

The World Bank
Global Facility for Disaster Reduction and Recovery
GFDRR

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**AN EXAMPLE OF THE ESTIMATION OF DISASTER LOSSES
IN THE ELECTRICAL SECTOR**

Exercise prepared by International Consultant J.Roberto Jovel, for use in training workshops on damage and loss assessment after disasters.

DESCRIPTION OF CASE STUDY

In order to acquaint Damage and Loss Assessment Workshop participants on the manner in which losses in the electrical sector are estimated following disasters, an actual example is described below. Real-life data for the electrical sector of the State of Gujarat (India) is used to show loss estimation procedures. The baseline data to be used refers to the period prior and after the Kutch earthquake that occurred in early 2001.

The earthquake caused extensive damage and destruction in urban areas and only minor effects on rural areas. Houses, small to medium size commercial and industrial establishments, and public lighting systems were specially affected. According to official reports, only minor damage was sustained by thermal power stations and extensive damage was suffered by the transmission and distribution systems in Kutch and Rajkot Districts. Total cost of damage in the sector was estimated at 183.7 Rs. Crore, or US\$ 39.5 million¹. No losses were estimated at the time of the assessment.

Due to the widespread damage and destruction of housing units, industry and commerce establishments as well as lighting grids and poles, electricity demand dropped considerably immediately after the earthquake. While the electrical enterprises serving the sector in the affected areas promptly repaired the damaged systems of production, transmission and distribution of electricity, user demand remained below normal values until reconstruction was completed two years after and the financial accounts of the electrical enterprises sustained significant losses.. The period for analysis will then cover the entire years 2001 and 2002.

BASELINE DATA ON ELECTRICITY SALES

Data on the volume and value of sales of electricity to the main user sectors is available for the affected area, as provided by the Gujarat Electricity Board (GEB) in its annual reports, as shown in the table below.

Table 1
Sales of Electricity to User-Sectors in Gujarat 1993 to 2003

	Industry		Residential		Commercial		Irrigation		Public lighting	
	Million KWh	Rs Crore	Million KWh	Rs Crore	Million KWh	Rs Crore	Million KWh	Rs Crore	Million KWh	Rs Crore
1997-98	9,817	3,325	2,411	395	683	226	10,757	191	448	57
1998-99	9,697	3,563	2,643	499	752	271	12,221	203	494	68
1999-00	9,147	3,596	2,813	595	816	317	14,914	219	556	87
2000-01	8,643	3,681	3,021	769	890	392	15,467	235	624	116
2001-02	8,646	3,772	2,937	791	866	406	15,647	912	613	152
2002-03	9,439	4,019	3,117	846	971	453	12,940	958	697	195

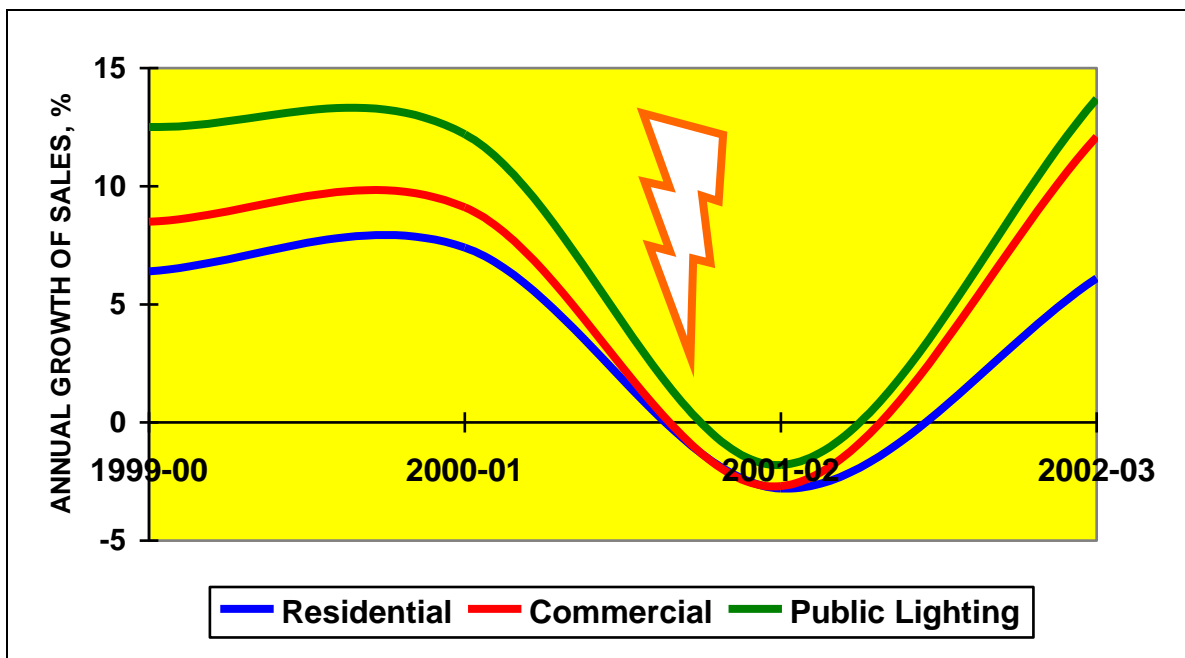
¹ World Bank and Asian Development Bank, *Gujarat Earthquake Recovery Program: Assessment Report*, March 2001, pages 60 to 61.

The data given in table 1 shows values for the period that goes from March of the first year to February of the second year.

It is to be noted that the performance of the industry sector sales reflects other, prior-to-the-disaster problems, and must not be included in the estimation of losses due to the earthquake. The same applies to the sales to the irrigation sector.

While it is difficult to clearly see the decline in sales for the last two years in Table 1, when the growth rate of sales is shown, the decline in demand can be more clearly noticed, as shown in the following graph (Figure 1).

Figure 1
Growth Rate of Annual Electricity Sales in Gujarat 1999 to 2003
Showing Decline after Earthquake

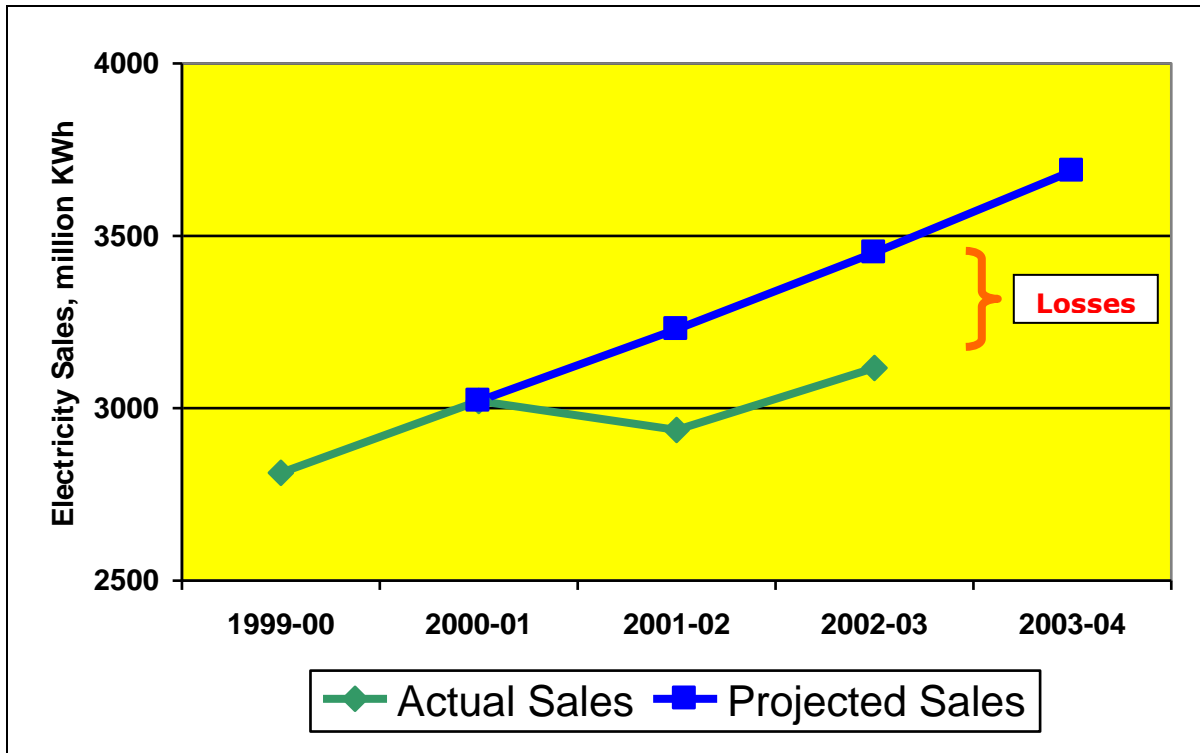


GUIDELINES FOR THE EXERCISE OF LOSS ESTIMATION

A sector-by-sector analysis – covering residential, commerce and public lighting sectors – is to be undertaken, in order to determine the average growth rate of annual electricity sales in the period 1999 to 2003. Such average growth rates are to be used to make projections of what the post-disaster sectorial sales should have been if the disaster had not occurred. These projected theoretical sales should then be compared to the actual sales that occurred in 2001 and 2002, for each sector. The difference between the two values (projected and actual sales) provides the amount of losses (in million KWh) that can be attributed to the disaster. These should be, in turn, converted into monetary values using the average value of KWh for each year in each sector.

The following graph shows an example of the comparison of projected and actual annual sales for the residential sector.

Figure 2
Actual and Projected Electricity Sales for Residential Sector in Gujarat
Before and After Kutch Earthquake



For the exercise, workshop participants must develop similar graphs of actual versus projected electricity sales for each sector to be analyzed (commerce, residential and public lighting).

Based on the above described graphs, estimates are to be made of the losses in electricity sales for years 2001 and 2002 for all three sectors. Results are to be included in the following table format (See Table 2).

In addition, participants must make a comparison of damage and losses in order to determine the relative importance of each disaster effect for the sector (See Table 3).

Table 2
Summary of Estimated Revenue Losses in Electrical Sector 2001 to 2002

Sector	2001-02	2002-03	Total
<u>Residential</u> Projected, million KWh Actual, million KWh Loss, million KWh Rate, Rs per Kwh Loss, Rs. Crore			
<u>Commercial</u> Projected, million KWh Actual, million KWh Loss, million KWh Rate, Rs/KWh Loss, Rs. Crore			
<u>Public Lighting</u> Projected, million KWh Actual, million KWh Loss, million KWh Rate, Rs/KWh Loss, Rs. Crore			
Total Loss, Rs. Crore			

Table 3
Total Value of Damage and Losses sustained by the Electrical Sector
After the Kutch Earthquake

Disaster Effects	Rs Crore
Damage to Electrical System Components	
Losses in Electricity Sales	

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