Sargent & Lundy LLC

Company Overview & Renewable Energy Services

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Sargent & Lundy – Company Profile

- Exclusive focus on power industry
- Headquartered in Chicago, USA
- Privately held; founded in 1891
- ISO 9001:2008 Certified Quality System
- 2,500+ staff members
- Annual revenue in excess of $500 million
- Consistently ranked in top five in Global Power Sector by *Engineering News-Record* magazine (number three in 2015)

Renewable Energy – Focus Technologies

- Wind Power
- Solar Power
- Microgrids and Battery Storage
- Distributed Energy Resources
- Biomass
- Landfill gas
- Hydroelectric
- Geothermal

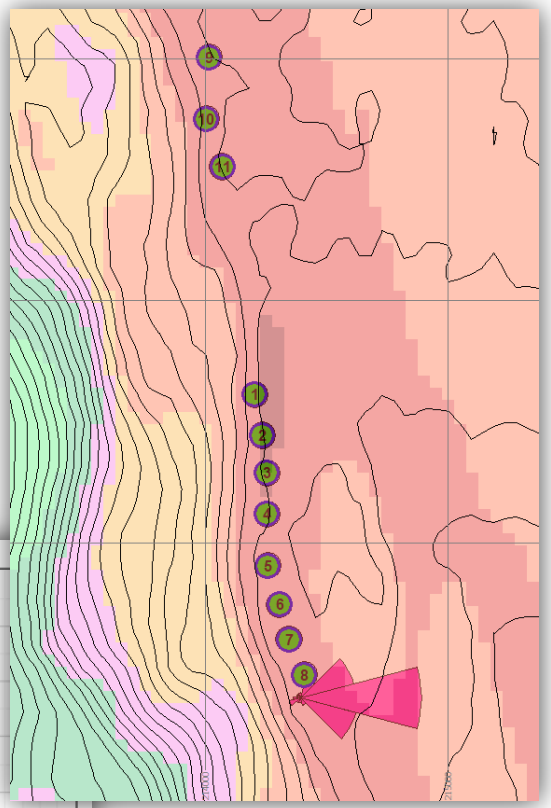
Wind Project Engineering and Design

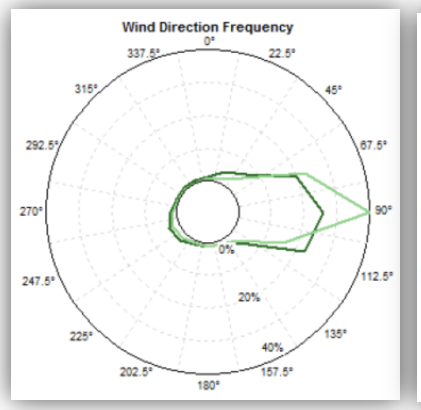
Full Scope Engineering and Design Capabilities

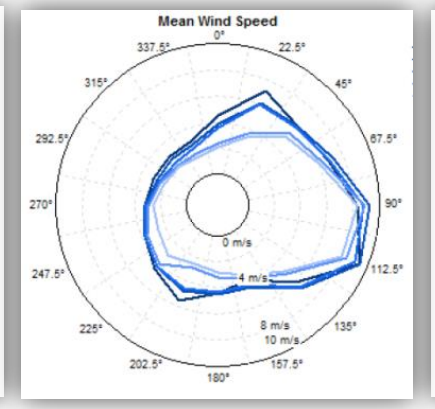
- Wind resource assessment
- Wind turbine selection and plant layouts
- Wind turbine foundations
- Civil design – roads, crane pads
- Collection systems and collection substations
- Overhead transmission
- Underground transmission
- Interconnection substations
- Electrical studies and analysis to support designs and grid connection
- Plus interconnect utility interface, field engineering, construction management, and commissioning

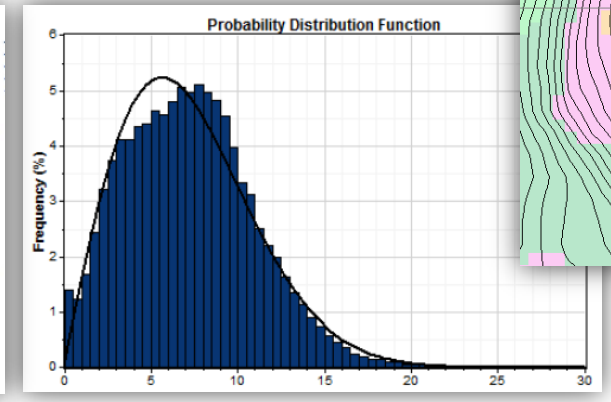
Wind Resource Assessment

- Wind data collection campaign planning support
- Assessment, verification and validation of available wind data
- Development of spatial wind map using modeling software openWind®
- Equipment selection evaluation and project layout optimization
- Estimation of energy losses including losses from wake effects
- Estimation of annual gross and net energy production
- Uncertainty analysis to determine P75, P90, P95, P99 annual energy









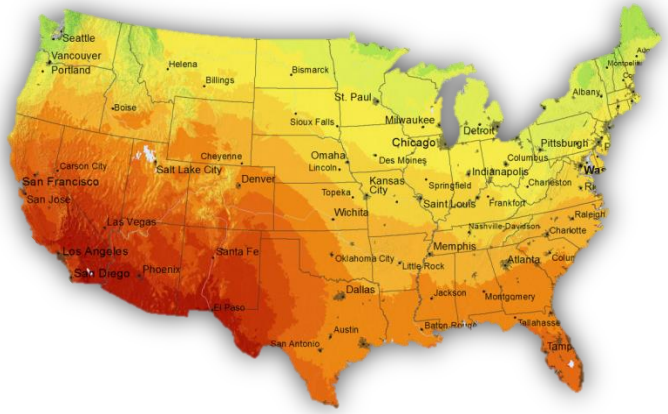
Solar Project Engineering and Design

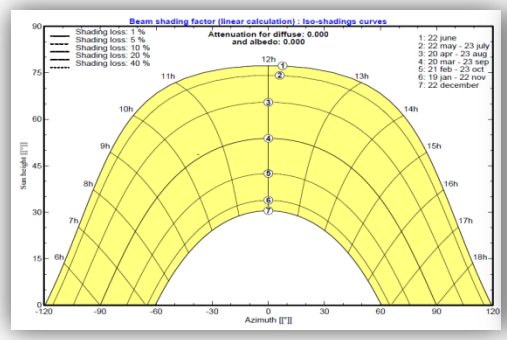
Full Scope Engineering and Design Capabilities

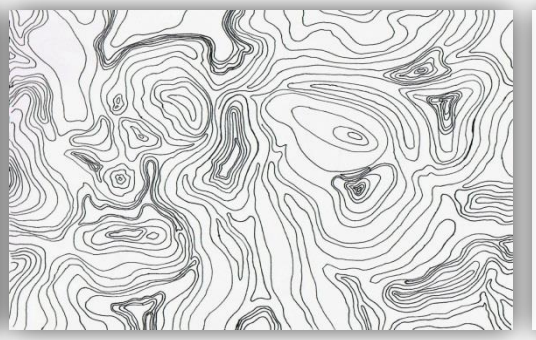
- Solar PV or solar thermal power
- Solar resource assessment
- Technology and equipment selection
- Plant layouts and optimization
- Civil design and foundations
- LV and MV electrical systems
- Overhead and underground transmission
- Interconnection substations
- Integration with battery energy storage and microgrids
- Electrical studies and analysis to support designs and grid connection
- Interconnect utility interface, field engineering, construction management, and commissioning

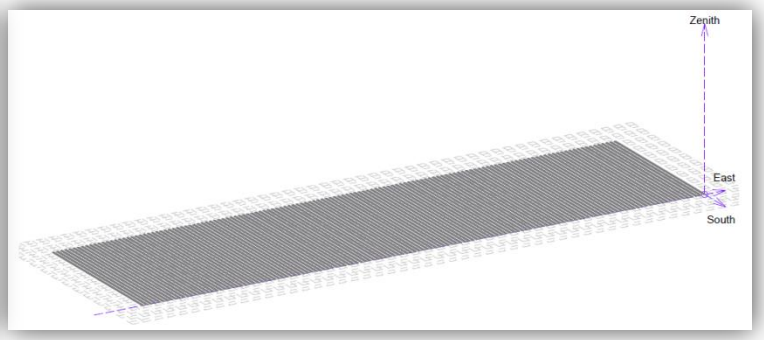
Solar Resource Assessment

- Analyze available solar resource data
- Assessment, verification and validation of selected solar data
- Assessment of land use and topography, construction feasibility, electrical interconnect, social and environmental barriers
- Equipment selection evaluation and project layout optimization
- Estimation of soiling, near shading and solar PV system losses
- Estimation of annual gross and net energy generation
- Uncertainty analysis to determine P75, P90, P95, P99 annual energy









Battery Energy Storage Systems

Full Scope Engineering and Design Capabilities

- Design and integration for more than 12 battery projects, 100+ MW
- Numerous applications:
  - T&D deferral
  - Load leveling and peak shaving
  - Ancillary support and reactive power control
  - Voltage and frequency regulation
  - Black-start capabilities
- Interfacing with component vendors, integration of devices, and design and interconnection of facility to grid
- Feasibility studies, project planning, technology selection
- Dynamic load flow and short-circuit modeling, arc-flash analysis, fault and system study analysis, protection relay settings, and site construction/engineering support

Microgrids

Full Scope Engineering and Design Capabilities

- Feasibility studies – full technical and economic evaluations
- Conceptual design and technology selections
- Sizing, full design, and integration of complete microgrid systems
- Electrical and grid studies – for island and grid connected modes
- Implementation and vendor coordination
- Construction/engineering support and project management
- Independent technical and financial advice
- Campuses, commercial and industrial, military, remote locations, communities, mission-critical, and other applications

Power System Planning and Studies

Our grid/system study team uses state-of-the-art software

- System Model Development
- Power Flow
- Short Circuit
- Transient Stability
- Voltage Stability
- Reactive Compensation
- System Loss Evaluation
- Microgrid Planning and Evaluation
- Collector System Design
- Insulation Coordination
- Open Phase Studies
- Transient Overvoltage
- Harmonics
- Induction Studies
- Grounding Studies
- Relay Coordination / Relay Settings

Renewable Energy Project Services: Concept to Operations

System Planning

- Regional Screening
- Resource Assessments
- Interconnection Planning
- Power System Studies
- PPA Support
- Financing Support
- Site Selection and Evaluations
- Land Use and Access Evaluations
- Environmental Studies
- Cost Estimating

Project Planning

- Resource Assessments
- Technology and Equipment Selection
- Micrositing
- Feasibility Studies
- Conceptual Designs and Layouts
- Interconnection Support
- Permitting and Environmental Services
- Geotechnical Support
- Due Diligence

Engineering

- Full Scope Design
- Civil Design
- Power Collection Systems
- Collection Substations
- Transmission Lines
- Interconnect Substations
- Electrical Analysis and Studies
- Owner's Engineer
- Battery Integration Engineering
- Permitting Support

Procurement

- Owner's Engineer
- Vendor Qualifications
- Technical Specifications
- Contract Negotiations
- Bid Evaluations
- Procurement Agent
- Expediting
- Quality Surveillance
- Vendor Drawing Review
- Preparation of Contracts
- Environmental Requirements

Construction

- Contracting Strategy
- Contractor Selection
- Construction Management and Supervision
- Quality Surveillance
- Material Controls
- Environmental Monitoring and Management
- Commissioning and Testing
- Operating Procedures
- EPC

O&M

- Asset Acquisition Support
- Condition Assessments
- Quality Surveillance
- Maintenance Spending Assessment & Optimization Programs
- Performance Monitoring & Troubleshooting
- Performance Benchmarking
- Failure / Damage Assessments
- End of Warranty Inspections

Construction Services for Renewable Projects

- Project Management
  - Project Controls
  - Cost Estimates
  - Constructability Reviews
- Construction Management
  - Construction Contracting Strategies
  - Contract Administration
  - Site Construction Management/Liaison
  - Technical Field Advisors
- Procurement
  - Material Coordination
  - Ordering/Expediting/Receiving/Inventory
- Commissioning
  - Interconnect Utility Outage Coordination
  - Testing/Commissioning
  - Operating Procedures
  - Security

Wind and Solar Experience: Past Five Years

- Executed more than 200 different projects and more than 18,000 MW
- Experienced with all major wind turbine OEMs and solar PV and concentrated solar power (CSP) technologies
- Experienced in due diligence, site evaluations, feasibility studies, permitting, environmental support, construction and commissioning services, O&M assessments
- Project experience in Africa, Asia, Middle East, North America, South America

Lender and Investor Services for Renewable Energy

- Pre-construction due diligence – for project financing and tax equity
- Financial modeling & independent capital and O&M cost estimates
- Independent wind and solar resource assessments
- Independent construction monitoring
- Construction and commissioning completion verification
- Operations monitoring
- Asset acquisition due diligence
- Sell-side consulting support
- Technology reviews

Wind Power, Solar PV, Solar Thermal, Biomass, Geothermal, Hydroelectric, Landfill Gas, Battery Projects

Client Base

- Utilities
- Project developers
- System owners and operators
- Electric cooperatives
- Contractors
- Lenders and investors

Over 200 renewable energy clients
Over 100 transmission and distribution clients
Over 300 consulting clients

What differentiates Sargent & Lundy from other engineering companies?

- High competence level of Sargent & Lundy staff (over 50% licensed Professional Engineers, over 500 Master of Science degrees)
- Strong quality focus with processes and procedures governing all major work steps
- Experienced in all aspects of the electric power business – generation, transmission, distribution – from concept phase to operations
- Detailed knowledge of all technical and financial aspects related to project development, construction, ownership, operations as well as asset transactions

Thinking Power … exclusively!

Conclusions

- Sargent & Lundy is headquartered in Chicago with seven regional offices in the U.S. and four international offices
- Sargent & Lundy has a staff of over 2,500 with more than 1,500 highly qualified engineers with extensive experience in all technologies related to renewable energy
- Sargent & Lundy can cover the entire scope from concept to operations
- Sargent & Lundy has successfully completed more than 300 different renewable energy projects and 30,000 MW

Thank you

For more information, please contact:

Matthew R. Thibodeau, P.E.
Vice President

Sargent & Lundy LLC
55 East Monroe Street
Chicago, Illinois 60603-5780
www.sargentlundy.com

+1-312-269-7633 - Office Phone
+1-312-269-0090 - eFax
mthibodeau@sargentlundy.com