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## Kabul City Medium-Voltage Distribution System Assessment Report



January 2010



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# Study Participants

## Study supervisor:

Eng. Shoaib Sahibzada, AEIC Deputy Engineering Director

## AEIC technical staff:

Eng. Faizi, Senior Electrical Engineer

Eng. Omar, Senior Electrical Engineer

Mahfooz Naveed, Senior Auto CAD Draftsman

## Field survey completed by:

KED technical staff

## Reviewed by:

James Willis, AEIC Engineering Director



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# Report Preparation Team

## Supervisor:

Eng. Shoaib Sahibzada, AEIC Deputy Engineering Director

## Preparation Team:

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## Review:

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# Introduction

**Survey Date:** January 2010

## Report Sections:

1. Background Information
2. Study Objective
3. Methodology
4. Approach
5. Goals
6. System Single Line Diagram
7. System Overlay Map
8. Summary Report Tables
9. Conclusion
10. Attachments



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# 1. Background Information

Two previous assessment studies of the Kabul City distribution system were completed by AEAI / AEIC engineers and KED technical staff:

- The initial study, completed in September 2007
- The second study, complete in February 2008



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## 2. Study Objective

Determine current system technical status and confirm the reliability and validity of the data provided

### **For each substation feeder**

Determine the number of connected transformers and the size (cross sectional area) of the feeder conductors

### **For each transformer**

Determine the transformer capacity(kVA), Ampacity, actual low-side load(in amps), GPS coordinates, and identify overload units



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# Study Objective Continued

## Distribution transformer loading criteria

The transformer loading data is based on KED measurements taken during winter peak conditions.

NOTE: This is due to the winter heating loads, provides a more accurate picture of system conditions and the number of overloaded transformers.

The winter system peaks for this study occurred during the early evenings of January 2010.



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## 3. Methodology

### Study Methodology

The study methodology employed the use of field checklists, site maps for the surveyors, and the development of area specific indexes.

The field studies were conducted by completing survey checklists and making field drawings of system feeders with GPS coordinates for major points-of-inflection(PIs) and distribution transformer locations.



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## 4. Approach

### Study Approach

Training was provided to the KED field survey team to ensure:

- Correct completion of the survey check list
- Precise use of GPS mapping instruments
- Accuracy in developing field sketches for use in completing the system Single Line Diagram update



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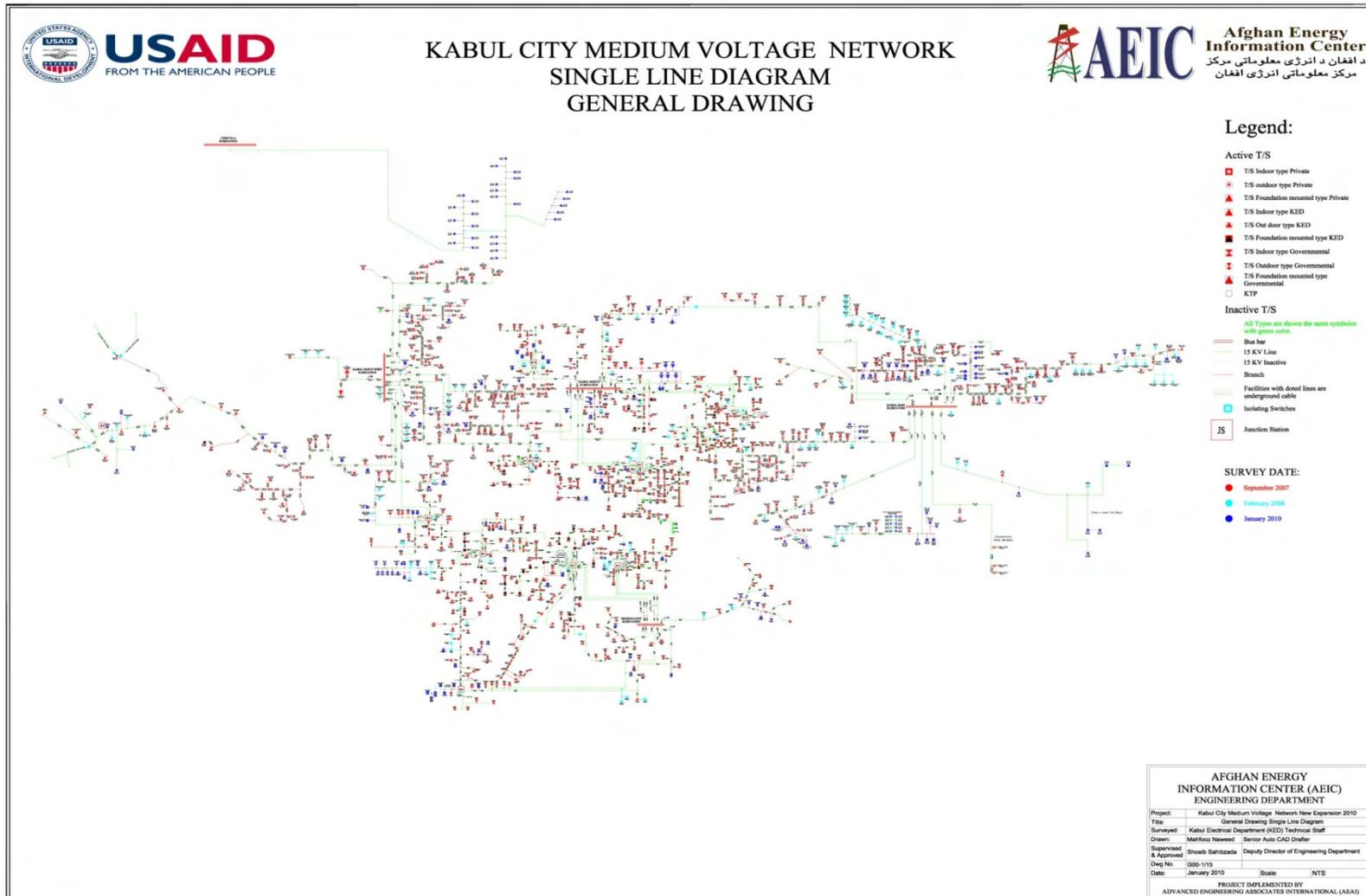
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## 5. Goals

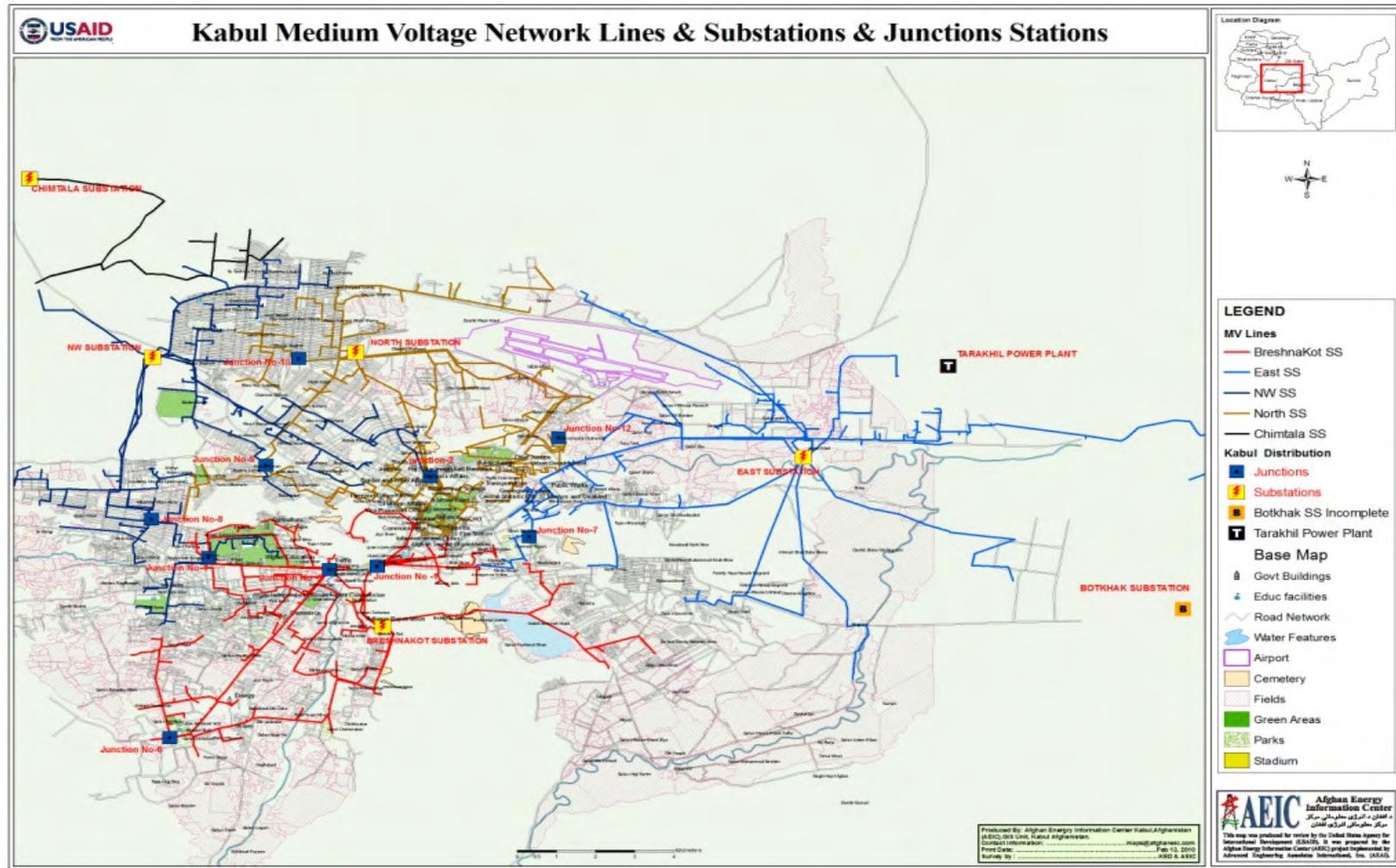
The goals of the system assessment were

1. Update the System Single Line Diagram with English and Persian version
2. Determine the total number of transformers connected
3. Identify overloaded transformers

# 6. System Single Line Diagram



# 7. System Overlay Map





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## 8. Summary Report Tables

### The following tables are provided:

Page 14 - 2007 System Assessment Report

Page 15 - 2008 System Assessment Report

Page 16 - 2010 New Transformers Added

Page 17 - 2010 System Assessment Summary

Note: three type of connected Transformers are in the system

1. Residential (belong to KED )
2. Commercial (property of private sector )
3. Governmental belong to Governmental Building



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# 2007 System Assessment Report

## Summary of Kabul City Distribution Installed Transformers September- 2007

Kabul City Power Substation	Transformers								Number	
	Number of Transformers				Transformer Capacity ( KVA)				Residential	Commercial
	Residential	Commercial	Governmental	Total	Residential	Commercial	Governmental	Total		
East	52	37	43	132	27165	15705	23835	66705	16628	155
Breshna Kot	104	6	44	154	65615	3430	20820	89865	37516	1385
North	128	15	77	220	83,690	8,160	39,450	131,300	38,851	2,279
North West	128	25	53	206	78345	7810	22385	108540	44823	1169
<b>Total</b>	<b>412</b>	<b>83</b>	<b>217</b>	<b>712</b>	<b>254815</b>	<b>35105</b>	<b>106490</b>	<b>396410</b>	<b>137818</b>	<b>4988</b>



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# 2008 System Assessment Report

**Summary of Kabul City Distribution New installed Transformers from Sep- 2007 up to Feb- 2008**

Kabul City Power Substation	Transformers								Number of Customers				Number of Distribution Transformers Overloaded
	Number of Transformers				Transformer Capacity ( KVA)								
	Residential	Commercial	Governmental	Total	Residential	Commercial	Governmental	Total	Residential	Commercial	Governmental	Total	
East	18	26	17	61	9065	11360	9570	29825	4016	26	12	4054	3
Breshna Kot	14	2	13	29	8200	1260	6330	15790	5638	29	46	5713	1
North	9	6	11	26	5090	2710	9990	17790	2308	18	82	2408	0
North West	27	3	5	35	155308	16385	43903	215596	5511	30	14	5555	0
<b>Total</b>	<b>68</b>	<b>37</b>	<b>46</b>	<b>151</b>	<b>177663</b>	<b>31715</b>	<b>69793</b>	<b>279001</b>	<b>17473</b>	<b>103</b>	<b>154</b>	<b>17730</b>	<b>4</b>



# 2010 New Transformers Added

Summary of Kabul City Distribution New installed Transformers from Feb- 08 to Jan- 2010													
Kabul City Power Substation	Transformers								Number of Customers				Number of Distribution Transformers Overloaded
	Number of Transformers				Transformer Capacity ( KVA)								
	Residential	Commercial	Governmenta	Total	Residential	Commercial	Governmenta	Total	Residential	Commercial	Governmenta	Total	
East	21	37	2	60	10845	21275	650	32770	6445	194	14	6653	2
Breshna Kot	11	11	10	32	5490	5400	3925	14415	4527	11	10	4548	1
North	12	16	1	29	6190	6455	400	13045	1609	95	0	1704	0
North West	26	13	3	42	14030	4475	1370	19875	7145	27	70	1954	0
Chimtala	27	0	0	27	5746	0	0	5746	3620	0	0	3620	2
<b>Total</b>	<b>97</b>	<b>77</b>	<b>16</b>	<b>190</b>	<b>42301</b>	<b>37605</b>	<b>6345</b>	<b>85851</b>	<b>23346</b>	<b>327</b>	<b>94</b>	<b>18479</b>	<b>5</b>



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# 2010 System Assessment Summary

## Collective Summary of Kabul City Distribution System From Sept 2007 to Jan-2010

Kabul City Power Substation	Transformers								Number of Customers				Number of Distribution Transformers Overloaded
	Number of Transformers				Transformer Capacity ( KVA)								
	Residential	Commercial	Governmental	Total	Residential	Commercial	Governmental	Total	Residential	Commercial	Governmental	Total	
East	91	100	62	253	47,075	48,340	34,055	129,300	27,089	375	83	27,547	6
Breshna Kot	129	19	67	215	79,305	10,090	31,075	120,070	47,681	1,425	551	49,657	6
North	149	37	89	275	94,970	17,325	49,840	162,135	42,768	2,392	396	45,556	15
North West	181	41	61	283	247,683	28,670	67,658	344,011	57,479	1,226	361	59,066	8
Chimtala	27	0	0	27	5,746	0	0	5,746	3,620	0	0	3,620	2
<b>Total</b>	<b>577</b>	<b>197</b>	<b>279</b>	<b>1053</b>	<b>474779</b>	<b>104425</b>	<b>182628</b>	<b>761262</b>	<b>178,637</b>	<b>5,418</b>	<b>1,391</b>	<b>185,446</b>	<b>37</b>



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## 9. Conclusion

The 2010 assessment provided the following new information

- A. 190 new transformers were added to the system
- B. 5 new distribution feeders were constructed
- C. The “Chimtala” 220/110/20kV substation was energized and added to system
- D. The system Single Line Diagram was updated

Note: three type of connected Transformers are in the system

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## 10. Attachments

The following are provided as attachments to this report

1. Single Line Diagrams
  - a) 15 drawings of general and components drawings for substations and junction stations are attached
2. The complete report with actual load data for all 1053 transformers, and 102 feeders