



Academy for Educational Development

ARMENIA ENERGY TRAINING PROGRAM

Contract No. LAG-I-00-98-00011-00, Task Order Two

Technical Report

**Course on *Grid Code and Contracting Practices*
(*Second Course*)**

June 24, 1999

Submitted to U.S. Agency for International Development

Submitted by the Academy for Educational Development
with Hagler Bailly Services

ARMENIA ENERGY SECTOR TRAINING PROGRAM
Technical Report
Course #8: Grid Codes and Contracting Practices (Second Course)

USAID Strategic Objective 1.5	A more economically sustainable and environmentally sound energy sector
Intermediate Result 2	Increased economic efficiency in the energy sector
Participant profile	Armenia's energy companies, government ministries and regulatory entities with competence over the energy sector

A. Course Purpose

The objectives of the AED seminar were to discuss the details of the draft Armenian grid code. During the seminar, the technical, economic, and financial specifications for the proposed wholesale power market were reviewed. The target course participants included technical and financial experts from the Ministry of Energy, distribution companies, generation companies, the Energy Regulatory Commission, Institute of Energy and Armtrans. Nineteen members of these organizations attended the seminar.

B. Material Covered

The discussion was separated into four segments. The first segment concerned the proposed power market members union and its oversight of the grid code. The second segment concerned the existing Armenian standards and associated norms in the power sector, the existing laws that impacted the creation, modification, and enforcement of the standards, and the organizations that enforce the standards. Discussions in this segment included Armenian law and its requirements on obligatory standards and non-obligatory standards. The third segment concerned the specific details of the grid code rules and procedures. The last segment focused on next steps to be taken to implement the grid code as part of the Armenian standards.

At the request of participants, an additional segment was added to provide an overview of the power market member associations and power sector structures in several other countries. In addition, comparisons and contrasts were noted between power sector structures in these countries and the power market structure proposed for Armenia. The course outline is attached (Appendix A).

C. Dates/Trainers/Attendees

The course was conducted June 7-9, 1999. Jake Delphia, who taught the overview Grid Codes course in February, served as the primary instructor for this course. While Mr. Galstian of the Ministry of Energy had been the designated co-trainer for the course, Mr. Galstian was unable to attend the course due to difficulties within the Ministry resulting from the recent National Assembly elections. Overall attendance from the Ministry of Energy was lower than anticipated for the same reasons. The list of participants is shown as Table 1.

Table 1: List of Participants

#	Name	Employer	June 7	June 8	June 9
1	Karen Sargsyan	Ministry of Energy	0		
2	Souren Matchkalyan	Ministry of Energy			0
3	Svetlana Ganjumyan	Institute of Energy	0	0	0
4	Yuri Budaghian	ERC	0	0	0
5	Anahit Avetisyan	ERC	0	0	0
6	Levon Shahverdyan	Energogosnadzor	0		
7	Mkrtich Jalalyan	Energogosnadzor	0		
8	Karen Arabyan	Energogosnadzor		0	0
9	Vachik Shahbazyan	Yerevan DisCo	0	0	0
10	Samvel Soujyan	Yerevan DisCo	0		
11	Meroujan Hovsepyan	Central DisCo	0	0	0
12	Roudik Zohrabyan	Central DisCo		0	
13	Derenik Asatryan	Armenergo	0	0	0
14	Meroujan Galaryan	Sevan-Razdan Cascade	0		
15	Rouben Aleksanyan	Sevan-Razdan Cascade		0	
16	Hakob Dingchyan	Vorotan Cascade	0	0	
17	Edik Movsesyan	Razdan TPP		0	0
18	Levon Ohanyan	Armtrans	0	0	
19	Gagik Khourshoudyan	Armtrans	0	0	
		TOTAL	14	13	9

D. Participant Evaluations

- The course was well received by the participants. In an exit questionnaire 88.9% of the participants said that the training program was useful while most (77.8%) felt it was directly relevant to their work.
- Participants gave Mr. Delphia good marks for the course, and indicated that they have made arrangements to maintain contact with him.
- Overall, participants felt that the course length was appropriate, and that their training objectives were met.

E. Anticipated Outcomes

The seminar participants gained much more detailed knowledge about the proposed grid code. Participants received a broad perspective on grid code and energy sector structures and on the role played by market member associations in the US and other countries. The workshop afforded participants an opportunity to discuss the changes that have taken place in the power sector structure and relationships since Soviet times, and how these changes require a corresponding change in transmission standards and norms.

The response to the course was quite positive. Generally, participants felt that Armenia needed such a grid code to help establish the proper relationships between market members and power market service organizations. They also felt that coordination of operations and planning in the new privatized utility structure would be very necessary.

The participants voiced a concern that the creation of the new market members union would create additional work for power entities' employees without additional compensation for the committee members. In addition, the participants seemed very concerned regarding which of the entities would be providing the power sector support services (wholesale contracting, dispatch, settlements center, and funds administration).

The workshop discussions have initiated dialogue on a number of key power sector issues. AED expects the discussion around these issues to continue as the restructuring moves forward.

F. Conclusions and Recommended Follow-up

Since the Ministry of Energy staff were unable to attend the course, it is recommended that Hagler Bailly consider offering a "short course" for the Ministry later this month as part of its ongoing technical assistance.

Participants suggested that USAID invite the directors of all power sector enterprises to a meeting to debate the Hagler Bailly project team's proposed restructuring. They felt that seeking written commentary, although useful, will not be as effective as a vigorous debate facilitated by Hagler Bailly. This kind of debate was seen during the seminar as representatives from generation,

distribution and Armenergo took contrary positions on key issues. The AED team recommends that USAID consider supporting a seminar at which the proposed restructuring options are presented to industry representatives in a setting that encourages debate.

APPENDIX A

Seminar Outline & Principle Topics

Grid Codes and Contacting Practices (Second Course)

ARMENIAN GRID CODE AND CONTRACTING PRACTICES
SECOND SEMINAR

Day 1 – Introduction to the Armenian Grid Code

- I. Overview
 - A. Basic structure of the power sector – Grid Participants
 - B. Energy Law, ERC regulations, Tariffs, Contracts
 - C. Power Market Members Union
 - 1. Voting Members – Market Buyers and Sellers, Armtrans
 - 2. Non-Voting Members – Service Organizations and ERC
 - D. Chapters of the Grid Code
 - E. Chapter 1- Introduction
- II. Support from Service Organizations
 - A. Role of the Wholesale Contractor
 - B. Role of the Settlements Center
 - C. Role of the Funds Administrator
- III. Developing and Maintaining the Grid Code
 - A. Creation of permanent PMMU Committees
 - B. Creation of temporary PMMU Committees
 - C. Role of the Central Dispatch
 - D. Chapter 2 – Code Administration
 - E. Role of the Energy Regulatory Commission
 - F. Chapter 9 - Glossary
- IV. Three Key Aspects of the Grid Code
 - A. Short Planning and Market Operations
 - B. Billing
 - C. Long-term Planning

Day 2 – Short-Term Planning and Market Operations

V. Chapter 3 – Operating Procedures

- A. Short-Term Reliability Standards
- B. Short-Term Load Forecasting
- C. Transmission and Generation Maintenance Scheduling
- D. Scheduling
- E. Unit Commitment
- F. Emergency Situations

VI. Chapter 4 - Market Rules

- A. Markets
 - 1. Annual
 - 2. Monthly
 - 3. Daily Regulating
- B. Capacity and Energy Requirements of Buyers
- C. Reserve Margin Requirements
- D. Ancillary Service Requirements
- E. Dispatching Facilities
- F. Reserve Capacity

VII. Market Operations Committee

- A. Review of Chapters 3 and 4
- B. Cooperation with Central Dispatch and Wholesale Contractor
- C. Recommendation for finalizing initial Chapters 3 and 4
- D. Future review of Grid Code and recommendations for modifications
- E. Periodic reporting of market operations
- F. Analyzing and reporting of studies in support of Executive Committee

Day 3 (morning) – Billing

VIII. Chapter 8 – Metering

- A. Designing, installing, and maintaining metering installations
- B. Real-time meter reading
- C. Monthly meter reading
- D. Protection of data

IX. Chapter 5 – Settlements Procedures

- A. Tariffs for generators
- B. Tariffs for transmission services
- C. Tariffs for ancillary services
- D. Tariffs for other services
- E. Data acquisition
 - 1. Availability of facilities
 - 2. Losses –actual and calculated
 - 3. Market purchases and sales
- F. Calculation of settlements
 - 1. Estimated
 - 2. Final
 - 3. Adjusted for disputes and late payments
- G. Calculation of Settlements during periods of revenue shortfalls
- H. Dispute Resolution

X. Chapter 6 – Funds Administration Procedures

- A. Retail customer accounting
- B. Transfers accounts
- C. Escrow accounts
- D. Payments to Grid Participants

XI. Billing Committee

- A. Review of Chapters 5, 6 and 8
- B. Cooperation with Settlements Center and Funds Administrator
- C. Recommendation for finalizing initial Chapters 5, 6, and 8
- D. Future review of Grid Code and recommendations for modifications
- E. Periodic reporting of funds administration
- F. Analyzing and reporting of studies in support of Executive Committee

Day 3(afternoon) – Long-term Planning

XII. Chapter 7 – Connection Requirements

- A. Interconnection Contracts with Armtrans
- B. Required Contracts
- C. Required Equipment
 - 1. Electrical Connection
 - 2. Communications
 - 3. Metering
- D. Operations and Maintenance of the Interconnection
- E. Failure to Comply with Grid Code
- F. Long-Term Reliability Standards
- G. Long-Term Load Forecasting
- H. Long-Term Maintenance Schedules
- I. Projections of Required Expansion of the Network

XIII. Planning Committee

- A. Review of Chapter 7
- B. Cooperation with Central Dispatch
- C. Recommendation for finalizing initial Chapter 7
- D. Future review of Grid Code and recommendations for modifications
- E. Review of planning reliability standards
- F. Calculation of long-term reserve margin requirement
- G. Calculation of losses for Armtrans and each distribution company
- H. Development of industry availability standards
- I. Analyzing and reporting of studies in support of Executive Committee

PRINCIPAL TOPICS

Included among the principal topics of the AED seminar were:

- The administration of the grid code by the Power Market Members Union (PMMU)
- The Law of Standardization
- Armenian power sector standards and norms
- Existing and proposed operating procedures
- Market rules for the wholesale power market
- Connection requirements and network planning
- Settlements procedures, funds administration procedures, and metering procedures for the collection and allocation of revenues from the power sector sales.
- Structure of the permanent committees of the PMMU
- Activities of the permanent committees
- Course evaluation.

APPENDIX B

Seminar Materials

Grid Codes and Contracting Practices (Second Course)



Seminar
Armenian Power Sector
Grid Code

PRESENTED TO:

Armenian Government and Power Sector Representatives

PRESENTED BY:

HAGLER BAILLY

SPONSORED BY USAID

Yerevan, Armenia

June 7 -9, 1999



Seminar Schedule

- Day 1. Preliminary Statements and Introductions**
- Power Market Members Union**
- Charter for the PMMU**
- Structure of the Power Sector**
- Overview of the Grid Code Sections**
- Power System Security**



Seminar Schedule

Day 2. Grid Code Administration

Dispute Resolution

Connection Requirements

Metering Procedures

Market Rules



Seminar Schedule

- Day 3.**
- Settlements Procedures**
- Funds Administration Procedures**
- Grid Code Terminology**
- Concluding Remarks**



Preliminary Statements and Introductions

- **Seminar schedule**
- **Seminar rules**
- **Background of trainers**
- **Introduction of Participants**



Power Market Members Union

- **Union Charter**
- **Executive Committee**
- **Market Members Representation**
- **Executive Director**
- **Secretary**
- **Permanent Committees**
- **Temporary Committees**

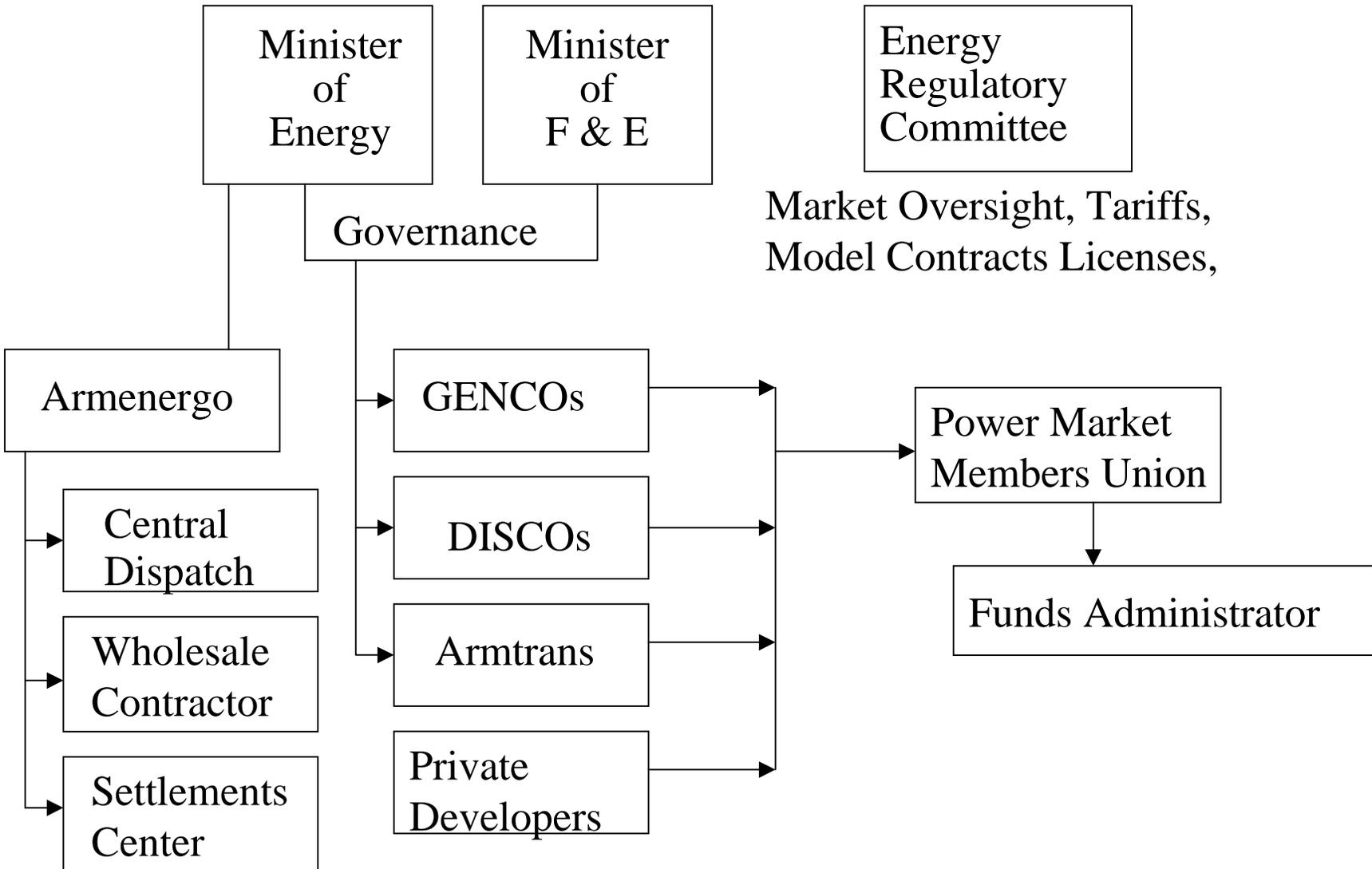


Charter for the PMMU

- **Legalizing the PMMU**
- **Creating the Committee Structure**
- **Creating the staff organization**
- **Developing relationships with service organizations**



Structure of the Armenian Power Sector





Overview of the Grid Code Sections

- **Chapter 1 - Introduction**
- **Chapter 2 - Grid Administration**
- **Chapter 3 - Power System Security**
- **Chapter 4 - Market Rules**
- **Chapter 5 - Settlements Procedures**
- **Chapter 6 - Funds Administration Procedures**
- **Chapter 7 - Connection Requirements**
- **Chapter 8 - Metering Procedures**
- **Chapter 9 - Glossary**



Power System Security

- **Definitions and principles**
- **Power System Security Responsibilities and Obligations**
- **Power System Frequency Control**
- **Control of Power System Voltage**
- **Protection of Power System Equipment**
- **Power System Stability Co-ordination**



Power System Security

- **Power System Security Operations**
- **Power System Security Related Market Operations**
- **Power System Operating Procedures**
- **Power System Security Support**
- **Nomenclature Standards**



Day 2

- **Grid Code Administration**
- **Connection Requirements**
- **Metering Procedures**
- **Market Rules**



Grid Code Administration

- **Protected Provisions**
- **Code Administrator (PMMU Executive Committee)**
- **Objectives of the Code Administrator**
 - **Administer and Enforce Code**
 - **Effective and efficient implementation of the Code**
 - **Collect information & statistics and provide to public**
 - **Administer ongoing development of Code**
 - **Interact with other bodies including ERC**
- **Participants are bound to comply with Code and ERC regulations**



Grid Code Administration

- **Reviewable Decisions**
- **Notices to Participants**
- **Retention of Records and Documents**



Connection Requirements

- **Purpose**
- **Obligations of the Parties**
- **Establishing or Modifying Connection**
- **Access Arrangements for Generators**
- **Planning and Development of Network**
- **Inspection and Testing**
- **Commissioning**
- **Disconnection & Reconnection**
- **Schedules**



Metering Procedures

- **Purpose**
- **Obligations of Market Members**
- **Responsibility for metering installations**
- **Metering installation arrangements**
- **Metering providers**
- **Register of metering information**
- **Testing of metering installation**



Metering Procedures

- **Rights of Access to Data**
- **Security of metering installation and data**
- **Processing of metering data for settlements**
- **Confidentiality**
- **Performance of metering installation**
- **Meter time**
- **Evolving technologies and process and development of the power market**



Market Rules

- **Operation of the Annual, Monthly, and Daily Market**
- **Daily regulating market price determination**
- **Acquisition and pricing of ancillary services**
- **Market information requirements & obligations**
- **Conditions and procedures for market suspension**
- **Dispatch**



Day 3

- **Settlements Procedures**
- Funds Administration Procedures**
- Grid Code Terminology**
- Concluding Remarks**



Settlements Procedures

- **Governance**
- **PMMU-Billing Committee**
- **Establishment of Initial Procedures and Future Modifications**
- **Settlements management by Settlements Center**
- **Connection Point Responsibility**
- **Generator Capacity Payments**
- **Generator Energy Payments**



Settlements Procedures

- **Payments to Armtrans**
- **Payments to Other Service Organizations**
- **Sales to Direct Customers**
- **Sales to Direct Customers**
- **Payments to Distribution Companies**
- **Preliminary Statements**
- **Final Statements**
- **Disputes**
- **Settlement dispute adjustments**



Funds Administration Procedures

- **Purpose**
- **Scope of Procedures**
- **Accounting and reconciling procedures**
 - **Establishment of escrow account(s)**
 - **Collection of retail customer electricity payments**
 - **Recording of funds received**
 - **Reporting of funds received**
 - **Billing period**
 - **Late payments from retail customers**
 - **Payments to Market Members & Service Organization**

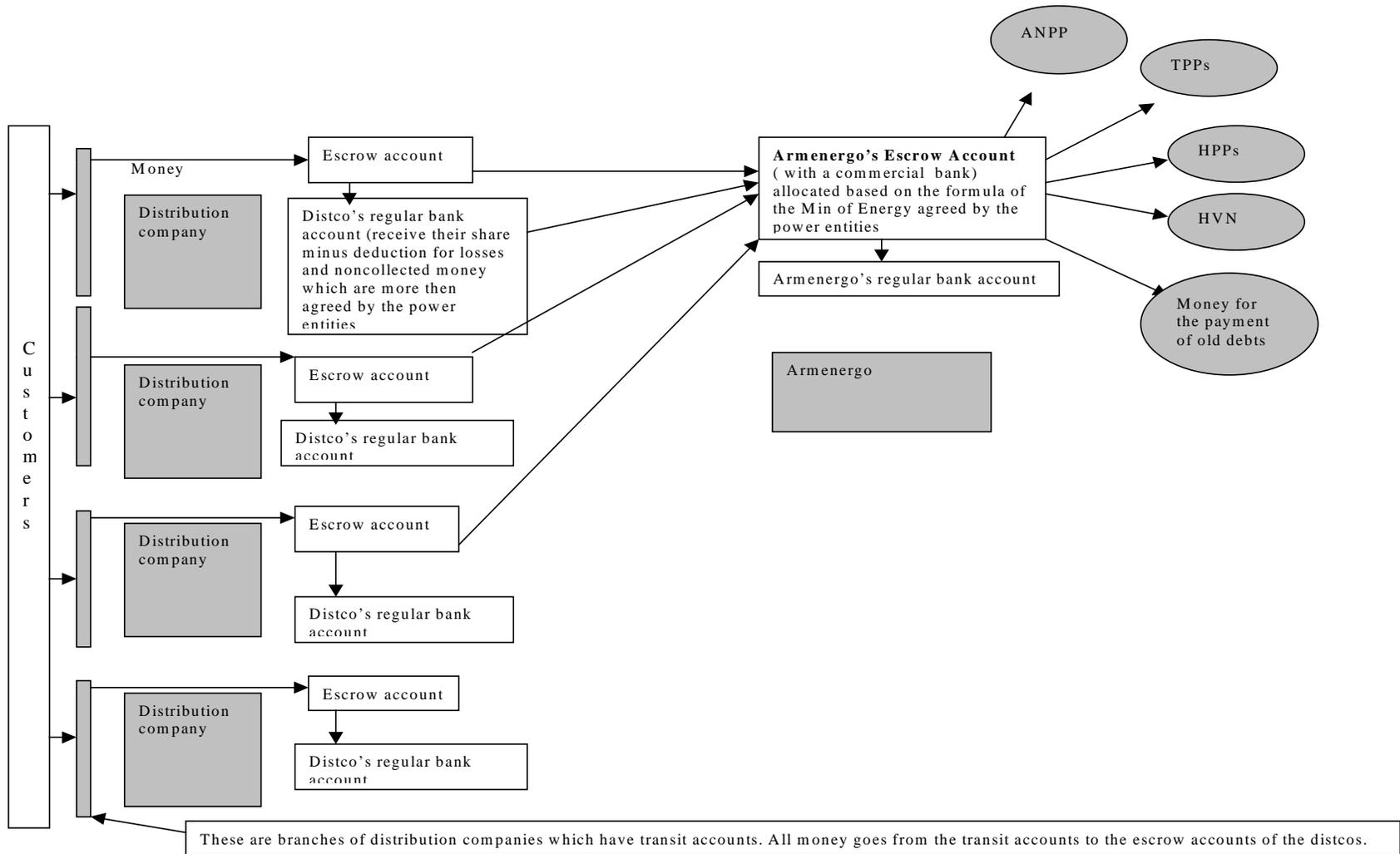


Funds Administration Procedures

- **Electronic funds transfer**
- **Other settlements**
- **Allocation during times of revenue shortfall**
- **Penalties for failing to comply with these procedures**



Plan of the Ministry of Energy on Restructuring Proposal





Grid Code Terminology

- **Purpose**
- **Structure (English, Russian, Armenian)**
- **Modifications**



Concluding Remarks

- **Review of the Grid Code**
- **Recommending changes to the Grid Code**
- **Approval of the Grid Code changes**
- **Next Steps for PMMU**