Implementing Renewable Energy Technology

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Westwood Renewables are renewable energy integrators who provide design and engineering for residential, commercial and utility-scale solar and wind projects.

In collaboration with our sister company, Westwood Professional Services, we support developers, utilities, and T&D designers in the siting, permitting, design and construction of renewable energy projects and transmission line infrastructure.
Our experience in energy project development began in the late 1970’s designing and constructing some of the very first solar and wind energy systems in the Midwest. Today we offer:

- Land Acquisition
- Survey
- Permitting
- Environmental Reviews
- Equipment Speciation and Procurement
- Civil & Electrical Design
- Site and Plant Layout
- Construction Staking
- Project & Contractor Management
- Operations & Maintenance
Project Consideration Priorities

- Energy conservation: a precursor to renewable energy projects.
  1. Use patterns/schedules
  2. Envelope integrity
     - Infiltration
     - Insulation
  3. Heating efficiency equipment
  4. Electrical efficiency equipment
Minnesota's Solar Resource

**kWh/kW/year around the world**

- **BERLIN, GERMANY**: 785
- **ANCHORAGE, AK**: 827
- **PARIS, FRANCE**: 849
- **NEW YORK CITY, NY**: 1231
- **HOUSTON, TX**: 1269
- **MADRID, SPAIN**: 1336
- **MINNEAPOLIS, MN**: 1337
- **SAN FRANCISCO, CA**: 1503
- **PHOENIX, AZ**: 1681

*Source: NREL*
Renewable energy implementation includes five major phases:

1. Analysis
2. Finance
3. Design & Permitting
4. Installation
5. O&M / Monitoring
Analysis
Preliminary Evaluation

- Financial analyses and incentive potentials
- Preliminary siting and equipment layouts
- Environmental assessments
- Energy production studies
- Utility interconnection study
Analysis

Site Assessment

- **Resource Evaluation**
  - Solar resource assessment
  - Shading aspects
  - Historical climate data
  - Long-term data collection and system performance studies
  - Standard formulas/simulation tools (software)
  - Component efficiency data
• Site-specific construction logistics
  • Roof materials and remaining roof life (roof systems)
  • Drainage and soil issues (ground systems)
  • Land availability/clearance from neighboring obstructions
  • State of pre-existing infrastructure
  • Material delivery and staging
1. Review financing options
2. Rebates and incentives
   - Federal ITC, State Rebate, Utility Incentives
3. Federal and state tax policies
4. Peak load reduction benefits
5. Alternative ownership structures
6. Utility rate tariffs and integration
7. Renewable energy valuation
8. Preliminary budget
Design

- Identify equipment
  - Climate and site appropriate
- System specifications
- Engineering
  - Structural
  - Electrical
  - Civil
- Construction plans
- Utility interconnection
1. **Same Process for Residential and Commercial Dev.**
   - Zoning
   - Conditional Use Permits
   - Environmental Review
   - Stormwater Management Plans

2. **City/County Design Standards**
   - Solar access laws
   - Setbacks & shading regulations

3. **Decommissioning Plans**
Installation trends

- In transition to national standards
- Increased regulation
- Certification requirements

Technology-specific contractors

- Skilled, seasoned, licensed
- Trades positioning to market segments
- Installed system costs going down
- Guesswork on construction methods removed
Minimal requirements

- No site personnel required
- Online monitoring and control systems
- Annual inspection
- Scheduled maintenance plan
- Remote fault alarms
- Facilitate warranty repairs/servicing
Solar O & M Monitoring

- Essential to sustained energy production and efficiency
  - Many renewable energy systems include integrated monitoring
    - Not revenue-grade
  - Simple meter readings and scheduled check-ups (residential)
  - Third party monitoring or revenue grade meters are required for commercial/utility incentive programs.
    - Utility net-metering
    - PPA requirements
    - Renewable energy credits (RECs)
Case Study: Saint John’s Solar Farm
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Overview

1. **400kW Solar Photovoltaic System**
   - Largest in Minnesota
   - 1,820 solar modules
   - 3.0 acres
   - 575,000 kWh annually (65 average homes)

2. **Linear Tracker System**
   - First large-scale tracker in Midwest & cold climate region
   - Follows sun throughout day to increase performance
Government Approvals

- Landuse Approvals/Permits:
  - Zoning Code text change (to allow solar): Stearns County
  - Rezoning to District that allowed solar: Stearns County
  - Conditional Use Permit: Avon Township
  - Site Permit: Stearns County
  - NPDES (Stormwater): State of Minnesota
  - State Building Permit (Electrical): State of Minnesota
  - Decommission Plan: Avon Township

- Legal Agreements
  - Interconnection Agreement: Xcel Energy
  - Land & Solar Lease: Saint John’s Abbey
  - Construction Agreements: Mortenson etc.
  - Vendor Supply Agreements: Modules, Tracker etc.
Site Plan
Project Components

American Made Products

Colorado

California

New Mexico
1. Sign agreement  
   - May

2. Design
   - June

3. Zoning/Permitting
   - June-August

4. Equipment Procurement
   - Aug-Sept

5. Site Work
   - September

6. Foundations
   - Sept-Oct

7. Tracker Assembly
   - October

8. Module Installation
   - November

9. Commissioning
   - December
Case Study: Saint John's Solar Farm

Finance

- **Financing Sources**
  1. Renewable Development Fund Grant
  2. Federal Investment Tax Credit
  3. Equity Investors
  4. Energy Sales

- Ownership held by project LLC
Jobs Created

- Legal
- General Contractor
- Project Engineer
- System Designer
- Surveyor
- Electricians
- Metal Workers
- Manufacturers
Standardized Pricing

- Provide long-term assurance that industry is here to stay
- Attract investors
- Transparent economic model
Moving Forward – Solar in Minnesota

- Recognize solar’s unique generation characteristics
  - Provide for true value of solar
    - 90% on-peak generation
    - 60% on-peak capacity factor
    - Offset utility peak loads
  - Distributed generation
    - Reduces transmission line infrastructure
    - Line loss reduction
Moving Forward – Solar in Minnesota

- Net Metering Cap
  - Currently 40kW maximum
  - 2MW maximum needed
    1. Streamline process for commercial and institutional users
    2. Reduce overhead cost of regulatory compliance
    3. Eliminates potential standby charges & penalties
Net Metering Caps Nationwide

www.dsireusa.org / October 2009

42 states & DC have adopted a net metering policy

* State policy applies to certain utility types only (e.g., investor-owned utilities)

Note: Numbers indicate individual system capacity limit in kW. Some limits vary by customer type, technology and/or application. Other limits might also apply.
Moving Forward – Solar in Minnesota

- Capital Cost Reduction
  - Primary equipment costs decline
  - Market penetration
  - Experienced labor pools
  - Manufacturing production capacities
Moving Forward – Solar in Minnesota

- Increased financing options
  - Investor-owned
  - Mortgage-tied
  - Non-profit alternatives
  - Bonding
  - Utility-owned
  - Leasing
  - Community-based
Moving Forward – Solar in Minnesota

- Examine solar market in Southwest
  - Utilize best practices
  - Provide good investment opportunities
  - Draw manufacturing jobs to region
  - Create new market for trades
  - Create a sustainable environment