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The World Bank

Report No: ICR00001790

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(IBRD-48170)

ON A LOAN

IN THE AMOUNT OF EURO 125 MILLION
(US$ 166 MILLION EQUIVALENT)

TO

TURKIYE ELEKTRIK ILETIM AS (TEIAS)
WITH THE GUARANTEE OF THE REPUBLIC OF TURKEY

IN SUPPORT OF THE SECOND TEIAS PROJECT UNDER THE THIRD PHASE
OF THE US$1,000 MILLION

ENERGY COMMUNITY OF SOUTH EAST EUROPE (APL) PROGRAM

September 28, 2011

Sustainable Development Department
Turkey Country Unit
Europe and Central Asia Region

CURRENCY EQUIVALENTS
(Exchange Rate Effective December 31, 2010)

Currency Unit	=	New Turkish Lira (YTL)
YTL 1.55	=	US$1
US$ 1.33	=	EUR 1

FISCAL YEAR
January 1 – December 31

ABBREVIATIONS AND ACRONYMS

APL	Adaptable Program Loan
DPL	Development Policy Loan
EC	European Commission
ECSEE	Energy Community of South East Europe
EMP	Environmental Management Plan
EMF	Environmental Management Framework
EMRA	Energy Market Regulatory Authority
ERP	Enterprise Resource Planning (A business software application)
ERR	Economic Rate of Return
EU	European Union
EUAS	Electricity Generation Corporation
FI	Financial Intermediary
GIS	Gas Insulated Switchgear
IBRD	International Bank for Reconstruction and Development
kWh	Kilo Watt hour
MWh	Mega Watt hour
LAMF	Land Acquisition Management Framework
MVA	Mega-Volt Ampere
NTGP	National Transmission Grid Project (Loan)
OP	Operational Policy
PCU	Project Coordination Unit
QAG	Quality Assurance Group
SEE	South East Europe
SPO	State Planning Organization
TEDAS	Turkish Electricity Distribution Corp
TEIAS	Turkish Electricity Transmission Corp
TETAS	Turkish Electricity Trading and Contracting Corp

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TURKEY

Energy Community of South East Europe APL 3 Project

CONTENTS

A. Basic Information			
Country:	Turkey	Project Name:	Energy Community of South East Europe APL 3 Project
Project ID:	P096400	L/C/TF Number(s):	IBRD-48170
ICR Date:	09/29/2011	ICR Type:	Core ICR
Lending Instrument:	APL	Borrower:	TEIAS (TURIYE ELEKTRIK ILETIM AS)
Original Total Commitment:	USD 150.00M	Disbursed Amount:	USD 176.28M
Revised Amount:	USD 150.00M		
Environmental Category: B			
Implementing Agencies: TEIAS (Turkish Electricity Transmission Corporation)			
Cofinanciers and Other External Partners:			

B. Key Dates				
Process	**Date**	**Process**	**Original Date**	**Revised / Actual Date(s)**
Concept Review:	11/15/2005	Effectiveness:	05/09/2006	05/09/2006
Appraisal:	01/31/2006	Restructuring(s):		
Approval:	03/24/2006	Mid-term Review:	09/30/2008	06/26/2009
		Closing:	06/30/2011	06/30/2011

C. Ratings Summary	
C.1 Performance Rating by ICR	
Outcomes:	Satisfactory
Risk to Development Outcome:	Low or Negligible
Bank Performance:	Satisfactory
Borrower Performance:	Satisfactory

C.2 Detailed Ratings of Bank and Borrower Performance (by ICR)			
Bank	**Ratings**	**Borrower**	**Ratings**
Quality at Entry:	Moderately Satisfactory	Government:	Satisfactory
Quality of Supervision:	Satisfactory	Implementing Agency/Agencies:	Satisfactory
Overall Bank Performance:	Satisfactory	**Overall Borrower Performance:**	Satisfactory

C.3 Quality at Entry and Implementation Performance Indicators			
Implementation Performance	**Indicators**	**QAG Assessments (if any)**	**Rating**
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA):	None
Problem Project at any time (Yes/No):	No	Quality of Supervision (QSA):	None
DO rating before Closing/Inactive status:	Satisfactory		

D. Sector and Theme Codes		
	Original	**Actual**
Sector Code (as % of total Bank financing)		
Power	100	100
Theme Code (as % of total Bank financing)		
Injuries and non-communicable diseases	20	
Other urban development	40	
Regional integration	40	100

E. Bank Staff		
Positions	**At ICR**	**At Approval**
Vice President:	Philippe H. Le Houerou	Shigeo Katsu
Country Director:	Ulrich Zachau	Andrew N. Vorkink
Sector Manager:	Ranjit J. Lamech	Peter D. Thomson
Project Team Leader:	Sameer Shukla	Ranjit J. Lamech
ICR Team Leader:	Jari Vayrynen	
ICR Primary Author:	Jari Vayrynen	

F. Results Framework Analysis

Project Development Objectives (from Project Appraisal Document**)**
The development objective of Turkey ECSEE-APL3 is to increase the safety, reliability, efficiency, and capacity of the bulk power transmission system in Turkey and to improve market access for consumers and suppliers of electricity.

Revised Project Development Objectives (as approved by original approving authority)

(a) PDO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	APL3 projects are completed successfully, and the power transmission system in Istanbul and Izmir operate reliably, safely and efficiently.			
Value quantitative or Qualitative)	0%	100%		100%
Date achieved	02/24/2006	12/31/2010		12/31/2010
Comments (incl. % achievement)	End of project target 100% achieved.			
Indicator 2 :	Peak demand carried by system (GW)			
Value quantitative or Qualitative)	23.5	31		33.4
Date achieved	12/31/2004	12/31/2010		08/05/2010
Comments (incl. % achievement)	Target achieved at108% of target value. Target was exceeded on August 5, 2010, and the peak demand carrying capacity of the system has been maintained since.			
Indicator 3 :	Electricity transmitted (TWh)			
Value quantitative or Qualitative)	121	176		192.37
Date achieved	12/31/2004	12/31/2010		12/31/2010
Comments (incl. % achievement)	Target achieved at 109% of target value.			
Indicator 4 :	Operating costs of transmission (US$/GWh)			
Value quantitative or Qualitative)	2030 (revised calculation - earlier estimate 1834)	1910 (revised calculation - earlier estimate 1700)		2057
Date achieved	12/31/2004	12/31/2010		12/31/2010
Comments (incl. % achievement)	Not achieved. Operating costs remain higher than target mainly due to increased staff and ancillary services costs as TEIAS has grown. The revisions on baseline and target values relate to changes in calculation assumptions and included cost categories.			
Indicator 5 :	Electricity sold on the market as % of electricity transmitted			
Value quantitative or Qualitative)	0%	20%		26.48
Date achieved	12/31/2004	12/31/2010		12/31/2010
Comments (incl. %	Target achieved at 132% of target value.			

achievement)				
Indicator 6 :	Fault index on 380 kV system			
Value quantitative or Qualitative)	6.8	5.8		8.36
Date achieved	12/31/2004	12/31/2010		12/31/2010
Comments (incl. % achievement)	Not achieved. The 380kV system faults were 44% above target in 2010. However, major blackouts have not occurred in recent years, and newest data shows progress. The indicator was revised as the original duration based indicator was difficult to measure.			
Indicator 7 :	Total accidents			
Value quantitative or Qualitative)	21	18 (revised target, earlier target 15)		22
Date achieved	12/31/2004	12/31/2010		12/31/2010
Comments (incl. % achievement)	Not achieved. The number of accidents remains above target. The indicator does not differentiate between serious and less serious accidents. The original target was considered unrealistic and was revised to 18.			
Indicator 8 :	Fault index on 154 kV system			
Value quantitative or Qualitative)	10.1	8.5		8.8
Date achieved	12/31/2004	12/31/2010		12/31/2010
Comments (incl. % achievement)	Almost achieved. The 154kV system faults are slightly (3.5%) above the target value. With the increased measures taken on e.g. replacing ceramic insulation with silicone insulation, the target could be achieved relatively soon.			

(b) Intermediate Outcome Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Satisfactory completion of the three new 154 kV GIS substations which provide an increase in supply capacity of 640			
Value (quantitative or Qualitative)	Nil	Contract implementation progress: 60% - 2009 90% - 2010 100% - 2011		100%
Date achieved	02/24/2006	12/31/2010		12/31/2010
Comments (incl. % achievement)	Four GIS substations were financed. Three were completed and the fourth one will be completed under the next phase (APL6),currently under implementation. The substations increase supply capacity by 1150MVA; the target is achieved at 180% of target value.			
Indicator 2 :	Incremental Load serviced by transmission network.			
Value (quantitative	0	100 MW - 2009, 350 MW - 2010,		347 MW

or Qualitative)		450 MW - 2011		
Date achieved	02/24/2006	06/01/2011		12/31/2010
Comments (incl. % achievement)	2010 target almost achieved. With the completion of the Yenikapi substation in 2012 (which was delayed due to an archeological chance find) the 2011 target value should also be achieved with a one year delay.			
Indicator 3 :	Urban transmission network upgrade			
Value (quantitative or Qualitative)	0%	Contract implementation progress: 60% - 2009 90% - 2010 100% - 2011		100%
Date achieved	02/24/2006	12/31/2010		12/31/2010
Comments (incl. % achievement)	End of project target 100% achieved.			

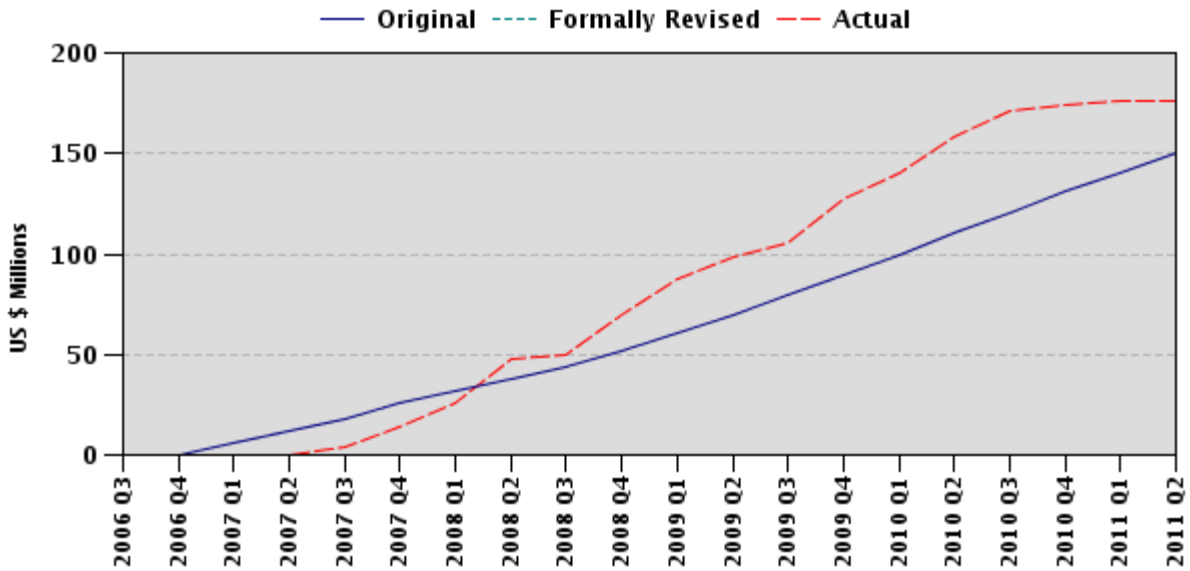
G. Ratings of Project Performance in ISRs

No.	Date ISR Archived	DO	IP	Actual Disbursements (USD millions)
1	09/06/2006	Satisfactory	Satisfactory	0.40
2	06/26/2007	Satisfactory	Satisfactory	14.06
3	03/26/2008	Satisfactory	Satisfactory	49.88
4	02/21/2009	Satisfactory	Satisfactory	105.07
5	10/27/2009	Satisfactory	Satisfactory	150.50
6	02/26/2010	Satisfactory	Satisfactory	169.32
7	12/09/2010	Satisfactory	Satisfactory	176.28

H. Restructuring (if any)

Not Applicable

I. Disbursement Profile



1. Project Context, Development Objectives and Design[1]

1.1 Context at Appraisal

The Energy Community of South East Europe (ECSEE) and the Athens Process Context

In the early 2000's, the improvement of the performance of the energy sector was identified as crucial to improve and sustain economic development in South East Europe (SEE). The power supply situation was in 2004 expected to tighten and constrain economic activity and affect the quality of life if not addressed with determined regional action. Apart from Turkey, investment in power generation since the early 1990s had been limited, with the average age of capacity in excess of thirty years. Significant capacity additions and plant rehabilitations were projected to be required, along with matching transmission and distribution system investments if demand were to be met and power shortages and supply interruptions were to be avoided.

The SEE countries had acknowledged that solutions to these regional issues based on isolated national markets were neither achievable nor desirable as a means to attempt to close investment gaps and emerging demand and supply imbalances. The governments of SEE countries and the European Commission (EC) had therefore signed "the Athens Memorandum" in December 2003 in which they expressed their commitment to what became the Energy Community[2] when they signed a Treaty on October 25, 2005. The Treaty became effective on July 1, 2006, formally establishing the Energy Community.

Since the early 1990s and in some cases even earlier, the Bank had supported individual countries of SEE in their efforts to rehabilitate and restructure their power sectors through policy dialogue, technical assistance and financing. The country knowledge deriving from such support, and participation in the development of the Energy Community, including regional trade strategy work, put the Bank in a strong position to provide regional lending, policy advice and technical assistance to support the Energy Community. The preparation of the APL program was a key component of the Bank's working partnership with the European Commission. The APL framework allows the Bank to maintain a key position as an active and sustained supporter of the regional power market and the sector reforms which underpin it. Individual operations are not constrained by the pace of progress in the regional program, and projects can also be added as demand emerges.

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[1] Since APL2 and APL3 closed within 6 months of each other and were closely related, the same ICR main text is used in both the APL2 and APL3 ICR, with a separate data sheet and relevant annexes for each project.

[2] Until June 2004, the program was called the South East Europe Regional Energy Market. The name was changed to the Energy Community of South East Europe (ECSEE) in October 2004. ECSEE is used in the December 2004 Project Appraisal Document and for all subsequent loans and credits approved under the regional ECSEE APL facility approved in January 2005. The final name, the Energy Community, was formally adopted in October 2005, and the Energy Community was formally established in July 2006. This ICR uses the name Energy Community except when referring to the ECSEE APL facility and related loans and credits.

The Energy Community is an integral element of the Contracting Parties', Participants' and the European Commission's efforts for all states in South East Europe to have access to stable and continuous energy supply which they regard as essential for economic development and social stability. The creation of an area without internal frontiers for energy contributes to economic and social progress and a high level of employment as well as balanced and sustainable development. These higher level objectives are expressed in the Treaty.

Turkish Context

At project appraisal in 2004, Turkey remained committed to the goals and principles of the Athens Process and continued implementation of the key provisions of the Athens Process. However, Turkey had not signed the Treaty owing to concerns emanating from the fact that several issues in the Treaty are also key aspects of the Energy and Environment Chapters of the *Acquis Communautaire*, which Turkey hoped to negotiate separately as part of its negotiations for accession to the EU (the EU decided on October 3, 2005 to begin discussions with Turkey in this regard).

Turkey initially participated in the ECSEE-APL Program through the ECSEE-APL2 (hereinafter referred to as APL2) approved by the Board on April 4, 2005, having met the original eligibility conditions of establishing and making operational an electricity sector regulator and a transmission system operator. It was on the basis of Turkey's continued implementation of the substantive provisions of the 2003 Athens Memorandum, the relevant EC Directive (2003/54/EC), its participation in the implementation mechanism, and the expectation that Turkey would sign the Treaty that the Bank continued to provide support to Turkey under the ECSEE-APL3 (hereinafter referred to as APL3), which was approved by the Board on March 24, 2006.

By the early 2000's the Government of Turkey had embarked upon a comprehensive reform and restructuring program of the electricity sector in order to create a liberalized, efficient and economic sector. This was initiated by the Electricity Market Law (Law No. 4628) promulgated in February 2001. The principles and goals of the reform program defined by this Law are substantially in line with EC Directives (1996/92/EC and 2003/54/EC) concerning rules for the internal market for electricity. The Government's 2004 Electricity Sector Reform and Privatization Strategy Paper further anchored and solidified these efforts. By APL3 appraisal, Turkey had completed several major reform actions, such as the restructuring of the sector (into a generating corporation EUAS, a trading corporation TETAS, a transmission corporation TEIAS, a distribution corporation TEDAS, and regional distribution companies), the establishment of an independent regulatory framework, and introduction of retail competition. Turkey was preparing for the introduction of a balancing and settlement system, and was also about to commence the privatization of distribution.

The Country Assistance Strategy for fiscal years 2004 – 2006 stated that utility sector reform continued to be a high priority and transformation of the electricity and gas sectors to competitive, appropriately regulated, private energy markets was important to

reduce cost and risks borne by the government. Indeed, at the time of both APL2 and APL3 appraisals, the Bank had a deep engagement in Turkey's energy sector with a wide-ranging policy dialogue, and several projects under preparation and implementation. The Bank was also providing technical assistance to the Government on electricity issues. Further, the Bank was supporting Turkey's market implementation and network development initiatives through the National Transmission Grid Project (NTGP), which supported the preparation of the balancing market and settlement regulations and the tender specifications for the Market Management System (MMS).

APL2 supported Turkey in its power market liberalization program and investments in the MMS, regional control centers and associated transmission infrastructure. APL3 continued the Bank's support for the implementation of the internal market and regional integration by financing investments in strengthening and expanding the transmission network to reliably meet the growing electricity demand and upgrading the transmission network in dense urban areas to minimize the risk to public safety posed by urban encroachment on existing overhead lines. The APL Program is being continued in Turkey through the APL6 project.

1.2 Original Project Development Objectives (PDO) and Key Indicators

The overall development objective of the ECSEE APL Program is the development of a functioning regional electricity market in South East Europe and its integration into the internal electricity market of the European Union, through the implementation of priority investments supporting electricity market and power system operations in electricity generation, transmission and distribution and technical assistance for institutional/systems development and project preparation and implementation.

Table 1 summarizes the PDOs and outcome indicators of APL2 and APL3, respectively, as presented in the PADs for the two projects.

PDO	Outcome Indicators
APL 2: The objective of the Project is to support the implementation of the investment programs of TEIAS, including: (a) creation of a market management system for the management of the electricity market; (b) strengthening supervisory control and data acquisition/energy management system to enable TEIAS to operate more efficiently; and (c) provision of transmission grid strengthening and expansion for overall stability.	(1) Electricity markets in South-East Europe are liberalized in accordance with the ECSEE Treaty (including derogations and subsequent modifications, if any) and a regional electricity market is functioning; (2) APL2 projects are completed in Turkey and its electricity market and power systems operate with the help of these new investments.
APL3: To increase the safety, reliability, efficiency and capacity of the bulk power transmission system in Turkey and to improve market access for consumers and suppliers of electricity.	(1) APL3 projects are completed successfully; (2) The power transmission network in Izmir and Istanbul operates reliably, safely and efficiently.

1.3 Revised PDO (as approved by original approving authority) and Key Indicators, and reasons/justification

The PDOs of APL2 and APL3 were not revised. However, new PDO indicators were added to both APL2 and APL3. The original outcome indicators of both APL2 and APL3 were at appraisal narrowly defined as being the completion and successful implementation of the financed subprojects. It was therefore decided in 2008 that in order to measure the impact of these projects, additional, more outcome-oriented indicators should be used. Agreement was reached with Government and TEIAS to include the following indicators to the results frameworks of the two projects:

- Peak demand carried by system (GW)
- Electricity transmitted (TWh)
- Operating costs of transmission (US$/ GWh)
- Electricity sold on the market as % of electricity Transmitted
- Duration of all faults on system (number of hours)[3]
- Total accidents

Since the additions to the original indicators did not require a formal restructuring, these were recorded through Aide Memoires and ISRs.

1.4 Main Beneficiaries

The main direct project beneficiary of both APL2 and APL3 was TEIAS. Secondary beneficiaries included TEDAS and the suppliers of electricity. Indirect beneficiaries include end consumers in Turkey, in particular those in the Izmir and Istanbul regions, who benefited from the improved and more reliable electricity supply.

1.5 Original Components

The overall ECSEE APL Program was designed to support priority investments and technical assistance that enhance the ability of ECSEE Regional Members to effectively participate in the regional electricity market. For Turkey to be able to contribute to the creation of a regional electricity market in SEE and to be linked to and participate in it, Turkey needed to, *inter alia*, create a functioning domestic market for electricity, improve its transmission system monitoring and control mechanisms, and strengthen its power transmission network. APL2 and APL3 and their project components were aligned with these objectives and investment needs and comprised the following:

APL2 Components

Component 1: Creation of a Market Management System (MMS) for the management of the electricity market in Turkey.

[3] This indicator was later further amended at TEIAS' request to their standard fault index as monitoring of the indicator in its original form proved problematic

Component 2: Strengthening of the SCADA/EMS (supervisory control and data acquisition/energy management system) so that TEIAS would be in a position to operate its system more efficiently and to coordinate with other SEE systems operators in order to meet overall stability and control requirements.

Component 3: Provision of grid strengthening and expansion for overall stability. This included funding some of TEIAS sub-stations investments.

APL3 Components[\]

Component 1: Transmission Network Strengthening. This component entailed construction of new Gas Insulate Switchgear (GIS) substations and a new 380 kV underground cable to strengthen the transmission networks in Istanbul and Izmir. The new GIS substations and underground cable would increase the capacity of the transmission networks in the cities and are necessary to meet the new and growing electricity demand in their local areas. The construction of the GIS substations and the 380 kV underground cable was necessary to strengthen the reliability and capacity of the transmission networks in Istanbul and Izmir and would as a result provide the distribution companies, eligible customers and competing energy producers with adequate and reliable access to the local transmission grid and the future ECSEE regional wholesale power markets.

Component 2: Urban Transmission Network Upgrading. This component involved construction of underground cables to replace existing 154 kV overhead transmission lines in densely populated areas of Istanbul and Izmir. The 154 kV overhead transmission lines proposed for replacement with underground cables had been enveloped in rapid urban expansion. The underground cable projects in the two cities included in Component 2 would have positive impact on the operation of the transmission networks and would ensure reliability of the energy supply to existing and future consumers.

1.6 Revised Components

APL2

Component 1 of APL2 was revised to include a Technical Assistance (TA) component to enhance the capacity of electricity market participants to actively participate in the market that was forthcoming, and to extend a Balancing and Settlement System (BSS) consultancy contract. Both the TA and the BSS contract had been initiated under the National Transmission Grid Project (NTGP) and it was important to continue their implementation under APL2 as the implementation of the electricity market in Turkey was taking longer than anticipated. These changes were approved by the Turkey Country Director and the loan agreement was amended through a letter agreement on November 14, 2007. The Bank also separately provided an approval for the extension of the BSS contract and its financing under APL 2. Components 2 and 3 of APL2 were not revised.

APL3

The components of APL3 were not revised.

1.7 Other significant changes

APL2 and APL3 investments represent a time slice of a large, ongoing investment program of TEIAS. Therefore, the investments identified during appraisal of both APL2 and APL3 were somewhat indicative and it was expected that they would likely change during implementation due to reprioritization of investments over time. This need for flexibility was incorporated into the projects' design and reflected in the PADs; specific subproject investments were not identified in the Loan Agreements. Indeed, the subproject investments changed significantly during implementation in the case of both APL2 and APL3. TEIAS prepared a justification for all changes to the subprojects which were then reviewed and approved by the Bank.

Design and subprojects

APL2

Under APL2 Component 1 (MMS), a decision was made by TEIAS to improve the existing balancing market system and to procure a day-ahead system only, rather than acquire a completely new system. As noted above, a consultancy and technical assistance contract was added to this component as well. Under Component 2 (SCADA/EMS), TEIAS decided to drop the Energy Management System (EMS) sub-component of the SCADA system; the EMS sub-component had been delayed significantly, and it is being financed under APL6 currently under implementation. Consequently, under Component 3 (Transmission Network Strengthening), it was possible to finance more substations of urgent priority as well as to acquire O&M equipment. Due to the changing priorities, one of the substations originally planned to be financed under APL2 was not ultimately financed.

APL3

Under APL3 Component 2 (Urban Transmission Network Upgrading), the financed subprojects differ significantly from those originally set out in the PAD. Construction of five of the eight pre-identified underground cables was not financed, and those subprojects were replaced by higher priorities: the construction of an underground cable at another location, an overhead transmission line, and purchase of 8 new transformers. In addition, one of the pre-identified substations was not financed. It was consequently possible to finance two relatively large substation investments under Component 1 (Transmission Network Strengthening) of APL3. One substation (held up by archeological finds) and one underground cable started under APL3 will be completed under APL 6.

See Annex 2 for more details on the changes in subprojects and outputs by component.

Financing

Given the changes and reprioritizations outlined above which reflect the time slice nature of APL2 and APL3 support, the allocations to components of both APL2 and APL3 changed from those envisaged at appraisal as summarized below.

	Appraisal (€ million)	Actual (€ million)
APL2		
Component 1(MMS)	13.8	4.5
Component 2 (SCADA/EMS)*	17.9	1.0
Component 3 (Grid Strengthening)	18.6	44.8
Total	*50.3*	*50.3*
APL3		
Component 1 (Transmission Network Strengthening)	38.3	56
Component 2 (Urban Transmission Network Upgrading)	86.4	68.7
Total	124.7	124.7

* EMS and parts of the SCADA work are being financed under APL6

2. Key Factors Affecting Implementation and Outcomes

APL2 and APL3 both financed a time slice of the same larger investment program of TEIAS in the same sector and policy context. Therefore, the background analysis, design choices and factors affecting implementation and outcomes were largely the same for both APL2 and APL3 and are presented in the sections below in a unified manner, with discussion of issues specific to either of the projects only where relevant.

2.1 Project Preparation, Design and Quality at Entry

Soundness of Background Analysis. APL2 and APL3 benefited from the innovative and well prepared and designed ECSEE APL Program. The Bank's country knowledge and extensive engagement with Turkey in the energy sector as well as the Bank's participation in the development of the Energy Community provided a good basis for the Bank's cooperation with Turkey through lending, policy advice and technical assistance. The use of the APL instrument gave the Bank the flexibility to respond to the changing priorities of the Government and TEIAS. The regular monitoring and regional benchmarking in the ECSEE process provided both peer support and peer incentives to improve performance. The Bank's Quality Assurance Group's (QAG) review of regional projects in October 2009 rated the quality of project design as Satisfactory and observed, *inter alia*, that the design of the APL program had proven sound over time and that the investments under APL3 were consistent with the Athens Treaty.

In addition, the background analysis done by the Bank in the context of the broader energy sector program, including advisory services on electricity sector reform options, the electricity market law, industry structure and the wholesale market, was used in the

preparation of APL2 and APL3. Two specific lessons from this analysis were particularly relevant for APL2 and APL3:

- **Regional Markets require Strong National Market Operational Capabilities.** Lessons from other regional electricity markets elsewhere were that to achieve progressive integration of energy markets required close attention to the design and operation of component national electricity markets. While Turkey's market implementation was amongst the most advanced in the ECSEE regional group, it required support from the highly experienced market operators to implement its market management systems and to achieve effective operation of its national market. Accordingly APL2 initiated and APL3 project continued the close advisory involvement of an international Panel of Experts, established by the World Bank, on the market design and implementation process.

- **Political Commitment and adequate financial support are key ingredients of successful reform programs.** Ongoing reforms in Turkey confirmed the country's abiding commitment to the regional initiative. APL2 and APL3 built on the political commitment of the Turkish Government to integrate with the European network and be an active participant in the implementation and operation of the ECSEE APL Program.

Project design. The PDOs of APL2 and APL3 were clear and aligned with the ECSEE APL Program objectives, and were realistically and appropriately defined to be such that each operation could be held accountable for achieving them. This is particularly evident in APL2 for which the PDO is very specific. For APL3 the PDO was broader, but still well within the scope and influence of the operation. Furthermore, the PDOs were fully in line with the country's key development objectives and important for Turkey to achieve given the very rapid growth in electricity demand. However, the outcome indicators of both APL2 and APL3 were initially output oriented (i.e. primarily tracking the completion of subprojects without adequately monitoring their impact). This was addressed, during implementation, by adding new, more outcome-oriented indicators. The project components of both APL2 and APL3 were well defined in relation to meeting the objectives and the factors that could be foreseen as influencing implementation – including government commitment and policies, appointment of key staff, management effectiveness – were within Government or TEIAS control. The project designs of both APL2 and APL3 were overall relatively simple, but the market components of APL2 did prove somewhat difficult to implement in the originally envisaged schedule, and, as a reflection of the time slice nature of the supported investments, the final sub-projects differed from those tentatively identified at appraisal. The capacity of TEIAS as the implementing agency was also a constraint in particular in terms of retaining qualified staff in certain areas of its operation, as discussed in the sections below.

Assessment of Risks. Overall, the risk analysis for both APL2 and APL3 was adequately done based on the information available and sector circumstances at the time of the appraisals. Potential risks to the ECSEE Program and the mitigating factors were identified as follows: (a) possible controversy over the pace of liberalization of the market, which was expected to be mitigated by provisions in the Energy Community

Treaty; this risk did not materialize in Turkey to any significant degree; (b) development of new generation capacity where individual countries may propose projects that are not necessarily optimal choices in the regional context; this was expected to be mitigated by the Energy Community implementation mechanism and also did not materialize for projects in Turkey; (c) the risk of delays in upgrading and implementing environmental legislation in countries that do not have short-term prospects of EU accession; this risk was to be mitigated by the provisions of the Treaty that require countries to comply with the relevant EC standards and by assistance from the international community; Turkey has implemented significant environmental legislation and the EU accession *Acquis Communautaire* chapter on environment is under negotiation; (d) the fundamental risk that the SEE region might not be able to meet the growing demand for electricity; the Energy Community program was regarded as the best mitigation for this risk, which could threaten the economic growth prospects and affect the quality of life in the region; this risk was expected to materialize in Turkey, but as the financial crisis temporarily slowed down growth in electricity demand the expected power supply shortage did not occur, and the increased investment by the private sector in particular in new generation capacity in recent years has so far enabled the rapidly growing electricity demand to be met; (e) the risk that in a liberalized market some uncompetitive plants may be forced to close and some less reliable customers may end up paying more for their electricity as generators prefer to sell to more creditworthy clients; this was expected to be mitigated by the countries who would manage the initial power contracting process; this risk did not materialize in Turkey.

The risk analysis specific to the APL2 investment projects (i.e. substations under Component 3) stated that the investments used proven designs and were not expected to contain any particular risks or controversial aspects. This has indeed proven to be the case. TEIAS' implementation capacity with regard to financial management and controls was correctly identified as a substantial risk in the APL2 PAD (see section 2.4). However, it appears that the risks related to the implementation capacity of TEIAS in other departments, in particular in relation to the market elements, were somewhat underestimated or not explicitly identified at APL2 appraisal. Taking into account the experiences from implementation of APL2 as well as the evolving electricity sector in Turkey, the risk analysis of APL3 identified the following key risks and mitigating factors:

(a) **Delays by Municipalities in issuance of permits for construction/installation work.** TEIAS had confirmed that they would obtain the necessary permits before the construction contracts were awarded. Given that the projects bring direct benefits to the municipalities it was expected that the process would be relatively smooth. This risk did not materialize in any significant way.

(b) **TEIAS Implementation Capacity**. TEIAS had scaled up its investment program and implemented new systems and procedures as part of the market implementation. With a de-facto restriction on hiring new staff, TEIAS' implementation capacity was expected to be stretched despite it having been able to hire some new staff for land acquisition, one critical area of TEIAS operations. This risk was expected to be mitigated to some extent by utilizing supply and installation contracts and the experience TEIAS had gained in the implementation of similar projects. However,

despite the mitigating factors, TEIAS's ability to attract and retain qualified staff has been a constraint.

(c) **Non-payment of electricity bills**. Although TEIAS' collection efficiency from EUAS had improved, it was still considered a moderate-to-high risk, in particular since the problem of non-payment of bills started with TEDAS not being able to collect all its bills, which then percolated up the chain of energy state owned enterprises. While TEIAS had managed to finance all its investments and meet its operating and debt servicing requirements, any decline in collection efficiency was expected to result in a cash constraint. Although the non-payment of bills became a serious concern, the problems were addressed and the situation has improved. These issues are discussed in the sections below.

2.2 Implementation

The implementation of the substations, cables and over-head line investments under APL2 and APL3 was satisfactory with the fairly routine nature of the investments, the familiarity of TEIAS with working with the Bank, and the flexibility and continuity of the APL instrument contributing to the good progress. Indeed, both the APL2 and APL3 mid-term reviews and the QAG 2009 review of APL3 noted that implementation progress was satisfactory with good commitment and disbursement rates (ahead of schedule in the case of APL3) and with TEIAS expected to meet performance targets.

Implementation of the market components of APL2 can be rated as moderately satisfactory. Their implementation was initially delayed by the preparation of the complicated and technically challenging bidding documents, which took longer than expected, and by TEIAS' understandable desire to wait for EMRA to issue market regulations before completing the design of the market management system. Although the APL2 mid-term review noted that the market component was moving well after initial delays, the bankruptcy of one of the contactors later during implementation caused further delays. As a consequence, some of the work on the market management system under APL2 is only now being completed and is expected to be brought into routine operation by mid-2011. At the same time, the restructuring of Component 1 of APL2 to include technical assistance and training of staff and market participants contributed to the overall successful implementation of APL2, and ultimately its market components as well.

TEIAS' financial situation was noted by both the APL3 mid-term review and the 2009 QAG review as an area of serious concern. TEIAS' cash flow position deteriorated rapidly in 2008 as a result of inadequate bill payment by its consumers, TETAS and EUAS.[4] This lead to a situation where TEIAS was no longer in compliance with the

[4] The main problem was the non-payment in the electricity balancing market, and TEIAS' inability to transfer delay payments to the state owned power generators. In addition, non-payments increased rapidly even outside the market with inadequate bill payment by TEDAS to TETAS and EUAS. In turn, TETAS and EUAS did not pay in full to either the market or TEIAS for transmission services.

APL2 and APL3 self-financing ratio covenant and where the cash flow situation was beginning to impact TEIAS' ability to finance its investment program and make debt servicing payments. Consequently, the Undersecretariat of Treasury had to step in during early 2009 to enable TEIAS to pay its repayment and interest obligations to the Bank. Treasury's debt management procedures require that any agency requiring Treasury payment guarantee should be current on all its debt servicing over the past 24 months. For the agencies which do not fulfill this requirement, Treasury directly borrows and onlends to the agencies. Therefore for APL6, Treasury borrowed the loan directly and onlent it to TEIAS. A further problem has been that TEIAS' auditors have been unwilling to issue an opinion on its annual audits leading to non compliance with another financial covenant (see section 2.4 for additional discussion).

However, since 2009 TEIAS's financial situation has improved dramatically and TEIAS has returned to compliance with the self-financing ratio covenant. Treasury allowed TEIAS to charge interest payments on any outstanding receivables between public sector companies. This enabled TEIAS to pass on the cost of delayed payments to the state owned power companies, and collect its receivables (dating as far back as 2003) from the generators, TETAS and TEDAS much more efficiently. Consequently, the company posted a substantial operating profit in 2009 and 2010. Also, legislation was adopted in early 2011 to net-out receivables and payables between public sector energy companies, which will also significantly reduce the receivables of TEIAS. See Annex 3 for a detailed financial analysis.

TEIAS implementation capacity, notably due its challenge of retaining qualified staff, has had an adverse impact on the implementation of APL2 and APL3, and on internal coordination within TEIAS itself. The staffing situation did nonetheless improve in certain areas, e.g. land acquisition (see below), and coordination within TEIAS appears to have improved, particularly after the appointment of the in 2010 General Manager (a position that was not officially filled for a considerable amount of time).

2.3 Monitoring and Evaluation (M&E) Design, Implementation and Utilization

APL2 and APL3 benefited from the comprehensive coordination and implementation apex mechanism established for the development of the Energy Community during the preparation of the ECSEE APL facility and further strengthened in accordance with the Treaty. ECSEE's Secretariat has provided an institutional mechanism for the regular monitoring of the countries' performance against agreed benchmarks. The Bank continued to participate in the Athens process including the Forum during APL2 and APL3 and also provided implementation support for the APL projects in the other SEE countries.

At the APL2 and APL3 project level, as noted in Section 1.3, the original indicators used to monitor progress toward PDOs were deemed inadequate and indicators that are more specific, outcome-oriented and easier to monitor were added during implementation. After the addition of such indicators, data has been collected by TEIAS in a reasonably timely manner. The data is monitored by the various departments of TEIAS and

consolidated by the project coordination unit. This was facilitated by the fact that the monitored data is being collected by TEIAS as part of its normal day to day operations and is of high relevance for TEIAS' own evaluation of progress made, helping it continuously improve the capacity and performance of its transmission system and the market. Given these factors, the monitoring and evaluation system is also very likely to be sustained beyond the APL2 and APL3 implementation periods.

The improvement of the results framework was a noteworthy achievement of project implementation. Nevertheless, some methodological shortcomings in the system fault and accident indicators collected for the transmission system as a whole make it difficult to assess the exact impact of APL2 and APL3 on the indicator values. Due to the formula used to calculate the fault indices, the indicator values on faults go down if the transmission network length increases, making it somewhat difficult to observe trends in faults over time. The fault indicators may also be misleading if they are compared with other countries. Current TEIAS definitions make a distinction between permanent faults (service interruptions requiring repair or replacement of equipment) and temporary faults (everything else), but there are inadequate records and reports on the origins and duration of the faults. The insufficient data prevents addressing the sources of faults suitably and precisely evaluating and benchmarking the power system's performance. TEIAS has agreed to review this and modify their monitoring systems as appropriate. Also, the specific data on the indicator on number of accidents does not differentiate between serious and less serious incidents, as an absolutely number target (rather than a relative value) does not account for the growth in the size of the TEIAS transmission system, and may also be influenced by how well staff is trained and encouraged to monitor and report accidents.

2.4 Safeguard and Fiduciary Compliance

Environmental Safeguard compliance. The ECSEE APL Program's overall environmental impact is considered positive as it has accelerated the introduction of EU-compatible environmental legislation and standards in the SEE region. In line with the Bank practice at the time, APL2 was assigned an environmental assessment category of Financial Intermediary (FI) since not all of the subprojects were fully identified at appraisal due to the time-slice nature of the investments. By the time of the APL3 appraisal the Bank's categorization practice had changed, and APL3 was assigned Category B for Environmental Assessment even though not all subprojects were identified. The Environmental Management Framework (EMF) developed by TEIAS during preparation of APL2, and which was utilized for both projects, gives guidance on the requirements of both the Turkish Environmental Impact Regulation and the relevant WB Operational Policies.

TEIAS implemented the requirements of the subproject EMPs in a satisfactory manner. All APL2 and APL3 subprojects were classified as Category B and the EMPs prepared by TEIAS were sent for prior review to the Bank. The approved EMPs were added to the Bidding Documents and TEIAS provided the awarded contractors supplementary information on the practical implementation of the EMP. Compliance with the EMPs was

continuously monitored by an independent environmental firm and the reports were shared with the World Bank on a quarterly basis, constituting a good practice example. Moreover, TEIAS Group Directorates are responsible for supervision of construction works, including the EMP implementation at the site. As a result, it can be said that EMPs were strictly followed and monitored. The only issue raised during implementation was the finding of archeologically important artifacts at the construction site of Yenikapi substation in 2008. As per the EMP, the mitigation measures defined for 'chance finds' were strictly followed. After the necessary archaeological works were completed, permission for continuing the construction works was given.

Land acquisition: Land acquisition impacts in APL2 and APL3 were limited to transmission tower footprints, agreements on rights-of-way for distribution line alignments, and land for sub-stations. Sub-stations were typically sited on government land, although in some cases private land was acquired for sub-station expansions. Management and mitigation of land acquisition impacts was undertaken in line with Turkish law and the Land Acquisition Management Framework (LAMF) prepared for the projects. The LAMF provided for a 'Summary Report of Land Acquisition Activities' to be submitted as part of the bi-annual project progress reporting to the World Bank. However, the LAMF did not specify the content or information requirements needed to meet OP4.12 resettlement plan criteria, and did not require prior Bank review and approval of resettlement plans. During project implementation, the Bank provided the client with written recommendations for follow-up, including the use of a Social Audit Reporting format for those projects where land acquisition was carried out using Turkish expropriation law, to verify if all land acquisition-related issues were resolved in a manner satisfactory to the World Bank's resettlement policy. The Social Audit reports have been prepared, reviewed by the Bank and disclosed publically. Bank supervision visits undertaken to clarify the situation indicated that no one was significantly impacted by land acquisition as a result of the projects.

TEIAS has demonstrated its willingness to improve implementation performance and has hired additional safeguard staff for land acquisition activities. Capacity building of these staff will be important to enhance implementation performance. Experience from APL 2 and 3 resulted in the LAMF for APL6 being revised to strengthen documentation, reporting and monitoring effectiveness in order to ensure full consistency with OP 4.12 requirements.

Fiduciary compliance. TEIAS has an acceptable financial management system for projects and control procedures were in place during implementation. The financial monitoring reports for APL2 and APL3 were received on time and the projects received unqualified audit reports for 2009 and the previous years. Staffing of the Financial Affairs Department is currently largely adequate. However, TEIAS did not meet the covenant on the ERP included in both APL2 and APL3. Although the ERP implementation is almost complete, it cannot be fully finalized as the contractor is bankrupt. TEIAS has attempted to renegotiate the contract but the ERP is not expected to become functional in the short-term and TEIAS' financial management software continues to be outdated and not responsive to TEIAS' needs.

TEIAS has for the last several years received a disclaimer opinion in the audit report for the entity's financial statements. The main issue relates to the lack of information on ownership of assets dating back to the time when parts of the system were owned by municipalities or by one of TEIAS' predecessors, i.e. TEK or TEAS. A way to resolve this issue would be for TEIAS to increase its capacity on this specific issue (in terms of qualified staff as well as technical expertise in this area) and to equip itself with information systems (ERP or alternative software) that would support updating the registries. In order to address these shortcomings, APL 6 includes a technical assistance component aimed at improving the reliability and quality of TEIAS' financial statements. TEIAS has agreed to prepare a financial management manual for Bank-financed projects.

Procurement. TEIAS complied with Bank procurement policies and guidelines in a satisfactory manner, and no significant issues were encountered. The procurement of Components 1 and 2 of APL2 took longer than expected due to the complex nature of the required services, bidding documentation, and the delays caused by the developing market regulations. In particular for the underground cable and GIS substation sub-projects, Bank involvement helped TEIAS develop good quality bidding documentation in English, with appropriate technical specifications that have been useful for TEIAS beyond Bank financed investments. However, in the last 2-3 years, there has generally been a low level of interest from firms to participate in tenders for transmission GIS substation and cable projects. The lack of interest from firms was most likely caused by the inordinate increase in worldwide demand for generation and transmission equipment. This issue was discussed between the Bank and TEIAS in particular in the context of GIS substation procurement. The Bank advised TEIAS to not restrict bidders only to GIS substation manufacturers and to also invite qualified contractors and suppliers to bid in the procurement of GIS sub-stations under APL6. This approach has indeed lead to an increase in the number of bids received.

2.5 Post-completion Operation/Next Phase

Both the physical and systems investments made under APL2 and APL3 are high priority for TEIAS and are expected to be maintained in a sustainable manner over time. The relevant operational departments of TEIAS have taken over the operation and maintenance of the market system, substations, cables and over-head transmission line financed by APL2 and APL3. The components of APL6 continue and complement the activities financed by APL2 and APL3, helping to ensure the continuity and sustainability of the investments made and measures taken thus far and transition to the post-completion phase. The environmental procedures used under APL2 and APL3 as well as monitoring of several of the indicators will also be continued under APL6, providing another measure of operational and institutional continuity and sustainability, and a way to continue monitoring and evaluating performance in the future. The supervision of APL6 will provide an opportunity for the Bank to further discuss and monitor the post-completion operation of the investments made under APL2 and APL3.

While staffing in the relevant departments of TEIAS is currently largely adequate and operational budgets are not a significant constraint, the ability to retain sufficient highly skilled staff remains the main short term risk to the post-completion phase operation and institutional capacity in an environment of competition with the private sector for such staff. Continuing to improve TEIAS' ability to operate efficiently will also be important for long term sustainability of the results achieved.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation

The ECSEE APL Program and the APL2 and APL3 project objectives and design remain appropriate and *highly relevant* for Turkey's power sector reforms and its integration to the SEE and European markets. Policy and market reforms and investments supported by the APL2 and APL3 projects were implemented in a satisfactory manner and provided significant support to the Government energy sector reforms and TEIAS' investment program aimed at increasing the safety, reliability, efficiency and capacity of the bulk power transmission system. The project objectives also remain relevant for the Country Assistance Strategy, under which the projects were prepared, and the 2008-11 Country Partnership Strategy, which reflects the Government's 9th National Development Plan and supported Government's efforts on reliable and efficient energy supply and on sustainable macroeconomic stability and economic growth.

3.2 Achievement of Project Development Objectives

The PDOs of APL2 and APL3 were achieved in a satisfactory manner. The projects made significant contributions to the investment program of TEIAS, and in particular to those related to the market management system and SCADA, despite the fact that their implementation took longer than anticipated and were still being completed at the time of this ICR. Further strengthening and upgrades of those systems are expected to be partly financed under APL6.

As evidenced by the outputs (see Annex 2 for details), the PDO objectives related to strengthening and expansion of the transmission grid and increasing its stability/reliability and capacity were also achieved and the APL2 and APL3 investments in the substations, transmission lines and underground cables made a significant contribution to the achievement of the objectives. The investments in GIS substations, monitoring equipment, cables and the over-head transmission line were targeted at geographic and power system areas experiencing rapid growth in load and demand, and where TEIAS' analysis showed that the reliability of the system was or would be at risk given these factors. Similarly, the introduction of the electricity market has increased the stability of the system with no major blackouts experienced since its introduction. The transmission capacity of TEIAS' system has significantly increased through the investments in the 380kV and 154kV GIS substations, 380kv and 154kV underground cables and the 380 kV over-head transmission line. APL2 and APL3 increased the transmission capacity at the substations in total by 3900MVA at critically important,

highly prioritized substations. It is particularly noteworthy that the investments in the substations not only increased TEIAS' total transformer capacity by over 4% but did so mostly in urban areas, requiring investment in the compact but more costly GIS substation technology.

Furthermore, the construction of a total of 33.6 km of underground cables in rapidly growing urban areas (making over-head cables an unviable option) such as the Istanbul region, was financed, significantly increasing the safety, capacity and reliability of the system in the subproject regions. Similarly, the 159.5 km over-head transmission line created a vital connection between South Marmara and Western Anatolia Regions, resulting in an enhancement of system reliability in the region.

As summarized in the table below and as detailed out in the project Data Sheet, the satisfactory rating for achievement of the PDOs is also substantiated by the projects having met or exceeded the outcome indicator target values for completion of investments, peak demand carried by the system, electricity transmitted, and share of electricity sold in the market, and progress being made towards meeting the target values for the two fault index indicators. Growth in TEAIS operations and energy demand provide background for the operating costs remaining higher than the indicator target, and methodological shortcomings in the indicator itself may have contributed to the total accidents number remaining higher than targeted. It should be noted that the size of APL2 and APL3 investments in the transmission infrastructure are nonetheless relatively small compared to the overall investment program of TEIAS, making it difficult to assess exactly the quantitative contribution of APL2 and APL3 transmission infrastructure investments to meeting the target values of the outcome indicators.

Indicator Description	Comments
APL2 and APL3 projects are completed.	APL2 projects are substantially completed and APL3 projects are completed (with the Yenikapi substation under construction, having been delayed by an archeological chance finding).
Peak demand carried by system (GW)	End of project target was achieved (at108% of target value).
Electricity transmitted (TWh)	End of project target was achieved (at 109% of target value).
Operating costs of transmissions (US$/GWh)	The operating costs remain higher than the targeted value mainly due to increased staff costs and costs for other ancillary services as TEIAS has grown in parallel to growing energy demand.
Electricity sold on the market as % of electricity transmitted	End of project target was achieved (at 132% of target value).
Total accidents	Total number of accidents remains above target by 22%. However, the indicator does not differentiate between serious and less serious accidents or, as an absolute target number, take into account the growth in the size of the

	transmission system. Better reporting may also be a contributing factor to the indicator value remaining above the target value.
Fault index on 380 kV system	The 380kV system faults have varied from year to year and were 44% above target in 2010. However, major blackouts have not occurred in the last few years, and most recent data shows progress due to measures to add insulation on critical lines to e.g. avoid faults caused by birds.
Fault index on 154 kV system	End of project target was almost achieved (at 3.5% above the target value). With the increased measures taken on e.g. replacing ceramic insulation with silicone insulation, the target could be achieved relatively soon.

3.3 Efficiency

The financing provided by APL2 and APL3 was designed to fund a time slice of the transmission investment program of TEIAS. Thus, the cost/benefit calculations were done on the total transmission investment program of TEIAS, not just Bank financing. The positive Net Present Values (NPV) and economic rates of return (ERR) as well as the outcome indicator values demonstrate that the costs involved in achieving APL2 and APL3 objectives were reasonable and that the investments represent "value for money".

The investment program of TEIAS was anticipated to be US$1.1 billion between 2005 and 2009 in the APL2 PAD and US$1.65 billion between 2006 and 2012 in the APL3 PAD. The APL2 PAD economic analysis yielded a base case real ERR of 14% with ERRs of between 7% and 17% in the low demand growth (5%/year) and high demand growth cases (9%/year) respectively. The NPV discounted at 10% is US$225 Million in the base case and US$-160 million and US$500 million under the low and high demand growth scenarios, respectively. The APL3 PAD analysis yielded an ERR of 18% in the base case and 12% in the low demand case, and NPVs of US$ 711 million and US$159 million under base case (8.3%/year) demand growth and low (6.3%/year) demand growth scenarios, respectively.

Although TEIAS has invested almost 30% more than anticipated in the APL2 PAD and 20% more than anticipated in the APL3 PAD, the transmission tariff has been enough to cover the costs. Thus, following the PAD approach and assumptions (other than for updated tariff and operating and maintenance costs) results in NPVs very similar to those in the PADs.

However, the economic benefits from expanding the transmission system are substantially higher than the transmission tariff charges. Therefore, in addition to the PAD base case approach, an alternative approach was used in this ICR to calculate the benefit of the entire investment project. Instead of the transmission tariff, the additional

transmission service is valued as the difference between the incremental cost of building small single cycle gas fired generating plants to serve local demand and supplying this demand through the grid using a new coal fired power plant with flue gas desulfurization – currently the least cost large new fossil plant type in Turkey. This difference is 0.9 Euro cents/kWh. This alternative approach results in higher NPVs (around US$6-7 billion and around US$8 billion using the APL2 and APL3 assumptions, respectively) and ERRs (approximately 40% and 50%, respectively) than the values in the PADs.

3.4 Justification of Overall Outcome Rating

Rating: Satisfactory

The overall outcomes are rated as satisfactory for both APL2 and APL3 based on the following: (1) as discussed in section 3.1, project development objectives and design remain appropriate and highly relevant for Turkey's power sector reforms and its integration to the SEE and European markets, as well as in the context of the Country Partnership Strategy between Turkey and the Bank, and the Government's National Development Plan; (2) as noted in section 3.2., project development objectives have been achieved as evidenced by the outcome indicators (see also Annex 2 for details on outputs) through the investments to the market management and SCADA systems and to the strengthening and expansion of the transmission system, notably in rapidly growing urban areas; (3) APL2 components were substantially completed and APL3 was disbursed ahead of schedule with all investment projects completed (see Annex 2 for details on outputs) with the exception of one substation that was delayed by archeological finds (APL6 will be used to complete the substation); (4) APL2 and APL3 are projected to yield attractive rates of return of 40% and 50%, respectively, as shown in the economic analysis summarized in section 3.3 and included in full in Annex 3; and (5) the project is sustainable and its priority in Turkey's power system remains high with the continued rapid growth in Turkey's energy sector, including rapid increase in renewable energy generation capacity. The shortcomings in the outcomes relate to delay in the implementation of APL2 market components and the fact that some outcome indicator targets were not achieved (possibly partly due to methodological shortcomings in the system faults and accident indicators as discussed in sections 2.3 and 3.2 above).

3.5 Overarching Themes, Other Outcomes and Impacts

(a) Poverty Impacts, Gender Aspects, and Social Development

Electricity consumers in Turkey benefit from a more cost-effective and efficient power supply facilitated by the projects, which has a positive impact on economic and social development.

(b) Institutional Change/Strengthening

The Bank's engagement with TEIAS and the Government in the energy sector over many years (through a comprehensive approach that included the NTGP, the three APL installments, other investment lending, the DPL series, policy dialogue, and technical

assistance) has significantly contributed to the operational and institutional capacity of TEIAS and the energy sector as a whole. Several TEIAS departments, including those responsible for the market, planning, and environmental issues have benefited from the cooperation with the Bank in terms of increased capacity or standards for economic analysis, feasibility studies, procurement documentation, environmental management and land acquisition. The Bank directly provided or arranged for a broad range of training, institutional strengthening and capacity building to TEIAS and other energy market participants, funded by both APL2 and APL3 as well as other sources (ESMAP and other trust funds, Bank budget etc.). For example:

- The Panel of Experts provided both general and targeted advice to TEIAS and the Government on electricity sector reform, regulation, privatization and market design.
- The market management system and control components of APL2, an area somewhat new to TEIAS, were accompanied by significant technical assistance that trained the staff and strengthened the institutional and other capacity of the market operator and market participants.
- Peer visits and study tours to and from Turkey to Romania and Brazil were arranged, enabling TEIAS to learn from other countries' experiences on e.g. market operation and splitting, system optimization and integration of wind and other renewable energy sources to the grid.
- TEIAS has an environmental team which is successfully following the EMFs and working cooperatively with the Bank. The team is participating in environmental safeguard training sessions of the Bank and has strengthened its performance based on feedback from Bank safeguard specialists through EMP reviews and regular supervision missions.

(c) Other Unintended Outcomes and Impacts

The Balancing and Settlement Mechanism in the Turkish electricity market commenced operations in August 2006, and though it was meant to be a market for imbalances, it evolved very quickly into a de-facto spot market with over 26% of all electricity transacted in this market in 2010. After the introduction of the market, private generators were able to attract much better prices for their electricity, triggering a significant increase in supply which helped improve the stability of the system and the energy security of the country as a whole. Furthermore, the market provided a profitable, viable off-take mechanism for renewable energy which otherwise had been struggling to find viable buyers. Prior to the introduction of the market as an alternative, renewable energy generators often hesitated to sell to the host distribution company since many of the distribution companies were not on a financially sound standing.

The market system and technical assistance components of APL2 made it more feasible to implement the wholesale market in a short time, and the power sector dialogue between the Bank, the Turkish Government and TEIAS allowed the Bank to provide its advice on its design and implementation. Furthermore, the Panel of Experts advised the

Government and TEIAS on the wholesale market design and helped create transparent market rules.

4. Assessment of Risk to Development Outcome
Rating: Negligible/Low

From the point of view of the overall ECSEE APL Program, the risk that the contributions made by Turkey to meeting its objectives would be at risk is very low. While Turkey has not signed the Energy Community Treaty it remains committed to its objectives and the Government has implemented many energy sector reforms that are directly relevant to the Energy Community objectives. A review of Turkey's progress relative to the requirements of the Treaty conducted by the Bank in the context of the APL6 preparation concluded that (a) if Turkey were to sign the Treaty, it would be in compliance at least at the same level, if not above, other signatories and (b) in practical terms the key elements of the Treaty required for the development of the electricity market have been substantially met by Turkey.

As noted in Section 2.5 above, the subprojects financed by APL2 and APL3 are being operated and maintained by TEIAS relevant operational departments, and the risk that the outcomes would not be maintained is low. TEIAS is implementing an extensive investment program, largely financed from TEIAS's budget appropriations, which will further support both ECSEE APL Program as well as APL2 and APL2 PDOs and the Energy Community objectives.

The QAG reviewed the APL3 project in October 2009 and made the following comment on the overall risk to the development objective: "*While bill collection and issuance of an audit opinion remain project issues which need to be addressed, the risks of this project not achieving its Regional Program or Project DOs concerning the evolution of the power market in Turkey are considered moderate.*" Since the QAG review, TEIAS ability to collect its bills and its overall financial condition have improved rapidly. However, the issues related to the audit opinion remain. The main uncertainties over the longer term relate to TEIAS' ability to operate more commercially, retain qualified staff, and continue its investment program in an effective manner to meet the rapidly growing electricity demand, in particular in certain regions of the country. TEIAS will also need to meet the expectations and needs of electricity distributors and generators, both of which are being or are planned to be largely privatized.

5. Assessment of Bank and Borrower Performance

5.1 Bank Performance

(a) Bank Performance in Ensuring Quality at Entry
Rating: Moderately Satisfactory

The Bank identified, prepared and appraised APL2 and APL3 in the broader policy context of the Energy Community, Turkey's Electricity Sector Reform and Privatization

Strategy Paper and the Country Assistance Strategy, and building on the solid background analysis and criteria of the ECSEE APL Program. The Bank also mobilized a team with all necessary skills including specialists in electricity markets, utilities, engineering, procurement, environment, and finance/financial management. The team included several staff with long experience in the energy, finance/financial management and environment sectors in Turkey. The combination of solid skills and experience enabled the Bank to develop a good working relationship with TEIAS, other energy sector agencies and government officials and effectively contribute to the high quality project. The Bank's analytical work and the Panel of Experts provided valuable policy advice to the Government, including on electricity market reform, both during appraisal and implementation. However, both the Bank and the borrower did somewhat underestimate during preparation the complexity (while overestimating the investment cost) of procuring and implementing the Strengthening of the National Load Dispatch System and Market Management System components of APL2. Also, as noted above, the original outcome indicators were later deemed inadequate and new outcome oriented indicators needed to be added. Given these issues, Bank performance during identification, preparation and appraisal of the APL2 and APL3 projects is rated as moderately satisfactory.

(b) Quality of Supervision

Rating: Satisfactory

The Bank was actively involved in Turkey's energy reform process throughout the projects' implementation period through policy dialogue, development policy lending and implementation support for other ongoing energy operations.

The Bank was particularly effective in integrating the implementation support for these projects with other efforts in Turkey, enabling frequent dialogue with TEIAS and ability to respond to events in a timely fashion. The Bank provided implementation support for the APL2 and APL3 projects regularly during 2006-2010. All implementation support missions and some follow-up visits were jointly conducted with TEIAS and other relevant counterparts, and included both Bank Turkey country office and headquarters staff. Country office staff interacted with TEIAS and other Government counterparts on a regular basis, allowing to maintain a constant dialogue, and to jointly address daily operational issues. The intensive and continuous implementation support provided by the Bank helped ensure timely and pro-active identification of potential problems and the identification of possible solutions, jointly with the borrower. Effective project implementation support was helped by the fact that the Task Team Leader at preparation is now the Sector Manager for the Sector Management Unit, the current Task Team Leader was part of the preparation team, and much of the core team remained largely unchanged throughout the implementation phase.

However, the QAG review of APL3 in 2009 noted the following: "*Although institutional financial issues seem to have been encountered for several years, the IP rating in all ISRs for all items has been "S" until ISR #4, and the mention of MS was only made in ISR #5 of July 2009. In the panel's view they should have been MS at end FY 08 and end FY 09 as*

the problems were ongoing for a while, and led to non compliance of covenants." This ICR agrees with the QAG panels assessment on this issue. Also, the Board was informed of the addition of the technical assistance component to APL2 only ex-post in 2009 along with several other projects in a similar situation, and the agreement to add new indicators was not formalized through changes to the legal agreements. Despite these issues and given the Bank's t strong and well-rooted dialogue with the Government and TEIAS on sector reform issues and proactive approach towards resolving issues related to TEIAS' financial status, this ICR rates the overall quality of supervision as Satisfactory.

(c) Justification of Rating for Overall Bank Performance
Rating: Satisfactory

Overall Bank performance is assessed as satisfactory based on the moderately satisfactory performance during identification, preparation and appraisal of the project, and satisfactory project implementation support.

5.2 Borrower Performance

(a) Government Performance
Rating: Satisfactory

Turkey remains committed to the goals, principles and key provisions of the Athens Process. The Government has and continues to implement a comprehensive electricity sector reform program including vertical unbundling of the sector, establishment of an independent regulatory framework, introduction of retail competition, introduction of the market, and privatization of distribution. Privatization of generation is expected to start during 2011, and there are active plans to separate the market operator from TEIAS to create an independent entity. The speed and depth of the reforms have been impressive.

However, some of the market regulations could have been implemented faster, and the Government was somewhat slow in addressing the bill payment issues leading to TEIAS' financial problems during 2008 and 2009 that had an adverse effect on the market. The budgets provisioned for TEIAS for its operating and investment costs, while an issue earlier, have in the recent years been adequate. The currently used three year budget planning process is also an improvement compared to the earlier yearly budgeting.

(b) Implementing Agency or Agencies Performance
Rating: Satisfactory

The Implementing Agency's performance is rated as satisfactory. TEIAS has performed very well taking into account the significant challenges of the very rapidly evolving electricity sector and related regulations, and its limited ability to increase and/or retain qualified staffing. The project coordination unit originally established under the NTGP continued its operation under APL2 and APL3, making coordination and cooperation within TEIAS and between TEIAS, the Bank and the Government efficient. Furthermore, TEIAS implemented all requirements related to Bank safeguard and fiduciary policies in

a satisfactory manner. In fact, the implementation and monitoring of EMPs can be deemed a good practice example. Quarterly progress reporting on implementation from TEIAS has also been timely and comprehensive. The shortcomings in meeting the financial covenant on the ERP and the continued inability of TEIAS to obtain unqualified entity level audit opinions did not have any direct impact on the implementation of the projects or achievement of the development objectives.

(c) Justification of Rating for Overall Borrower Performance
Rating: Satisfactory

Overall Borrower performance is assessed as satisfactory based on the satisfactory performance of both the Government and the Implementing Agency.

6. Lessons Learned

Several broad lessons learned from the overall ECSEE APL Program contained in the 2009 QAG reviews also apply to Turkey and the APL2 and APL3 projects and can be summarized as follows:

- **Analyze and put in place critical program level conditions and design elements for success when designing and implementing programmatic operations.** The regional ECSEE APL program has been a success due to (i) the underlying Treaty framework, apex institutions, and leadership and monitoring at the program level; (ii) a flexible project design and (iii) pro-activity and continuity among Bank staff and success in obtaining outside funds to support the agenda. However, these conditions may not work or be critical in all cases.
- **Upfront approval of an APL facility can help solidify both Bank and client commitment and cooperation around a sectoral and/or regional agenda.** While the APL instrument offered little streamlining in processing of individual operations, the upfront approval of the US$ 1 billion APL facility provided strong evidence of Bank commitment and helped increase the credibility of the Energy Community ahead of the signing and effectiveness of the Treaty.
- **Creating a formal project identity for regional engagements would enhance visibility and accountability within the Bank for operations involving complex regional dialogue and structures.** As there is no formal lending relationship underpinning the Energy Community dialogue between the Bank and regional apex institutions, there is no formal project identity, budgeting and direct accountability within the formal Bank system for effective regional dialogue. Fortunately this does not appear to have been a serious problem to date, given steady and strong management support and continuity in staffing assignments.

In addition the following more specific lessons can be drawn from the implementation and achievements of APL2 and APL3:

- **Political commitment and sustained dialogue over time are critical for electricity market reform and the APL instrument is useful in this regard.** Electricity market reform is a complicated agenda and takes time to implement even when backed by the Government's strong political commitment, as is the case in Turkey. The programmatic nature of the APL instrument allowed the Bank to continue and sustain its support to the Government's agenda. The Bank's continued broad engagement in the energy sector in general and the ongoing APL6 in particular provide a platform for maintaining the dialogue in the post completion phase.

- **Opportunities for enhanced coordination between electricity market actors in Turkey remain and should be exploited.** Increased coordination and continuous information sharing between EMRA and TEIAS could help TEIAS plan and target its investments more effectively and in a timely manner.

- **A restructured, largely privatized electricity sector requires that TEIAS as the system operator and market operator has the capacity to react to rapidly evolving operating environment in a proactive and timely manner; the Government may therefore want to consider ways to increase TEIAS' capacity to operate more efficiently.** TEIAS will need to operate in a manner that reacts to changing circumstances and the needs of the increasingly privatized distribution and generation sectors, as well as be able to attract and retain qualified staff.

- **In order to maximize the benefits provided by the flexibility of the APL instrument, define clear criteria for subprojects, ensure sufficient size of individual loan installments.** The APL instrument was particularly useful in the rapidly developing Turkish environment, allowing both the borrower and the Bank to react to changing priorities. Its programmatic and time slice nature allowed flexibility to continue investments initiated under APL2 in APL3 and on to APL6 in some cases and to replace subprojects with higher priority ones during implementation. At the same time, it was somewhat costly and time consuming for TEAIS to move subprojects from one APL installment to the next or to apply Bank requirements to sub-projects that had originally been initiated under national procurement and safeguard policies. Better defined criteria for investments would have helped TEIAS plan and identify subprojects accordingly, and this lesson is reflected in the criteria for APL6. Larger size of the APL loan installments would also have helped in this regard – in fact, APL2 was originally planned to be of more significant size, and the size of the Turkey APL installments has increased over time with APL6 being the largest installment to date.

- **Identify indicators that not only measure the completion or output of projects but also outcomes, impact or results, and that help quantify the impact and causally link them to the projects.** While the original results indicators in APL2 and APL3 were useful, they were output oriented and additional, outcome and results oriented indicators needed to be added during

implementation. Also, some of the indicators used made it difficult to quantify the specific impact of the APL2 and APL3 subprojects on the indicator values.

7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners

(a) Borrower/Implementing Agencies

A summary of TEIAS' ICR is presented in Annex 7. The Bank has no comments on issues raised in the Borrower's ICR.

(b) Cofinanciers

The ECSEE APL2 and APL3 projects did not have co-financing.

(c) Other partners and stakeholders

The European Commission and the Energy Community Secretariat are the Bank's main partners in the ECSEE APL program. Commission and Bank staff cooperated during the ECSEE APL program preparation, and Commission, Secretariat and Bank staff cooperated during implementation of APL2 and APL3. Commission and Secretariat comments on the overall ECSEE APL program were included in their comments on the ICR for the APL1 Romania Hidroelectrica S.A. Project, and are not duplicated here.

Annex 1. Project Costs and Financing

APL3

(a) Project Cost by Component (in USD Million equivalent)

Components	Appraisal Estimate (EURO millions)	Actual/Latest Estimate (EURO millions)	Percentage of Appraisal
Transmission Network Strengthening	41.3	76.3	185%
Urban Transmission Network Upgrading	95.0	73.4	77%
Total Baseline Cost	**136.4**	**149.7**	**110%**
Physical Contingencies	5.8	Included in the total costs	n/a
Price Contingencies	7.5	Included in the total costs	n/a
Total Project Costs	149.7	149.7	100%
Front-end fee PPF	0.00	0.00	
Front-end fee IBRD	0.3	0.3	
Total Financing Required	**150.0**	**150.00**	**100%**

(b) Financing

Source of Funds	Type of Cofinancing	Appraisal Estimate (EURO millions)	Actual/Latest Estimate (EURO millions)	Percentage of Appraisal
Borrower		25.0	25.0	100%
International Bank for Reconstruction and Development		125.00	125.00	100%

Annex 2. Outputs by Component

APL2 and APL3 investments represent a time slice of a large, ongoing investment program of TEIAS. Therefore, the investments identified in the APL2 and APL3 PADs were somewhat indicative and changed during implementation due to reprioritization of investments over time, as discussed in Section 1.7 above and as detailed in the table below. Note also that in many cases the total contract cost is higher that the amounts financed by APL2 and APL3, respectively, with the balance financed from other sources (including NTGP and APL6 in some cases).

Table: Pre-identified and implemented/actual sub-projects financed by APL2 and APL3

Pre-identified/planned	Implemented/actual
APL-2	
Component 1: Market Management System	
Market Management System (MMS)	Market Management System (MMS) (Day Ahead Market Trading and Settlement System
	Automatic Meter Reading System (AMR)
	Balancing and Settlement System (BSS)
Component 2: Strengthening of National Load Dispatch	
Regional Terminal Units (RTUs), regional control centers (RCC), control center & communication equipment and expansion/revision of the EMS programs	Three Remote Control Centers and 75 Remote Terminal Units
	Tele-control Interface Equipment and Services
Component 3: Transmission System Reinforcement	
Strengthening and renovation of existing substations and O&M equipment	GIS Yenibosna Substation
	GIS Beykoz Substation
	GIS Altintepe Substation
	GIS Van Substation
	Davutpas-Yenibosna underground cable
	O&M materials, equipment
APL- 3	
Component 1: Transmission Network Strengthening	
GIS Alsancak Substation	GIS Alsancak Substation
GIS Yenikapi Substation	GIS Yenikapi Substation
Ayrilikcesme 154 kV GIS Substation	*Not financed*
Yildiztepe – Davutpasa 380 kV Underground Cable	Yildiztepe – Davutpasa 380 kV Underground Cable
Additional Investments (not identified)	GIS Mancarlik Substation
	GIS Küçükbakkalköy Substation
Component 2: Urban Transmission Network Upgrading	
154 kV Davutpasa-Bagcilar underground cable	154 kV Davutpasa-Bagcilar underground cable
154 kV Bagcilar-Atisalani underground cable	154 kV Bagcilar-Atisalani underground cable

380 kV Ümraniye-Kucukbakkalöy underground cable	380 kV Ümraniye-Kucukbakkalöy underground cable
Ümraniye-Vaniköy (P20) underground cable	*Not financed*
Bornova – University underground cable	*Not financed*
(Bornova-University) Bran P.- Morsan underground cable	*Not financed*
Bozyaka-Karabağlar underground cable	*Not financed*
Karabağlar-Buca underground cable	*Not financed*
	380 kV Davutpasa-Yenibosna underground cable
	Karabiga-Can-Soma over-head transmission line
	5 new 154/33KV transformers
	3 new 380/154 KV auto-transformers

APL2

Component 1 – Market Management System (MMS): Component 1 consisted of the Market Management System (Day Ahead Market Trading and Settlement System), the Automatic Meter Reading System (AMR) and a technical assistance contract for the electricity market balancing and settlement system (BSS) and training, as summarized in the table below.

The Day Ahead Market Planning was largely completed with simulations and training for participants is underway. The Day Ahead Market is expected to be put on-line on by December 1, 2011. Warranty payments on the system will continue for at least three years thereafter. The AMR was completed as originally planned. However, the operational acceptance tests have taken a long time and are not completed yet. The consulting contract for the BBS was renewed for 18 months in March 2010 to be partly financed by APL6, and will continue until September 2011.

Subproject	Amount financed by APL2
Market Management System (MMS) (Day Ahead Market Trading and Settlement System)	€ 1,617,603
Automated Meter Reading System (AMR)	€ 745,763
Balancing and Settlement System (BSS)	€ 2,103,231
Total	€ 4,466,596

Component 2 – SCADA/EMS (supervisory control and data acquisition/energy management system): Three Regional Control Centers, 75 Remote Terminal Units (RTUs) and related equipment were financed under this component as summarized below. The contract was scheduled to have been finished in July 2010, but the equipment was only delivered towards the end of August 2010, with installation continuing into 2011. The three Regional Control Centers are completed and the testing of the RTUs is expected to be completed by June 2011. TEIAS and the contractor agreed in April 2011 to integrate the database management system of the three new Regional Control Centers

to TEIAS' existing SCADA database system, which lead to extension of the contract completion date to June 14, 2011.

Subproject	Amount financed by APL2
Three Remote Control Centers and 75 Remote Terminal Units (RTUs)	€ 936,727
Tele-control Interface Equipment and Services	€ 109,406
Total	€ 1,046,133

Component 3 – Transmission grid strengthening and expansion: Four GIS substations, an underground cable and O&M materials and equipment (thermal cameras, mobile transformers and monitoring systems) were financed as follows (including voltage and size of the GIS substations):

Subproject	Amount financed by APL2
GIS Yenibosna Substation (380/154kV, 950MVA)	€ 17,048,546
GIS Beykoz Substation (380kV, 250MVA)	€ 9,456,736
GIS Altintepe Substation (154kV, 200MVA)	€ 8,344,830
GIS Van Substation (380kv)	€ 2,008,591
380kV Davutpaşa-Yenibosna underground Cable (7.1km)	€ 1,438,074
O&M materials, equipment	€ 6,537,195
Total	€ 44,833,971

APL3

Component 1 – Transmission Network Strengthening: Construction of four GIS substations and an underground cable were financed as summarized in the table below (including voltage and size of the GIS substations and voltage and length of the cable). One of the substations, Yenikapi, was held up on account of archeological findings and will be completed under APL 6.

Subproject	Amount financed by APL3
GIS Alsancak Substation (154kV, 50 MVA)	€ 5,807,578
GIS Yenikapi Substation (154kV, 250MVA)	€ 6,119,832
420 kV Yildiztepe – Davutpasa Underground Cable (9.3 km)	€ 15,201,945
GIS Mancarlik Substation (154kV, 100MVA)	€ 6,654,692
GIS Küçükbakkalköy Substation (420kV, 750MVA)	€ 22,215,824
Total	€ 55,999,870

Component 2 – Urban Transmission Network Upgrading: Four underground cables, an overhead transmission line, and eight new transformers were financed as summarized below (including the voltage and length of the cables and the transmission line). The

Yenibosna-Davutpasa Underground Cable initiated with APL2 and APL3 financing will be completed under APL 6.

Subproject	Amount financed by APL3
154 kV Davutpasa-Bagcilar underground cable (5.8 km)	€ 11,879,684
154 kV Bagcilar-Atisalani underground cable (5.0 km)	€ 10,957,284
380 kV Ümraniye-Kucukbakkalöy underground cable (6.3 km)	€ 16,118,504
380 kV Davutpasa-Yenibosna underground cable (7.3 km)	€ 2,555,319
380 kV Karabiga-Can-Soma over-head transmission line (159.5 km)	€ 16,300,317
Five154/33KV transformers & three 380/154 KV auto-transformers	€ 10,876,522
Total	€ 68,687,630

Impact on Reliability and Transmission Capacity

APL2 and APL3 made a significant contribution to the reliability of the system. The investments in GIS substations, monitoring equipment, cables and the over-head transmission line were targeted at geographic and power system areas experiencing rapid growth in load and demand, and where TEIAS' analysis showed that the reliability of the system was or would be at risk given these factors. Similarly, the introduction of the electricity market has increased the stability of the system with no major blackouts experienced since its introduction.

The transmission capacity of TEIAS' system was also significantly increased through the investments in the 380kV and 154kV GIS substations, 380kv and 154kV underground cables and the 380 kV over-head transmission line. APL2 and APL3 increased the transmission capacity at the substations by 1450MVA and 1150MVA, respectively. APL3 greatly exceeded the intermediate results indicator target of 640MVA. Furthermore, the eight new transformers purchased to serve as reserve equipment total 1300MVA. Thus, the total capacity addition of 3900MVA at critically important, highly prioritized substations was achieved.

The construction of a total of 33.6 km of underground cables in rapidly growing urban areas (making over-head cables an unviable option) such as the Istanbul region was financed, significantly increasing the safety, capacity and reliability of the system in the subproject regions. Similarly, the 159.5 km over-head transmission line created a vital connection between South Marmara and Western Anatolia Regions, enhancing the reliability of the system in the region, allowing expected connection of close to 1000MW of new wind power supply by 2012, and forming a part of a bigger transmission project.

Annex 3. Economic and Financial Analysis

ECONOMIC ANALYSIS

Original PAD Analysis of APL2

The financing provided by the APL2 Loan was designed to fund a time slice of the transmission investment program of TEIAS. Thus the cost/benefit calculations were done on the total transmission investment program of TEIAS, not just Bank financing. The investment program of TEIAS totaled US$1.1 billion between 2005-2009, averaging close to US$220 million per year.

This investment program has provided the funding to upgrade and to expand TEIAS' transmission system and thus to increase the quantity of electricity transmitted, which is the main measurable project benefit. The incremental benefit from transmitting an additional kWh of electricity was valued in the PAD as 0.4 US cents/kWh, which was the estimated electricity transmission tariff. Thus the benefit from the transmission investment program for any given year was the incremental electricity transmitted that year (compared to the base year) times the incremental benefit.

Program costs have comprised the annual capital investments plus an estimate of the incremental operating costs of the investment program. The incremental operating cost of transmitting one kWh of electricity was estimated in the PAD as 0.12 US cents/kWh.

The analysis in the PAD was undertaken using these assumptions from 2005 to 2025. This analysis showed that the project had a real economic rate of return (ERR) of 14% and the Net Present Value (NPV), discounted at 10%, was US$225 million in 2005 dollars. Besides, two sensitivity tests were conducted. The first assumed a lower growth in Turkish electricity demand and TEIAS' transmissions (5% per year) than is expected. In this scenario, the ERR from the investment program dropped to about 7% and it had a negative NPV (US$-160 million) at a 10% discount rate. The second sensitivity test assumed that electricity demand and transmission of electricity was to grow at the historic rate of about 9% per year. In this scenario, the ERR rose to 17% and the NPV of the program at a discount rate of 10% rose to US$500 million.

No rates of return were calculated in the PAD for individual project components.

ICR Base Case

In the base case, the same approach to calculate the benefit of the entire investment project in the PAD analysis, adjusted to the inflation, has been followed. The economic analysis was undertaken using two demand scenarios. Based on MAED mode, the electricity demand growth has been estimated as 7.5% and 6.7% per year in the high case scenario and low case scenario, respectively. The benefits are the actual incremental electricity transmitted, which is valued at the actual average tariff charged for transmitting electricity (0.33 Euro cents per kWh or about 0.45 US cents/kWh). The

costs are the actual investment costs of the program during 2005-2010 plus an estimate of the incremental operating and maintenance costs. For the latter, the incremental cost of 0.13 Euro cents per kWh, that is the ratio of the increase in the operating costs in the last five years to the increase in the volume transmitted in the same period , is applied.

This analysis led to very similar NPVs to the NPVs in PAD analysis in both 2005 and 2010 dollars and under both demand scenarios. Although TEIAS' investments were higher than the anticipated amounts at the project beginning, the tariffs have covered the increased investment costs. Besides, the economic benefits from expanding the transmission system are substantially higher than the transmission tariff charged.

ICR Alternative Case

Similar to the base case, the economic analysis was undertaken using two demand growth scenarios (low case scenario of 6.7% growth per year and high case scenario of 7.5% growth per year).

As mentioned earlier, the economic benefits to Turkey from expanding the transmission system are substantially higher than the transmission tariff charged. If the transmission system was not expanded then it is assumed the load growth would be met from local generating plants using natural gas, or possibly, fuel oil. For APL6, it was estimated that the cost of supplying electricity to a city through new small local gas-fired generation plants was about 0.9 Euro cents/kWh higher than supplying power through the grid from large new coal-fired combined cycle plants.[5] The additional operating and maintenance costs per kWh of electricity transmitted are estimated at 0.13 Euro cents/kWh. Using these assumptions for the value of the transmission service (0.9 Euro cents/kWh) and its cost (0.13 Euro cents/kWh), adjusted for inflation, combined with the actual investment costs and amounts of electricity transmitted leads to an ERR of 39% and 40% (according to low demand and high demand scenarios). The NPV, in this case discounted at 10 percent, would be US$ 5.9 billion and US$ 6.4 billion in 2005 dollars (as shown in Table below).

Table: Economic Results for APL2

	Anticipated Demand Growth	ERR (percentage)	NPV@10% (2005 US$ million)	NPV@10% (2010 US$ million)
PAD	High (9%)	17%	500	
	Expected	14%	225	
	Low (5%)	7%	-160	
ICR - Base Case	High (7.5%)	11%	200	223

[5] Given the gas prices in Turkey (2010), the estimated cost of this power is 6.9 Euro cents/kWh at a 10% rate of return. The cost of supplying power from a new generating plant located some distance from the load source was about 6.0 Euro cents/kWh assuming that it is a new coal fired plant with flue gas desulfurization (with a 10% rate of return). This difference of 0.9 Euro cents/kWh was used as the value provided by the substation and transmission lines.

	Low (6.7%)	10%	52	58
ICR - Alternative Case	High (7.5%)	40%	6,437	7,187
	Low (6.7%)	39%	5,861	6,544

Original PAD Analysis of APL3

The economic analysis in the PAD of APL3 was undertaken using two different approaches:

1. **Economic analysis of the TEIAS investment program as a whole:** An assessment, similar to the analysis in the PAD of APL2, was conducted for the ERR of TEIAS' entire investment program, of which the Bank has cumulatively financed a "time-slice" of about 16%, through NTGP, ECSEE-APL2 and ECSEE-APL3.

2. **Economic Rate of Return on specific components**: An assessment was conducted for the economic benefits of specific components, such as a sample of substations (Alsancak, Yenikapi and Ayrilikcesme) where the growth in load in the area around the substation provided an economic rationale for that particular substation, and the 380 kV transmission cable, Yildiztepe-Davutpasa, which was designed to improve reliability in the Davutpasa area.

In the assessment of the TEIAS' entire investment program, the APL3 PAD used the same approach as the APL2 PAD had used. The incremental benefit from transmitting an additional kWh of electricity was valued as 0.43 US cents/kWh, which was the estimated electricity transmission tariff. The incremental operating cost of transmitting one kWh of electricity was estimated in the PAD as 0.12 US cents/kWh.

In this analysis for APL3 undertaken from 2006 to 2026, two demand forecasts based on an economic growth scenario prepared by SPO and electricity demand forecasts driven from the MAED model (Model for Analysis of Energy Demand) were used. In the base/high case scenario and low case scenario, the electricity demand growth was estimated as 8.3% and 6.3% per year, respectively. Electricity transmitted through the TEIAS system was assumed to remain about 78% of demand, which was the case in 2004 and 2005.

Based on these assumptions, the ERR for TEIAS' investment program was 12% in the low demand case and 18% in the base or high case. The NPV of this program at a 10% discount rate was US$159 million in the low demand case and US$710 million in the base case.

Economic rate of return on some of the individual substations constructed under APL3 were estimated as well. The estimated value-added of a substation would be the difference in cost between a new local single-cycle gas-fired power plant and the power delivered through the grid, including estimated wire costs from a new combined-cycle power plant. This difference is 1.0 US cents/kWh, although this approach is not a precise

fit for all of the project-financed substations, it is a useful first approximation of the substation service value. Using 1.0 cents/kWh, a real economic rate of return was calculated for each substation built under this project. The ERR ranged from a low of 13% for Ayrilikcesme to a high of 20% for Alsancak, and the ERR for Yenikapi (18%) was in the middle.

In addition to this, the ERR for Yildiztepe-Davutpasa 380 kV transmission cable was estimated as 21%, based on the cost of estimated energy interruptions if that cable had not been in place, and the international average of outage (3.4 hrs per year) per kilometer on a 380 KV cable. The cost of unserved energy was taken at 385 Euros per MWh - that is the Bank consultants' estimate of unserved energy in Southeast Europe.

ICR Base Case

In the base case, the same approach was used to calculate the benefit of the entire investment project as in the APL3 PAD, adjusted for inflation. This economic analysis was undertaken using two demand scenarios. Based on MAED model, the electricity demand growth has been estimated as 7.5% and 6.7% per year in the high case scenario and low case scenario, respectively. The benefits are the actual incremental electricity transmitted, which is valued at the actual average tariff charged for transmitting electricity (0.33 Euro cents per kWh). The costs are the actual investment costs of the program during 2006-2010 plus an estimate of the incremental operating and maintenance costs. For the latter, the incremental cost of 0.08 Euro cents per kWh that was used in the PAD of the APL6 is applied.

This analysis led to very similar NPVs to the NPVs in PAD analysis in both 2005 and 2010 dollars and under both demand scenarios. Although TEIAS' investments were higher than the anticipated amounts at the project beginning, the tariffs have covered the increased investment costs. Besides, the economic benefits from expanding the transmission system are substantially higher than the transmission tariff charged.

ICR Alternative Case:

Similar to the base case, the economic analysis was undertaken using two demand growth scenarios – a low case scenario of 6.7% growth per year and high case scenario of 7.5% growth per year.

As mentioned earlier, the economic benefits to Turkey from expanding the transmission system are substantially higher than the transmission tariff charged. If the transmission system was not expanded then the load growth would be met from local generating plants using natural gas, or possibly, fuel oil. For APL6, it was estimated that the cost of supplying electricity to a city through new small local gas-fired generation plants was about 0.9 Euro cents/kWh higher than supplying power through the grid from large new

coal-fired plants.[6] The additional operating and maintenance costs per kWh of electricity transmitted are estimated at 0.13 Euro cents/kWh. Using these assumptions for the value of the transmission service (0.9 Euro cents/kWh) and its cost (0.13 Euro cents/kWh), adjusted for inflation, combined with the actual investment costs and amounts of electricity transmitted leads to an ERR of 56% and 57% (according to low demand and high demand scenarios). The NPV, in this case discounted at 10 percent, would be US$ 7.4 billion and US$ 8.2 billion in 2005 dollars (as shown in Table below).

Table: Economic Results for APL3

	Anticipated Demand Growth	ERR (percentage)	NPV@10% (2006 US$ million)	NPV@10% (2010 US$ million)
PAD	High/Base (8.3%)	18%	710	
	Low (6.3%)	12%	159	
ICR - Base Case	High (7.5%)	13%	470	508
	Low (6.3%)	14%	658	712
ICR - Alternative Case	High (7.5%)	57%	8,177	8,844
	Low (6.3%)	56%	7,442	8,050

FINANCIAL ANALYSIS

The Loan Agreement stipulated three financial covenants – self-financing ratio, current ratio and debt service coverage. As seen in Table below, TEIAS has achieved all of these targets. Although, regarding the self-financing ratio, TEIAŞ had difficulty in meeting the target in some years (2005, 2006 and 2008), the recovery has been achieved remarkably by the end of the decade.

Table: Summary of the Financial Covenants

Covenants	**Covenant**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010***
Self-financing ratio (%)	**35%**	*20%*	*19%*	59%	*24%*	95%	167%
Current ratio	**1.0**	3.9	1.8	2.5	1.2	1.2	2.3
Debt service coverage	**1.5**	8.3	6.3	8.8	3.5	4.7	7.4

*unaudited

Although transmission charges are adequate for TEIAS to realize a small profit margin set by the Treasury, its financial performance has suffered from a knock-on effect of payment delays by EUAS and TETAS, who are in turn affected by payment delays from TEDAS. Since 2006 TEIAS has also been responsible as an intermediary for the market

[6] Given the gas prices in Turkey (2010), the estimated cost of this power is 6.9 Euro cents/kWh at a 10% rate of return. The cost of supplying power from a new generating plant located some distance from the load source was about 6.0 Euro cents/kWh assuming that it is a new coal fired plant with Flue gas desulfurization (with a 10% rate of return). This difference of 0.9 Euro cents/kWh was used as the value provided by the substation and transmission lines.

operations, which has resulted in the accumulation of corresponding accounts receivable, with fewer accounts payable.

The accounts receivable issue is a systemic problem of the sector, and is outside TEIAS' control; however it is causing TEIAS to have trouble collecting against its bills. The problem stems from the retail sector, including municipalities that did not pay for public street lighting and have been slow to pay for other uses, creating a cash flow problem for TEDAS. Besides, before the privatization of the distribution companies, TEDAS suffered much from high distribution losses and inadequate bill collection. These shortfalls flow back up the chain, leading to cash flow shortages at EUAS and TETAS, and this leads to high levels of accounts receivable at TEIAS.

Though, TEIAS had by and large been able to manage its finances despite the problem of receivables till 2008, although there had been times when it faced liquidity pressures. However, TEIAS' receivables increased from TL 1.5 billion in 2006 to TL 5.8 billion in 2008. This resulted in payables increasing from TL 700 million to TL 4.9 billion in the same period as TEIAS did not pay EUAS.

This situation was largely the result of delays in payments for transactions in the electricity balancing market (the market was launched in August 2006, and a large part of TEIAS' receivables in 2008 pertained to inadequate payments in that market). Furthermore, the drought in the summer of 2008 had an adverse effect on the hydropower portfolio of EUAS, causing it to fail to meet the supply requirements in its long term bilateral agreements. Hence, in addition to the other public energy companies with payment problems, EUAS had to buy electricity from balancing market through TEIAS for the first time, incurring debt. Because of the non-payments for transactions in the electricity market, TEIAS, as the operator of the market, was billed penalties amounting to TL 283 million in 2009 and TL 49 million in 2010, which it was not initially allowed to pass on to TEDAS, EUAS and TETAS.

During 2009, the Government prioritized the sector's cash flows towards ensuring current payments and the clearance of past dues to: 1) private sector Build-Operate-Transfer (BOT) plants; 2) private sector Build-Own-Operate (BOO) power plants, and 3) BOTAŞ the public gas import/wholesale company. This, combined with a high level of capital investments, led to TEIAS facing increased cash shortfalls, and TEIAS hence was not able to service its debt for ECSEE APL2 and APL3 in early 2009. Treasury therefore had to support TEIAS on occasion to make debt servicing payments for APL2 and APL3 under the Treasury Payment Guarantee. TEIAS paid back Treasury and completed the repayment by mid-October 2010.

As a result, TEIAS netted a loss of TL 79 million and TL 55 million in 2008 and 2009, respectively. However, starting in late 2009 and continuing currently, TEIAS' financial situation has improved substantially. The main factors contributing to this improvement are given below.

First, the Government has recognized the need to ensure sustained bill payments to TEIAS by EUAS, TEDAS and TETAS, in order to enable private suppliers in the wholesale market to be paid in time.

Second, an amendment in the Electricity Market Law in mid-2008 has also helped improve cash flows. This amendment created a mechanism for direct payment by Treasury for street lighting on behalf of the municipalities. The payments are made to the distribution companies through TEDAS. Treasury paid TL 780 million and TL 804 million in 2009 and in 2010, respectively, and is expected to pay about TL 1 billion in 2011. This mechanism will continue until 2015.

Third, intensification of bill collections by TEDAS (with the Government support) and the privatized distribution companies have also increased collections and reduced losses. Companies that had averaged about 70 percent in payment now pay on average about 98 percent of all payment obligations. As the privatization of the distribution companies is expected to be completed in 2011, the overall collection rate and cash flow of the energy sector is expected to improve significantly in the next few years.

Fourth, in 2010, Treasury allowed TEIAS to charge interest payments on any outstanding receivables between public sector entities. This enabled TEIAS to pass on the cost of delayed payments to the state owned power companies, and collect its receivables (dating as far back as 2003) from EUAS, TETAS and TEDAS much more efficiently. Besides, the penalties amounting to TL 332 million (total of TL 283 million in 2009 and TL 49 million in 2010) that had been billed to TEIAS because of the non-payments for transactions in the electricity market was also accrued to the accounts payables of TETAS in March 2010.

In 2010, a further amount of TL 984 million was paid by TETAS on its accounts payable with the support of the Treasury. TEIAS in turn used the funds it received from TETAS and some other funds (partly from TEDAS) to pay its accounts payable of TL 1.2 billion in the beginning of 2009 to the private sector by April 2010.

As shown in the table below, net receivables of TEIAS from the public energy entities – stemming from transmission services and the balancing & settlement activities- decreased to as low as TL 493 million as of 2010 year-end.

Table: TEIAS' Payables/Receivables to/from Other Public Energy Entities as of 2010 year-end

Public Entity	Receivables (million TL)			Payables (million TL)			Net Receivables (million TL)		
	Trans.	B&S	Total	Trans.	B&S	Total	Trans.	B&S	Total
EUAS			478	47	478	525	(47)	(478)	(525)
TETAS		939	939	57		57	(57)	939	882
TEDAS	142		142	1	5	6	141	(5)	(136)

Total	142	939	1,081	105	483	588	37	456	493

Legislation that has allowed a onetime net-out of receivables/payables amongst public energy companies was passed as of February, 2011. The write-off will allow the companies except for TEDAS to clear their balance sheet and increase their capital efficiency. As per the new law, net debt of all the public energy companies, that is expected to cost around TL 10-12 billion, will be borne by TEDAS. The companies are expected to sign MoUs among themselves to reconcile their mutual debts. TEIAS has already signed MoUs with EUAS and TETAS, and is about to conclude one with TEDAS.

Clearance of past dues to BOTAŞ and BOT/BOO power plants has also eventually helped free up some cash for other parts of the sector such as TEIAS.

Consequently, TEIAS' receivables have declined sharply from TL 4.4 billion in 2009 to TL 1.9 billion in 2010 and payables have decreased sharply from TL 3.7 billion to TL 0.7 billion in the same period.

As shown in the table below, TEIAS posted a substantial operating income in 2009 (TL 234 million) and in 2010 (TL 272 million), and also increased its cash on hand from TL 85 million at the end of 2009 to TL 764 million at the end of 2010. Net profit increased from a loss of TL 55 million in 2009 to a profit of TL 332 million in 2010. The receivables declined significantly from 187 days of sales revenue to 51 days in the same period, while payables showed a commensurate decrease in this period from161 days of sales revenue to 32 days. TEIAS' funds from internal resources have improved notably so that it can sustain increases in investments which in future are planned to increase by increments of TL 50 million per year. The self-financing ratio improved significantly from 24% in 2008 to 95% in 2009 and further to 167% in 2010.

Table: TEIAS Financial Condition – Historical Performance

(TL Million)	**2005**	**2006**	**2007**	**2008**	**2009**	**2010***
Energy Transmitted (GWh)	126,139	142,179	164,553	172,635	172,188	188,308
Total Revenue[7]	783	1,725	4,593	7,473	8,499	8,484
Operating Income	83	150	63	21	234	272
Net Income	112	65	102	-79	-55	332
Financial Ratios						
Net Profit Margin	14.3%	3.8%	2.2%	-1.1%	-0.6%	3.9%
Pre-Tax Return on Assets	1.9%	1.4%	2.2%	-1.6%	-1.2%	7.7%

[7] TEIAS books the electricity market transactions on its balance sheet and income statement, constituting more than 80% of its total revenue. TEIAS is the market operator and not the buyer/seller of electricity, therefore should only book the market operator fee and not the entire energy purchase/sales of the balancing market on its financial statements. A reassessment of the regulatory and accounting framework may be necessary in the future in this regard.

Return on Equity	1.9%	1.1%	1.7%	-1.3%	-0.9%	5.2%
Receivables (days)	278.2	308.4	102.0	284.2	187.3	50.9
Payables (days)	35.6	151.7	35.6	243.5	161.0	32.2
Self-Financing Ratio	20%	19%	59%	24%	95%	167%
Debt Service Coverage	8.8	6.3	8.8	3.5	4.7	7.4

***: Unaudited**

Annex 4. Bank Lending and Implementation Support/Supervision Processes

APL3

(a) Task Team members

Names	Title	Unit	Responsibility/ Specialty
Lending			
Ranjit Lamech	Task Team Leader	ECSIE	
Sameer Shukla	Senior Energy Specialist	ECSIE	
Husam Beides	Senior Power Engineer	ECSIE	
James Moose	Economist	ECSIE	
Gurhan Ozdora	Senior Operations Officer	ECSPF	
Shinya Nishimura	Financial Analyst	ECSIE	
Salih Kemal Kalyoncu	Procurement Specialist	ECSPS	
Norval Stanley Peabody	Lead Social Scientist	ECSSD	
Bernard Baratz	Environment Specialist	ECSIE	
Dilek Barlas	Senior Counsel	LEGEC	
Seda Aroymak	Sr. Financial Mgt Specialist	ECSPS	
Zeynep Lalik Mete	Financial Mgt. Specialist	ECSPS	
Andrina Ambrose	Senior Finance Officer	LOAG1	
Yukari Tsuchiya	Program Assistant	ECSIE	
Selma Karaman	Program Assistant	ECCU6	
Ozlem Katisoz	Team Assistant	ECCU6	
Supervision/ICR			
Ayse Seda Aroymak	Sr Financial Management Specia	ECSO3	
Bernard Baratz	Consultant	EASCS	
Husam Mohamed Beides	Senior Energy Specialist	MNSEG	
Salih Kemal Kalyoncu	Senior Procurement Specialist	ECSO2	
Selma Karaman	Program Assistant	ECCU6	
Iftikhar Khalil	Consultant	ECSS2	
Zeynep Lalik	Financial Management Specialist	ECSO3	
Devesh Chandra Mishra	Manager	ECSO2	
James Moose	Consultant	ECSS2	
Kishore Nadkarni	Consultant	EASIN	
Shinya Nishimura	Senior Energy Specialist	ECSS2	
Ahmet Gurhan Ozdora	Senior Operations Officer	ECSS2	

Yesim Akcollu Oguz	Energy Specialist	ECSS2	
Norval Stanley Peabody	Consultant	ECSS2	
Sameer Shukla	Senior Energy Specialist	ECSS2	
Yukari Tsuchiya	Temporary	ECSSD	
Jari Väyrynen	Senior Environmental Specialist	ECSS2	
Fan Zhang	Energy Economist	ECACE	

(b) Staff Time and Cost

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of staff weeks	USD Thousands (including travel and consultant costs)
Lending		
FY06	26.53	127.25
Total:	26.53	127.25
Supervision/ICR		
FY07	24.72	124.00
FY08	22.54	118.35
FY09	47.24	243.23
FY10	19.41	133.55
FY11	25.40	137.26
Total:	139.31	756.39

Annex 5. Beneficiary Survey Results
Not applicable

Annex 6. Stakeholder Workshop Report and Results
Not applicable.

Annex 7. Summary of Borrower's ICR

TEIAS considers APL2 and APL3 to have been successful and the Project development objectives to have been met. The APL2 electricity market development-related components were critical in introducing a well functioning national electricity market; APL2 helped Turkey meet Energy Community objectives and gradually integrate its system with the European market. By completing all APL2/ APL3-financed transmission projects, TEIAS increased its installed capacity by 4250MVA of transformers, 160km of overhead transmission line, and 34.28km of underground cable. Together these investments provide enormous additional capacity to TEIAS' interconnected transmission grid and have significantly improved the reliability, efficiency and safety of the system. Results achieved are discussed below.

ECSEE APL2 Project

Component 1: The first objective of APL 2 Project was to provide support for implementation of the Turkish wholesale electricity market that is managed by TEIAS and create a well-functioning trading system through three projects:

- Balancing and Settlement System Project
- Day Ahead Market Trading and Settlement System Project (MMS)
- Automated Meter Reading System Project (AMR)

The objective of Balancing and Settlement System is to give technical assistance and implementation support for the electricity market, operational and implementation support for procured market systems (MMS and AMR) and, operation and updating of final market design ancillary services, collateral mechanism. In April 2009, the revised Balancing and Settlement Regulation (BSR) came into force through combined efforts of the consultant and TEIAS.

To create a successful Day Ahead Market in Turkey, a well-functioning trading system that is able to support the future regional market is needed. To this end, the Day Ahead market Trading System and Settlement System (MMS) was created and Project financing was obtained from the APL-2 loan. As of December 2011, the Day Ahead Market will begin to operate; the market structure was created in accordance with the European Union Acquis Communitaire, is similar to systems in developed markets, and therefore aligned with objectives of the ECSEE APL Program and APL2 and APL3.

The AMR system supports TEIAS with the daily tasks of acquiring accurate metered data from energy meters and metering points and the transmission of these values to a central database. The data will be used for settlement and billing and be transferred to actors on the deregulated market. The AMR System's Operational Acceptance Test began on 26 April 2010 but is yet to be completed.

The Projects improved the quality of TEIAS' tendering documents and procedures, for example, the SCADA project. World Bank-financed projects use internationally competitive bidding procedures; bidders can tender in foreign currencies and since 2009,

bid payments are made in tendered currencies. Since 80 percent of contract value is based on material price, during the sub-station construction, risks to our institution and to contractors were reduced. Since the creditor determines qualification criteria for bidders; in general, the result has been that TEIAS gets to work with more informed and experienced contractors, which raised the quality of Projects health and safety conditions and ensures that Projects are completed on time.

Component 2: The second objective of APL 2 Project was to strengthen supervisory control and the data acquisition/energy management system (SCADA/EMS) to enable TEIAS to operate more efficiently. The capacity of the existing six Regional Control Centers to be connected to Remote Terminal Units was increased by 60 additional Telecontrol Interface Boards (TCBs), which enables TEIAS to continue to connect more RTUs to these control centers.

Some Project outcomes are yet to materialize due to Project implementation delays. However, at Project completion, important transmission substations and power plants will be included in the SCADA system—in Seyhan, Erzurum and Kepez Load Dispatch regions, resulting in more than 300 transmission substations and power plants in TEIAS SCADA/EMS System. This TEIAS SCADA System extension will improve the reliability, efficiency and operational performance of the Turkish Power System.

A lesson learned from this Project is that massive data entry into the SCADA database can impair SCADA operations (and hence operation of the power system) when new parts of SCADA are being integrated with the existing SCADA system.

Component 3: The third objective of the APL 2 Project was to strengthen and expand the transmission grid for overall system stability; subprojects financed from APL2 under this component included three new GIS substations and O&M materials and equipment (thermal cameras, mobile transformers and monitoring systems). The GIS substations were implemented in fast-growing urban residential areas and areas of rapid load and demand growth—high priority investments for TEIAS to improve supply, meet rapid demand growth, and increase system reliability and safety in subproject areas.

Altintepe GIS: Altıntepe GIS was constructed in a new substation field as an alternative to the existing substations in the same region which had reached the end of their economic lives as locations for new substations.

Beykoz GIS Substation: This substation is in a fast-growing residential area of Istanbul on the Anatolian side; the distance from the main distribution and sub-transmission (154kV) network makes this region difficult to feed. The rate of load increment showed that transferring large load from a distribution level is technically infeasible and the expansion of loads to northern Beykoz required strong connection of this region, which makes it reasonable to construct a simple 380/33kV substation below these 380kV lines.

Yenibosna GIS Substation: Please see below under APL3 Yenibosna-Davutpasa Cable subproject.

O&M Materials and Equipment: The O&M materials and equipment included thermal cameras, remote monitoring systems, and mobile transformers.

Thermal Cameras: the 39 thermal cameras were distributed to TEIAS' provincial units; measurement results are reported in three-month periods. According to the 2010 reports, 8391 heated points were detected with thermal cameras and 2797 heated points were addressed by prioritizing through importance, urgency and applicability. This procedure before the occurrence of breakdowns prevented power failures.

Remote Monitoring Systems: The 45 units of Substation Remote Monitoring System were installed at the transformers. Most operations with Substation Remote Monitoring Systems were disabled due to problems originating from GSM access and its costs. Instead, it was decided that remote access should be provided via the Internet (ADSL). However, since 2009, remote monitoring devices have been reinstalled—either at the substations where needed or at the substations where the urgent monitoring is required. Hydrogen (H) and Carbon Dioxide (CO) formed in the insulation oil of the transformers is also being monitored and followed up on a daily basis.

Mobile Transformers: Two 170/33 kV, 25/31.25 MVA Mobile Transformers were acquired. Mobile Transformers provided big advantages in ability to meet energy demand in emergency cases in regions where breakdowns or outages occurred.

ECSEE APL 3 Project

The objective of APL3 Project was to increase the safety, reliability, efficiency and capacity of the bulk power transmission system in Turkey and to improve market access for consumers and supplies of electricity. The subprojects consisted of underground cable projects, GIS substations, a transmission line and transformers.

420 kV Underground Cable Projects

Yıldıztepe-Davutpasa Cable: Yıldıztepe-Davutpasa cable is crucial in terms of grid reliability in this region. The load forecast and load flows made it obvious that constructing 380 kV Yıldıztepe-Davutpasa cable was urgent to compensate demand in Istanbul region, which increases daily.

Umraniye-Kucukbakkalkoy Cable: This line is necessary for connecting K.Bakkalkoy substation to the system in one of the most populated regions of Istanbul where the urbanization rate is very high and building overhead lines is not possible. Consumption increases daily and this cable reduced transmission losses and increased safe supply.

170 kV XPLE Power Cable Projects

Davutpasa-Bagcilar Cable and Atısalanı-Bagcilar Cable: The Istanbul urbanization rate increases daily and safety is compromised by the old overhead transmission lines that are too close to buildings; they are a hazard when they break and fall. Hence, cable is more suitable and by considering consumption increases from development, these lines cross-section and capacity were increased.

380 kV Power Cable Projects

Yenibosna GIS Substation (Within the scope of the APL 2) & Yenibosna-Davutpasa Cable: Fast-growing Istanbul has huge energy consumption. Considering the average 8.0 percent increment of Turkish power system load, local increment value for big load points such as Istanbul, Izmit, Izmir and Adana is over 10 percent. These regions are over-populated and require new substations and overhead lines.

Considering the peak summer load for 2010, consumption is reaching up to ~2500MVA. This demand is supplied by the four substations mentioned (2050MVA), including the existing Yenibosna S/S which has power transformer capacity of 4x100MVA and six 154kV line feeders. To complete the 380kV ring starting from Ambarlı, Ambarlı NGCCPP-Yenibosna Cable and Yenibosna-Davutpasa Cable projects are included in official investment program of TEIAS.

420 kV GIS Projects

Kucukbakkalkoy GIS Substation: The main function of Kucukbakkalkoy S/S is to provide reliable and sustainable transmission system operation in Umraniye and Kucukbakkalkoy region; hence, supplying uninterrupted electricity where the cost of unserved energy is very high compared to rural areas. Even with Kucukbakkalkoy GIS in operation in 2010, autotransformer load in Tepeoren is near thermal limits. To ensure reliable and continuous supply for this industrialized zone with thousands of workers, the ongoing projects Kartal GIS and 380kV connections will complete progress.

170 kV GIS Projects

Alsancak GIS: This substation was built between Bornova and Hilal substations to meet increased energy demand in the region; it was loaded 48 MW in 2010. The new load demand of the region will be supplied from the 154 kV Alsancak GIS, decreasing the loading of Bornova SS and Hilal SS.

Yenikapi GIS: Due to the rapidly increasing energy demand in Istanbul, new substations were needed. The planned substation Yenikapı will be installed between Veliefendi and Aksaray SS and will increase energy reliability to this region. After Yenikapı GIS is built, Aksaray SS, which is at the end of its useful economic life, will be reconstructed.

Mancarlik GIS:

Antalya, a large touristic center has rapidly increasing energy demand that required new substations. The existing 66 kV Mancarlık SS was out of operation, having reached the end of its economic life. A154 kV substation was constructed. The region which is 6 km away from the nearest substation is now supplied more reliably.

380 kV Transmission Lines

Karabiga-Can-Soma Overhead Line: Recently commissioned Karabiga-Can-Soma line creates a vital connection between South Marmara and Western Anatolia Region. Before the transmission line was constructed, around the south Marmara region there was only single 380/154 Substation located at Karabiga iron/steel factory with a 150MVA autotransformer which was connected through a single long transmission line to Bursa NGCCP substation. System reliability was low due to line interruptions on windy days. The Can and Karabiga region is one of the most efficient places in terms of wind power parks. It was agreed that almost 1000MW wind power plant connection would be connected before 2012, and transferred to the grid via 380kV S/S, Can. Soma S/S will also be connected to 380kv Morsan via a transmission line as part of TEIAS' official investment plan. By doing so, the connection between West Anatolia and South Marmara will be strengthened. In addition, the overall transmission system plan related to South Marmara is to connect Karabiga to Gelibolu and Istanbul by laying a submarine cable on Dardanelle, of which the Karabiga-Can-Soma Transmission is part.

Transformers

The installed Power Transformers and Autotransformers met the load demand of the necessary districts and contributed lower failures sourced from insufficient loads. Thee autotransformers of 380/158 kV, 250 MVA were purchased through two supply contracts. They were put to service to service at Afyon 2 SS on 21.06.2008, at Gaziantep 2 SS on 21.03.2008 and Varsak SS on 16.04.2008, respectively.

Five154/33,6 kV, 80/100 MVA Power Transformers were also purchased through three supply contracts. Two of them were put to service at Diliskelesi SS and Kemer SS on 05.02.2008 and 18.01.2008 respectively, while another two were put into service at Nevşehir 2 SS and Kayseri3 SS on 14.04.2008 and 18.02.2010 respectively. One transformer purchased through the third contract was put into service at Samsun 2 SS on 05.12.2007.

Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders
Not applicable

Annex 9. List of Supporting Documents

1. Energy Community:

ECSEE Treaty, October 25, 2005

Other Energy Community documents:

http://www.energy-community.org/portal/page/portal/ENC_HOME/DOCUMENTS?library.category=155

Energy Community Secretariat web-site:

http://www.energy-community.org

2. TEIAS/APL2 and APL3 projects:

TEIAS, annual reports, up to 2009

TEIAS, audited financial statements, up to 2009

Other TEIAS information at: http://www.teias.gov.tr/eng/

World Bank aide memoires, energy sector policy notes

Project Appraisal Documents, # 31703-TR and 34909-TU

Loan Agreements

Guarantee Agreements

IBRD 34466R

TURKEY

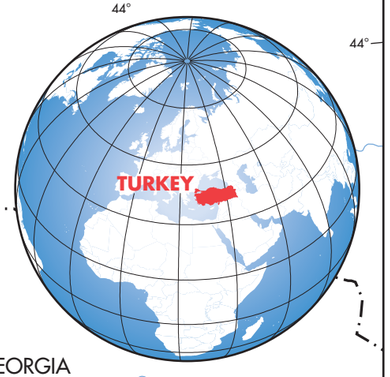
ENERGY COMMUNITY OF SOUTH EAST EUROPE (APL3) PROJECT

SELECTED EXISTING COMPONENTS:
- HYDRO POWER PLANTS
- PLANNED HYDRO POWER PLANTS
- THERMAL POWER PLANTS
- 380 kV SUBSTATIONS
- 154 kV GIS/OPEN TYPE SUBSTATIONS
- OTHER SUBSTATIONS

APL2 PROJECT WORKS UNDER CONSTRUCTION:
- NATIONAL DISPATCH CENTER
- REGIONAL CONTROL CENTERS
- PROJECT 380 kV SUBSTATIONS
- EXISTING 380 kV TRANSMISSION LINES
- 380 kV TRANSMISSION LINES PLANNED OR UNDER CONSTRUCTION
- EXISTING 220 kV TRANSMISSION LINES
- 154 kV XLPE CABLES & TRANSMISSION LINES

- PROVINCE CAPITALS*
- NATIONAL CAPITAL
- RIVERS
- PROVINCE BOUNDARIES
- INTERNATIONAL BOUNDARIES

*Province names are the same as their capitals.



ROMANIA
BULGARIA
GREECE
RUSSIAN FEDERATION
GEORGIA
ARMENIA
AZERBAIJAN
AZER-BAIJAN
ISLAMIC REP. OF IRAN
IRAQ
SYRIAN ARAB REPUBLIC

Black Sea
Sea of Marmara
Aegean Sea
Mediterranean Sea
Gulf of Antalya
Gulf of Iskenderun

Edirne, Kirklareli, HAMITABAD, ULAS, Ergene, TASOLUK, IKITELLI, YILDIZTEPE, PASAKOY, ICMELER, BAHCESEHIR, Istanbul, Istanbul Strait (Bosphorus), Kocaeli (Izmit), GEBZE, Yalova, L. Sapanca, Sakarya (Adapazari), Lark, OSMANCA, EREGLI, Zonguldak, Bartin, Karabük, Kastamonou, Sinop, BOYABAT, ALTINKAYA, Samsun, CARASAMBA, Ordu, GIRESUN, TIREBOLU, Trabzon, KALKANDERE, Rize, BORCKA, DERINER, Artvin, Ardahan, Cildir Gölü, YUSUFELI, Kars, KARS, OLTU, ISPIR, Coruh, Gümüshane, Bayburt, HORASAN, Erzurum, REGIONAL CONTROL CENTER, Erzincan, Igdir, Agri, BEYAZIT, BAZARGAN, Tekirdag, BAHCESEHIR, Sea of Marmara, KARABIGA, KARACABEY, Lake Manyas, Koca Cay, Simav, Canakkale, GORUKLE, Lake Apolyon, Bursa, Canakkale Strait (Dardanelles), Balikesir, BALIKESIR, BIGADIC, SOMA, Bilecik, GOKCEKAYA, Sakarya Nehri, Porsuk Cayi, Eskisehir, SEYITOMER, Kütahya, Çankiri, Delice Irmak, KAYABASI, Amasya, Çorum, Tokat, Kelkit Cayi, Yesil Irmak, H. UGURLU, Kizil Irmak, GAYIRHAN, BAGLUM, Ankara, SINCAN, IMRAHOR, ANKARA, NATIONAL DISPATCH CENTER, Kirikkale, Yozgat, Sivas, Kirsehir, Lake Seyfe, Tuz Gölü, Nevsehir, Kayseri, Aksaray, Sultan Marsh, DERINKUYU, YSILHISAR, ELBISTAN, Konya, Nigde, Karaman, Adiyaman, Kahraman Maras, Gaziantep, Sanliurfa, BIRECIK, HALEPPO, Malatya, KEBAN, Keban Reservoir, Elazig, KARAKAYA, Tunceli, OZLUCE, LICE, Bingöl, Mus, Bitlis, Lake Van, Van, KHOY, BASKALE, SILVAN, Diyarbakir, Batman, Siirt, Tigris, Euphrates, HILVAN, ATATURK, Sirnak, ILISU, Cizre, KIZILTEPE, Mardin, ZAKHO, ULUDERE, DOGANU, Hakkari, GUKURCA, Aci Gölü, Hoyran Gölü, Burdur Gölü, Egridir Gölü, Beysehir Gölü, Sügla Gölü, Isparta, Burdur, Sütcüler, SYDISEHIR, Aydin, DENIZLI, Denizli, Büyükmenderes Nehri, Golcuk Lake, Izmir Körfezi, Gediz Nehri, Nif, Marisa, ALIAGA, SARUHANLI, TURGUTLU, izmir, For detail, see IBRD 34467, USAK OSB, Usak, Afyon, KOCATEPE, Karamik Lake, Eber Lake, Güllük Körfezi, YENIKOY, YATAGAN, Mugla, KEMERKOY, Gökova Körfezi, Köycegiz Lake, VARSAK, Antalya, OYMAPINAR, ERMENEK, Göksu, Göksu Delta, Finike Körfezi, Icel (Mersin), ADANA II, Adana, REGIONAL CONTROL CENTER, Osmaniye, ERZYN, ISKEN, ISDEMIR, Kilis, Gaziantep, G.ANTEP, KAVSAK, ANDIRIN, Kahraman Maras, Hatay (Antakya), Amik Gölü, Asi Nehri, Orontes, Lake Amik, Ceyhan Nehri

For detail, see IBRD 34467

0 50 100 150 200
KILOMETERS

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MAY 2011

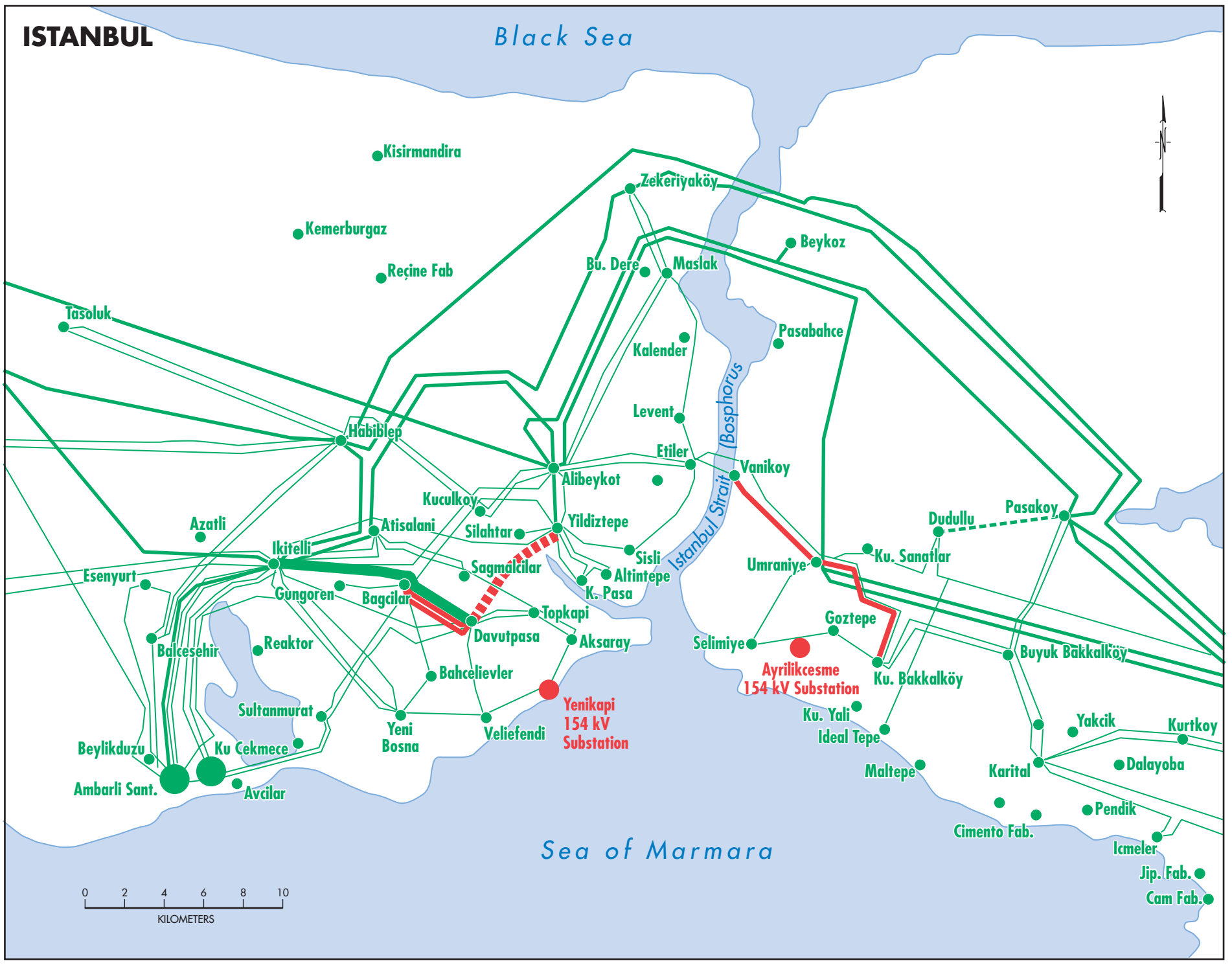
TURKEY

ENERGY COMMUNITY OF SOUTH EAST EUROPE (APL3) PROJECT
ISTANBUL AND IZMIR

PROJECT COMPONENTS:

- 380 kV SUBSTATIONS
- NEW 380 kV TRANSMISSION CABLES
- 154 kV TRANSMISSION LINES BEING REPLACED WITH UNDERGROUND CABLE

- EXISTING THERMAL POWER PLANTS
- EXISTING 380 kV SUBSTATIONS
- EXISTING 380kV TRANSMISSION CABLES
- EXISTING 380 kV TRANSMISSION LINES
- 380 kV TRANSMISSION LINES PLANNED OR UNDER CONSTRUCTION
- EXISTING 154 kV TRANSMISSION LINES



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