



Rehabilitation of Peligre Transmission Line

(HA-L1100 and HA-G1030)

Project Completion Report (PCR)

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ELECTRONIC LINKS

1. [Development Effectiveness Matrix \(DEM\) Summary](#)
2. Changes to the Results Matrix – not applicable
3. [Final version of the Progress Monitoring Report \(PMR\)](#)
4. [PCR Checklist](#)

OPTIONAL ELECTRONIC LINKS

1. [Cost Effectiveness Analysis](#)
2. [Minutes of the project's Exit Workshop](#)

ACRONYMS AND ABBREVIATIONS

CBA	Cost Benefit Analysis
CEA	Cost Effectiveness Analysis
EA	Executing Agency
EDH	<i>Electricité d'Haïti</i>
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMR	Environmental and Social Management Report
GHG	GreenHouse Gas
GOH	Government of Haiti
IDB	Inter-American Development Bank
INE/ENE	Energy Division of the Infrastructural and Environment Sector
KfW	German <i>Kreditanstalt für Wiederaufbau</i>
kV	kilo Volt
kWh	kilo Watthour
L/T	Transmission Line
M&E	Monitoring and Evaluation
MTPTC	<i>Ministère des Travaux Publics, Transports et Communications</i>
MVA	Mega Volt-Ampere
MWh	Mega Watt-hour
OC	Ordinary Capital
OII	Office of Institutional Integrity
PAP	Port-au-Prince
PCR	Project Completion Report
PPP	Purchasing Power-Parity
QRR	Quality and Risk Review
SPD	Strategic Planning Department
S/S	Sub Station
UCP	<i>Unité de Coordination de Projet</i>
UTP	<i>Unité Technique de Projet</i>

BASIC PROJECT INFORMATION

HA-L1100 Rehabilitation of the Peligre Transmission Line

Country Beneficiary Republic of Haiti	Instrument Investment Grant	Beneficiary Republic of Haiti	Grant(s) 3413/GR-HA	Sector Energy	Sub-Sector Energy Sector Rehabilitation And Efficiency
Date of Board Approval Dec 17, 2014	Date of Eligibility for First Disbursement Dec 09, 2015	Date of Closure (CO) Not Available	Grant Amount - Original 7,700,000.00	Grant Amount - Current Not Available	Pari Passu 0%
Total Project Cost 7,700,000.00	Months In Execution from Approval 72	Months In Execution from First Disbursement 59	Original Date of Final Disbursement Mar 06, 2019	Actual Date of Final Disbursement Dec 30, 2019	Cumulative Extension(Months) 9

HA-L1030 National Supplementary Program for Managing Catchment Areas

Country Beneficiary Republic of Haiti	Instrument Investment Grant	Beneficiary Republic of Haiti	Grant(s) GRT/HR-14830-HA	Sector Energy	Sub-Sector Energy Sector Rehabilitation and Efficiency
Date of Board Approval Dec 17, 2014	Date of Eligibility for First Disbursement Dec 11, 2015	Date of Closure (CO) Aug 15, 2019	Grant Amount - Original 16,000,000.00	Grant Amount - Current 16,000,000.00	Pari Passu 0%
Total Project Cost 16,000,000.00	Months In Execution from Approval 56	Months In Execution from First Disbursement 34	Original Date of Final Disbursement Mar 06, 2019	Actual Date of Final Disbursement Dec 30, 2019	Cumulative Extension(Months) 9

Ratings of project Performance in PMRs



Has This Project Received Funds from another Project? ☐ Yes ☒ No

Has This Project Sent Funds to Another Project? ☐ Yes ☒ No

Development Effectiveness Classification

No	PMR Date	PMR Stage	Classification	Actual Disbursements
1	Apr 28, 2016	Second period Jan-Dec 2015	Satisfactory	0.00
2	Apr 27, 2017	Second period Jan-Dec 2016	Satisfactory	2,843,829.00
3	May 07, 2018	Second period Jan-Dec 2017	Satisfactory	8,671,752.00
4	May 15, 2019	Second period Jan-Dec 2018	Satisfactory	14,499,676.00
5	May 03, 2020	Second period Jan-Dec 2019	Satisfactory	20,327,598.00

(*) According to OP-1072-5 (Progress monitoring report (PMR) - Update to the methodology and validation process, PMR's performance indicators at project level are calculated based on the following parameters: Planned Value (PV), Earned Value (EV), annual Earned Value (EVA), and Actuals (AC). The parameters are used at output level for all project's outputs. The financial information related to the "other costs" is not considered. Operation HA-L1100 and HA-G1030 disbursed a total amount of US\$ 23.7 M; however, this table reflects only the disbursements directly associated to calculated PMR's performance indicators (for a total of US\$ 20.3 M) and does not consider contingencies, administration and evaluation costs (for a total of US\$ 3.4 M).

^Bank Staff



Positions	At PCR No CO Date Available	At Approval Dec 17, 2014
Vice-President VPS	Rodríguez-Ortiz, Ana María	Levy,Santiago
Vice-President VPC	Rosa, Alexandre Meira	Rosa,Alexandre Meira
Country Manager	Zavala Lombardi, Verónica	Aguerre,Jose Agustin (CDH/CDH)
Sector Manager	Aguerre, José Agustín	Roa, Nestor
Division Chief	Yépez-García, Rigoberto Ar	Yepez-Garcia,Rigoberto Ariel (INE/ENE)
Country Rep	Mellinger, Yvon	Aguerre, José Agustín (CDH/CDH)
Project Team Leader	Thys, Pierre Kenol	Thys,Pierre Kenol (ENE/CHA)
PCR Team Leader	Vanegas Rico, Wilkferg	N/A

^HA-L1100

^Staff Time and Cost



Stage Project Cycle	# of Staff Weeks	USD (including Travel and Consultant Costs)
Preparation	10.70	39,978.08
Supervision	230.67	597,544.01
Total	241.38	637,522.09

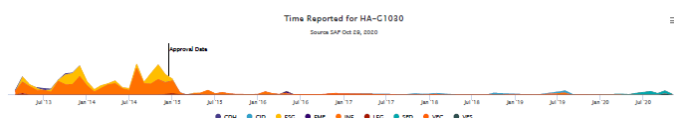
^HA-G1030

^Staff Time and Cost



Stage Project Cycle	# of Staff Weeks	USD (including Travel and Consultant Costs)
Preparation	62.46	424,523.56
Supervision	13.24	64,157.64
Total	75.70	488,681.20

^Time



I. INTRODUCTION

Project Context

- 1.1 Between 2006 and 2016, Haiti's average annual economic growth rate was 2.0%. Significant gains in extreme poverty, enrollment in education, and health indicators were also achieved. By 2014, social and economic indicators for Haiti had improved. However, by 2016 national per capita income was still 30% lower than in 1980 due to a decline in productivity, notably in the agricultural and manufacturing sector. Growth is hampered by poverty and inequality, lack of access to basic services, and an inadequate infrastructure (including energy supply) for economic activities. Inequality notably affects the rural area where 38% live in extreme poverty compared to 12% of the urban population. Of the latter, 70% live in underdeveloped and underserved settlements.
- 1.2 In that macroeconomic context, the Program "Rehabilitation of the Peligre Transmission Line" (HA-L1100 and HA-G1030) was designed to pursue the repair and upgrading of the 115-kV Peligre Transmission Line (L/T) at the end of its technical and useful lifetime. The L/T is the backbone of Haiti's main energy system which connects Haiti's sole hydropower plant at the Peligre Lake to the capital Port-au-Prince (PAP), which is the main electricity demand center in the country. Ensuring a more reliable electricity supply to PAP area will promote economic development for the region and the country.
- 1.3 The Program is part of a broader effort from the Inter-American Development Bank (Bank or IDB, indistinctively) to support Haiti to restore and strengthen the electricity infrastructure serving the Port-au-Prince (PAP) metropolitan area.¹ The IDB involvement with the electricity supply in PAP began with the return of the international community to Haiti in 2004. Bank assistance to the Government of Haiti (GOH) was formalized through the signing of the Interim Cooperation Agreement (ICF) in 2006, followed by the first Country Program (CP) 2007-2011. The Technical Cooperation (TC) HA-T1040 "Support for Port-au-Prince Electrical Distribution Rehabilitation Program" supported the preparation of the investment grant (HA-L1014) for rehabilitation of the distribution network to a total amount of US\$18,250,000 as executing partners (approved 2006). Execution was through the *Ministère de Travaux Publics, Transports, Energie et Communications* (MTPTC) and the national utility *Electricité d'Haïti* (EDH).
- 1.4 Low disbursement rates under operation HA-L1014 and a growing acknowledgement of the actual, poor state of the Sub Station (S/S) and circuits led to a re-assessment of that program.² In response, GOH requested a new TC (HA-T1080, approved 2009) to fund feasibility and engineering studies into solutions, in particular the new Tabarre S/S near the PAP International Airport, identified in 2007 by EDH with United States Trade and Development Agency (USTDA) funding as critical measure to reduce network congestion and subsequent load shedding.

¹ Therefore, it is necessary to mention the other operations in this specific PCR.

² As stated in the HA-L1014 and HA-L1035 operations' PCR, over the course of the initial 24 months of execution of the "Rehabilitation of the Electricity Distribution System in Port-au-Prince" project, priority investments had to be re-assessed as it was when execution began that IDB became better acquainted not just with the real state of disrepair of the substations and circuits but also with the other critical investments that were needed. Rehabilitation of the Ancien Delmas, Martissant and Canape Vert substations identified serious overload and congestion issues. These findings were in line with the conclusions of a 2007 study undertaken for EDH and financed by the United States Trade and Development Agency (USTDA) which identified the urgent need to build a new substation at Tabarre, which became the main investment component under HA-L1035.

Financing for the Tabarre (S/S) from IDB was foreseen through investment grant HA-L1035 (US\$14,000,000).³

- 1.5 Physical damage to the infrastructure provoked by the January 12th, 2010 earthquake led to a change in scope and prioritization of activities. Work on the Tabarre S/S was postponed as the site became a temporary shelter for displaced people and the changes in load shedding in the post-earthquake situation. Flooding of the site was another problem to be factored in, increasing complexity and overall project costs. Of the seven distribution circuits for which studies were completed, only three were eventually rehabilitated given the funds available in view of the extra repair works needed. Meanwhile, the rehabilitation of the three generation groups of the Peligre Hydropower Plant (PHP) itself, approved by IDB in 2008 with additional funding from the German *Kreditanstalt für Wiederaufbau* (KfW) and the OPEC Fund for International Development (OFID), proved technically challenging and more costly than expected. The main works on each generation group were gradually completed in June 2016 (Group 3), February 2018 (Group 2) and June 2018 (Group 1). However, since January 2019, the power plant has not been operating at its full capacity due to a technical malfunction in generation group 2 (January 2019) and in group 3 since April 2020. Due to unrest periods, COVID-19 crisis and disagreements between the GOH and the constructor firm, that repair works only started in October 2020. Group 3 was already repaired and is operating. It is expected that Group 1 will be fully operational by January 2021.
- 1.6 In compliance with the IDB GCI-9, the loans for Haiti were converted into non-reimbursable grants. Subsequent donor coordination to support electricity sector modernization involved IDB, World Bank (WB), the United States Agency for International Development (USAID), European Union, and International Monetary Fund (IMF). The Energy Sector White Paper⁴ performed a diagnostic assessment and proposed a strategy to overcome electricity sector challenges. The IDB, USAID, and WB coordinated their investment plans and in 2011, decided to approve US\$400,000,000 for five years. Alongside HA-L1100 (US\$7,700,000) and HA-G1030 (US\$16,000,000), IDB approved another five operations under CP 2011-2015 for a total amount of US\$120,800,000.⁵
- 1.7 Relevant mentioning is further the approval on October 18th, 2018, of complementary funding to the Program through the operation "Financial Support for the Reinforcement of Transmission Lines and Road Infrastructure Rehabilitation. Third Amendment to Resolution DE-175/10" (Non-Reimbursable Financing GRT/HR-12410-HA) (HA-G1022).⁶ This amendment allowed the use of remaining balances from operation "Program to Support Productive Chains (HA-G1022)" to provide additional resources for the underground section of the Peligre T/L aiming at reducing socioeconomic impacts of the works. These additional resources from HA-G1022 aimed at building a new block of conduits in reserve for future circuits, as an alternative solution to reduce the cost of future expansion and to improve the resilience of the infrastructure using concrete splicing chambers, while reducing the amount of time that the ground trenches remain open in

³ Two S/S and five medium and low-voltage circuits were rehabilitated; 21,000 meters of service lines were installed; one S/S was constructed; 93 km of distribution lines were constructed, and two resource management systems were developed.

⁴ Co-funded by the Bank under HA-T1130 "Towards a Sustainable Energy Sector Haiti - White Paper".

⁵ As such, the Program represents 19.6% of total resources approved by IDB towards the PAP electricity system in the programming period CP 2011-2015.

⁶ Financial Support for the Reinforcement of Transmission Lines and Road Infrastructure Rehabilitation. Third Amendment to Resolution DE-175/10 (Non-Reimbursable Financing GRT/HR-12410-HA) For the Use of the Remaining Balances from Operation HA-G1022 Program to Support Productive Chains (HA-G1022) – Reformulated Non-Reimbursable Financing.

a dense urban setting. The alternative solution was identified at the start of the contract for the rehabilitation works.

- 1.8 The IDB Operation HA-L1100 entered pipeline on August 15th, 2014. Total funding amounts to US\$23,700,000 through operations HA-L1100 (US\$7,700,000 from the IDB's Grant Facility) and the HA-G1030 (US\$16,000,000 from the Haiti Reconstruction Fund). With social and environmental assessments and the technical design studies implemented in the following months, the Program was approved on December 17th, 2014. The socioenvironmental category was determined as "B" and the Risk Level as "Substantial". On February 20th, 2015, the GOH signed the corresponding Grant Agreement 3413/GR-HA, which became eligible on December 9th, 2015. The Executing Agency was the MTPTC with the technical assistance of EDH. A dedicated *Unité de Coordination du Programme* (UCP) that reports to the MTPTC was responsible for the fiduciary and financial aspects of the program; and the *Unité Technique du Projet* (UTP) which reports to EDH was responsible for all technical aspects.⁷

Project Description

Development Objectives.

- 1.9 The 115-kV, 52-km⁸ Peligre L/T runs from the PHP to the main PAP metropolitan area. It is the backbone of Haiti's electricity system, linking the largest power plant (54 MW nominal capacity) to the main demand center in Haiti. The L/T consists of 194 towers⁹ supporting the two, aerial, three-phase circuits. Maximum capacity per circuit is 72 MVA. After over 40 years of operation, the L/T has reached the end of its lifetime. Conductors, insulation, and ground wires, as well as some towers are deteriorated affecting operational availability and reducing technical efficiency (transmission losses are around 4%). Quality of service has also become a concern proper service delivery can no longer be enforced in stretches of the L/T because of dense urbanization¹⁰ in the PAP districts Delmas and Croix-des-Bouquets and Mirebalais.
- 1.10 To establish the best possible conditions for technical and operational sustainability, IDB chose to reduce environmental and social risks by minimizing the need for resettlement of people. An underground cable solution was chosen replacing the overhead L/T over a 10-km distance from tower P152T to the Nouveau Delmas (S/S). The rest of the L/T remains above ground and on its original path, except a detour around Mirebalais. In the area of Morne-à-Cabrit, there is a large, informal limestone quarry. Mining activities have come too close to some towers affecting their stability. Based on a cost analysis, the solution was chosen to reinforce the foundations of these towers rather than by-passing the mine by changing the L/T route.

⁷ The executing structure proposed considering previous experiences from IDB-financed operations in the energy sector in Haiti, such as the need to have a team fully dedicated to technical aspect of the program and another team dedicated to procurement, financial and reporting aspects. This arrangement was designed following on the assessment of EDH and the MTPTC's capacities to conduct IDB funded projects. That assessment was based on the latest management capacity evaluation of UCP/MTPTC and EDG completed in 2011.

⁸ The transmission line size was roughly estimated at 55 km at the time of the grant proposal approval. The estimation got accurate at the time of the operation starts. The result matrix properly shows 42km of above ground cable and 10km of underground cable for a total of 52km.

⁹ Numbers as P1 to P196 (P derived from the French word "pylône"). P152T is a special tower where the aerial L/T goes underground.

¹⁰ That area was rural sparsely populated by 1970 when the Peligre L/T was built but is currently a dense urban area impeding convenient access to the L/T and greatly complicating any maintenance and repair.

Therefore, the general objective of the Program was **to improve the performance of the Peligre T/L and provide reliable supply and secure power**. The specific objectives of the Program were: (i) *to rehabilitate the capacity of the 115-kV transmission line from Peligre to Tabarre/Nouveau Delmas*; (ii) *to reduce transmission losses and power outages*; and (iii) *to minimize environmental and social impacts*.

1.11 Components. The combined Grant Agreement for the program (operations HA-L1100 and HA-G1030) consisted of three components, each pursuing one outcome as follows:

1.12 Component I - subcomponent (a): Investment in the Peligre-Nouveau Delmas Transmission Line, engineering design and construction (US\$21,800,000). This subcomponent included investment to rehabilitate and improve the capacity of the transmission line as follows: (i) above-ground rehabilitation of the capacity of the transmission line (115-kV) from the PHP to the area of tower 152 east of Rivière Grise, with the replacement of aerial conductors, isolators and fittings and replacement of the ground wire for improved communications capacity; and (ii) construction of an underground transmission line, covering a distance of 10-km approximately, from the area of tower 152 to Nouveau Delmas, through the new Tabarre S/S. Specifically, the Peligre transmission line consists in the rehabilitation of two circuits (above ground and underground) with a transfer capacity of 160 MVA for both circuits operating together, thereby allowing up to 80 MW of generation capacity to be transmitted in the event that one of the circuits breaks down or is not operational (n-1 reliability requirement as demanded by EDH).¹¹ Hence, 54 MW is 67.5% of total capacity (80 MW). However, GOH has the expectation to add further RE to feed into the Peligre L/T, eventually reaching 80-MW. As per the ex-ante CBA, this was to be achieved within five years of T/L completion.

1.13 This subcomponent also financed the repair and/or reinforcement of the Morne-à-Cabrit towers as well as light upgrading of associated substations to ensure stable connections.¹² Definition of specifications, parameters and basic requirements, procurement of goods, services and equipment, and construction according to the requirements established in the bidding documents were also financed through this subcomponent, including pre-investment activities during the engineering, construction and repair phases. Figure 1 below represents the current design of the Peligre transmission line at project preparation (100% aerial) from Nouveau Delmas (PAP area) to Peligre (central region). Figure 2 and 3 represent the selected alternative showing the underground section from Nouveau Delmas to the area of tower 152 and then above ground from the above point to Peligre.

¹¹ The n-1 condition is used in power system design, which means that 100% service is maintained if one major system is put out of service. Then max capacity is 80-MW, as one circuit can be cut off with the other circuit still transporting the 80-MW.

¹² S/S works financed under this operation included the required and necessary civil works and electromechanical equipment at the connecting S/S.

PLS-CADD Overlay

Centre

Boucan-Carré

Substation P

38N 37N 43N 44N

P1 P2 P3 P4 P5 P6 P7 P8 P9 P10 P11 P12 P13 P14 P15 P16 P17 P18 P19 P20 P21 P22 P23 P24 P25 P26 P27 P28 P29 P30 P31 P32 P33 P34 P35 P36 P37 P38 P39 P40 P41 P42 P43 P44 P45 P46 P47 P48 P49 P50 P51 P52 P53 P54 P55 P56 P57 P58 P59 P60 P61 P62 P63 P64 P65 P66 P67 P68 P69 P70 P71 P72 P73 P74 P75 P76 P77 P78 P79 P80 P81 P82 P83 P84 P85 P86 P87 P88 P89 P90 P91 P92 P93 P94 P95 P96 P97 P98 P99 P100 P101 P102 P103 P104 P105 P106 P107 P108 P109 P110 P111 P112 P113 P114 P115 P116 P117 P118 P119 P120 P121 P122 P123 P124 P125 P126 P127 P128 P129 P130 P131 P132 P133 P134 P135 P136 P137 P138 P139 P140 P141 P142 P143 P144 P145 P146 P147 P148 P149 P150 P151 P152 P153 P154 P155 P156 P157 P158 P159 P160 P161 P162 P163 P164 P165 P166 P167 P168 P169 P170 P171 P172 P173 P174 P175 P176 P177 P178 P179 P180 P181 P182 P183 P184 P185 P186 P187 P188 P189 P190 P191 P192 P193 P194 P195 P196 P197 P198 P199 P200 P201 P202 P203 P204 P205 P206 P207 P208 P209 P210 P211 P212 P213 P214 P215 P216 P217 P218 P219 P220 P221 P222 P223 P224 P225 P226 P227 P228 P229 P230 P231 P232 P233 P234 P235 P236 P237 P238 P239 P240 P241 P242 P243 P244 P245 P246 P247 P248 P249 P250 P251 P252 P253 P254 P255 P256 P257 P258 P259 P260 P261 P262 P263 P264 P265 P266 P267 P268 P269 P270 P271 P272 P273 P274 P275 P276 P277 P278 P279 P280 P281 P282 P283 P284 P285 P286 P287 P288 P289 P290 P291 P292 P293 P294 P295 P296 P297 P298 P299 P300 P301 P302 P303 P304 P305 P306 P307 P308 P309 P310 P311 P312 P313 P314 P315 P316 P317 P318 P319 P320 P321 P322 P323 P324 P325 P326 P327 P328 P329 P330 P331 P332 P333 P334 P335 P336 P337 P338 P339 P340 P341 P342 P343 P344 P345 P346 P347 P348 P349 P350 P351 P352 P353 P354 P355 P356 P357 P358 P359 P360 P361 P362 P363 P364 P365 P366 P367 P368 P369 P370 P371 P372 P373 P374 P375 P376 P377 P378 P379 P380 P381 P382 P383 P384 P385 P386 P387 P388 P389 P390 P391 P392 P393 P394 P395 P396 P397 P398 P399 P400 P401 P402 P403 P404 P405 P406 P407 P408 P409 P410 P411 P412 P413 P414 P415 P416 P417 P418 P419 P420 P421 P422 P423 P424 P425 P426 P427 P428 P429 P430 P431 P432 P433 P434 P435 P436 P437 P438 P439 P440 P441 P442 P443 P444 P445 P446 P447 P448 P449 P450 P451 P452 P453 P454 P455 P456 P457 P458 P459 P460 P461 P462 P463 P464 P465 P466 P467 P468 P469 P470 P471 P472 P473 P474 P475 P476 P477 P478 P479 P480 P481 P482 P483 P484 P485 P486 P487 P488 P489 P490 P491 P492 P493 P494 P495 P496 P497 P498 P499 P500 P501 P502 P503 P504 P505 P506 P507 P508 P509 P510 P511 P512 P513 P514 P515 P516 P517 P518 P519 P520 P521 P522 P523 P524 P525 P526 P527 P528 P529 P530 P531 P532 P533 P534 P535 P536 P537 P538 P539 P540 P541 P542 P543 P544 P545 P546 P547 P548 P549 P550 P551 P552 P553 P554 P555 P556 P557 P558 P559 P560 P561 P562 P563 P564 P565 P566 P567 P568 P569 P570 P571 P572 P573 P574 P575 P576 P577 P578 P579 P580 P581 P582 P583 P584 P585 P586 P587 P588 P589 P590 P591 P592 P593 P594 P595 P596 P597 P598 P599 P600 P601 P602 P603 P604 P605 P606 P607 P608 P609 P610 P611 P612 P613 P614 P615 P616 P617 P618 P619 P620 P621 P622 P623 P624 P625 P626 P627 P628 P629 P630 P631 P632 P633 P634 P635 P636 P637 P638 P639 P640 P641 P642 P643 P644 P645 P646 P647 P648 P649 P650 P651 P652 P653 P654 P655 P656 P657 P658 P659 P660 P661 P662 P663 P664 P665 P666 P667 P668 P669 P670 P671 P672 P673 P674 P675 P676 P677 P678 P679 P680 P681 P682 P683 P684 P685 P686 P687 P688 P689 P690 P691 P692 P693 P694 P695 P696 P697 P698 P699 P700 P701 P702 P703 P704 P705 P706 P707 P708 P709 P710 P711 P712 P713 P714 P715 P716 P717 P718 P719 P720 P721 P722 P723 P724 P725 P726 P727 P728 P729 P730 P731 P732 P733 P734 P735 P736 P737 P738 P739 P740 P741 P742 P743 P744 P745 P746 P747 P748 P749 P750 P751 P752 P753 P754 P755 P756 P757 P758 P759 P760 P761 P762 P763 P764 P765 P766 P767 P768 P769 P770 P771 P772 P773 P774 P775 P776 P777 P778 P779 P780 P781 P782 P783 P784 P785 P786 P787 P788 P789 P790 P791 P792 P793 P794 P795 P796 P797 P798 P799 P800 P801 P802 P803 P804 P805 P806 P807 P808 P809 P810 P811 P812 P813 P814 P815 P816 P817 P818 P819 P820 P821 P822 P823 P824 P825 P826 P827 P828 P829 P830 P831 P832 P833 P834 P835 P836 P837 P838 P839 P840 P841 P842 P843 P844 P845 P846 P847 P848 P849 P850 P851 P852 P853 P854 P855 P856 P857 P858 P859 P860 P861 P862 P863 P864 P865 P866 P867 P868 P869 P870 P871 P872 P873 P874 P875 P876 P877 P878 P879 P880 P881 P882 P883 P884 P885 P886 P887 P888 P889 P890 P891 P892 P893 P894 P895 P896 P897 P898 P899 P900 P901 P902 P903 P904 P905 P906 P907 P908 P909 P910 P911 P912 P913 P914 P915 P916 P917 P918 P919 P920 P921 P922 P923 P924 P925 P926 P927 P928 P929 P930 P931 P932 P933 P934 P935 P936 P937 P938 P939 P940 P941 P942 P943 P944 P945 P946 P947 P948 P949 P950 P951 P952 P953 P954 P955 P956 P957 P958 P959 P960 P961 P962 P963 P964 P965 P966 P967 P968 P969 P970 P971 P972 P973 P974 P975 P976 P977 P978 P979 P980 P981 P982 P983 P984 P985 P986 P987 P988 P989 P990 P991 P992 P993 P994 P995 P996 P997 P998 P999

Cabaret

Thomazeau

9

chosen only involved the resettlement of 13 households (vs. 383 households if the line was to be rehabilitated 100% above ground).

- 1.15 Supervision, administration and management of the project (US\$1,590,000). The Program financed administration, management, monitoring, evaluation and audit. It also included institutional strengthening of UCP and UTP; contracting of additional personnel for execution; financing for works supervision as well as social and environmental activities in order to minimize risk factors and ensure completion of the Program on time and on budget.

II. CORE CRITERIA

II.1 Relevance

a. Alignment with country development needs

- 2.1 During project design, the electricity sector faced several challenges: (i) weak governance characterized by an insufficient regulatory framework and low operational and technical capacity for policy making and regulation; (ii) an electricity tariff unchanged since August 2009, with an average tariff of about 29 US¢/per Kilowatt hour (kWh) (15 US¢/kWh for a residential consumer with a monthly consumption of 100 kWh and 35 US¢/kWh for an industrial consumer) for 11 hours per day. Service in PAP is not affordable for most consumers in a country with the lowest income per capita in the region, and many consumers simply do not have the capacity to pay or are unwilling to pay these prices for a poor service resulting in the loss of most EDH's large industrial consumers, which prefer to disconnect from the grid and operate with their own power supply; (iii) outdated electricity generation and transmission infrastructure of the Peligre system.¹⁴ This last challenge poses also resulted in low reliability and quality of electricity service, high level of power losses, increased amount of unmet demand, and vulnerability in the PAP. Haiti's Country Development Challenges (CDC) report showed that during project execution and closure, one of the main barriers for Haiti's productivity and business development was energy, as a basic service for households, and insufficient basic infrastructure (specifically transport and energy).
- 2.2 The GOH with support from bilateral and multilateral organizations, set up a series of plans and strategies for territorial, economic, social, and institutional rebuilding and development. Those initiatives seek to address critical aspect that challenges Haiti's socioeconomic development such as reliable and affordable access to electricity. In the Action Plan for the National Recovery and Development of Haiti of March 2010, the GoH established that reconstruction of the electricity sector should be part of an overall development national plan to make it: (i) efficient and financially viable; (ii) operate as an open, transparent market; (iii) increase energy transmission capacity; (iv) promote renewable energy; and (v) attract sufficient capital to meet the rising demand while providing affordable, high-quality electricity service. Accordingly, the following general areas of action have been identified for the sector's recovery: (i) complete short-term repair work in order to ensure a minimum of service to the population; (ii) increase the supply of electricity services and respond to development needs, while improving the management of EDH so it can achieve financial balance; and (iii) update the electricity sector's legal and regulatory framework.

¹⁴ By 2014, the Peligre T/L that transport the electricity of the PHP to the PAP area, was technically obsolete after 40 years of operation, affecting supply reliability and high transmission losses (around 4% of transported energy).

- 2.3 The rehabilitation of the Peligre T/L was aligned with the needs and actions proposed by the GOH since it will: (i) promote the increase in supply of electricity to customers in the PAP; (ii) increase the reliability of the L/T system and reduce electricity losses; and (iii) secure supply of hydro energy from PHP to avoid more costly thermal power from imported fossil fuel.
- 2.4 Moreover, the operation sought to address the following needs: (i) invest in the rehabilitation of the Peligre T/L from Peligre to Nouveau Delmas; (ii) continue with the effort to reduce power outages and losses; and (iii) mitigate environmental and social impacts that will be triggered by the rehabilitation works.

b. Strategic alignment

- 2.5 The IDB's Country Strategy 2011-2015 (document GN-2646) is the first post-earthquake strategy approved under the Ninth General Increase in the Resources of the IDB (IDB-9). The IDB-9 mandate converted investment loans into grants and committed upscaling of grant operations to an unprecedented amount of US\$2.2 billion in ten years. The CS 2011-2015 continued to focus on the sectors in which the Bank had been active before the earthquake. One of its pillars was "improving conditions for supply of goods and services and basic infrastructure, including the electricity sector".
- 2.6 The CS 2011-2015 allocated a total of US\$1,271,000 to six priority sectors: water and sanitation; education; transportation; energy; and private sector development. Energy represented 9% (US\$122,000,000) of the budget; about 60% was aimed at improving electric service coverage and quality in the PAP and the remainder in three Policy-Based Grant (PBG) operations to modernize the sector and enhance the efficiency of EDH.
- 2.7 The CS 2011-2015 formulated the following strategic objectives for the energy sector: (i) modernizing the sector and enhancing the efficiency and transparency of EDH; (ii) improving electricity service coverage and quality in Port-au-Prince; and (iii) expanding electricity and energy coverage in rural areas. Targets were: (1) electricity coverage increase from 40% to 70%, (2) technical/commercial losses reduction of EDH from 60% (2010) to 30% (2015); 200 MW RE generation installed at PHP. In 2014 an update of the CS was made: (1) the coverage indicator was eliminated; (2) the technical/ commercial loss reduction target was reduced to 45% (2015); and (3) the generation target was lowered to 54 MW equivalent to the original nominal capacity of the PHP. Since the current Program was designed towards the end of the CS 2011-2015, this may explain why impact indicators and targets were not explicitly provided.

At the time of closure, the Program was consistent with the IDB Group Country Strategy (CS) with Haiti 2017 - 2021 (GN-2904). Concretely it supports the technical dialogue in the energy on infrastructure investments to provide more reliable and quality services of electricity.

- 2.8 The Program was aligned with the Bank's Updated Institutional Strategy 2010-2020 (UIS) (AB-3008) fostering productivity, innovation by providing infrastructure for the safe and stable provision of energy. It is instrumental for the cross-cutting areas climate change and environmental sustainability, and it contributes to the Corporate Results Framework (CRF) 2016-2019 (GN 2727-10) by reducing greenhouse gas emissions. The Program is aligned with

the Energy Sector Framework (GN-2830-8) and is responsive to the IDB's Integrated Strategy for Mitigation and Adaptation to Climate Change and Sustainable Energy, as well as the Strategy for Sustainable Infrastructure for Competitiveness and Inclusive Growth (GN-2710-5).

c. Relevance of design

Vertical logic.

- 2.9 The general objective was to improve the performance of the Peligre T/L and provide reliable supply and secure power. The specific objectives of the Program were the following: (i) rehabilitation of the capacity for the 115-kV T/L from Peligre to Tabarre/Nouveau Delmas; specific objective; (ii) reduction of transmission losses and power outages; and (iii) minimizing environmental and social impacts.
- 2.10 Specific objective (i) is reliant on the achievement of one outcome indicator: the maximum transmission capacity from Peligre to Port-au-Prince. The outputs associated with this outcome are: (a) 115-kV T/L cable rehabilitated above ground; and (b) 115-kV transmission line cable rehabilitated underground.
- 2.11 Specific objective (ii) is a standard objective for distribution energy projects, and in this case it is related to two outcomes indicators: (a) Total power losses corresponding to the transmitted energy on the Peligre T/L; and (b) Total power outages on the Peligre T/L corresponding to the domestic electricity market. As shown in Figure 3, the objectives (i) and (ii) share the same outputs.
- 2.12 Specific objective (iii) is related to one outcome indicator: people resettled in conformity with Resettlement Plan, which could be achieved through the output of houses relocated or affected by the Project.
- 2.13 The Program's rationale was to increase electricity supply at the S/S Nouveau Delmas because of the superior technical properties of the upgraded installation (i.e. reduced losses). It was assumed that the electricity would be available from the rehabilitated PHP, which was expected to become fully operational prior to completion of the L/T. The envisioned reduction of power outages is attributable to the enhanced infrastructure including a Supervisory Control and Data Acquisition system (SCADA), improved staff operations, factors external to the Program, or a combination of these.
- 2.14 Rehabilitation of electricity grid infrastructure is a typical and common long-term investment to ensure a properly functioning and reliable electricity service. The effectiveness of this approach has been demonstrated, for example, by the Bank in Ecuador (EC-L1070, "Transmission Support Program"), showing an average economic return on investment of 26.5% over 40-year lifetime obtained from reduced losses and avoided power cuts. The technical lifetime and performance of the transmission infrastructure directly relate to the objectives (i) and (ii).
- 2.15 Specific objective (iii) responds to the principles of the Bank's Involuntary Resettlement Policy (OP-710) specifically: (i) to minimize people affected in their social and economic continuity

affecting livelihood; and (ii) to minimize delays, cost overruns or repercussions on the project itself affecting its impact and sustainability. Given Haiti's context of frequent social unrest and blockades, the design for the T/L was chosen to minimize the number of people to be relocated (ESMR, 2014). This option entailed the replacement of the aerial line by an underground cable in the 9.6-km section towards S/S Nouveau Delmas.

- 2.16 During the execution of the program two large contracts were awarded through international competitive bidding processes: one for the construction works and one for the supervision. The winning offer for the construction works amounted to US\$ 17,200,000 million¹⁵; it was signed on August 18th, 2016 and became eligible on November 7th, 2016. The supervision contract amounted to US\$1,500,000.¹⁶ The contract was signed on February 23rd, 2016 and became eligible on July 5th, 2016. The contract experienced delays totaling 11 months. The contract became eligible with a three-months delay since presidential elections were taking place. Works began 3 months in late due to negotiations and approval process regarding modifications in the underground section agreed between the Bank and the firm. Over a 1-month delay was caused by periods of unrest in Haiti, including a demobilization of personnel in February 2019. 4 months are attributable to the constructor and EDH: The firm left the country for 1-month during the holidays season at the end of 2018, 1-month delay in the shipment of equipment for the underground sections, and 2-months delay since the firm proposed a new subcontractor to perform some of the works activities. This subcontractor was not considered in approved proposal; therefore, EDH took this time to review the request before approving it.
- 2.17 The contract with the construction firm was amended six (6) times: two times for extending the execution period, three times for accommodating an increase in contract price; and once for including an additional funding source from the IDB.
- 2.18 The Amendment #1 occurred in October 2017 (almost one year after activity starts) to reflect the modifications in the technical solution for the underground section proposed by the firm and accepted by the Bank in order to reduce the socioeconomic impacts of the project and reduce the time and costs associated to the future O&M of the T/L. The total contract sum was increased by US\$5,422,110.38. The required funds were paid by operation HA-G1022 (3413/FR-HA) as described in previous sections.
- 2.19 Amendment #2 (October 2018) extended the execution period until December 15th, 2018, to address execution delays resulted from the modification of the underground section. Amendment #3 (US\$1,816,717.37) was signed in December 2018 to: (i) extend the execution period for the underground works until May 7th, 2019; to address delays in the shipment of equipment for the underground sections; and (ii) execute a mandatory clause for price revision in contracts with a duration of over 18 months and manage claims made by the contract partners. In addition, some changes to the scope of work were made, involving towers P6 and P152T and the disassembly of the L/T section between P152T and the S/S Nouveau Delmas (which is replaced by the underground cable).
- 2.20 In March 2019, Amendment #4 was made to incorporate the operation HA-L1038 (2684/GR-HA) as an additional funding source but did not imply an increase in the amount of the contract. Amendment #5 was signed on May 8th, 2019 defining the contract expiration on June 7th, 2019.

¹⁵ The offer was presented in two currencies: US\$7,584,547.02 plus €8,356,829.14.

¹⁶ The services were quoted in three currencies: €789,800.00 plus US\$607,600.00 plus HTG 846,000.

This amendment mainly addressed delays caused by insecurity and unrest periods in Haiti during the first quarter of 2019. Finally, Amendment #6 (€127,524,91) was agreed for a second settlement of prices and claims and fixed the final project date on September 7th, 2019. As a result of the amendments, the final cost of the contract increased to US\$24,500,000, which means a 43% increase in the amount of the contract; however, if it is considered that the modifications in the underground solution were agreed between the parties to reduce socioeconomic impacts of the project and facilitate the O&M of the T/L, project's over costs related to the contraction work can be considered to be around 10% (US\$1.9 Million).

- 2.21 The contract for the supervision of works contract originally covering two years of supervision of works plus one additional year during the guarantee period. Due to the modification in the technical scope of works, the total duration of the contract was used for the supervision of works until the end of the contract implying that the supervision had to keep the whole team during the three-year contract period. This situation had an impact in the total amount of the contract, which was increased from to US\$1,500,000 to US\$1,600,000 (6% increase). The supervision firm demobilized by mid-August 2019, when the T/L works had a completion progress of 98.4%. EDH carried out the last supervision activities of the constructors including a training program for EDH staff, installation of the communication system and the commissioning of the T/L. The technical supervision of works were performed successfully as the T/L was completed following all the technical specifications; however, better actions could have been taken by the supervision firm to prevent delay associated to the constructor firm, such as verifying in advance subcontracts made by the constructor, following-up on the delivery of imported equipment, among others. Issuance of the contract for reconstruction of the houses (objective iii) was delayed due to adjustments in the identified beneficiaries and resulting scope of work and budget. The contract (CP/T-12410-07-20) was assigned to local firm COMASA by EDH in August 2020¹⁷, covering 10 houses¹⁸. As a temporary solution, the affected people are temporarily relocated to rental homes, the rents being paid from the operation. Once the new homes are delivered (expectedly end 2020), the beneficiaries will take possession of these. This contract is currently being financed under the operation HA-G1022.

¹⁷ The 10 houses are being built on a land newly acquired by EDH funded by the operation. Before the construction could start, EDH must find the appropriate land for the resettlement of the houses' beneficiaries. This step of the entire process last for about 18 months as land titling in Haiti is a national and well-known issue. When the land was identified, Haiti went through several lockdowns due to insecurity in 2019 and the pandemic in early 2020.

¹⁸ The Resettlement Plan defined that houses should be built for PAPs assessed as particularly vulnerable and with a risk of mismanagement in case of financial compensations.

Figure 3. Vertical Logic

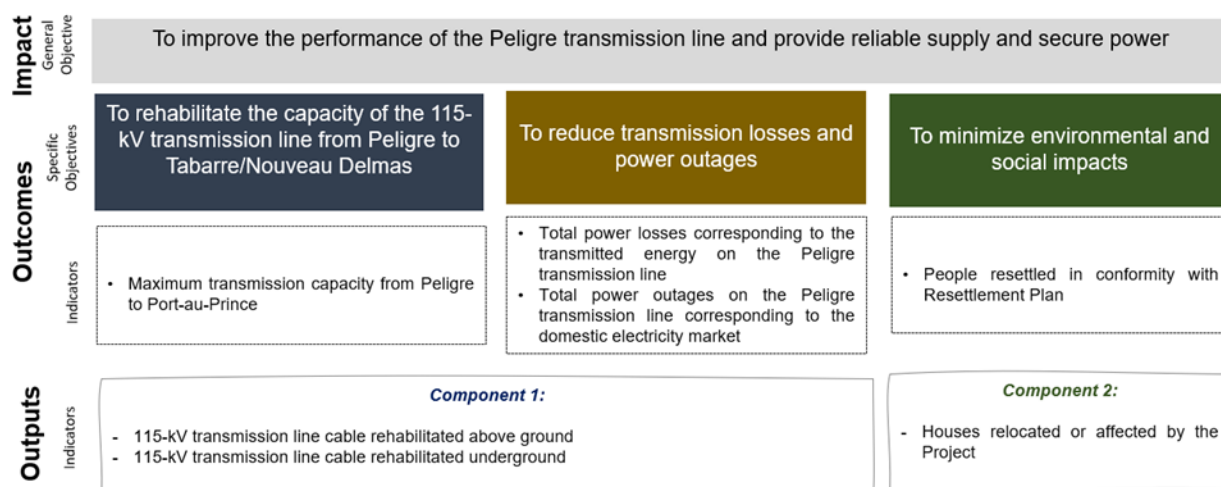


Table 1. Results Matrix

Indicator	At Approval			At Startup Plan			At Project closure (PCR)			Comments
	Unit of measure	Baseline	EOP (P)	Unit of measure	Baseline	EOP (P)	Unit of measure	Baseline	EOP (P)	
Specific Objective 1: To rehabilitate the capacity of the 115-kV transmission line from Peligre to Tabarre/Nouveau Delmas										
Maximum transmission capacity from Peligre to Port-au-Prince	MVA	40	160	MVA	40	160	MVA	40	160	
Specific Objective 2: To reduce transmission losses and power outages										
Total power losses corresponding to the transmitted energy on the Peligre transmission line	%	4	3	%	4	3	%	4	3	
Total power outages on the Peligre transmission line corresponding to the domestic electricity market	outages / yr	12	6	outages / yr	12	6	outages / yr	12	6	
Specific Objective 3: To minimize environmental and social impacts										
People resettled in conformity with Resettlement Plan	%	0	100	%	0	100	%	0	100	

2.22 The Program was aligned with the country development needs at the time of approval, during the execution, and at the time of the Program closure. By the same token, from the beginning until the closure, the program aligned with two different Country Strategies for Haiti: (i) 2011-2015 through GN-2646; and (ii) 2017-2021 through GN-2904. With regards to the vertical logic, there was a clear connection between the outputs and the outcomes, and from

those with the specific objectives. Therefore, the PCR team considers a score of **Excellent** for Relevance Rating.

II.2 Effectiveness

2.23 Based on the available verified information that is presented below, it is concluded that more than 50% of the project objectives were fully achieved and are attributable to the operation. Hence, the PCR rates effectiveness as **Satisfactory**.

a) Statement of project development objectives.

2.24 As mentioned before, the general objective of the Program was to improve the performance of the Peligre T/L and provide reliable supply and secure power. The effectiveness assessment comprises an analysis of the three specific objectives.

b) Results achieved.

2.25 The results of the program and accomplishment of the results matrix are described in this section (Table 2), detailing the activities undertaken and the degree of completion of the indicators defined in the results matrix.

2.26 There are four outcomes, which remained unchanged since approval. Three indicators were fully achieved (100%) and one was partially achieved (70%). At the output level, five (5) indicators were defined; their achievement is presented in Table 2 (Table of Outputs). Two output indicators were fully met (100%), one nearly met (96%), one partially (71%) and one not achieved (0%).¹⁹

Table 2. Results Achieved Matrix

Specific Outcome/ Indicator	Unit of measure	Baseline	Baseline year	Targets and actual achievement		% Achieved	Means of verification
Specific Objective 1: To rehabilitate the capacity of the 115-kV transmission line from Peligre to Tabarre/Nouveau Delmas							
1.1 Maximum transmission capacity from Peligre to PAP	MVA	40	2015	P	160	100%	Acceptance reports; L/T operational data; EDH final report
				P(a)	160		
				A	160		
Specific Objective 2: To reduce transmission losses and power outages							
2.1 Total power losses corresponding to the transmitted	%	4	2015	P	3	100%	Acceptance reports; L/T operational data; EDH final report; Internal calculation
				P(a)	3		

¹⁹ At the time of the Operation Design, it was assessed that 13 families should be compensated through new houses. At the beginning of the rehabilitation, a new design option (detailed in section "Development Objectives") was chosen to reduce social impact and resettlement and as a result, only 10 houses needed to be built. The 10 houses are being built on a land newly acquired by EDH funded by the operation. Before the construction could start, EDH must find the appropriate land for the resettlement of the houses' beneficiaries. This step of the entire process last for about 18 months as land titling in Haiti is a national and well-known issue. When the land was identified, Haiti went through several lockdowns due to insecurity in 2019 and the pandemic early 2020.

Specific Outcome/ Indicator	Unit of measure	Baseline	Baseline year	Targets and actual achievement		% Achieved	Means of verification
energy on the Peligre transmission line				A	3		
2.2 Total power outages on the Peligre transmission line corresponding to the domestic electricity market	Outages/ year	12	2015	P	6	100%	EDH Reports
				P(a)	6		
				A	0		
Specific Objective 3: To minimize environmental and social impacts							
3.1 People resettled in conformity with Resettlement Plan	%	0	2015	P	100	70%	EDH Reports
				P(a)	100		
				A	70 ²⁰		

Output	Unit of measure	Baseline	Baseline year	Targets and actual achievement		% Achieved	Means of verification
Component 1- Subcomponent (a) Investment in Peligre-Nouveau Delmas transmission line -engineering design and construction (Specific Objectives 1 and 2)							
1.1 115-kV transmission line cable rehabilitated above ground	km	0	2015	P	42	100%	Work progress reports and final acceptance of the work (EDH).
				P(a)	42		
				A	42		
1.2 115-kV transmission line cable rehabilitated underground	km	0	2015	P	10	96%	Work progress reports and final acceptance of the work (EDH).
				P(a)	10		
				A	9.6 ²¹		
Component I -Subcomponent (b) Resettlement and social-related impact management (Specific Objective 3)							
2.1 Houses relocated or affected by the Project.	# Households	0	2015	P	13	0%	Resettlement Action Plan. Monitoring report.
				P(a)	13		
				A	0 ²²		
Supervision, administration and management							
3.1 Annual Supervision Plan	# report	0	2015	P	4	100%	EDH Reports
				P(a)	4		
				A	4		
3.2 Bi-monthly Progress Report	# report	0	2015	P	21	71%	Work progress reports and final acceptance of the work (EDH)
				P(a)	21		
				A	15 ²³		

²⁰ This outcome has an achieved percentage of 70 because as part of the Resettlement Plan, the affected families are being compensated either through financial compensation or the construction of equivalent houses. The compensation process is being finalized (60% paid) and the houses are under construction (20% progress), with the planning of completing the entire Resettlement Plan by end of 2020.

²¹ As the time of the project concept, the underground section estimation was based on Google Maps. That section was estimated at 10km. The final and length is 9.6 km, which was specified at the time of the construction.

²² At the time of the Operation D. design, it was assessed that 13 families (vs. 383 households if the line was to be rehabilitated 100% above ground) should be compensated through new houses. At the beginning of the rehabilitation, a new design option (detailed in section "Development Objectives") was chosen to reduce social impact and resettlement. Only 10 houses needed to be built. The 10 houses are being built on a land newly acquired by EDH funded by the operation. Before the construction could start, EDH must find the appropriate land for the resettlement of the houses' beneficiaries. This step of the entire process last for about 18 months as land titling in Haiti is a national and well-known issue. When the land was identified, Haiti went through several lockdowns due to insecurity in 2019 and the pandemic in early 2020.

²³ The contract period covered 18 bi-monthly reports of works. The results matrix was not updated accordingly. In February 2019, the works were suspended due to periods of unrest in the country. After construction works started back again, the

- 2.27 The general objective was to improve the performance of the Peligre T/L and provide reliable supply and secure power. The specific objectives of the Program were as follows: specific objective (i): to rehabilitate the capacity of the 115-kV T/L from Peligre to Tabarre/Nouveau Delmas; specific objective (ii): to reduce transmission losses and power outages; and specific objective (iii): to minimize environmental and social impacts.
- 2.28 Specific objective (i) -to rehabilitate the capacity of the 115-kV transmission line from Peligre to Tabarre/Nouveau Delmas- is reliant on the achievement of one outcome indicator: the maximum transmission capacity from Peligre to Port-au-Prince.
- 2.29 Specific objective (ii) - To reduce transmission losses and power outages- is a standard objective for distribution energy projects, and in this case it is related to two outcomes indicators: (a) Total power losses corresponding to the transmitted energy on the Peligre transmission line, and b) Total power outages on the Peligre transmission line corresponding to the domestic electricity market.
- 2.30 Specific objectives (i) and (ii), as shown in Figure 3, share the same outputs: (a) 115-kV transmission line cable rehabilitated above ground; and (b) 115-kV transmission line cable rehabilitated underground.
- 2.31 The Contractor implemented all requested systems, and the project was formally accepted by EDH on October 22nd, 2019. The L/T was supplying electricity as evidenced by an IDB site visit to the power line S/S Nouveau Delmas, although at partial capacity as power generation by the PHP is not yet fully operational. Based on the information provided in the final evaluation submitted by the Executing Agency and the infrastructure and acceptance statements, it is concluded that the rehabilitated L/T meets the target for outcome 1.1. Hence it is concluded that the Operation successfully achieved the specific objectives (i) and (ii). The achievement of the outcomes of the operation fully depends on the accomplishment of the outputs.
- 2.32 Specific objective (iii)- To minimize environmental and social impacts. There was one outcome associated with this objective “People resettled in conformity with Resettlement Plan”. In this case the baseline was zero and the achievement was 70%, falling short from the goal of 100%.
- 2.33 The people to be considered as affected by the project (PAPs) were assessed following IDB safeguards policies. The number of PAP during the implementation phase of the Resettlement Plan (RP) and the number identified during the pre-identification phase decreased due to: (i) slight adjustments of underground T/L section localization and changes in the implementation method of the works on the area where above ground cable presented less crops affected than estimated, and (ii) the adaptation of the methodology deployed for the trenches earthwork of the underground line which shortened the duration of works in the area, minimizing the impacts on economic activities. These adjustments decreased the number of PAPs from more than nine hundred people to one hundred. 90% of the identified PAPs get financially compensated while the other 10% get resettled with the objective to provide them with a new and equivalent house. In the meantime, the beneficiaries receive a semestrial compensation as temporary housing

firm did not submit reports on a bi-monthly basis during the last six months of its contract. However, the firm submitted monthly reports of technical coordination meetings.

solution. The houses are not fully built at the time of the PCR due to delays at the beginning in identifying and purchasing the land, and later in contracting the construction firm.

- 2.34 Regarding health and safety risks, several actions were planned in the construction plan, the Environmental and Social Management Plan (ESMP) and the Health and Safety (HS) plan. Health and safety issues were addressed by implementing specific measures during the whole duration of the works on site, such as: regular meetings organized by the contractor with its employees and sub-contractors, on site signalers surrounding works areas, on site daily safety meetings held by the safety managers about specific measures, warnings, safety reminders, etc., and on site information meetings with the surrounding communities on work progress. Those plans helped execute the works without any major accidents.

c) Counterfactual analysis.

- 2.35 Other IDB operations addressing integral network rehabilitation have demonstrated a reduction of electricity losses resulting from this kind of projects such as: (i) Guyana (GY-L1037, "Sustainable Operation of the Electricity Sector and Improved Quality of Service") in which 46% losses reduction in low-voltage networks was obtained; and (ii) Dominican Republic (DR-L1026, "Electricity Distribution Network Rehabilitation Project") where rehabilitation of transmission and distribution lines contributed to a decrease in the percentage of losses (between 3% and 7%).
- 2.36 The rehabilitation of the Peligre T/L contributed to a significant reduction of technical losses and the number of power outages because of the successful electric circuit upgrade of the Peligre Transmission Line related to this project. In areas that became urbanized in the recent decades the L/T was relocated (around Mirebalais) or replaced by an underground cable (Croix-de-Bouquets to Nouveau Delmas).
- 2.37 Transmission system reliability is measured in terms of the transmission system availability (net of several planned line outages and unplanned line outages) and the transmission line losses when it is available for operation.^{24, 25} Thus, improvements in the transmission system will increase the load serving capability from generation to delivery.
- 2.38 Each L/T has a maximum it can safely take. It is considered congested when it has reached its maximum; and if it passes its maximum capacity it is considered overloaded and a threat to system stability. According to Hunt (2002) a main factor that affects a transmission system reliability is the adequate investment in L/T.²⁶
- 2.39 Therefore, by rehabilitating the 40-year old L/T cable, the project directly contributed to at least three of the outcomes achievement: Maximum transmission capacity from Peligre to Port-au-Prince, Total power losses corresponding to the transmitted energy on the Peligre transmission line and Total power outages on the Peligre transmission line corresponding to the domestic electricity market.

²⁴ Mazer, A. (2007). Electric Power Planning for Regulated and Deregulated Markets, IEEE Press, John Wiley & Sons, US.

²⁵ Harris, C. (2006). Electricity Markets: Pricing, Structures and Economics, John Wiles & Sons Ltd, England.

²⁶ Hunt, S. (2002). Making Competition Work in Electricity, Annex F: Building New Transmission: Where, When and How, John Wiles & Sons Ltd, New-Jersey, US.

d) Unanticipated outcomes.

2.40 The L/T rehabilitation contributes to reduce and prevent greenhouse gas (GHG) emission as it allows the electricity generated by the PHP to be evacuated to PAP area. Peligre T/L will also allow to transport additional electricity from other cleaner and cheaper sources such as solar and natural gas, as it is currently planned by the GOH. As reported in the ex-ante CBA, the total hydro-based electricity made available by the L/T amounts to approximately 76,500 MWh per year. At an indicative power sector CO₂-intensity of 0.8 tCO₂/MWh, annual GHG emission reductions will be around 60,000 tCO₂eq. It is also expected that the T/L will have positive results related to financial sustainability of EDH since it: (i) reduces the costs associate to O&M; (ii) allows producing and transporting cheaper electricity from hydro energy and potentially solar and natural gas; and (iii) reduces the amount of unserved electricity due to power outage and O&M.

II.3 Efficiency

2.41 During the design phase, the Program presented an ex-ante Cost-Benefit Analysis (CBA) for the Peligre Transmission Line. Table 3. presents the results of the analysis.

Table 3. HA-L1100 and HA-G1030 Cost- Benefit Analysis (Ex-Ante)

Concept		NPV (US\$) Ex-Ante
BENEFITS	(1) Reduced transmission losses	6,275,327
	(2) Reduced power outages	3,646,860
	(3) Eliminated risk of major failure	7,894,949
	(4) Commercialized additional energy capacity	47,787,108
	Subtotal	65,594,244
COSTS	(1) Capital costs (CAPEX)	26,773,632
	(2) Operational costs (OPEX)	65,161
	Subtotal	26,838,793
PROJECT VALUE	NPV (@12%)	38,765,451

2.42 At the end of the Program's execution, there was not enough information available to replicate the CBA with an ex-post analysis using the corresponding data and baseline.²⁷ Therefore, the Cost Effectiveness Analysis (CEA) was focused on specific objective (i) which is reliant on the achievement of one outcome indicator: the maximum transmission capacity from Peligre to PAP and its related outputs. Project total costs are presented in Table 4.

²⁷ There were two main constraints; first, there is no available data from 2016-2019, especially regarding the assumptions made in the ex-ante CBA, which included power production, number of unplanned outages, duration of outages, power flow, and major failures related data. Secondly, the electricity source is not yet working at full capacity, because the rehabilitation is still in process; thus, they have not reached the amount of electricity expected.

Table 4. Costs of the Project

1 Investment in Péligre-Nouveau Delmas transmission line -engineering design and construction

Component Revised Cost

19,682,241.45

Outputs			2015	2016	2017	2018	2019	Cost
1.1	115-kV transmission line cable rehabilitated above ground	P	0	934,888	1,869,777	1,869,777	1,869,777	6,544,219
		P(a)	0	934,888	3,143,856.72	2,600,777	552,416.72	7,340,996.49
		A	0	2,118,427.16	1,200,000	3,470,152.61	872,798.38	7,661,378.15
1.2	115-kV transmission line cable rehabilitated underground	P	0	1,618,077	3,236,154	3,236,154	3,236,154	11,326,539
		P(a)	0	1,618,077	4,444,029	4,255,375.48	1,412,906.49	12,341,244.96
		A	0	3,666,510.52	1,600,000	5,661,827.95	1,701,922.81	12,630,261.28

2 Resettlement and social-related impact management

Component Revised Cost

716,347.70

Outputs			2015	2016	2017	2018	2019	Cost
2.1	Houses relocated or affected by the Project	P	0	0	288,271	288,271	288,270	864,812
		P(a)	0	0	348,874	532,271	45,355.55	716,347.70
		A	0	42,311.45	240,000	388,680.70	3,000	673,992.15

Other Costs			2015	2016	2017	2018	2019	Cost
Contingencies		P	0	0	1,124,134	1,124,134	1,124,134	3,372,402
		P(a)	0	0	1,524,377.18	1,400,134	0	800,000
		A	0	0	800,000	0	0	800,000

i Total Costs include inactive outputs

Total			2015	2016	2017	2018	2019	Cost
Total cost		P	0	2,843,829	6,952,057	6,952,058	6,952,056	23,700,000
		P(a)	0	2,843,829	10,246,407.90	9,354,564.48	3,189,838.55	23,700,000
		A	0	6,294,290.15	4,170,000	10,045,871.30	3,197,920.05	23,708,081.50

Similar programs

2.43 In projects related to L/T it is very important to consider the lines voltage level, and if the system is either above ground or underground. Considering that HA-L1100 included L/T of 115 kV, a comparable L/T are, preferably, within a range of 100- 138 kV.

2.44 For the L/T above ground we identified two similar programs: (1) one in Kenya, included in the project “Scaling Up power transmission investment in Africa”, funded by the World Bank; and (2) a transmission system in Ecuador, financed by its government. Table 5 presents a summary of the programs and the key aspects considered to assert they are comparable to HA-L1100.

Table 5. Key information from similar Programs (above ground TL)

Project	Specific Objective	Related Outputs	VA	Measure Unit	Length
P152573- Africa- Kenya	Rehabilitation of the Nyahururu-Maralaland associated substation in Kenya (2016)	132kV Line and 1No.7.5MVA Substation at Marcial	132 kV	Km	148 Km
Ecuador	Rehabilitation of the transmission system of Concordia – Pedernales (2019)	Transmission System Concordia - Pedernales	138 kV	Km	80 Km

2.45 For the transmission lines underground, we identified one similar program in Peru, which consisted in a 220-kV transmission line in La Planicie-Industriales as part of Haiti’s Investment Plan 2013-2017. Table 6 presents the key information of this program.

Table 6. Key information from similar Programs (underground TL)

Project	Specific Objective	Related Outputs	VA	Unit of Measure	Length
Peru- Transmission Line La Planicie-Industriales and Associated Substations	To meet the expected growth in demand in this area in a timely manner and under adequate quality conditions (2017)	Transmission Line La Planicie-Industriales	220 kV	Km	4.9 Km

Unit cost comparison.

2.46 The comparative analysis of the unitary costs is presented in Table 7. Given that costs were already expressed in nominal US dollars for the comparison projects, to make costs comparable for the two outputs (above ground and underground L/T) with respect to each of the alternatives, we first deflate the prices using the Consumer Price Index of the United States for 2016. We also adjust by the Purchasing Power-Parity (PPP) and then we discounted our costs and calculated the Net Present Value in 2019 using a discount rate of 12%.

Table 7. Cost- Efficiency Ratios

Country	Project	Transmission line	Cost-efficiency ratio (US\$2019 unitary cost adjusted by PPP)	Cost of HA-L1100 (alternative)	Conclusions
Above ground					The unitary cost for this product lies below the magnitude of what it has been paid in similar Programs from other countries
Haiti	HA-L1100	115-kV transmission line cable rehabilitated above ground	388,235.0		
Kenya	P152573. Nyahururu-Maralaland associated substation	132kV Line and 1No.7.5MVA Substation at Marcial	468,929.61	83%	
Ecuador	Pedernales 138 kV	Pedernales 138 kV	1,017,376.79	38%	
Underground					The unitary cost for this product lies below the magnitude of what it has been paid in similar Programs from other countries
Haiti	HA-L1100	115-kV transmission line cable rehabilitated underground	3,764,072.7		
Peru	La Planicie – Industriales y Subestaciones asociadas	220-kV transmission line	15,899,249.4	24%	

2.47 As shown in Table 7, HA-L1100 unitary costs at 2019 adjusted by PPP were lower than the alternatives. In the above ground projects, the unitary cost of a transmission line cable per kilometer in Haiti (US\$388,235.0) was 83% the unitary cost of the project in Kenya, and 38% of the cost in Ecuador. Also, in the underground transmission lines, the project represented 24% the unitary cost of the project in Peru. Given that there are no additional factors that reduce efficiency, we can assert that the project was more cost-efficient than the alternatives from the point of view of unitary costs. Therefore, the PCR score for the Efficiency section is Excellent.

Additional Analysis.

2.48 An additional comparison was made by using the information from Levy (2020)²⁸ about 260 projects of transmission lines (above ground) in various ranks of geography and voltage levels, including Asia Pacific, Europe, Latin America, North America, and Africa. We applied the same methodology for projects with voltages within a 110-138 kV rank, only without the adjustment for PPP because the costs provided are the average of multiple countries.

²⁸ Levy (2020). *El Estado del Arte en Transmisión y Distribución*. IDB. This document summarizes the state of the art in activities and transmission equipment around the world, including trends in towers, conductors and cables, insulators, power transformers, breakers, and reactors. Where possible, the document details the information for LAC. The document is based on the Global Electricity Transmission Equipment Market Report, 2018-2027, prepared by Global Transmission Research and published in December 2018.

Table 8. Cost-Efficiency Ratio, comparing with referential cost Levy (2020)

Country	Project	Transmission line	Cost-efficiency ratio (US\$ 2019)
Above ground			
Haiti	HA-L1100	115-kV transmission line cable rehabilitated above ground	\$162,440.1
Levy (2020)	110/115/132/138 kV	min	\$125,086.7
		max	\$229,325.7
		Average	\$177,206.2

As shown in Table 8, HA-L1100 unitary cost was lower than the comparison projects; thus, it was more cost-efficient than the average of the projects included in Levy (2020).

II.4 Sustainability

2.49 The overall sustainability rate of the operation is Satisfactory (3). This rate is established based on the following factors and as it is explained in more detail in the sections to follow: (i) low Operation and Maintenance (O&M) requirements for the T/L; (ii) technical capacities of the team at EDH; and (iii) EDH's knowledge and experience to address socioenvironmental aspects, despite the fact that there are activities still to be performed according to the Compensations and Resettlement Plan.

a. General Sustainability Aspects.

2.50 Operation and maintenance (O&M) costs of the Peligre transmission line are assumed by EDH and are expected to be significantly lower given the increase in its efficiency and reliability deriving from the upgrade of the L/T. Annual O&M costs are expected to be less than US\$ 100,000/year. According to the supervision firm's final report and the final evaluation submitted by EDH, the L/T follows all technical specifications and standards agreed as part of the contract between GOH and the constructor firm. However, the L/T has not been operated at nominal capacity yet, given that the PHP operates at partial capacity. Hence there is a low risk that hidden defects may only become evident once the system is operated under full load. It will be important that EDH supervises the operation of the L/T regularly in order to detect possible malfunctioning as the PHP starts gradually entering into full capacity operation between November 2020 and January 2021 and, report any anomalies to the constructor firm before the expiration of the warranty period in February 2022.

2.51 Outcomes 2.1 and 2.2 relate to the technical performance of the investment, as its merits will only prosper if the Peligre power system is adequately operated. Long-term sustainability of the results shall be guaranteed through effective operation involving adequate procedures, skilled operators, and financial resources. As mentioned during the closing workshop of the operation, EDH has a technical team in charge of the O&M of High-Voltage L/T which was trained by the constructor firm; however, there is not a specific O&M plan or alternative equipment such as drones for aerial inspection to supervise the physical status of the power line. IDB requested the preparation and approval of an O&M plan by EDH. That plan will be the basis for EDH to properly operate and maintain the T/L, and for the IDB to follow-up on two special maintenance

and operation clauses considered in the Grant Proposal: At the request of the Bank and up to five years after the last disbursement date: (1) provide evidence that EDH is performing an adequate maintenance and operation of the facilities financed by the Program and that EDH has allocated adequate resources to that effect; and (2) present, to the Bank, maintenance reports on the condition of the works and goods financed by the Bank.

Environmental and Social Safeguards.

- 2.52 The project was classified as category B according to the Bank's safeguards policies, since the potential environmental and social impacts resulting from its implementation are localized and short-term, and for which there are effective mitigation measures. The applicable policies are OP-703, OP-704 and OP-710. The overall environmental and social risk rating at Program approval was "substantial".
- 2.53 In compliance with IDB's safeguards policies, an Environmental Analysis and an Environmental and Social Management Report were prepared during the design of the operation. These documents defined the mitigation measures to monitor negative impacts and promote positive impacts associated to the program. Additionally, a detailed assessment of people and livelihoods to be potentially affected by the construction and operation of the L/T was performed in 2014²⁹. Due to changes in the T/L layout and underground solution (mainly the detour around Mirebalais), a Final Compensation and Resettlement Plan was delivered by mid-2018, after the start of works. The plan included the construction of new houses for the relocated families.
- 2.54 The underground cable was pulled through modular High-density Polyethylene (HDPE) tube sections with junction chambers instead of open channels, which significantly reduced nuisance and economic losses for neighbouring people and businesses and avoided large scale permanent physical resettlement. A significant effort was made through technical revisions and site visits by EDH, the constructor and supervisor, to secure civil works (tower foundations, base plates and river crossing) against the effects of surface water and local soil instabilities. Anti-erosion measures including restoration of the vegetation cover were considered.
- 2.55 The environmental and social supervision of the works financed by the program was carried out by a specialist provided by UCP/EDH. The Supervisor and ESG missions found that labor safety and topsoil management guidelines were not always adhered to, notably when the constructor had no staffs on site and works were done by local subcontractors. While some improvement was made over time, it shows that awareness raising, and compliance enforcement needed continuous supervision by the Executing Agency.
- 2.56 Since there are ongoing activities in execution according to the Compensation and Resettlement Plan, as stated in previous sections, the Bank, through the ESG unit and the technical team, will continue supervising the implementation of the Compensation and Resettlement Plan under the operation HA-G1022.

²⁹ Reference AECOM.

III. NON-CORE CRITERIA

III.1 Bank Performance

- 3.1 The Bank's performance has been rated as **Satisfactory** (S) considering the following aspects: (i) close collaboration between the Executing Agency and the Bank during the execution of the program; (ii) Bank support to the Executing Agency through the hiring of consultancies to support technical and socioenvironmental aspects; (iii) support in the review of major contracts and payments before no-objection; (iv) regular participation in site visits; (v) facilitating meetings to settle disputes and other points of disagreement between the Executing Agency and the firms; and (vi) support in the identification of solutions to facilitate the application of IDB's safeguards policies.

III.2 Beneficiary Performance

- 3.2 The Executing Agency showed good knowledge of IDB policies and procedures for socioenvironmental and fiduciary aspects. However, some weaknesses were observed on: (i) adequate follow-up of contracts that resulted; (ii) systematic communication mechanisms with the firms for resolution of conflicts and expedite project execution; and (iii) mechanisms for reporting project progress and project execution status. In spite of UCP and EDH's capacity gaps in planning management and risk mitigation, the L/T was successfully implemented with EDH engineers playing an active role to guide the process, providing local terrain knowledge, initiate contacts with rural villagers and peri-urban communities, and further adding value by reviewing technical solutions, in particular related to the construction and consolidation of the towers at Mirebalais and Morne-à-Cabrit. While slow, EDH involvement proved effective to steer the process and achieve amicable agreements in a country context characterized by social conflict and sometimes hostility towards foreign organizations. (2) Mobilization of terrain knowledge as input for fine-tuning of technical solutions, specifically foundations of towers near Mirebalais and Morne-à-Cabrit. (3) Direct engagement with population to communicate the purpose of the works, respond to inquiries and manage expectations, in particular vis-a-vis contracting of unskilled labor. (4) EDH participated in in-factory inspections in several EU countries for equipment acceptance prior to shipping. Given the limited capacities as assessed under the baseline, and the effective delivery of the Operation's targets, the Beneficiary's performance is rated as **Satisfactory** (S).

IV. FINDINGS AND RECOMMENDATIONS

4.1 Dimension 1 to 5

Findings	Recommendations
1. Technical-Sectorial Dimension	
Finding #1. Differences between Bank safeguard policies and national legislation and practices, led to substantial delay to consolidate the list of affected people and agree upon compensation type and level.	Recommendation #1. A lesson learnt is that gaps between Bank's safeguard policies and local legislation concerning compensation of affected people should be identified during Project design. If required, the Executing Entity should receive training on Bank policies. It is recommended that the Bank follows up closely in case an Executing Entity has no previous experience with Bank operations. Additionally, the institution in charge of implementing compensation process in Haiti reports to the MEF and not to the Executing Agency. Coordination with the MEF at an early stage of execution and during the preparation of any socioenvironmental plans is highly recommended to avoid risks of delay later in the execution.
Finding #2. Mechanisms for monitoring and evaluation were not implemented according to the Monitoring and Evaluation (M&E) plan. This situation prevented the AE to identify potential delays in contracts execution, adjust results matrix targets accordingly and collect data for the preparation of the final evaluation and ex post Cost Benefit Analysis.	Recommendation #2. Hiring a monitoring and evaluation specialist as part of the executing agency team to ensure the proper implementation of monitoring and evaluation mechanism as per the M&E plan,
2. Organizational and Managerial Dimension	
Finding #3. Delays during project execution demonstrated the need for enforcement of the special execution condition to have terrain tenure and right of path secure prior to starting the works.	Recommendation #3. It is recommended to ensure that conditions are in place to effectively start construction activities according to planning.
Finding #4. Changes in staffing were made by the Supervisor without notifying the Executing Agency. These changes could have resulted in projects delays and potentially affected quality of the work.	Recommendation #4. To prevent such practices in future operations a control mechanism is recommended to verify that staffing is as proposed by the supplier and individuals confirm their availability. Specific clauses may be formulated to be included in the respective contracts to mitigate this risk, while procedures for checking of staffing can be laid out in the Project Operations Manual.
Finding #5. Constant contract's amendments for deadlines extension. Despite that most of delays are attributable to changes in design of the underground section, insecurity and presidential elections, other causes related to subcontracting of firms not considered within the contract and shipment of equipment, could have been prevented with better contract management by the supervision firm and the executing agency.	Recommendation #5. To prevent delays associated to subcontracting of works and procurement of materials and equipment, it is recommended to include in the monthly technical and coordination meetings, follow-up actions on contract conditions for subcontracting and the procedures and status of materials and equipment procurement. This will help to identify potential delay risks and contract's deviations, as well as their mitigation measures accordingly. If these risks would have been identified in advance but not mitigated, their related contract's amendments could have been considered as part of one of other amendments regarding delays from external factors or modification in the scope of the contract. That would have reduced the total number of amendments.
Finding #6. Contract management was a point of concern under this operation as the Bank team faced difficulties to have updated information about the status of each contract at any time.	Recommendation #6. Close monitoring is therefore recommended to enable continuous, detailed analysis contract status and key activities, monitor and control the available budget. Monitoring shall include the assessment of eventual price revisions allowed under contract terms, both requested by the supplier and resulting from exchange rate changes. The impact of modifications on the work scope and total throughput time shall be duly acknowledged and quantified, enabling proactive planning and control of the overall process.
	Recommendation #7. A lesson learned is that contracts with suppliers should be revised and amended as soon as changes occur in the stipulated activities. This allows for early identification of potential budget shortages and assist in contract supervision and termination.

3. Public Processes and Actors Dimension	
Finding #7. Project execution made evident the legitimate demand by local communities to participate in the construction work, specifically unskilled labor for civil works.	Recommendation #8. It is recommended to devise a mechanism allowing local laborers to generate income and improving acceptance of the works, but without compromising quality and contractor liabilities.
4: Fiduciary Dimension	
Finding #8. The operation proved that a neutral environment contributes to settle disagreements between the Executing Entity and the contractors in a more amicable and expedite manner, notably related to cost level disputes, payment schedule and pending activities for satisfactory contract termination.	Recommendation #9. The Bank can play a role by facilitating such space, which can be considered a good practice.