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# ENERGY POLICY PROGRAM

**EXECUTIVE EXCHANGE ON BEST PRACTICES  
IN GRID, MARKET AND COMMERCIAL  
OPERATIONS FOR NATIONAL TRANSMISSION  
AND DESPATCH COMPANY (NTDC)  
OCTOBER 2014 – APRIL 2015**



**November 2015**

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## EXECUTIVE EXCHANGE ON BEST PRACTICES IN GRID, MARKET AND COMMERCIAL OPERATIONS FOR NATIONAL TRANSMISSION AND DESPATCH COMPANY (NTDC)

OCTOBER 2014 – APRIL 2015

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# ACRONYMS

AEAI	Advanced Engineering Associates International, Inc.
AGC	Automatic Gain Control
BOD	Board of Directors
CPPA	Central Power Purchasing Authority
DG	Director General
DISCOs	Distribution Company
DM	Deputy Managers
EHV	Extra High Voltage
EMS	Energy Management System
EPA	Environmental Protection Agency
EPP	Energy Policy Program
FERC	Federal Energy Regulatory Commission
FESCO	Faisalabad Electric Supply Company
GEPCO	Gujranwala Electric Power Company
GSC	Grid Station Construction
GSO	Grid Station Operations
HR	Human Resources
IESCO	Islamabad Electric Supply Company
IT	Informational Technology
IPP	Independent Power Producers
KESC	Karachi Electric Supply Company
LESCO	Lahore Electric Supply Company
LDs	Liquidated Damages
MD	Managing Director
MEPCO	Multan Electric Power Company
MW	Mega Watt
MWP	Ministry of Water and Power
NEPRA	National Electric Power Regulatory Authority
NPCC	National Power Control Center
NTDC	National Transmission and Dispatch Company

NUST	National University of Sciences and Technology
PEPCO	Pakistan Electric Power Company
PPIB	Private Power and Infrastructure Board
RTUs	Remote Terminal Unit
SAP	Systems, Applications and Products
SCADA	Supervisory Control And Data Acquisition
SOP	Standard Operating Procedures
SPTL	Special Purpose Transmission Line
SVCs	Switched Virtual Circuit
USAID	United States Agency for International Development
USEA	United States Energy Associates
WPPO	Water and Power Development Authority Power Privatization Organization

# EXECUTIVE SUMMARY

This assessment report summarizes and highlights the responses collected during the periodic follow ups conducted with exchange visit participants between November 2013 to April 2015 in Lahore and Islamabad. Based on participant feedback, the assessment highlights the challenges and achieved objectives from action plans w.r.t their learnings during the training. To date, the Energy Policy Program (EPP) trained 26 participants (19 males and 7 females) from National Transmission and Despatch Company (NTDC). Best practices in Grid, Market and Commercial Operations' training was designed to improve capacity in the Pakistan power sector's electricity grid through exposure to best practices in transmission operations, maintenance, and planning, including the integration and dispatch of renewable energy into the grid, while establishing professional relationships for NTDC.

As a result of this training all the participants learned new skills to be implemented at NTDC. The chart below details the number of participants:

Trainings	Participants
Executive Exchange on Best Practices in Grid Operations for NTDC	9
Executive Exchange on Best Practices in Market Operations for NTDC	8
Executive Exchange on Best Practices in Commercial Operations for NTDC	9
<b>Total</b>	<b>26</b>

To support the future training, EPP conducted periodic follow ups with exchange visit participants at NTDC Planning Department Lahore and EPP's Islamabad Office to interview and survey the projected and achieved aims and objectives. EPP asked the participants to detail the challenges they faced during the training program w.r.t their daily departmental work to that of training contract and work done by US companies.

This assessment reviews the background on the exchange visit trainings, participant feedback and recommendations provided by participants. Annex-I Participants details provides the name and organization of the participants from each exchange visit batch.

# PROGRAM GOALS

Improve capacity in the Pakistan power sector's electricity grid through exposure to best practices in transmission commercial operations, while establishing professional relationships for NTDC to draw upon after the conclusion of the program.

To date, EPP trained 26 participants (19 males and 7 females) from National Transmission and Despatch Company (NTDC) in three batches. All these participants received the training manuals and other training materials from United States Energy Association (USEA) for future support. EPP conducted detailed periodic assessments of the training participants to review their experience, capacity gaps, and challenges. The assessment outlines improvements, USAID procedure compliance, recommendations, and future monitoring and evaluation procedures.

## PROGRAM OBJECTIVES

Training objective per batch is as follows:

### GRID OPERATIONS - TRANSMISSION SYSTEMS

- Asset management
- Planning
- Data collection and modeling
- System reliability and transmission standards (grid codes)
- Operations and maintenance
- Wheeling mechanisms
- Congestion management
- Ancillary services
- Transmission scheduling and power dispatch
- Renewable integration

### MARKET OPERATIONS - POWER MARKET DESIGN, ORGANIZATION AND OPERATIONS

- Market organization, staffing and functions
- Market membership and governance
- Role of market participants (IPPs, Power Marketers, etc.)
- Bilateral, day ahead and real time transactions
- Transmission scheduling and power dispatch
- Commercial operations
- Settlement processes
- Market monitoring/surveillance and mitigation techniques
- Ancillary services
- Renewable integration & renewable markets
- Privatization

### COMMERCIAL OPERATIONS - UTILITY COMMERCIAL OPERATIONS

- Business process improvement
- Financial management
  - Managing utility expenditures
  - Established, successful accounting practices and procedures
  - Financial forecasting and analysis procedures
  - Relations with regulator and ministry on financial issues

- Utility commercial management practices
  - Commercial department structure and functions
  - Pricing and tariff setting practices

# POST TRAINING ASSESSMENTS

## MONITORING AND EVALUATION VISITS

In conducting the training assessment, EPP's M&E team worked closely with the participants at NTDC Lahore, NPCC Islamabad, and CPPA Lahore. The assessment sessions provided the participants an opportunity to express their opinions about the training, and gave EPP important information that will shape future programs. White paper follow up reports are attached in - Annex II – Initial Post training feedback/Assessment Forms are attached in Annex III. EPP conducted the assessment visits on the following dates:

Post – Training Follow up Session	Dates
Executive Exchange on Best Practices in Grid Operations for NTDC	November 25 <sup>th</sup> , 2014
Executive Exchange on Best Practices in Market Operations for NTDC	February 25 <sup>th</sup> , 2015 March 2 <sup>nd</sup> , 2015
Executive Exchange on Best Practices in Commercial Operations for NTDC	May 12 <sup>th</sup> , 2015
Post – Training Follow up Session	Dates
Executive Exchange on Best Practices in Grid Operations for NTDC	September 1 <sup>st</sup> , 2015
Executive Exchange on Best Practices in Market Operations for NTDC	September 2 <sup>nd</sup> , 2015
Executive Exchange on Best Practices in Commercial Operations for NTDC	September 3 <sup>rd</sup> , 2015

## ASSESSMENT FINDINGS

The findings below are based on the white paper's monitoring and evaluation sessions with the participants at NTDC Lahore based on the recommendations and progress made so far on the departmental level. The tables below highlight the feedback and comments given by the participants:

Highlighted Issues	General Feedback and Comments
	<b>Grid Operations</b>
Transparency/availability of data	<p><i>"Up to date Daily merit order, supply/demand gap and its reasons, energy usage data of individual DISCOs and periodic reports are still not available online. An independent IT section is not yet in operation at NPCC Islamabad. For NPCC Data Transparency MWP influence needs to be shut off. NPCC must work independent to decide at its own umbrella of system constraints and supply/demand gaps"</i></p> <p><i>"Data regarding daily load curve, peak demand, daily despatch by generation units etc. is being shared by NPCC to its liaison office on daily basis"</i></p> <p><i>"The issue has been highlighted in different meetings within the organization. MWP may implement the policy of transparency of data like energy bought and sold, load shedding schedule in different areas and cost of the energy consumed. NEPRA can also implement the policy of transparency and availability of data"</i></p>
Delays in procurement processes	<p><i>"The issue has been discussed at many different forums within the organization Head of procurement can implement the policy regarding procurement execution committee for smooth and timely completion of contracts"</i></p> <p><i>"The tribunals can be established by NEPRA and Ministry of Water and Power"</i></p>

	<i>“Update in this regard may be taken from Grid Station Construction (GSC) department and design</i>
<b>Creation of parallel/free markets</b>	<i>Creation of free market is related to Private Power and Infrastructure Board (PPIB) and Ministry of Water and Power (MWP); yet no achievement has been made which an individual Pakistan can think of” “CPPA (Central Power Purchasing Agency) has now been separated from NTDC and is being made an independent entity wholly responsible for the purchase/procurement of power from generation companies/entities. It will also deal with all the purchase agreement</i>
<b>Independent regulatory body</b>	<i>This issue has been highlighted and MWP may probe the issue and implement the policy” “Third party contractors have been involved in developing SOPs for preparation and protection. In this regard USAID has also contributed in developing SOPs for NPCC” “NEPRA is not independent in deciding the fate of electricity market in Pakistan. It has to be empowered and authoritative and free of political influences. NEPRA has a long way to go to materialize its SOPs for Power system operations, planning, and monitoring to be followed by all power transmission and distribution companies”</i>
<b>Demand Response and Net metering Programs</b>	<i>I cannot think of having a metering system in Pakistan. Such program is effective in areas where consumers are not facing electric power shortage and prolonged load shedding. Here we are using solar PVs at our premises because we have no power at our main DISCO. Solar PV is not leisure its needs now. There are areas where people are 100% relying on solar PV and are happy with it. They do not care about utility owing to huge bills with no inputs at the main connections” “Net metering systems have been installed at cut-off points (power delivery points) throughout NTDC networks. Other than those Tariffs for peaks and off—peak loads are effective to the users and encourage them for demand side management” “Recently, NEPRA has approved tariff on net metering systems and time of used metering is under effective implementation by DISCOs” “NEPRA may implement the policy of demand response and net metering system but to implement the policy there should be no load shedding otherwise one is left with no option but to use the energy when it is available”</i>
<b>Implementation of SCADA system effectively at Grids</b>	<i>Implementation of SCADA system is an ongoing process at NTDC and will continue in future” “Project for up-gradation of NPCC’s load despatch center has recently been completed. Now most of the 500 kV and 200 kV grid stations are equipped with SCADA system and remotely connected with National Power Control Center through RTU’s. “SCADA system is installed at our grid stations but not fully operational, practically due to the locations to which we cannot afford to have an unattended grid station. Moreover, number of operations is huge due to which operational discrepancies taking time to be resolved”</i>
<b>Enhance solid waste management generation</b>	<i>Solid waste management is in practice but on smaller scale” “Small generation facilities have been promoted at DISCOs level which can efficiently convert solid municipal waste into electricity. LESCO is procuring power from such plants at DISCO level. Similarly, generation of electricity from Bagasse (solid waste of sugar cane remains) is also being used as a fuel in cogeneration plants”</i>
<b>Asset management</b>	<i>“Staff counseling has been arranged for proper record keeping of assets at 500 kV grid station Nokhar. Condition of every equipment and instrument should be checked and record is being maintained” “The issue of an asset management of the office has been discussed with authorities; convinced to start proper management of resources i.e. computers, printers, office supplies etc. at organizational level”</i>

### **Market Operations (NPCC)**

<b>Connect generators through AGC and use EMS/SCADA system for real time power system operations</b>	<i>As the project is not fully completed and due to partial data availability of real time stations, NPCC is facing a lot of issues to run these applications. To improve these operations, we tried to optimize and provided maximum data fed into EMS systems. Results, for applications to work more efficiently we developed net and generation model. We are constantly improving these models by getting TIFs, generators and line data from the respective sections to get better outputs. Secondly, for AGC, we are in correspondence with all Thermal/Hydel and IPPs. Major Hydel stations are already working on AGC and producing positive results. Moreover, spinning reserve quota allocated” “Formal letters have been sent to relevant information for implementing the AGC system. Hydel plants are presently running their operations on AGC”</i>
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	<p><i>"We communicated the problem to all of our respective departments. So, AGC has been provided on all hydel power plants but currently not on thermal plants. We are expediting the competent person/authorities to provide the AGC on all thermal plants like implemented on Hydro plants. Furthermore, a suitable spinning reserve of about 100-200 MW has been allowed to operate and all power planning allocations to DISCOs on day ahead basis and hourly basis as per prevailing system conditions"</i></p>	
<p>Up-gradation/maintenance of grid system besides removal of prevailing network constraints</p>	<p><b>DISCOs Network</b></p>	<p><i>We have initiated the process by informing all the recommended solutions to all the DISCOs. Four out of 10 DISCOs has already started their projects to upgrade and connected all 132 kV networks through capacitor banks. LESCO constructed links between Orient Power and associated networks and hence the contingency has been provided in this area. Similarly, FESCO, MEPCO, IESCO, and GEPCO constructed, rehabilitated the capacitor banks and line to reduce the network constraints. The achievement is encouraged in all aspect. Now DISCOs has been provided the tools and plants, all the DISCOs availing shut down through live lines crews by the efforts of our teams. The live line training organized by EPP was one of our recommendations in white paper"</i></p> <p><i>"A few augmentation and upgradations have been made to our system in order to minimize the constraints on the system e.g. at Kot Lakh Pat, Burhan and Mardan. Formal letters have been sent to the DISCOs and follow up program review meetings are being held on a monthly basis. DISCOs are presently engaging live line crews purely upon their inputs (formal and informal) as recommendations on this matter."</i></p>
	<p><b>Low Voltages</b></p>	<p><i>SVCs have been installed at 220 kV NKLP grid station, left over are in plane different locations. Shunt reactors are in service, capacitor banks are installed at different locations of networks on our initiatives. Month wise DISCOs, NTDC and NPCC meetings are being arranged to cope with the recommendations"</i></p> <p><i>"SVC installed at NKLP grid station and now they are ready to connect/ energize which will improve the voltage issues. Many such projects are under progress at different stages at our planning section. All real time grid station where Shunt reactors are installed, we keep their status updates so that the despatcher has the live status and information in real time for any required work"</i></p> <p><i>"Few SVCs are in planning stage and we are formally playing our role as controllers to push hard for expedition's actions due to the importance of the system"</i></p>
	<p><b>Capacity Building</b></p>	<p><b>Forced load shedding can be avoided by authorizing the shift in-charge to change the quota in case of any emergency outages. (SOP is needed to be for quota allocation and forced load management).</b></p> <p><i>"NPCC started implying and the SOP are approved and available, targets have been achieved as the shift in charge has been authorized to take initiative and actions regarding the system operation requirement"</i></p> <p><b>An automated program i.e. SCADA system for 132kV network can be the very helpful to record operational data and updating of electronic mimic board.</b></p> <p><i>"Work in progress for the upgradation of 132 kV SCADA system"</i></p> <p><i>"SCADA system for 132 kV N/W is already at LESCO and IESCO. IESCO's SCADA project is anticipated to start shortly. A team of engineers from IESCO visited NPCC and they have been trained i.e. overview and detail of NPCC's new SCADA system. NPCC is anticipating better results in future from IESCO"</i></p> <p><b>Communication system can be improved by establishing control room as well as staff for prompt communication purpose. By doing this restoration can be done within minimum time and load shedding will be reduced.</b></p> <p><i>"New communication system is already under progress by M/S Alstom and at our end we keep our EMS system updated with the latest telephonic records in directories. All the stations are telemeters and have their hot lines i.e. mobile number on real time display which is very convenient for information sharing"</i></p> <p><b>An additional desk to be introduced in control room for short term</b></p>

	<p>load forecasting</p> <p>“Operational staff has been planning short term forecasting and the proposals are forwarded to the higher officials for approvals”</p>
<b>Market Operations (CPPA)</b>	
Shortage of Electricity	<p>“In my opinion the challenges is wrongly addressed in terms of severe pressure on WPPO/(WAPDA Power Privatization Organization)NTDC. Being in the prime department of Pakistan’s energy sector we are not meant to work more than ordinary. Here at CPPA (G), we have revised our SOPs for the development of Hydel Power Projects. We can work on parallel lines, we do not wait for the completion of each and every step to move forward unless it is necessary i.e. approvals from BODs or NEPRA. Resultantly, our timelines for project development have improved significantly”</p> <p>“New Environmental Protection Agency (EPA) being signed with upcoming small Hydel and Solar IPPs are not based on capacity payments. Only energy payments are being made to them on take and pay basis”</p> <p>“CPPA and other stakeholders have made a standardized EPA for solar projects i.e. a total of 300 MW EPA has been signed and up to 2000 MW projects are in pipeline”</p>
Single buyer to single buyer plus model	<p>CPPA has been separated from NTDC has given the target of power market establishment in Pakistan as in other countries by 2025”</p> <p>“More generation is being added to the system in addition to improvement of transmission facilities. Private transmission facilities are also being discussed and transmission license has been granted to a private company”</p> <p>“NEPRA is taking steps to operationalize wholesale energy market with the country gradually. Recently, NEPRA has advertised Special Purpose Transmission License (SPTL) to a private company which has never been done in the past”</p>
Circular Debt Issue	<p>“CPPA has been separated from NTDC and a new company CPPA (G) Ltd has been formed in order to streamline liquidity problems and circular debt issues. NEPRA has announced guidelines for renewable energy 2015 and upfront tariff for small Hydropower projects which is a good step towards the new Hydro Power generation i.e. the cheapest of all”</p> <p>“Government has established Escrow Accounts for payments to IPPs so that the circular debt may not hot the private sector investors”</p> <p>“A database called IPAs has been established for the data related to invoices of IPPs enabling CPPA to calculate liquidated damages (LDs). Invoice adding to National exchequer”</p>
Inadequate Transmission Facilities	<p>As already mentioned that steps are being taken to incorporate private sector transmission facilities at the National grid”</p> <p>“GOP has made a policy by which private sector can also built transmission line in Pakistan”</p> <p>“NTDC, Extra High Voltage (EHV) department is working hard to strengthen the existing network and expansion of the network as well. NTDC is claiming to operationalize new Jhimpir Grid in the next year. Resultantly, wind power will flourish more than today as well”</p>
Deficiency of Legal Department:	<p>“It is the biggest weakness of CPPA (G) Ltd that we don’t have any legal department and the issue is still unaddressed”</p> <p>“CPPA has advertised for a chief legal officer post. We are hopeful to have improvements in legal department”</p>
<b>Commercial Operations</b>	
Organizational restructuring	<p>After the training, participants had various discussions with the department heads and higher authorities to reshape the organizational structure at NTDC. Following the discussions, NTDC is restructuring the 1 DG, 2 MD, and 7 DM chain of command to a more departmental level decision making approach for quick results. Organizational restructuring will help in organizing the ongoing and future activities much more efficiently.</p>
Human Resource Departmental Issues	<p>NTDC HR department forwarded the new HR policy to the higher authorities for approval; HR policy is inspired by rules and regulation of the companies visited during training. HR policy underlines, incentives, travel and work allowances, better medical and health facilities i.e. NTDC is outsourcing the health insurance to a qualified insurance company for better facilities. New transport policy is also under review by the staff which details the allotment of vehicles under conditions (i.e. specific to the nature of the job). NTDC is also introducing employee of the month policy to recognize extraordinary work</p>

	<p>performance from each department, departments will forward the nominations to HR for finalization. For capacity building trainings, NTDC is currently in negotiations with NUST, Islamabad to organize similar training as organized by WAPDA Staff College while incorporating changes in the training content based on commercial operations training content provided by USEA. It will be a twice a year mandatory training for every employee.. Supervisors will conduct meetings prior to the training to discuss individual and departmental action plans. As per the promotional policy, NTDC will not adhere to any of the Thermal/Hydro promotions under PEPCO to that of NTDC's gazette/non-gazette posts. Thermal/Hydro promotions will follow the PEPCO promotional policy whereas; NTDC's promotions will be processed by their BODs subjected to only NTDC employees. All these policies are under process and will help NTDC build a strong work environment.</p>
Procurement procedures	<p>Comparison of the procurement policies helped outlining the root cause of delays and required changes in the current policies. After returning, design department discussed the difference to solve the ongoing procurement problems. Previously NTDC was using single state, single envelope, lowest cost bidder options. After the changes made in the procurement policy, design department is now following one state, two envelope policy i.e. technical and financial bidding. NTDC evaluates the technical and financial details as per the requirements of the project and negotiates with the best service provider. Though, NTDC is facing a lot of objections from Grid station staff on the new policy.</p>
Financing issues	<p>Installation of the financial software will help integrate all the financial details across NTDC i.e. budgeting, accruals, payments and disbursement invoices, etc. for better understanding of the allocated budget all to the DISCOs. Moreover, software will help in record maintenance of disbursements invoices for budget analysis. NTDC is planning an installation of software similar to the one being used by KESC i.e. SAP. SAP benefits include: a smaller data footprint, higher throughput, faster analytics and reports. It will help NTDC input all the financial details using cloud platform gives faster access to data (social, text, geo, graph and processing). In addition to the use, NTDC will provide hands on SAP training to the staff for future improvements. In US, companies have their own maintenance plans, NTDC's GSO maintenance plan is in the process to monitor the grid-wise payment disbursements w.r.t their spending; past GSO cost-analysis clearly exposed over spending of many DISCOs. Implementation of the GSO maintenance plan will monitor the budget allocated vs the budget spent. NTDC is planning to introduce a tax department solely to look after the tax related payments, invoices, and other issues. Furthermore, introduction of a regulatory department at NTDC is also in consideration i.e. to ensure the tax obligations are as per NEPRA's rules and regulation to avoid any discrepancies in project completions.</p>
Risk Assessment Strategy	<p>NTDC requires a risk assessment strategy for analyzing upcoming risks and their potential situations based on current scenarios. Studying current scenarios will not only help in assessing what can happen but will also lead towards a possible solution. Due to bad risk and cash flow management cash inflow and outflow mismatches all day due to time lags. Introduction of a risk management tool will help identify where and why the lags are occurring. In US, companies are outsourcing expert companies to reconcile their cash flows on the daily basis. By following similar approach and outsourcing, NTDC can save time and effort of calculating lags. Since, NTDC and NPCC are two different entities now; outsourcing will help reconciling the cash flows on individual basis.</p>

# RECOMMENDATIONS

As a result of EPP's assessment, the following recommendations have been offered by each training group to enhance future operations at NTDC:

## GRID OPERATIONS

- Availability of transparent data about the energy bought and sold on daily basis and regular dispatches will prevent irregularities.
- More efficient procurement processes are required which will help resolve critical delays in the implementation process caused due to disputes in awarding of contracts.
- An independent regulatory body like Federal Energy Regulatory Commission is required to formulate regulations for generation, transmission and distribution utilities ensuring the development of reliable and efficient energy infrastructure at reasonable cost.
- In Demand Response the consumer refrains from using power during peak hours and in turn receives an incentive in the form of lower electricity bill, similarly in Net Metering Program consumers having solar PV at their residence that can export the additional power to the grid and reduce their power bill. NTDC consumers should be introduced to these programs for efficient and reduced power consumption.
- Poor asset management at NTDC is causing trouble e.g. non availability of data including surveys detailing the equipment's history, track of the useful life of material/equipment used, and record based on studies that which equipment is unavoidable to be replaced/augmented.
- In USA, Generation of Electricity from municipal solid waste is a very profitable and reliable source of generation where people pay for the resource (garbage) to be utilized in efficient manner

## MARKET OPERATIONS

- Connect generators through AGC and use EMS /SCADA system for real time power system operations. SCADA system of power system has been recently upgraded at NPCC. But unfortunately, most of the applications of SCADA system are not meant for the operator at the moment. Therefore, the system operator is facing issues to operate the system without using latest techniques on real time basis. Moreover, the gap between supply and demand creates a great deal of difficulty for system operator to control frequency that continuously threatens the reliability of system.
- Severe overloading is being observed at 132kV and lower voltage levels under the jurisdiction of Discos. Similarly contingencies of the transformers and transmission lines are not available.
- Voltage is another issue that NTDC system has to face during peak times in summer and winter seasons. In summer voltage are low due to high reactive demands and non-availability of VAR compensators. Sometimes voltage reaches beyond the permissible limits cause load shedding in addition to generation shortfall is carried out to avoid voltage collapse. Similarly, in winters the voltages become very high during less load hours (especially at night). The system operators open the 500 and 220 kV transmission lines due to non-availability of VAR compensators. The openings of lines are very critical for system stability and this practice is not exercised in the US power system.
- 132Kv and down below system have no real data available due to absence of SCADA system. Operators are using traditional telephonic communication. Due to this, authentic planning is not possible for load management and demand forecast etc. As an example, if the overloading or tripping occurs, operator cannot observe or guess the problem until or unless the staff person of grid under problem contacts by himself telephonically. Following

suggestions are furnished to take necessary measures which will reduce the supply interruption timings besides system stability and causalities

- System operators are under administrative controls of a transmission company that has its own standard operating procedures. Resulting in forced circumstances where NPCC is compelled to run the power system in critical conditions and to overlook the operating standards for better system reliability.
- Pakistan is facing acute electricity crises due to demand supply gap of 5000 MW to 7000 MW and resultantly facing severe load shedding. This shortage of electricity has put a severe pressure on WPPA/NTDC to make extended efforts to inject more power into the system.
- Electricity shortage causing problems in converting Pakistan Energy market from single buyer to single buyer. The end price of electricity to the consumer is already comparatively high, therefore, open market operation may add additional burden on the consumer.
- Since FY 2006-07 Pakistan is facing severe liquidity problems which are contributing to accumulate circular debt in the country. Due to which private investors are reluctant to invest in the power market of Pakistan
- An inadequate transmission facility for the transportation of electricity to the far flung areas is one big issue for NTDC. Due to ever increasing electricity demand, expansion of electricity transmission system at different voltage levels is required. This augmentation of system requires huge finances and deployment of significant manpower capable of establishing this transmission system.
- IPPs of 1994 Power Policy has completed 15 to 18 Agreement years during that period there are number of operational disputes. In the absence of proper legal department it is very difficult to attend the objections raised by the IPPs.

## COMMERCIAL OPERATION

- NTDC had been following the old methods of organizational reporting and related working patterns i.e. biannual meetings with employees for future improvements. Organizational structure is the base of task allocation, coordination between the departments i.e. linked with project supervision, which is directed towards the organizational goals. NTDC lack in house coordination as compared to the organizational structuring in the US. In US, companies are paying attention to individual goals first and then to the ultimate organizational objectives. Similar to the structure in US, NTDC needs to restructure their organizational reporting and decision making approach for better and quick results.
- Like other organizations in Pakistan, NTDC's HR department is performing the daily tasks, where there are many ongoing issues related to staff hiring, promotions, job descriptions, incentives, health facilities, on the job, in and out of country capacity building trainings, and in house meetings for better results. In US, power companies are focusing in building strong HR policies to take care of all employees and their job performance related concerns. In US, power companies are motivating their employees by asking for their recommendations w.r.t. their departmental work, incentives, employee job description, and role and responsibilities, health care facilities, and opportunities for more on the job and in/outside country trainings, helping not only the organization but the employees in their personal growth.
- During our visit, we went through the detailed procurement policies followed by different power companies in the US. NTDC needs a new procurement policy, as major revisions are required in the single state, single envelope, and lowest cost bidder selection strategy. In US, procurement department has a defined policy thorough which they select bidders on the basis of a two envelope bidding process i.e. technical and financial evaluations more weightage given to technical expertise even if they costly.
- NTDC needs to redefine the budget w.r.t daily, monthly and annual payment structures to DISCOs. Online data should be available which will help the organization track the financial performance of grid stations w.r.t. their set and achieved objectives. In US, companies are monitoring their financial details online to reduce cost allocation and payments errors on a daily/monthly basis.

- In US, power companies are using artificial scenario case study approach to predict and overcome possible upcoming risks. Companies are creating artificial situations and testing their risk management strategies. This beforehand risk assessment helps analyzing weak areas and the required working techniques for better organizational performance under emergency situations. In US, we studied cases based on what-can-happen and what-can-be-the-possible-solution approach.

## PARTICIPANT SELECTION AND BRIEFING

EPP employed USAID-approved participant selection and eligibility criteria. Specifically, EPP followed the following selection criteria:

- Possess technical knowledge
- Potentially long career with current organization (not retiring soon)
- Belong to senior and mid-management level positions
- Priority will be given to women nominees with a target of 50% integration
- Have the ability to lead and train office staff after the training
- Possess basic knowledge of Grid, Market and Commercial Operations at NTDC

# ANNEXES

# ANNEX I: PARTICIPANTS DETAILS

No.	Name	Designation
<b>Grid Operations Participants</b>		
1	Anees Ahmad	Deputy Manager
2	Sadia Murshid	Assistant Manager Planning
3	Anique Ahmed	Assistant Manager Planning
4	Anum Sahar	Assistant Manager Shift
5	Zahra Fatima	Assistant Manager Design
6	Shahzad Butt	Deputy Manager Design
7	Aziz Ullah Khan	Deputy Manager
8	Kirn Zafar	Assistant Manager Planning
9	M. Adnan Zahid	Assistant Manager EHV
<b>Market Operations Participants</b>		
1	Abdul Muqet	Assistant Manager
2	Bilal Hussain	Assistant Manager
3	Azhar Saleem	Manager Finance
4	Muhammad Yasir Hussain	Assistant Manager
5	Muhammad Salman Nazar Bajwa	Assistant Manager (Technical)
6	Faiza Yaqub	Deputy Manager SCADA
7	Salahuddin Azam khan	Deputy Manager
8	Saeed Ahmed	Deputy Manager RCC
<b>Commercial Operations Participants</b>		
1	Sohail Mumtaz Bajwa	Manager Design
2	Sarah Sharif	Deputy Manager Design
3	Mamoonah Shaheen	Deputy Manager Design
4	Sibtain Tahir	Deputy Manager CPPA
5	Usman Farooq	Assistant Manager Design
6	Mohsin Amjad	Assistant Manager Design
7	Naveed Ahmad Faraz	Assistant Manager
8	M.Zahid Ikram Bhutta	Assistant Manager
9	Tariq Mehmood	Deputy Manager

# ANNEX II: WHITE PAPER FOLLOW UP REPORTS



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## **Executive Exchange on Best Practices in Grid Operations for National Transmission and Despatch Company (NTDC)**

Training dates: October 19<sup>th</sup> – 31<sup>st</sup>, 2015

In this activity, Energy Policy Program (EPP) successfully delivered the executive exchange training course in Best Practices in Grid Operations for National Transmission and Despatch Company (NTDC) from October 19<sup>th</sup> – 31<sup>st</sup>, 2015. Nine participants (four females and five male) from National Transmission and Despatch Company (NTDC) attended the training. Best practices in Grid Operations course was designed to improve capacity in the Pakistan power sector's electricity grid through exposure to best practices in transmission operations, maintenance, and planning, including the integration and dispatch of renewable energy into the grid, while establishing professional relationships for NTDC to draw upon after the conclusion of the program.

After the first follow up, EPP asked the participants to draft white papers based on the challenges they are facing w.r.t recommended solutions for future course of action. Grid operation participants submitted their white paper. EPP conducted the follow up session with NTDC participants on September 1<sup>st</sup>, 2015 at AEAI's Lahore office. EPP's M&E and Senior Energy Expert conducted the follow up session. The session was a discussion based session followed by a questionnaire based on the progress on the mentioned challenges. Find below are the comments made by the NTDC participants on the specific challenges and future recommendations.

### **Challenge # 1: Transparency/availability of data**

Availability of the transparent data about the energy bought and sold on daily basis and regular dispatches may prevent irregularities.

#### **Current status**

Participants detailed the concern over the availability of data to power consumers.

*“Up to date Daily merit order, supply/demand gap and its reasons, energy usage data of individual DISCOs and periodic reports are still not available online. An independent IT section is not yet in operation at NPCC Islamabad. For NPCC Data Transparency MWP influence needs to be shut off. NPCC must work independent to decide at its own umbrella of system constraints and supply/demand gaps”*

*“Data regarding daily load curve, peak demand, daily despatch by generation units etc. is being shared by NPCC to its liaison office on daily basis”*

*“The issue has been highlighted in different meetings within the organization. MWP may implement the policy of transparency of data like energy bought and sold, load shedding schedule in different areas and cost of the energy consumed. NEPRA can also implement the policy of transparency and availability of data”*

### **Challenge # 2: Delays in procurement processes**

Most of the critical delays in the implementation process are caused due to disputes in award of contracts and bidding process.

#### **Current status**

Participants highlighted the delays in procurement procedures and recommendations to improve the process:

*“The issue has been discussed at many different eels and forums within the organization Head of procurement can implement the policy regarding procurement execution committee for smooth and timely completion of contracts”*

*“The tribunals can be established by NEPRA and Ministry of Water and Power”*

*“Update in this regard may be taken from Grid Station Construction (GSC) department and design”*

### **Challenge # 3: Creation of parallel/free markets**

In US, wholesale transactions (bids and offers) in electricity are typically cleared and settled by the market operator or a special-purpose independent entity charged solely with that function.

#### **Current status**

##### **Participants highlighted the differences in parallel and free markets in US and Pakistan:**

*“Creation of free market is related to PPIB and MWP; yet no achievement has been made which an individual Pakistan can think of”*

*“CPPA (Central Power Purchasing Agency) has now been separated from NTDC and is being made an independent entity wholly responsible for the purchase/procurement of power from generation companies/entities. It will also deal with all the purchase agreement”*

### **Challenge # 4: Independent regulatory body**

An independent regulatory body like FERC is required to formulate regulations for generation, transmission and distribution utilities ensuring the development of reliable and efficient energy infrastructure at reasonable cost

#### **Current status**

##### **Participants highlighted the need of an Independent regulatory body like FERC in Pakistan as well:**

*“This issue has been highlighted and MWP may probe the issue and implement the policy”*

*“Third party contractors have been involved in developing SOPs for preparation and protection. In this regard USAID has also contributed in developing SOPS for NPCC”*

*“NEPRA is not independent in deciding the fate of electricity market in Pakistan. It has to be empowered and authoritative and free of political influences. NEPRA has a long way to go to materialize its SOPs for Power system operations, planning, and monitoring to be followed by all power transmission and distribution companies”*

### **Challenge # 5: Demand Response and Net metering Programs**

The distribution utilities in US have introduced demand response and net metering programs for the consumers to facilitate them in reducing their power usage. In Demand Response the consumer refrains from using power during peak hours and in turn receives an incentive in the form of lower electricity bill, similarly in Net Metering Program consumers having solar PV at their residence that can export the additional power to the grid and reduce their power bill.

#### **Current status**

### **Participants highlighted the net metering programs initiated by NTDC:**

*“I cannot think of having a metering system in Pakistan. Such program is effective in areas where consumers are not facing electric power shortage and prolonged load shedding. Here we are using solar PVs at our premises because we have no power at our main DISCO. Solar PV is not leisure its needs now. There are areas where people are 100% relying on solar PV and are happy with it. They do not care about utility owing to huge bills with no inputs at the main connections”*

*“Net metering systems have been installed at cut-off points (power delivery points) throughout NTDC networks. Other than those Tariffs for peaks and off—peak loads are effective to the users and encourage them for demand side management”*

*“Recently, NEPRA has approved tariff on net metering systems and time of used metering is under effective implementation by DISCOs”*

*“NEPRA may implement the policy of demand response and net metering system but to implement the policy there should be no load shedding otherwise one is left with no option but to use the energy when it is available”*

### **Challenge # 6: Implementation of SCADA system effectively at Grids**

Most of the Grid stations in USA are un-attended due to proper implementation of SCADA system

#### **Current status**

On the Implementation of SCADA system effectively at Grids, participants highlighted the following aspects:

*“Implementation of SCADA system is an ongoing process at NTDC and will continue in future”*

*“Project for up-gradation of NPCC’s load despatch center has recently been completed. Now most of the 500 kV and 200 kV grid stations are equipped with SCADA system and remotely connected with National Power Control Center through RTU’s.*

*“SCADA system is installed at our grid stations but not fully operational, practically due to the locations to which we cannot afford to have an unattended grid station. Moreover, number of operations is huge due to which operational discrepancies taking time to be resolved”*

### **Challenge # 7: Enhance solid waste management generation**

In USA, Generation of Electricity from municipal solid waste is a very profitable and reliable source of generation where people pay for the resource (garbage) to be utilized in efficient manner.

#### **Current status**

Explaining the management of solid waste participants compared US ad Pakistani markets:

*“Solid waste management is in practice but on smaller scale”*

*“Small generation facilities have been promoted at DISCOs level which can efficiently convert solid municipal waste into electricity. LESCO is procuring power from such plants at DISCO level. Similarly, generation of electricity from Bagasse (solid waste of sugar cane remains) is also being used as a fuel in cogeneration plants*

### **Challenge # 8: Asset management**

Poor asset management at NTDC is causing trouble e.g. non availability of data including surveys detailing the equipment's history, track of the useful life of material/equipment used, and record based on studies that which equipment is unavoidable to be replaced/augmented.

**Current status**

**NTDC pointed out the issues due to the non- availability of asset management issues:**

*“Staff counseling has been arranged for proper record keeping of assets at 500 kV grid station Nokhar. Condition of every equipment and instrument should be checked and record is being maintained”*

*“The issue of an asset management of the office has been discussed with authorities; convinced to start proper management of resources i.e. computers, printers, office supplies etc. at organizational level”*



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## **Executive Exchange on Best Practices in Market Operations for National Transmission and Despatch Company (NTDC)**

Training dates: January 11<sup>th</sup> – 23<sup>rd</sup>, 2015

In this activity, Energy Policy Program (EPP) successfully delivered the executive exchange training course in Best Practices in Market Operations for National Transmission and Despatch Company (NTDC) from January 11<sup>th</sup> – 23<sup>rd</sup>, 2015. Eight participants (seven males and one female) attended the training from National Transmission and Despatch Company (NTDC) and National Power Control Center (NPCC). Best practices in Market Operations course was designed to improve capacity in the Pakistan power sector's electricity grid through exposure to best practices in transmission operations, maintenance, and planning, including the integration and dispatch of renewable energy into the grid, while establishing professional relationships for NTDC to draw upon after the conclusion of the program.

After the first follow up, EPP asked the participants to draft white papers based on the challenges they are facing w.r.t recommended solutions for future course of action. Market operation participants from NPCC and CPPA wrote 2 different white papers. EPP conducted the follow up session with CPPA participants on September 2<sup>nd</sup> at AEAI's Lahore office and with NPCC participants on September 21<sup>st</sup>, 2015 at AEAI's Islamabad office. EPP's M&E and Senior Energy Expert conducted the follow up session. Both the sessions were discussion based session followed by a questionnaire based on the progress on the mentioned challenges. Below are the comments made by the CPPA participants on the specific challenges and future recommendations.

### **Challenge # 1: Shortage of Electricity**

Pakistan is facing acute electricity crises due to demand supply gap of 5000 MW to 7000 MW and resultantly facing severe load shedding. This shortage of electricity has put a severe pressure on WPPO/NTDC to make extended efforts to inject more power into the system.

#### **Current status**

Participants were asked to detail the concerns regarding the ongoing acute electricity crises due to demand supply gap of 5000 MW to 7000 MW causing severe load shedding:

*"In my opinion the challenges is wrongly addressed in terms of severe pressure on WPPO/(WAPDA Power Privatization Organization)NTDC. Being in the prime department of Pakistan's energy sector we are not meant to work more than ordinary. Here at CPPA (G), we have revised our SOPs for the development of Hydel Power Projects. We can work on parallel lines, we do not wait for the completion of each and every step to move forward unless it is necessary i.e. approvals from BODs or NEPRA. Resultantly, our timelines for project development have improved significantly"*

*"New EPAs being signed with upcoming small Hydel and Solar IPPs are not based on capacity payments. Only energy payments are being made to them on take and pay basis"*

*"CPPA and other stakeholders have made a standardized EPA for solar projects i.e. a total of 300 MW EPA has been signed and up to 2000 MW projects are in pipeline"*

### **Challenge # 2: Single buyer to single buyer plus model**

Electricity shortage causing problems in converting Pakistan Energy market from single buyer to single buyer. The end price of electricity to the consumer is already comparatively high, therefore, open market operation may add additional burden on the consumer.

### **Current status**

Participants were asked to explain NTDC's progress on the single buyer to buyer plus model approach:

*"CPPA has been separated from NTDC has given the target of power market establishment in Pakistan as in other countries by 2025"*

*"More generation is being added to the system in addition to improvement of transmission facilities. Private transmission facilities are also being discussed and transmission license has been granted to a private company"*

*"NEPRA is taking steps to operationalize wholesale energy market with the country gradually. Recently, NEPRA has advertised Special Purpose Transmission License (SPTL) to a private company which has never been done in the past"*

### **Challenge # 3: Circular Debt Issue**

Since FY 2006-07 Pakistan is facing severe liquidity problems which are contributing to accumulate circular debt in the country. Due to which private investors are reluctant to invest in the power market of Pakistan

### **Current status**

Participants detailed circular debt's impact:

*"CPPA has been separated from NTDC and a new company CPPA (G) Ltd has been formed in order to streamline liquidity problems and circular debt issues. NEPRA has announced guidelines for renewable energy 2015 and upfront tariff for small Hydropower projects which is a good step towards the new Hydro Power generation i.e. the cheapest of all"*

*"Government has established Escrow Accounts for payments to IPPs so that the circular debt may not hot the private sector investors"*

*"A database called IPAs has been established for the data related to invoices of IPPs enabling CPPA to calculate liquidated damages (LDs). Invoice adding to National exchequer"*

### **Challenge # 4: Inadequate Transmission Facilities**

An inadequate transmission facility for the transportation of electricity to the far flung areas is one big issue for NTDC. Due to ever increasing electricity demand, expansion of electricity transmission system at different voltage levels is required. This augmentation of system requires huge finances and deployment of significant manpower capable of establishing this transmission system.

### **Current status**

Participants detailed the Inadequate Transmission Facilities and the related issues:

*"As already mentioned that steps are being taken to incorporate private sector transmission facilities at the National grid"*

*"GOP has made a policy by which private sector can also built transmission line in Pakistan"*

*“NTDC, EHV department is working hard to strengthen the existing network and expansion of the network as well. NTDC is claiming to operationalize new Jhimpir Grid in the next year. Resultantly, wind power will flourish more than today as well”*

**Challenge # 5: Deficiency of Legal Department:**

IPPs of 1994 Power Policy has completed 15 to 18 Agreement years during that period there are number of operational disputes. In the absence of proper legal department it is very difficult to attend the objections raised by the IPPs.

**Current status**

**Participants explained the need of a Legal Department:**

*“It is the biggest weakness of CPPA (G) Ltd that we don’t have any legal department and the issue is still unaddressed”*

*“CPPA has advertised for a chief legal officer post. We are hopeful to have improvements in legal department”*



## **Executive Exchange on Best Practices in Market Operations for National Transmission and Despatch Company (NTDC)**

Training dates: January 11<sup>th</sup> – 23<sup>rd</sup>, 2015

In this activity, Energy Policy Program (EPP) successfully delivered the executive exchange training course in Best Practices in Market Operations for National Transmission and Despatch Company (NTDC) from January 11<sup>th</sup> – 23<sup>rd</sup>, 2015. Eight participants (seven males and one female) attended the training from National Transmission and Despatch Company (NTDC) and Nation Power Control Center (NPCC). Best practices in Market Operations for course was designed to improve capacity in the Pakistan power sector's electricity grid through exposure to best practices in transmission operations, maintenance, and planning, including the integration and dispatch of renewable energy into the grid, while establishing professional relationships for NTDC to draw upon after the conclusion of the program.

After the first follow up, EPP asked the participants to draft white papers based on the challenges they are facing w.r.t recommended solutions for future course of action. Market operation participants wrote 2 different white papers i.e. NPCC and CPPA (Central Power Purchasing Authority). EPP conducted the follow up session with CPPA participants on September 2<sup>nd</sup> at AEAI's Lahore office and with NPCC participants on September 21<sup>st</sup>, 2015 at AEAI's Islamabad office. EPP's M&E and Senior Energy Expert conducted the follow up session. Both the sessions were discussion based session followed by a questionnaire based on the progress on the mentioned challenges. Below are the comments made by NPCC participants on the specific challenge and future recommendations.

### **Challenge # 1: Connect generators through AGC and use EMS /SCADA system for real time power system operations**

SCADA system of power system has been recently upgraded. But unfortunately, most of the applications of SCADA system are not meant for the operator at the moment. Therefore, the system operator is facing issues to operate the system without using latest techniques on real time basis. Moreover, the gap between supply and demand creates a great deal of difficulty for system operator to control frequency that continuously threatens the reliability of system. The system frequency must be within the permissible limits as defined in NEPRA's grid code, whereas the ground situation is very critical.

#### **Current status**

Participants were asked to detail the concerns regarding the use of SCADA and other systems related to real time power system operations; and they explained:

*“As the project is not fully completed and due to partial data availability of real time stations, NPCC is facing a lot of issues to run these applications. To improve these operations, we tried to optimize and provided maximum data fed into EMS systems. Results, for applications to work more efficiently we developed net and generation model. We are constantly improving these models by getting T/Is, generators and line data from the respective sections to get better outputs. Secondly, for AGC, we are in correspondence with all Thermal/Hydels and IPPs. Major Hydel stations are already working on AGC and producing positive results. Moreover, spinning reserve quota allocated”*

*“Formal letters have been sent to relevant information for implementing the AGC system. Hydel plants are presently running their operations on AGC”*

*“We communicated the problem to all of our respective departments. So, AGC has been provided on all hydel power plants but currently not on thermal plants. We are expediting the competent person/authorities to provide the AGC on all thermal plants like implemented on Hydro plants. Furthermore, a suitable spinning reserve of about 100-200 MW has been allowed to operate and all power planning allocations to DISCOs on day ahead basis and hourly basis as per prevailing system conditions”*

## **Challenge # 2: Up-gradation/maintenance of grid system besides removal of prevailing network constraints:**

### **1 - DISCOs Network**

Severe overloading is being observed at 132kV and lower voltage levels under the jurisdiction of Discos. Similarly contingencies of the transformers and transmission lines are not available.

#### **Current status**

Participants were asked to detail the DISCOs network w.r.t the upgradation and maintenance done so far to improve DISCO operations and they explained:

*“We have initiated the process by informing all the recommended solutions to all the DISCOs. Four out of 10 DISCOs has already started their projects to upgrade and connected all 132 kV networks through capacitor banks. LESCO constructed links between Orient Power and associated networks and hence the contingency has been provided in this area. Similarly, FESCO, MEPCO, IESCO, and GEPCO constructed, rehabilitated the capacitor banks and line to reduce the network constraints. The achievement is encouraged in all aspect. Now DISCOs has been provided the tools and plants, all the DISCOs availing shut down through live lines crews by the efforts of our teams. The live line training organized by EPP was one of our recommendations in white paper”*

*“A few augmentation and upgradations have been made to our system in order to minimize the constraints on the system e.g. at Kot Lakh Pat, Burhan and Mardan. Formal letters have been sent to the DISCOs and follow up program review meetings are being held on a monthly basis. DISCOs are presently engaging live line crews purely upon their inputs (formal and informal) as recommendations on this matter.”*

### **2 - Low Voltages**

Voltage is another issue that NTDC system has to face during peak times in summer and winter seasons. In summer voltage are low due to high reactive demands and non-availability of VAR compensators. Sometimes voltage reaches beyond the permissible limits cause load shedding in addition to generation shortfall is carried out to avoid voltage collapse. Similarly, in winters the voltages become very high during less load hours (especially at night). The system operators open the 500 and 220 kV transmission lines due to non-availability of VAR compensators. The openings of lines are very critical for system stability and this practice is not exercised in the US power system.

#### **Current status**

Participants were asked to detail the steps taken so far by NPCC in terms of low voltages. They detailed as follows:

*“SVCs have been installed at 220 kV NKLP grid station, left over are in plane different locations. Shunt reactors are in service, capacitor banks are installed at different locations of networks on our initiatives. Month wise DISCOs, NTDC and NPCC meetings are being arranged to cope with the recommendations”*

*“SVC installed at NKLP grid station and now they are ready to connect/ energize which will improve the voltage issues. Many such projects are under progress at different stages at our planning section. All real time grid station where Shunt reactors are installed, we keep their status updates so that the despatcher has the live status and information in real time for any required work”*

*“Few SVCs are in planning stage and we are formally playing our role as controllers to push hard for expedition’s actions due to the importance of the system”*

### **Challenge # 3: Capacity Building**

132Kv and down below system have no real data available due to absence of SCADA system. Operators are using traditional telephonic communication. Due to this, authentic planning is not possible for load management and demand forecast etc. As an example, if the overloading or tripping occurs, operator cannot observe or guess the problem until or unless the staff person of grid under problem contacts by himself telephonically. Following suggestions are furnished to take necessary measures which will reduce the supply interruption timings besides system stability and causalities

#### **Current status**

Participants were asked to detail the steps taken so far by NPCC to reduce the capacity building gaps within the organization. They detailed as the recommended solutions as follows:

Forced load shedding can be avoided by authorizing the shift in-charge to change the quota in case of any emergency outages. (SOP is needed to be for quota allocation and forced load management).

*“NPCC started implying and the SOP are approved and available, targets have been achieved as the shift in charge has been authorized to take initiative and actions regarding the system operation requirement”*

An automated program i.e. SCADA system for 132kV network can be the very helpful to record operational data and updating of electronic mimic board.

*“Work in progress for the upgradation of 132 kV SCADA system”*

*“SCADA system for 132 kV N/W is already at LESCO and IESCO. IESCO’s SCADA project is anticipated to start shortly. A team of engineers from IESCO visited NPCC and they have been trained i.e. overview and detail of NPCC’s new SCADA system. NPCC is anticipating better results in future from IESCO”*

Communication system can be improved by establishing control room as well as staff for prompt communication purpose. By doing this restoration can be done within minimum time and load shedding will be reduced.

*“New communication system is already under progress by MIS Alstom and at our end we keep our EMS system updated with the latest telephonic records in directories. All the stations are telemeters and have their hot lines i.e. mobile number on real time display which is very convenient for information sharing”*

An additional desk to be introduced in control room for short term load forecasting

*“Operational staff has been planning short term forecasting and the proposals are forwarded to the higher officials for approvals”*

#### **Challenge # 4: Administrative Restructuring**

System operators are under administrative controls of a transmission company that has its own standard operating procedures. Resulting in forced circumstances where NPCC is compelled to run the power system in critical conditions and to overlook the operating standards for better system reliability.

Participants were asked to the upgradation and maintenance of the grid system and steps taken to improve DISCO networks with that of NPCC, and they explained:

##### **Current status**

*“Some administrative restructuring has been going on w.r.t CPPA and soon it will be done for NPCC. Preparing presentations to be given to the higher ups to highlight the difference and improvements made after the exchange visit program”*

*“Discussion with officials is in process in comparison to the NYISO standards, and NEPRA grid code is being followed at NPCC. For the study of system frequency as required by other sections is being provided by SCADA section. As in our EMS system the data is being recorded and archived on continuous basis. This helps in study of the system and blackouts”*

##### **Current status**

Explaining the management of solid waste participants compared US ad Pakistani markets:

*“Solid waste management is in practice but on smaller scale”*

*“Small generation facilities have been promoted at DISCOs level which can efficiently convert solid municipal waste into electricity. LESCO is procuring power from such plants at DISCO level. Similarly, generation of electricity from Bagasse (solid waste of sugar cane remains) is also being used as a fuel in cogeneration plants”*

#### **Challenge # 8: Asset management**

Poor asset management at NTDC is causing trouble e.g. non availability of data including surveys detailing the equipment’s history, track of the useful life of material/equipment used, and record based on studies that which equipment is unavoidable to be replaced/augmented.

##### **Current status**

NTDC pointed out the issues due to the non- availability of asset management issues:

*“Staff counseling has been arranged for proper record keeping of assets at 500 kV grid station Nokhar. Condition of every equipment and instrument should be checked and record is being maintained”*

*“The issue of an asset management of the office has been discussed with authorities; convinced to start proper management of resources i.e. computers, printers, office supplies etc. at organizational level”*



## **Executive Exchange on Best Practices in Commercial Operations for National Transmission and Despatch Company (NTDC)**

Training dates: March 22<sup>nd</sup> – April 3<sup>rd</sup>, 2015

In this activity, Energy Policy Program (EPP) successfully delivered the executive exchange training course in Best Practices in Commercial Operations for National Transmission and Despatch Company (NTDC) from March 22<sup>nd</sup> – April 3<sup>rd</sup>, 2015. Nine participants (two females and seven males) from the key departments of Design, Metering, Human Resource, Administration and Central Power Purchase Authority (CPPA) attended the training. Best practices in Commercial Operations for NTDC course was designed to improve capacity in Pakistan power sector's electricity grid through exposure to best practices in business process improvement, financial management, utility commercial management practices; while establishing professional relationships for NTDC to draw upon after the conclusion of the program.

After the first follow up, EPP asked the participants to draft white papers based on the challenges they are facing w.r.t. recommended solutions for future course of action. Commercial operation participants drafted the white paper with EPP's assistance. EPP conducted the follow up session with CPPA participants on September 3<sup>rd</sup> at AEAI's Lahore office. EPP's M&E and Senior Energy Expert conducted the follow up session. The session was a discussion based session followed by a questionnaire based on the progress on the mentioned challenges. Below are the comments made by Commercial operations participants on the specific challenge and future recommendations.

### **Organizational restructuring**

NTDC had been following the old methods of organizational reporting and related working patterns i.e. biannual meetings with employees for future improvements. Organizational structure is the base of task allocation, coordination between the departments i.e. linked with project supervision, which is directed towards the organizational goals. NTDC lacks in-house coordination as compared to the organizational structuring in the US. In the US, companies are paying attention to individual goals first and then to the ultimate organizational objectives. Similar to the structure in the US, NTDC needs to restructure their organizational reporting and decision making approach for better and quick results.

### **Recommended Solution**

After the training, participants had various discussions with the department heads and higher authorities to reshape the organizational structure at NTDC. Following the discussions, NTDC is restructuring the 1 DG, 2 MD, and 7 DM chain of command to a more departmental level decision making approach for quick results. Organizational restructuring will help in organizing the ongoing and future activities much more efficiently.

### **Human Resource Departmental Issues**

Like other organizations in Pakistan, NTDC's HR department is performing the daily tasks, where there are many ongoing issues related to staff hiring, promotions, job descriptions, incentives, health facilities, on the job, in and out of country capacity building trainings, and in-house meetings for better results. In the US, power companies are focusing on building strong HR policies to take care of all employees and their job performance related concerns. In the US, power companies are motivating their employees by asking for their recommendations w.r.t. their departmental work, incentives,

employee job description, and role and responsibilities, health care facilities, and opportunities for more on the job and in/outside country trainings, helping not only the organization but the employees in their personal growth.

### **Recommended Solution**

NTDC HR department forwarded the new HR policy to the higher authorities for approval; HR policy is inspired by rules and regulation of the companies visited during training. HR policy underlines, incentives, travel and work allowances, better medical and health facilities i.e. NTDC is outsourcing the health insurance to a qualified insurance company for better facilities. New transport policy is also under review by the staff which details the allotment of vehicles under conditions (i.e. specific to the nature of the job). NTDC is also introducing employee of the month policy to recognize extraordinary work performance from each department, departments will forward the nominations to HR for finalization. For capacity building trainings, NTDC is currently in negotiations with NUST, Islamabad to organize similar training as organized by WAPDA Staff College while incorporating changes in the training content based on commercial operations training content provided by USEA. It will be a twice a year mandatory training for every employee.. Supervisors will conduct meetings prior to the training to discuss individual and departmental action plans. As per the promotional policy, NTDC will not adhere to any of the Thermal/Hydro promotions under PEPCO to that of NTDC's gazette/non-gazette posts. Thermal/Hydro promotions will follow the PEPCO promotional policy whereas; NTDC's promotions will be processed by their BODs subjected to only NTDC employees. All these policies are under process and will help NTDC build a strong work environment.

### **Procurement procedures**

During our visit, we went through the detailed procurement policies followed by different power companies in the US. NTDC needs a new procurement policy, as major revisions are required in the single state, single envelope, and lowest cost bidder selection strategy. In US, procurement department has a defined policy thorough which they select bidders on the basis of a two envelope bidding process i.e. technical and financial evaluations more weightage given to technical expertise even if they costly.

### **Recommended Solution**

Comparison of the procurement policies helped outlining the root cause of delays and required changes in the current policies. After returning, design department discussed the difference to solve the ongoing procurement problems. Previously NTDC was using single state, single envelope, lowest cost bidder options. After the changes made in the procurement policy, design department is now following one state, two envelope policy i.e. technical and financial bidding. NTDC evaluates the technical and financial details as per the requirements of the project and negotiates with the best service provider. Though, NTDC is facing a lot of objections from Grid station staff on the new policy.

### **Financing issues**

NTDC needs to redefine the budget w.r.t daily, monthly and annual payment structures to DISCOs. Online data should be available which will help the organization track the financial performance of grid stations w.r.t. their set and achieved objectives. In US, companies are monitoring their financial details online to reduce cost allocation and payments errors on a daily/monthly basis.

### **Recommended Solution**

Installation of the financial software will help integrate all the financial details across NTDC i.e. budgeting, accruals, payments and disbursement invoices, etc. for better understanding of the allocated budget all to the DISCOs. Moreover, software will help in record maintenance of disbursements invoices for budget analysis. NTDC is planning an installation of software similar to the one being used by KESC i.e. SAP. SAP benefits include: a smaller data footprint, higher throughput, faster analytics and reports. It will help NTDC input all the financial details using cloud platform gives faster access to data (social, text, geo, graph and processing). In addition to the use, NTDC will provide hands on SAP training to the staff for future improvements. In US, companies have their own maintenance plans, NTDC's GSO maintenance plan is in the process to monitor the grid-wise payment disbursements w.r.t their spending; past GSO cost-analysis clearly exposed over spending of many DISCOs. Implementation of the GSO maintenance plan will monitor the budget allocated vs the budget spent. NTDC is planning to introduce a tax department solely to look after the tax related payments, invoices, and other issues. Furthermore, introduction of a regulatory department at NTDC is also in consideration i.e. to ensure the tax obligations are as per NEPRA's rules and regulation to avoid any discrepancies in project completions.

### **Risk Assessment Strategy**

In US, power companies are using artificial scenario case study approach to predict and overcome possible upcoming risks. Companies are creating artificial situations and testing their risk management strategies. This beforehand risk assessment helps analyzing weak areas and the required working techniques for better organizational performance under emergency situations. In US, we studied cases based on what-can-happen and what-can-be-the-possible-solution approach.

### **Recommended Solution**

NTDC requires a risk assessment strategy for analyzing upcoming risks and their potential situations based on current scenarios. Studying current scenarios will not only help in assessing what can happen but will also lead towards a possible solution. Due to bad risk and cash flow management cash inflow and outflow mismatches all day due to time lags. Introduction of a risk management tool will help identify where and why the lags are occurring. In US, companies are outsourcing expert companies to reconcile their cash flows on the daily basis. By following similar approach and outsourcing, NTDC can save time and effort of calculating lags. Since, NTDC and NPCC are two different entities now; outsourcing will help reconciling the cash flows on individual basis.

# ANNEX III: INITIAL ASSESSMENT FEEDBACK FORMS

**Confidential information redacted**

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