

Validation Report
September 2021

The Islamic Republic of Pakistan: Renewable Energy Development Sector Investment Program

Reference Number: PVR-799
Program Number: 34339-013
Loan Numbers: 2286 and 2287
MFF Number: 0005



Raising development impact through evaluation

ABBREVIATIONS

ADB	–	Asian Development Bank
AEDB	–	Alternative Energy Development Board
CO ₂	–	carbon dioxide
DMF	–	design and monitoring framework
EIRR	–	economic internal rate of return
FIRR	–	financial internal rate of return
GWh	–	gigawatt-hour
IED	–	Independent Evaluation Department
IEE	–	initial environmental examination
KPK	–	Khyber Pakhtunkhwa
LRMC	–	long-run marginal cost
MFF	–	multitranches financing facility
MW	–	megawatt
NEPRA	–	National Electric Power Regulatory Authority
O&M	–	operation and maintenance
PAM	–	project administration manual
PCR	–	program completion report
PEDO	–	Pakhtunkhwa Energy Development Organization
PPA	–	power purchase agreement
PPDCL	–	Punjab Power Development Company Limited
RRP	–	report and recommendation of the President
SERF	–	shadow exchange rate factor
TA	–	technical assistance
WACC	–	weighted average cost of capital
WTP	–	willingness-to-pay

NOTE

In this report, “\$” refers to United States dollars.

Director General	Marvin Taylor-Dormond, Independent Evaluation Department (IED)
Deputy Director General	Sona Shrestha, IED
Director	Nathan Subramaniam, Sector and Project Division (IESP)
Team Leader	Sherine Ibrahim, Principal Evaluation Specialist, IESP

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PROGRAM BASIC DATA

Program number	34339-013	PCR circulation date	12 Jan 2021	
Loan and MFF numbers	2286, 2287, and 0005	PCR validation date	Sep 2021	
Program name	Renewable Energy Development Sector Investment Program			
Sector and subsectors	Energy	Energy sector development and institutional reform Renewable energy generation – small hydro		
Strategic agendas	Environment sustainable growth Inclusive economic growth			
Safeguard categories	Environment		B	
	Involuntary resettlement		B	
	Indigenous peoples		B	
Country	The Islamic Republic of Pakistan		Approved (\$ million)	Actual (\$ million)
ADB financing^a (\$ million)	ADF: 10.00	Total program costs	145.00	144.7
	OCR: 105.00	Loan		
		2286	105.00	109.73
	2287	10.00	3.00	
	Borrower	30.00	31.96	
Approval Date 0005 2286/2287	01 Dec 2006 13 Dec 2006	Effectiveness date	03 Jan 2008	29 Nov 2007
Signing Date	05 Oct 2007	Program completion date Financial closing 0005 2286/2287	30 Jun 2012 – –	30 Jun 2018 31 Dec 2017 07 Jun 2018
Program Officers	L. Tianhu E. Khattak	Location ADB headquarters PRM	From Nov 2007 Jan 2015	To Jan 2015 Jun 2018
IED review Director Team Leader	N. Subramaniam, IESP S. Ibrahim, Principal Evaluation Specialist, IESP ^b			

– = no approved financial closing date, ADB = Asian Development Bank, ADF = Asian Development Fund, IED = Independent Evaluation Department, IESP = Sector and Project Division, MFF = multitranches financing facility, OCR = ordinary capital resources, PCR = program completion report, PRM = Pakistan Resident Mission.

^a ADB initially approved a total of \$510 million for the whole MFF.

^b Team members: H. Hettige (quality reviewer), F. De Guzman (senior evaluation officer), W. Zhou and P. Selvam (consultants).

I. PROGRAM DESCRIPTION

A. Rationale

1. Despite its rich endowment of renewable resources and a net oil importer mainly for electricity generation, Pakistan faced a 20% power shortage. Only 55% of its population had access to electricity from the national grid while the rest used kerosene, fuelwood, and other biofuels for lighting, cooking, and heating. It had one of the lowest per capita energy consumptions in the world. Recognizing the pressing need to address energy security and expand supply, the government set out an energy roadmap over the medium to long-term. An increase from 19.5 gigawatts in 2006 to 162.6 gigawatts in 2030 was needed to meet the increasing demand.

This capacity requires financing of \$150 billion for Pakistan's power sector. The government delegated the authority to provinces to generate capacities of up to 50 megawatts (MW) and to emphasize renewable energy targeted as 3.5% of the total energy supply mix by 2015 and 6% by 2030. In the \$150 billion power sector investment plan, physical investments for renewable energy were projected to reach \$13.9 billion by 2030, of which \$2.2 billion were expected by 2015.

2. In response to the government's request, the Asian Development Bank (ADB) approved a multitranche financing facility (MFF) for the Renewable Energy Development Sector Investment Program in Pakistan (the program).¹ It was designed to provide 23.2% of the \$2.2 billion financing plan aimed at contributing to strategic objectives of energy diversity and security, environmental sustainability, universal electrification, poverty reduction, and social equity. It combined investments in new generation across provinces in several subsectors and nonphysical interventions in capacity development and policy reform. The design was to deliver the MFF program, with tranche 1 focusing on small hydropower investments in two provinces, and tranches 2 and 3 expanding to cover more provinces and a broader range of renewable energy resources and technologies. Tranche 1 had significant delays and tranches 2 and 3 were cancelled, reducing the program to a de facto stand-alone loan.

3. Tranche 1 was approved with the program for \$115 million focusing on physical investments in eight small hydropower subprojects in Khyber Pakhtunkhwa (KPK, formerly the north-west frontier) and Punjab, feasibility studies and due diligence for eight new renewable energy subprojects, and capacity development. The government as the borrower, made the loan proceeds available to the provinces on the same terms and conditions, as applicable.

B. Expected Impact, Outcome, and Outputs

4. According to the design and monitoring framework (DMF), the program's expected impact was inclusive economic growth and reduction in carbon dioxide (CO₂) emissions. The program's intended outcome was increased production and use of clean energy through financially sustainable renewable energy sources. Its planned outputs had three components. First, the construction of small to medium-size hydropower stations and other sources of renewable energy units. Second, preparation of feasibility studies and other due diligence work on new renewable energy schemes. Third, the introduction of a capacity development program at federal, provincial, and project levels. Tranche 1's expected impact and intended outcome was fully aligned with that of the program, with its planned outputs focusing on KPK and Punjab.

C. Provision of Inputs

5. The program was approved in December 2006 and was available until December 2017. Tranche 1's loan and project agreements were signed in October 2007 and became effective in November 2007. The 10-month delay in signing agreements was due to the need to obtain the Planning Commission's approval, whose internal procedures required additional time. Tranche 1, scheduled to complete in June 2012, was completed in June 2018. The loan closing date was extended four times to December 2017. These extensions (April 2012, June 2014, June 2016, and May 2017) covered implementation delays caused by issues on project design, readiness, procurement, contractors' performance, government's internal approval procedures, and unforeseeable external development. The whole program financially closed in June 2018.

¹ ADB. 2006. *Report and Recommendation of the President to the Board of Directors: Proposed Multitranche Financing Facility and Technical Assistance Grant to Islamic Republic of Pakistan for the Renewable Energy Development Sector Investment Program*. Manila.

6. At appraisal, the total cost of the MFF investment program was \$2.2 billion, with 23.2% from ADB, 40.9% from the private sector, 18.2% from other financiers, and 17.7% from the government. Tranche 1's total cost was \$145 million equivalent, with an ADB loan covering 80% and the government financing the balance. The ADB loans consisted of \$105 million equivalent and \$10 million equivalent. At completion, tranche 1's actual total cost (and of the MFF program) was \$144.7 million, with 77.9% from ADB and the balance from the government.

7. As planned, the program implementation consultants for the physical component were engaged using quality- and cost-based selection procedure, with a quality–cost ratio of 80:20. For nonphysical components, the program engaged a consulting firm for capacity building activities and an individual consultant for clean development mechanism work. Turnkey contracts were procured using international competitive bidding and a single-stage, two-envelope bidding procedure. The contracts were awarded between December 2010 and January 2014. The delays were caused by low-quality detailed design, bidding documents, and technical bid evaluation reports, as well as the insufficiency of funds due to the depreciation of the Japanese yen.

8. The program and tranche 1 were classified as category B for environment, involuntary resettlement, and indigenous peoples. The program and tranche 1 were categorized as "no gender elements" and therefore did not involve any gender action plan.

D. Implementation Arrangements

9. As planned, the Alternative Energy Development Board (AEDB) was the executing agency at the federal level, and the Irrigation and Power Departments of the governments of KPK and Punjab were the executing agencies at the provincial level. Pakhtunkhwa Energy Development Organization (PEDO) was the implementing agency for KPK while Punjab Power Development Company Limited (PPDCL) was the implementing agency for Punjab. Two project management units were established under PEDO and PPDCL for day-to-day program implementation. Each was headed by a project director, reporting directly to the respective executing agency's manager.

10. The executing agencies complied with 87 out of the 89 covenants. The two covenants with partial compliance pertained to delayed submission of audited accounts and financial statements. A technical assistance (TA) was attached to the MFF program to formulate the medium-term renewable energy policy and strengthen AEDB's institutional capacity for implementation. The TA of \$800,000 was funded by ADB's TA Special Funds resources that was implemented from March 2007 to December 2008. Its completion report indicated that it was successful having delivered the draft medium-term renewable policy and providing timely and demand-driven capacity development assistance.²

II. EVALUATION OF PERFORMANCE AND RATINGS

A. Relevance of Design and Formulation

11. The program completion report (PCR) rated the program relevant. At appraisal, during implementation, and at completion, the program and its intended outcome were aligned with the government's policies, strategies, and development priorities. The energy sector development strategy in the Medium-Term Development Framework for 2005–2010 set the objectives of increasing the use of hydropower, optimizing the use of indigenous resources to reduce

² ADB. 2009. *Technical Assistance Completion Report. Pakistan: Renewable Energy Policy Formulation and Capacity Development of the Alternative Energy Development Board*. Manila.

dependence on imported fuel, creating an environment conducive to private sector investment, among other things.³ As stated in the Alternative and Renewable Energy Policy 2011, the government aimed to achieve at least 5% of total commercial energy supplies through alternative and renewable energy by 2030.⁴ The National Power Policy 2013 articulated a set of measures with ambitious objectives of increasing power generation, reducing transmission losses, improving financial performance, and decreasing the overall cost of power generation. Building hydropower capacity was among the priorities for medium to long-term.⁵ The prioritization of hydropower development was reemphasized in the Power Generation Policy 2015, which aimed to incentivize private sector and public–private partnership projects.⁶ Pakistan's Intended Nationally Determined Contribution submitted for the 2015 Paris Agreement stated the overarching target of reducing Pakistan's 2030 projected greenhouse gas emissions by 20%, through a range of policies and measures, including promoting renewable energy development.⁷

12. The program was fully aligned with ADB's strategies and policies at appraisal and remained so during its implementation through completion. Promoting renewable energy and energy efficiency was one of the three pillars emphasized in ADB's Energy Policy 2009.⁸ Similarly, expanding the use of clean energy sources was an integral part of the core operations in infrastructure and environment under ADB's Strategy 2020.⁹ Increasing renewable energy capacity was identified as one of the sub-pillars supporting climate change mitigation, which was a strategic priority in tackling climate change, building climate and disaster resilience, and enhancing environmental sustainability under ADB's Strategy 2030.¹⁰ At the country level, one of the focal areas defined in ADB's Country Partnership Strategy 2009–2013 for Pakistan was investment and reforms in energy and infrastructure, where ADB was to extend financing and advice for the government's hydropower schemes and other renewable energy development.¹¹ This program was among the ongoing MFF operations highlighted in the assistance pipeline. In its Country Partnership Strategy 2015–2019 for Pakistan, investments to increase the supply of renewable energy was a priority among ADB's areas of intervention in the energy sector.¹²

13. The program was designed to be delivered in three tranches. Tranche 1 experienced significant delays. The PCR listed 17 specific delays, which can be generally attributed to five areas. First, design and readiness issues, such as delayed preparation and approval of model studies of program components and ground water conditions, additional dewatering, and land acquisition requirements due to geological conditions at Marala subproject. Second, procurement issues, like not taking advance action on recruiting consultants and additional time required for government's approval. Third, contractors' performance issues, such as insufficient financial and human resources of the sole contractor for all four subprojects in Punjab province and the contractors' weak performance for Deg Outfall and Chianwali subprojects. Fourth, government's internal approval procedures, like longer-than-expected approval by the Planning Commission and delays in tariff determination by the National Electric Power Regulatory Authority (NEPRA).

³ Government of Pakistan, Planning Commission. 2005. *Medium Term Development Framework, 2005–2010*. Islamabad.

⁴ Government of Pakistan. 2011. *Alternative and Renewable Energy Policy*. Islamabad.

⁵ Government of Pakistan. 2013. *National Power Policy*. Islamabad.

⁶ Government of Pakistan. 2015. *Power Generation Policy*. Islamabad.

⁷ United Nations Framework Convention on Climate Change. 2015. *Pakistan's Intended Nationally Determined Contribution*. <http://www4.unfccc.int/ndcregistry/PublishedDocuments/Pakistan%20First/Pak-INDC.pdf>.

⁸ ADB. 2009. *Energy Policy*. Manila.

⁹ ADB. 2008. *Strategy 2020: Working for an Asia and Pacific Free of Poverty*. Manila.

¹⁰ ADB. 2018. *Strategy 2030: Achieving a Prosperous, Inclusive, Resilient, and Sustainable Asia and the Pacific*. Manila.

¹¹ ADB. 2009. *Country Partnership Strategy: Pakistan, 2009–2013*. Manila.

¹² ADB. 2015. *Country Partnership Strategy: Pakistan, 2015–2019*. Manila.

Fifth, unforeseeable external developments, such as remedial actions for sudden settlement of the spillway of Deg Outfall subproject, security concerns at the Ranolia subproject site, road rehabilitation works, complications in the construction of the feeder channel at Chianwali subproject, among other things. Excluding unforeseeable external developments, other delays reveal inadequate due diligence, deficient project design, and incomplete risk assessment, which affected the delivery of targeted outputs and intended program outcomes in a material manner.

14. Tranche 2 involved a \$200 million guarantee facility set up to mobilize long-term commercial debt for wind and other renewable energy projects by encouraging project sponsors to seek debt financing from export credit agencies.¹³ This guarantee facility was not mentioned in the report and recommendation of the President (RRP), but ADB's MFF annual report 2010 mentioned it was the first case under an MFF in ADB's operations.¹⁴ It required a minor change in scope for the program, which was approved in December 2010. According to the PCR, the government did not use it and it lapsed in December 2013, and subsequently tranche 2 was cancelled. The PCR did not provide further details. It is unclear whether this guarantee facility was approved based on adequate consultation and interest by the government, or whether this was an unforeseeable external development, or whether it was related to tranche 1 implementation delays. The PCR briefly indicated that tranche 3, which was to cover two small hydropower plants, was cancelled in 2015 due to insufficient time to complete the construction within the MFF period. It did not elaborate on the significant reduction in the scope of tranche 3, which, as described in the RRP's investment and financing plans, was intended to cover hydropower as well as wind, solar, biogas, and biomass subprojects across various provinces.

15. Given that tranche 1 was significantly delayed, the subsequent two tranches were cancelled, the program was discontinued, and the available MFF financing amount was significantly underutilized, collectively questioning the appropriateness of MFF modality in this context. The RRP was relatively light on the rationale for using MFF. There was no comparison of the MFF with other modalities. Implementation issues showed that MFF was not necessarily the appropriate modality for this program. Taking this program as an example, ADB's policy paper on mainstreaming the MFF in 2008 pointed out that approaches, based on multiple agencies were not necessarily conducive to fast implementation and due diligence work should have focused more on capacity issues.¹⁵ One of the key factors of MFF design, as identified in the Independent Evaluation Department's (IED) real-time evaluation study of MFF in 2012, was that the level of implementation complexity arising from a project involving multiple executing and implementing agencies can be managed.¹⁶ Similarly, the MFF annual report 2017, based on a review of this program and other five programs that faced challenges in completing their scope before the end of their MFF periods, highlighted the risk of optimistic assumption of the capacity of implementing agencies.¹⁷ In IED's sector assistance program evaluation on Pakistan's energy sector, the use of MFF for this program was considered a design flaw, as a result of a broad scope, a wide range of subprojects, and multiple executing and implementing agencies, all of which increased program complexity, made progress difficult and led to cancellations.¹⁸ IED's evaluation on MFF's performance and results over the 2005–2018 period observed the impact of the MFFs' complexity, ambitious targets, and involvement of multiple agencies on completing programs within the 10-

¹³ ADB. 2012. *Real-Time Evaluation Study of the Multitranchise Financing Facility*. Manila

¹⁴ ADB. 2011. *Multitranchise Financing Facility Annual Report 2010*. Manila

¹⁵ ADB. 2008. *Mainstreaming the Multitranchise Financing Facility*. Manila.

¹⁶ ADB (IED). 2012. *Real-Time Evaluation Study of the Multitranchise Financing Facility*. Manila.

¹⁷ ADB. 2018. *Multitranchise Financing Facility Annual Report 2017*. Manila.

¹⁸ ADB (IED). 2019. *Sector Assistance Program Evaluation. Pakistan: ADB's Support to Pakistan Energy Sector (2005–2017)*. Manila.

year MFF time limit.¹⁹ The PCR made an explicit statement that “the MFF modality was not the best approach since separate physical investment projects (tranches) could have been financed more effectively through a project-based loan that included reform actions”.

16. The program's DMF was logical and had sound links of outcome and outputs leading up to the development impacts. However, some outcome and output targets appeared to be ambitious, such as annual incremental power generation of 1,700 gigawatt-hours (GWh) in 2017 and the share of renewable energy in total power generation reaching 3.5% in 2015. The DMF in the PCR differed substantially from the one in the project administration manual (PAM) in 2014. The PAM included a facility DMF and that for tranche 1.²⁰ The DMF in the PCR was substantially reduced without differentiating the facility and tranche 1. There was only one indicator for the share of renewable energy. The other two indicators (increased gross energy output and financial performance of implementing agencies), were removed. The new generation capacity and annual incremental power generation were 44 MW and 272 GWh in the PCR's DMF, but these were 75 MW and 394 GWh in tranche 1's DMF. The PCR was vague on this and appeared to be contradictory as it indicated that the DMF targets were revised (PCR, para. 52), but also commented that ADB could have considered DMF improvement during implementation (PCR, para. 59). Despite a clarification from the PCR team, this validation is unclear whether the DMF in the PCR was a revised version with approval and why it differed substantially from the DMF in the PAM.²¹

17. Despite aligning with the government's and ADB's strategies, the program was closed with tranche 1 significantly delayed, tranches 2 and 3 cancelled, and its financing significantly underutilized. It deviated from its original design and intended purpose, and effectively became a stand-alone loan project. The use of MFF was not adequately justified at appraisal and found to be less than appropriate during implementation. This validation assesses the program less than relevant.

B. Effectiveness in Achieving Program Outcomes and Outputs

18. The PCR rated the program less than effective. The materials available for this validation did not contain records of approved changes in the DMF, although paragraph 52 of the PCR indicated that the DMF targets were revised and redefined. This validation assesses the effectiveness based on the PCR's DMF.

19. The program's intended outcome was partially achieved. In 2015, the share of renewable energy generation in the total generation was 1.35%, below the 1.5% target. The physical outputs were partially delivered. Of the planned eight hydropower plants, Daral Khwar (36.6 MW) in KPK and Okara (4.16 MW) in Punjab were removed due to insufficient funds resulting from depreciation of Japanese yen against the United States dollar. Of the remaining six plants, two in Punjab were under construction at program completion. Deg Outfall (4.04 MW) experienced a sudden settlement of the spillway causing the structure to be rebuilt. Chianwali (5.38 MW) was

¹⁹ ADB (IED). 2019. *ADB's Multitranchise Financing Facility, 2005–2018: Performance and Results Delivered*. Manila.

²⁰ ADB. 2014. *Project Administration Manual of MFF0005-PAK: Renewable Energy Development Sector Investment Program – Tranche 1*. Manila.

²¹ Based on the clarification provided by the PCR team on 5 July 2021, the original DMF was revised in July 2011. However, attachment 3 of the provided copy of the memorandum dated 26 July 2011, which was regarding the revised DMF, was missing. Therefore, it is not possible to ascertain the full consistency between the revised DMF dated July 2011 and the one presented in the PCR. If the two versions were the same, it then raises the question of why the DMF in the 2014 PAM was not updated in accordance with the DMF revised and approved in 2011. As noted by the PCR team, the project was delegated to PRM in January 2015 and they had no answer to this question.

delayed due to a change in design relating to the addition of a feeder channel and a reassessment after the spillway settlement at Deg Outfall. Both plants were to be commissioned and operational in 2021. By 2019, the new generating capacity constructed was 30.78 MW in four plants with estimated annual power generation of 180.53 GWh.²² With the expected operation of Deg Outfall and Chianwali plants in 2021, the total new capacity and annual power generation would likely reach 40.2 MW and 237 GWh, close to the DMF targets of 44 MW and 272 GWh. The nonphysical outputs were delivered as expected. Feasibility studies and due diligence for eight plants were completed.²³ Capacity building activities were carried out. A total of 23 international and national trainings were conducted, with attendance of 57 officials and eight courses were implemented.

20. The program's environmental safeguard categorization was inadequate. While the RRP made a categorical statement that the program would not support any environment category A subprojects, no supporting documents such as environmental assessment categorization form, rapid environmental assessment checklist, or categorization approval by the chief compliance officer were available for review. As the environmental assessment guidelines require consideration of direct and indirect impacts as well as induced development impacts, it is unclear why the potential impacts from new transmission lines connecting the hydropower plants were not considered for categorization purposes. Also, it is unclear why a sectoral environmental assessment or cumulative assessment was not considered for this program. According to the PCR, initial environmental examinations (IEEs) were prepared for the investment subprojects and the eight feasibility studies. However, only the IEEs for the investment subprojects were disclosed. Available documents suggested that only one resettlement plan was prepared. It is unclear whether resettlement plans were also prepared for other subprojects. Indigenous people development plans were not prepared since no indigenous peoples were identified. Back-to-office mission reports indicated that environment and social specialists rarely joined review missions, except on two occasions. There was little follow-up on the status of implementation of IEEs or the environmental and social monitoring reports. On the whole, given the partial achievement of outcome and outputs, this validation assesses the program less than effective.

C. Efficiency of Resource Use

21. The PCR rated the program efficient, as the 16.4% reevaluated economic internal rate of return (EIRR) of the four completed plants combined, including Marala and Pakpattan in Punjab, and Ranolia and Machai in KPK, exceeded the 12% benchmark. Sensitivity analysis under adverse scenarios suggested that the program would highly likely remain economically viable. A 10% increase in operation and maintenance (O&M) costs combined with a 10% decrease in benefits would result in an EIRR of 13.3%. The environmental benefits of avoided CO₂ emissions were not quantified or included in the reevaluation.

22. This validation has the following observations. First, according to the PCR's appendix 8, costs and benefits were valued using the domestic price numeraire in Pakistan, with tradable inputs adjusted by a shadow exchange rate factor (SERF) of 1.21 and unskilled labor adjusted by a shadow wage rate factor of 0.73. However, in the supporting Excel spreadsheet, it is unclear whether the SERF and shadow wage rate factor had been applied since the economic values of project capital cost and annual O&M in the EIRR calculation were the same as the financial values in the financial internal rate of return (FIRR) calculation. Second, in the spreadsheet, there were

²² These four plants comprised Marala (7.64 MW) in Punjab, Pakpattan (2.82 MW) in Punjab, and Ranolia (17.5 MW) and Machai (2.82 MW) in KPK.

²³ These plants include Koto (40.8 MW), Jabori (10.2 MW), and Karora (11.8 MW) in KPK, and main line Lower Chenab canal (7.55 MW), Qadirabad Barrage (23.0 MW), Khanki Barrage (14.09 MW), Qadirabad Balloki Link canal (10.71 MW), and Upper Chenab canal (3.58 MW) in Punjab.

no assumptions and calculation details for the willingness-to-pay (WTP) values of the residential, commercial, and industrial sectors. Methodologically, as described in the PCR and RRP, for residential consumers, the difference between the tariff and alternative energy sources was taken as the consumer surplus in the PCR's appendix, while 33% of this difference was taken as the consumer surplus in the RRP's economic analysis. For commercial and industrial sectors, the RRP used 50% of the difference between the marginal tariff and alternative energy cost to represent consumer surplus and then derive the WTP, while the PCR directly used the lifecycle cost of alternative energy source (diesel generators) to represent the WTP. The difference in approach needs to be explained. Third, the PCR noted that non-incremental output was valued using the estimated long-run marginal costs (LRMCs) of peak and off-peak energy. In the spreadsheet, it is unclear why the LRMC was calculated by multiplying the average WTP with the SERF, and why there was no differentiation in LRMC between peak-period output and off-peak-period output. For the non-incremental energy, the spreadsheet calculated it as 5% of net energy generation. This assumption needs to be explained and justified. Fourth, the full table of EIRR reevaluation presented in the end of the PCR's appendix 8 is inconsistent with the numbers in the text of appendix 8, as well as the supporting spreadsheet.

23. The program had significant process delays and underutilization of funds. The implementation delay and cost changes had already been considered in the reevaluation of EIRR. Although the reevaluated EIRR exceeded the benchmark, given the methodological issues remaining to be clarified, this validation assesses the program less than efficient.

D. Preliminary Assessment of Sustainability

24. The PCR rated the program likely sustainable. The PCR's reevaluation of the program's FIRR largely followed the approach taken at appraisal. It updated the financial analysis to reflect the actual costs of the subprojects and the implementation delays. The combined weighted average cost of capital (WACC), which was 4.43% at appraisal, was recalculated by the PCR as 3.67% using the same methodology. The difference in WACC was attributed to the changes in the capital structure and the updated assumptions on the cost of equity and cost of debt from appraisal to completion. The tariffs used in the calculation were reference tariffs approved by NEPRA for the Machai subproject in 2014 and Marala, Pakpattan, and Ranolia subprojects in 2015. These tariffs were determined, based on cost recovery through generating incremental revenues that could cover debt servicing, depreciation, O&M, and regulated return on equity.

25. The PCR indicated that the recalculated FIRR for the four completed subprojects was 4.66%, higher than the updated WACC of 3.67%, thereby suggesting financial viability. The recalculated FIRR was substantially lower than the appraisal estimate due primarily to the significantly delayed implementation progress. Sensitivity analysis under the adverse scenario of a 1-year delay in signing power purchase agreement (PPA) and a 10% increase in operation cost showed the FIRR would be 4.05%, remaining above the WACC. However, if the two plants under construction at Chianwali and Deg Outfall were included, the recalculated FIRR for the six plants was 3.07%, lower than the WACC. Sensitivity analysis under the adverse scenario would further decrease the FIRR to 2.58%, substantially below the WACC. These results suggest that the program, as a whole, would not be financially viable.

26. The PCR indicated that the four completed subprojects were with pending formal commercial operation tests subject to execution of the PPA. While the calculation assumed that commercial operations would commence in 2021, there exists the possibility of delay in PPA negotiations and signing. Moreover, the subprojects are subject to the risk of unfavorable tariff adjustment by NEPRA at commercial operation stage. There is also material risk of delay in

payment from power purchasers for the power procured. The prevailing issue of circular debt in Pakistan power sector continues to pose a serious risk to the bankability and sustainability of power projects. As highlighted by a previous evaluation on ADB's support to Pakistan's energy sector (footnote 18), almost all operations of ADB's energy-related programs and projects in Pakistan, including this program, were considered less than likely sustainable due to the impact of circular debt on the financial sustainability of the power sector entities, both public and private. Given the reevaluated FIRR for the six subprojects as a whole being less than the updated WACC and the financial and operational risks of the current power sector in Pakistan, this validation assesses the program less than likely sustainable.

III. OTHER PERFORMANCE ASSESSMENTS

A. Preliminary Assessment of Development Impact

27. The PCR rated the program's development impact satisfactory, claiming that it achieved the impact targets relating to sustained annual gross domestic product growth of 6% to 8% from 2007 and avoided CO₂ emissions of 175,000 tons yearly from 2011 and 775,000 tons annually from 2017 onwards. However, the PCR did not provide adequate evidence in support of this claim. In fact, in the PCR's DMF, the target relating to gross domestic product was removed. On CO₂ emissions, the annually avoided CO₂ emissions that could be achieved by the four subprojects in Punjab, including the two still under construction, were calculated to be 76,608 tons. As noted in the PCR, data for the subprojects in KPK was not available. Given the installed capacities of these subprojects, the maximum possible amount of annually avoided CO₂ emissions of all six plants, completed or to be completed by the program, would be significantly lower than the target of 775,000 tons, even under the most optimistic operation scenario. This validation assesses the development impact of the program less than satisfactory.

B. Performance of the Borrower and Executing Agency

28. The PCR rated the performance of the borrower and the executing agency less than satisfactory. The Economic Affairs Division, Ministry of Economic Affairs and Statistics, as the representative of the borrower, demonstrated weak ownership during program implementation. The release of counterpart funds was delayed. Important implementation issues were not responded to in a timely manner. AEDB, as the executing agency at the federal level, performed below expectations. Its efforts to facilitate implementation and completion were less than effective despite advisory assistance from the consultants. The performance of provincial implementing agencies was below expectation until 2015, when the program administration was delegated to the resident mission. They effectively managed the consultants' and contractors' work to address implementation issues and accelerate progress. Performance monitoring and progress reports and financial reports were submitted as required. On the whole, this validation assesses the performance of the borrower and AEDB less than satisfactory.

C. Performance of the Asian Development Bank

29. The PCR rated ADB's performance less than satisfactory. At appraisal, ADB's Central and West Asia Department and the Pakistan Resident Mission worked closely with AEDB to ensure timely program preparation and approval. The program was approved by ADB's Board of Directors within 1 month of the government's periodic financing request. However, the program design, particularly the use of MFF, was not appropriate in this context. The program ran into significant delays, cancellations, underutilization of available funds, and effectively became a stand-alone loan project. ADB could have considered design changes to address the issues.

During implementation, ADB fielded 22 missions but did not closely supervise implementation for adequate program performance monitoring. Its actions were not as timely and appropriate. Delegation of the program administration to the resident mission in January 2015 facilitated effective implementation and close monitoring of progress at the contract and subproject level. Throughout the implementation, the quality of portfolio monitoring, reporting of progress and covenant compliance, and risk management was inconsistent.

30. ADB's safeguard work quality at appraisal was adequate, except for the lack of evidence on the rationale for categorizing the program as B for environment and for not carrying out a sectoral environmental assessment. The legal covenants were comprehensive to cover the environmental and social safeguards issues. There was inadequate supervision of safeguards with environmental and social specialists rarely (only twice) joined program review missions. There were no follow-ups on issues raised by the external environmental and social monitoring reports. There were no references or discussions on environmental and social risk assessments for the eight feasibility studies. There was a lack of information on the status of institutional strengthening for safeguards. This validation assesses ADB's performance less than satisfactory.

IV. OVERALL ASSESSMENT, LESSONS, AND RECOMMENDATIONS

A. Overall Assessment and Ratings

31. The PCR rated the program successful. This validation assesses the program less than relevant due to the design deficiency. It is less than effective, given the partial achievement of its outcome and outputs. It was less than efficient due to methodological issues in establishing EIRR. The reevaluated FIRR for the six subprojects as a whole was below the WACC and there were financial and operational risks prevalent in the power sector suggesting less than likely sustainability. Overall, this validation assesses the program less than successful.

Overall Ratings

Validation Criteria	PCR	IED Review	Reason for Disagreement and/or Comments
Relevance	Relevant	Less than relevant	MFF was not the appropriate modality, it led to poor deliverables.
Effectiveness	Less than effective	Less than effective	
Efficiency	Efficient	Less than efficient	There were methodological issues in EIRR calculation.
Sustainability	Likely sustainable	Less than likely sustainable	Reevaluated FIRR for the six subprojects was below the WACC and there are financial and operational risks in the power sector.
Overall Assessment	Successful	Less than successful	Overall weighted average of core criteria rating values is 1.
Preliminary Assessment of Impact	Satisfactory	Less than satisfactory	Avoided CO ₂ emissions of subprojects significantly lower than the target.
Borrower and executing agency	Less than satisfactory	Less than satisfactory	
Performance of ADB	Less than satisfactory	Less than satisfactory	
Quality of PCR		Less than satisfactory	Paras. 36–38.

ADB = Asian Development Bank, CO₂ = carbon dioxide, IED = Independent Evaluation Department, EIRR = economic internal rate of return, FIRR = financial internal rate of return, MFF = multitranche financing facility, PCR = program completion report, WACC = weighted average cost of capital.
Source: ADB (IED).

B. Lessons

32. The PCR identified six lessons. First, applying readiness filters during program processing can ensure better implementation, such as completion of critical actions, necessary government approvals, and detailed design and preparation, and approval of procurement documents, etc. Second, ADB-sponsored training and workshops on procurement, safeguards, and financial management could benefit executing and implementing agencies. Third, the involvement of local communities at all stages of planning and implementation raises their awareness and encourages cooperation. Fourth, proactive ADB program implementation team on assisting in startup activities such as consultant recruitment and preparation of engineering designs can mitigate implementation delays. Fifth, sound technical design and engineering can support more accurate cost estimate and set a more reasonable implementation schedule. Sixth, further onsite training within the defect liability period can ensure sustainable operation of the plants.

33. This validation supports the PCR lessons and offers the following additional lessons:

(i) **Project-level lesson.** Adequate due diligence at appraisal can ensure project design appropriateness and a realistic project implementation plan and timeframe considering the borrower's and executing agency's capacity across institutional, financial, and operational aspects. Identifying and implementing risk mitigation measures and providing adequate early-stage support are crucial in minimizing initial delays and addressing emerging project needs.

(ii) **Results framework and methodology-level lessons.** MFF as a choice of financing modality for a proposed investment needs to be adequately justified, with due consideration of the fulfillment of preconditions, scope of tranches, and the extent to which it would generate potential value addition on efficiency, portfolio performance, and development results.

(iii) A realistically designed scope and amount of an MFF, considering the absorptive and implementation capacity of the executing and implementing agencies, would achieve a significant improvement during program implementation.

(iv) **Country-level lessons.** An MFF is more suitable for circumstances where the government's ownership and commitment to reforms are strong and the risks of discontinuation of the established partnership between ADB and the government and the cancellation of planned investments are low. When there are large political, governance, security, and/or integrity uncertainties, it would be more appropriate to use a stand-alone project loan, with possible additional financing depending upon emerging needs.

(v) An MFF is better suited to finance existing long-term plans by one executing agency rather than to simultaneously work with multiple unrelated ones and/or design new tranches during implementation. Simpler project designs with specific purposes and involving fewer agencies in a limited number of locations are more likely to succeed than those with a broad scope and overly ambitious and complex structures.

C. Recommendations for Follow-Up

34. The PCR had three recommendations that this validation supports. First, each implementing agency should have a generation system operations unit for daily operation supervision and performance monitoring. Second, covenants in the loan and project agreements should be maintained in their existing form until all subprojects have been completed. Third, due diligence under ADB's Access to Clean Energy Investment Program should be conducted during site activities for Deg Outfall and Chianwali subprojects' completion.

V. OTHER CONSIDERATIONS AND FOLLOW-UP

A. Monitoring and Reporting

35. A program performance and monitoring system was established within PEDO and PPDCL. Prepared monthly progress reports provided details on the status of activities performed, including the procurement of materials, the subprojects' physical execution, contract awards and disbursements, and the monitoring and evaluation of social and environmental safeguard-related covenants. Submitted quarterly progress reports complied with the reporting requirement. Audited project accounts and financial statement disclosed with slight delays. No project and facility completion reports were prepared, except for the project completion report for Pakpattan hydropower subproject.

B. Comments on Program Completion Report Quality

36. The PCR followed pertinent guidelines and provided a comprehensive description of the project design and implementation process and a succinct summary of the environmental and social safeguards. Its findings, lessons, and recommendations were evidence-based, relevant, and useful. However, it could be improved across the following aspects, based on which this validation assesses its quality less than satisfactory.

37. The evaluation of program performance against the core criteria should have been more critical, candid, and cogent, i.e., it indicated that the MFF was not the best approach for this program but did not consider it as a design deficiency. Aside from methodological issues, for both EIRR and FIRR, the details presented in the PCR appendix are inconsistent with the spreadsheet. There is inadequate clarity about whether there was an approved revision of the DMF. The PCR could have given more information on key issues of program implementation. Its appendixes could have been more informative as the chronology of main events is very short, with very limited information that is not commensurate with a 10-year investment program, and there was no implementation schedule, organization chart for implementation, nor list of ADB-financed contract packages. It was also light on outputs of capacity development, an important component of the program, as it only introduced its intended outputs but not the actual ones while its paragraph 51 on effectiveness and the DMF provided limited information.

38. Lastly, it had five inconsistencies. First, it said, "The program is assessed overall successful, given that the outputs and outcomes were not fully achieved" (PCR para. 61). Second, "The program is rated less than effective, even though the output targets were mostly met, and the generated outcomes exceeded the indicators in the DMF" (PCR para. 63), whereas it described the program's outcome as "largely achieved" and the DMF described it as "achieved" (PCR para. 51, despite the actual achievement below the target). Third, the achievement of impact target rated the program satisfactory (PCR para. 56), although the DMF clearly showed a partial achievement. Fourth, covenants related to the determination of tariffs were not complied

with (PCR para. 74), but the appendix indicated that they were complied with. Fifth, DMF targets were revised and redefined (PCR para. 52), but its paragraph 59 commented that ADB could have considered design changes and DMF improvement.

C. Data Sources for Validation

39. Data sources used for this validation include the PCR, RRP, loan and project agreements, PAM, back-to-office and safeguard reports, national strategies and policies, and ADB strategies, policies, and guidelines.

D. Recommendation for Independent Evaluation Department Follow-Up

40. The PCR suggested for project performance evaluation report preparation in 2023, when the constructed hydropower plants would have been in operation for 3 years. This validation views such report as better scheduled after ascertaining the construction completion time of the Deg Outfall and Chianwali plants, both of which were under construction at the time of PCR preparation with expected completion in 2021.