

LOAD MONITORING SYSTEM

Load Data Improvement Project (LDIP)



MicroTech
Industries (Pvt) Ltd.

REDEFINING TECHNOLOGICAL HORIZONS

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SMARTENING THE GRID

Imagine what would happen if the electricity were to shut off right now. Lights turn off in classrooms, assembly lines stop in factories, and your ironing or cooking gets put on hold. Water-bottling companies discard their half-processed bottles and steelmakers send half-made product to the scrap heap. Now imagine the frustration if this were to happen nearly every day, sometimes without warning. Eventually, kids stop coming to school, factories and offices stop working. You definitely wouldn't feel like paying your electric bill.



For 130 million electric customers in Pakistan, this isn't hard to imagine at all. Pakistan doesn't have enough electricity to go around. This country of 183 million people currently runs on 10,000-12,000 MW, about one-third the power consumption of California (which has only 38 million people). Pakistan's electricity supply meets only 55-70% of demand, creating a chronic power shortage that is managed by rolling blackouts. For most customers, the lights are off for 10-16 hours a day.

Pakistan has been agitated with energy crisis for the last few years. The energy sector is beset by a host of issues and shortcomings. These include technical and non-technical losses that mainly constitute electricity pilferage, inefficient distribution system and poor energy management. The prevailing power losses adversely affect the utilities' profitability and consequently the quality of services. Moreover, the cumulative revenue loss due to these losses accounts for millions of rupees annually in Pakistan. To deal with such problems, efficient and smart technologies are needed that are designed and customized keeping in view the local requirements and the international standards. A one-size-fits-all solution will not work in this market as its dynamics are quite unique.

The solution is based on MicroTech's fleet of Advanced Metering Infrastructure solutions including metering and backend software system

Foreseeing this scenario, MicroTech had been spending substantial amount of resources into research and development of the smart technologies. This has eventually led us to develop a comprehensive portfolio of smart metering solutions for both local and global energy markets. These innovative solutions have allowed us to successfully implement multiple smart metering projects such as Load Data Improvement Project (LDIP) all across Pakistan impacting the lives of hundreds of thousands of people connected to the national grid network.

To overcome the situation, Grid smartening was the need of the hour for which combined efforts from different stakeholder were required. Keeping in view the scenario MTI come up with an efficient load monitoring and management system to shorten the gap between supply

and demand.

The system was plagued by mis-communication, non-communication, and miscalculation of consumption levels. The National Power Control Center (NPCC), the government authority that manages Pakistan's nationwide power grid, is responsible for distributing power between DISCOs. If one DISCO was taking more than its share, NPCC had no way of finding out where the excess load was coming from and often made arbitrary decisions about where to impose blackouts. In the absence of accurate data, decisions about load shedding were sometimes based on bribery and political influence.

solutions including metering and backend software system that is deployed at all ten electric utility companies as well as the National Power Control Center (NPCC).

LOAD DATA IMPROVEMENT PROJECT (LDIP)

The LDIP was first of the kind implementation of AMI technology, initiated by Power Information Technology Company (PITC) and sponsored by USAID Power Distribution Program to monitor load and losses at grid and feeder level. The solution is based on MicroTech's fleet of Advanced Metering Infrastructure (AMI)

DISTRIBUTION COMPANIES AND THEIR STATISTICS

Previously, the distribution companies had no visibility into the load consumption and distribution trends. It was very difficult for them to predict the demand and manage the available supply of energy. Due to the state of such un-predictability of demand, unscheduled load shedding was carried and had become more of a routine task.

The map below shows the holistic overview of all Distribution Companies (DISCOs) of Pakistan. It depicts the geographic presence and operational areas of the distribution companies', the number of consumers, peak demand & the percentage of aggregate technical and commercial losses (ATC).

Geographic presence of Distribution Companies in Pakistan & their Statistics (Fiscal Year 2015)

Peshawar Electric Supply Company (PESCO)

- Serves the province of Khyber Pakhtunkhwa
- 2.9 million consumers
- Peak demand 2,718 MW (megawatt)
- Security and law and order issues
- 42.6% aggregate technical and commercial (AT&C) loss, mainly due to high transmission and distribution losses (34.8%)

Faisalabad Electric Supply Company (FESCO)

- Serves the central Punjab
- 3.4 million consumers
- Peak demand 3,062 MW
- Consumer base: industrial, mostly textile factories
- 10.9% AT&C loss, 100% revenue collection

Islamabad Electric Supply Company (IESCO)

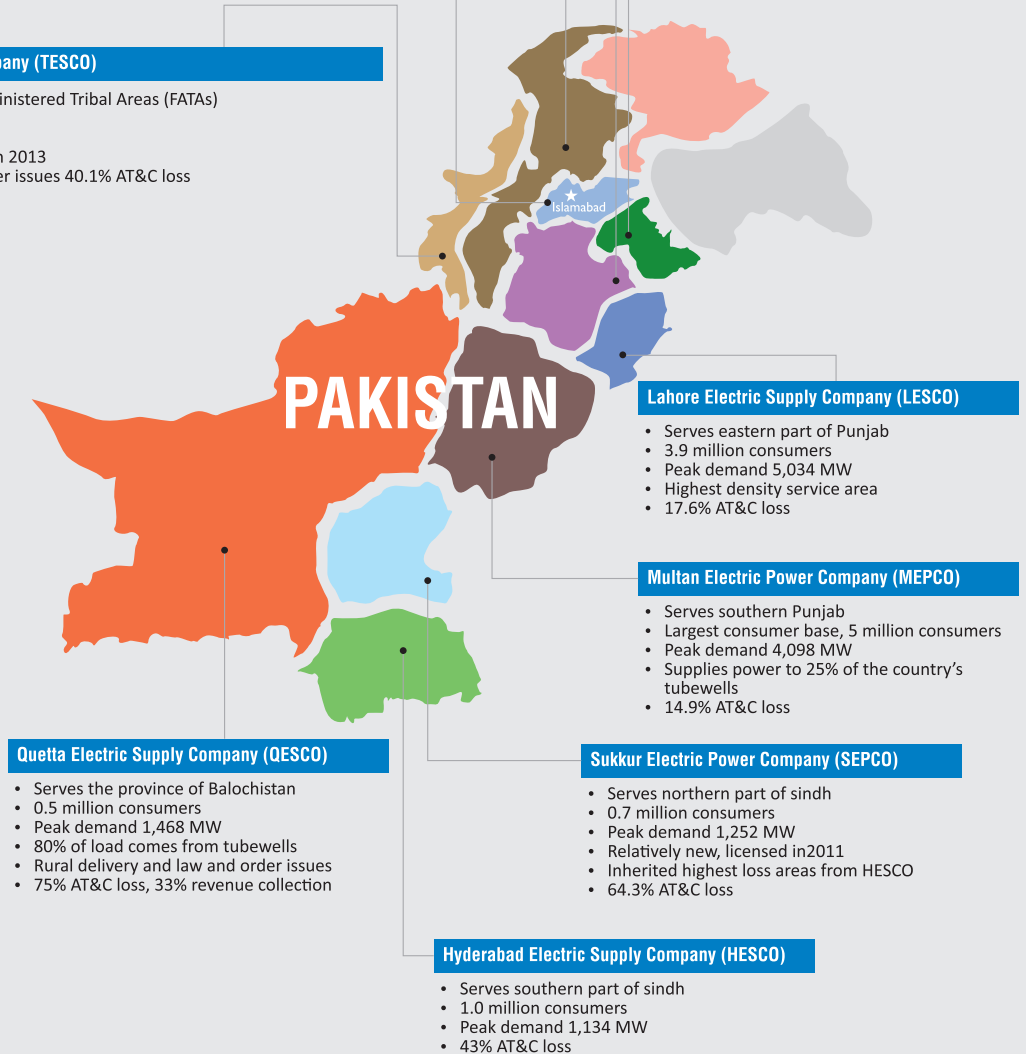
- Serves Islamabad, northern Punjab, some of Azad Jammu and Kashmir
- 2.4 million consumers
- Peak demand 2,206 MW
- Consumer base: Mostly government consumers
- 17.6% AT&C loss.

Gujranwala Electric Power Company (GEPCO)

- Serves northeastern Punjab
- 2.9 million consumers
- Peak demand 2,335 MW
- Consumer base: steel industry and small fan factories
- 13.3% AT&C loss

Tribal Electric Supply Company (TESCO)

- Serves the Federally Administered Tribal Areas (FATAs)
- 0.4 million consumers
- Peak demand 379 MW
- Relatively new, licensed in 2013
- Security and law and order issues 40.1% AT&C loss



Lahore Electric Supply Company (LESCO)

- Serves eastern part of Punjab
- 3.9 million consumers
- Peak demand 5,034 MW
- Highest density service area
- 17.6% AT&C loss

Multan Electric Power Company (MEPCO)

- Serves southern Punjab
- Largest consumer base, 5 million consumers
- Peak demand 4,098 MW
- Supplies power to 25% of the country's tubewells
- 14.9% AT&C loss

Quetta Electric Supply Company (QESCO)

- Serves the province of Balochistan
- 0.5 million consumers
- Peak demand 1,468 MW
- 80% of load comes from tubewells
- Rural delivery and law and order issues
- 75% AT&C loss, 33% revenue collection

Sukkur Electric Power Company (SEPCO)

- Serves northern part of sindh
- 0.7 million consumers
- Peak demand 1,252 MW
- Relatively new, licensed in 2011
- Inherited highest loss areas from HESCO
- 64.3% AT&C loss

Hyderabad Electric Supply Company (HESCO)

- Serves southern part of sindh
- 1.0 million consumers
- Peak demand 1,134 MW
- 43% AT&C loss

(Source: USAID Power Distribution Program 2010-2015)

PROJECT OVERVIEW

The main objective of the LDI Project was to mitigate the instances of unplanned load shedding by improving visibility into the load consumption and distribution trends of the energy sector. To provide near real time monitoring of load data, smart energy meters were deployed by MTI's installation teams on Incoming and Outgoing feeders of more than 750 Grid Stations all around Pakistan. The meters installed at 11 KV Incoming side communicate load data on near real time basis and the meters installed on 11 KV

Outgoing side communicate load data after every 15 minutes interval. Simultaneously, on/ off status of the feeders with time is also being monitored / indicated.

The main objective of LDIP was to reduce the incidence of unscheduled load shedding and to implement an effective load management & monitoring system to shorten the gap between supply and demand

A Meter Data Collection (MDC) software collects the metering data and makes it available to National Power Control Center (NPCC) and different utility Power Dispatch Centers (PDCs). The implemented solution has also helped NPCC to retrieve live data for better management and allocation of load quota to each utility.

PROJECT IMPLEMENTATION

MTI has a dedicated Service Division for the implementation of complex AMI networks. With the help of our competent field staff, backed by an in-house team of engineers and subject matter experts we successfully managed LDI project massive roll out and its operations in an effective manner.

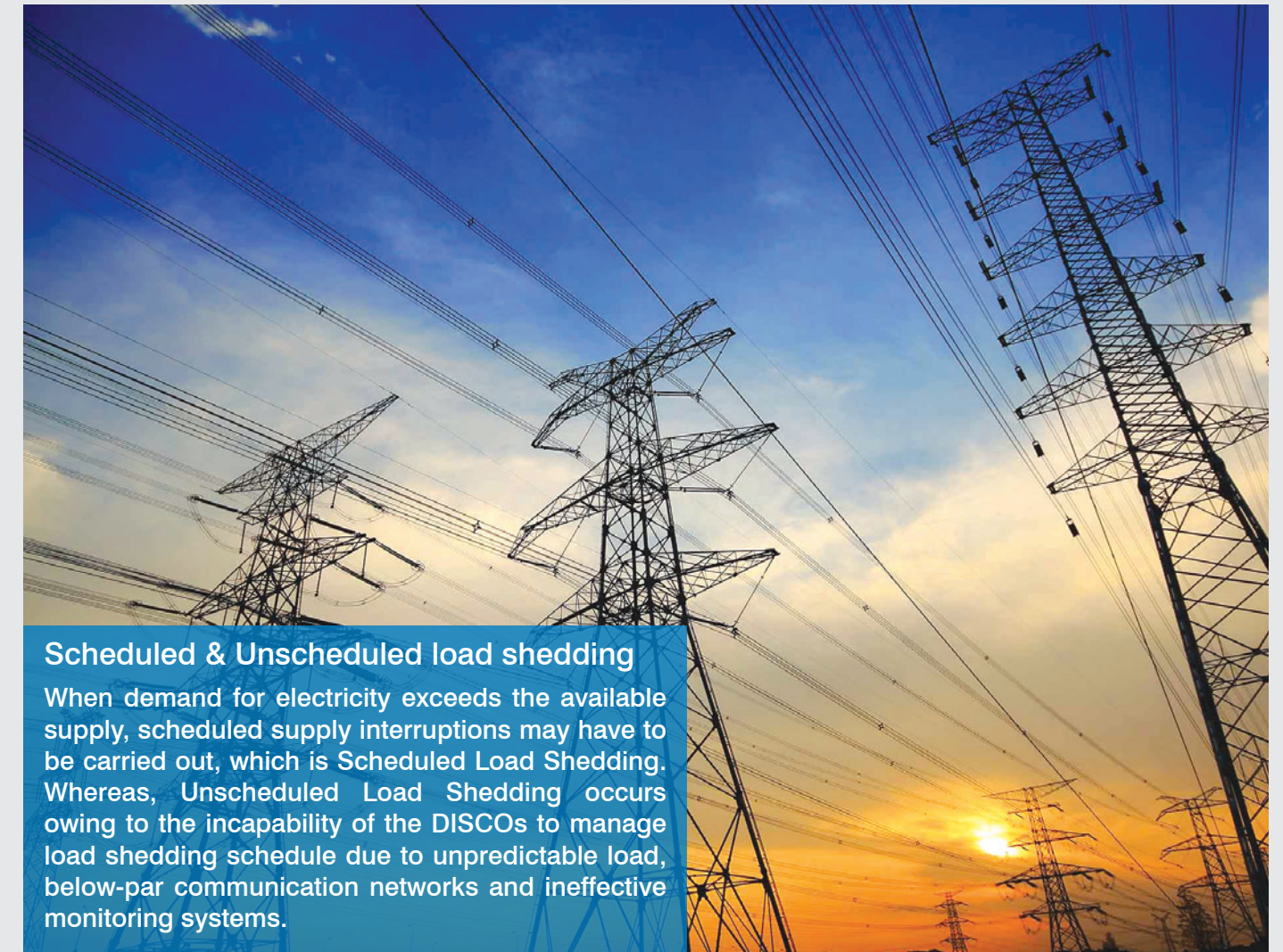
Our field teams provided efficient meter installation services and managed to install smart energy meters on more than 750 Grid Substations all across Pakistan. In order to efficiently manage on-field activities, 28 field installation teams were deployed, moreover 6 customer support teams provided full back-end support to deal with the problems encountered in the field.

To receive, store and process the metering data, a state-of-the-art Network Operations

Center (NOC) was established by MTI's solution architects and subject matter experts. This ensures that all the ten utility companies have 24/7 access to the metering data which enables them to perform utility wide analysis and management. Also it allows NPCC to better forecast the electricity requirements of the country based upon historic data and trends.

Our experienced teams are fully capable to provide services for designing, installation, verification and customer support from meter maintenance right through to management and analysis of the metering data.

This project involved multiple stakeholders ranging from the Water and Power Ministry to all the ten Distribution Companies.



Scheduled & Unscheduled load shedding
When demand for electricity exceeds the available supply, scheduled supply interruptions may have to be carried out, which is Scheduled Load Shedding. Whereas, Unscheduled Load Shedding occurs owing to the incapability of the DISCOs to manage load shedding schedule due to unpredictable load, below-par communication networks and ineffective monitoring systems.

PROJECT BENEFITS

The project has resulted in a number of benefits such as

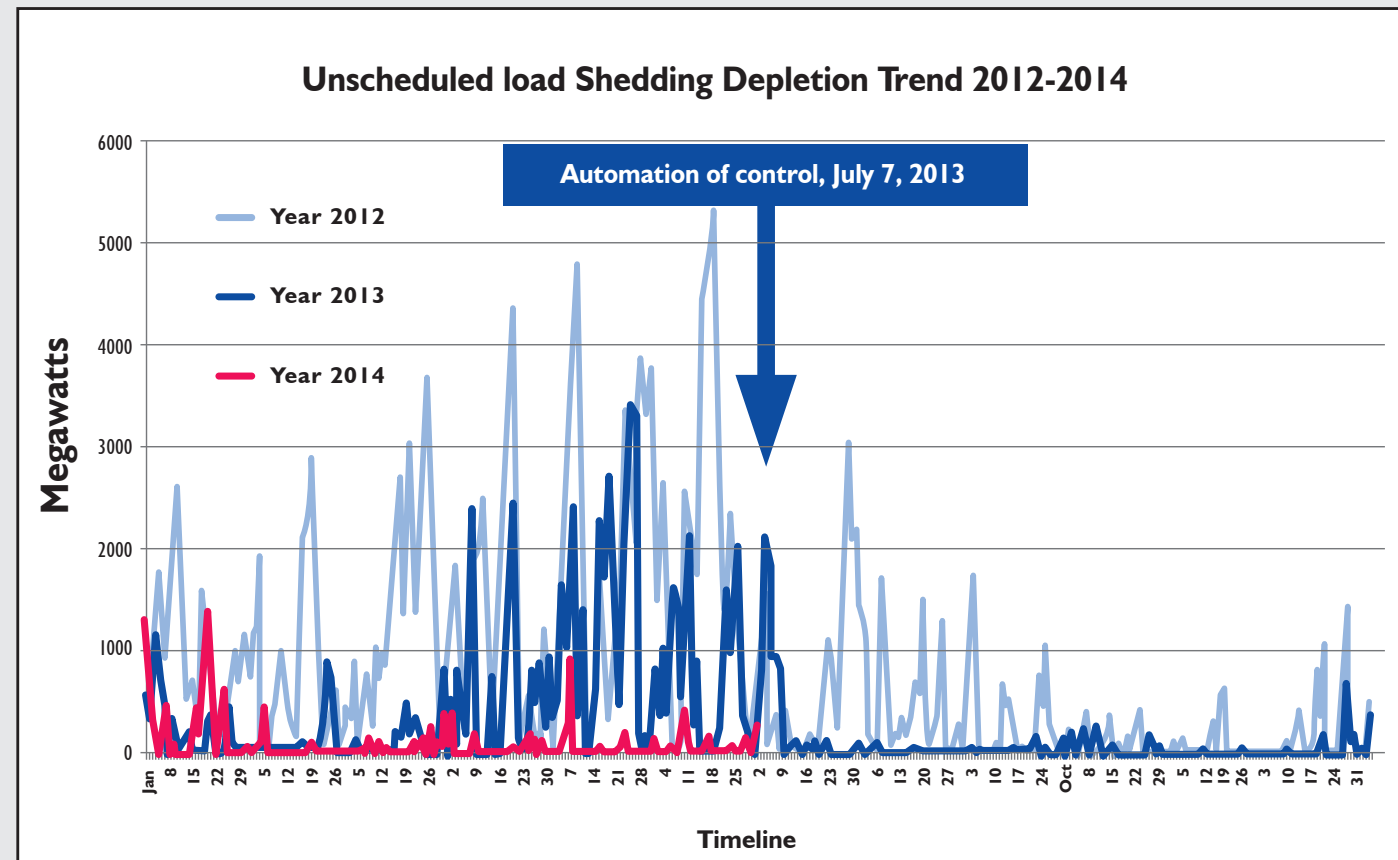
- Elimination of unscheduled load shedding
- Visibility into the load consumption and distribution trends
- Better implementation of quota allocation by NPCC
- Accessibility of utility wise and nationwide energy demand requirement
- Availability of real-time load information to the decision makers
- Optimum load management and utilization of available power
- Monitoring of system imbalances for preemptive action and maintenance by improving reliability of power supply and predictability of load shedding

Increased revenues of DISCOs by **\$62.3 million** annually

Reduction in overall economic loss by **\$180 million** annually

The graph below gives an overview of mitigation trend of unscheduled load shedding over the years 2012-2014. It is evident from the graph that LDI project has helped the DISCOs in streamlining the instances of un-scheduled load shedding to a significant level, enabling the DISCOs to efficiently manage

the allocated quota by NPCC. Whilst providing real-time load information to the decision makers and availability of DISCO wise and nationwide energy demand requirement that was previously considered near to impossible.



Source: USAID Power Distribution Program 2010-2015

CHALLENGES

The implementation involved a number of challenges. First of all there was no precedent of a solution as sophisticated and complex as LDIP in the country. Then the successful implementation of the project required effective coordination among multiple stakeholders including USAID, PITC, power utilities, NPCC and MicroTech. Also, the scope of work for the project was huge as the network to be established had nodes (grid stations) located at far-flung areas all across Pakistan and



LDIP comprises:

- A Network Operation Center at WAPDA House, Lahore
- 10 Power Distribution Control Center
- Around 9,335 Smart Meters to Track and Report Data
- A Display & Control Screen at National Power Control Center

required highly qualified technical experts to visit and implement the network.

The technical solution by MicroTech and our commitment has allowed us to implement a project of this size in a record short time that can act as a case-study for other countries.

INTERNATIONAL RECOGNITION

Earlier, there was no way to assess the energy demand at any given point in time as records were not that precise and were maintained on papers. The power distribution companies were unable to manage distribution proficiently due to lack of communication and minimal statistics of energy usage levels.

LDIP gave clear insights regarding consumption patterns which enabled policy makers to make informed decisions resulting in better management of the load and diminish the instances of unscheduled load shedding. This project was so inimitable in nature that it is even recognized internationally.

Load Data Improvement (LDI) Project won USAID "Data into Action" Award. This first of the kind Load Monitoring and Management System helped to shorten the gap between supply and demand. We are proud to mention that out of 147 projects from eighty countries around the world, 12 projects were selected and awarded including MTI LDI Project. The award acknowledged major achievements such as:

- Mitigating unscheduled load shedding
- Availability of real time load data to the decision makers for the first time

Data into Action Award

Winner of "Data into Action" award by Global Development Labs, U.S.A.



Established in 1992, MicroTech Industries (MTI) is a multi-discipline technology company involved in the design, development & manufacturing of hi-tech products, providing comprehensive business solutions to valued customers both locally and internationally. With twenty-three years of innovation, MTI continues to lead with the objective of indigenously developing and implementing specialized solutions at global standards. Its core strength has always been to transform ideas into reality through innovation in electronics, electrical and computer engineering.

The Research & Development department at MTI acts as a catalyst in converting technical solutions into successful commercial ventures by quickly assimilating the ever-changing needs of the customers, serving them with timely, cost effective and reliable solutions. The product line of MTI includes Smart Metering Solutions, Smart & Static Energy Meters (Postpaid and Pre-paid), Payphones (Landlines and GSM), Vehicle Tracking Systems and GSM Call Routers.



REDEFINING TECHNOLOGICAL HORIZONS

Plot # 2, Street # 2, Attari Industrial Estate, 18 Km. Ferozpur Road, Lahore, Pakistan.
PABX : +92-42-35990015, Fax: +92-42-35924780
E-mail: marketing.info@mtlimited.com, Web: www.mtlimited.com