IMAGINEERING
THE FUTURE OF ENERGY
SOLAR POWER

L&T Construction
Solar Projects
The sun is the giver of life. Our generation is not the first to realize the power of sun or harness it for the benefit of mankind. But we are, perhaps, the first generation to need a source of power that is both inexpensive and unlimited.

To provide economically viable and technically superior solar energy solutions, Larsen & Toubro diversified in to the renewable energy spectrum by incubating the Solar Business Unit. In partnership with leading solar technology providers, L&T offers Engineering, Procurement and Construction (EPC) solutions in the key elements of the solar value chain covering concentrated solar power and solar photovoltaic technologies.

L&T is India’s largest Solar PV EPC player with an indigenous capability to design solar photovoltaic power system, balance of system and the requisite power evacuation systems. L&T offers EPC services covering the entire gamut of project implementation ‘from concept to commissioning’ for grid-connected as well as off-grid PV systems for utility scale and roof-top power plants.

The annual growth rate of L&T’s Solar EPC business ranks well over the industry average in India through its successful project delivery in record time.

With a regulated solar market visibility of 7-11 GW over the next few years, L&T is equipped to meet the sudden surge in requirements for quality EPC solutions.
Larsen & Toubro (L&T) is a US$14 billion, technology, engineering, construction and manufacturing company with a global presence.

A strong, customer-focused approach, conformity to global HSE standards, and the constant quest for top-class quality have enabled L&T to sustain leadership in its major businesses for over 75 years.

L&T’s construction arm, ‘L&T Construction’ is India’s largest construction organisation. It offers EPC solutions with single-source responsibility to execute large industrial and infrastructure projects from concept to commissioning.

With a track record of over 70 years, L&T Construction has the proven capability to execute all types of mega projects on a turnkey basis, using innovative design, comprehensive construction services including procurement, supply, installation, testing and commissioning services.

L&T has a wide international presence, with a global spread of offices and gained significant market presence in GCC for executing power evacuation, transmission and distribution projects on EPC basis. Leveraging the Gulf’s tropical position (which ensures an abundant, year-round supply of sunshine) and with inherent strength of EPC offerings in solar and wind power, L&T is geared to complement its initiatives towards a cleaner and greener Gulf.
BUSINESS AREAS

GRID CONNECTED PV (UTILITY SCALE)

CONCENTRATING SOLAR POWER (CSP)

ROOFTOP & MICRO-GRID PV SYSTEMS
L&T is committed to playing a significant role in the solar power arena by spearheading the green revolution. L&T can develop economically viable and technically superior EPC solutions in solar energy by partnering with core solar technology providers. L&T’s core competencies encompass the key elements in the solar value chain covering concentrated solar power and solar photovoltaic technologies.

In collaboration with world leaders in module and inverter technology, L&T offers turnkey EPC solutions with wrap guarantees. Over the years, L&T has gained expertise in different solar technologies to design and execute solar power plants including financing assistance for solar projects of different capacities.

**INTEGRATED LUMP SUM TURNKEY SOLUTIONS**

**PROJECT DEVELOPMENT**
L&T offers complete end-to-end solutions, including land parcel arrangements, resource assessment and feasibility analysis, solar farm site evaluation and selection, grid analysis and connections and permits and regulatory approvals.

**ENGINEERING**
L&T’s core team of in-house design experts use cutting-edge software to design the layout and choose the best technology for the solar farm. L&T produces optimised designs for lowest LCOE and higher ROE after thoroughly studying the long-term energy prediction analysis.

**CONSTRUCTION**
World-class construction management and planning with single-point responsibility gives L&T an edge over the competition. L&T ensures timely project completion within the estimated budget, establishing a long-term sustainable solution for the customer in the shortest time.

**PROCUREMENT**
L&T’s access to the best technology solutions is facilitated by its wide experience across global supply chain and the long-term component partnerships it shares with supply partners. L&T’s JIT techniques optimise resources. L&T also provides ISO and OHSAS-certified facilities for manufacturing structures.

**OPERATIONS & MAINTENANCE**
L&T offers post commissioning monitoring, operations and maintenance support with tailor-made O&M packages for tension-free operation (Turn-Key +). Apart from established processes and procedures for proactive and breakdown (reactive) maintenance, L&T offers 24/7 site surveillance support for very large solar farms. Smooth functioning is ensured by a remote monitoring system at L&T’s Headquarters, real-time plant technician support, and a well-networked communication channel with the transmission/grid operator and plant owners.
GRID CONNECTED PV (UTILITY SCALE)

Having commissioned several hundred MWs on ground in India, L&T provides technologically agnostic, independent and flexible utility solar power projects with a high bankability factor. L&T’s solar projects are characterised by speed of execution, highest yield per MWp and lowest cost of generation (LCOG).

20 MWp Solar Power Plant (149.02 acres with 23.54 Latitude, 71.11 Longitude) at Charanka, Gujarat

- Gujarat State Policy Scheme
- Thin-Film Frameless Modules
- Sharp Inverter

Performance:
- One of the biggest plants in Charanka
- Approx 31,500+ MWh generated annually
- Approx 29,500 t CO2 per year displacement
10 MWp Solar Power Plant (73.17 acres with 23.3 Latitude, 71.65 Longitude) at Dhama, Gujarat

**Project**
- Gujarat State Policy Scheme
- Tracker Technology Modules
- SMA Inverter

**Performance**
- Superior CUF and Top Class performance. Proves tracker suitability to Indian conditions
  - Approx 18,750+ MWh generated annually
  - Approx 17,500 t CO2 displacement per year

40 MWp Solar PV Power Project (341.78 acres with 26.82 Latitude, 71.99 Longitude) at Dhursar Village, Pokharan Teshil, Rajasthan, India

**Project**
- Open access scheme
- Thin-Film Modules
- Power One Inverter

**Performance**
- One among the largest PV plants in India, commissioned in record 129 days from concept
  - Approx 71,400+ MWh generated annually
  - Approx 66,600 t CO2 displacement per year
Backed by the expertise and experience gained in executing power generation, transmission and distribution projects in India and Middle East, L&T offers single-point turnkey EPC solutions for Solar Thermal Power plants with all possible CSP technologies like Parabolic Trough, Linear Fresnel Reflector and Power Tower.

L&T’s solar business portfolio covers comprehensive EPC services for

- Stand-alone CSP Plants
- Solar Combined Cycle & Hybrid Power Plants
- Solar Cooling & Heating Applications for Industrial process
- Solar Desalination
- Solar Enhanced Oil Recovery (EOR)

The strategic technology tie-ups with global leaders complement the innovative design and latest construction techniques for successful project commissioning.
125 MWe CSP Project (600 acres) Rajasthan, India

**Project**: Compact Linear Fresnel Technology (CLFr)

**Performance**: Upon completion would be Asia’s largest CSP plant • Upto 400 degrees C Temperature • Upto 106 bar Pressure
L&T offers EPC and O&M service solutions for distributed generation solutions specifically microgrids and solar rooftop PV systems. As a first step towards green initiative in solar power, L&T created a unique technology test bed at its various campus building rooftops across India to evaluate various technologies and configurations.

L&T's first pilot 1 MW rooftop project (commissioned in phases) at its Chennai campus in India affirms its innovation and project execution capabilities. Operational since 2009, this rooftop project has unique wave type BOS (east-west configuration), which is yielding ~6% more energy than the conventional south-facing configuration.

100 kWp Rooftop Solar PV Plant at Tirumala Tirupati Devasthanams (TTD) at Tirupati, Andhra Pradesh

Project:
- Polycrystalline modules & string inverters
- SCADA system for remote monitoring

Performance:
- Catering to the electricity needs of TTD along with its existing wind energy facilities, the plant saves approximately 100 tonnes of CO₂ emissions annually

158 kWp Solar PV Plants at the L&T Training Institute in Kanchipuram, Tamil Nadu

Project:
- Pilot plant model to solarise the entire campus and serve as a technology test bed
- Combination of monocrystalline, LCPV crystalline & thin-film CIGS modules, string & central inverters and a tracker system

Performance:
- Meeting the entire energy demands of the campus, the excess electricity is being pumped to the grid. This installation is poised to serve as an ideal training ground in O&M of solar PV technologies

100 kW (AC) Microgrid Project with energy storage at the Hon. CM's official residence in Patna, Bihar

Project:
- One among the very few microgrid projects in India, this is a demo project for use of solar energy with microgrid and battery backup concept

Performance:
- Hybrid inverters integrating distributed energy sources like solar & DG (with option to add microwind turbine & biomass in future), along with SCADA system. Unique control system for prioritisation of loads & remote monitoring

DISTRIBUTED GENERATION SOLUTIONS
Rooftop PV Systems

L&T offers customized solutions for any kind of roof (RCC/metallic/pitched/flat) including design and development of innovative products, which is adaptable to each client’s needs.

Every advantage of a usually available surface is cleverly combined for profitable production of clean energy. Our solution perfectly adapts to small, medium and large-size rooftops and offers a reliable option for industrial and commercial end users. Currently, L&T is executing India’s largest rooftop PV project with an installed capacity of 7.52MWp.

Microgrids

L&T can provide customised solutions from concept to commissioning for microgrids which are an integrated energy system network consisting of distributed generation sources (like solar, microwind turbines, fossil fuels and biomass), energy storage and advanced control systems.

Solutions are offered after careful analysis of source and load controls to operate as a single autonomous grid either in parallel or exclusive island set up from the existing utility power grid.

L&T campuses are getting converted to pilot microgrids and customized solutions are offered with project execution for various external clients.
KEY SUCCESS FACTORS ADD BRILLIANCE

L&T’s strengths are solar PV power project design, fast and cost-effective solar PV power plant construction without compromising on quality, and its ability to bring in financial assistance for developers of utility scale photovoltaic power plants, CSP as well as rooftop systems in India.

L&T’s market leadership as EPC contractor in the solar PV power plant segment stems from its many decades of power plant EPC experience in India, constant innovation and adaptation to new ideas within the solar industry, and extensive networks with financing communities.

Characteristics of L&T’s solar power projects
- Customer-centric
- Cost-competitive
- Technologically agnostic
- Optimised designs
- Wide network across stakeholders
L&T's talent pool of design engineers actively incubate various technologies and have derived valuable insights on different aspects of solar power systems. The ‘state-of-the-art’ design office delivers cost-effective solutions using latest software and the designs are accredited by leading financial institutions and technical agencies.

A core team interacts with global technology suppliers in the solar domain to constantly enhance the knowledge and optimise design options for Indian conditions. A special team of foundation engineering experts have developed unique structural design and innovative techniques to speed up construction process.

Design optimisation includes:

- Selection of solar components for maximum power
- Optimum string and array design
- Shadow analysis for optimisation of array layout
- Optimisation of cabling
- Optimally locating junction boxes, collector boxes and control room
L&T’s IT-driven procurement capabilities span the globe, ensuring supply of top-quality elements on time, to specifications for all its engineering businesses. This enables us to adhere to stringent delivery schedules.

Dedicated teams in all regions ably support the project team to manage the logistics and cater to quick gestation requirements. L&T’s ISO and OHSAS certified rolling mills at Puducherry and Pithampur handle the fabrication of the mounting structures essential for solar power projects.

Salient features of global sourcing include:

- GPS enabled advanced monitoring systems for tracking the flow of goods
- JIT techniques for optimization of resources
- Strategic long-term component partnerships with supply partners
- Regularly contributing to the value creation in the project area by contracting to local construction and transportation companies

L&T’s Project Management Teams have repeatedly demonstrated their ability by delivering complex projects ahead of time even under critical conditions and stringent timelines. With the perfect understanding of the fundamental driver in the sector, L&T implements world-class project management practices in all its projects. L&T meets the core criteria of shortest gestation time from conceptualization to commissioning. This is evident from the hallmarks of execution in the Indian solar industry.

L&T has executed the largest and fastest solar power plant projects in India and has emerged as the No.1 EPC player, providing solutions for various solar technologies.

**Fastest Project in the Country: 20 MWp in Phalodi, Rajasthan was executed in a record 60 days flat right from concept-to-commissioning**

**Largest Project: 40 MWp plant in Pokharan, Rajasthan, completed in 129 days**

**Largest Tracker Project: 10 MWp plant in Dhama, Gujarat is India’s largest tracking plant**.

**Asia’s Largest CSP Project: 125 MWe CSP Project under construction in Rajasthan.**

L&T has been setting benchmarks in the solar industry with its fleet of GPS-enabled ramming and trench-cutting machines and permanent establishments for pre-assembly of module tables, steel service centres and precast concrete plants including infra-red imaging for string level monitoring and high-end security and surveillance systems. *as on October 2013*
QUALITY & SAFETY - CORE COMMITMENTS

Quality is the key component which propels performance and defines leadership traits. At L&T, quality standards have been internalised and documented in Quality Assurance Manuals. L&T also recognizes the crucial significance of the human element to adopt quality standards and through structured training programmes ensure that every employee is conscious of his/her role and responsibility in extending the company’s tradition of leadership through quality.

A commitment to safety springs from a concern for the individual worker – every one of the thousands braving the rigours of construction at numerous project sites. At L&T, safety management is viewed and managed in the same way as other operational functions. Risk factors have been analysed and counter-measures developed to ensure that safety standards are integral to operational procedures. Several national and international awards testify the safety standards established by L&T.

SUSTAINABILITY ENSURES A BRIGHT FUTURE

L&T is committed to environmental and societal well-being. It is the first company in India in the engineering & construction space to publically disclose its sustainability performance across the traditional three ‘Ps’ of Planet, People and Profits - and has been globally recognized as an organisation that contributes significantly to societal well-being.

L&T is empowering the vast army of rural, underprivileged, unemployed youth by imparting skill training through full-fledged Construction Skills Training Institutes (CSTI) across the country that impart training in different construction trades.

Skill training facilities with specialised training modules for solar workmen are being developed in association with MNRE/SEC in CSTI. Every successful batch brings to the industry trained construction workers and reaffirms L&T’s commitment in building rural and greener India.
AWARDS & ACCOLADES – A GLINT OF GOLD

For its pioneering work in the green-energy area, L&T has been rated the Most Trusted Company by leading publications. The Company commands the respect of various government agencies, investors and private and public sector companies in India.

9th in Global Ranking of World’s Most Innovative Companies
Forbes - the reputed US-based global business magazine - ranked L&T the 9th most innovative company in a global study.

4th Greenest Company in the World
Newsweek, the globally respected and widely read news magazine published ‘Green Rankings’ - a comparative score card of the top 500 green companies.

Having developed over 200 MW projects in the year 2012, L&T Construction created a record in Solar PV installations catapulting itself to the list of global top 10 solar PV installers, and is the only Indian Solar EPC in the global top 10!
(Source: IMS Research (IHS), world’s leading research agency for the solar industry).

28th ranking among top 225 global contractors by Engineering - News Record (ENR) Magazine, USA in 2013. L&T is the 1st and the only Indian EPC among the top 100 to appear ahead of globally renowned names such as Technip, Samsung, Hyundai, Foster Wheeler etc. on that list.

L&T Solar Business Unit is an Accredited MNRE Channel Partner and supports the customer for obtaining MNRE subsidy for their solar systems. L&T is graded “SP 1A” by CARE for our performance capability and financial strength.