director arrived in Djibouti only in December 2015 as the initial procurement was not successful and was relaunched, and due to disagreements amongst Donors on procurement processes. The geological consultant was only contracted in September 2015 in spite of its critical role in the preparation of the bidding document for the drilling contract. Twelve to eighteen months were lost in this project inception phase.

91. External Actors. Geothermal projects involve a number of actors (internal and external) during project design and during implementation. Each actor often has different policies, guidelines, and processes. However, the PIU has the central role in planning, communicating and coordinating the stakeholders. During implementation and supervision missions, the WB has encouraged the PIU to monitor closely the contractor's activities on the field and to report any challenges issues on time. As a result, some contracts were negotiated with a reduced scope, with the Donors' approval, to take into consideration the limited project financing.

92. Government Commitment: During implementation, the project benefited from a very high level of Government commitment and proactivity from EDD senior management. Djibouti's commitment has also been demonstrated by (i) the substantially increased financial contribution from the Djibouti entities, notably EDD; and (ii) his active support in resolving implementation issues. The PIU staff (based in Djibouti-City and at the project site) performed adequately after initial adjustments.

93. Similarly, the project donors showed flexibility in resolving project financing issues. AfDB provided two additional financing (the first one of US\$15 million allowing the drilling of a third well and the resolution of the drilling issue on the Fiale 2 well), and a second additional financing of US\$3.26 million.

94. Delays in procurement: Procurement delays, outside the implementing agency, have been encountered due to no-objections delays from donors (mainly from AfDB). Currently, the schedule for the remobilization dates of the drilling contractor and some other contractors cannot be confirmed since the no-objection on the extended drilling contract is still pending from AfDB. During the implementation and supervision missions, the WB encouraged AfDB to reduce as much as possible their response time in order to complete the project's activities by the closing date.

95. Technical Aspect: During project drilling, the project benefitted from competent technical advisors and contractors based on the site, and necessary adjustments were made in coordination with the PIU when needed (the original drilling angle has been reassessed and modified to comply with the geological nature of the area). Furthermore, to check the viability of technical procedures, tests and analysis, an Independent Evaluator was recruited. A recommendation report was produced highlighting areas of improvement for the drilling component. However, due to limited financing resources, and due to the delay already faced by the project regarding the recruitment of the geothermal advisor, the most plausible option of cleaning Fiale 2, even when additional financing would be required, was considered.



96. Social and Environmental Safeguards. OP 4.12 was not triggered as the project, situated in a desert un-populated area of Djibouti (see Annex 6), was not expected to involve any involuntary land leading to involuntary displacement of communities and/or loss of income sources, habitat and other resources. The project was rated by the World Bank as Category B and OP 4.01 was triggered. No large scale or irreversible negative impacts on the environment was foreseen, but the exact nature of the impacts could not then be determined until a detailed design of the drilling program was known. Throughout project implementation the individual safeguards were rated as *satisfactory*.

97. Monitoring and Evaluation (M&E). An adequate monitoring and evaluation framework were designed and put in place and operationalized through the PIU and the contractors, in particularly those involved in the drilling program. The M&E framework includes:

- a state-of-the art data gathering, information sharing and analysis on the drilling operations conceived and monitored by the geological consultant (GCC) and the geothermal independent expert. Data are collected and analyzed daily on the drilling operations, with information shared with the PIU and with EDD General Manager.
- a monitoring and reporting mechanism for the project environmental and social aspects, including reporting on grievance and proactive actions (no substantive grievances have been registered so far).
- a monitoring and reporting mechanism for the fiduciary aspects.
- all aspects are recorded with regular reports prepared and shared by the PIU.

Factors subject to the World Bank Control

98. Adequacy of supervision: The WB implemented its planned supervision program, filing 13 ISRs, and participating in 7 Joint Donors Missions. The WB was also very proactive during project implementation, acting as the Lead Donor, particularly during the early implementation phase when the PIU needed to strengthen its implementation capacities, replace personnel and contract the international project director. The WB improved Donor Coordination through very frequent and direct consultations with the PIU Director and with the Donors, particularly on procurement matters. This led to an upgrade in the initial ratings.

99. Supervision Missions and ISRs. Supervision missions were undertaken every 6 months. Restructurings and extension of the closing date to complete activities were processed in a timely manner. No serious management issue was raised. The project benefitted from the presence in the PIU of a procurement specialist, an environmental, a social safeguards specialist and a financial Management Specialist. An official representing the PIU director was also assigned to the project site.

100. The Project's Mid-Term Review (MTR) was carried out in December 2017. As a result of the MTR, the mission confirmed the strong engagement of the GoDJ with the Project, removed procurement-related obstacles on the supply of equipment and materials, and agreed on a short-term plan to accelerate project implementation by increasing discussions and meetings with both donors and the counterpart. However, the team did not use that opportunity to realign the project's indicators and PDO, to focus mainly on the WB financed activities.

101. In May 2020, the WB team, requested a 9-month extension of the ICR deadline to be able to capture the results of the final drilling tests and of the feasibility study, in light of the delays and the impacts of the COVID-19 in Djibouti and worldwide (the main contractors are foreigners and were demobilized to their country of origin during the complete lockdown). During this period, the WB continued to conduct remote discussions with AfDB and the PIU on project's progress.



102. Continuity of Task Team Leaders (TTLs). Three World Bank Task Team Leaders (TTLs) were involved during project preparation and implementation. Responsibilities were transferred through the participation of the designated TTL in the Bank supervision missions. Hand over was done appropriately and there was no continuity issue. The number of TTL was adequate considering that WB financed activities were successfully completed. The remaining activities were financed by AfDB and the role of the WB TTL was then to ensure proper coordination among donors and counterpart (i-e, to follow-up closely on AfDB's approval of the second additional financing, among others), and project's M&E.

Factors outside the control of government and/or implementing entities

103. The negative factors outside the control of the government or the implementing entities have been:

- the inherent challenges and delays related to deep exploratory drillings (at depth that could exceed 2,500 meters) where unexpected geological structures are encountered, requiring adjustment in drilling strategies.
- the procurement issues and delays due to the need to have agreement on the Donors' procurement guideline as well as the lengthy approval process of procurement activities financed by other donors.
- the challenges and delays regarding importation and repairs of special equipment and spares, as few Djibouti facilities can repair the specialized drilling and testing equipment.
- the impact of Covid-19. In March 2020, the international contractors departed Djibouti due to Covid-19 leaving however all the equipment on the project site. Their return date has not yet been programmed and depends in large part on the evolution of the Covid-19 pandemic and on obtaining the financiers' no-objection for signing contracts or contractual amendments.

IV. BANK PERFORMANCE, COMPLIANCE ISSUES, AND RISK TO DEVELOPMENT OUTCOME

A. QUALITY OF MONITORING AND EVALUATION (M&E)

M&E Design

104. The PDO and the Intermediate Results Indicators used for tracking progress towards the achievement of the desired outcomes were sufficient. With respect to the project site and the drilling activities a state-of-the art/best practices system has been put in place based on the recommendations of the geological consultant and the independent advisor, producing, recording, analyzing and sharing daily data. Staff from Djibouti has been trained by the geological consultant. Health and Safety issues, as well as environmental and social issues, activities with the local communities and interactions with the local authorities are very carefully monitored and recorded. Fiduciary aspects are adequately managed and monitored by the PIU.

M&E Implementation and Utilization

105. The selected set of indicators were tracked regularly, and updates provided by the PIU on every supervision mission. On site and in Djibouti, they are recorded and monitored daily by the geothermal consultant, by the drilling contractor and by the PIU team. The Bank regularly carried out semi-annual supervision missions during which project progress, outputs and work plan updates were reviewed. Joint-Donors supervision missions were also carried out. The PIU team also produced semi-annual progress reports including procurement, financial management, and environmental aspects among others. As a result of M&E implementation and utilization, communication among donors and counterpart increased significantly, and project restructuring was completed to adjust the project throughout implementation.



Justification of Overall Rating of Quality of M&E

106. Based on the information above, **the Overall rating on M&E quality is Substantial**. While in the first stages of project implementation M&E quality was judged modest with respect in particular to financial management (low disbursement rate, reflecting the delays in procurement processes and implementation), it improved with the presence of the geothermal consultant and with the monitoring mechanisms and data analysis put in place, and also with the experienced gained by the PIU staff.

B. ENVIRONMENTAL, SOCIAL, AND FIDUCIARY COMPLIANCE

Environmental and Social Safeguards

107. Environmental and Social Safeguards compliance was *Moderately Satisfactory* throughout project implementation. No major safeguards-related issues or deficiencies in the implementation of the EMPs were reported during project implementation. No complain was also registered.

108. The project was classified as environmental Category B. Environmental Assessment (OP 4.01) was triggered. A site-specific Environmental Management Plan (EMP) was prepared in accordance with the published Environmental and Social Management Framework (ESMF) document. The ESMP was duly consulted and disclosed. The Bank's Environmental and Social Safeguards Specialist was located in the country office during the entire implementation period. Safeguards field visits to the sites were regular to assess the project's effects related to noise, dust, waste, chance finds, reporting, complaints, potable water and sewage, fire protection, and familiarity with the project EMP and monitoring. Mission findings were reported in the Aide Memoires of the sites visited. No complaint was registered by the (limited) inhabitants living in the project vicinity.

Financial Management

109. Financial Management: The Financial Management rating, rated *Moderately Satisfactory* during the first years of the Project, has then been *Satisfactory* until Project Close, with appropriate financial management control procedures in place. The project has been always in compliance with the audit covenants and there were no overdue audits, except the 2018 audit that was delayed due to the hiring process of a new firm financed by AfDB.

110. A Financial Management Specialist based in Djibouti regularly carried out the financial management (FM) implementation support missions to review project accounting and reporting arrangements, organization and staffing, internal control procedures, planning and budgeting, counterpart funding, funds flow and disbursement, and external audits. The quarterly Interim Unaudited Financial Reports were submitted to the Bank for review in the agreed time frame and there were no inconsistencies for follow up. The audits, conducted by a private audit firm (Ernst and Young), were acceptable to the Bank. The auditors provided an unqualified (clean) opinion on the project financial statements during project implementation. The auditor stated that there were no internal control deficiencies or accounting issues to report on.

Procurement

111. Procurement: Procurement by the Bank was also rated *Moderately Satisfactory* during the first years of the Project, and then has been *Satisfactory* until Project Close. A Procurement Specialist was present in Djibouti and this arrangement allowed for direct and regular interaction with the PIU staff, notably with the Procurement Consultant. Procurement delays were however experienced mainly due to delays in obtaining no-objections.

112. Procurement was carried out in accordance with the applicable WB procurement guidelines (for the WB financed activities), the provisions of the Credit Agreement and the project procurement plan which was duly updated,



reviewed by the Bank, and disclosed. Regular supervision missions were carried out. The last post review was conducted in October 2019 with a Satisfactory rating and a positive feedback on the PIU procurement performance capacity and professional procurement practice. The rating on procurement was maintained as Satisfactory throughout the implementation of the project.

C. BANK PERFORMANCE

World Bank performance is rated Moderately Satisfactory.

Quality at Entry

113. The Bank was the lead agency during project preparation. It had regular consultations with the Government and the Donors during project preparation.

114. Project Strategic Relevance and Project Approach. The project had, and still has, a very high strategic relevance for the Government. It should be noted that very recently a contract has been awarded to development geothermal resources from another site. As mentioned earlier, electricity costs and poor reliability has repeatedly been cited as a major constraint to economic development and diversification. Over many years, Djibouti had been focused on the development of its geothermal resources as a strategic way to reduce the cost of electricity, the dependence on imported hydrocarbons for producing electricity, and on harnessing its renewable energies. The project benefitted from continued Government support and resources, and the data accumulated over years of geothermal exploration including in the Fiale Caldera area has been used in other geothermal projects.

115. Project Technical, Financial, and Economic Aspects. As mentioned, project design benefitted from the geothermal exploration data accumulated in Djibouti over many years, notably from previous geothermal drilling programs in Lake Assal region and Global Geothermal Development Plan by ESMAP. While the drilling cost estimates were based on cost standards, they have (in retrospect) been significantly underestimated. The main reasons appear to have been: (i) the lack of contractors' interest (as illustrated by the fact that only 2 offers were received and only one was responsive); (ii) the risk perception about Djibouti; (iii) over-design at least during the initial drilling phase; and (iv) unforeseen additional drilling work on Fiale 2, wells stimulation, and site specific issues. The economic and financial assessments presented in the PAD reflected the cost standards, and the then prevailing assumptions regarding some critical parameters such as the oil prices outlook.

116. Poverty, Gender, and Social Development Aspects. Geothermal development in Djibouti was, and is seen as an important way to bring down the cost of supplying electricity and electricity tariffs through the provision of expected cheaper base-load generation. This would decrease the share of household and firm budgets allocated to essential electricity supply.

117. Environmental Aspects. As the Fiale drilling site was located in a desert and unsettled area, the project was assessed as a Category B project with low expected impacts that could be readily mitigated. An ESMF was however prepared and published in accordance with World Bank Safeguards. No environmental and social issues have been registered so far.

118. Other Aspects (Fiduciary Aspects, Implementation Arrangements, M&E Arrangements). Other aspects were adequately considered at entry, including the need for coordination mechanisms among the Donors. Though, two of the five PDO indicators should have been part of the "intermediate indicators" during the Design and the Project Appraisal phases.



119. Risk Assessment. The Bank team identified the main risks and corresponding mitigation measures. The predominant risks and the corresponding mitigation measures were listed as:

- Technical Risk. Technical risk is defined in the PAD as the risk that the resource would not be of sufficient quantity and quality for large-scale (50 MW) power generation. This risk was partially mitigated through the reviews of the geologic testing and through independent reengineering reviews, including an analysis of the work) carried out over 40 years by Reykjavik Energy International (REI) which handed over all the geologic testing and information it developed in 2008. This led to assessing (in the PAD) the chances of success of the exploration phase at 80 percent. However, the WB Team assessment of the inherent risks of doing geothermal business in Djibouti were underestimated which lead to implementation delays and associated costs overruns.
- Implementing Agency Risk. The initial lack of capacity in the PIU was mitigated by the hiring of an international PIU Director, reporting directly to the Head of EDD. The PIU was also to include an accountant, a procurement specialist, a social safeguard specialist, and an environmental safeguard specialist. A representative of the PIU Director was also present on the project site. There were however delays in reaching project effectiveness and in the initial mobilization of some experts, requiring the extension of the Bank financing by one year (till December 2019).
- Project Risk. At Appraisal the main identified Project Risk was Donor Coordination, due to the participation of multiple donors, requiring higher level of coordination and harmonization of processes. Risks related to drilling, mobilization of drilling equipment, maintenance and repairs and staff were not mentioned as a predominant risk. While substantial coordination resources were applied, the differences in procurement processes created implementation delays.

Quality of Supervision

120. Implementation support missions were undertaken twice a year to review progress and identify any issues. Quality of supervision was enhanced by having the participation of not only WB fiduciary and E&S specialists, but as well as vis-à-vis located in the PIU, which enabled quick responses. Additionally, the unchanged PIU Director since December 2015 facilitated project implementation.

121. ISRs provided a candid review of the progress made since the last mission and assessed whether the Project was achieving the PDO's objective. All ISR's were archived on time and any management issues raised were addressed promptly by the team and in a candid manner. Safeguards compliance was reviewed regularly and found to be satisfactory throughout implementation. The Mid-Term Review (MTR) was carried out in December 2017, relatively late. In addition to confirming with the Government the PDO and the importance of mobilizing additional financing to drill at least a 3rd well, the MTR took note that the PIU had been strengthened with 2 senior positions not considered in the initial project design. The MTR highlighted the delays related to procurement and the key role of the PIU in coordinating and resolving the issues, and the importance for the PIU to manage the implementation schedule to prevent further delays. A 1-year extension was also provided for the project's closing date. The MTR did not consider any adjustment to the project's PDO's indicators notably moving them as intermediate indicators and did not propose a re-focus on the activities financed only by the WB.



Justification of Overall Rating of Bank Performance

122. Based on the Quality at Entry, the Quality of Supervision assessments and the Bank's role in leading project implementation, overall Bank Performance is rated as **Moderately Satisfactory**. Recognizing that this type of project is a high risk/high reward endeavor, the main shortcomings in quality at entry and quality of supervision were the following:

- Drilling program costs estimates, which were significantly underestimated, even though only 3 wells (rather than 4) were drilled. Resource exploration is however inherently prone to unforeseeable challenges.
- Delays in Project effectiveness and Operationalization of the PIU, which took one year (achieved in July 2014). Operationalization of the PIU was also delayed and the mobilization of the international project director only occurred in December 2015, in part because of disagreements on the PIU essential requirements for effective implementation.
- Lack of proactivity at the early stage of project implementation to realign project's indicators, and implementing rules such as procurement processes.
- Coordination difficulties. The number of Donors involved, which reflected the limited IDA resources available to Djibouti at the time of project preparation, made project implementation inherently challenging and prone to delays. The Bank however played an essential role in proposing solutions and coordinating.

D. RISK TO DEVELOPMENT OUTCOME

123. **The risk to development outcomes is rated as Modest.** This rating reflects the following facts: (i) the Government's more than 40 years continued commitment on geothermal development and the activities it implemented and financed to develop Djibouti geothermal resources; (ii) the recent contract signing for geothermal development projects in other sites of Djibouti; (iii) the creation of ODDEG as the primary national institution coordinating the development of the national geothermal resources; and (iv) the Government significantly increased financial contribution to the project (initially US\$500,000 and likely increased to about US\$10 million, bringing Djibouti as the second project financier after AfDB).

V. LESSONS AND RECOMMENDATIONS

124. The main lessons from this geothermal resource exploration project are the following

- Availability of pre-assessment of sufficiently accurate geothermal resource data can be a determining factor in project design. The project design reflected this requirement, as it obtained and used the relevant information from previous geothermal exploration surveys and previous drillings in the project area. This pre-assessment should also present preliminary cost analysis which will inform the design of future projects.
- Pre-feasibility Study. A pre-feasibility study carried out by a reputable geothermal consultant would be useful to better design the project, assess potential technical aspects that could impact the project, provide realistic budgets, and importantly propose a country specific implementation strategy, a



realistic implementation schedule and critical points to assess at the Appraisal stage. It would also likely provide comfort to potential bidders.

- *The strength and capacity of the counterpart's institutions involved in the geothermal development can critically impact project implementation and timeline.* As there was no such geothermal organization during project preparation and the initial implementation phase, the project design included a PIU located at EDD to be managed by an international expert based in Djibouti and by outside geothermal technical advisors. As the recruitment of these experts took a long time, as an interim solution, national staff experienced on previous Djibouti geothermal activities were brought on board. In 2013, ODDEG was created and is now coordinating and carrying geothermal activities in other geothermal sites in Djibouti.
- *The drilling phase being a major risk particularly for potential private sector developer, public funding can be the key mitigation measure for distant countries and the ones located in high security risk areas.* The project sought to mitigate this risk by using public funding (from Djibouti and the Donors) to carry out exploration drilling, assess and certify the results using state-of-the art protocols, commission a technical, economic and financial feasibility study, and assist in the preparation of the prequalification and bidding documents by a reputable geothermal firm. This appears to be the right approach.
- *Drilling costs are very country specific.* International norms may not always apply in countries with little geothermal experience or considered relatively risky such as Djibouti. Market sounding conducted with drilling companies may provide some important insights on costs and risk perceptions.

125. Resource exploration is inherently risky, and this should be reflected in project design, implementation requirements and funding. The most significant lessons and recommendations from the Geothermal Power Generation project (now expected to be completed in early-mid 2022) are the following:

- *The lack of specific geothermal skills at the early stage of project can impact decision making process and further delay implementation.* As geothermal drilling projects demand very specific skills and quick decision making as equipment mobilization costs are high, an experienced PIU director is needed from the start of project implementation, supported by a high-level decision maker representing the Government and by advisors and contractors with proven experience in geothermal drilling.
- *Any delay in decision making process or in project management activities can impact the project's finances negatively. Donors coordination mechanisms elaborated during project preparation and agreed upon with the Counterpart during Appraisal can improve project implementation and increase success rate.* Multi-Donor financing should be excluded if full alignment of procurement processes is not feasible. A properly delineated Coordination Protocol or Memorandum of Understanding needs to be agreed amongst the key stakeholders during project preparation. One set of rules will limit delays and facilitate management of the project by a weak PIU. This would also ensure contract continuity if any addendum is necessary.
- *Donors coordination can be more challenging when using parallel or co-financing instruments.* This project, as written, is a program itself. The drilling program being complex and very risky by nature, due to structure of each areas geologically and probable cost overrun linked to the findings, the possibility



of using a programmatic approach with different specific phases, all of them contributing to the same program objective, could be further analyzed for potential consideration.

- Early preparation of bidding documents and detailed project's schedule and cost during project preparation can reduce or decrease delays within project implementation. A very detailed and well thought implementation schedule needs to be developed to ensuring careful and adequate sequencing of project activities, including all preparatory works such as elaboration of TORs or bidding documents prior to Board approval, taking into account the challenges with site mobilization of the drilling equipment and repair and maintenance requirements.

The proposed implementation schedule should also allow for unforeseen events (most likely expected to be related to drilling activities) leading to implementation delays and additional project costs.

- As geothermal exploration is a high-risk operation, lack of proper contingencies (on costs and implementation duration) can significantly impact project's success rate. Being different from World Bank standard operations, higher contingencies should be factored in the costs estimate and the financing plan of resource exploration projects to address issues as they arise and allow flexibility in project design or adjustments.



ANNEX 1. Results Framework and Key Outputs

A. RESULTS INDICATORS

A.1 PDO Indicators

Objective/Outcome: Assist Djibouti in assessing the commercial viability of the geothermal resource in Fiale Caldera

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Greenhouse Gas Emissions Avoided	Metric ton	0.00 05-Jun-2013	390,358.00 31-Dec-2019		0.00 31-Dec-2019
Comments (achievements against targets):					

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Develop a fully-fledged power generation feasibility study	Text	No study has been done 05-Jun-2013	Study completed 31-Dec-2019		No study has been done 31-Dec-2019
Comments (achievements against targets):					



Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Publish periodic updates of project implementation	Text	None	All periodic updates published		All periodic updates published
		05-Jun-2013	31-Dec-2019		31-Dec-2019

Comments (achievements against targets):

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Geothermal well test protocol developed and in place	Text	No	Yes		Yes
		05-Jun-2013	31-Dec-2019		31-Dec-2019

Comments (achievements against targets):

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Well test results independently reviewed and certified	Text	No	Yes		No
		05-Jun-2013	31-Dec-2019		31-Dec-2019

Comments (achievements against targets):



A.2 Intermediate Results Indicators

Component: Component 1 - Drilling Program

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of wells drilled	Number	0.00	4.00	3.00	3.00
		26-Apr-2013	31-Dec-2019	31-Dec-2019	31-Dec-2019

Comments (achievements against targets):

Component: Component 2 - Technical Assistance

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Joint missions by donors	Number	0.00	4.00		7.00
		26-Apr-2013	31-Dec-2019		31-Dec-2019

Comments (achievements against targets):

Component: Component 3 - Operating Costs of the Program Management Unit

Indicator Name	Unit of	Baseline	Original Target	Formally Revised	Actual Achieved at
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	Measure			Target	Completion
Access to the site is constructed	Text	No 26-Apr-2013	Yes 31-Dec-2019		Yes 31-Dec-2019
Comments (achievements against targets):					



B. KEY OUTPUTS BY COMPONENT

Objective: <i>Assist the Recipient in assessing the commercial viability of the geothermal resource in Fiale Caldera within the Lake Assal region</i>	
Outcome Indicators	<ol style="list-style-type: none">1. Greenhouse Gas Emissions avoided2. Fully-fledged power generation feasibility study developed3. Geothermal well test protocol developed and in place4. Well test results independently reviewed and certified
Intermediate Results Indicators	<ol style="list-style-type: none">1. Access to the site is constructed2. Number of wells drilled3. Joint missions by donors
Key Outputs by Component (linked to the achievement of the Objective)	<ol style="list-style-type: none">1. 3 wells drilled2. Test protocol developed, reviewed, and certified



ANNEX 2. Bank Lending and Implementation Support/Supervision

A. TASK TEAM MEMBERS

Name	Role
Preparation	
Ilhem Salamon	Task Team Leader(s)
Walid Dhouibi	Procurement Specialist(s)
Rock Jabbour	Financial Management Specialist
Fatou Fall	Social Specialist
Gael Gregoire	Social Specialist
Andrew Michael Losos	Social Specialist
Supervision/ICR	
Lucine Flor Lominy	Task Team Leader(s)
Melance Ndikumasabo, Abdoulaye Keita	Procurement Specialist(s)
Rock Jabbour	Financial Management Specialist
Antoine V. Lema	Social Specialist
Mark M. Njore	Operations Support
Khaled Mohamed Ben Brahim	Team Member
Mohamed Adnene Bezzaouia	Environmental Specialist
Thrainn Fridriksson	Team Member



B. STAFF TIME AND COST

Stage of Project Cycle	Staff Time and Cost	
	No. of staff weeks	US\$ (including travel and consultant costs)
Preparation		
FY12	34.652	298,808.90
FY13	24.483	171,834.60
FY14	0	1,612.21
Total	59.14	472,255.71
Supervision/ICR		
FY14	12.089	127,473.96
FY15	15.035	129,572.05
FY16	17.682	132,208.38
FY17	12.210	108,592.82
FY18	16.232	117,898.72
FY19	18.737	150,214.44
FY20	15.752	114,297.38
Total	107.74	880,257.75

ANNEX 3. Project Cost

Project Financing Plan at Appraisal (US\$)

Component	IDA	AfDB	AFD	ESMAP	AfDB Trust Fund	GoDJ	GEF	OFID	TOTAL
Component 1: Drilling Program	5,035,550	3,729,000	2,727,590	923,184			5,069,121	5,874,809	23,359,254
.. Contingency	964,450	737,800	422,410	176,816			970,879	1,125,191	4,497,546
Total Component 1	6,000,000	4,466,800	3,250,000	1,000,000			6,040,000	7,000,000	27,856,800
Component 2: Technical Assistance					1,591,100				1,591,100
.. Contingency					173,900				173,900
Total Component 2					1,765,000				1,765,000
Component 3		462,000			500,000	450,000			1,412,000
Project Management Unit									
.. Contingency		71,200			75,000	50,000			196,200
Total Component 3		533,200			575,000	500,000			1,608,200
TOTAL PROJECT COST	5,035,550	4,191,000	2,727,590	923,184	2,091,100	450,000	5,069,121	5,874,809	26,362,354
TOTAL CONTINGENCY	964,450	809,000	422,410	176,816	248,900	50,000	970,879	1,125,191	4,867,646
TOTAL COST	6,000,000	5,000,000	3,250,000	1,000,000	2,340,000	500,000	6,040,000	7,000,000	31,230,000

Comparison of Project Budget at Appraisal and at WB Financing Project Close (December 31, 2020) (US\$)

	Budget at Appraisal	Budget at Project Close
IDA	6,000,000	6,000,000
ESMAP	1,000,000	1,000,000
GEF	6,040,000	6,040,000
OFID	7,000,000	7,000,000
AFD	3,250,000	3,250,000
AfDB	7,340,000	25,325,000
GoDJ	500,000	9,075,000
TOTAL	31,230,000	57,690,000



RÉPUBLIQUE DE DJIBOUTI

Unité – Égalité - Paix

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ÉLECTRICITÉ DE DJIBOUTI

PROJET D'EXPLORATION GÉOTHERMIQUE
DE LA REGION D'ASSAL

**RAPPORT DES ACTIVITES
FINANCES PAR LA BANQUE
MONDIALE**

INTRODUCTION

Le Projet de production de l'énergie géothermique de la République de Djibouti représente un élément essentiel pour le secteur de l'énergie verte ainsi que pour le développement économique et social du pays. Basé sur la réalisation de quatre forages déviés profonds dans la région du rift d'Assal et financé par un groupe de bailleurs de fonds internationaux il a effectivement été lancé depuis la fin de 2015. Le projet est réalisé par l'Électricité de Djibouti, EDD, avec l'assistance de l'Unité de Gestion du Projet, UGP.

A l'issue de l'appel d'offres pour les services de forage, il s'est avéré que le financement alloué à ce projet est insuffisant pour la réalisation de quatre forages comme il était prévu initialement. Il est donc apparu nécessaire de (i) revoir la conception des forages, (ii) prévoir la réalisation de deux forages en tranche ferme selon la conception ainsi révisée dans le cadre du financement disponible, (iii) annuler les appels d'offres de matériaux aciers et les relancer pour tenir compte des besoins découlant de la révision de la conception des forages. Les deux autres forages, à savoir le 3^{ème} e le 4^{ème}, seront réalisés selon la disponibilité de leur éventuel financement. Les activités du projet en cours portent sur la mise en œuvre de ces révisions, à savoir (i) la conception des forages et l'identification des besoins en fournitures correspondants, (ii) la finalisation de la négociation du contrat de forage, (iii) la préparation de DAO révisés et la relance des appels d'offres pour les fournitures de matériaux acier.

Le présent rapport d'avancement décrit de manière détaillée cette situation de développement du projet à travers l'état et le niveau des passations des divers marchés ainsi que les décaissements. Néanmoins, il rappelle aussi en synthèse la situation du gap financier en particulier au niveau des matériels en acier, des services de la compagnie conseillère en géothermie et de la réalisation des forages.

PARTIE I : RESUME DESCRIPTIF

1. Description

Le Projet d'exploration Géothermique dans la région du Lac Assal comprend les composantes suivantes :

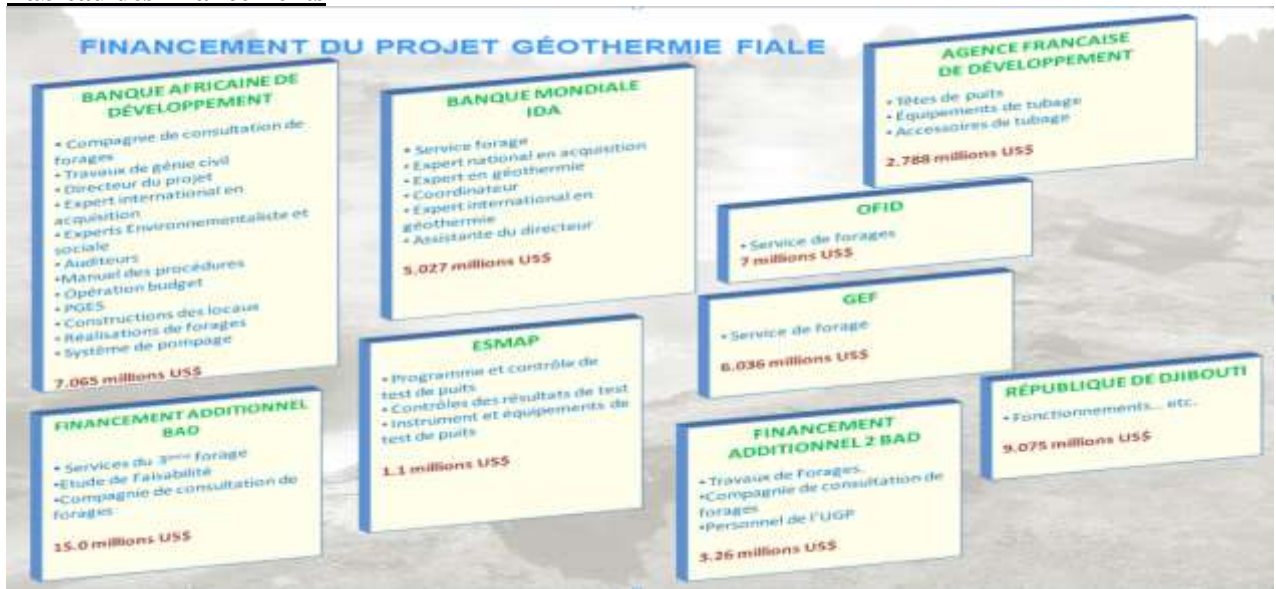
- Composante 1 – Programme de forage. Cette composante prévoit (i) des travaux préparatoires de génie civil nécessaires à l'exécution du programme de forage (financés par la BAD) ; (ii) l'exécution du programme de forage conçu par l'Entreprise de consultance en géothermie (cofinancé conjointement par le FEM, la BM et l'OFID) ; (iii) l'achat de matériaux en acier nécessaires à l'exécution du programme de forage (financés par l'AFD); et (iv) l'inspection et les tests de flux des réservoirs (financé par l'ESMAP).
- Composante 2 – Assistance technique pour le programme de forage. Cette composante inclut la fourniture d'équipement et de services de consultants pour (i) concevoir le programme de forage et le protocole de test de puits ; (ii) exécuter le protocole de test et garantir la certification des résultats par une tierce partie et (iii) préparer une étude de faisabilité technique pour la centrale géothermique au cas où les ressources géothermiques permettent la production d'électricité à grande échelle. Ce volet sera financé par le SEFA.
- Composante 3 – Gestion du projet. Cette composante couvre les coûts du Directeur international de Projet (financés par le SEFA), de l'expert international en passation de marché, du comptable, des spécialistes en sauvegarde, des auditeurs, du manuel des procédures du projet et du logiciel

comptable (financés par la BAD), ainsi que d'autres coûts de fonctionnement (financés par le Gouvernement de Djibouti).

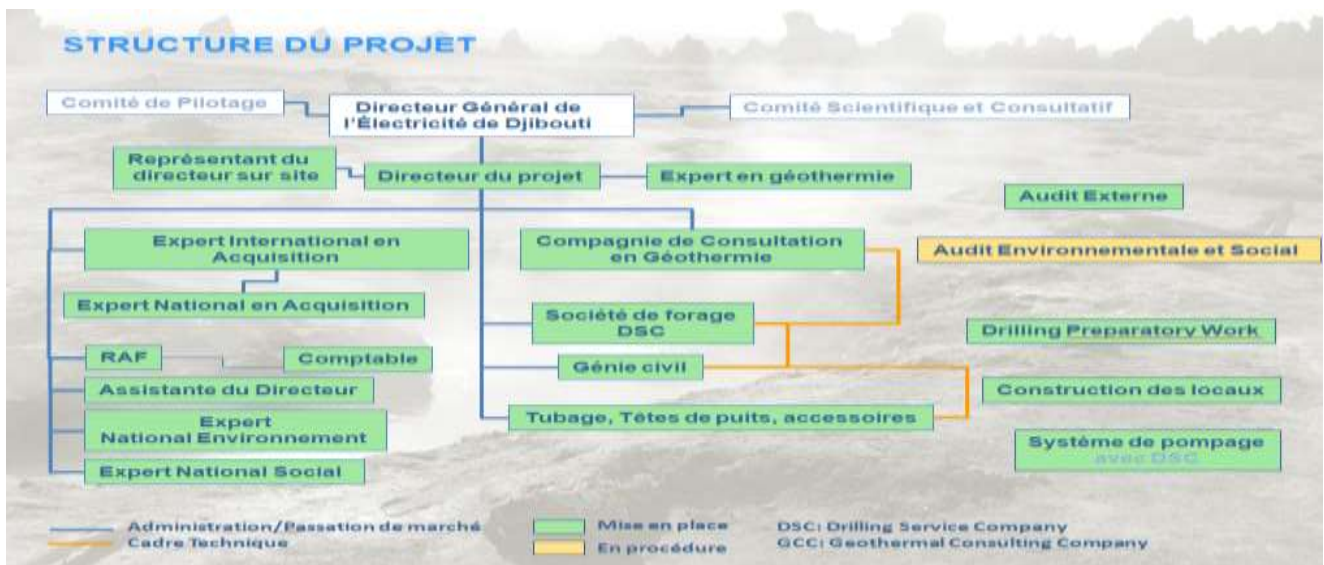
- Composante 4 – Gestion Environnementale et sociale. Cette composante couvre l'exécution du plan de gestion environnementale et sociale du projet.

Le projet consiste en la réalisation d'un programme de 4 forages d'exploration géothermique. La zone des forages est non habitée et dépourvue de végétation du fait de la composition volcanique de ses terrains. Le projet est susceptible de générer des impacts environnementaux (fluides géothermiques pollués, déchets solides issus des boues de forage, risques d'éruption, etc.) et sociaux (perte provisoire d'un parcours de pâturage et d'une piste touristique essentiellement) qui peuvent être atténués par des mesures de compensation adéquates. Compte tenu notamment du fait que la zone du projet est non habitée et dépourvue de végétation, le projet a été classé en catégorie 2 selon les procédures de la Banque Africaine de Développement sur l'évaluation environnementale et sociale et a été classé en catégorie B selon les procédures de la Banque mondiale.

Tableau des financements



Organigramme du projet



2. Personnel

L'équipe Passation des Marchés (PDM) du Projet est composée de deux agents :

(i) Un expert international en passation des marchés a été recruté en avril 2014. Il a travaillé sur le Projet depuis cette date de son bureau en France l'équivalent de 131 jours (42 jours dans le cadre d'un contrat financé par le Projet Accès et Diversification dans le secteur de l'énergie -contrat financé par la Banque mondiale (IDA), et 69 jours dans le cadre d'un contrat financé par le Projet d'Exploration géothermique -contrat financé par le FAD, signé en mai 2014 et 20 jours dans le cadre d'un avenant pour une extension correspondant à 20,5 jours de travail additionnel signé le 27 octobre 2016). Le contrat de l'expert international s'est achevé depuis décembre 2018 et l'expert national a continué les activités de passation jusqu'à ce jour.

(ii) Une spécialiste nationale a été recrutée en octobre 2015 sur financement IDA³.

L'équipe PDM a reçu l'appui des autres membres de l'UGP, de l'expert international en géothermie et de l'équipe du Consultant en Géothermie (GCC) notamment sur les aspects techniques⁴.

L'équipe de passation des marchés (PDM), ainsi appuyée par les autres membres de l'UGP, est en mesure de faire face à la charge de travail qui a connu une pointe au cours de la dernière année y compris la réalisation de deux premiers forages.

L'UGP a participé dans un atelier de communication sur les Nouvelle Politiques de la Passation des Marchés. Suivi d'une formation de l'experte en passation en deux sessions sur le STEP). Cet outil est un outil informatique conçu pour les projets financés par la Banque mondiale et qui servira à planifier les activités et la gestion des contrats d'un projet donné.

3. Plaintes déposées par les soumissionnaires, les consultants et les utilisateurs finaux

Aucune plainte n'a été recensée à la date du présent rapport.

4. Amendements aux contrats

Des avenants ont été engagés pour l'expert en géothermie, l'experte nationale en passation et l'expert en environnement sur le financement ESMAP ainsi que sur l'IDA.

5. Prestations insuffisantes des entreprises, fournisseurs et consultants

Les consultants suivants ont abandonné leur poste ou démissionné :

- Il s'agit du spécialiste en acquisition initialement recruté, qui effectuait un double travail et ne pouvait réaliser ses tâches définies dans les TDR, et qui a démissionné. Une nouvelle Experte en passation des marchés a été recrutée le 18 Octobre 2015.
- La secrétaire bilingue a pris des congés et n'a pas rejoint son poste. Son contrat a été résilié de plein droit et a été remplacé par une nouvelle secrétaire (agent EDD) le 02 janvier 2016.

³Un premier spécialiste national en passation des marchés avait été recruté sur financement IDA en mars 2015, mais il a démissionné en juillet 2015.

⁴L'équipe locale de l'UGP a reçu une formation locale en passation des marchés donnée par des spécialistes de la BAD et de la BM les 19 et 20 octobre 2015.

- La comptable initialement recrutée en avril 2015 a démissionné de son poste en octobre 2015. L'actuelle comptable est un agent de l'EDD qui a été détachée pour le projet sur financement de la BAD le 24 Février 2016.

PARTIE II : TABLEAUX SUR LA PASSATION DES MARCHES

1. Rapport sur la passation des marchés de fournitures et travaux financés par la Banque Mondiale, l'OFID

<u>Suivi/Observations</u> <u>Marché</u>	<u>Actions accomplies / à prévoir</u>
Services de forage	<p>Préqualification lancée fin avril 2014 ; 10 dossiers de candidatures reçus ; Evaluation des candidatures finalisée le 29 juin 2014 ; et ANO de la BM obtenu le 23/09/14 - 9 sociétés de forages pré-qualifiées</p> <p>Notification des résultats de la pré-qualification en novembre 2014</p> <p>Préparation du DAO avec le concours technique de GCC (Geologica) finalisée le 18/02/16 ; Demande de Non-Objection adressé à la BM le 23/02/16 ; ANO reçu le 31/03/2016</p> <p>DAO envoyé aux 9 sociétés de forages pré-qualifiées à la date 10 avril 2016 par Fedex et par Email le 05 avril 2016 pour une remise des offres initialement le 25 mai 2016 ; date reportée par additif au 8 juin 2016.</p> <p>Désistement de la société TPIC annoncé en juillet 2015 et confirmé par l'absence de réponse aux envois du DAO.</p> <p>Désistement de la société EXALO de 26 avril 2016 et Désistement de la société COFOR le 06 mai 2016</p> <p>Visite du site et réunion préalable au dépôt des offres le 11 mai 2016.</p> <p>Ouverture des plis reportée au jeudi 09 juin 2016 ; Réception de deux offres (Marriott Drilling et Iceland Drilling) ; Evaluation des offres achevée le 30 juin 2016.</p> <p>La commission nationale des marchés publics décide de retenir l'offre IDC qui a été jugée la seule recevable techniquement et financièrement. Cependant la commission note que le cout des forages est très élevé et par conséquent autorise la négociation sur la base du budget alloué d'un montant de 19 000 000 USD avec une tranche ferme de deux forages et une tranche conditionnelle à la mise en place du financement requis pour les travaux de deux autres forages.</p> <p><i>Budget Insuffisant</i> : une négociation est envisagée avec la société attributaire pour réaliser 2 forages en tranche ferme et le 3ème et 4ème forages en tranche conditionnelle, sous réserve de l'obtention du financement complémentaire.</p> <p>Rapport d'attribution validé par la Commission Nationale des MP le 27 juillet 2016.</p> <p>Réception du PV de la CNMP le 25/08/2016 à la Banque pour non-objection ; Demande d'ANO envoyé à la BM le 27/08/2016</p> <p>L'expertise d'un cabinet tiers (CAPUANO) a été demandée pour la BM et le travail de M. Capuano a permis d'identifier des éléments dans la conception globale du projet pour réduire les couts. Certains aspects ont été adoptés par la GCC pour réduire les couts après l'attribution du marché. Ce qui a permis de faire rentrer l'offre d'Iceland Drilling dans l'enveloppe budgétaire et la partition en 2 forages en tranche ferme et 2 optionnelle.</p> <p>La BM a donné sa NOB sur le rapport d'attribution le 21/09/2016 et le principe de négocier le contrat avec IcelandDrillingCompany (IDC).</p> <p>Des négociations ont abouti avec la société IDC retenue le 19/04/2017 pour seulement 2 forages.</p> <p>Négociation finalisée pour entrer dans l'enveloppe budgétaire disponible de la BM, GEF et OFID. Les activités « <i>installation de pompage, construction de campement, travaux de caves</i> etc » sont des activités initialement financées par la BAD mais ils ont été incorporés dans le DAO des forages.</p> <p>Nous avons lancé l'appel d'offres « services de Forages » y compris les activités de la BAD. Dans la phase négociation, il a été décidé de retirer ces activités en les imputant sur la contrepartie nationale et sur la BAD.</p> <p>Envoi des commentaires sur le contrat aux remarques de la BM sur le contrat IDC le 23/04/2017</p> <p>La Banque mondiale a donné l'ANO le 25/04/2017 sur l'adjudication du contrat à Iceland Drilling pour le forage de 2 puits de production avec une option de deux</p>

	<p>forages additionnels. Contrat signé le 21/05/2017 ; Mobilisation de la foreuse en avril 2018 ; Arrivée de la machine le 08 juin 2018. Etablissement des exonérations et Suivi du transport de la machine jusqu'au Lac Assal. Inauguration des installations des travaux de forage par le président le 11/07/2018. Début des travaux de forage en juillet 2018 ; Exécution de deux forages prévus par la BM. Demande d'un financement supplémentaire pour exécuter le 3^{ème} forage à la BAD. Finalisation des 3 puits de forages. Demande d'un nouveau financement à la BAD et à l'EDD. Approbation d'un montant par EDD pour effectuer la stimulation. En cours de validation du financement de la BAD.</p>			
Tests, échantillons	<p>Les fournitures d'équipements de test sont prévues dans le marché DSC et sont financés dans le cadre du financement ESMAP. Spécifications établis pour l'acquisition des équipements de test et le recrutement d'un cabinet pour réaliser l'inspection tierce.</p> <table border="1" data-bbox="448 550 2040 1327"> <tr> <td data-bbox="448 550 1243 1327"> <p>1^{er} consultation : Nous avons lancé sur STEP une consultation pour l'acquisition des équipements de test. Les spécifications ont été élaborées par GCC et la consultation se fera sous six (6) lots. L'estimation par lot est comme suit : Lot 1 : Flow Testing Equipment: \$100,000 Lot 2 : Downhole pressure monitoring: \$40,000 Lot 3: PT/PTS: \$373,000. Lot 4 : Generator and Lighting: \$89,000 Lot 5: Injection Equipment: \$163,000. Lot 6 : Laboratory Analysis: \$110,000 ANO reçu le 13/05/2018</p> <p>Demande de prix adressée aux 9 fournisseurs le 17/05/2018 pour une remise des offres le 05/06/2018, reportée au 12/06/2018. A la remise des offres, nous n'avons reçu que 3 offres. Ouverture des plis le 20 juin. Analyse des offres sur les six lots. Le lot 4 a été annulé car la contrepartie nationale a pris en charge l'activité d'acquérir des groupes électrogènes. Le lot 5 a été déclaré infructueux. Sur les 6 lots, 2 lots ont été attribués à JRG et 2 lots ont été attribués à Pars Drilling. ANO reçu sur le rapport d'évaluation en novembre 2018 Contrat JRG signé le 11/12/2018. Contrat Pars Drilling signé le 18/12/2018.</p> </td> <td data-bbox="1243 550 2040 1327"> <p>2^{ème} consultation : Nous avons lancé sur STEP une consultation pour l'acquisition des équipements de test. Les spécifications ont été élaborées par GCC et la consultation a été adressée aux six cabinets le 17 juin pour une remise des offres le 03 juillet 2018 reporté au 08 juillet 2018. A la remise des offres, nous n'avons reçu que 4 offres. Ouverture des plis le 08 juillet. Analyse des offres. Attribution à Mauro Parini. Contrat signé le 15/10/2018. Paiement de la facture 1 sur ESMAP. Clôture des fonds ESMAP. Contrat Imputé sur la contrepartie après clôture de l'ESMAP.</p> </td> </tr> </table>		<p>1^{er} consultation : Nous avons lancé sur STEP une consultation pour l'acquisition des équipements de test. Les spécifications ont été élaborées par GCC et la consultation se fera sous six (6) lots. L'estimation par lot est comme suit : Lot 1 : Flow Testing Equipment: \$100,000 Lot 2 : Downhole pressure monitoring: \$40,000 Lot 3: PT/PTS: \$373,000. Lot 4 : Generator and Lighting: \$89,000 Lot 5: Injection Equipment: \$163,000. Lot 6 : Laboratory Analysis: \$110,000 ANO reçu le 13/05/2018</p> <p>Demande de prix adressée aux 9 fournisseurs le 17/05/2018 pour une remise des offres le 05/06/2018, reportée au 12/06/2018. A la remise des offres, nous n'avons reçu que 3 offres. Ouverture des plis le 20 juin. Analyse des offres sur les six lots. Le lot 4 a été annulé car la contrepartie nationale a pris en charge l'activité d'acquérir des groupes électrogènes. Le lot 5 a été déclaré infructueux. Sur les 6 lots, 2 lots ont été attribués à JRG et 2 lots ont été attribués à Pars Drilling. ANO reçu sur le rapport d'évaluation en novembre 2018 Contrat JRG signé le 11/12/2018. Contrat Pars Drilling signé le 18/12/2018.</p>	<p>2^{ème} consultation : Nous avons lancé sur STEP une consultation pour l'acquisition des équipements de test. Les spécifications ont été élaborées par GCC et la consultation a été adressée aux six cabinets le 17 juin pour une remise des offres le 03 juillet 2018 reporté au 08 juillet 2018. A la remise des offres, nous n'avons reçu que 4 offres. Ouverture des plis le 08 juillet. Analyse des offres. Attribution à Mauro Parini. Contrat signé le 15/10/2018. Paiement de la facture 1 sur ESMAP. Clôture des fonds ESMAP. Contrat Imputé sur la contrepartie après clôture de l'ESMAP.</p>
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	<p>Réception des matériels du lot 2 (JRG) le 09/06/2019 et le lot 3 19/02/2019. Vu que les financements sont clôturés alors les derniers paiements seront imputés sur la contrepartie. Réception des équipements du lot 1 par PARS. Problème de conformité sur les équipements. Paiement de 20% en instance. Lot 6 de PARS en cours de traitement.</p>	
Bits, Stabilizers, reamers & Hole Openers	<p>Besoins à définir par GCC Equipements incorporés dans le marché DSC. Il n'est pas prévu de lancer un AO.</p>	

2. Rapport sur la passation des contrats de services de consultants financés par la Banque mondiale

Suivi/Observations

Marché	Actions accomplies/ à prévoir
Directeur intérimaire de l'UGP, devenu Expert en conseil géothermie	<p>Nomination au 26/11/14 Engagement du directeur intérimaire/expert géothermie. ANO reçu. Contrat signé le 01/09/15. Avenant soumis à la banque. Prolongation du contrat de l'expert fait jusqu'à la fin du projet au 31/12/2018. Suivi d'un second avenant pour un période de 4 mois imputé sur ESMAP. Puis un avenant de 5 mois sur IDA. Et un autre avenant au contrat pour une durée de 3 mois sur l'IDA. Imputation sur la contrepartie un avenant de 3 mois dont un mois Ferme et deux mois conditionnelle en attendant le financement de la BAD. L'expert a été reconduit sur le financement additionnel 2 pour une période 9 mois.</p>
Coordinateur du Projet	<p>Nomination du coordinateur. Contrat signé en juillet 2015 pour une durée de 2 ans. Un projet d'avenant a été soumis à la banque mondiale pour une prolongation de 18 mois. Prolongation du contrat de l'expert fait jusqu'à la fin du projet au 31/12/2018. Ce contrat a été cloturé.</p>
Expert international en géothermie	<p>Contrat initial financé par le Projet Power Access annulé Nouveau contrat négocié soumis à la BM pour ANO en 02/15. ANO de la BM le 12/03/15 et Contrat achevé fin 2015.</p>
Spécialiste national en acquisitions	<p>AMI publié en octobre 2014 ; 20 Candidatures reçues Demande d'ANO envoyée à la BM le 04/01/2015 ; ANO reçu le 13/01/15 Contrat négocié envoyé à la BM pour ANO le 13/01/15, puis signé le 21 /03/15 Le Consultant a démissionné le 21 juillet 2015 Prise de fonction d'un nouveau spécialiste national le 18 octobre 2015. ANO reçu le 03 décembre 2015 ; Contrat signé le 18 décembre 2016. Avenant soumis à la banque ; ANO reçu le 18 Octobre 2017. Prolongation du contrat de l'expert fait jusqu'à la fin du projet au 31/12/2018.</p>

	Suivi d'un second avenant pour un période de 4 mois imputé sur ESMAP. Puis un avenant de 5 mois sur IDA. Pour des raisons d'un gap sur le financement IDA, il a été décidé d'imputer un contrat de 6 mois dont quatre mois Ferme et deux mois conditionnels en attendant le financement de la BAD sur la contrepartie. L'expert a été reconduit sur le financement additionnel 2 pour une période de 9 mois.
Secrétaire bilingue anglais/français)	AMI publié en octobre 2014 ; 45 Candidatures reçues Demande d'ANO envoyée à la BM le 04/01/2015 ; ANO reçu le 13/01/15 Contrat négocié envoyé à la BM pour ANO le 01/02/15 ; ANO reçu le 22/02/15 ; Secrétaire en poste le 02/03/15. Licenciement de la secrétaire après abandon de poste le 30/11/2015. Mise en place d'une nouvelle secrétaire le 02 janvier 2016, agent de l'EDD détaché pour le projet.
Expert environnementaliste	AMI envoyé pour non-objection à la BM le 04/04/2016 ; ANO reçu sur l'AMI le 08/04/16 Publication faite le 13 avril 2016 et pour des raisons techniques, la nation a publié le 20 avril 2016 pour une remise le 04 mai 2016. Trois (3) CV reçus. L'UGP a décidé de republier pour avoir plus de candidats le 16 mai pour une remise le 25 mai 2016. Cinq (5) CV reçus à la date limite. Ouverture des plis fait le 28 mai 2016. Rapport d'évaluation des CV des candidats finalisé. Demande d'ANO sur le rapport d'évaluation adressé à la BM le 14 juin 2016 ; ANO reçu sur le rapport sous réserve de vérifier que la fonction de l'expert. Note de service du ministère de l'habitat pour une mise à disponibilité de 20 mois sans soldes ANO sur le projet de contrat reçu le 03/09/2016 ; Contrat signé le 01 septembre 2016. Prolongation du contrat de l'expert fait jusqu'à la fin du projet au 31/12/2018. Ensuite un second avenant a été imputé sur ESMAP pour une période de 4 mois suivie de deux autres avenants de deux mois chacun sur IDA. L'expert a un nouveau contrat sur le financement additionnel 2 qui s'activera dès les débuts des travaux de forages en 2021.

PARTIE III : SITUATION FINANCIERE DU PROJET

Le projet fait l'objet d'un co-financement et bénéficiera de dons et de prêts de la banque africaine de Développement, du Groupe de la Banque Mondiale (BM), du Fonds OPEP pour le Développement International (OFID), de l'Agence Française de Développement (AFD), du Fonds pour l'Environnement Mondial (FEM) ainsi que du fonds ESMAP.

Le budget de la banque mondiale s'élevait à 12.595 millions US.

PARTENAIRES FINANCIERS		
Sources	Montant (million d'USD)	Instrument
Banque Mondiale (IDA)	5.459	Prêt

Fonds pour l'Environnement Mondial (FEM)	6.036	Don
ESMAP	1.100	Don
Financement Total	12.595	

A mis parcours du projet, les financements se sont avérés insuffisant pour réaliser trois forages. Cependant pour combler ce gap, la Banque Africaine de Développement a accordé un financement additionnel de l'ordre 10.74 million UC soit environ 15 millions US afin d'optimiser les chances de réussite de cette phase d'exploration. La contrepartie nationale a suivi avec une enveloppe additionnelle portant le total à 8,128 millions US.

Dans la phase finale du projet, et pour améliorer la productivité des puits de forage, il a été nécessaire d'entreprendre des activités de nettoyage de Fialé 2, de faire des tests des trois forages, ainsi que l'assistance technique pour la supervision des travaux et des tests. Encore une fois, la Banque Africaine de Développement a contribué un deuxième Don Additionnel de l'ordre de 2.36 UC, ce qui porte le total BAD à 18,1 million UC.

Difficultés rencontrées et leçons apprises

1- Difficultés rencontrées et défis

- Approbation et mises en place des financements des bailleurs nécessitant beaucoup d'effort et engendrant beaucoup de retards.
- Retard important dans la mise en place de l'UGP et notamment le directeur international
- Recrutement des consultants nationaux à temps partiel qui ne sont pas toujours disponibles pour le projet
- Recrutement des sociétés prestataires et des consultants internationaux nécessitant beaucoup de consultation et de coordination entre les bailleurs et l'UGP.
- Procédures d'acquisition chez les bailleurs notamment la BAD sont assez sévères et compliquées et engendrant beaucoup de retard.
- Multitude des bailleurs nécessitant des efforts de coordination et engendrant des difficultés de gestion.
- Difficultés à avoir plusieurs soumissionnaires pour les appels d'offres pour le recrutement des consultants et des sociétés prestataires vu qu'il s'agit d'une nouvelle expérience à Djibouti, sans antécédent et à risques.
- Difficultés et retard dus aux négociations avec le seul soumissionnaire pour le forage afin de rentrer dans le budget de la banque mondiale qui ne couvraient pas deux forages alors qu'il était destiné à quatre forages.
- Difficultés et retard dus aux appels d'offres du matériel acier que l'agence française de développement a exigé de refaire suite au changement à la baisse des dimensions du design du projet pour rentrer dans le budget initial.
- Sous-estimation des budgets disponibles pour les différentes composantes du projet et les aléas mettant parfois le projet en difficulté. L'extension du budget nécessaire prend du retard et n'est pas toujours disponible.
- Difficultés rencontrées dans les forages dues à la nature du sol engendrant du retard et un dépassement budgétaire.
- Nettoyage des forages bouchés et difficultés rencontrés lors des tests de production engendrant du retard et nécessitant des extensions budgétaires.

2- Leçons apprises

- Prévoir le recrutement de l'UGP dès le démarrage du projet
- Prévoir un budget adéquat pour toutes les composantes du projet
- Limiter le nombre de bailleurs intervenants par la procédure de délégation (comme avec ESMAP, GEF et OFID) et unifier les procédures d'acquisition.
- Regrouper les appels d'offres pour délimiter et cadrer les responsabilités ce qui permettra de décharger l'UGP.
- Améliorer les contacts avec les prétendants potentiels pour une meilleure participation aux appels d'offres.

- Alléger les procédures d'acquisition chez les bailleurs.
- Assurer à l'UGP le bon soutien et le suivi permanent par les bailleurs durant toute la période du projet et dans tous les domaines.
- Ne pas anticiper des rapports finaux et des conclusions par les bailleurs avant la fin de tous les travaux et la réalisation de l'étude de faisabilité.

3- Appréciations du support de la banque mondiale

- La Banque Mondiale a assuré au projet un bon suivi et un soutien permanent durant toutes les phases du projet par le contact direct avec l'UGP pour résoudre certains problèmes, pour accélérer certaines procédures, pour assurer une meilleure coordination avec les autres bailleurs et aussi par la mise à disposition d'experts hautement qualifiés dans tous les domaines.
- Les points à améliorer par la banque sont notamment :
 - Le soutien financier pour le projet en cas de besoin d'extension du budget pour les aléas qui a fait défaut tout au long du projet
 - Une meilleure coordination entre le task manager et le représentant local pour éviter des situations d'incompréhension. En effet, le suivi assuré par la représentation locale ainsi que les interprétations des données se faisaient uniquement à travers les documents à disposition et non de la source par des contacts directs avec le task manager ou les responsables de l'UGP.

4- Impacts du projet sur l'activité géothermique à Djibouti

- Avoir une grande expérience dans la gestion et l'exécution des projets géothermiques notamment dans les domaines de l'acquisition, de la gestion financière et du forage.
- Exploiter les résultats des forages pour optimiser les études d'exploration géothermique au pays.

Fin

ÉLECTRICITÉ DE DJIBOUTI
ÉTABLISSEMENT PUBLIC

RÉPUBLIQUE DE DJIBOUTI
UNITÉ - ÉGALITÉ - PAIX

إدارة الكهرباء

ص.ب 175

تلفون 202801

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PROJET GÉOTHERMIE FIALÉ

Réf. N° 347/PGEO/MC/RE/2021/EDD



رقم ك.ج

Djibouti, le 18 MARS 2021

Objet: Comments on the World Bank final evaluation report of the Fialé geothermal project

To
Madam Lucine LOMINY
Energy Specialist
Energy & Extractives, MNA (IMNE1)
Tel : +1 (202) 473-3506
llominv@worldbank.org
Banque Mondiale

Dear Madam,

Here are our comments concerning your final report of the Fialé geothermal project :

The project is not completed. However, World Bank controlled funds have been completely used. This appears to be the reason World Bank is publishing this report prior to project completion. This difference between the World Bank and project completion date appears to significantly impact the efficacy scores for the project. The additional funds and project plan have been approved and project completion is currently scheduled for 2021. We recommend requesting the World Bank allow EDD to finish the funded project prior to publishing the report.

Efficacy :

The low efficacy rating of Modest is due to 2 incomplete items (greenhouse gas emission avoidance and power generation feasibility study) and one partially complete (independent review of well testing). The government of Djibouti has funding and plans to finish cleaning and testing Fiale 2 and testing Fiale 1 and 3. They also have funding and plans to complete a geothermal power plant feasibility study. When this remaining effort is complete the following two items will also be complete significantly changing the efficacy rating, Development of a fully-fledged power generation feasibility study and well test results independently reviewed and certified. We believe Modest rating will improve when the project is complete. Therefore, either these 3 items should not be included in the scoring at this time or the score should be delayed until the efforts are completed.

In paragraph 51, the following statement is made "the project objective of assessing the commercial viability of the geothermal resource in Fiale Caldera through exploration drilling is very likely to be achieved in the near future (early/mid 2022)".

Efficiency :

The effort to date has confirmed the existence of a deep, hot reservoir of potential commercial interest (paragraph 49). This information supports the need to complete the Feasibility Study to predict project costs and to perform an economic analysis. The Study will evaluate all the potential uses including geothermal power plants, hybrid power plants and other cascading uses and to develop project costs.

Exploration drilling costs are significantly higher than the original expectation partially because the costs were underestimated and actual costs were higher due to several reasons cited by the World Bank including having only one bidder, approval delays etc., depth of the wells along with the cost for the required infrastructure of the exploration program such as roads and pads, camp and other one-time costs. The well costs are similar to exploration well costs in Indonesia. The efficiency rating at project close of negligible is based on cost overrun due to poor budget development, lower cost alternatives (wind and solar), lower than expected well capacities and incomplete 3 wells (Fiale 2 needs to be cleaned out). The later two will change upward when the planned well testing and cleanout are completed and the cost analysis may change when Feasibility Study is published, therefore the Negligible rating may also change when the project is completed.

Overall Rating :

Based on the finished project we recommend World Bank reconsider the overall outcome rating of Moderately Unsatisfactory. We believe these three low ratings will impact the investors we want to attract and should not be reported until the rest of the funded actives are complete and evaluated.

Co-financing :

The project has 9 different finance institutions. We propose they coordinate to produce one report that will support Djibouti's future efforts to reach out to potential investors.

Sincerely,

Le Directeur Général de l'Électricité de Djibouti P/I



ABOUBAKER HASSAN GUESSOD



Comments received from the French Development Agency (AFD)

Message n° 018

Bonjour Lucine,

Nous vous remercions d'avoir partagé ce Rapport d'Evaluation Finale du Financement de la Banque Mondiale du projet de géothermie de Fialé et l'avons parcouru avec intérêt. Vous trouverez ci-après nos réactions de fond sur les quelques points ci-après.

0- Remarques générales

Je me permets en préambule de souligner que le délai (5 jo) laissé pour analyser ce document dense et émettre des commentaires pertinents est assez contraint. Nous regrettons également vivement qu'aucun échange n'ait pu avoir lieu entre les bailleurs BAfD/AFD et les experts et consultants chargés de cet exercice d'évaluation finale du financement BM, alors même qu'il nous semble que cela avait bien été prévu ou annoncé lors des précédentes missions de supervisions conjointes.

Par ailleurs, nous avons compris lors de la mission de supervision de février 2020 et des échanges ultérieurs, que ce travail d'évaluation attendrait les résultats de la dernière phase de financement du projet, avec la stimulation et le nettoyage des puits puis les campagnes de tests. Compte-tenu des contraintes liées au C-19, il ne nous semble pas que cette phase ultime soit achevée et que le rapport soit établi en prenant en compte ces résultats, ce qui est peut-être dommage.

1- Performances de l'Unité de Gestion du Projet

Dans le point 87, il est indiqué que *"The PIU staff (based in Djibouti-City and at the project site) performed adequately after initial adjustments."*

Notre appréciation sur ce point reste assez éloignée de celle formulée par la Banque, dans la mesure où ce sujet de la gestion de projet était remonté quasiment systématiquement lors des missions de supervisions des bailleurs de fonds. Le partage des informations, des documents et des rapports, la communication du projet, la diffusion des rapports des bailleurs, l'annonce et la préparation des missions de consultants par exemple... était loin d'être optimales. De nombreux constats réservés ont émaillé les missions de supervisions, portant sur les retards récurrents dans la diffusion d'informations (diffusions souvent partielles en fonction des bailleurs...), les difficultés pour disposer des budgets détaillés et lisibles du projet, des plannings actualisés, les difficultés liées à la prise en main et l'utilisation du logiciel de comptabilité, etc. etc. A titre d'exemple, sur la dernière phase du programme actuellement en cours, nous (AFD) n'avons reçu aucun rapport ni information conséquente sur l'état d'avancement depuis début 2020. Mais peut-être que ces informations ont-elles bien été transmises à la BAfD, seul financier encore en lice...?

2- Coûts du projet

Concernant "l'explosion" des coûts du projet au fil de l'eau, il est indiqué dans le point 118 notamment que *« Drilling costs are very country specific »*. Cela peut certes se comprendre, mais n'explique pas tout et en particulier le niveau final des coûts pour 3 forages profonds.

Il nous semble qu'il aurait été intéressant d'interroger un peu plus finement et en détail, le jeu d'acteurs des différentes parties prenantes au projet, notamment ceux de l'équipe projet (Directeur de Projet International, conseillers techniques, équipe de la PIU) mais aussi du maître d'ouvrage délégué (EDD). Par exemple, on peut souligner que dans le budget de la dernière phase de financement demandée à la BAfD (environ 3,3 M€), le seul financement du poste du Directeur de Projet représente 60% des coûts de la PIU. Une des recommandations pourrait éventuellement être de fixer la rémunération sur l'atteinte d'objectifs du projet ou de certains indicateurs de performance dans la gestion du projet.

Par ailleurs, le sujet de la Passation des Marchés particulièrement complexe pour ce programme, aurait probablement mérité une analyse détaillée de la totalité des marchés passés et pas uniquement ceux de la BM, même si nous comprenons que l'approche de cette évaluation ne concerne que les sujets BM.

Enfin, dans le coût global du projet, le financement de l'Etat Djiboutien est passé de 0,5 MUSD à 10 MUSD, ce qui in fine, pèsera lourd sur le modèle économique du projet dans sa phase de production (si elle venait à voir le jour...), tout particulièrement si le coût des prêts contractés est intégré dans les calculs financiers globaux.

3- Coordination inter-bailleurs

Sujet récurrent, de notre point de vue, cette coordination entre bailleurs a largement été défailante (point 92) dès le démarrage du projet et l'absence d'accord conjoint tripartites entre les bailleurs dès le début a représenté une contrainte très forte dans la bonne harmonisation et cohérence des décisions. Malgré le fait que l'AFD a tiré la sonnette d'alarme à plusieurs reprises lors des missions de supervisions en particulier, aucune mesure significative n'a finalement été prise. D'ailleurs, on peut mettre en parallèle la réalisation de ce rapport d'évaluation par la Banque sans avoir malheureusement associé en amont nos collègues de la Banque Africaine ou nous –mêmes, ce qui est une illustration assez parlante de cette communication insuffisante entre les 3 bailleurs principaux du programme.

Nous espérons vivement que ces quelques premiers éléments pourront figurer en annexe du rapport d'évaluation finale.

Vous en souhaitant bonne réception.

Philippe Collignon, collignonp@afd.fr

Comments received from the AfDB

A la page 2 sur 49 : FINANCING : Ci-dessous les données des financements de la BAD :

NOM DU PROJET : PROJET D'EXPLORATION GEOTHERMIQUE DANS LA REGION DU LAC ASSAL				
DONNÉES DE BASE				
Projet d'exploration géothermique dans la région du lac Assal				
	Date d'approbation :	Date de signature :	Date de mise en vigueur :	Taux décaissement (%)
Don FAD: 3,531 MUC	28 juin 2013	26 août 2013	26 août 2013	99,4
Prêt FAD: 0,269 MUC	28 juin 2013	26 août 2013	26 août 2013	100
Don SEFA: 1,8 MUSD	28 juin 2013	26 août 2013	26 août 2013	95
1 ^{er} financement supplémentaire				
Prêt FAD: 10,74 MUC	02 mai 2018	08 mai 2018	27 septembre 2018	94,90
2 ^e financement supplémentaire				
Don FAD: 2,36 MUC	15 janvier 2020	03 juin 2020	03 juin 2020	2,02

Partout où il sera question de la contribution de la BAD dans le rapport d'achèvement de la Banque Mondiale, le tableau ci-dessus devra être utilisé comme référence.

A la page 5 sur 49 : Section 3 : Cette section doit être révisée en tenant compte du tableau ci-dessus.

A la page 5 sur 49 : Section 4 : Dans cette section, il faut préciser que le financement nécessaire pour compléter le projet a été approuvé par la BAD le 15 janvier 2020 et la notification à Djibouti a été faite le 31 mars 2020.

A la page 5 sur 49 : Section 5 : Le forage des 3 puits était achevé en décembre 2020. Toutefois, l'un des puits a révélé une obstruction qu'il est nécessaire de nettoyer.

A la page 13 sur 49: Section 45: Je suggère de réviser la section comme suit: « Well test protocols have been developed by the **consultant or owner engineer** (Geologica) and applied to each of the three wells drilled. This **expected outcome has been met** »

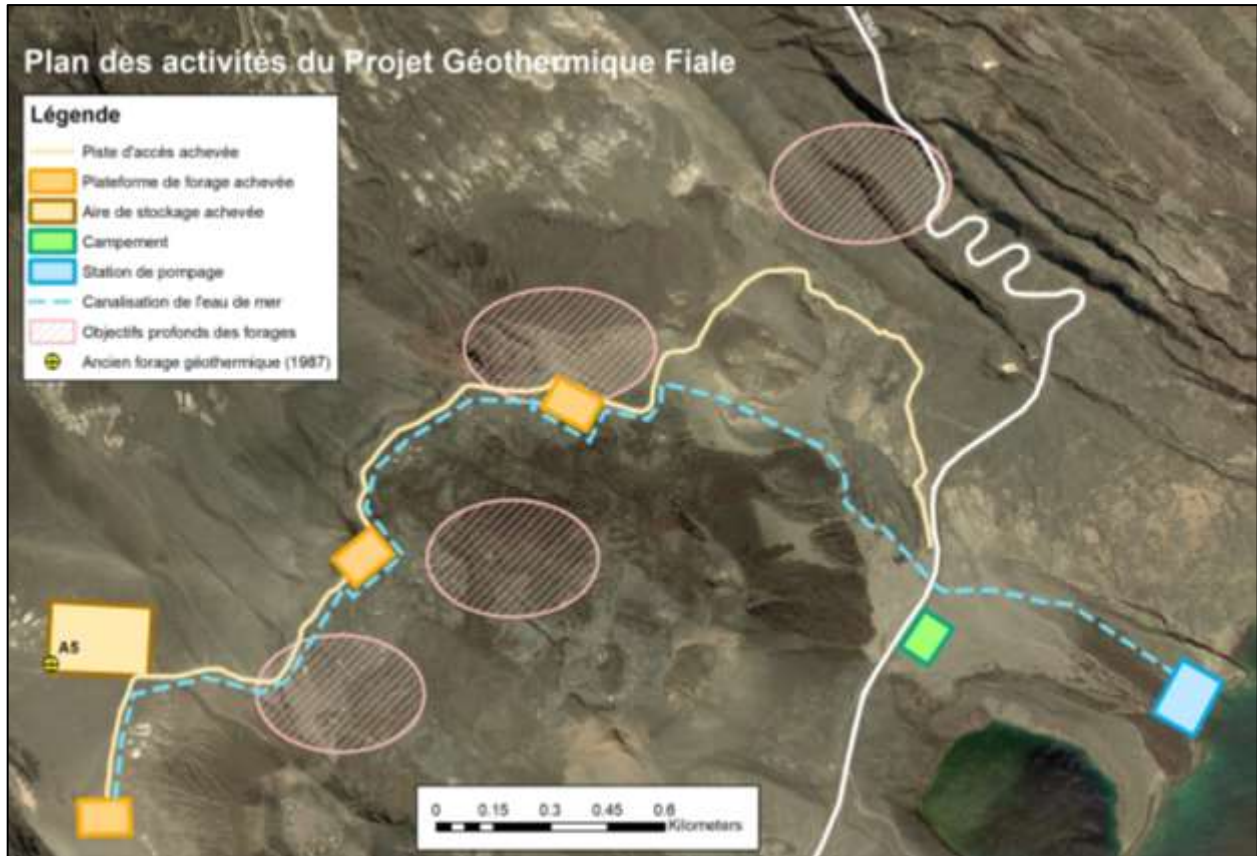
A la page 14 sur 49 : Section 51 : La section parle d'un contrat signé entre ODDEG et KenGen pour forer des puits additionnels. Prière de bien noter que les puits additionnels ne font pas partie du projet de Fiale.

A la page 14 - 15 sur 49 : Section 54 : Pour ce qui est des couts du projet, la contribution de la BAD est donnée dans le tableau au début de ce document.

A la page 15 sur 49 : Section 55 : Le processus de passation de marchés compétitif a donné lieu à des prix exorbitants. Nous nous interrogeons si le recrutement direct (sans compétition) de KenGen, dont l'expérience est prouvée, n'aurait pas fortement réduit ces couts exorbitants ? Quelles sont les leçons à tirer de ce projet par rapport à la méthode de passation de marchés au regard des montants exorbitants mis en jeux ?

Moussa Kone
Chef de Projet, m.o.kone@afdb.org

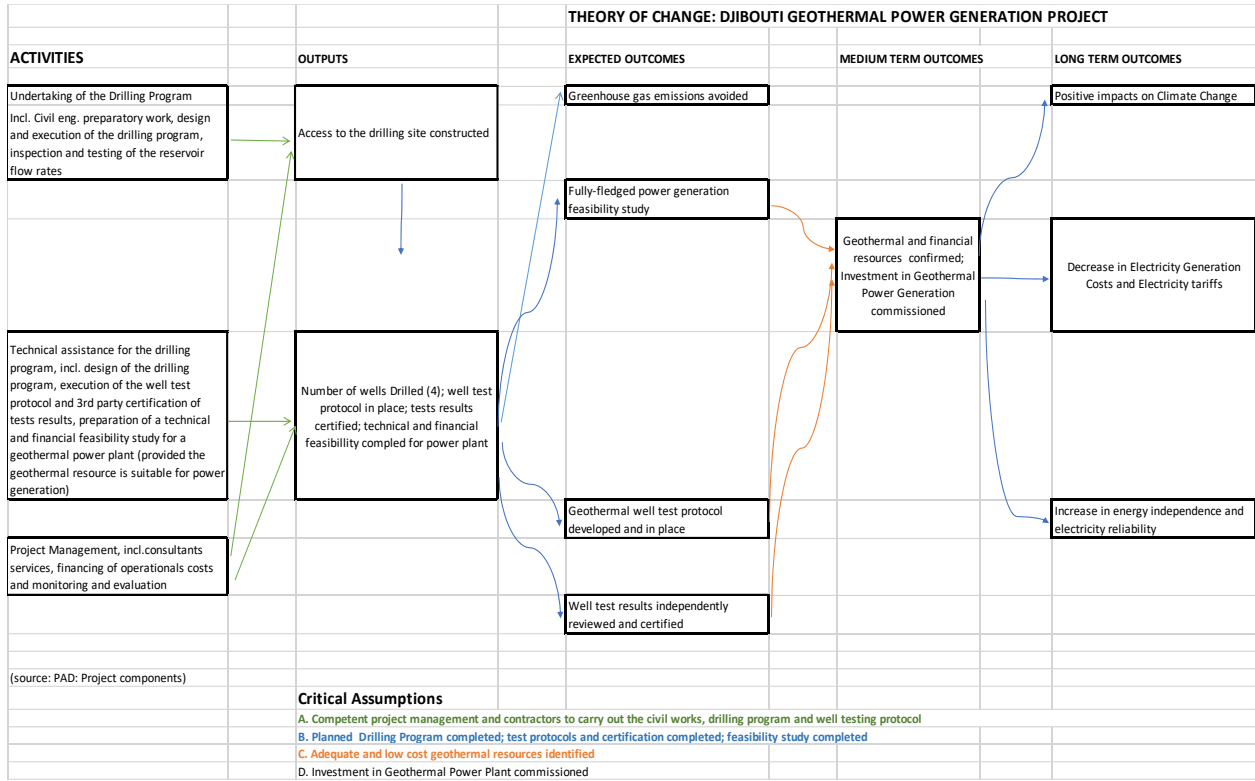
ANNEX 5. Project Map and Site Layout



Project Site Layout

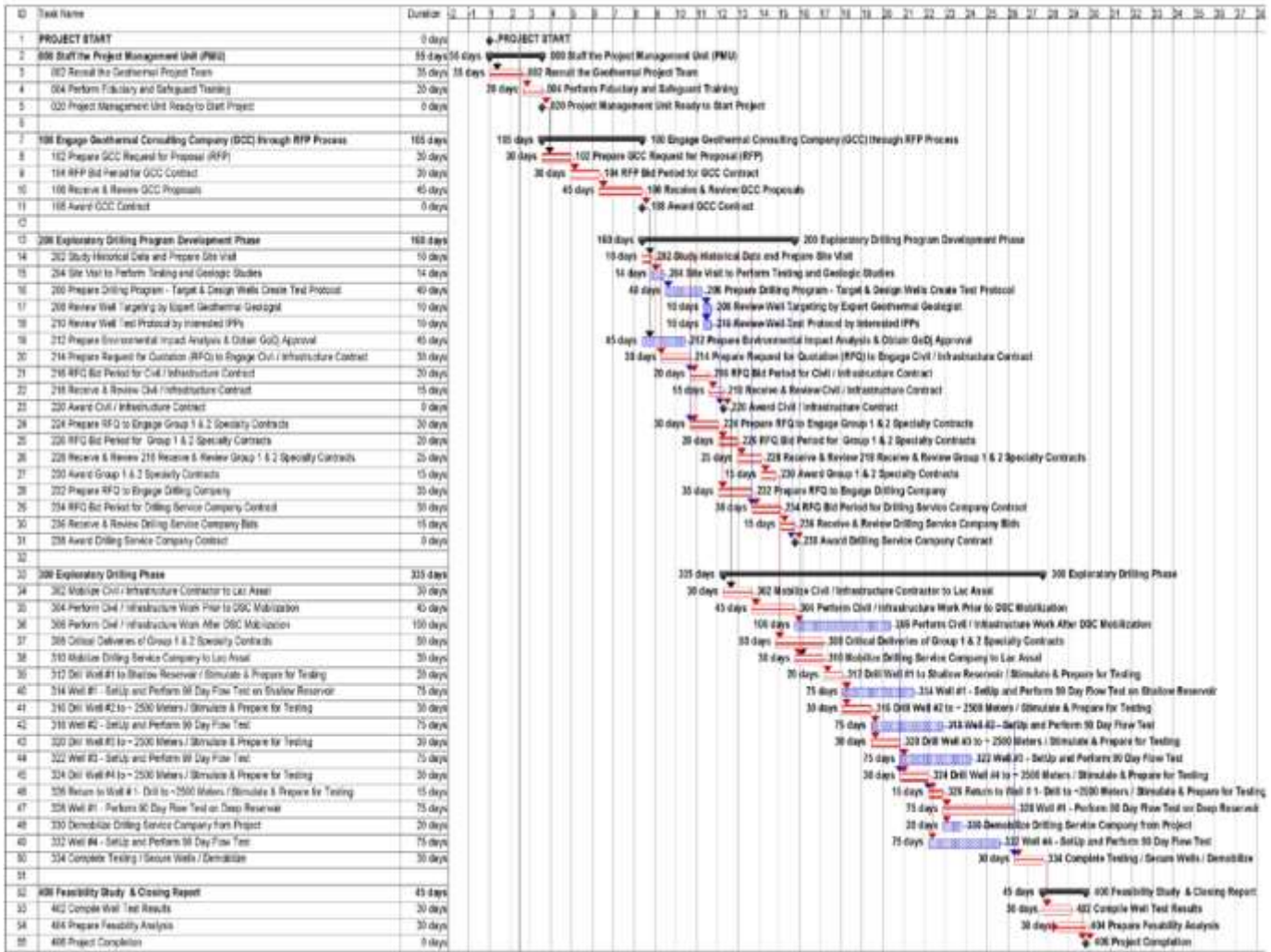


ANNEX 6. Project Cost

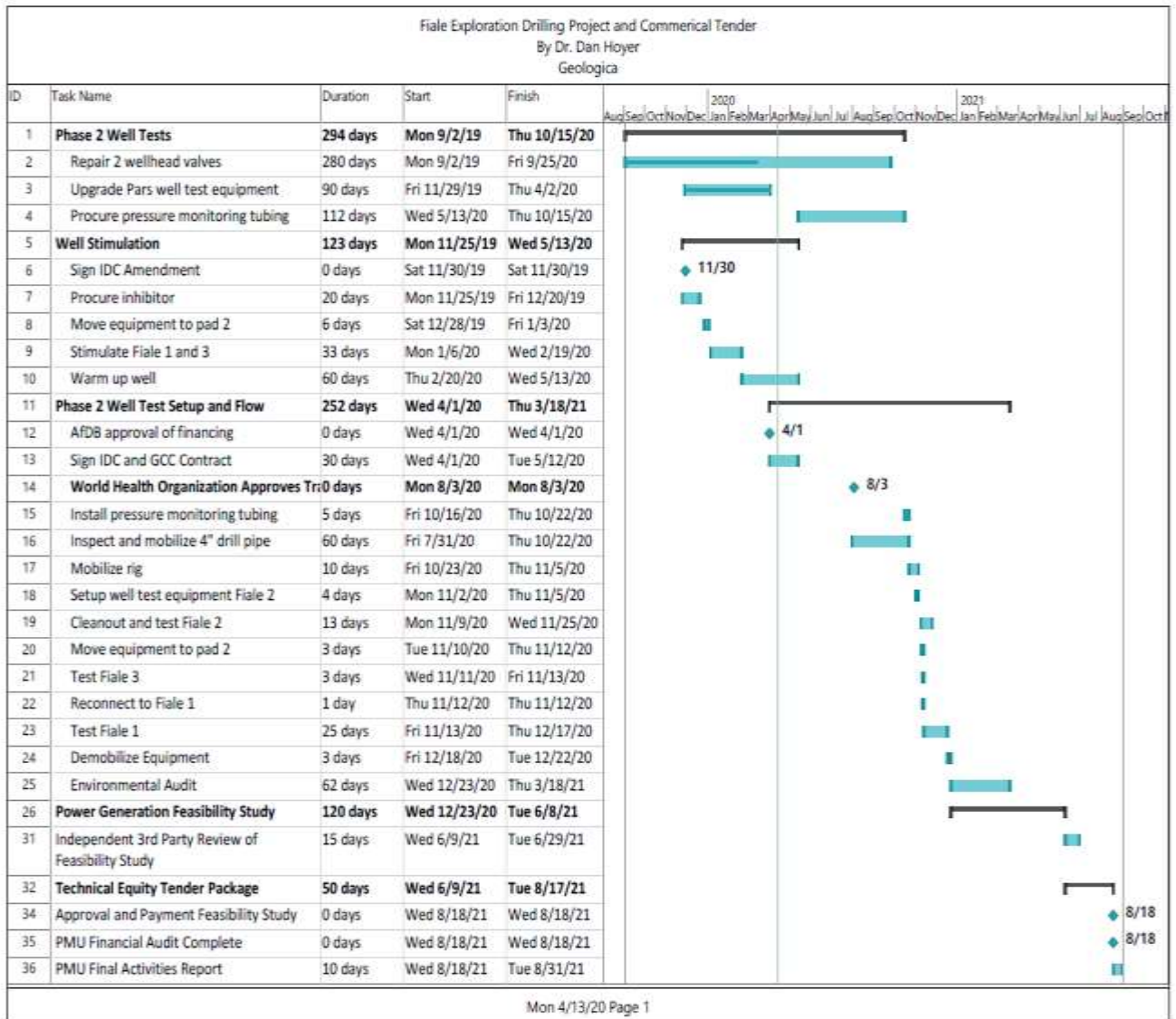


ANNEX 7. Project Implementation

Project Implementation as in the PAD



PROJECT IMPLEMENTATION AS OF APRIL 2020



ANNEX 8. Supporting Documents

- PAD
- ISRs
- Aide-Memoires
- Legal Agreements
- E&S documents
- ICRs of Geothermal IDA financed projects in 1983 and 1989
- Client's Progress Reports