



USAID
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GRID-CONNECTED RENEWABLE ENERGY TOOLKIT:

ANNOTATED BIBLIOGRAPHY

OCTOBER 2009

This publication was produced for review by the United States Agency for International Development. It was prepared by the Institute of International Education.

USAID GRID-CONNECTED RENEWABLE ENERGY TOOLKIT – ANNOTATED BIBLIOGRAPHY

1. [LEAN AND GREEN TOOLKIT, US EPA, OCTOBER 2007, EPA-100-K-06-003.](#)

Document Type: Toolkit

The Lean and Environment Toolkit offers practical techniques and strategies that can help shape environmentally protective, minimal waste, least cost decision making for business operations. This toolkit draws heavily from the experience of EPA partners and builds on research sponsored by EPA's Lean Manufacturing and Environment Initiative, which promotes business models and collection methods to minimize waste and maximize environmental benefits.

2. [GLOBAL RENEWABLE ENERGY POLICY AND MEASURES](#)

Document Type: Database

The Global Renewable Energy Policies and Measures Database provides information on policies and measures taken to encourage renewable energy. The database covers measures in IEA member countries, together with members of the Johannesburg Renewable Energy Coalition (JREC), and Brazil, China, the European Union, India, Mexico, Russia, and South Africa. Containing more than 1,000 records dating back to 2000 and sometimes earlier, the database provides detailed information on renewable energy policy developments and complements the policy analysis carried out by the IEA on renewable energy.

3. [INTERNATIONAL MOTIVATIONS FOR SOLAR PHOTOVOLTAIC MARKET SUPPORT: FINDINGS FROM THE UNITED STATES, JAPAN, GERMANY AND SPAIN](#)

Document Type: Memo

This memo explores the motivations for supporting the development of domestic solar PV markets in the United States (focused on California), Japan, Germany, and Spain. It briefly details the nature of the supporting policies, and explores the benefits of the support system to date.

PV has a number of important characteristics that, depending on local conditions, enable the shift to a more sustainable energy system. Policymakers, governments, utilities, and customers are the major stakeholders for PV, and there are different motivations and arguments for PV deployment among each stakeholder group. Six primary benefits are identified:

- **Fossil fuel avoidance or displacement benefits** (including energy security and avoided fuel cost, fuel scarcity, and fuel price volatility benefits);
- **Environmental benefits** (reduction of greenhouse gas emissions and air pollutants, as well as the avoidance of associated external costs);
- **Cost reduction benefits** (including learning by doing benefits within the local supply chain and labor market);
- **Electric utility benefits** (including decentralized supply that avoids certain transmission and distribution expenditures, and peak power generation that helps avoid the construction and use of other peaking generation plants);
- **Industrial development and employment benefits** (including the establishment of jobs and domestic growth industries); and
- **Customer benefits** (including green pricing programs and perceived green characteristics).

4. [ANALYSIS OF PV SYSTEMS' VALUES BEYOND ENERGY](#)

Document Type: Report

This report identifies, evaluates, and quantifies the major values and benefits of urban-scale PV based on country specifics. Although PV currently appears an expensive option for producing electricity compared to other energy

sources, many countries support this technology because of its promising future potential and the additional benefits, besides generating electricity, associated with PV.

The major stakeholders for PV include policymakers and governments, utilities, and customers. The evaluated and/or quantified values have been categorized under the following topics:

- Avoiding fossil fuels
- Environmental benefits
- Electric utilities benefits
- Industry development and employment benefits
- Customer's individual benefits

5. EASING INVESTMENT BARRIERS: NICARAGUA'S RENEWABLE ENERGY POTENTIAL

Document Type: Report

Nicaragua's economy faces a triple squeeze: high power prices, power shortages, and increased costs for imported fuels. Despite the country's economically viable renewable energy (RE) potential, risk-averse private investors prefer diesel power plants, with their low upfront costs. This note highlights lessons from the country's failed power-sector reform of 1998–99 and recent measures to ease barriers to RE investment.

6. REN21 – RENEWABLE ENERGY POTENTIALS: OPPORTUNITIES FOR THE RAPID DEPLOYMENT OF RENEWABLE ENERGY IN LARGE ECONOMIES, ITS IMPACTS ON SUSTAINABLE DEVELOPMENT AND APPROPRIATE POLICIES TO ACHIEVE IT

Document Type: Report

The report focuses on energy production potentials from renewable energy sources, their cost and regional distribution, and the extent to which RE technologies are able to provide sufficient and cost-efficient supply over the next 40 years. It identifies the long-term supply opportunities renewable energy technologies offer in the energy markets based on the technical potentials, but takes into account the constraints that may hinder the realization of the potential (including competition for land use, technology cost, and stock turnover).

The report also highlights the opportunities renewable energies present, not only for climate change mitigation and other environmental objectives, but also for economic development and employment, as well as for energy security. It makes the case for the fast and large-scale deployment of renewable energy.

7. REN21 GLOBAL STATUS REPORT 2007

Document Type: Report

In 2007, more than \$100 billion was invested in new renewable energy capacity, manufacturing plants, and research and development. This report provides an overview of renewable energy worldwide in 2007, capturing the perceptions and reality of renewable energy. The report covers trends in markets, investments, industries, policies, and rural (off-grid) renewable energy. (By design, the report does not provide analysis, discuss current issues, or forecast the future.) Many of the trends reflect increasing significance relative to conventional energy.

8. UNEP – GLOBAL TRENDS IN SUSTAINABLE ENERGY INVESTMENT 2008: ANALYSIS OF TRENDS AND ISSUES IN THE FINANCING OF RENEWABLE ENERGY AND ENERGY EFFICIENCY

Document Type: Report

This report presents the financial perspective, or "dollar view," of the current state of sustainable energy development. The analysis in this report consists of actual data on the different types of capital flows, combined with analysis of regional and sectoral trends. This information is intended to be a strategic tool for understanding the

status of the clean energy sector's development and for weighing future public and private commitments to the sector.

9. WORLD BANK RENEWABLE ENERGY (RE) TOOLKIT

Document Type: Website

RE Toolkit provides a broad set of tools to assist Bank staff and country counterparts to improve the design and implementation of renewable energy (RE) projects, incorporate best practices and lessons learned from RE projects supported by the World Bank and others, and is operationally oriented to address practical implementation needs at each stage in the project cycle.

RE Toolkit will help to identify and design feasible RE projects, determine appropriate promotional policies, identify sustainable business models, finance mechanisms and regulatory frameworks – and utilize the best available project tools, including technical standards and generic terms of reference.

10. HANDBOOK ON BEST PRACTICES RE INDIA

Document Type: USEA Report

This handbook was created under the U.S. Department of State Asia Pacific Partnership on Clean Development and Climate as a tool to assist in the removal of barriers to the deployment of clean energy technologies. The handbook, intended for policymakers, utility executives, regulators, and project developers, is a compilation of open source documents that are cited and listed at the end of each topic, as well as in the bibliography.

11. U.S. GEOTHERMAL POWER PRODUCTION AND DEVELOPMENT UPDATE (AUGUST 2008)

Document Type: Report

This report details geothermal power production in the United States, the global leader in online geothermal capacity, with 30 percent of the world total. As of August 2008, geothermal electric power generation is occurring in seven US states: Alaska, California, Hawaii, Nevada, New Mexico, Utah, and Idaho. Other states, such as Oregon and Wyoming, are soon to be added to the list. As of August 2008, the United States had a total installed capacity of 2957.94 MW.

12. THE STATE OF GEOTHERMAL TECHNOLOGY - PART I: SUBSURFACE TECHNOLOGY (NOVEMBER 2007- FULL REPORT)

Document Type: Report

This report details geothermal exploration and development requirements. Operating geothermal power plants utilize fluids that flow through fracture networks of heated subsurface rock, which creates reservoirs of hot fluid or steam. Prior to constructing and connecting a geothermal plant to the grid, developers must go through several steps to locate and harness these reservoirs. The steps to subsurface resource development are: 1) exploration, 2) drilling, and 3) reservoir management.

Successful completion of these steps involves the employment of numerous subsurface technologies. These technologies, which include both the tools used and approaches taken to develop a given resource, are effective in only the best of conditions. To utilize most of the geothermal resource base, subsurface technologies would need to be improved, new exploration technologies developed, and costs for drilling significantly reduced.

13. THE PARTNERSHIP FOR CLEAN INDOOR AIR WEBSITE

Document Type: Website

At the Partnership for Clean Indoor Air website 309 partner organizations contribute their resources and expertise to reduce smoke exposure from cooking and heating practices in households around the world. This collaborative effort is focused on four essential elements of effective and sustainable household energy and health programs:

- Meeting the needs of local communities for clean, efficient, affordable, and safe cooking and heating options;
- Improving cooking technologies, fuels, and practices for reducing indoor air pollution;

- Developing commercial markets for clean and efficient technologies and fuels; and
- Monitoring and evaluating the health, social, economic, and environmental impact of household energy interventions.

14. [HYDROELECTRIC POWER: HOW IT WORKS \(BASIC DESCRIPTION WITH ANIMATION\)](#)

Document Type: Website

This US Geological Survey website provides an overview of the workings of a hydroelectric facility. Included is an animation provided by the Tennessee Valley Authority, which demonstrates how a hydroelectric power project produces electricity.

15. [THE STORY OF PINGSTON CREEK: A RECENT SMALL HYDRO DEVELOPMENT IN CANADA](#)

Document Type: Report

This report on the development of the 30 MW Pingston Hydro Project in southwest British Columbia provides insights into the challenges facing private hydropower developers. Completing the process of finding a site, obtaining leases and permits, and constructing the plant required patience, willingness to take calculated risks, and a commitment to developing green power.

16. [HYDROELECTRIC POWER EVALUATION: A DETAILED TREATMENT OF HYDRO BENEFITS](#)

Document Type: Report

This report provides a detailed methodology for determining the benefits of a proposed hydroelectric power facility. The report was prepared by the Federal Power Commission and released in 1968.

17. [DAM SAFETY: PROBABLE MAXIMUM FLOOD – A DESCRIPTION OF DAM FAILURES AND FLOOD DESIGN CRITERIA](#)

Document Type: Fact Sheet

This fact sheet details the Ohio Administrative Code requirements on dam construction. Dams that are not designed to withstand major storms may fail, releasing uncontrolled floodwaters that result in catastrophic damage downstream. In order to protect lives and property downstream, the Ohio Administrative Code requires that dams be constructed to safely handle an appropriate percentage of the Probable Maximum Flood (PMF). This percentage varies according to the height of the dam, size of the impoundment, and the extent and severity of damage possible upon failure. The requirements established in Ohio are similar to those used in other states, and correlate to historical records of significant storms and dam failures.

18. [UKRAINE HYDROPOWER REHABILITATION: UPGRADING EXISTING PROJECTS](#)

Document Type: Report

The Ukraine Hydropower Rehabilitation (Carbon Finance) Project will rehabilitate at least 46 hydroelectric units at nine hydropower plants along the Dnipro River in central Ukraine by the end of 2012. Twenty-six of these units had been rehabilitated by the end of 2006. Though the Project's outdated and worn-out hydraulic power, electro-mechanical and hydro-mechanical equipment will be replaced, civil works will also be conducted on hydraulic structures and computer-aided dam safety monitoring systems will be installed. Rehabilitation of these units will increase the available hydropower capacity by 160 MW (by 2012). Through increased capacity and energy savings, hydropower generation is expected to rise to 78 GWh by 2007 and to continue to gradually increase to 471 GWh by 2012.

19. [CHAPTER 9 – RESERVOIR PROBLEMS: A DISCUSSION OF ENVIRONMENTAL ISSUES](#)

Document Type: Report

This is an online version of Chapter 9 from the book "*Safety of Existing Dams: Evaluation and Improvement*" (1983) and written by the Commission on Engineering and Technical Systems (CETS).

20. HYDROPOWER REGULATION: A DISCUSSION OF LICENSING AND PUBLIC PARTICIPATION

Document Type: Report

The “*Citizen Toolkit for Effective Participation in Hydropower Licensing*” (June 2005) was prepared by the Hydropower Reform Association. The report provides a guide to the licensing of hydroelectric facilities by the Federal Energy Regulatory Commission.

21. MICRO HYDRO POWER PROS AND CONS

Document Type: Website

This article outlines some of the advantages and disadvantages of small-scale water turbines. Small-scale micro hydropower can be both an efficient and reliable form of energy. However, there are certain disadvantages that should be considered before constructing a small hydropower system. It is crucial to have a grasp of the potential energy benefits as well as the limitations of hydro technology. There are some common misconceptions about micro hydro power that need to be addressed. With the right research and skills, micro hydro can be an excellent method of harnessing renewable energy from small streams.

22. JAMES BAY PROJECT: A SUMMARY OF ONE OF THE LARGEST HYDROELECTRIC COMPLEXES EVER DEVELOPED

Document Type: Website

The James Bay Project, a monumental hydroelectric power development on the east coast of Canada’s James Bay, was initiated in 1971 and is still under construction. The \$13.7 billion project entails massive diversions of water from three rivers to dammed reservoirs on La Grande Rivière; the average flow of La Grande Rivière was increased from 1700 to 3300 m³/s. A tiered spillway, three times the height of Niagara Falls, was blasted from the bedrock, and La Grande-2 (LG-2), which was completed in 1982 and has the world’s largest underground powerhouse, generates 5328 MW of electric power. The completion of LG-3 (Feb 1984) and LG-4 (May 1984), which ended Phase I of the project, increased Hydro-Québec’s generating capacity to 10,300 MW.

The project has raised controversy for its effect on the native people and environment.

23. NAM THEUN 2: A DESCRIPTION AND FINANCIAL STRUCTURE OF A RECENT LARGE HYDROELECTRIC PROJECT IN LAOS

Document Type: Report

This report details a large hydro project on the Nam Theun River. The potential for hydroelectric power projects on the Nam Theun River was first identified in the mid-1970s and was the subject of detailed studies during the following decades. In the early 1990s the Nam Theun 2 hydroelectric project (NT2) was recognized by the Government of the Lao PDR (GOL) as a key project for the economic and social development of the Lao nation. With the introduction in 1994 of sponsors Electricité de France (EDF) and Italian-Thai Development Public Company Limited (ITD) of Thailand, and the invitation to the World Bank to participate in the project, NT2 moved from a concept to the development phase. The project design and preparation of a complete set of economical, environmental, and social safeguards have taken more than ten years. A temporary delay caused by the Asian financial crisis of 1997 allowed the sponsors, which by 2000 also included Electricity Generating Public Company Limited (EGCO) of Thailand, to update some of aspects of the project, and to develop an adjusted structure best suited to the requirement of commercial lenders. This led to the successful project financing, with full construction activities beginning in June 2005.

24. RENEWABLE ENERGY POLICY OPTIONS FOR CHINA: A COMPARISON OF RENEWABLE PORTFOLIO STANDARDS, FEED-IN TARIFFS, AND TENDERING POLICIES

Document Type: Report

The three most prominent policies in the United States and Europe to stimulate the commercialization of renewable electricity projects are feed-in laws, tendering policies, and renewable portfolio standards.

Feed-in laws have been the primary mechanism used historically to support renewable energy development in both Europe and the United States. The successes of feed-in laws have been numerous, and feed-in laws have many benefits relative to other forms of renewable energy policy. Renewable portfolio standards (RPS) and related mechanisms have become increasingly popular in the United States and internationally in the last several years. Many expect that RPS policies, which maximize competition among eligible renewable energy projects, will (over time) replace feed-in laws as the primary approach for spurring renewable energy development. Finally, tendering policies, such as the Non-Fossil-Fuel Obligation (NFFO) in the United Kingdom, have been used to spur new renewable development with mixed success in the United States and United Kingdom.

This paper briefly reviews experience with feed-in policies, tendering, and renewable portfolio standards, and compares the relative merits and disadvantages of each approach both generically and for application in China. This paper does not recommend one specific policy approach for China, but rather describes the pros and cons of multiple approaches for consideration in China.

25. RENEWABLE ENERGY AS A HEDGE AGAINST FUEL PRICE FLUCTUATION: HOW TO CAPTURE THE BENEFITS

Document Type: Report

This paper demonstrates the benefits of renewable energy as a hedge against electricity market fuel price fluctuation. The paper considers how regulators and electricity customers may address this opportunity either as a socialized cost/benefit scenario (by including renewable energy in the rate base), on an individual customer basis (through green pricing options that convey price stability benefits, via on-site installation of renewable energy generation technology under different business models, and through fuel switching), or through several approaches simultaneously.

This paper uses the term “hedge” in the traditional generic meaning, referring to the activity of reducing the exposure to price risk. In general, there are two key ways that renewable energy provides a financial hedge:

1. Since renewable energy resources (with the exception of biomass) do not require purchased fuel, the operating costs over time are highly predictable, as opposed to fossil fuel markets.
2. Renewable energy reduces the demand for non-renewable resources, potentially easing prices of fossil fuels.

The first point suggests an approach where an energy supplier or even an individual energy consumer can privately benefit from the price stability of renewable energy. The second point depicts the public benefits that renewable energy provides for all energy consumers.

26. THE EFFECTS OF INTEGRATING WIND POWER ON TRANSMISSION SYSTEM PLANNING, RELIABILITY, AND OPERATIONS

Document Type: Report

In response to emerging market conditions, and in recognition of the unique operating characteristics of wind generation, the New York Independent System Operator (NYISO) and New York State Energy Research and Development Authority (NYSERDA) commissioned a joint study to produce empirical information that will assist the NYISO in evaluating the reliability implications of increased wind generation. The work was divided into two phases. Phase I, Preliminary Overall Reliability Assessment, was completed in early 2004. This initial phase provided a preliminary overall screening assessment of the impact of large-scale wind generation on the reliability of the New York State Bulk Power System (NYSBPS).

This report builds on what was learned in Phase I. A base case wind scenario with 3,300 MW of wind generation (10 percent of NY state peak load) was selected for analysis. Operation of the NYSBPS with 3,300 MW of wind was evaluated in numerous ways, considering impacts on the following aspects of grid performance:

- Reliability and generation capacity;

- Forecast accuracy;
- Operation of day-ahead and hour-ahead markets;
- Economic dispatch and load following;
- Regulation; and
- Stability performance following major disturbances to the grid.

27. BALANCING COST AND RISK: THE TREATMENT OF RENEWABLE ENERGY IN WESTERN UTILITY RESOURCE PLANS

Document Type: PowerPoint Presentation

This August 2005 presentation, prepared by Mark Bolinger and Ryan Wisler, Lawrence Berkeley National Laboratory, summarizes western utility resource plan treatment of renewable energy, based on compilation and analysis of resource plan assumptions and methods.

28. ACHIEVING A 33 PERCENT RENEWABLES TARGET

Document Type: Report

The purpose of the report is to assess how to accelerate and expand the current California Public Utilities Commission (CPUC) Renewable Portfolio Standard (RPS) and related programs to achieve the California governor's goal of meeting 33 percent of statewide electric power supply with renewable energy by 2020. This report identifies what the CPUC can do within the scope of its current jurisdiction and what changes in law are needed to expand renewable resources to meet this goal. This report also focuses specifically on necessary implementation steps, barriers that must be overcome and a step-by-step schedule for implementation and adoption of policy changes needed from 2010-2020 to accelerate California's RPS program to the 33 percent level. Wherever possible this project relies on existing research, analysis, and modeling results.

29. STRATEGIC VALUE ANALYSIS FOR INTEGRATING RENEWABLE TECHNOLOGIES IN MEETING TARGET RENEWABLE PENETRATION

Document Type: Report

This report discusses a methodology developed by the Public Interest Energy Research (PIER) of the California Energy Commission for strategically locating new renewable technologies close to transmission "hot spots" or congestion zones to improve transmission reliability while meeting the target renewable penetration levels. The methodology is called "Strategic Value Analysis." A detailed statewide transmission load flow was developed which locates potential transmission problem areas. By overlaying renewable energy resource locations onto a Geographical Information System (GIS) map, locations can be identified where renewable technologies would benefit the system by reducing transmission overloads. This report describes how each technology location was evaluated by its transmission benefit and its cost of energy.

30. DEVELOPING COST-EFFECTIVE SOLAR RESOURCES WITH ELECTRICITY SYSTEM BENEFITS

Document Type: Report

Under California's Renewable Portfolio Standard (RPS) and the Energy Action Plan, electricity suppliers must provide up to 20 percent of electricity purchases from renewable resources by 2010. This draft white paper presents a method for evaluating the ability to use California's solar resources as cost-effective contributions to the RPS goals, and assessing the impacts of those contributions on the state's electricity system. Cost and performance trends for concentrating solar power and flat plate photovoltaic technologies are used in a revenue requirement model to generate estimates of levelized costs of electricity generation (LCOE) for the technologies going out to 2017. The resulting LCOE estimates are compared against Market Price Referent (MPR) values and forecasted combined cycle electricity costs to assess the cost competitiveness of the solar technologies in a 2010 and 2017 timeframe. Power flow analyses are used concurrently to identify locations in the state's electricity system that may face capacity or congestion problems going out to 2017. GIS tools are then used to intersect cost-competitive solar resources with

grid system “hot spots.” Lastly, combined GIS and power flow analyses are used to evaluate the impacts of developing solar resources that could help meet RPS goals on the state’s electricity system. Results of the evaluations are presented for concentrating solar power and flat plate photovoltaic technologies for the 2010 and 2017 timeframes.

31. CALIFORNIA RENEWABLE PORTFOLIO STANDARD RENEWABLE GENERATION INTEGRATION COST ANALYSIS PHASE III: RECOMMENDATIONS FOR IMPLEMENTATION

Document Type: Report

In support of the Renewable Portfolio Standards, the California Energy Commission was tasked with providing input on the technical evaluation of integration costs. The technical review became known as the RPS Integration Cost Study, a multi-phased study to develop, quantify, and define procedures needed for routine calculation of the indirect integration costs for eligible renewable generators. The RPS Integration Cost Study was completed over the course of 18 months. Under Phase I, the goal was to develop initial methodologies for evaluating the integration costs for existing renewable generation sources in California and compare their characteristics with non-renewable generation sources. Phase II concentrated on evaluating key attributes of renewable generators that might affect integration costs. Attributes such as developing technology, geographic issues and other technical aspects were considered. Phase III formalized the evaluation process and provided recommendations for implementation. The ultimate goal of the RPS Integration Cost Study was to develop and define a fair, transparent, and unbiased methodology to assess integration costs for all renewable resources.

Phase III objectives include:

- Formalizing a process using developed methodologies to conduct a fair and transparent evaluation of integration costs, specifically capacity credit, regulation costs, and load following.
- Performing analysis using the methods on a full-year generation dataset and multi-year dataset and present the results, including evaluation using simplified methods.
- Recommending calculation procedures and data handling suitable for routine application on a continuing basis as part of the resource procurement process.
- Recommending processes for conducting routine assessment of integration costs.

The Phase III report provides detailed recommendations for performing integration cost analyses of various renewable generation resources under the RPS requirement.

32. INTERNATIONAL EXPERIENCE WITH PUBLIC BENEFITS FUNDS: A FOCUS ON RENEWABLE ENERGY AND ENERGY EFFICIENCY

Document Type: Report

This report summarizes international experience with PBF policies that target renewable energy and energy efficiency investments, and identifies lessons learned from these experiences that are applicable to the Chinese context. Financially supported by the Energy Foundation, a number of Chinese organizations are exploring the possibility of applying PBFs at both the national and provincial level in China. This report is intended to assist these efforts by summarizing international experience.

33. A TENTATIVE MANAGEMENT METHOD OF SPECIAL FUNDS FOR RENEWABLE ENERGY DEVELOPMENT

Document Type: Regulations

This document is an English translation of the regulations issued by China to govern the creation and use of their Public Benefit Funds.

34. U.S. ENERGY INFORMATION ADMINISTRATION DATABASE

Document Type: Database

The U.S. Energy Information Administration's website is the U.S. Government's official source for energy data and information.

35. DATABASE OF STATE INCENTIVES FOR RENEWABLES & EFFICIENCY

Document Type: Database

The Database of State Incentives for Renewables & Efficiency is a comprehensive source of information on state, local, utility, and federal incentives that promote renewable energy and energy efficiency

36. RENEWABLE ENERGY TRENDS IN CONSUMPTION AND ELECTRICITY 2006

Document Type: Report

The Energy Information Administration (EIA) reports detailed historical data on renewable energy consumption and electricity annually in its *Renewable Energy Annual*. This July 2008 report, *Renewable Energy Trends in Consumption and Electricity, 2006*, provides an overview and tables with historical data spanning as far back as 1989, including revisions.

37. INCREASING COSTS IN ELECTRIC MARKETS

Document Type: PowerPoint Presentation

This presentation by the Office of Enforcement with the Federal Energy Regulatory Commission covers the potential for increased electricity charges, and the cause for these increases.

38. THE FUTURE OF GEOTHERMAL ENERGY: IMPACT OF ENHANCED GEOTHERMAL SYSTEMS (EGS) ON THE UNITED STATES IN THE 21ST CENTURY

Document Type: Report

The goal of this assessment was to provide an evaluation of geothermal energy as a major supplier of energy in the United States. An 18-member assessment panel with broad experience and expertise was formed to conduct the study beginning in September 2005. The work evaluates three major areas of Enhanced Geothermal Systems (EGS):

1. Magnitude and distribution of the EGS resource;
2. Status and remaining requirements of EGS technology needed to demonstrate feasibility at a commercial scale; and
3. Economic projections of impact of EGS on US energy supply to 2050.

39. DOCUMENTS ON CSP TECHNOLOGY AND R&D STRATEGY PAPERS FROM THE IEA SOLARPACES LIBRARY

Document Type: Website

SolarPACES is an informational website developed by the International Energy Agency. This page provides information on concentrating solar thermal power (CSP) technology and research.

40. LAVA LAW: LEGAL ISSUES IN GEOTHERMAL ENERGY DEVELOPMENT

Document Type: Report

Geothermal energy projects, like other major energy projects, face number of challenges: real property issues; regulatory and permitting requirements; interconnection, transmission, and power purchase negotiations; financing challenges; construction contracting issues; and tax considerations.

Recognizing these challenges, the Stoel Rives Geothermal Team developed LAVA LAW: Legal Issues in Geothermal Energy Development. This 2004 guide contains insights gained during the last 11 years of working with the US geothermal industry.

41. ASSESSMENT OF MODERATE- AND HIGH-TEMPERATURE GEOTHERMAL RESOURCES OF THE UNITED STATES

Document Type: Report

Scientists with the U.S. Geological Survey recently completed an assessment of US geothermal resources. At the time this report was written, geothermal power plants were operating in six states: Alaska, California, Hawaii, Idaho, Nevada, and Utah.

The assessment indicates that the electric power generation potential from identified geothermal systems is 9,057 Megawatts-electric (MWe), distributed over 13 states. The mean estimated power production potential from undiscovered geothermal resources is 30,033 MWe.

42. CONTINENTAL RIFT: GEOTHERMAL POWER IN AFRICA

Document Type: Article

This article explores Africa's potential geothermal resources. While the African continent's lack of electricity is a big deterrent to foreign investors, demand for power grows by 8 percent per year. According to some experts, the Rift Valley, which stretches from the northern end of the Red Sea down to Mozambique, is ideal for generating geothermal power.

43. WORLD GEOTHERMAL GENERATION IN 2007

Document Type: Article

These findings by Ruggero Bertani, Enel – International Division – Renewable Energy Business Development, on worldwide geothermal generation were delivered at the 2007 European Geothermal Congress.

44. THE GEOTHERMAL POTENTIAL IN THE UPPER RHINE

Document Type: Article

This article looks at geothermal energy potential in the Upper Rhine Graben and the adjacent areas, providing estimates created using a 3D model. The total length of the Graben area, which lies mainly on German and French territory and includes a small part on Swiss territory in the Basel area, is about 300 km and the average width is 40 km. The database for the creation of the 3D model consists of temperature values measured in intervals of 100 m in 928 boreholes with a maximum depth of 3600 m. The datasets used in the study were provided by the NLFb - GGA, Hannover.

45. FINAL REPORT AND STRATEGIC PLAN ON THE FEASIBILITY STUDY TO ASSESS GEOTHERMAL POTENTIAL ON WARM SPRINGS RESERVATION TRIBAL LANDS

Document Type: Report

This study looks at a geothermal resource exploration area on the Warm Springs Reservation, located on the eastern slope of Mt. Jefferson. Mt. Jefferson is a large stratovolcano the U.S. Geological Survey has classified as a site with significant potential for geothermal resources. In 1991 the Warm Springs Tribal Council authorized a geological assessment of this area by a private exploration company, California Energy Company. This initial study identified an area with significant geological potential for geothermal resources. Exploratory drilling was not initiated at that time due to the combination of market conditions and tribal interest not being sufficient or favorable to warrant exploration or further discussions regarding a development agreement.

46. FUTURE TRENDS AND DEVELOPMENT (AUSTRALIA)

Document Type: Report

Assuming success in demonstration and proof of concept projects, the Electricity Supply Association of Australia concluded that 6.8 percent of all Australia's power could come from geothermal by 2030 under a scenario that emissions are reduced to 70 percent of 2000 levels by 2030. The forecast 6.8 percent represents 5.5 GW in generating capacity from Enhanced Geothermal Systems (EGS). At roughly two percent growth, Australia's power demand is projected to grow from approximately 50 GW of current generation capacity to approximately 80 GW in 2030.

47. GEODYNAMICS ANNUAL REPORT 2008

Document Type: Report

Geodynamics is an Australian company engaged in geothermal development. The 2008 annual report discusses geothermal development needs, and the outlook in Australia.

48. RENEWABLES PORTFOLIO STANDARD - QUARTERLY REPORT OCTOBER 2008 (CA PUC)

Document Type: Report

Established in 2002 under Senate Bill No. 1078 and accelerated in 2006 under Senate Bill No. 107, California's RPS obligates investor-owned utilities (IOUs), energy service providers, and community choice aggregators to procure an additional one percent of retail sales per year from eligible renewable sources until 20 percent is reached, no later than 2010. This report highlights:

- Major challenges and solutions to achieving a 33 percent RPS by 2020;
- The three-legged stool: achieving a 33 percent RPS will require greater coordination between energy policy, resource and transmission planning, and procurement; and
- The CA Public Utilities Commission process to analyze the costs, feasibility, barriers, and solutions to reaching a 33 percent RPS by 2020.

49. CA ENERGY ACTION PLAN 2003

Document Type: Joint Agency Order

In 2003 California's principal energy agencies joined to create an Energy Action Plan. The plan identifies specific goals and actions to eliminate energy outages and excessive price spikes in electricity or natural gas. These initiatives were intended to send a signal to the market that California is a good place to do business and that investment in the more efficient use of energy and new electricity and natural gas infrastructure will be rewarded.

50. CA ENERGY ACTION PLAN II: IMPLEMENTATION ROADMAP 2005

Document Type: Report

California's Energy Action Plan II describes a coordinated implementation plan for state energy policies that have been articulated through the Governor's Executive Orders, instructions to agencies, public positions, and appointees' statements; the Energy Commission's Integrated Energy Policy Report; agency processes; the agencies' policy forums; and legislative direction.

51. 2008 ENERGY ACTION PLAN UPDATE

Document Type: Report

This report provides a 2008 update. The Energy Action Plan (EAP) II brought together a coordinated implementation plan for California state energy policies that had been articulated in various Executive Orders issued by the Governor, the Energy Commission's *Integrated Energy Policy Report*, Public Utilities Commission and Energy Commission proceedings, and legislative direction.

52. AB32: CALIFORNIA'S GLOBAL WARMING SOLUTIONS ACT OF 2006

Document Type: Legislation

This bill required the state air resources board to adopt regulations to require the reporting and verification of statewide greenhouse gas emissions and to monitor and enforce compliance with this program, as specified. The bill also required the state board to adopt a statewide greenhouse gas emissions limit equivalent to the statewide greenhouse gas emissions levels in 1990 to be achieved by 2020, as specified. The bill required the state board to adopt rules and regulations in an open public process to achieve the maximum technologically feasible and cost-effective greenhouse gas emission reductions, as specified. The bill authorized the state board to adopt market-based compliance mechanisms, as defined, meeting specified requirements. The state board is required to monitor

compliance with and enforce any rule, regulation, order, emission limitation, emissions reduction measure, or market-based compliance mechanism adopted by the state board.

53. [SBI 368: GHG EMISSION STANDARDS FOR CALIFORNIA](#)

Document Type: Legislation

This bill prohibits any load-serving entity, as defined, and any local publicly owned electric utility, from entering into a long-term financial commitment, as defined, unless any baseload generation, as defined, complies with a greenhouse gases emission performance standard.

54. [A STUDY OF THE PRICING POLICY OF WIND POWER IN CHINA](#)

Document Type: Report

This joint study conducted by the Chinese Renewable Energy Industry Association, Greenpeace, and the Global Wind Energy Council examines the issues associated with wind development in China. The report makes specific recommendations for changes in wind power pricing policy.

55. [THE COST OF TRANSMISSION FOR WIND ENERGY: A REVIEW OF TRANSMISSION PLANNING STUDIES](#)

Document Type: Report

This report looks at the rapid development of wind power in the United States over the last several years, and addresses the concern that wind development will require substantial additions to the nation's transmission infrastructure. Transmission is particularly important for wind power due to the locational dependence of wind resources, the relatively low capacity factor of wind plants, and the mismatch between the short lead time to build a new wind project and the longer lead time often needed to plan, permit, and construct transmission lines.

Institutional issues related to transmission planning, siting, and cost allocation pose major obstacles to accelerated wind power deployment, along with concerns about the potential cost of this infrastructure build out.

56. [NREL: LEARNING - PHOTOVOLTAICS](#)

Document Type: Website

The National Renewable Energy Laboratory maintains a website devoted to learning about renewable energy. This portion of the website is devoted to photovoltaics and includes an overview of current research.

57. [IEA - PV PERFORMANCE, RELIABILITY AND COST ANALYSIS](#)

Document Type: Website

This website provides detailed information on operational performance, long-term reliability, and costs of worldwide installed photovoltaic power (PV) systems and components. The information comes from the International Energy Agency's Photovoltaic Power Systems (PVPS) program.

58. [DETAILS OF US AND GLOBAL CSP PROJECTS](#)

Document Type: Spreadsheet

This spreadsheet, developed by Morse Associates, Inc., provides a detailed summary of CSP activity in the United States and internationally as of March 2009.

59. [GLOBAL HYDROPOWER SCENARIO](#)

Document Type: Overview

Hydropower constitutes 21 percent of the world's electricity generating capacity. The theoretical potential of worldwide hydropower is 2,800 GW, about four times greater than the 723 GW that has been exploited. Yet, the actual amount of electricity that will ever be generated by hydropower will be much lower than the theoretical potential, due to the environmental concerns and economic constraints. About 44 percent of the world's hydropower was generated in four countries in 2002, mostly large- and mid-scale plants.

60. [World in Transition - Towards a Sustainable Energy System](#)

Document Type: Overview

The first section of this summary for policymakers presents in brief the prime concerns surrounding today's energy systems, while the second part proposes the criteria that need to be met to turn energy systems towards sustainability. The third section, building upon an exemplary scenario, sets out a possible path for transforming the global energy system within the 21st century. According to this analysis, the transformation will require a substantial redirection of energy policies over the coming decades. On that basis, the fourth section proposes a roadmap with concrete goals and policy options for action by which to implement this global transformation.

61. [Project 0489: Repowering Small Hydro Plants in the State of Sao Paulo, Brazil](#)

Document Type: Overview

This website looks at the details and agreements that made these repowering projects possible. The repowering of small hydro plants in Brazil was undertaken as a project of the UN Framework Convention on Climate Change as part of the Clean Development Mechanism (CDM). The CDM allows emission-reduction (or emission removal) projects in developing countries to earn certified emission reduction (CER) credits, each equivalent to one ton of CO₂. CERs can be traded and sold, and used by industrialized countries to a meet a part of their emission reduction targets under the Kyoto Protocol.

62. [Dells Generating Plant Repowering Project, Eau Claire, WI](#)

Document Type: Overview

This document provides the details of the repowering project undertaken by Miron to refurbish the Dells Hydro, a 9.3 MW plant located in Eau Claire, and one of the six Chippewa River plants that collectively account for almost one-third of Xcel Energy's total hydro generation capacity.

63. [A Control Model for Dependable Hydropower Capacity Optimization, American Geophysical Union](#)

Document Type: Website

This article presents a control model that can be used to determine the dependable power capacity of a hydropower system. The model structure consists of a turbine load allocation module and a reservoir control module, and allows for a detailed representation of hydroelectric facilities and various aspects of water management. Although this scheme is developed for planning purposes, it can also be used operationally with minor modifications. The model is applied to the Lanier-Allatoona-Carters reservoir system on the Chattahoochee and Coosa River basins, in the southeastern United States. The case studies demonstrate that the more traditional simulation-based approaches often underestimate dependable power capacity. Firm energy optimization with or without dependable capacity constraints is taken up in a companion article.

64. [The Potential Contribution of Small Hydroelectric Generation to Meeting Electrical Demand on Vancouver Island](#)

Document Type: Report

This work focuses on the electrical contribution small hydro generation can make to meeting Vancouver Island's electrical demand, both today and in the future. A hydrologic assessment of Vancouver Island was undertaken between 1999 -2005. Eight regional areas were identified that exhibited temporally similar specific discharge runoff patterns, termed flow area curves (FACs). A small hydro generation MATLAB model was developed and the FACs were used as input to represent available generation flow. The model was used to calculate temporally accurate generation values from 175 small hydro facilities under four development scenarios for the seven-year period. Generation results from each scenario were compared to electrical demand on Vancouver Island during that time period to determine the contribution provided by small hydro facilities. Results demonstrated that small hydro facilities are unable to offer dependable capacity, but are capable of meeting a portion of Vancouver Island's electrical demand.

65. [Solarbuzz: World PV Report 2009](#)

Document Type: Report

Solarbuzz Report indicates that the worldwide photovoltaic market grew to 5.95 gigawatts in 2008. In addition, worldwide PV installations reached a record high of 5.95 gigawatts (GW) in 2008, representing growth of 110% over the previous year.

66. [Presentation from Hydro Quebec on the Eastmain-Sarcelle Projects](#)

Document Type: PowerPoint Presentation

This Hydro Quebec presentation, in French, details the Eastmain-Sarcelle hydroelectric projects.

67. [Supporting Localization of Wind Technology Manufacturing Through Large Utility Tenders in Quebec](#)

Document Type: Report

This case study summarizes the experiences of Québec, Canada in supporting local wind technology manufacturing through two large utility tenders for wind power. The first tender (at 1,000 MW), when released in 2003, represented the largest single award for wind generation capacity in the history of the global wind industry. It has since been surpassed by the second tender (at 2,000 MW).

The tenders are relatively unique in that they mandate the use of local content in an attempt to stimulate economic development in the target region by attracting international technology leaders in the wind power technology industry. This sort of mandated local content in wind turbine project development has only been used in a few other countries to date (e.g., China, Spain, Brazil).

68. [Dollars from Sense: The Economic Benefits of Renewable Energy](#)

Document Type: Report

For decades, proponents of renewable energy technologies have focused on their indirect economic benefits, such as the reduced health and environmental restoration costs stemming from their lower environmental impact. These arguments have been acknowledged as legitimate, but have had little real effect on energy resource and policy decisions, partly because these benefits are difficult to quantify.

This document illustrates the direct economic benefits, including job creation, of investing in renewable energy technologies.

69. [Renewable Energy Price-Stability Benefits in Utility Green Power Programs](#)

Document Type: Report

The guiding principle of voluntary green power markets is that electricity consumers can choose to purchase electricity derived from renewable energy as distinguished from that produced from the standard power system mix, which typically includes electricity generated from fossil fuel and nuclear sources. The willingness of consumers to make these purchases, almost always at higher cost, rests on the value they receive in return, which usually comes in the form of environmental benefits. However, environmental improvement benefits the broader public, as all consumers benefit from a cleaner environment regardless of who pays for it. The overall success of the voluntary green power market rests on the willingness of large numbers of individual consumers to pay more for these electricity products, despite the fact that environmental benefits accrue to the public at large.

70. [California Feed-In Tariff Design and Policy Options](#)

Document Type: Report

This report explores using feed-in tariffs for renewable electricity generation projects in California, and makes recommendations for future policy development. California has a Renewable Portfolio Standard (RPS) that requires the state's investor-owned utilities, community choice aggregators, and energy service providers to provide 20 percent of retail sales with renewable resources by 2010; publicly owned utilities are required to develop RPS programs as well.

71. [Feed-In Tariffs – Boosting Energy for Our Future: A Guide to One of the World's Best Environmental Policies](#)

Document Type: Report

Prepared by the World Future Council in Germany, this guide provides an explanation of feed-in tariffs and why they are important to encouraging renewable development.

72. [Supporting Solar Photovoltaic Electricity: An Argument for Feed-In Tariffs](#)

Document Type: Report

This report looks at the role of feed-in tariffs in the development of solar photovoltaic (PV) electricity. The global electricity generation portfolio is based on exhaustible and scarce fuels (uranium, gas, coal, petroleum). Global reserves are diminishing fast, while greenhouse gas emissions and fuel prices continue to rise. The report looks at feed-in tariffs as one way to promote PV energy, and decouple economic growth from the supply of fossil fuels.

73. This reference is no longer in use – the document was moved to Further Reading.

74. [International Tax Incentives for Renewable Energy: Lessons for Public Policy](#)

Document Type: Report

This paper identifies the types of tax incentives currently in use, drawing on the tax incentive policies of the 29 countries and 35 states examined. Throughout the world, tax

incentives have supported public policies designed to stimulate development of renewable energy. Tax incentives are often complementary to other types of renewable energy incentive programs. They are powerful and highly flexible policy tools that can be targeted to encourage specific renewable energy technologies and to impact selected renewable energy market participants.

75. [IEA: The Impact of the Financial and Economic Crisis on Global Energy Investment](#)

Document Type: Report

This report from the International Energy Agency (IEA) details the impact of the current global economic crisis on energy investment. This report was prepared for a meeting of the G-8 energy ministers held in May 2009.

76. [Green-e Website: Certification of Renewable Energy Certificates](#)

Document Type: Website

Green-e, a program of the Center for Resource Solutions, is an independent consumer protection program for the sale of renewable energy and greenhouse gas reductions in the retail market. This website details the process of certification and verification of renewable energy and greenhouse gas mitigation products.

77. [Association of Issuing Bodies: Information on European Renewable Energy Certificate Tracking](#)

Document Type: Website

The Association of Issuing Bodies (the AIB) promotes the use of a standardized system, based on harmonized environment, structures, and procedures, in order to ensure the reliable operation of international energy certificate systems. This standardized system is known as EECS (the European Energy Certificate System) and is set out in "The Principles and Rules of Operation" (the PRO) and its supporting documents.

Of the 27 countries of the European Union, 15 are now active members, along with Norway and Switzerland: 8 offer internationally transferable renewable energy guarantees of origin (RES-GO), and all offer voluntary RECS certificates. In the coming months, a number of countries will commence issuing guarantees of origin for cogeneration (CHP-GO). Since 2001, 446 million MWh certificates have been issued, of which 272 million have already been used to guarantee to consumers the origin of the renewable energy they have purchased. In the first 9 months of 2008, more than 122 million certificates were issued, and 97 million of these were redeemed.

78. [Information on Tracking Renewable Energy Certificates in North America](#)

Document Type: Website

The Environmental Tracking Network (ETNNA) is a voluntary association of certificate tracking systems, regulators, and interested market participants that are vested in promoting harmonization among certificate tracking systems and emissions registries in North America. ETNNA states that harmonization will encourage trade, create a common currency for certificates, prevent double counting, and support new and emerging markets.

79. [IREC – Freeing the Grid – 2007 Edition](#)

Document Type: Report

Freeing the Grid 2007 analyzes the current state US interconnection standards and net-metering rules as they apply around the country.

80. [Energy Tax Policy: History and Current Issues](#)

Document Type: Report

This Congressional Research Service report discusses the history, current posture, and outlook for federal energy tax policy. It also discusses current energy tax proposals and major energy tax provisions enacted in the 109th Congress.

81. [Introduction to US Electricity Regulatory Structure](#)

Document Type: Report

Richard Cowart of the Regulatory Assistance Project developed this discussion of the development and implementation of US electricity regulations.

82. [National Regulatory Research Institute Website](#)

Document Type: Website

The National Regulatory Research Institute describes its mission as “creating new knowledge and democratizing existing knowledge...to empower utility regulators to make public interest decisions of the highest possible quality.”

The website discusses the range of services the Institute can perform for the regulatory community under five industry subject areas: electricity, gas, telecommunications, water, and multi-utility.

83. [Bioenergy Primer – United Nations Development Program](#)

Document Type: Report

This report looks at the potential for modernized biomass to provide improved rural energy services based on agricultural residues/biomass. Widespread use of modernized biomass for cooking and combined heat and power (CHP) generation in rural areas can address multiple social, economic, and environmental bottlenecks that now constrain local development.

The availability of low-cost biomass power in rural areas could help provide cleaner, more efficient energy services to support local development, promote environmental protection, stem the use of coal as a home fuel, and improve the living conditions of rural people, especially women and children who currently face air pollution associated with indoor burning of agricultural residues

84. [Photovoltaic Market Sees 17 Percent Growth Rate](#)

Document Type: Report

This March 2009 report by Suzanne Deffree, a managing editor with Electronic News, looks at Gartner Incorporated’s forecast of the PV solar cell market. Gartner estimates call for the photovoltaic market to grow at 17 percent CAGR (compound annual growth rate) between 2008 and 2013 to reach \$34 billion in revenue in 2013.

85. [Costa Rica’s Yoko Terales Geothermal Area](#)

Document Type: Website

This website (in Spanish) provides a guide to Costa Rica's Yoko Termals geothermal area and its geothermal features.

86. [Geothermal Energy in Europe](#)

Document Type: Presentation

This December 2008 presentation discusses the status of geothermal use in Europe, identifying trends and the outlook for geothermal use in Europe's future.

87. [Valley of Geysers - What Actually Happened](#)

Document Type: Report

On June 3, 2007 a landslide seriously damaged the Valley of Geysers in Kamchatka. During the first few days following the landslide, contradictory news was received, including reports that the valley had been destroyed. The damage was not as extensive as the initial media reports. The PDF is a reprint in both Russian and English of the material found at: http://www.kscnet.ru/ivs/expeditions/2007/Geyser_Valley-06-2007/Geyser_Valley-06.htm.

88. [A Guide to Geothermal Energy and the Environment](#)

Document Type: Report

This guide is designed to provide accurate and current information about the environmental aspects of geothermal energy, particularly as they relate to high temperature grade, electricity-producing geothermal plants. The two other forms of geothermal technology, direct use and heat pumps, are not discussed at length. While technical and referenced, this guide is meant to be accessible to a wide audience, including interested individuals and policymakers. The paper focuses upon US domestic geothermal environmental concerns and benefits, though much of the information presented applies to worldwide geothermal development as well.

89. [Power from the Earth – Zero Emission Power](#)

Document Type: Report

Geodynamics Limited prepared this report on the development of their Cooper Basin project in Australia. The report includes graphics depicting the use of a closed-loop system employing hot fractured rocks.

90. [Greenpeace – Concentrating Solar Thermal Power Now](#)

Document Type: Report

This report provides the basis for Greenpeace's determination that there are no technical, economic, or resource barriers to supplying five percent of the world's electricity needs from solar thermal power by 2040 – even against the challenging backdrop of a projected doubling in global electricity demand. The solar thermal industry is projected to emerge as a dynamic sector within 20 years, unlocking a new global era of economic, technological, and environmental progress.

The benefits of solar power include: environmental protection; economic growth; job creation; diversity of fuel supply; rapid deployment; and global technology transfer and innovation. The underlying advantage of solar energy is that the fuel is free, abundant, and

inexhaustible. The total amount of energy irradiated from the sun to the earth's surface is enough to provide for annual global energy consumption 10,000 times over.

91. [Geo-Heat Center Publication Website](#)

Document Type: Website

This website provides a central repository for technical reports and papers regarding geothermal energy.

92. [European Deep Geothermal Energy Programme, Soultz HDR Project](#)

Document Type: Website

The European Deep Geothermal Energy program's website discusses this research program for heat and electric power generation from a deep enhanced geothermal system in France.

93. [Tracking the Sun: The Installed Cost of Photovoltaics in the U.S. from 1998-2007](#)

Document Type: Report

This report summarizes trends in the installed cost of grid-connected PV systems in the United States from 1998 through 2007. As installations of grid-connected solar photovoltaic (PV) systems have grown, so too has the desire to track the installed cost of these systems over time, by system characteristics, by system location, and by component. The report is based on an analysis of installed cost data from nearly 37,000 residential and non-residential PV systems, totaling 363 MW of capacity, and representing 76 percent of all grid-connected PV capacity installed in the United States through 2007.

94. [California Power Crisis: Lessons Learned](#)

Document Type: Report

This is a World Bank assessment on the causes and lessons learned from California's 2000-2001 power crisis.

95. [NREL - Assessment of Parabolic Trough and Power Tower Solar Technology Costs and Performance Forecasts](#)

Document Type: Report

This report by the National Renewable Energy Laboratory examines the potential for the implementation of concentrating solar thermal power technology, including power towers and parabolic trough solar technologies.

96. [Assessment of the World Bank/GEF Strategy for the Market Development of Concentrating Solar Thermal Power](#)

Document Type: Report

This report talks about the World Bank's Global Energy Facility (GEF) program to promote CSP project development.

97. [New Mexico Central Station Solar Power: Summary Report](#)

Document Type: Report

This feasibility study, prepared by the Electric Power Research Institute (EPRI), was performed for a 50 to 500 MW central station solar power plant to be developed in New Mexico by mid-2011. The project participants included the Public Service Company of New Mexico (PNM), El Paso Electric (EPE), San Diego Gas & Electric (SDG&E), Southern California Edison (SCE), Tri-State Generation & Transmission Association (TSGT), and Xcel Energy. The study includes site and technology assessments, analyzes technology-specific design and performance, evaluates plant economics and financial incentives, and assesses environmental and regulatory issues.

98. [The State of Renewable Energies in Europe 2008](#)

Document Type: Report in French and English

For over 10 years, EurObserv'ER has been collecting data on European Union renewable energy sources in order to describe the state of the different renewable sectors. This report provides a survey of the eight renewable sectors. Their performances are compared with the objectives of the European Commission White Paper and its Biomass Action Plan. Two synthesis notes on solar thermal electricity and ocean energy are also included.

99. [Photovoltaic Energy Barometer – European Union](#)

Document Type: Report in French and English

This report discusses recent developments in the EU market for photovoltaics. Thanks to a German market at its peak, and growing markets in Spain and Italy, the European Union established a new record for photovoltaic installations. According to preliminary estimates, 1 541.2 MWp were installed in 2007 (+57% over 2006 levels), bringing total EU installed capacity up to 4,689.5 MWp.

100. [Biofuels Barometer- EurObserv'er](#)

Document Type: Report in French and English

This report looks at EU trends in biofuels, which account for 2.6 percent of the energy content of all the fuels used in road transport in Europe today. Nearly half of the target of 5.75 percent for 2010 set by the 2003 directive on transport biofuels has been reached in four years' time. To achieve 5.75 percent biofuels use, the European Union must increase its production and call even more on imports, with biofuels at the core of complex ecological and economic issues.

101. [Biogas Barometer – EurObserv'ER](#)

Document Type: Report in French and English

This report looks at the biogas potential in Europe. The major increase in the price of fossil fuels has made biogas more attractive. The applications of biogas – once limited to recycling and/or recovering energy from waste – have widened with the use of energy crops. This has stimulated European production, which has now reached 5.9 Mtep, a 20.5 percent increase in relation to 2006 production.

102. [Solar Thermal Barometer – EurObserv'ER](#)

Document Type: Report in French and English

This report summarizes the European market for solar thermal power. After two years of very strong growth, the solar thermal market (taking all technologies, including unglazed

flexible collectors, into account) declined slightly in 2007 with 6.9 percent less collectors being sold with respect to 2006 sales. This decrease reflects a strong decline of the German market, the largest market of the European Union. Conversely, other countries are continuing to develop their markets and are showing double-digit growth rates.

103. [Solid Biomass Barometer – EurObserv'ER](#)

Document Type: Report in French and English

This report looks at solid biomass energy production, which showed a slight increase in the European Union in 2007. First available estimates put production in the region of 66.4 Mtoe, only 0.7 Mtoe more than in 2006. Climatic conditions in 2007 may partially explain this slowdown.

104. [Wind Barometer – EurObserv'ER](#)

Document Type: Report in French and English

This report looks at global installed wind power facilities. Installed wind power worldwide is estimated at 120,823.5 MW. Although growth in the European Union market fell slightly in 2008

(-1.8% at 8,447.1 MW), growth was strong in the United States (+ 59.4% at 8,358MW) and China (+ 90.7% at 6,300 MW).

105. [Global Installed Wind Capacity 2008](#)

Document Type: Data and Charts

This document, developed by the Global Wind Energy Council, provides a detailed database, by country, of the installed wind capacity as of 2008.

106. [Technical Standards for Interconnection to the Grid – India](#)

Document Type: Grid Connection Standards

This document from India's Ministry of Power Notification provides the Central Electricity Authority's regulations that establish the technical standards for connectivity to India's grid.

107. [Capacity/Energy Costs Mekong Basin Hydro](#)

Document Type: Graphs

This document presents a series of graphs depicting the capacity and energy cost from a large sample of hydroelectric projects located in the Mekong River basin.

108. [Capacity Planning for Fossil Fuel and Renewable Energy Resources Power Plants](#)

Document Type: Report

This study evaluates energy generation technologies both from an economical and environmental view. The report applies the Analytical Hierarchy Process (AHP) to assess multi-criteria problems and determines total preference weights for generation technology, using several criteria in fossil fuel and renewable energy power plants.

109. [Criteria for the Selection of Installed Capacity of Small Hydro Projects – Brazil](#)

Document Type: Article

This article presents a methodology that can be used to estimate the ideal installed capacity of small hydro projects. This methodology is based on results represented by typical economic parameters and considers the current rules of the Brazilian electricity sector.

110. [Project Application – Pingston Creek Hydro Project](#)

Document Type: Application

This application illustrates the parameters of a hydro project, in this case the 25 MW Pingston Creek hydro project in Canada, as proposed by the developer, Canadian Hydro.

111. [Hydropower Reform Coalition Glossary](#)

Document Type: Glossary

This is a glossary of hydro-related terms prepared by the Hydropower Reform Coalition.

112. [Barriers to Fish Migration – Mekong Basin](#)

Document Type: Presentation

This presentation examines the barrier effects of mainstream dams to fish migration in the Mekong, with an integrated perspective on the design of mitigation measures.

113. [NASPI User Manual](#)

Document Type: PowerPoint Presentation

This user manual was prepared by USAID's Transboundary Water and Energy Program for the Naryn Syrdaryaa Planning Instrument (NASPI).

114. [Report on NASPI Training](#)

Document Type: Report

In December 2004 the Transboundary Water and Energy Program of USAID undertook the development of a planning instrument to assist the countries of the Syrdarya River basin in understanding the effects of different scenarios of operation of several water storage reservoirs used for irrigation and hydropower. These countries are Uzbekistan, Kazakhstan, Tajikistan, and the Kyrgyz Republic. The Naryn River is one of the major tributaries of the Syrdarya and includes Toktogul, a multi-year storage reservoir that together with a chain of power plants is the primary source of electricity in the Kyrgyz Republic. The reservoir is also a key element in the conflict over the seasonal use of water in the basin. This Naryn Syrdarya Planning Instrument is abbreviated as NASPI.

This report discusses the training held at the Training Center on Integrated Water Management within the Kazakh National Agrarian University in Almaty during April 4-6, 2006.

115. [Nicaragua Energy Presentation](#)

Document Type: PowerPoint Presentation

This PowerPoint presentation, in Spanish, looks at energy use in Nicaragua and was developed by Carlos Yermoli.

116. [A Guide to Energy Investment in Nicaragua](#)

Document Type: Report

This document provides a guide to energy investments in Nicaragua. The document is written in Spanish.

117. [Optimal Hydropower Operation with Environmental Requirements](#)

Document Type: Thesis

This thesis looks at engineering solutions to the environmental impacts of hydropower operations on downstream aquatic ecosystems, using revenue-driven optimization models.

Peaking hydropower operations affect stream ecosystems by abruptly changing flow conditions. Operations are often restricted by minimum releases to a sensitive stream and maximum rates of change, or ramping rates, of releases. These constraints potentially reduce the economic value of daily generation by reducing operational flexibility.

118. [Regulations Governing Firm Capacity in Peru](#)

Document Type: Regulations

This document provides the Spanish text of the regulations for delivery of firm capacity in Peru.

119. [Issues Involving Contract and Spot Sales of Hydropower in Peru](#)

Document Type: PowerPoint Presentation

This PowerPoint presentation, prepared by Carlos Yermoli, discusses the contract and spot sale of hydro generation in Peru.

120. [Institutional Aspects of the Hydrological Warning System in the Del Plata Basin](#)

Document Type: Report

This paper by Dr. Dora Goniadzki, National Water Institute – Argentina, discusses the hydrological warning system used in Argentina’s Del Plata Basin.

121. [Description of a Tool for Developing Reservoir Rule Curves](#)

Document Type: Paper

This paper describes the Rule Curve Tool (RCT) program. The RCT allows the user to rapidly estimate three rule curves that define the operation of the reservoir under the assumption that such operation is planned to maximize energy production.

122. [Savage Rapids Sediment Evaluation Study](#)

Document Type: Study Example

This is the table of contents for a sediment evaluation study, which was prepared by the Department of Interior’s Bureau of Reclamation.

123. [Tennessee Valley Authority \(TVA\) Hydropower Brochure](#)

Document Type: Brochure

This brochure, prepared by the TVA, discusses hydro generation on the Tennessee River.

124. [The EGS Pilot Plant of Soultz-Sous-Forêts \(Alsace, France\): Technology](#)

Document Type: Presentation

This presentation on the enhanced geothermal systems pilot facility in France discusses the benefits of the enhanced system.

125. [The GEOTHERM Programme of BGR, Hannover, Germany: Focus on Support of the East African Region](#)

Document Type: Presentation

This presentation by GEOTHERM staff shows potential geothermal electricity production areas located in eastern Africa.

126. [Direct Heat Utilization of Geothermal Resources Worldwide](#)

Document Type: Report

This report by John W. Lund with the Geo-Heat Center at the Oregon Institute of Technology discusses the worldwide direct use of geothermal resources as of 2005. The article contains examples of direct use geothermal technologies.

127. [Geothermal Development in El Salvador – A Country Update](#)

Document Type: Report

El Salvador has an area of 21,000 km², and a population of six million inhabitants, making it one of the most densely populated countries in the American continent. Since the mid-1970s geothermal has been one of the main sources of electricity in the country, supplying up to 41% of national electricity demand in 1981.

Since 1996, Comisión Ejecutiva Hidroeléctrica del Río Lempa (CEL), the country's national electric utility, has embarked on projects to recover and expand geothermal electricity generation, all in the midst of wholesale reform of the electricity legislation and regulation. Geothermal generation now competes favorably with other energy sources in an open market.

128. [Geothermal Heating and Cooling of Buildings](#)

Document Type: Presentation

This presentation by L. Rybach, Geothermal IA ExCo Vice Chairman, looks at the use of geothermal heat from thermal waters to supply geothermal heat to customers via large district heating networks.

129. [Environmental Management at Olkaria Geothermal Power Project, Kenya](#)

Document Type: Presentation

This presentation by staff of the Olkaria Geothermal Power Project in Kenya covers the environmental practices employed at the facility.

130. [Hunter Fanney – International Standards for RE Sources](#)

Document Type: Presentation

This November 2007 presentation by A. Hunter Fanney of the National Institute of Standards and Technology looks at the need for international standards for renewable sources.

131. [Nexant Parabolic Trough Solar Power Plant System Size](#)

Document Type: Report

This Nexant report, prepared for NREL, observes that the Rankine cycles for commercial parabolic trough solar projects range in capacity from 13.5 MWe at the Solar Electric Generating Station I (SEGS I) plant, to a maximum of 89 MWe at the SEGS VIII / IX plants. The series of SEGS projects showed a consistent reduction in the levelized energy cost due to improvements in collector field technology and economies of scale in both the Rankine cycle and the operation and maintenance costs. Nonetheless, the question of the optimum Rankine cycle capacity remains an open issue. The capacities of the SEGS VIII / IX plants were limited by Federal Energy Regulatory Commission and Public Utility Regulatory Policy Act requirements to a maximum net output of 80 MWe. Further improvements in the Rankine cycle efficiency, and economies of scale in both the capital and the operating cost, should be available at larger plant sizes. The report includes an analysis conducted to determine the effect of Rankine cycle capacities greater than 80 MWe on the levelized energy cost.

132. [PV Financial Analysis Model](#)

Document Type: Spreadsheet

This Microsoft Excel spreadsheet can be used to analyze the purchase and installation of a photovoltaic electric system, and the resulting cost of electricity.

133. [Comparison of Alternate Cooling Technologies](#)

Document Type: Report

This is a February 2002 report prepared by the Electric Power Research Institute for the California Energy Commission. It examines the use of alternative cooling techniques for California's electric generation facilities.

134. [Challenges for Small & Behind the Meter Generation](#)

Document Type: Presentation

This presentation by Ashley Houston of XEnergy was given at the Wind Repowering America New England Regional Wind Power Issues Workshop. It focuses on the potential challenges facing behind the meter generation.

135. [American Energy: The Renewable Path to Energy Security](#)

Document Type: Report

This September 2006 World Watch Institute report details the important role renewable energy can play in energy security.

136. [CA Solar Energy Legislation: Assembly Bill No. 1714](#)

Document Type: Legislation

Under existing law, the California Public Utilities Commission (PUC) has regulatory authority over the state's public utilities, including electrical corporations. Existing law requires the PUC to undertake certain steps in implementing the California Solar Initiative, including requiring time-variant pricing for all ratepayers with a solar energy system, as defined.

This bill authorized the PUC to delay implementation of time-variant pricing for ratepayers with a solar energy system, until the effective date of the rates established in the next general rate case of the state's three largest electrical corporations. If the commission delays implementation of time-variant pricing, the bill would require that ratepayers required to take service under time-variant pricing between January 1, 2007, and January 1, 2008, and that would otherwise qualify for flat rate pricing, be given the option to take service under flat rate or time-variant pricing.

137. [CA Solar Initiative Program Handbook - January 2009](#)

Document Type: Handbook

This California Solar Initiative (CSI) Program Handbook describes the detailed requirements for receiving funding for the installation of solar projects under California Public Utilities Commission managed incentive programs.

138. [CA Net Metering Bill – Senate Bill I](#)

Document Type: Legislation

Senate Bill I, adopted by the California legislature and signed into law in 2006, requires both the California Energy and Public Utilities Commissions to look at various options to speed the implementation of solar electric installation in the state. The bill sets forth the requirements for California investor-owned utilities to buy back the electric energy generated by their customers.

139. [Treatment of Behind the Meter Generation – WAPA](#)

Document Type: Policy Paper

This paper outlines the Western Area Power Administration's policy regarding their treatment of behind the meter generation.

140. [NREL Data on CSP Plants](#)

Document Type : Website

This website, developed by the National Renewable Energy Laboratory, provides data on parabolic trough power plants in operation and under development in the United States. The data include plant type, technology, net output, project type, and funding.

141. [IEA – International Standards to Promote EE and RE Sources](#)

Document Type: Report

This is an information paper, developed by the International Energy Agency, which supports the argument that international standards are a powerful tool for disseminating new technologies and good practices, developing global markets, and supporting the harmonization of government policies on energy efficiency and renewable sources on a global scale.

142. [The Impacts of Drilling and Reservoir Technology Advances on EGS Exploitation](#)

Document Type: Research Paper

This paper explores the effects of resource quality, reservoir performance, and drilling costs on EGS economics to identify areas that could benefit from intensified R&D. The

parameters examined includes drilling costs as a function of depth, average temperature gradient, production well flow rate, and the impacts of drilling technology innovation.

Authored by experts from the Massachusetts Institute of Technology, West Virginia University, and the University of Calgary, this paper was delivered at the Thirty-Third Workshop on Geothermal Reservoir Engineering at Stanford University, January 2008.

143. [Geysers Factsheet – Calpine 2009](#)

Document Type: Factsheet

This factsheet was published by Calpine Corporation regarding the Geysers Geothermal Area in northern California. Combining all of the units, The Geysers is the largest geothermal electric generation facility in operation in North America.

144. [Environmental Management at the Miravalles Geothermal Field](#)

Document Type: Research Paper

This research paper, delivered at the World Geothermal Congress in 2005, discusses the environmental mitigation employed at the Miravalles Geothermal Field in Costa Rica.

145. [La Geo Company](#)

Document Type: Website

The LaGeo Company website (in Spanish) describes the company's work in electrical energy generation, primarily from geothermal resources, in Central America.

146. [Las Hornillas Volcanic Activity Center – Costa Rica](#)

Document Type: Website

Volcano Miravalles is a dormant stratovolcano on the edge of a very large caldera, 2,028 m high with six eruption points at its peak. The only reported recent eruption was a small steam explosion in 1946, although high heat flow remains. Although dormant, Miravalles provides an opportunity to sample hot spring waters, bubbling mud pots, water pools, and fumaroles only found in Las Hornillas.

147. [Ormat Corporation Website](#)

Document Type: Website

According to the company's website, Ormat modular power plants are designed to match the full range of geothermal resources, which include:

- High enthalpy, high pressure steam fields, whether steam-dominated or water-dominated;
- Low and medium enthalpy water-dominated sources;
- Resources with challenging fluid chemistries and high gas content; and
- Resources whose fluid conditions may vary over time.

Ormat's geothermal power plants operate worldwide, and are designed for outdoor installation and remote control unattended operation. Ormat has supplied approximately 1,100 MW of geothermal power plants.

148. [Podcast: Touring the Steamboat Geothermal Plant](#)

Document Type: Podcast

This is a podcast by Inside Renewable Energy, covering the Steamboat Geothermal Plant in Nevada.

149. [Reservoir Management at the Miravalles Geothermal Field](#)

Document Type: Research Paper

This research paper, delivered at the World Geothermal Congress in 2005, discusses the reservoir management measures employed at the Miravalles Geothermal Field in Costa Rica.

150. [Renewable Energy Policies and Barriers](#)

Document Type: Policy Paper

This policy paper, prepared by Fred Beck of the Renewable Energy Policy Project and Eric Martino of the Global Environment Facility, examines barriers to the implementation of renewable energy systems and policies to overcome these barriers.

151. [Summary of Philippines Renewable Energy Act – March 2009](#)

Document Type: Policy Paper

The Philippine Department of Energy is preparing the rules and regulations necessary to implement the country's Renewable Energy Act. This summary provides background on the salient provisions of and the Act and an overview of renewable energy issues and concerns.

152. [English Translation of China's Renewable Energy Law](#)

Document Type: Legislation

This document is an authorized English translation of China's renewable energy law.

153. [Renewable Portfolio Standards: A Factual Introduction](#)

Document Type: Journal Article

Renewables portfolio standards (RPS) have proliferated at the state level in the United States since the late 1990s. What began as a policy idea in California has emerged as an important driver for renewable energy capacity additions in the United States. This article, prepared for Electricity Journal under the auspices of the Lawrence Berkeley National Laboratory, explores the details of this policy.

154. [Electricity Market Design: The Good, the Bad, and the Ugly](#)

Document Type: Research Paper

This paper, prepared by Peter Cramton of the University of Maryland, examines the principles of market design as applied to electricity markets. Cramton illustrate the principles with examples of both good and bad designs, and discusses one of the main design challenges—dealing with market power. The paper also provides a discussion of FERC's choice of a standard market design.

155. [A Tale of Two Systems: Brazil and Columbia](#)

Document Type: Report

This comparison of the electric systems of Brazil and Columbia was presented by Jaime Millan at the World Bank Workshop on Electricity Supply Security vs. Intermittent Renewable Energies, February 2009.

156. [California PUC Website on Solar Initiative](#)

Document Type: Website

This website details the California Solar Initiative goal of creating 3,000 MW of new, solar-produced electricity by 2016, moving the state toward a cleaner energy future and helping lower the cost of solar systems for consumers.

The CSI statewide budget is \$3.3 billion over 10 years, distributed between three distinct program components: the California Solar Initiative (\$2.167 billion/1940 MW); the New Solar Homes Partnership (\$400 million/360 MW); and the Publicly Owned Utility Programs (\$700 million/700 MW).

157. [Impact of Policy Uncertainty on RE Investment: Wind Power and PTC](#)

Document Type: Report

This December 2008 Working Paper, prepared by Merrill Jones Barradale with the Energy and Resources Group at the University of California at Berkeley, examines the impact of policy uncertainty on investments in wind power.

158. [National Policy Instruments: Policy Lessons for the Advancement & Diffusion of Renewable Energy Technologies Around the World](#)

Document Type: Background Paper

This is one of 12 thematic background papers prepared by Worldwatch for the International Conference for Renewable Energies held in Bonn in 2004 (renewables 2004).

159. [World Institute of Sustainable Energy – India](#)

Document Type: Website

The World Institute of Sustainable Energy website provides a variety of information on renewable technology and its implementation in India.

160. [Energy and Environmental Tax Models from Europe and Their Link to Other Instruments for Sustainability: Policy Evaluation and Dynamics of Regional Integration](#)

Document Type: Research Paper

This paper, authored by Fouquet and Johansson, reflects on energy taxation and other policy instruments used in Europe, and puts these efforts into perspective with other measures such as emission trading and voluntary agreements. It provides examples from selected member states on energy taxation and their effectiveness, and outlines the strengths and weaknesses in combining different mechanisms.

161. [Awea – Wind Energy Production Tax Credit Fact Sheet](#)

Document Type: Fact Sheet

This is a fact sheet on wind energy production tax credits produced by the American Wind Energy Association (AWEA) in October 2008.

162. [Model Net Metering Rules](#)

Document Type: Model Regulation

In 2006 the Interstate Renewable Energy Council (IREC) developed a set of model net metering rules. IREC's model rules have been highly influential in New Jersey and Colorado, which are widely considered to have the best net metering policies in the United States. IREC's model rules apply to systems up to two megawatts in capacity.

163. [Government of India – Ministry of New and Renewable Energy](#)

Document Type: Website

This website provides information on renewable energy in India. The Ministry facilitates the research, design, development, manufacture, and deployment of new and renewable energy systems/devices for transportation, portable, and stationary applications in rural, urban, industrial, and commercial applications.

164. [Matrix for Comparative Assessment of Countries for Grid-Connected and Off-Grid Renewable Energy Application for Electricity Service – Sri Lanka](#)

Document Type: Assessment Matrix

This assessment matrix, developed by CORE International, Inc., is used to determine the suitability for grid-connected or off-grid renewable electricity production in Sri Lanka.

165. [IEA/DOE Website on Renewably and Alternative Fuels](#)

Document Type: Website

This website, provided by the Energy Information Administration and the U.S. Department of Energy, provides data, reports, and analysis on renewable and alternative fuel use in the United States.

166. [Small Power Purchase Agreement Application for Renewable Energy Development: Lessons from Five Asian Countries](#)

Document Type: Report

This January 2004 report by Steven Ferry analyzes the lessons learned from six Small Power Purchase (SPP) programs in five Asian nations, comparing and contrasting their program designs, tariff designs, and power purchase agreements.

167. [Wolcott – Feature Article: The Big Creek Project](#)

Document Type: Article on Web

The article discusses the history of the Big Creek hydro project, which was developed in the Sierra Nevada Mountains in the early 1900s.

168. [Clean Energy-Environment Guide to Action: Policies, Best Practices, and Action Steps for States](#)

Document Type: Policy Paper

This 2006 guide was prepared by the U.S. Environmental Protection Agency, and is designed to assist states in developing policies that encourage the use of clean energy.

169. [NRECA – Clean Renewable Energy Bonds](#)

Document Type: Fact Sheet

This is a fact sheet on the Clean Renewable Energy Bonds (CREBs). The Energy Policy Act of 2005 provided electric cooperatives and public power systems with the ability to issue CREBs, which deliver an incentive comparable to the Production Tax Credit that is available to private developers and investor-owned utilities.

170. [Identifying Optimal Legal Frameworks for Renewable Energy in India](#)

Document Type: Report

This report provides a detailed overview of renewable energy law and policy in India.

171. [California Interconnection Guidebook](#)

Document Type: Guidebook

The Guidebook is intended to help a person or project team interconnect one or more electricity generators to the local electric utility grid under California Rule 21. Rule 21 applies only to the three electric utilities in California that are under jurisdiction of the California Public Utilities Commission: Pacific Gas and Electric, Southern California Edison, and San Diego Gas and Electric. The Guidebook may also be useful for interconnection in some municipal utility areas with interconnection rules resembling Rule 21.

172. [Distributed Generation Interconnection Manual – Public Utility Commission of Texas](#)

Document Type: Manual

This manual was prepared by the Public Utility Commission of Texas to guide the inclusion of distributed generation into the Texas electric system.

173. [Standard Interconnection Agreements for Large Generators](#)

Document Type: Website

The Federal Energy Regulatory Commission provides access to standard interconnection agreements and procedures on their website and updates these documents to conform to Commission decisions.

174. [FERC – Standard Interconnection Agreements for Wind Generators](#)

Document Type: Website

This section of the Federal Energy Regulatory Commission website provides access to standard interconnection agreements and procedures for wind generators.

175. [California ISO – Scheduling Process for Services](#)

Document Type: Procedure

This procedural document describes the current scheduling process for electric power for the California Independent System Operator as of March 2006.

176. [Capacity of the Victorian Electricity Transmission Network to Integrate Wind Power - 2007](#)
Document Type: Report
VENCorp prepared this assessment of the technical impacts of wind turbine generation developments in the Victorian shared electricity transmission network.
177. [Large Scale Integration of Wind Energy in the European Power Supply: Analysis, Issues and Recommendations](#)
Document Type: Report
This report, prepared by the European Wind Energy Association, provides the rationale, conclusions, and recommendations for the large-scale integration of wind energy in Europe.
178. [Effect of Large Scale Wind Farms on the Egyptian Power System Dynamics](#)
Document Type: Research Paper
In this paper, aggregated wind farm modeling is presented to investigate the effect of wind farms of different sizes on the Egyptian power system dynamics. The wind farm is aggregated into a minimal set of equivalent wind generator models combining all turbines with the same mechanical nature frequency into single equivalent turbine. Power system dynamics simulation software is used to study the impact of increasing wind turbine penetration on system performance.
179. [California Renewable Portfolio Standard Renewable Generation Integration Cost Analysis: Phase III Recommendations for Implementation](#)
Document Type: Report
In implementing California's Renewable Portfolio Standard, the Energy Commission was tasked with providing input on the technical evaluation of integration costs. The technical review effort became known as the RPS Integration Cost Study, a multi-phased study to develop, quantify, and define procedures needed for routine calculation of the indirect integration costs for eligible renewable generators. This report is the culmination of the Phase III effort and provides detailed recommendations for performing integration cost analyses of various renewable generating resources.
180. [Energy Almanac](#)
Document Type: Website
The Energy Almanac provides a one-stop source for energy information and statistics for California. Hosted by the California Energy Commission, the site also provides links to California-related information and statistics.
181. [Assessment of the Potential for the Commercialization of Conjunctive PV-Hydro Power Generation](#)
Document Type: Executive Summary
This September 2001 study looks at the potential for the commercialization of PV-hydro electrical generation.
182. [950kW CEPALCO PV Power Plant Project History and Rationale](#)

Document Type: Report

This report details the development of a 950 kW (AC) photovoltaic power plant located outside the city of Cagayan de Oro on the island of Mindanao, Philippines, which started operations in June 2004. It is owned and operated by Cagayan Electric Power and Light Company Inc. (CEPALCO), an investor-owned, 100 MW power distribution company serving the city of Cagayan de Oro and three adjacent municipalities in the Province of Misamis Oriental on the northern part of Mindanao. A substantial portion of the financing was provided by the Global Environment Facility (GEF), with the International Finance Corporation (IFC) acting as the project executing agency on behalf of the GEF.

183. [Project Brief: CEPALCO Distributed Generation PV Power Plant](#)

Document Type: Project Brief

This project brief was prepared for the CEPALCO Distributed Generation PV Power Plant.

184. [PowerPoint: CEPALCO PV Solar Project – Philippines](#)

Document Type: PowerPoint Presentation

This PowerPoint presentation on the CEPALCO Solar Project was given by Mr. Ramon C. Abaya, chairman of the Cagayan Electric Power & Light Co., Inc. The presentation was delivered at the EMPower Meeting, Paris, in June 2005.

185. [Biopower Technical Assessment: State of the Industry and Technology](#)

Document Type: Report

This 2003 assessment by the National Renewable Energy Laboratory examines the technologies and opportunities for development of electricity from biomass resources.

186. [IEA Bioenergy, 2004 Annual Report, Task 37, Energy from Biogas and Landfill Gas](#)

Document Type: Report

Under the International Energy Agency Framework for International Energy Technology Cooperation, the Executive Committee of each Implementing Agreement must produce an Annual Report for IEA Headquarters. This is the report of the IEA Bioenergy Executive Committee for 2004 and contains a special feature on the group's biogas and landfill gas work.

187. [Harvesting Manure for Energy, Nutrients & More](#)

Document Type: Article

This article from the Spring 2003 issue of Green Matters, a newsletter from the Alberta Environmentally Sustainable Agriculture Council, examines the use of manure for energy development.

188. [NW Community Energy Website-Inland Empire Project](#)

Document Type: Website

This website highlights the Centralized Anaerobic Biogas facilities located at Chino Basin in California. The projects were developed by the Inland Empire Utilities Agency.

189. [Inland Empire Dairy Manure to Energy Program](#)

Document Type: Presentation

This April 2007 presentation by the Inland Empire Utilities Agency covers the utility's "Cow Power" program.

190. [Biomass Energy – Potential & Prospects](#)

Document Type: Fact Sheet

This fact sheet, prepared by the Confederation of Indian Industry in June 2004, discusses the potential and prospects for biomass energy.

191. [Biomass for Renewable Energy and Fuels](#)

Document Type: Article

This 2004 article, prepared by Donald Klass of Entech International, examines the development and impacts of the use of biomass as a source of renewable energy and fuel.

192. [Biomass as Feedstock for a Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply, Joint Study of the US Departments of Agriculture and Energy](#)

Document Type: Report

The United States Department of Agriculture (USDA) and the United States Department of Energy (DOE) both place high importance on developing resources and conversion technologies for producing fuels, chemicals and power from biomass. The two departments are working together on several aspects of bioenergy. This report is the third to be produced from this joint collaboration.

193. [Investing in a Climate for Change; Engaging the Finance Sector, United Nations Environmental Programme \(UNEP\), 2008a](#)

Document Type: Report

This UNEP report looks at climate change issues, which will require substantial investment in new technologies, processes, and services. The report argues that this investment is not just desirable; it is essential. Without substantial and sustained investment in clean energy and other measures now, the reality of a global economy free of climate change impacts will remain a distant dream.

194. [Energy Privatization and Reform in East Africa](#)

Document Type: Report

This paper reviews the experiences with electricity reforms and privatization in Kenya, Tanzania, and Uganda. The first three sections review each country in turn, looking at the use of independent power producers (IPPs) and reforms in power generation, distribution systems, and major developments. A further section reviews the main multinational companies active in electricity in the region.

This report discusses the issues of pricing policies; investment and the role of public finance; the problems experienced with IPPs and the associated power purchase agreements (PPAs); proposals for regional integration; corruption and transparency; employment protection; and management service contracts.

195. [Survey of Energy Resources 2007, Biomass for Electricity Generation, World Energy Council](#)

Document Type: Website

The World Energy Council has provided survey data to produce dynamic maps of the key indicators for each energy type surveyed. The resulting maps can be viewed at the World Energy website.

196. [Global Trends in Sustainable Energy Investment 2008: Analysis of Trends and Issues in the Financing of Renewable Energy and Energy Efficiency](#)

Document Type: Report

This report presents the financial perspective, or “dollar view,” of the current state of play in sustainable energy development. The analysis in this report consists of actual data on the different types of capital flows and their movement over time, combined with analysis of regional and sectoral trends. This information is intended to be a strategic tool for understanding the status of the clean energy sector’s development and for weighing future public and private commitments to the sector.

197. [Biomass Resource Assessment in California](#)

Document Type: Report

This 2005 report updates previous biomass resource assessments and incorporates new information developed by the California Department of Forestry and Fire Protection on gross and technically available forest resources including logging slash, in-forest thinning, mill residue, and shrub land biomass. The update also includes projections to 2005 of agricultural and municipal waste resources from 2002 and 2003 base year data included in the previous assessment. Agricultural biomass projections are based on population and historical production trends. Municipal waste projections are based largely on population trends. Specific details concerning the methodology used are available in the database.

198. [Biomass Power and Conventional Fossil Systems With and Without CO₂ Sequestration – Comparing the Energy Balance, Greenhouse Gas Emissions and Economics](#)

Document Type: Report

This NREL report examines power generation for two fossil-based technologies (coal-fired power production and natural gas combined-cycle [NGCC]) and two biomass technologies (a biomass-fired integrated gasification combined cycle [IGCC] system using a biomass energy crop, and a direct-fired biomass power plant using biomass residue as well as a biomass residue/coal co-fired system). Each system includes the upstream processes necessary for feedstock procurement (mining coal, extracting natural gas, growing dedicated biomass, collecting residue biomass), transportation, and any construction of equipment and pipelines.

199. [Experts Ponder Future of Biomass Industry](#)

Document Type: Article

This May 2007 article from Power Magazine, written by Phil Reese, Reese-Chambers Systems Consultants, and Bill Carlson, Carlson Small Power Consultants, examines the future of the biomass industry.

200. [Summary of Biomass Power Generation in India](#)

Document Type: Report

This 2005 summary report, prepared by Hitofumi Abe, examines the status of India's biomass electricity generation industry.

201. [An Assessment of a Biomass Gasification Based Power Plant in the Sunderbans](#)

Document Type: Report

The findings of the study indicate that this biomass power plant has made a very positive impact on the life of the villagers of Chottomollakhali Island. There has been an increase in economic activities, while households have shown a willingness to pay a higher price for full-time power supply. The cost-benefit ratio, internal rate of return, and pay-back period of the project are 1.68, 19%, and 7 years, respectively.

202. [Biomass Power Generation: Sugar Cane Bagasse and Trash](#)

Document Type: Report

This is the final project report for a biomass power generation project in Brazil, discussing recommendations for further biomass work.

203. [Renewable Energy Policy Brazil](#)

Document Type: PowerPoint Presentation

This presentation was given by Claudia do Valle to the Center for Integrated Studies on Climate Change and the Environment (Centro Clima) in 2005.

204. [NASA Surface Meteorology and Solar Energy: Methodology](#)

Document Type: Report

This document describes how various parameters used in NASA's methodology were obtained, their limitations, and estimated accuracies based on information available to NASA. The intent is to provide maps and accuracy charts such that a user may make decisions concerning suitability of the SSE data for a project in a particular region of the globe.

205. [DOE: 20 Percent Wind Energy By 2030](#)

Document Type: Report

This July 2008 Department of Energy report demonstrates the need to increase wind energy use in the United States to 20 percent of the electricity mix by 2030.

206. [Global Wind Energy Outlook 2008](#)

Document Type: Report

This report from Greenpeace and the Global Wind Energy Council documents the worldwide need for wind energy in 2008.

207. [Fostering a Renewable Energy Technology Industry: An International Comparison of Wind Industry Policy Support Mechanisms](#)

Document Type: Report

This November 2005 report examines the importance of national and sub-national policies in supporting the development of successful global wind turbine manufacturing companies. It explores the motivations behind establishing a local wind power industry, and the paths that different countries have taken to develop indigenous large wind turbine manufacturing industries within their borders. A cross-country comparison is given of the policy support mechanisms that have been employed to directly and indirectly promote wind technology manufacturing in twelve countries.

208. [Annual Report on US Wind Power Installation, Cost and Performance Trends: 2007](#)

Document Type: Report

The US wind industry experienced unprecedented growth in 2007, surpassing even optimistic projections from years past. This rapid pace of development has made it difficult to keep up with trends in the marketplace. Yet, the need for timely, objective information on the industry and its progress has never been greater. This report, the second of an ongoing annual series, attempts to meet this need by providing a detailed overview of developments and trends in the US wind power market, with a particular focus on 2007.

209. [Renewable Energy Feed-In Tariff Guidelines: Energy Regulator of South Africa \(NERSA\)](#)

Document Type: Policy Paper

This is the March 26, 2009 statement of reasons prepared by the Energy Regulator of South Africa providing the detail for the approval of feed-in tariffs (FITs) for renewable energy. The document provides the current FITs, by technology, as approved by the regulator.

210. [South Africa Renewable Energy Feed-in Tariff - Regulatory Guidelines](#)

Document Type: Regulatory Guidelines

These guidelines apply to the implementation of South Africa's feed-in tariffs (FITs).

211. [WindEnergy Study 2008: Assessment of the Wind Energy Market Until 2017](#)

Document Type: Presentation

This is a presentation given on behalf of the author of the study, HUSUM WindEnergy, at the HUSUM WindEnergy – The Leading Wind Energy Trade Fair, held on September 9-13, 2008, in Husum, Germany.

212. [Global Wind 2007 Report: Global Wind Energy Council](#)

Document Type: Report

This is the third annual report on the status of the global wind industry by the Global Wind Energy Council (GWEC). It provides a comprehensive snapshot of this global industry, which now extends to more than 70 countries. The data and country profiles for this report were collected through GWEC's member associations around the world and additional government and industry contacts.

213. [A Comparative Analysis of Community Wind Power Development Models](#)

Document Type: Report

Only within the past few years has farmer- or community-owned wind power development become a reality in the United States. The primary hurdle to this type of development in the United States has been devising and implementing suitable business and legal structures that enable such projects to take advantage of tax-based federal incentives for wind power. This article discusses the limitations of such incentives in supporting farmer- or community-owned wind projects, describes four ownership structures that potentially overcome such limitations, and conducts comparative financial analysis on those four structures, using as an example a hypothetical 1.5 MW farmer-owned project located in the state of Oregon.

214. [Community Wind: The Third Way](#)

Document Type: Web Article

An online article by Paul Gipe that states that North Americans have been exposed to only a few of wind energy's many possibilities. For most North Americans, wind energy is either giant wind farms at the end of long transmission lines great distances from the cities they serve, or small wind turbines found at a few rural homesteads.

There is, however, a third way. In Denmark and Germany—world leaders in wind energy development—many commercial-scale wind turbines are installed as single units or in small clusters distributed across the countryside, or scattered around and sometimes within urban agglomerations.

215. [Community Wind Support Schemes in Europe and Their Relevance to the United States](#)

Document Type: Report

This May 2001 report by Mark Bolinger, Environmental Technologies Division of the Lawrence Berkeley National Laboratory, discusses the relevance of Europe's support mechanisms for wind projects located in the United States.

216. [A Comparison of Wind Power Industry Development Strategies in Spain, India and China](#)

Document Type: Report

This paper compares the manner in which Gamesa (Spain), Suzlon (India), and Goldwind (China) became domestic leaders in their respective countries' wind industries. The paper reviews the respective policy environments for wind energy in India, China, and Spain and how these policies encouraged the emergence of a domestic wind turbine manufacturer. It then examines and compares the manner in which Suzlon, Goldwind, and Gamesa became domestic leaders in their respective countries' wind industries, with a focus on technology acquisition, technological know-how, and the associated intellectual property rights that allowed each company to become a leading wind turbine manufacturer in its own domestic market.

217. [International Electrotechnical Commission \(IEC\) Wind Turbine Standards](#)

Document Type: Website

This website hosted by the American Wind Energy Association provides a complete set of the international standards for wind energy systems. International standards are developed by the working groups of IEC Technical Committee-88 (TC-88).

218. [Wind at Work: Wind Energy and Job Creation in the EU](#)

Document Type: Report

This January 2009 report produced by the European Wind Energy Association discusses the creation of employment opportunities within the growing European wind market.

219. [A Cost Curve for GHG Reduction](#)

Document Type: Article

This February 2007 global study of the cost of reducing greenhouse gas emissions provides insights for businesses and policymakers. The article was prepared by Per-Anders Enkvist, Tomas Naclér, and Jerker Rosander. Free registration is required to read the full article.

220. [Transmission and Integration into the U.S. Electric System](#)

Document Type: Report

This report projects that the US electric power system would allow the 20 percent Wind Scenario to be realized by 2030. This scenario would require the continuing evolution of transmission planning and system operations, in addition to expanded electricity markets.

221. [Basics of a Power Purchase Agreement: Sample Power Purchase Agreement](#)

Document Type: Report

Originally provided as an appendix to the Community Wind Handbook, this October 2007 article by Daniel A. Yarano and Christy Brusven, with Fredrikson & Byron, P.A., provides a detailed discussion on the details contained in a power purchase agreement, including a sample power purchase agreement (PPA).

222. [Bat Fatalities at Wind Turbines: Investigating the Causes and Consequences](#)

Document Type: Website

This website provided by the U.S. Geological Survey's Fort Collins Science center discusses the potential for bat fatalities from wind generators.

223. [AWEA Wind Energy Siting Handbook](#)

Document Type: Handbook

The Wind Energy Siting Handbook was developed by the AWEA Siting Committee, in collaboration with Nixon Peabody LLP and Tetra Tech EC, Inc., to inform wind energy developers and other interested parties about environmental siting issues relevant to land-based commercial-scale wind energy project development in the United States.

224. [The Community Wind Development Handbook](#)

Document Type: Handbook

This handbook, developed on behalf of the Rural Minnesota Energy Board, is designed to give developers of "wholesale" community wind projects practical knowledge of what to

expect when developing commercial-scale community wind energy projects in the range of 2 to 50 MW.

225. [Sample Wind Project Calculator](#)

Document Type: Spreadsheet

The sample Wind Project Calculator is part of the larger Community Wind Toolbox. The function of the Toolbox and the Wind Project Calculator is to help current and future community wind developers to understand many of the complexities of planning, financing and constructing a commercial-scale wind project in the size range of 2 to 50 MW. This Wind Project Calculator creates wind project cash flows for a time span of up to 20 years. If the project's time line does not fit within this calculator, the calculator can still help wind developers understand the financial concepts involved and transfer them to another format or calculator, depending upon the project specifications.

227. [Policy Action on Climate Toolkit Website](#)

Document Type: Website

The Policy Action on Climate Toolkit or PACT project aims to provide the necessary elements for rapidly introducing policy to combat climate change –giving parliamentarians, civil servants, and advocates around the world access to the legal and technical expertise needed to envisage, to argue for, and to enact laws and policies that effectively protect the climate.

228. [International Feed-In Cooperation Website](#)

Document Type: Website

The governments of Spain and Germany initiated the International Feed-in Cooperation for Renewable Energies in Bonn in June 2004 (renewables2004) to promote the exchange of experiences and improve the feed-in system design in each country. Thereafter, a joint declaration between both governments was signed on October 6, 2005 in Madrid. Slovenia joined the cooperation on January 29, 2007. Since feed-in systems have proven to be the most effective and efficient option to promote renewable energies, the International Feed-in Cooperation aims at demonstrating the advantages of a feed-in system. In this context, the member countries intend to stimulate the enhancement of feed-in tariffs worldwide by including other countries into their information exchange process.

229. [United Nations Environmental Program \(UNEP\) CDM/JI Project Pipeline Analysis and Database Website](#)

Document Type: Website

The CDM/JI Pipeline Analysis and Database contains all clean development mechanism/joint implementation projects that have been sent for validation/determination. It also contains the baseline and monitoring methodologies, a list of international DOEs, and several analyses.

230. [Renewable Portfolio Standards in the States: Balancing Goals and Implementation Strategies](#)

Document Type: Report

Renewable portfolio standards (RPS) establish a minimum percentage of electricity that retailers must provide from renewable energy sources. However, RPS rules vary from state to state, which presents important challenges to successful implementation. Key issues are discussed in terms of resource availability, solar-specific provisions, and political and regulatory consistency, and their impacts on the ability to finance new renewable energy projects. A successful RPS policy must balance a state's goals for fuel diversity, economic development, price effects, and environmental benefits.

231. [Request for Proposals for a Turn-Key One-Megawatt Grid-Tied Photovoltaic System for Cagayan Electric Power and Light Company](#)

Document Type: Request for Proposals

This request for proposal document, released in 2001 by Cagayan Electric Power and Light in the Philippines, covers the development of a grid-connected photovoltaic system.

232. [Selection Criteria for the Cagayan Electric Grid-Tied Photovoltaic System](#)

Document Type: Spreadsheet

This Excel document contains the selection criteria and weighting factors for development of the Philippine photovoltaic system.

233. [German 250 MW Wind Program](#)

Document Type: Report

The German 250 MW Wind Program is perhaps the most sizable effort of any country to support the piloting and demonstration of new wind turbines and wind turbine designs, with a focus on turbines owned by domestic companies. Such a program does not replace the need for basic and applied R&D, but can fill a critical niche between that R&D and the full commercial deployment of new technologies. It does so by piloting prototype or early-commercial turbines in the field, thereby preparing them for full commercial deployment. Germany's 250 MW Program demonstrates a possible model that China might utilize as it seeks to support its local wind manufacturers as they move from R&D to full commercialization.

234. [Final Consultant Report: California Feed-In Tariff Design and Policy Options](#)

Document Type: Report

This report explores the potential to use feed-in tariffs as a tool to aid in making California's renewable generation goals a reality. The report discusses a variety of potential feed-in tariff

policy design options and policy paths, including appropriate tariff structure, eligibility, and pricing.

235. [Big Energy Overview Presentation – Karl Rabago](#)

236. Document Type: PowerPoint Presentation

Karl Rabago's PowerPoint presentation to the Renewable Energy for Tribal Community Development group discusses the tribe's options for development of a large-scale renewable electric generation facility. The presentation provides a detailed discussion of the available renewable generation technologies.

236. [Promotion of Renewable Energy in Sri Lanka: Future Directions](#)

Document Type: Presentation

This presentation by Tissa Herath, Additional Secretary (Technical) with Sri Lanka's Ministry of Power & Energy, discusses the proposed implementation of Sri Lanka's vision of providing 10 percent of the country's overall power needs from renewable energy sources by 2015.

237. [NREL Parabolic Trough Solar Field Technology Website](#)

Document Type: Website

This page, from the National Renewable Energy Laboratory's TroughNet Parabolic Solar Power Network website, provides a detailed discussion of parabolic trough solar field technology.

238. [First Solar Stumbles](#)

Document Type: Article

This report, dated February 25, 2009, discusses the economic issues facing First Solar, a leader in thin film solar panel technology.

239. [Regional Greenhouse Gas Initiative Website](#)

Document Type: Website

The Regional Greenhouse Gas Initiative (RGGI) is the first mandatory, market-based effort in the United States to reduce greenhouse gas emissions. Ten Northeastern and Mid-Atlantic states will cap and then reduce CO₂ emissions from the power sector 10 percent by 2018. States will sell emission allowances through auctions and invest proceeds in energy efficiency, renewable energy, and other clean energy technologies. RGGI will spur innovation in the clean energy economy and create green jobs in each state.

This website provides a portal for official user platforms, state applications, and materials for RGGI participants, as well as current information about the status of RGGI auctions and state rules.

240. [NREL: Third-Party Financing and Power Purchase Agreements for Public Sector PV Projects](#)

Document Type: Presentation

This presentation, prepared by Jason Coughlin and delivered via the TAP Web Seminar on May 27, 2009, provides a detailed discussion of the structure and value of power purchase agreements for public sector photovoltaic projects.

241. [Boulder County: Power Purchase Agreements](#)

Document Type: Presentation

This presentation, prepared by Ann Livingston, Boulder County Sustainability Coordinator, and delivered via the TAP Web Seminar on May 27, 2009, discusses Boulder County's use of power purchase agreements in pursuit of the renewable energy goals.

242. [**Nothing But Net: Renewable Energy and the Environment, Midamerican Legal Fictions, and Supremacy Doctrine – Steven Ferrey**](#)

Document Type: Report

One of the most significant legal innovations to promote decentralized energy development is net metering. Net metering creates a legal fiction that when an eligible small power producer sells power back to the utility grid, it in fact does not legally constitute a "sale," despite the fact that power is physically transferred, often at times that the utility recipient does not need additional power, and under all legal principles of the U.C.C. or common law, title to power is legally transferred. The legal precedent that FERC utilizes indicates that the legal result should be contrary. Nonetheless, this key decision has spurred more than 40 states to adopt net metering at the state level, making it the most prevalent policy incentive for the promotion of decentralized power in the United States. Other countries in the world are now also adopting this concept. This article analyzes the legal machinations that created net metering, and surveys the disparate policies of the states in implementing this legal innovation. The article concludes by stating that FERC's means to reach its legal conclusion are questionable.

243. [REN21: Renewables Global Status Report 2009 Update](#)

Document Type: Report

This "Update" edition of the Renewables Global Status Report is the fourth in a series launched in 2005. It provides an integrated picture of the global renewable energy situation, and how the sector has fared during the global economic crisis.

244. [Example Power Purchase Agreement: Bonneville Power Administration](#)

Document Type: Power Purchase Agreement

A 2002 example of a power purchase agreement (PPA) for selling power to the Bonneville Power Administration (BPA), this document includes the requirements that are expected of anyone selling power to BPA and are typical of industry requirements.

245. [An Open Season Scheme to Develop Transmission Interconnection Investments for Large Wind Farms in Mexico](#)

Document Type: PowerPoint Presentation

This April 2009 presentation delivered in Washington, D.C. by Francisco Barnes (Comisión Reguladora De Energia) discusses Mexico's plan to develop large wind farms.

246. [Innovative Electricity Markets to Incorporate Variable Production](#)

Document Type: Report

IPA Energy + Water Economics (IPA), in consortium with COWI of Denmark and SGA Energy of Canada have been appointed by the IEA Renewable Energy Technology Deployment (RETD) to investigate innovative electricity market products and services needed for better integration of variable electricity generation. The results of this work are contained in this 2008 final report.

247. [IPP Hydropower Procurement Manual for Lao PDR](#)

Document Type: Manual

The IPP Hydropower Procurement Manual, prepared in 2006 for the Government of Lao, is intended to contribute to the strengthening of IPP procurement in Lao PDR by encouraging system, rigor, transparency, and competition. This manual and its annexes provide a set of guidelines and documentation for the procurement of medium and large hydropower projects on a Build-Operate-Transfer (“BOT”) basis. It has been prepared to guide government agencies in the selection of developers, solicitation and evaluation of IPP proposals, and the drafting and execution of project agreements.

248. [Need for Proactive Transmission Policies and Practices - Kevin Porter](#)

Document Type: Presentation

Delivered at the World Bank Energy Week in Washington, D.C. on April 1, 2009 by Kevin Porter, this presentation looks at the worldwide need for additional transmission resources to serve a growing renewable generation market.

249. [The Future of Renewable Energy in Asia in the Current Economic Crisis and Beyond – Peter Greenwood](#)

Document Type: Presentation

This presentation by Peter Greenwood, Executive Director for Strategy with CLP Holdings, was delivered at the World Bank Energy Week in Washington, D.C., on April 1, 2009. The presentation examines the costs and benefits of renewable energy generation in Asia in light of the current economic situation.

250. [Policy Instrument Design to Reduce Financing Costs in Renewable Energy Technology Projects](#)

Document Type: Report

Prepared by David de Jager and Max Rathman with Ecofys International BV for the IEA’s Renewable Energy Technology Deployment program in October 2008, the report discusses the role of policies and policy instrument design in reducing the financing cost of renewable energy technology projects.

251. [Wind Energy in Jamaica – Ruth Potopsingh](#)

Document Type: Presentation

This presentation by Ruth Potopsingh, Group Managing Director, Petroleum Corporation of Jamaica, was delivered at the World Bank Energy Week in Washington, D.C., on April 1, 2009. The presentation provides a profile of the country, a case study for a wind production facility, and the implementation challenges the country faces.

252. [Geothermal Energy in Indonesia - Star Energy](#)

Document Type: Presentation

Prepared by Star Energy, this presentation examines the role of geothermal energy in Indonesia's energy mix.

253. [Wind Power Costs/Benefits](#)

Document Type: Report

Prepared by Sonja Nowakowski, this 2008 report looks at the costs and benefits of wind power. The report concludes that wind integration costs can be driven by the market and flexibility available to a utility. Utilities operating in control areas with limited flexibility for managing loads face wind integration costs that are largely a function of market prices.

254. [Wind Turbine Industry Steps Up to Global Demand](#)

Document Type: Press Release

This June 2008 press release from Emerging Energy Research states that the wind turbine industry finds itself in a crucial transition period as it races to catch up with booming global demand for wind power, which surged to nearly 20 GW in annual installations during 2007. The sector is on track to more than double within a decade, led by rapid growth in the United States and China. Emerging Energy Research, a research and advisory firm analyzing clean and renewable energy markets, expects the global installed wind base to grow more than fivefold from its 2007 total of 94 GW to more than 576 GW by 2020.

255. [U.S. Offshore Wind and Wave Renewable Energy Potential – Burton Hamner](#)

Document Type: Presentation

Burton Hamner, president of Grays Harbor Ocean Energy Company, prepared this presentation identifying the benefits to coastal areas from the use of offshore wind and wave energy.

256. [Regional Renewable Energy Planning: International Case Studies, Lessons Learned](#)

Document Type: Report

Commissioned by the GEF / World Bank Assisted China Renewable Energy Scale-up Program (CRESP) and by the Energy Foundation's China Sustainable Energy Program (CSEP), this study is designed to assist China's Center for Renewable Energy development (CRED) in completing a study on provincial-level renewable energy planning, including the development of specific planning methodologies for China's provinces.

257. [Inland Empire Utilities Agency - Facilities](#)

Document Type: Website

Inland Empire Utilities Agency, a California Municipal Water District, hosts this web discussion regarding the facilities operated by the agency.

258. [Biomass Energy – Potential & Prospects](#)

Document Type: Fact Sheet

Prepared by the Confederation of Indian Industry (CII) in 2004, this fact sheet discusses the use of biomass for electricity generation and includes case studies of Indian projects.

259. [Emergy Evaluation of Bio-Oil Production Using Sugarcane Biomass Residues at Fast Pyrolysis Pilot Plant in Brazil](#)

Document Type: Research Report

Fast pyrolysis can directly produce a liquid fuel from biomass named bio-oil. It can be readily stored or transported. This liquid fuel can be a substitute for fuel oil in any static heating or electricity generation application and can also be used to produce a range of commodities and chemicals, such as phenol and its derivatives. This report evaluates the embedded energy (emergy) available for producing bio-oil from sugarcane biomass residues.

260. [Project Design Document Form \(CDM PDD\): Punjab Biomass Facility](#)

Document Type: Design Document

Administered by the UN's Framework Convention on Climate Change, the Clean Development Mechanism (CDM) allows emission-reduction (or emission removal) projects in developing countries to earn certified emission reduction (CER) credits, each equivalent to one tonne of CO₂. CERs can be traded and sold, and used by industrialized countries to meet a part of their emission reduction targets under the Kyoto Protocol. Each project must complete the required CDM PDD for their project. This project design document involves grid-connected biomass based power generation, and includes development, design, engineering, procurement, finance, construction, operation and maintenance of a 24 MW (2 x 12 MW) installed capacity biomass (rice husk) based captive electric generating station.

261. [Gujarat Solar Policy – 2009](#)

Document Type: Policy Document

Developed by the government of state of Gujarat in India, this solar policy document encourages the development of clean and green power in Gujarat. This policy is in effect until 2014.

262. [Executive Order 13123 – Greening the Government Through Efficient Energy Management](#)

Document Type: Presidential Order

As published in the Federal Register on June 8, 1999, this Presidential Order sought to lead the nation by example through the implementation of measures to reduce energy use and greenhouse gas emissions in federal buildings.

263. [Executive Order 13423 - Strengthening Federal Environmental, Energy, and Transportation Management](#)

Document Type: Presidential Order

This Presidential Order, published in the Federal Register on January 26, 2007, replaces EO 13123 and implements standards to strengthen federal environmental, energy, and transportation management strategies.

264. [Integrating Renewables into the Power System](#)

Document Type: Presentation

This presentation, delivered by Dr. Marcelino Madrigal in Washington, D.C. in May 2006, provides a detailed background on the integration of renewable electric generation into the power system. Included is a discussion on drivers/trends; power system operation and variability; the system impacts of variability; and transmission barriers that must be overcome.

265. [NREL: State Clean Energy Policies Analysis \(SCEPA\) Project: An Analysis of Renewable Energy Feed-In Tariffs in the United States](#)

Document Type: Report

The use of feed-in tariffs (FIT) is gaining popularity in the United States as a policy option for encouraging renewable energy (RE) development. A number of states have recently implemented FITs and several utilities have launched utility-specific FIT. Experience around the world suggests that FITs could be used effectively to meet a number of US state policy goals, including job creation, economic development, and meeting state RE targets. This May 2009 NREL report suggests that FIT policies will continue to grow in importance as evidence mounts that they provide an effective framework for the promotion of RE development and job creation.

266. [Issues Note of the REToolkit – REToolkit: A Resource for Renewable Energy Development - June 30, 2008](#)

Document Type: Report

This Issues Note reviews the global status and costs of renewables as of 2007 and describes the environmental, economic, and development benefits of renewable energy projects. The benefits are followed by a discussion of the economic, legal, financial, and institutional barriers to renewable energy and an overview of approaches to overcome these barriers. Specific considerations for each type of renewable energy system (grid, minigrid and stand-alone) are detailed.

267. [Clean Technology Fund: Concept Note for a Concentrated Solar Power Scale-Up Program in the Middle East and North Africa Region](#)

Document Type: Report

The purpose of this concept note is to seek the World Bank Trust Fund Committee's views on:

- a) Whether the proposal has the appropriate scope and level of ambition and is of transformational scale;
- b) The minimum level of country-specific information and analysis that the TFC would expect in a regional investment plan;
- c) The range of financial instruments to meet the large investment and risk mitigation needs of the proposed program; and
- d) How bilateral development agencies/banks and other donors could contribute to the objectives of the proposed program

268. [Trends in Photovoltaic Applications: Survey Report of Selected IEA Countries between 1992 and 2007](#)

Document Type: Report

This 2008 report was prepared by the International Energy Agency's (IEA) Photovoltaic Power Systems Program (PVPS). As part of the work of the group's work, annual surveys of photovoltaic power applications and markets are carried out in the reporting countries. The objective of this series of annual reports is to present and interpret developments in both the PV systems and components being used in the PV power systems market, and the changing applications for these products within that market. These trends are analyzed in the context of the business, policy, and non-technical environment in the reporting countries.

269. [PV Status Report 2008: Research, Solar Cell Production and Market Implementation of Photovoltaics – September 2008](#)

Document Type: Report

Produced by the European Commission's DG Joint Research Center, Institute for Energy, Renewable Resources Unit in Italy, this report provides an overview of the current activities for PV research, manufacturing, and market implementation. While the report covers the market worldwide, special focus is placed on Japan, the People's Republic of China, Taiwan, the United States, and the European Union.

270. [NREL: Assessment of Parabolic Trough and Power Tower Solar Technology Cost and Performance Forecasts – October 2003](#)

Document Type: Report

Sargent & Lundy LLC (S&L) was selected by DOE/EERE to conduct this independent analysis of parabolic trough and power tower solar technology cost and performance. The work by S&L was done in close collaboration with the National Research Council (NRC) Committee, which was contracted by DOE/EERE to provide this second level of independent review.

As detailed below, S&L's analysis of the cost-reduction potential of CSP technology over the next 10–20 years included the following:

- An examination of the current trough and tower baseline technologies, including a detailed assessment of the cost and performance of these plants.
- Analysis of the industry projections for technology improvement and plant scale-up out to 2020, including a detailed assessment of the cost and performance projections for future trough and tower plants based on factors such as technology R&D progress, economies of scale, economies of learning resulting from increased deployment, and experience-related O&M cost reductions resulting from deployments.
- Assessment of the level of cost reductions and performance improvements that, based on S&L experience, are most likely to be achieved, and a financial analysis of the cost of electricity from such future solar trough and tower plants.

271. [Worldwide System for Conformity Testing and Certification of Electrotechnical Equipment and Components – PV Standards](#)

Document Type: Website

The International Electrotechnical Commission (IEC) publishes international standards for all electrical, electronic, and related technologies. This website lists the current standards applicable to photovoltaic systems. Copies of these standards may be purchased at the website.

272. [International Biochar Initiative Website](#)

Document Type: Website

The International Biochar Initiative (IBI) is a registered non-profit organization supporting researchers, commercial entities, policymakers, development agents, farmers and gardeners, and others committed to supporting sustainable biochar production and utilization systems that remove carbon from the atmosphere and enhance the earth's soils.

273. [Calpine: The Geysers on the Web](#)

Document Type: Website

This company website provides an overview of the world's largest geothermal power complex. In the Mayacamas Mountains, located 72 miles north of San Francisco, naturally occurring steam field reservoirs below the earth's surface are being harnessed by Calpine to produce clean, renewable energy for homes and businesses across Northern California. The Geysers facility covers 30 square miles along the Sonoma and Lake County border. Calpine owns and operates 15 power plants at the Geysers with a net generating capacity of about 725 megawatts of electricity – enough to power 725,000 homes, or a city the size of San Francisco.

274. [Calpine: Geothermal Power Technologies on the Web](#)

Document Type: Website

This section of the Calpine company website provides details of all the company's power plants, including the 15 geothermal power plants at The Geysers facility in northern California, which generates up to 725 megawatts of renewable "green" power or nearly 40 percent of the geothermal energy in the United States. The website includes a section on renewable energy certificates.

275. [Comisión Ejecutiva Hidroeléctrica Del Rio Lempa, Boletín De Estadísticas Eléctricas No. 33, 2002](#)

Document Type: Report in Spanish

A 2002 bulletin, in Spanish, issued by the Comisión Ejecutiva Hidroeléctrica Del Rio Lempa in El Salvador.

276. [El Salvador - Energy and Power on the Web](#)

Document Type: Website

This page, from the Encyclopedia of the Nations website, discusses electric power production in El Salvador, which has no readily available fossil fuel sources.

277. [Household Energy Network on the Web](#)

Document Type: Website

The HEDON Household Energy Network is an informal forum dedicated to improving social, economic, and environmental conditions through promotion of local, national, regional, and international initiatives in the household energy sector.

HEDON includes a collaborative discussion forum for ongoing knowledge creation and professional discussion.

278. [International Energy Agency: Statistics by Country/Region](#)

Document Type: Web Database

This website, developed by the International Energy Agency, provides an interactive database that can be used to search for statistical data by either specific country or by region.

279. This reference is no longer in use – the document was moved to Further Reading.

280. [Steamboat Springs Geothermal Field on the Web](#)

Document Type: Website

This website provides an overview of the Steamboat Springs geothermal resource, located south of Reno, Nevada. Two electric generating facilities utilize geothermal waters related to a high temperature fluid that rises from depths beneath the Steamboat Hills and cools along a path to the area of the lower facility, the SB Geo plant. North and northeast-striking faults predominate in the Steamboat Hills area and probably provide the main conduits for fluid flow to the resource areas tapped by the two companies.

281. [Ormat: Geothermal Configurations on the Web](#)

Document Type: Website

This company website discusses the various equipment configurations available to Ormat customers and the advantages of each under various geothermal conditions. Included on the website are animated graphics depicting the operation of each of the available configurations.

282. [Geothermal Resources Council Website](#)

Document Type: Website

Designed for members of the Geothermal Resources Council, this website contains information of interest to the geothermal power industry.

283. [Small Power Purchase Agreement Application for Renewable Energy Development: Lessons from Five Asian Countries](#)

Document Type: Report

Steven Ferry's 2004 report was prepared for the Asia Alternative Energy Program of the World Bank, with support from the United Nations Development Program. This report analyzes experience in six small power programs in five nations in Asia and compares and contrasts program design, power purchase agreements, and tariff design in these programs.

284. [Electricity Generation and Environmental Externalities: Case Studies](#)

Document Type: Report

Released in September 1995 by the Energy Information Administration, this report provides an overview of the economic foundation of externalities, the federal and state regulatory approaches, and case studies of the impacts of the externality policies adopted by three states.

285. [ETNNA: Renewable Energy Credit \(REC\) Questions and Answers](#)

Document Type: FAQ

This series of questions and responses looks at renewable energy credits prepared by the Environmental Tracking Network of North America (ETNNA).

286. [Wind Power Increase in 2008 Exceeds 10-Year Average Growth Rate](#)

Document Type: Web Article

This May 7, 2009 article, written by Janet L. Sawin, examines the growth of wind power in 2008. Worldwatch Institute published this article online.

287. [Mapping the Global Wind Power Resource](#)

Document Type: Website

Presented by the University of Delaware's College of Earth, Ocean, and Environment, this web page provide graphics depicting worldwide, year-round average wind speed maps derived from 10 years of GEOS-1 satellite data.

288. [DOE - Historic Wind Development in New England: The Age of PURPA Spawns the "Wind Farm"](#)

Document Type: Web Article

An online article presented by the Department of Energy's Wind and Hydropower Technologies Program, which examines the Crotched Mountain Wind Farm that, in 1980, became the first to be developed under the Public Utility Regulatory Policies Act or PURPA.

289. [Global Wind Power Capacity Reaches 100,000 Megawatts](#)

Document Type: Web Article

Written by Jonathan G. Dorn and published by the Earth Policy Institute on March 4, 2008, this article looks at the potential for a world-wide wind power capacity of 100,000 megawatts.

290. [Fostering a Renewable Energy Technology Industry: An International Comparison of Wind Industry Policy Support Mechanisms](#)

Document Type: Report

This November 2005 article, published by Lawrence Berkeley National Laboratory, examines the importance of national and sub-national policies in supporting the development of successful global wind turbine manufacturing companies. The authors, Joanna Lewis and Ryan Wiser, explore the motivations behind establishing a local wind power industry, and the paths that different countries have taken to develop indigenous large wind turbine manufacturing industries within their borders. This is done through a

cross-country comparison of the policy support mechanisms employed to directly and indirectly promote wind technology manufacturing in twelve countries.

60. 291. [GOING GREEN: WHY GERMANY HAS THE INSIDE TRACK TO LEAD A NEW INDUSTRIAL REVOLUTION](#)

Document Type: Web Article

Published April 7, 2009 on the web in Knowledge@Wharton, this article looks at how the German government and individuals helped such companies as Enercon, the world's third-largest producer of wind generators, and Q-Cells, the world's largest producer of photovoltaic cells, reach their present position, and what their gains might mean for the country and the world.

292. [Germany Country Report: Innovative Electricity Markets to Incorporate Variable Production](#)

Document Type: Report

This May 2008 report to the International Energy Agency's Renewable Energy Technology Deployment group provides an overview of the operation of renewable generation within the German power markets. It primarily considers federal regulations and market conditions, but also refers to regional specifications on the level of the German Laender (federal states) where applicable.

293. [Renewables Portfolio Standards in the United States: A Status Report with Data Through 2007](#)

Document Type: Report

As the popularity of renewables portfolio standards (RPS) has grown, so too has the need to keep up with the design, early experience, and projected impacts of these programs. This report – the first in a regular series – seeks to fill this need by providing basic, factual information on RPS policies in the United States. The report was published in April 2008 by Lawrence Berkeley National Laboratory.

294. [A Review of the Potential International Trade Implications of Key Wind Power Industry Policies in China](#)

Document Type: Report

Prepared by Joanna Lewis for the Energy Foundation China Sustainable Energy Program, this paper reviews wind power industry policies in China, investigates how similar regulations in other industries have been treated under the policies of the World Trade Organization (WTO), and assesses the likely international trade implications of the aforementioned policies in the wind sector. It concludes with a brief discussion of whether Chinese government policies to promote local wind turbine manufacturing are likely to be challenged by other WTO member countries.

295. [Wind Power Economics: Wind Energy Costs – Investment Factors](#)

Document Type: Fact Sheet

This fact sheet, prepared by the European Wind Energy Association (EWEA), examines the factors governing wind power economics.

296. [Wind Power to Combat Climate Change: How to Integrate Wind Energy into the Power System](#)
Document Type: Electronic Magazine
Denmark's success in developing wind power is discussed in this electronic magazine produced by Green Thinking in Denmark.
297. [Hawaii Energy, Environment, and Sustainability: Aspects of Grid Integration of As- Available Resources](#)
Document Type: PowerPoint Presentation
Terry Surles of the Hawaii Natural Energy Institute made this presentation to the APEC Regis workshop on January 13, 2009. The presentation discusses efforts to reduce Hawaii's oil dependence through renewable and sustainable energy sources.
298. [Design and Operation of Power Systems with Large Amounts of Wind Power - First Results of IEA Collaboration](#)
Document Type: Report
Developed for the International Energy Agency by VTT Technical Research Center of Finland, this report analyzes the design and operation factors required to integrate large amounts of wind energy in an existing electricity system.
299. [Contextualizing Avian Mortality: A Preliminary Appraisal of Bird and Bat Fatalities from Wind, Fossil-Fuel, and Nuclear Electricity – Benjamin K. Sovacool](#)
Document Type: Journal Article
Benjamin K. Sovacool explores the threats that wind farms pose to birds and bats in this journal article published in Volume 37, Issue 6 of Elsevier's Energy Policy in June 2009. Sovacool also briefly surveys recent literature on avian mortality and summarizes some of the problems with these findings. Based on operating performance in the United States and Europe, this study offers an approximate calculation for the number of birds killed per kWh generated for wind electricity, fossil fuel, and nuclear power systems.
300. [Technology Acquisition and Innovation in the Developing World: Wind Turbine Development in China and India – Joanna I. Lewis](#)
Document Type: Journal Article
Although China and India rely on coal to fuel most of their electricity generation, both countries are also home to burgeoning wind power industries. India currently leads the developing world in manufacturing utility-scale wind turbines, and China is close behind. This study examines the technology development strategies pursued by Suzlon and Goldwind, India and China's leading wind turbine manufacturers. While the institutional and other barriers present in large developing countries such as China and India present challenges to the concept of energy technology leapfrogging, an examination of wind turbine development in these countries has shown that substantial technical advances are possible in a relatively short time.
301. [Community Development through Wind Energy: Lessons from Wind Developments in Remote and Small Island Nations](#)

Document Type: Thesis

Small islands and other remote developing states represent some of the most difficult cases of development. This is especially true in the energy sector. Fragmentation, remoteness, and lack of natural resources compound the problems already associated with carrying out energy projects in developing countries. This study, written by Grayson Badgley, seeks to answer the question of whether or not wind energy is a viable technological alternative for promoting community development in small island and remote communities.

302. [Illustrated History of Wind Power Development](#)

Document Type: Website

Developed by Darrell M. Dodge of Littleton, Colorado, this website provides an illustrated history of wind development and an examination of its future.

303. [Wind Energy in Greece: An Interdisciplinary Analysis of Greece's Progress towards EU RES Targets](#)

Document Type: Thesis

European Union Directive 2001/77/EC set an indicative target for Greece to obtain 20.1 percent of its electricity from renewable energy sources (RES) by 2010. Greece will not achieve this target, but the challenges faced by the country offer a number of valuable lessons for its efforts to reach the mandatory target for 2020 set by a new Directive. This thesis, written by Therese Miranda, analyzes economic, technical, social, and political factors that influence the development of wind resources in Greece.

304. [Financing Non-Residential Photovoltaic Projects: Options and Implications](#)

Document Type: Report

Financial innovation in the non-residential PV market over the last five years has been more revolutionary than evolutionary in nature. Drawing upon financial structures pioneered in the US wind power industry, and spurred on by a sharp increase in tax benefits at the federal level and a shift towards performance-based incentives at the state-level, third-party ownership has transformed the market for non-residential PV. This January 2009 report from Lawrence Berkeley National Laboratory explores the options for financing these projects.

305. [Lewis – The Evolving Role of Carbon Finance in Promoting Renewable Energy Development in China \(COMING\)](#)

Document Type: Report

The world is currently negotiating what the international climate change regime will look like after 2012—the year that current Kyoto Protocol greenhouse gas emissions reduction targets expire. Critics claim the scale of reductions that the CDM is driving in the developing world is insufficient from a scientific perspective if we are to avoid dangerous climate change, that the

project-by-project crediting process is inefficient, and that the reductions being achieved are not “additional”—meaning they would have happened anyway and thus should not be financially supported. Yet, the efficacy of CDM must be examined in the broader context of

carbon mitigation in the developing world and the actions that are taking place. This paper examines the role that the CDM has played in promoting renewable energy development in China in order to assess how international carbon finance can best be used to help promote

emissions mitigation in the developing world.

306. [Cagayan Electric Power & Light: An Invitation for Expression of Interest for the Proposed 1,000 kW Photovoltaic \(PV\) Plant Turnkey Project](#)

Document Type: Expression of Interest

Issued by Cagayan Electric Power & Light in the Philippines, this document seeks the interest of parties for the development of a 1,000 kW photovoltaic project.

307. [Electricity Emissions Reductions in Mexico: Some Preliminary Results](#)

Document Type: Presentation

This November 2005 presentation from Mexico's Instituto Energeia was presented at the April 2005 Developing Country meeting in Oslo, Norway. The report discusses Mexico's energy sector and the steps taken to reduce emissions from electric generation.

308. [Mexico: Electricity Sector Outlook 2007-2016](#)

Document Type: Report

Prepared by Mexico's Secretary of Energy, this report presents electricity consumption and demand estimations from a national, sector, and regional approach. It provides the electricity capacity and generation requirements needed to properly face the demand increase estimated for 2007-2016. The expansion of the National Electric System (Sistema Eléctrico Nacional - NES) is viewed in the context of the degree of participation of state-owned companies, and the self-generation activities undertaken by the private sector.

309. [Hedging Mexico's Electricity Bets: The Case for Renewable Energy](#)

Document Type: Article

Taken from the Energy Sector Management Assistance Program (ESMAP) Knowledge Exchange Series in June 2007, this article by Daniel Farchy illustrates Mexico's growing recognition of renewable energy as a viable way to broaden investments in power generation and increase long-term security.

310. [Bidding on the Largest Wind Project in Mexico](#)

Document Type: Presentation

A 2006 presentation by Mexico's Federal Electricity Commission (CFE), this presentation offers a detailed look at the development of the country's largest wind development, the 85 MW La Venta II wind project. The presentation also provides a background on the existing Mexican electric system and the potential for wind development in the country.

311. [Mexico Large-Scale Renewable Energy Development Project](#)

Document Type: PowerPoint Presentation

This presentation by Juan Mata in Washington, D.C., during Energy Week 2006, highlights Mexico's efforts to stimulate and accelerate the commercialization of renewable energy

applications and markets in Mexico, particularly at the grid-connected level, in order to reduce greenhouse gas and other emissions while responding to increasing energy demand and imperatives for sustainable economic growth.

312. [Mobilizing Investments in Commercial or Near-Commercial Technologies – Two Successful Stories in Mexico: Wind Energy and Energy Efficiency](#)

Document Type: PowerPoint Presentation

Delivered by Francesco Barnes, Comisión Reguladora De Energia, at the Make Markets Work for Climate meeting in Amsterdam, 2006, this presentation details Mexico's success in implementing wind energy and energy efficiency projects.

313. [Croatia: Report on the In-Depth Review of the First National Communication of Croatia](#)

Document Type: Report

This report examines the emission of greenhouse gasses in Croatia, the source of these emissions, and the potential for reduction.

314. [The Power Sector in Mexico](#)

Document Type: Briefing Points

Power Sector in Mexico is a briefing document discussing the key points of Mexico's electric system.

315. [Presentation of Sharyland Utilities 150 MW Back-to-Back HVDC Tie in Mission-Reynosa: Opportunities for Power Transactions on Both Sides of the Border - May 2008](#)

Document Type: Presentation

This 2008 presentation details the existing interconnections between Mexico and the United States and the opportunities for future border power transactions.

316. [La Ventosa Wind Farm Financing](#)

Document Type: Summary

This summary document provides key details of the financing of the La Ventosa wind project in Oaxaca in southern Mexico.

317. [Conversion of Stoker Fired Boiler Plants into Cofiring FBC Boiler Systems](#)

Document Type: Presentation

Delivered at the Final NetbioCof Conference, July 2007, in Budapest, Hungary, this presentation details the costs and benefits of converting boilers to use biomass fuels.

318. [Wind and Biopower Resource Assessment](#)

Document Type: Presentation

Taken from the Municipal Technical Training for New Jersey's Clean Energy program, this presentation provides the basic knowledge needed to perform wind and biopower resource assessments.

319. [OECD: African Economic Outlook 2003-2004](#)

Document Type: Report

This outlook, developed by the African Development Bank, provides a tool for understanding current economic and social conditions and for highlighting the development prospects for the African continent.

320. [Bio-Energy in Mauritius: Lessons Learned](#)

Document Type: Presentation

This presentation by Sanju Deenapanray, CDM National Project Coordinator, Mauritius, discusses the country's electricity sector, bagasse cogeneration and co-firing, and the potential for CDM in Africa.

321. [DOE Joint BioEnergy Institute \(JBEI\) Website](#)

Document Type: Website

Research at the DOE Joint BioEnergy Institute (JBEI) uses the tools of synthetic biology to produce the next generation of biofuels. JBEI is engineering microbes and enzymes to process the complex sugars of cellulosic biomass into biofuels that can directly replace gasoline.

322. [2008 Wind Technologies Market Report](#)

Document Type: Report

This report, authored primarily by Ryan Wiser and Mark Bolinger of Lawrence Berkeley National Laboratory, provides a comprehensive overview of trends in the US wind power market, with a particular focus on 2008 developments.

Drawing from a variety of sources, this report provides the latest information on a variety of topics, including:

- Wind project installation trends;
- Wind industry developments;
- Evolution of wind power sales prices;
- Comparing the price of wind and fossil generation;
- Installed wind project costs;
- Wind turbine prices;
- Wind project performance;
- O&M cost trends;
- Integration, transmission, and policy developments; and
- Future outlook.

323. [2008 Wind Technologies Market Report Summary](#)

Document Type: Presentation

This presentation by Ryan Wisler and Mark Bolinger of Lawrence Berkeley National Laboratory summarizes their 2008 Wind Technologies Market Report.

324. [Feed-in Tariff Policy: Design, Implementation, and RPS Policy Interactions](#)

Document Type: Report

Feed-in tariff (FIT) policies have been implemented in more than 40 countries around the world and are cited as the primary reason for the success of the German and Spanish renewable energy markets. As a result of that success, FIT policy proposals are starting to gain traction in several US states and municipalities.

This report explores the design and operation of feed-in tariff policies, including a FIT policy definition, payment-structure options, and payment differentiation, while also looking at the potential interactions between FIT policies and RPS policies at the state level.

325. [The American Wind Wildlife Institute](#)

Document Type: Website

The American Wind Wildlife Institute (AWWI) is a first-of-its-kind collaborative nonprofit founded in December 2007 by 20 of the nation's top science-based conservation and environmental groups and wind energy companies. AWWI's mission is to facilitate timely and responsible development of wind energy while protecting wildlife and wildlife habitat. AWWI accomplishes its mission through research, mapping, mitigation and public education on best practices in wind farm siting and habitat protection.

326. [Environmental Management at Olkaria Geothermal Project, Kenya](#)

Document Type: Report

This report looks at geothermal and environmental considerations in Kenya. Geothermal development can have numerous impacts, which if not mitigated can make geothermal resource not environmentally viable. Geothermal utilization can cause surface disturbances, physical effects due to fluid withdrawal, noise and emissions of chemicals. It can also affect the neighboring communities either socially or economically. The environmental impacts can be mitigated by using several mitigating measures like reducing the drill pad sizes, rehabilitating the opened areas by planting grass and trees, and putting in place monitoring programs. The emissions of greenhouse gases to the atmosphere are far less than with most other energy resources. With the new Environmental Management and Co-ordination Act 1999, KenGen is required to put in place an effective Environmental Management System (EMS) and possibly seek ISO 14000 certification to be compliant with all national and international environmental standards.

327. [Biomass for Electricity Generation](#)

Document Type: Report

This paper examines issues affecting the uses of biomass for electricity generation. The methodology used in the National Energy Modeling System to account for various types of biomass is discussed, and the underlying assumptions are explained. The Energy Information Administration's estimation of biomass resources shows that there are 590 million wet tons of biomass available in the United

States on an annual basis; 20 million wet tons (enough to supply about 3 gigawatts of capacity) are available today at prices of \$1.25 per million Btu or less. The average price of coal to electric utilities in 2001 was \$1.23 per million Btu.

328. [Methane Production through Anaerobic Digestion of Various Energy Crops Grown in Sustainable Crop Rotations](#)

Document Type: Report

Biogas production is of major importance for the sustainable use of agrarian biomass as renewable energy source. This report details experiments aimed at optimizing anaerobic digestion of energy crops. The following aspects were investigated: suitability of different crop species and varieties, optimum time of harvesting, specific methane yield and methane yield per hectare. The experiments covered 7 maize, 2 winter wheat, 2 triticale varieties, 1 winter rye, and 2 sunflower varieties and 6 variants with permanent grassland. In the course of the vegetation period, biomass yield and biomass composition were measured. Anaerobic digestion was carried out in eudiometer batch digesters.

The paper outlines possibilities for optimizing methane yield from versatile crop rotations that integrate the production of food, feed, raw materials and energy. These integrated crop rotations are highly efficient and can provide up to 320 million t COE, which is 96% of the total energy demand of the road traffic of within the 25 EU member countries.

329. [SEPCO - Country Case Study - Mexico](#)

Document Type: Report

Prepared by Sustainable Energy Policy Concepts (SEPCO), this report provides a case study of Mexico and its people. The study focuses on Mexico's energy policies applicable to electrification, as well as a study of the country's electric system.

330. [Asociados PanAmericanos - Partners Page](#)

Document Type: Webpage

Captured from the Asociados PanAmericanos, Energy for Sustainable Growth with Social Justice and a Clean Environment website, this document discusses the associations partners who have assisted in developing wind energy in Mexico.

331. [La Ventosa Wind Farm](#)

Document Type: Webpage

Captured from the La Ventosa wind farm website, this document provides the details of the wind farm. The project comprises the development, construction, commissioning and operation of an onshore wind farm in the state of Oaxaca in southern Mexico

332. [GEF - Building the Philippines' Capacity for Grid-Connected Solar Power](#)

Document Type: Fact Sheet

The Cagayan Electric Power and Light Company, or CEPALCO, the third largest electric distribution utility in the Philippines, supplies energy developed through the GEF solar photovoltaic (PV) project. This groundbreaking demonstration project combines hydro- and photovoltaic-based power for homes, schools, hospitals, offices, and other users.

According to the developer, the key to this demonstration project is its strong emphasis on education and capacity building.

333. [CEPALCO - Expression of Interest for the Proposed 1,000 kW Photovoltaic \(PV\) Plant Turn-key Project](#)

Document Type: Expression of Interest

The initial expression of interest developed by CEPALCO in order to receive bids for the turn-key operation of a 1,000 kW photovoltaic facility in the Phillipines.

334. [How the Hydrologic Cycle Works](#)

Document Type: Webpage

How come we never run out of water? This webpage, provided by the Foundation for Water & Energy Education explains how the process of the hydrologic cycle cleans the earth's drinking water.

335. [1,000 MW Run-of-river Hydroelectric Power Plant at Toba](#)

Document Type: Article

A November 2008 announcement by Plutonic Power Corporation and GE Energy Financial Services regarding a bid to develop approximately 1,000 megawatts (MW) of clean, run-of-river hydroelectric capacity in the Toba and Bute Inlets along the southwest coast of British Columbia. With approximate capital costs of US \$4 billion, the joint investment would be the largest single private sector investment in hydroelectric generation in Canada. This announcement was originally published in Renewable Energy World.

336. [Brandywine Creek, Run-Of-River Hydroelectric Project](#)

Document Type: Press Release

This March 11, 2004 press release from Norris Screen discusses the installation of a second-generation coanda intake on the Ledcor Industrial Ltd. Brandywine Creek Hydro Project. This is the first time a coanda intake was used on a run-of-the river hydro project in Canada. The Coanda intake system was chosen for its' ability to finely screen intake water.

337. [Ontario Power Generation, Video on Hydroelectric Generation](#)

Document Type: Web Video

A web video presentation, hosted by Ontario Power Generation, depicting the process for converting falling water into electricity.

338. [Pumped Storage Plant](#)

Document Type: Web Video

Presented by Arizona State University, this video demonstrates the operation of a typical pumped storage hydroelectric plant.

339. [Hydroelectric Facts, Oldest and Largest Plants, Hydroelectric Countries](#)

Document Type: Web Article

A discussion of hydroelectric information hosted by Bamboo.com. The information includes access to information on large hydro projects, such as China's Three Gorges Dam.

340. [Tidal Power](#)

Document Type: Website

Tidal energy is produced through the use of tidal energy generators. These large underwater turbines are placed in areas with high tidal movements, and are designed to capture the kinetic motion of the ebbing and surging of ocean tides in order to produce electricity. Tidal power has great potential for future power and electricity generation because of the massive size of the oceans. This website explores the potential energy of tidal power technologies.

341. [SeaGen Shatters Tidal Generation Record](#)

Document Type: Web Article

Written by Timothy Hurst, this December 2008 article discusses Marine Current Turbine's SeaGen project in the United Kingdom, the world's first commercial scale tidal stream turbine. The website contains animations of the SeaGen turbine in operation.

342. [Heuristic Algorithm with Simulation Model for Searching Optimal Reservoir Rule Curves](#)

Document Type: Journal Article

This study proposes a heuristic algorithm to connect with simulation model for searching the optimal reservoir rule curves. The proposed model was applied to determine the optimal rule curves of the Ubolratana reservoir (the Chi River Basin, Thailand). The results showed that the pattern of the obtained rule curves similar to the existing rule curve. Then the obtained rule curves were used to simulate the Ubolratana reservoir system with the synthetic inflows. The results indicated that the frequency of water shortage and the average water shortage are reduced to 44.31 and 43.75 percent respectively, the frequency of excess release and the average excess release are reduced to 24.08 and 22.81 percent. Originally published in 2009 by the American Journal of Applied Sciences.

343. [Abundant Hydroelectric Potential Lures Corporations to the Mekong River](#)

Document Type: Web Article

According to this July 2008 article, the Mekong River has begun to lure corporations who wish to take advantage of the Mekong's hydroelectric potential in order to reduce manufacturing costs.

344. [Payments for Ecosystem Services: Getting Started - A Primer](#)

Document Type: Report

This primer is designed to provide a solid understanding of what Payments for Ecosystem Service (PES) are and how PES deals work. It is intended for an audience interested in exploring the potential of PES – either as prospective PES sellers themselves or as staff of organizations that work directly with communities or landowners who may be interested in PES. The primer should be read before you set out to design a PES deal, as it provides guidance on conditions under which PES is most relevant and likely to succeed

345. [FERC – Preparing Environmental Documents Guidelines](#)

Document Type: Guidelines

The preparation of quality environmental documents plays a critical role in the hydropower licensing process. These September 2008 guidelines were developed for the Federal Energy Regulatory Commission (FERC) staff as well as applicants preparing an application for a hydroelectric project under FERC jurisdiction.

346. [FERC - Guidelines for Public Safety at Hydropower Projects](#)

Document Type: Guidelines

Conditions may exist at or near hydropower facilities that could be dangerous or conducive to accidents that could cause injury or loss of life. The potential for drowning, accidental deaths and injuries near project facilities and on other project lands and waters has been of concern to the Federal Energy Regulatory Commission (FERC) and project owners for a considerable time. FERC is primarily concerned with the hazards created by project structures and operations.

This March 1992 document describes the types of hazards that can exist at hydropower facilities and the safety devices or other measures that can be employed to enhance the protection of the public.

347. [FERC - Hydropower Licensing](#)

Document Type: Website

This webpage provides the Federal Energy Regulatory Commission's portal for general information on hydropower licensing with regular updates by Commission staff.

348. [FERC - Recreation Development at Licensed Hydropower Projects](#)

Document Type: Guidelines

A March 1996 guide describing the responsibility of licensee's to provide recreation opportunities at hydroelectric projects developed under FERC jurisdiction. The guide includes information on the development of comprehensive recreation plans, as well as applicable recreation policies.

349. [Ghazi Barotha Run-of-River Hydroelectric Project, Pakistan](#)

Document Type: Article

The run-of-river Ghazi Barotha Hydroelectric project is located around 100km from Islamabad, on the Indus River in northwest Pakistan. This article discusses the development of the project and examines how the project was financed.

350. [Hydroelectric Project Licensing & 5 MW Exemptions from Licensing](#)

Document Type: Handbook

FERC's April 2004 handbook provides a step-by-step guide to applying for an original license, a new license or subsequent license (relicenses), and 5 MW exemptions from licensing, and can

be used to improve the quality and consistency of license or exemption applications. The handbook also clarifies the responsibilities of prospective applicants, FERC staff, resource agencies, Indian tribes, non-governmental organizations, and members of the public.

351. [China Three Gorges Project](#)

Document Type: Website

Information regarding China's Yangtze Three Gorges Project (TGP) is available at the project's website. The TGP ranks as one of the biggest hydropower-complex project in the world, and the key project for improvement and development of Yangtze River. The dam is located in the areas of the Xilingxia gorge, one of the three gorges of the river, which will control a drainage area of 1 million km², with an average annual runoff of 451 billion m³.

352. [Best Practice Paper for the International Feed-In Cooperation](#)

Document Type: Report

The European Union has the objective to increase the share of electricity generated from renewable energy sources (RES-E) to 21% of the total electricity consumption in the 27 EU Member States by 2010. This is the core element of Directive 2001/77/EC, which requires each Member State to apply appropriate instruments in order to achieve the national target for RES-E. In the past years several instruments to support the electricity generation from renewable energy sources have been implemented in the EU countries, where the most frequent measure is *feed-in tariff design*, which allows RES-E generators to sell their electricity at a fixed price per kWh.

The paper's goal is to demonstrate the wide range of different feed-in tariff designs applied in the European Union.

353. [LIHI Certificate #23 – Raystown Hydroelectric Project](#)

Document Type: Website

The Raystown Hydroelectric Project (William F. Matson Generating Station) is a 21 MW facility located at the Raystown Dam. The Dam is managed by the U.S. Army Corps of Engineers (Corps). The William F. Matson Generating Station is owned and operated by the Alleghany Electric Cooperative, and licensed by the Federal Energy Regulatory Commission (FERC). This website provides the details regarding the project's licensing and information on its certification by the Low Impact Hydro Institute (LIHI) as a low impact project.

354. [Esteio Engineering and Survey, Brazil](#)

Document Type: Website

Esteio Engineering and Survey's website discussing the development of hydroelectric expansion plans.

355. [Mekong River Commission Secretariat, Vientiane, Laos](#)

Document Type: Website

The Mekong River Commission (MRC) was formed in April 1995 by an agreement between the governments of Cambodia, Lao PDR, Thailand and Viet Nam. The four countries signed The Agreement on the Cooperation for the Sustainable Development of

the Mekong River Basin and agreed on joint management of their shared water resources and development of the economic potential of the river. This website details the work of the MRC.

356. [UNEP - Glacial Lake Outburst Flood Monitoring and Early Warning System](#)

Document Type: Website

The global climatic change during the first half of the twentieth century brought a tremendous impact to the high mountainous glacial environment. Many of the big glaciers melted rapidly and gave birth to the origin of a large number of glacier lakes. Due to the faster rate of ice and snow melting, possibly caused by the global warming, the accumulation of water in these lakes has been increasing rapidly and resulting sudden discharge of large volumes of water and debris and causing flooding in the downstream. Glacial lake outburst flood (GLOF) causes disasters to life and property along the downstream, results serious death tolls and destruction of valuable forests, farms and costly mountain infrastructure. This website discusses the need for glacial monitoring and the potential for catastrophic events in the Himalayan region

357. [NASA World Book: Global Warming](#)

Document Type: Article

A discussion of the causes and impacts of global warming prepared by NASA from their World Book Online Reference Center.

358. [USAID Environmental Compliance – Impact Assessment](#)

Document Type: Website

As a federal government agency, the U.S. Agency for International Development (USAID) is subject to applicable U.S. environmental laws, regulations, Executive Orders and procedures that ensure the wise use of the taxpayer's money. Effective implementation of these through state of the art environmental impact assessment ensures that the development activities USAID undertakes are not only economically sustainable but are protective of the world's environment. This website documents USAID's compliance efforts.

359. [Addressing Water Challenges in the Developing World: A Framework for Action.](#)

Document Type: Report

The 2009 report represents U.S. AID's framework for the overall U.S. Government approach to the world's water challenges, embracing the government's broad and interrelated portfolio of water expertise and approaches.

360. [Lazard – Levelized Cost of Energy Analysis](#)

Document Type: Report

This June 2008 study compares the levelized cost of energy for various conventional and alternative energy generation technologies in order to understand which alternative energy generation technologies may be cost-competitive with conventional generation technologies, either now or in the future, and under various operating assumptions, as well as to understand which technologies are best suited for various applications based on locational requirements, dispatch characteristics and other factors.

361. [WB – ESMAP Technical and Economic Assessment of Generation Resources](#)

Document Type: Report

Energy Sector Management Assistance Program (ESMAP) prepared this 2007 study to convey the results of an assessment of the current and future economic readiness of electric power generation alternatives for developing countries. The objective of the technical and economic assessment was to systematically characterize the commercial and economic prospects of renewable and fossil fuel-fired electricity generation technologies now, and in the near future.

362. [UNEP, SEFI - Public Finance Mechanisms to Catalyze Sustainable Energy Sector Growth](#)

Document Type: Report

This 2005 United Nations Environment Program publication serves to guide policy-makers and public finance agencies through the gaps in financing sustainable energy and provides examples of existing support mechanisms designed to close those gaps. It is not meant as a complete inventory of existing mechanisms. Though it deals mainly with domestic public policy, the report also highlights some examples from economies in transition and developing countries.