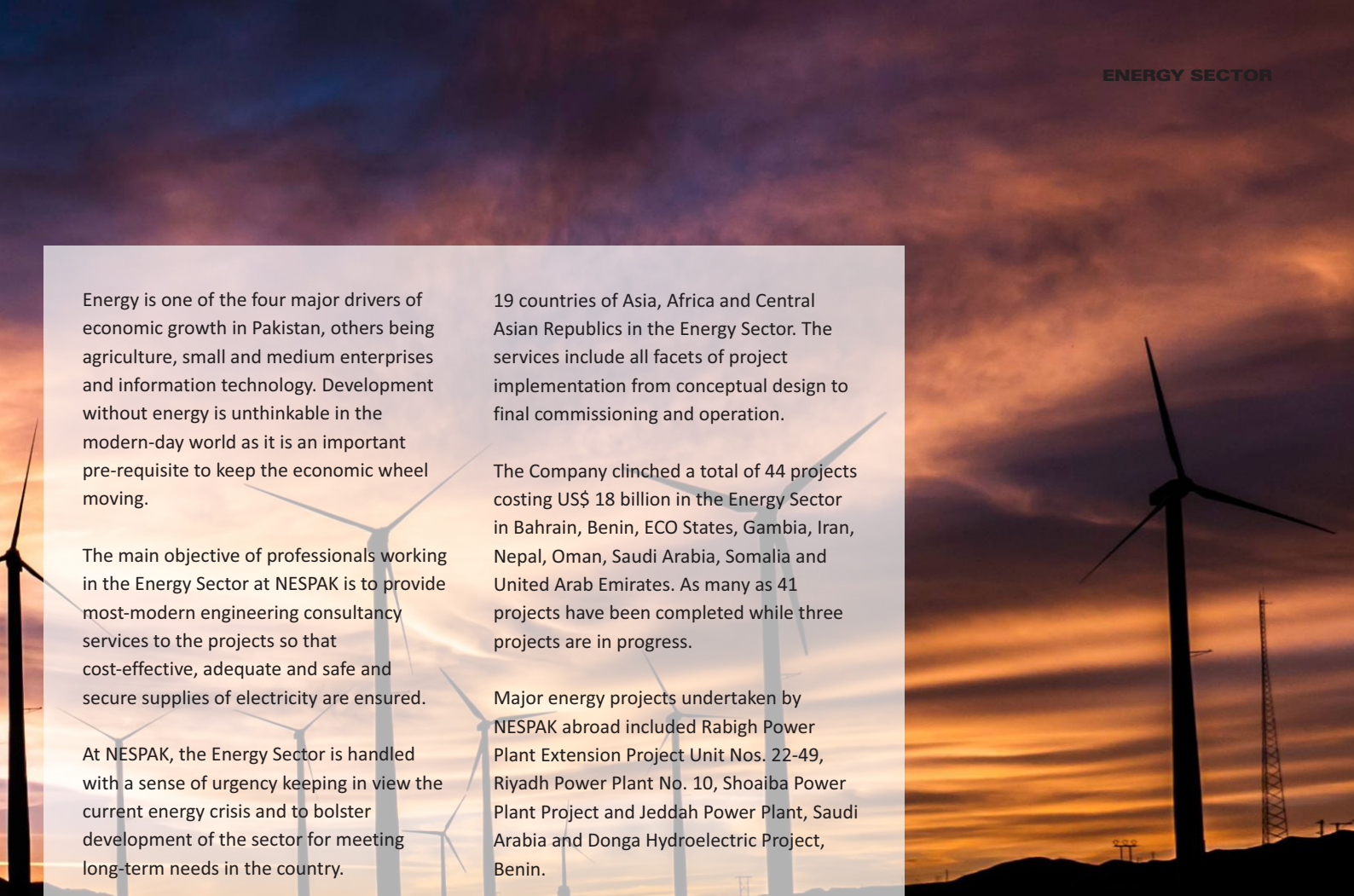
Energy Sector

"We will make electricity so cheap that only the rich will burn candles."

Thomas A. Edison



Energy is one of the four major drivers of economic growth in Pakistan, others being agriculture, small and medium enterprises and information technology. Development without energy is unthinkable in the modern-day world as it is an important pre-requisite to keep the economic wheel moving.

The main objective of professionals working in the Energy Sector at NESPAK is to provide most-modern engineering consultancy services to the projects so that cost-effective, adequate and safe and secure supplies of electricity are ensured.

At NESPAK, the Energy Sector is handled with a sense of urgency keeping in view the current energy crisis and to bolster development of the sector for meeting long-term needs in the country.

NESPAK is the front-runner on the national scene in rendering top-class engineering consultancy services in the Energy Sector. It has been in the vanguard of the energy development efforts and has been associated with most of the public and private sector projects in Pakistan since its inception in 1973.

The Company has rich experience in offering services to the public and private sector clients on energy projects of varied and diverse nature. NESPAK's set-up has been evolved with due cognisance of the requirements of this Sector which has been undergoing structural and institutional reforms in the recent past in many countries including Pakistan.

In the Energy Sector, NESPAK has rendered invaluable consultancy services for the projects in Pakistan and abroad. To date, NESPAK has acquired a total of 431 projects in Pakistan and foreign countries, costing Rs. 5,199 billion. As many as 405 projects have been completed while the number of active projects stands at 24.

The experience and expertise gained at home enabled NESPAK to secure projects in 19 countries of Asia, Africa and Central Asian Republics in the Energy Sector. The services include all facets of project implementation from conceptual design to final commissioning and operation.

The Company clinched a total of 44 projects costing US$ 18 billion in the Energy Sector in Bahrain, Benin, ECO States, Gambia, Iran, Nepal, Oman, Saudi Arabia, Somalia and United Arab Emirates. As many as 41 projects have been completed while three projects are in progress.

Major energy projects undertaken by NESPAK abroad included Rabigh Power Plant Extension Project Unit Nos. 22-49, Riyadh Power Plant No. 10, Shoaiba Power Plant Project and Jeddah Power Plant, Saudi Arabia and Donga Hydroelectric Project, Benin.

NESPAK has also carried out a feasibility study in association with the SNC-Lavalin of Canada, for the National Power Expansion Plan awarded by the Government of Pakistan. The programme encompasses complete power planning up to the year 2030. The Company made recommendations to increase the electricity generation, thus reducing power outages in the country.

NESPAK has around 725 personnel including mechanical and electrical engineers related to this field, on its strength for providing state-of-the-art services in the arena of energy development plans.

In the Energy Sector, NESPAK offers engineering consultancy services in the following fields:

Planning and System Studies
Hydropower
Thermal Power
Nuclear Power
Transmission
Substations
Distribution and Rural Electrification
SCADA and Telecommunications
Mechanical

SCOPE OF SERVICES

Planning: Project identification and definition, load forecasting, least cost generation, transmission and distribution system planning, interconnection of power systems, demand side management, financial and economic analysis.

Studies: Reconnaissance, pre-feasibility, feasibility, economic and financial analysis, tariff analysis, socio-economic and environmental impact assessment, project siting and resettlement plans, project options and optimisation, load flow, short circuit and transient stability studies, electromagnetic transient studies, probabilistic production cost simulations, cost of service analysis, restructuring and corporatisation of the Government-owned utilities, rehabilitation, refurbishment and upgradation of projects, development of short and long-term policies for attracting private investment in energy and infrastructure projects, evaluation and due diligence of plants and assets.

Engineering: Preliminary and detailed design, drawings and specifications, cost estimates and budgetary forecasts, design review and approval of shop drawings, testing, commissioning, operation and maintenance procedures, equipment selection, quality assurance and control.

Contract Packaging: Supply and supervision contracts, supply, installation and commissioning contracts, turnkey contracts, contractor-financed contracts, engineering procurement and construction management contracts, Build, Own and Operate (BOO) contracts, Build, Operate and Transfer (BOT) contracts, Build, Lease and Transfer (BLT) contracts, Operation and Maintenance (O&M) contracts.

Procurement: Bidding documents for procurement within the framework of guidelines issued by financing agencies like the World Bank, the Asian Development Bank, the Japan International Cooperation Agency, KfW (Kreditanstalt für Wiederaufbau-Reconstruction Credit Institute), the Islamic Development Bank and the Kuwait Fund for Arab Economic Development, pre-qualification documents, bidding documents for engineering, procurement and construction & turnkey contracts, invitation and evaluation of bids, negotiations and award of contracts and shop inspection and testing.

Project Management: Planning, scheduling and budgetary control of project implementation, coordination and monitoring of costs, resources, schedules and progress, review and approval of construction methods, machinery and resource allocation, control of project documents, security and safety requirements, review and approval of codes and standards, preparation and update of project master schedule, progress reviews and expediting reports, certification of plant performance and commencement of commercial operation, review and approval of operation and maintenance manuals, project completion reports and as-built drawings, training of O&M staff, quality assurance and control.

Independent Engineer: In the role of independent engineer, NESPAK provides pre-financial closure equity investor support, due diligence involving review of project design, cost and scheduling, due diligence in the implementation and operation phases, asset valuation and assessment.

EXPERIENCE

Since 1973, NESPAK has worked in Pakistan and 19 other countries on various projects in the Energy Sector. The depth of experience acquired in this Sector is summarised below:

Planning and System Studies: Planning and interconnection studies for hydel and thermal power plants. System studies for EHV transmission networks of Water and Power Development Authority and the Karachi Electricity Supply Company. Feasibility Study of Thermal Power Plants

based on Gas from Small Gas Fields of Pakistan has been prepared. NESPAK has carried out 24 projects in this area.

Hydropower: As many as 65 hydropower projects including low, medium and high-head power stations, with individual plant capacity varying from less than one MW to 3,600MW, having a total capacity of over 10,026MW.

Thermal Power: The number of thermal projects undertaken by NESPAK stands at 140. In Pakistan, a total capacity of 22,769MW using combined cycle, conventional steam turbine, diesel engine or gas turbine technology with plant size ranging from 4.8MW to 1,800MW has been installed. In Saudi Arabia, total capacity of 22,000MW with maximum plant size of 5,200MW has been completed

Nuclear Power: A total of 25 assignments involving project planning, detailed engineering and construction supervision have been undertaken.

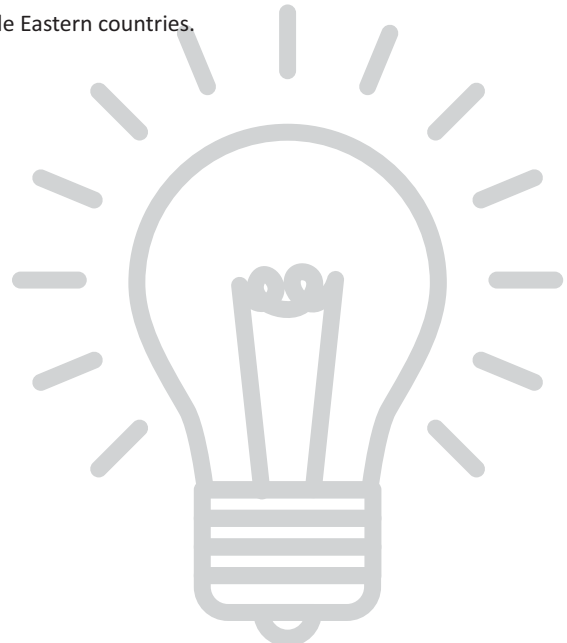
HV/EHV Transmission Lines: As many as 93 projects involving planning, engineering and supervision services for a cumulative length of 11,500 kms of HV/EHV transmission lines for voltages ranging from 110kV to 500kV have been completed.

Substations: Planning, engineering and construction supervision services rendered for 29 conventional outdoor and GIS HV EHV/EHV substation projects ranging from 66kV to 500kV, involving a cumulative transformation capacity of 23,500 MVA.

Power Distribution, Rural/Urban Electrification and Building Electrical Services: Electrification of 1,800 villages and computerised mapping of 60,000 kms of 11kV power distribution feeders, power distribution network for cities and colonies, specialised projects of sports floodlighting (4 cricket stadiums and 1 hockey stadium), large number of high rise buildings, electrical services, power distribution system for barrages/dams and water sewerage treatment and supply systems and road lighting design within and outside Pakistan. NESPAK has undertaken almost 25 projects in the field of rural electrification in Pakistan and abroad.

SCADA and Telecommunications: The SCADA and Telecommunications group at NESPAK has been instrumental in the setting up of control rooms equipped for monitoring and remote control of large electrical power networks. Intelligent energy management features including network state estimation, optimal power flow, load forecasting, contingency analysis and outage scheduling have been provided. More than 90 load despatch centres have been installed for power utilities involving energy management functions and state-of-the-art computer hardware supported by the telecommunication system. The telecommunication system comprises microwave, fibre-optic, power line carrier and data and voice connectivity equipment. NESPAK has also provided consultancy services including project management to establish SCADA system for the Water and Sanitation Agency (WASA), Telecom and CCTV infrastructure for the Lahore and Quetta Safe City Projects and SCADA, Telecom, CCTV and public utility systems for the Lahore Orange Line Metro Train Project.

Mechanical: Planning, design and construction supervision of large water, oil and gas transmission line networks in Pakistan and the Middle Eastern countries.



Neelum-Jhelum Hydropower Project

Leading the local consultants in a joint venture with foreign firms, NESPAK is reviewing the design of the 969MW Neelum-Jhelum Hydropower Project and supervising its construction. This mega project comprises the construction of a diversion dam and a desander at the Neelum River about 41km upstream of Muzaffarabad, a 32km long tunnel and an underground powerhouse at Chattar Kalas in Azad Jammu and Kashmir. The Rs. 414 billion project being constructed at the Neelum River will contribute about 5.15 billion units of low-cost electricity to the national grid. The high-profile project has some unique technical features which make it an engineering milestone. These Include tunnel excavation through drill and blast (D&B), use of Tunnel Boring Machines (TBMs) for excavation of twin tunnels, crossing of headrace tunnel under the Jhelum River, steel lining in the prescribed section of headrace tunnel and an underground powerhouse. Work on the project continues at a brisk pace and is fast heading towards completion.

Guddu Combined Cycle Power Plant Project

A NESPAK-led joint venture has completed tender documentation, design review, construction supervision, and testing & commissioning for the 747MW Combined Cycle Power Plant Guddu Project in Sindh. The plant comprising two gas turbines, two heat recovery steam generators and one steam turbine started commercial operation in 2016. The Rs. 62 billion project awarded by the Central Power Generation Company Limited is located in the vicinity of 1,650MW Thermal Power Station Guddu.

Nandipur Combined Cycle Power Plant Project

NESPAK has carried out engineering consultancy services for this 425MW Combined Cycle Power Plant Project at Nandipur. The project was awarded by the Water and Power Development Authority.

NESPAK services included assistance during award of contract, contract documentation, design review, construction supervision, installation, testing & commissioning, outsourcing of operation & maintenance and gas conversion of the plant.

The Rs. 58 billion power plant located in the neighbourhood of the 16MW Nandipur Hydropower Station near Gujranwala comprises three gas turbines and a steam turbine.

Riyadh Power Plant No. 9, Saudi Arabia

The Riyadh Combined Cycle Power Plant is the largest of its kind in the Middle East. The plant is located on old Khurais Road, 60 kms from the Riyadh City in the Kingdom of Saudi Arabia. Spread over an area of 3 sqkm, it features a generating capacity of 3,280 megawatts.

NESPAK scope of services included the preparation of design report, tender documents/specifications, design review, site supervision, contract administration, construction management, testing & commissioning, verification of contractor's invoices and evaluation of contractor's claims. The project was completed in 2010 at a cumulative cost of US$ 3 billion.

Rabigh Power Plant Extension Project Units 22-49, Saudi Arabia

The NESPAK-SAUDCONSULT joint venture was hired for the 1,680MW Rabigh Power Plant Extension Project at the Red Sea, 150 kms north of Jeddah City near the town of Rabigh in the Kingdom of Saudi Arabia. The project comprised engineering design, procurement and training on equipment, systems, structures and civil works for 28 gas turbines for its Units 22-49. The scope of services included design review, contract administration, testing & commissioning, verification & evaluation and construction supervision for this project awarded by the Saudi Electric Company, Western Operating Area. This two-phase project helps in meeting the electricity needs of Makkah Al-Mukarramah and Madinah Al-Munawwarah Regions. The project was completed in 2012 at a cumulative cost of US$ 2 billion.

Tabouk Power Plant No. 2 — Extension Project, Saudi Arabia

The 454MW Tabouk Power Plant No. 2 — Extension Project was completed in three phases at a cumulative cost of US$ 356 million. NESPAK scope of services for this power expansion project included design review and construction supervision. As many as seven power units were constructed under this project. The Client, Saudi Electricity Company — Western Operating Area — issued a “Letter of Special Thanks and Appreciation” for meritorious services rendered by NESPAK for the overall completion of the project ahead of the contractual schedule.

Haveli Bahadur Shah Combined Cycle Power Plant

NESPAK rendered consultancy services for feasibility study, tender documentation, design review and construction supervision for the Regasified Liquified Natural Gas-based 1,230MW Haveli Bahadur Shah Combined Cycle Power Plant. The National Power Parks Management Company (Pvt.) Limited (NPPMCL) engaged NESPAK for undertaking the project costing Rs. 59 billion. This fast-track project was set up on a piece of land measuring 758 kanals situated near the Jhang District in the Punjab Province.

500kV Switchyard: NESPAK provided tender documentation, design review and construction supervision services for 500kV switchyard at 500kV Switchyard at Haveli Bahadur Shah, Jhang to disperse power of the plant. The 500kV Switchyard Project is being financed by the NPPMCL.

Balloki Combined Cycle Power Plant

NESPAK is provided consultancy services for feasibility study, tender documentation, design review and construction supervision for the RLNG-based 1223MW Combined Cycle Power Plant at Balloki. Awarded by the NPPMCL, the project costing Rs. 56 billion was set up on a piece of land measuring 856 kanals in Balloki, Kasur.

500kV Balloki Switchyard: NESPAK carried out tender documentation, design review and construction supervision services for 500kV switchyard at Balloki to disperse power of the plant. The switchyard comprises 500kV bays arranged in breaker-and-a-half scheme.

Bhikki Combined Cycle Power Plant

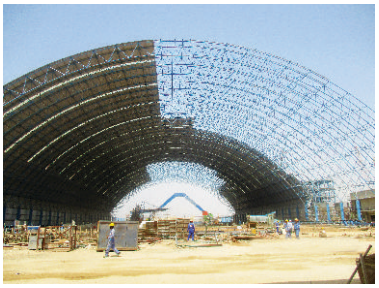
NESPAK is carried out feasibility study, tender documentation, design review and construction supervision for the 1180MW RLNG-based Combined Cycle Power Plant at Bhikki. The project was set up on a piece of land measuring 800 kanals situated in Bhikki area of Sheikhupura in the Punjab Province. NESPAK was hired by the Quaid-e-Azam Thermal Power Company for this Rs. 54 billion project. The project employs state-of-the-art equipment including two gas turbines, two HRSGs and one steam turbine. It is one of the highest efficiency plants in the world.

500kV Bhikki Switchyard: NESPAK has completed tender documentation, design review and construction supervision for 500kV switchyard at Bhikki to disperse power of the plant.

Ghazi-Barotha Hydropower Project

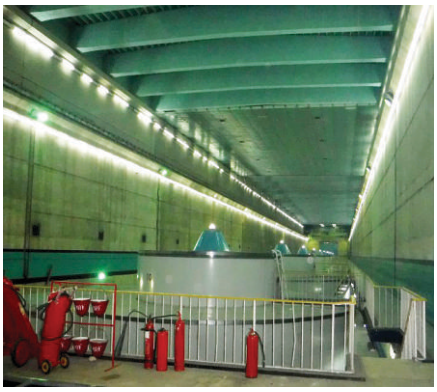
NESPAK provided services as the leader of a consortium of consultants for the 1,450MW Ghazi-Barotha Hydropower Project costing Rs. 111 billion. Completed in 2006, the project comprised a barrage downstream of Tarbela, a 52 km long power channel and a powerhouse comprising five units of 290MW each.

500kV Transmission Lines Network: NESPAK also carried out tender documentation, design review and construction supervision for the 500kV Transmission Lines Network Ghazi-Barotha Hydropower Project costing Rs. 14 billion.



FFBL Steam-based Coal Power Plant

NESPAK is rendered detailed design and construction supervision services for the Steam-based Coal Power Plant in the Eastern Industrial Zone of Bin Qasim, 45 km from Karachi City. The Rs. 40 billion switch-over project was initiated by the Fauji Fertilizer Bin Qasim Limited (FFBL) owing to the paucity of natural gas. Detailed scope of work included design and supervision for civil works, HVAC and the inside electrification of the plant buildings.



Mangla Power Station Refurbishment Project

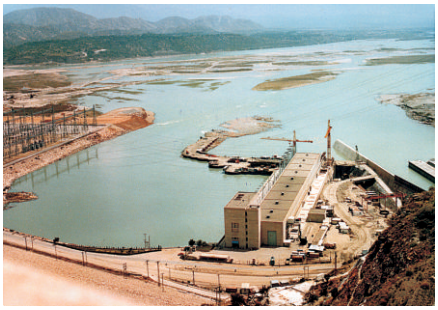
NESPAK in a joint venture with a US concern is rendering consultancy services for the Mangla Power Station Refurbishment Project which has entered the implementation stage. The NESPAK joint venture is responsible for tender documentation and design review for this Rs. 43 billion modernisation project awarded by the Water and Power Development Authority. The project aims at increasing the generation capacity of the powerhouse by 310 megawatts and modernisation refurbishment of the systems of Mangla Units 1-10 due to the raising of Mangla Dam to ensure availability of a fully functional power station for another life-cycle of 50 years.

Gulpur Hydropower Project

A NESPAK joint venture with a US firm is supervising the construction for the 102MW Gulpur Hydropower Project located on the Poonch River in Azad Jammu and Kashmir. The scope of services also includes design review of this project being developed on the Build-Operate-Own-Transfer (BOOT) basis. The Rs. 25 billion project has been assigned by the M/s Mira Power Limited, a subsidiary of the Korea South-East Power Co. Limited, South Korea. It is financed by Korea Exim Bank, Asian Development Bank, International Finance Corporation, the Islamic Development Bank and ECO Bank. The project has the capability of generating an average annual energy of 465 GWh.

New Bong Escape Hydroelectric Power Project

A NESPAK-US firm joint venture provided design review and construction supervision services for the 84 MW New Bong Escape Hydroelectric Power Project. This Rs. 18 billion venture located at Mangla is the first Independent Power Producer (IPP) Project in the hydropower sector in Pakistan and also the first hydropower project registered with the United Nations Framework Convention on Climate Change as Clean Development Mechanism project. The project was financed by a group of national and international lenders including, inter alia, the Asian Development Bank, the Islamic Development Bank and the International Finance Corporation.



Tarbela Hydropower Extension Project, Pakistan

A NEPSAK joint venture for Tarbela hydropower Third Extension Project undertook detailed design, preparation of tender documents and construction supervision for Units 11-14 in 1998. The project was designed to generate 1,728MW on Tunnel-3 enhancing total capacity of the power house to 3,478MW.

BTS Equipment Shelters and Towers for Nokia

NESPAK prepared site surveys, reviewed design and supervised “Construction of BTS (Build-to-Suit) Equipment Shelters and Towers for Nokia” during 2066-2011. Once the design was finalised, a complete set of construction drawings along with the Bill of Quantities (BoQs) were generated by NESPAK. During the initial phase, 500 base and repeater stations were set up from Okara to Peshawar. Roof Top towers and Green Field ground towers were installed under this breakthrough project. NESPAK scope of services was later extended to 1,000 sites for this venture costing Rs. 1 billion.

Port Qasim-Hub-Jamshoro Transmission Line

NESPAK has rendered design review and construction supervision services for 500kV Double Circuit Quad Bundle Transmission Line from the Port Qasim Power Plant for interconnection with the 500kV Single Circuit Hub-Jamshoro Transmission Line. The 1,320MW Pakistan Port Qasim Power Project, which uses imported coal, comprises two 660MW supercritical coal power plants as part of the China-Pakistan Economic Corridor (CPEC). The objective of the project is to disperse the electricity generated by the Port Qasim Power Plant by connecting it to the national grid at Matiari. The 1,320MW power from Matiari can be directed to Sindh/Karachi or towards northern Pakistan via Matiari to Lahore. As a stopgap arrangement, the power is partially evacuated to Karachi and Jamshoro till the completion of second phase of the 500kV line for ultimate dispersal. The project has been successfully energised under the supervision of NESPAK.

3rd Circuit Jamshoro-Moro-Dadu-Rahim Yar Khan Transmission Line and Moro Substation

NESPAK is rendering engineering consultancy services for 3rd Circuit Jamshoro-Moro-Dadu-Rahim Yar Khan Transmission Line and Moro Substation. The National Transmission and Despatch Company Limited (NTDC) selected NESPAK to supervise the construction of the project, extending the contract by four amendments in appreciation of NESPAK services. Work is continuing on this two-phase project with an overall cost of Rs. 42 billion. Additional services pertaining to detailed survey of the new proposed 220/132kV transmission lines (220km) from Jhimpir, Gharo and Hyderabad routes and construction supervision of Jhimpir Grid Station, extension works at 500kV Jamshoro Grid Station, 220kV T. M. Khan Grid Station were added to the original contract.

Thar-Matiari Transmission Line

NESPAK provided engineering consultancy services for design review and construction supervision of the 500kV Double Circuit Quad Bundle Thar-Matiari Transmission Line costing Rs. 4 billion. The line was constructed to evacuate 660 megawatts of the Thar Coal Project of the Sindh Engro Coal Mining Company. The project has been successfully energised by the National Transmission and Despatch Company ahead of the scheduled timeline.

Transmission Line for Hydropower Projects on River Indus

NESPAK provided design review and construction supervision services for this transmission lines project to disperse power generated by three high-head hydropower stations on Tributaries of River Indus, namely Duber Khwar, Khan Khwar and Allai Khwar. Under this Rs. 3 billion project, the 50 km long 132/220 kV Duber Khwar–Khan–Khwar–Allai Khwar Transmission Line and 220kV Allai Khwar–Mansehra New Transmission Line were constructed and energised in 2012. The lines traverse one of the most difficult terrains in Northern Areas of Pakistan. The powerhouses and transmission lines will provide relief to the national grid in face of the prevailing energy crunch.

Dadu-Khuzdar Power Transmission System

A NESPAK-led joint venture carried out tender documentation, construction supervision and design review for the Dadu-Khuzdar Power Transmission System Project. Both the transmission line and substation have been successfully energised under this Rs. 5 billion project awarded by the NTDC and sponsored by the Japan International Cooperation Agency (JICA).

Transmission Line Interconnection from Uch-II Power Project

NESPAK is rendering consultancy services for the Transmission Line Interconnection for the Dispersal of Power from Uch-II Power Project. The scope of work entails construction supervision and allied activities including testing & commissioning and services during the defects liability period for this Rs. 2 billion project awarded by the NTDC.

New Lahore Grid Station

NESPAK is providing engineering consultancy services for construction of New Lahore 500kV Substation and Associated Transmission Lines The scope of services includes preparation of bidding documents, evaluation award of contract, design review and construction supervision. The Rs. 13 billion project is being financed by JICA.

Dera Murad Jamali Grid Station

NESPAK rendered consultancy services for 220/132kV AIS Grid Station at Dera Murad Jamali (New), Balochistan. The scope of services includes construction supervision for civil works, erection, testing & commissioning. Most of the equipment has been delivered at site and civil works progressed fast under this Rs. 2 billion project awarded by the NTDC. The project will help improve the voltage system for the Quetta Electric Supply Company.

SVC New Kot Lakhpat Grid Station

A NESPAK-led joint venture undertook design review and construction supervision services for the Static Var Compensator (SVC) at the 220/132kV New Kot Lakhpat Substation Lahore. Construction work along with equipment installation has been completed for this Rs. 2 billion project assigned by the NTDC and funded by the Asian Development Bank.

Rahim Yar Khan Substation and Transmission Lines Project

NESPAK rendered services for the preparation of tender documents, evaluation, award of contract, design review and construction supervision of both components of the project i.e., Rahim Yar Khan 500/220/132kV Substation (Package-I) and In & Out Arrangement of Guddu-Multan Third Circuit at the Rahim Yar Khan 500kV Substation (Package-II).
The main objective of the project is to increase the capacity of the transmission system by adding 500kV Substation and associated transmission lines in the Southern Punjab Region. This will improve voltage and stabilise power supply to the Multan Electric Power Company network. The project costing Rs. 7 billion was funded by the Japan International Cooperation Agency.

Thuwal Substation Project Jeddah, Saudi Arabia

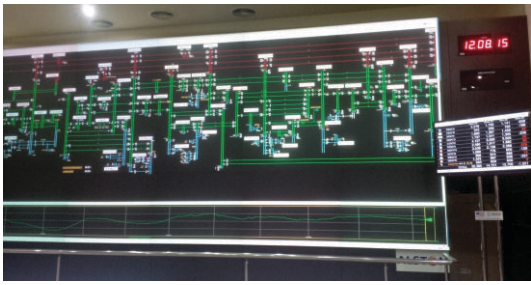
NESPAK completed engineering and construction management services for the 110kV Thuwal Substation/Transmission Line Project in the Governorate of Jeddah, Kingdom of Saudi Arabia. Awarded by the Saudi Electricity Company, the project is located in its Western Operating Area.

Substations and Transmission Lines, Dammam, Saudi Arabia

NESPAK provided consultancy services for engineering and design of high-voltage GIS/AIS Substations and high voltage Overhead Lines and Underground Cable circuits in the Eastern Operating Area of the Saudi Electricity Company at Dammam, Saudi Arabia.

Load Despatch System Upgrading Project

NESPAK carried out tender documentation, design review and construction supervision for the Load Despatch Upgrading Project, Islamabad, costing Rs. 4 billion. This first-of-its-kind project was awarded by the NTDC and funded by JICA. The major aim of the project is the efficient control and monitoring of the NTDC system to reduce power outages by enabling it to take timely operational decisions. The project includes a network of weather stations to help forecast power demands based on present and near future weather conditions.

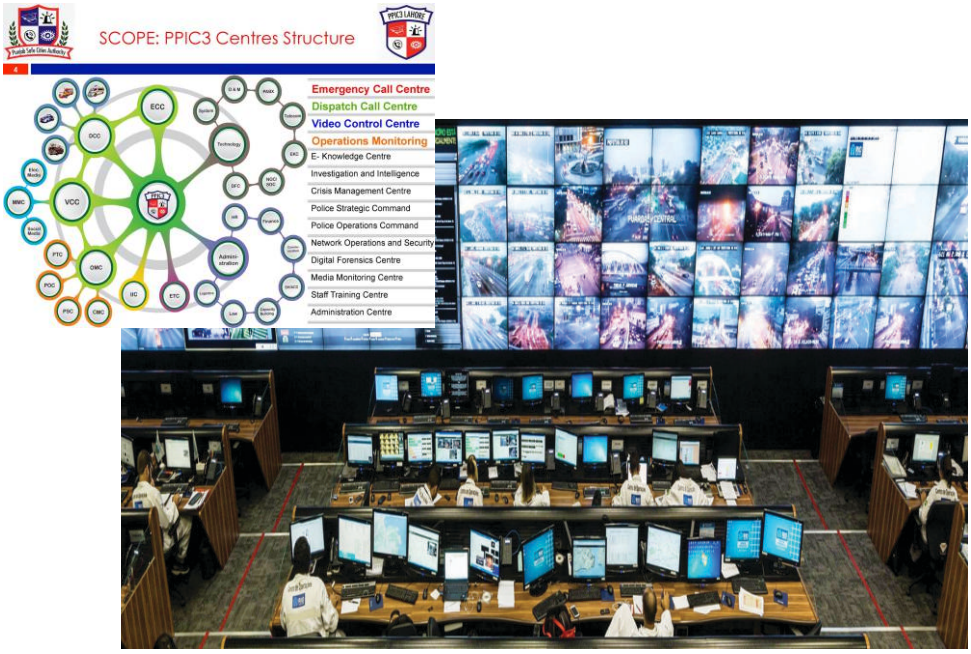


Lahore Safe City Project

NESPAK and the Punjab Safe Cities Authority have signed a contract to provide consultancy services for the Punjab Police Integrated Command, Control and Communication (PPIC3) Centre, Lahore, commonly known as the Lahore Safe City Project.

NESPAK in association with a UK firm is rendering design review and construction supervision of civil, mechanical and electrical works for this turnkey project.

The aim of this Rs. 13 billion pilot project is to help police proactively manage the security situation and professionalise the police response to incidents by moving towards directed and mission-focussed deployment of resources.



Quetta Integrated Video Surveillance System Project

NESPAK successfully completed feasibility study and preliminary design for the Rs. 1 billion Quetta Integrated Video Surveillance System Project awarded by the Balochistan Science and Information Technology Department. The first-of-its-kind system will help improve collaboration among the law-enforcement, crime-fighting and crisis management agencies for better security in the Balochistan Province.