USEA

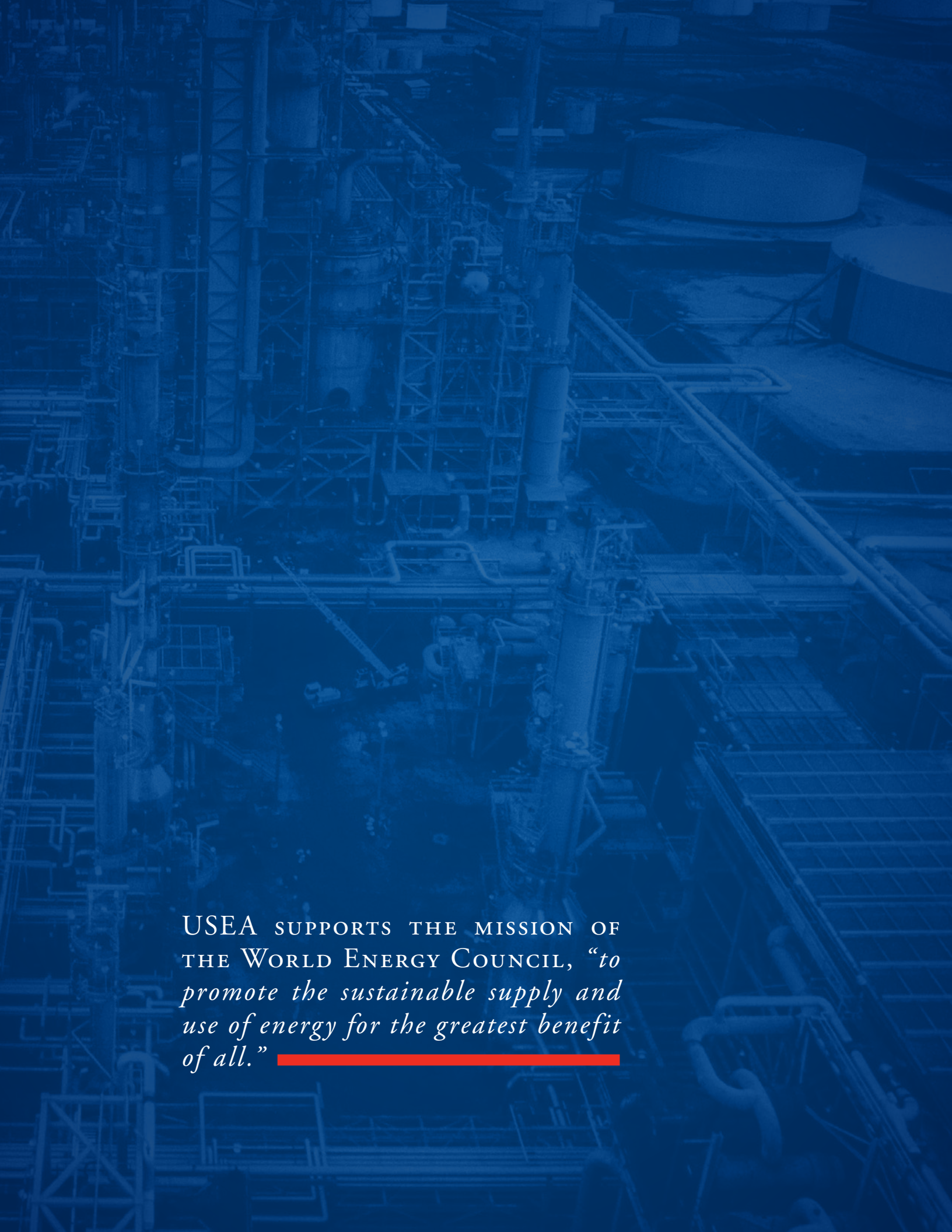
United States Energy Association

TWO THOUSAND SIXTEEN

ANNUAL *Report*

25 Years of International Energy Partnerships

CREATING OPPORTUNITIES FOR U.S. INVESTMENTS, EXPERTS & JOBS



USEA supports the mission of the World Energy Council, *"to promote the sustainable supply and use of energy for the greatest benefit of all."*

Table of Contents

A Message from Chair Vicky Bailey

Dear USEA Members & Friends,

I am honored to serve as the Chairman of the United States Energy Association. As energy development continues to be central to U.S. and global economic growth, I'm especially proud to highlight our organization's accomplishments in this 2016 Annual Report.

We are living in interesting times, and our sector bears unique challenges to energy security, resource management and energy access. There are more than a billion people in the world who live without energy every single day. They cook in iron pots over wood or dung-fired makeshift stoves. Their night is only illuminated by natural light. There is no manufacturing beyond what is handmade. There are no vehicles for transport. Inaccessibility is real. Some live in analog worlds without Internet or cell towers. Our team at USEA is on the ground in developing countries and emerging economies reversing that reality. Concurrently, in the industrialized world, a discussion is ongoing about how to reduce emissions and manage our energy resources.

We will need to serve another 3.4 billion people with electricity while maintaining supply to the existing 3.7 billion consumers as world population is projected to increase by 2 billion people by 2050. In my view, that leaves an opportunity for all types of generation – renewable resources, nuclear power, natural gas, coal, oil and other traditional fuels.

USEA represents 152 members across the energy sector through its advisory, and the team has a unique view and perspective on the various roles for diverse sources of energy and how to advance them. We look forward to continuing our work thanks to the support of our members and partners.

Among international energy stakeholders, USEA specialists have built a brand for our country that represents reliability, economic development and prosperity for U.S. companies and the developing world.

USEA has enjoyed a fruitful partnership with the United States Agency for International Development to that end. In fact, this year we celebrate 25 years with USAID, expanding energy infrastructure around the world, bringing together stakeholders and helping to educate and grow the sector globally. It has certainly been an exciting year, and we look forward to our continued cooperation.

USEA also works closely with the U.S. Department of Energy's Office of Fossil Energy. Teams from USEA and DOE explore opportunities for joint research, technology development, and commercial collaboration.

In 2016, USEA completed its 93rd year as the U.S. member committee of the World Energy Council, the U.N.-accredited energy body. USEA's Executive Director, Barry Worthington, has done an outstanding job representing the country, the organization and the U.S. energy sector in that role. He continues to provide sound counsel on energy development, and changing geopolitics that affect the sector writ large. USEA is a stable resource for global energy ministers, stakeholders and industry in the United States.

2016 was marked by robust debate about climate change, a potential nuclear renaissance, natural gas abundance and price stability, oil production shortfalls but also global oil gluts that drove down prices. We elected President Trump, who promised new priorities for the United States and, in turn, the global energy sector. USEA is at the core of all of these discussions and developments, promoting education about, and access to, all forms of energy worldwide.

We expect a dynamic and collaborative 2017. Thank you for your support.

Sincerely,

Vicky A. Bailey

Chairman
United States Energy Association

Merribel S. Ayres

Principal
Lighthouse Consulting Group, LLC

Vicky A. Bailey

Principal
BHMM Energy Services, LLC

Steve Bolze

President & CEO
GE Power & Water

Gerry Cauley

President & CEO
North American Electric Reliability Corporation

Bruce Culpepper

U.S. Country Chair & President
Shell Oil Company

Tom D'Agostino

Senior Vice President, Strategy & Development
Fluor

Marvin S. Fertel

President, Chief Executive Officer
Nuclear Energy Institute

Jack Futcher

President & Chief Operating Officer
Bechtel

Jack Gerard

President & CEO
American Petroleum Institute

Patricia Fry Godley

Partner
VanNess Feldman

Donald R. Hoffman

President & CEO
Excel Services Corporation

Sheila Slocum Hollis

Partner, Member of the Executive Committee, and Chair
Washington Office Duane Morris, LLP

Michael W. Howard

President & CEO
Electric Power Research Institute

Thomas R. Kuhn

President
Edison Electric Institute

Michael LeClair

President & CEO
Babcock Power Inc.

Dave McCurdy

President & CEO
American Gas Association

Joseph M. Naylor

Vice President, Policy, Government & Public Affairs
Chevron Corporation

Robert P. Powers

Vice Chairman
American Electric Power

Hal Quinn

President & CEO
National Mining Association

Randall B. Roe

Vice Chairman (Ret.)
Burns & Roe

Lydia Thomas

President & CEO (Ret.)
Noblis

Majida Turner

Vice President,
Government Relations
Cheniere Energy, Inc.

Barry K. Worthington

Executive Director
U.S. Energy Association

Dr. Daniel Yergin

Vice Chairman, IHS Markit;
Founder, IHS Cambridge Energy Research Associates

2017 Incoming Board Members

Charles Patton, *Executive Vice President – External Affairs*
American Electric Power

John J. Buchovecky
Partner
Van Ness Feldman, LLP

Robert Fee, *Chief of Staff/Acting Senior Vice President, External Affairs*
Cheniere Energy

Maria G. Korsnick
President & CEO
Nuclear Energy Institute

USEA *Members*

ABENGOA

Advanced Engineering Associates International, Inc.

AECOM

AEGIS Insurance Services, Inc.

Alexandria Energy Associates, Inc.

Alstom

American Coal Council

American Council of Engineering Companies

American Electric Power

American Fuel & Petrochemical Manufacturers

American Gas Association

American Geological Institute

American Petroleum Institute

American Public Power Association

American Society of Mechanical Engineers'

Association of Energy Engineers

ASTM International

Babcock Power

Baker Botts, LLP

Battelle

Bechtel

BHMM Energy Services, LLC

Black & Veatch

Bluewave Resources, LLC

BNL Clean Energy

Brookhaven National Laboratory

Burns & Roe

Cambridge Energy Research Associates

Carnegie Endowment for International Peace

CenterPoint Energy

CENTRUS Energy Corporation

Chemonics

Cheniere

Chevron Corporation

Clifton Larson Allen, LLP

Combined Cycle Journal

ConocoPhillips

ContourGlobal

Deloitte

Duane Morris, LLP

Edison Electric Institute

Electric Power Research Institute

Electric Power Supply Association

Energy & Mineral Law Foundation

Energy Equipment & Infrastructure Alliance

Energy Holdings LLC

Energy Markets Group, Inc.

Energy Policy Institute of Australia

Energy Systems & Technology

ENGIE North America

Engility Corporation

Ernst & Young

ESTA International

Excel Services Corporation

Exelon Corporation

Exxon Mobil Corporation

Fluor Corporation

Gas Systems Engineering, Inc.

Gas Technology Institute

GE Power & Water

Global Development Opportunities, LLC

Gorrelick, Tievy & Associates

Hemisphere Frontiers Consulting, LLC

Hunton & Williams LLP

ICF International

Idaho National Laboratory

IHS Cambridge Energy Research Associates (CERA)

Interstate Natural Gas Association of America

Johnson Controls, Inc.

Jordan Capital Management

KPMG

Lawrence Livermore National Laboratory

Lehigh University

Lighthouse Consulting Group, LLC

Lukens Energy Group - A Black & Veatch Company

Mid-West Energy Research Consortium

Morgan Stanley

Mott MacDonald Inc.

National Energy Foundation

National Mining Association

National Ocean Industries Association (NOIA)

National Rural Electric Cooperative Association

Natural Gas Supply Association

Nexant, Inc.

Noblis

North American Electric Reliability Corporation

Nuclear Energy Institute

Oak Ridge National Laboratory

Oliver Wyman

Peabody Energy

Pepco Holdings, Inc.

Petco International LLC.

Planning & Forecasting Consultants

PricewaterhouseCoopers

Sacramento Municipal Utility District (SMUD)

Schweitzer Engineering Laboratories, Inc.

Shell Oil Corporation

Siemens Corporation

Smart Electric Power Alliance

Solar Energy Industries Association (SEIA)

Somes International

Southern Company

Squire, Sanders & Dempsey LLP

SRA International, Inc.

Stony Brook University

Strategic Power Systems, Inc.

Summit Power Group, LLC

Tennessee Valley Authority

Tetra Tech

The Abraham Group

The Gee Strategies Group

Total Gas & Power

Tulane University

U.S. Agency for International Development

U.S. Department of Energy

U.S. Geological Survey

University of Florida

University of Minnesota Duluth

University of Oklahoma

University of Southern California

VanNess Feldman

West Financial Services, Inc.

Westinghouse Electric Company

INCREASING the **UNDERSTANDING** *of ENERGY ISSUES*

9TH ANNUAL ENERGY SUPPLY FORUM

OCTOBER 6, 2016

The 2016 Annual Energy Supply Forum brought together the country's top energy industry and policy leaders to examine the current state of energy exploration and production, electricity generation, and global and domestic fuel supply. Former deputy secretaries of Energy from both Republican and Democratic administrations laid out challenges for the next Secretary of Energy. Policy leaders reviewed the outlook for Carbon Capture Utilization and Storage and nuclear energy technology.

Clay Sell, former Deputy Energy Secretary for President George W. Bush, says the country needs a carbon tax to provide certainty and efficiency that investors desire.

27TH ANNUAL ENERGY EFFICIENCY FORUM

JUNE 23, 2016

The Energy Efficiency Forum is a nonpartisan, non-commercial event that raises awareness for the many benefits of energy efficiency in buildings and transportation. The theme for 2016 was "Driving Innovation." The Forum highlighted policies, technologies and best practices that expand energy efficiency and energy system innovation. World Energy Council Secretary General Dr. Christoph Frei shared a global perspective on how efficiency can drive down consumption.

PSE&G Chairman, President and CEO Ralph Izzo discusses the important role of energy efficiency in the company's future.

USEA BRIEFINGS

USEA organizes regular briefings to discuss current energy challenges and solutions with the greater Washington, D.C. energy community. We draw from our domestic and international networks of industry experts to orchestrate timely programs on a wide variety of topics, including carbon capture utilization and storage, tax reform to encourage clean energy technology development and energy resource management. In 2016, USEA hosted over 18 briefings, including presentations from this illustrative list of participating companies and agencies:

- Fearnoil Inc.
- University of Chicago
- Pennsylvania State University
- NET Power, LLC
- Element VI Consulting
- Carbon Engineering
- Massachusetts Institute of Technology
- Duke Energy
- Verdigris Capital
- IEA Greenhouse Gas R&D Programme
- Coal Utilization Research Council
- National Coal Council
- Alberta Energy Regulator
- North American Electric Reliability Corporation
- Nexant Global Gas
- Energy Policy Institute of Australia
- Northeast Group, LLC
- World Energy Resources

Geoffrey Holmes, Director of Business Development at Carbon Engineering, covered the technical basis for direct air capture of CO2 and opportunities for commercialization and deployment of the technology.

Neil Kern, Technology Development and Manager of Duke Energy, discussed the changing utility industry and how advanced fossil energy generation could fit.

ANNUAL MEMBERSHIP MEETING & PUBLIC POLICY FORUM

MAY 5, 2016

The Annual Membership Meeting and Public Policy Forum is one of USEA's premier events. It brings together more than 150 USEA members and energy stakeholders, including administration officials, thought leaders, lawmakers, diplomats, and journalists to delve into the current energy landscape.

The 2016 Forum examined trends and challenges to managing our energy resources, bringing those resources to more people for economic growth, and advancing new technology to improve energy production and delivery.

Melanie Kenderdine, the U.S. Energy Department's Director of Energy Policy and Systems Analysis, and Energy Counselor to then-Energy Secretary Ernest Moniz, unveiled findings from the celebrated Quadrennial Energy Review, an analysis of the state of the U.S. energy industry and its infrastructure.

The review revealed a dire need to modernize energy infrastructure for reliability, reduce emissions from energy production and improve delivery efficiency.

American Electric Power's CEO, Robert Powers, gave a detailed presentation about the utility of the future, how to improve the customer experience, and the sobering reality of the pitfalls and the obscurity of the path forward.

The idea of infrastructure improvement for energy delivery dovetailed well with Federal Energy Regulatory Commission Commissioner Colette Honorable's presentation on issues facing the regulatory body from transmission to natural gas pipeline expansion to FERC's role in the LNG terminal approval process.

Conversations pivoted when Thomas O. Melia, Assistant Administrator for Europe & Eurasia at the U.S. Agency for International Development explained how and why we need to help secure Eastern Europe's energy future, a hallmark of the 25 year smart development partnership between USEA and USAID.

As with most USEA events, energy leaders broke news. SPACECOM Executive Director James Causey shared how space technology and research could advance energy development and new technology.

Featured speakers at the 2016 meeting

- **William A. Von Hoene, Jr.**, SVP & Chief Strategy Officer, Exelon Corp.
- **Chairman Stephen G. Burns**, U.S. Nuclear Regulatory Commission
- **Lori Motherwell**, President & General Manager, Shell Cansolv
- **Kurt Bilas**, Executive Director, Government Relations, Midwest Independent System Operator
- **Willem Theron**, General Manager, Business Development, Southern African Energy, Eskom Holdings SOC Limited
- **Vicky Bailey**, Chairman, USEA
- **Sheila Hollis**, Partner, Duane Morris, LLP & Treasurer, USEA

Each year, the Forum also presents the USEA Annual Energy Award to one member of the energy community who has made a significant impact on the industry. In 2016, ExxonMobil Chairman and CEO Rex W. Tillerson, accepted the award.

Tillerson said the energy revolution is driving economic growth, not necessarily the other way around. He underscored the need to sustain the revolution with good policies. Those policies would increase energy access and meet existing global climate goals.

BROADENING ENERGY SECTOR RELATIONSHIPS

U.S. - CHINA OIL & GAS INDUSTRY FORUM

SEPTEMBER 27 – 29, 2016 in Tysons Corner, Virginia

The 16th U.S. - China Oil & Gas Industry Forum, made possible by generous sponsorship from Chevron, ConocoPhillips, Devon, ExxonMobil and the U.S. Department of Commerce, was held in Tysons Corner, Virginia. The U.S. - China Oil & Gas Industry Forum (OGIF) is a public-private partnership involving government and industry representatives from the United States and China. The Forum enables the two countries to meet common goals, including development of secure, reliable and economic sources of oil and natural gas, while facilitating investment in the energy industry. OGIF also seeks to facilitate greater public-private cooperation and create new market opportunities for U.S. companies in China. Successfully building relationships between industry and government has helped to now make China the largest single importer of U.S. crude oil.

The 16th OGIF opened with an informal reception hosted at the American Gas Association. Assistant Secretary for Fossil Energy Chris Smith and China's Deputy Administrator for the National Energy Administration Li Fanrong celebrated the ongoing collaboration between industry and governments to develop each country's oil and natural gas resources. Over 140 decision makers and thought leaders participated in the 16th OGIF.

OGIF is hosted alternately by the U.S. Department of Energy and China's National Energy Administration every year. It features presentations and discussions of key topics and developments in oil and natural gas exploration, production, trade, and regulation.

12TH ANNUAL STATE OF THE ENERGY INDUSTRY FORUM

JANUARY 21, 2016

USEA begins every calendar year with its widely-recognized State of the Energy Industry Forum. In 2016, the 12th annual Forum brought together distinguished representatives from the most influential energy trade associations to discuss dynamic issues facing the energy industry as we entered another election year.

Jack Gerard, President and CEO of the American Petroleum Institute, underscored, in his remarks, the need to lead. He said the United States must sustain its role as a global energy leader and choose priorities and policies that boost our economy and national security for all Americans. He looked back on eight years of the Obama administration policies that encouraged low energy economies and restricted energy choices. President Obama and his cabinet advanced a misconception that the production of fossil fuels was not compatible with environmental protection, he said.

In reality, with a record production of oil and natural gas, the Environmental Protection Agency reported declining emissions of criteria air pollutants and near 20-year lows in greenhouse gas emissions, Gerard said.

Dena Wiggins, President and CEO of the Natural Gas Supply Association, covered 10 topics in 10 minutes about the policies and market issues that stymie natural gas production and supply. The amount of recoverable natural gas has doubled in the past decade, she said.

So, the U.S. has an opportunity. Wiggins discussed new technology to improve production, like the walking rig. She talked about robust natural gas markets such as railroads, fleet vehicles, and Mexico, a major buyer of U.S. natural gas.

Wiggins also celebrated the 50th anniversary of NGSA in 2016.

Because this hallmark event typically occurs around the President's State of the Union address, the Forum allows associations' chief executives to lay out their public policy objectives and explain how their priorities comport with the administration's goals.

Other speakers included:

- **Chet Thompson**, President, American Fuel and Petrochemical Manufacturers
- **Dave McCurdy**, President and CEO, American Gas Association
- **Donald Santa**, President and CEO, Interstate Natural Gas Association of America
- **Tom Kuhn**, President, Edison Electric Institute
- **Marv Fertel**, Fmr President and CEO, Nuclear Energy Institute
- **Hal Quinn**, President and CEO, National Mining Association
- **Dan Dolan**, President, New England Power Generators Association
- **Susan Kelly**, President and CEO, American Public Power Association
- **Rhone Resch**, President and CEO, Solar Energy Industries Association

PROMOTING RELIABLE AND AFFORDABLE *ENERGY ACCESS*

U.S. - EAST AFRICA GEOTHERMAL PARTNERSHIP (EAGP) ENGAGING ETHIOPIA, KENYA, DJIBOUTI

The U.S. – East Africa Geothermal Partnership (EAGP), under Power Africa, is a public-private partnership between the U.S. Agency for International Development (USAID), the Geothermal Energy Association (GEA) and implemented by the U.S. Energy Association (USEA). EAGP's goal is to promote U.S. companies' involvement in geothermal energy development in East Africa.

EAGP aims to advance U.S. business and regional government relationships and support growth of clean geothermal energy by offering assistance at early stages of project development in East Africa. East Africa's Great Rift Valley contains some of the world's premier geothermal resource prospects. As the world leader in geothermal power generation, U.S. companies are uniquely positioned to respond to market opportunities. In the four years since EAGP was established, the number of U.S. companies conducting geothermal work in East Africa has more than tripled. EAGP's work in 2016 focused on removing obstacles to geothermal development in Djibouti, Ethiopia and Kenya. These three key geothermal markets received expert assistance in geothermal geoscience, environmental sustainability, policy and regulatory reform, drilling engineering, power purchase agreements, geothermal reservoir management, public-private partnerships, community engagement and geothermal data management.

KenGen Geothermal Partnership

The geothermal partnership with the Kenya Electricity Generating Company (KenGen) was launched in 2016 to support KenGen's efforts to develop more than 2,500 MW of additional geothermal generation capacity. The partnership focuses on several key challenges facing KenGen, including geothermal reservoir management, community and environmental stewardship, and power plant operational efficiency. The additional projects represent immediate opportunities for leading U.S. companies as they will be developed as public-private partnerships.

Conducted in partnership with the U.S. Department of Energy (DOE), Power Africa, and Lawrence Berkeley National Laboratory (LBL), the partnership with KenGen included consultations with US technical

DOE and LBL staff discuss the geology of the Olkaria Geothermal Field with KenGen geoscientists.

experts to identify key areas for support. In August 2016, geothermal experts from LBL and DOE joined EAGP staff in Naivasha, Kenya for meetings with the KenGen Reservoir Management staff. In November, the first of three embedded internships for KenGen staff commenced at LBL. The KenGen geochemist began with a training program in the TOUGH suite of reservoir modeling softwares produced in the U.S. by LBL. After completing the training, the KenGen staff worked hand in hand with LBL staff to incorporate geochemical data into the Olkaria reservoir model. The TOUGH software enables KenGen to study the geochemical effects of reinjecting geothermal fluids into the Olkaria reservoir. Understanding the reservoir is critical for KenGen to ensure sustainable generation from its existing 570 MW of geothermal generation at Olkaria and to ensuring sustainable supply of geothermal fluids for an additional 500 MW of capacity additions at Olkaria.

EAGP provides drilling supervision support to ODDEG for geothermal drilling at Gale la Goma.

Djibouti Geothermal Partnership

The geothermal partnership with the Office de Djibouti du Développement de l'Energie Géothermique (ODDEG) in Djibouti was launched in 2016 to support Djibouti's efforts to develop 250 MW of geothermal generation by 2025. While Djibouti has the potential to have up to 1,000 MW of geothermal electricity generation, no geothermal power plants have yet been commissioned. ODDEG was created as the main geothermal governmental entity by the President of Djibouti in 2014 in order to identify and perform early stage exploration on geothermal resources. Ultimately, these resources will be allocated to private industry for power plant development. U.S. companies have played a critical role in early exploration in Djibouti and are expected to expand their roles as the resources are developed.

In 2016, EAGP also assisted ODDEG with a data management assessment to ensure that their data collection, storage and sharing practices are in line with international best practices and has provided technical assistance with drilling at the Gale la Goma geothermal prospect in October and November, 2016. EAGP plans to provide continuing support for the ongoing geothermal drilling projects at Gale la Goma, as well as providing technical assistance with implementation of recommendations from the data management assessment.

Ethiopia Geothermal Partnership

The Ethiopia Geothermal Partnership continued in 2016 to support Ethiopia's efforts to develop more than 2,000 MW of geothermal generation capacity. The partnership focuses on several key challenges facing the Geological Survey of Ethiopia, Ethiopian Electric Power and the Ministry of Water, Irrigation and Electricity, including geothermal project planning and management, legal and regulatory frameworks for geothermal development, and geothermal drilling and data management.

Project milestones in 2016 included the ratification of Ethiopia's first Geothermal Resources Development Proclamation (GRDP). GRDP, the nation's first legislation about geothermal project development, was a key stepping stone to developing the country's vast geothermal resources. Several projects owned by U.S. companies had been delayed due to a lack of licensing and regulatory frameworks. USEA, through EAGP, provided technical support to the Government of Ethiopia from U.S. industry and regulatory experts to develop GRDP, which outlines clearly the regulatory bodies and principles for geothermal projects. In addition, it developed policy incentives for private investment in geothermal projects to encourage further involvement from U.S. companies. Passed in June 2016, the law was developed in consultation with key private sector stakeholders, international donor organizations, and donor-funded investment banks. U.S. companies are expected to have significant involvement in the development of a projected 2,000 MW of geothermal generation by 2030.

EASTERN AFRICA TRANSMISSION PLANNING PARTNERSHIP

With the support of USAID, USEA launched the Eastern Africa Transmission System Planning (EATP) Partnership in 2013 designed to provide assistance to the Eastern African Power Pool (EAPP) and the utilities of Ethiopia, Kenya, Tanzania, Uganda, Rwanda and Burundi, to establish sustainable regional planning capacity under the auspices of the EAPP Planning Subcommittee. In its two years since inception, the EATP Working Group has completed over 2,700 hours of technical training and developed East Africa's first integrated and harmonized load flow planning model for the 2020 planning horizon. This provided EATP and EAPP with a powerful tool to calculate net transfer capacity and forecast system investment required to accelerate regional clean energy and trade, while providing each utility with a platform to analyze internal network investments needed to increase electrification and operate their systems in a secure and reliable manner.

L to R: William Polen, USEA; Hans Jaoko, USAID, Lebbi Changullah, Eastern Africa Power Pool present a certificate of training to Dennis Okot, Uganda Electricity Transmission Company.

The Eastern Africa Transmission Planning Partnership – July 2016 Entebbe, Uganda.

UNDERSTANDING NATURAL GAS AND LNG OPTIONS

USEA, in partnership with the U.S. Department of Energy's Offices of Fossil Energy and International Affairs and Power Africa, brought together top private and public sector technical and legal experts in natural gas and liquefied natural gas (LNG) development to create a comprehensive handbook on "Understanding Natural Gas and LNG Options". The handbook, the third volume in Power Africa's "Understanding" series, was designed as a resource for senior civil servants in sub-Saharan Africa to understand best practices in developing natural gas resources.

Natural gas development can help many countries in Africa to meet soaring domestic energy demands while also providing critical revenue for developing countries through the export of LNG to global markets. These projects also present a significant opportunity for U.S. companies to access new overseas markets. The handbook dives into the impacts of pursuing specific project development models, technical capabilities required to develop projects, and the tradeoffs between gas-to-power projects and LNG exports.

Natural gas exploration, production, development, transportation and LNG terminals provide excellent opportunities for U.S. exports of manufactured products and engineering services. Helping develop mature markets for oil and gas development is an important part of supporting U.S. industry.

ENERGY UTILITY PARTNERSHIP PROGRAM

Under direction of the U.S. Agency for International Development (USAID), USEA manages the Energy Utility Partnership Program (EUPP). This program assists USAID-funded countries in the regions of Asia, Africa, Latin America and the Caribbean to develop environmentally sustainable energy production and generation. The program also assists the various overseas energy utilities by improving their operational efficiency and increased financial viability. The goal of the Energy Utility Partnership Program is to increase energy access to the USAID-assisted countries by:

- Improving policy and legal frameworks to establish necessary market conditions for the private sector delivery of energy services and environmental management services;
- Increasing institutional ability to provide or deliver energy and environmental management services in the new and enhanced markets;
- Increasing public understanding of, and participation in, decisions regarding energy delivery and environmental management services, and;
- Transferring best practices and allowing developing country utilities to benchmark themselves against world standards.

These activities aim to highlight U.S. best practices in policy, incentive mechanisms, and program design and implementation by bringing U.S. speakers, experts, and companies to discuss the relevant issues hindering the utilities. These international participants gain an increased understanding of the strategies and mechanisms used by the U.S. and other utilities to plan supply and demand resources to meet future capacity needs.

Tanzanian Natural Gas executives visit Xcel's Cherokee Generating Station outside of Denver, Colorado. Xcel's Michael O'Shea discusses Cherokee's new combined-cycled units during a full tour of the utility's power plant.

NIGERIA METER INSTALLATION TRAINING

The partnership program in Nigeria concluded in 2016 with a final training session conducted in Lagos, Nigeria for staff of the National Power Training Institute of Nigeria (NAPTIN).

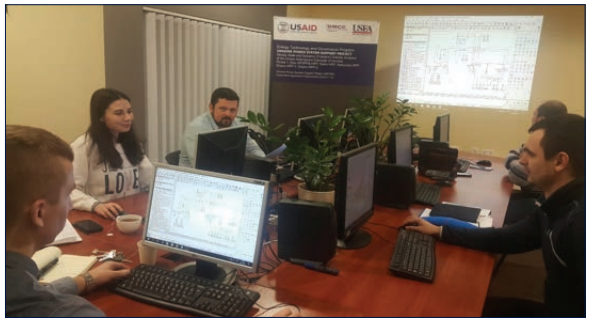
To help initiate the first steps toward the government of Nigeria's metering goals, USAID Power Africa funded the training of the instructors at NAPTIN and USEA coordinated the planning with NAPTIN's assistance. The training was conducted as a direct result of Nigeria's goal of metering all power consumers within the country and training 2,000 Nigerian technicians on metering and installations.

Conducted in coordination with Meralco Power Academy (MPA), the training focused on electrical engineering concepts, industry standards, metering technologies, installation techniques, meter tampering and detection, meter design and construction. The NAPTIN instructors all had electrical engineering backgrounds with years of industry experience so there was a mutual exchange of high level technical information between the NAPTIN instructors and MPA facilitators. The intensive training included a practical hands-on meter installation session and three course examinations. In addition, USAID Power Africa donated various electric meters and MPA donated metering supplies to NAPTIN for future training courses. As a result of the training course and knowledge exchange, the NAPTIN instructors left with new industry knowledge and tangible metering supplies needed to facilitate the much needed meter installation training courses throughout Nigeria.

NAPTIN Instructors Attend the Meter Installation Training with MERALCO Power Academy.

IMPROVING RELIABILITY & EFFICIENCY

UKRAINE POWER SYSTEM SUPPORT PROJECT (UPSSP)



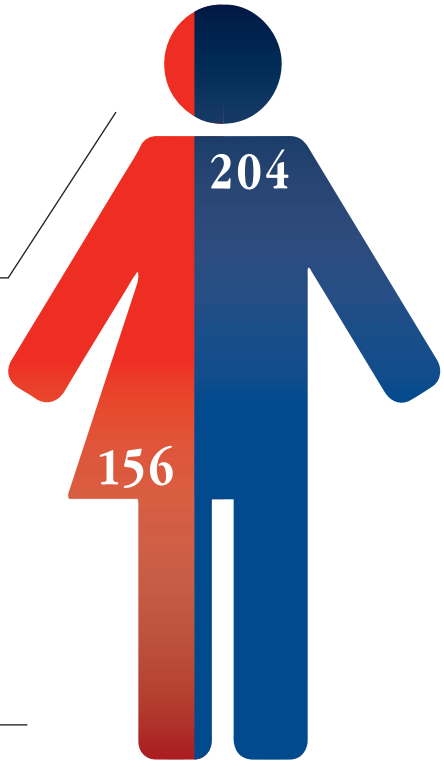
Ukrenergo interns performing dynamic stability analysis on the Dnipr Hydro Cascade.

Vsevolod Pavlovsky, DMCC; Vitaliy Zaichenko, Ukrenergo; Sukru Bogut, USAID and William Polen, USEA present certificate to Tatiana Tkatchuk, Ukrenergo (center) upon completion of Dnirp Hydro Cascade internship.

The Ukraine Power System Support Project is a component of the USAID/USEA Energy Technology and Governance Program. The UPSSP provides ongoing technical support to Ukrenergo, the Ukrainian national transmission company, to ensure system stability in the wake of coal supply disruptions resulting from conflict in eastern Ukraine. In 2016, the UPSSP instituted a 360 hour internship program for five engineers designed to build institutional capacity within Ukrenergo. The interns performed a dynamic stability study of the six hydropower units on the Dnipr River hydro cascade, providing valuable base load energy and balancing services for intermittent renewable generators on the Ukrainian network. Their analysis revealed unstable network conditions that prevent the optimal use of the Dnipr cascade units, potentially causing widespread blackouts in Ukraine. In response, the interns developed and submitted to the Ministry of Energy, recommendations for a set of network upgrade and investments to enable the full use of the Dnipr River cascade generation capacity.

SPLIT OF INTERNSHIP TIME BY MALE AND FEMALE PARTICIPANTS

- *The total number of man hours of the internship program is **360***
- *The number of internship hours received by male students is **204 (57%)***
- *The number of internship hours received by female students is **156 (43%)***



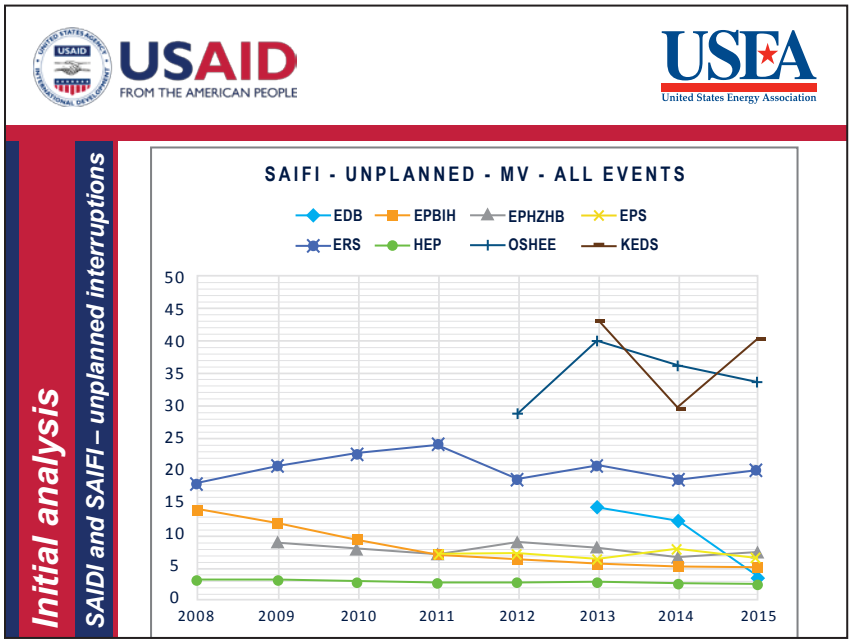
OPERATIONAL ASSESSMENT REPORT FOR KOSOVO "A" THERMAL POWER PLANT

USEA contracted U.S. engineering firm Worley Parsons to conduct the Operational Assessment of the Kosovo "A" power plant, one of two old coal-fired power plants in Kosovo that supply over 90% of the country's energy needs. The plant dates from the late 1960s and early 70's and is significantly past its useful life. The report provides recommendations on how to keep the plant in operation, improve efficiency and reduce its environmental impact for the next 6-8 years until a new plant can be built. The report builds upon an earlier USAID/USEA damage assessment by Black & Veatch following a plant explosion in 2014.

Worley Parsons team conducts Operational Assessment of Kosovo "A" power plant.

SOUTHEAST EUROPE DISTRIBUTION SYSTEM OPERATOR SECURITY OF SUPPLY WORKING GROUP

The USAID/USEA Southeast Europe Distribution System Operator Security of Supply Working Group is a component of the USAID/USEA Energy Technology and Governance Program. The Working Group is assisting electric distribution utilities in Southeast Europe improve the resilience of their networks to increasingly frequent weather related outages.



System Average Interruption Frequency Index (SAIFI) – DSO Benchmarking Report

This year the Working Group completed a study examining the operational challenges distribution utilities face when incorporating increasing amounts of distributed renewable energy resources into their networks. Work was also initiated on updating the Benchmarking Report of over 100 general, reliability, financial and customer service key performance indicators for the DSOs in the region for the three-year period 2013-2015. The first report, completed in 2014 for the period 2008-2012, was the most detailed ever for the region. USEA member, American Electric Power, serves as the volunteer expert to the Working Group and provided technical expertise to both reports.

WHERE WE MAK


BEAUFORT SEA
BERING SEA
ALASKA (USA)
CANADA
HUDSON BAY
BAFFIN BAY
GREENLAND (DENMARK)
GREENLAND SEA
NORWEGIAN SEA
ICELAND
FAROE ISLANDS
UNITED KINGDOM
NORTH SEA
IRELAND
FRANCE
GULF OF BISCAY
PORTUGAL
SPAIN
MOROCCO
ALGERIA
WESTERN SAHARA
MAURITANIA
MALI
SENEGAL
GUINEA
COTE D'IVOIRE
GHANA
GULF OF GUINEA
EQUATOR
UNITED STATES OF AMERICA
PACIFIC OCEAN
GULF OF MEXICO
MEXICO
THE BAHAMAS
CUBA
HAITI
DOMINICAN REPUBLIC
CARIBBEAN SEA
VENEZUELA
COLOMBIA
PANAMA
ECUADOR
PERU
BRAZIL
BOLIVIA
PARAGUAY
CHILE
URUGUAY
ARGENTINA
FALKLAND ISLANDS (UK)
ATLANTIC OCEAN
USAID
WEC
DOE

E A DIFFERENCE

TANZANIA CAPACITY - BUILDING ASSISTANCE PROGRAM

In Tanzania, USEA provides capacity building support through the Power Africa Initiative to the Tanzania Electric Supply Company (TANESCO), Zanzibar Electricity Corporation (ZECO), Energy and Water Utilities Regulatory Authority (EWURA), and the Tanzania Petroleum Development Corporation (TPDC) through workshops and executive exchanges to introduce American technologies and best practices in the energy sector. In 2016, USEA conducted a number of activities under this partnership, such as:

- In February 2016, USEA sponsored on behalf of USAID a delegation to Houston, TX and Washington, DC in order to learn best practices on natural gas investment and strategic planning; market analysis of natural gas pipelines; management and administration of upstream and downstream natural gas; and the planning, operations and management of LNG terminals from some of the top American companies, like Dominion, Bechtel, Shell, American Petroleum Institute, Hunton & Williams LLP, and Cheniere. The delegation visited Cheniere's Sabine Pass LNG Terminal in Cameron, LA to get a firsthand look at the United States' natural gas liquefaction and regasification imports and exports.
- In June 2016, USEA conducted two workshops one in Arusha, Tanzania and the other in Morogoro, Tanzania. The first focused on natural gas contract negotiations and fiscal regimes for participants while the second looked at the Reverse Power Auction system in a competitive bidding framework. Experts from Brazil and South Africa shared their experience setting up reverse power auctions in their respective countries.
- In October 2016, USEA took a delegation to Washington, DC and Denver, CO on an Executive Exchange to meet with a number of U.S. companies, such as: Xcel Energy, Colorado Public Utilities Commission, Washington Gas, Berkeley Research Group, FERC and DOE. While in the U.S. they learned about best practices surrounding gas distribution networks, pipeline maintenance and safety standards, and about the current global LNG market.

Each of these activities strengthened U.S. - Tanzania bilateral relations through the promotion of best practices and technologies to help develop the Tanzanian power sector.

Participants Mr. Ole-Lolubo, Mr. Charles Omujuni, Eng. Joyce Kisamo, Mr. Rwelamila of Tanzania and Mr. Rogness Swai of USAID visit Cheniere's Sabine Pass LNG Terminal in Cameron, Louisiana.

ETHIOPIA

The Ethiopian Electric Utility partnership is focused on loss reduction and substation maintenance to improve the performance and reliability of their system and support the country's economic growth. From May 30 – June 2, 2016, USEA hosted a Metering, Billing and Loss Reduction Workshop to learn about strategies, technologies and techniques for improving distribution utility performance from their peers at utilities and meter and software manufacturers. The participants discussed a range of issues, including strategies for reducing technical losses, combatting electricity pilferage and meter tampering, and new information and data analysis technologies. The participants also learned about the importance of customer service and proactively engaging the community to achieve loss reduction targets and protect the utility's revenue over the long-term. The workshop highlighted three important topics: the importance of loss reduction to system stabilization; the relationship between smart metering, AMI and revenue enhancement; and billing and collections best practices, prepayment systems and new technologies. The workshop participants all agreed meter maintenance and inspection programs need to be implemented as a first step to generating more revenue for the utility. After the program concluded, all participants agreed that a pilot project with smart meters should commence. dVentus, a U.S. owned company, will begin the pilot in Addis Ababa in 2017.

NELSAP

A regional partnership with the Nile Equatorial Lakes Subsidiary Action Program (NELSAP) in East Africa began in 2016. The first activity was a scoping mission April 21-26 to discuss the new regional partnership and determine their key needs. NELSAP stated that a big issue was contract terminations and ensuring projects are done on time and within budget. The region has an aggressive target to greatly increase the amount of generation, but transmission lines have not been completed in time - stranding generation and delaying development. NELSAP requested that USEA focus on contract and project management for regional interconnection projects, and so USEA organized a workshop from November 7-11 to address these concerns with participants from Rwanda, Uganda, Kenya, Tanzania, and the regional organizations: EAPP and NELSAP. Speakers from MISO, Mott McDonald, Van Ness Feldman, and Berkeley Research Group covered best practices in RFPs, prequalification of bidders, managing multiple projects, schedule and cost changes, preventing scope creep, and dispute resolution procedures. Moreover, several key barriers to U.S. investment in the region including procurement laws and underbidding were recognized as serious issues and discussed at length. This with partnership with NELSAP has strengthened regional relations and has promoted collaboration between East African countries and the United States.

SOUTHEAST EUROPE COOPERATION INITIATIVE (SECI) TRANSMISSION SYSTEM PLANNING PROJECT

The USAID/USEA Southeast Europe Cooperation Initiative (SECI) Transmission System Planning Project is a component of the Energy Technology and Governance Program. SECI supports a regional approach to network planning within the Energy Community of Southeast Europe through the development of common transmission planning tools and methodologies.

In 2016, SECI completed the study "Network and Market Perspectives to 2030: Assessing the Impact of Regional Connections to Italy" which evaluated the impact of planned undersea interconnections between Southeast Europe and Italy on electricity flows in the region and its effects on forecasted wholesale electricity market prices. The study required the development of the first ever cost production model for Southeast Europe which was completed during the first phase of the study.

Results from the 2016 study indicate that market coupling of Southeast Europe with Italy will cause significant changes in traditional power flow patterns in the SECI region. The study reveals that regional power flows will experience significant congestion upon commissioning of the undersea cable and recommends new transmission investment alleviate bottlenecks on the Romania-Serbia and the Bosnia-Herzegovina-Croatia borders.

KETRACO

USEA has conducted capacity building activities for the Kenya Electricity Transmission Company Limited (KETRACO) to support developing a methodology to calculate the wheeling tariff for the EKT transaction.

The Ethiopia-Kenya-Tanzania (EKT) transaction will involve the sale of electric energy by Ethiopian Electric Power to TANESCO, and the wheeling of electric energy through the Kenyan transmission system by KETRACO. At the conclusion of several meetings held with the key players involved from all three countries, the end result will be to provide a:

- Transmission service agreement for long term firm wheeling transmission service for the Ethiopia-Kenya-Tanzania transaction
- Tariff that includes a transmission service rate for those receiving the service

Meetings continue to be held to present the required documents that have been reviewed and approved by all relevant stakeholders. This transaction promises to be the beginning of many more similar transactions in sub-Saharan Africa as many more countries begin to export power to their neighbors.

BLACK SEA REGIONAL TRANSMISSION SYSTEM PLANNING PROJECT (BSTP)

With the support of USAID, USEA established the Black Sea Regional Transmission Planning Project (BSTP), a regional approach to transmission system network planning, identifying priority transmission investments, enhancing electric power trade, harmonizing planning principles and promoting analysis results to policy and regulatory authorities. This year's efforts focused on supporting the development of cross border markets for the balance of energy and capacity in the Black Sea region. In 2016, the BSTP completed an Impact Assessment of Regional Balancing Integration in the BSTP Network that identified current approaches to system balancing and enhanced the understanding of potential future regional balancing market structures and opportunities for cross-border exchange of balancing services. In addition, the BSTP added a new Short Circuit planning model to its suite of regional simulation models, enabling utilities to conduct short circuit analyses designed to minimize damage to system components and limit the extent and duration of service interruptions in the Black sea region.

The Black Sea Transmission Planning Project – March 2017, Tbilisi, Georgia

SOUTH ASIA REGIONAL INITIATIVE FOR ENERGY INTEGRATION (SARI/EI)

The USAID SARI/EI program, which covers Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka, promotes energy security in South Asia by performing in three focus areas: 1) cross border energy trade, 2) energy market formation and 3) regional clean energy development. As one of the implementing partners of SARI/EI, USEA executed a series of activities in 2016 under the Energy Utilities Partnership Program umbrella. The activities focused on the sharing of best practices in cross-border electricity trade, electricity markets and planning and operations – with a goal to improve regional energy cooperation and energy integration in the region.

As part of the SARI/EI program, the U.S. Energy Association conducted an executive exchange to Bhutan for executives from Bangladesh, Nepal, and Pakistan to examine the environmental and economic aspects of hydro power development. The final day of the tour included a site visit to the 1,200-MW Punatsangchhu 1 hydroelectric project, constructed as a joint venture of the governments of India and Bhutan.

Through cooperation from PTC Financial Services Ltd and the National Power Training Institute, USEA organized a Techno-Economic Hydro Power Project Appraisal Training for executives from Afghanistan, Bangladesh, Bhutan, Nepal, and Pakistan. USAID/India Mission Director Ambassador Jonathan Addleton (second from left) presents at the closing ceremony.

CLEAN ENERGY INTEGRATION

GREENING THE GRID (GTG) INDIA SYSTEM OPERATORS PARTNERSHIP

As part of a study tour to New York, Massachusetts, Washington, DC, and Minnesota, heads of the Indian Ministry of Power, Central Electricity Regulatory Authority, and the national system operator, met with the New York Independent System Operator to discuss how New York has addressed large-scale renewable energy integration and maintained grid stability. Discussion highlighted New York's Reforming the Energy Vision (REV) – a comprehensive energy strategy to make the state's power system cleaner and more resilient.

USAID and India's Ministry of Power recently rolled out a major new initiative to build the capability of India's power systems and manage the large-scale integration of renewable energy into its power grid at an acceptable cost. This new clean energy project called Greening the Grid, focuses on: (1) rigorous analytical modeling of reforms to integrate 175 gigawatts of renewable energy by 2022; (2) supporting six grid-integration pilots to test the building blocks for improved integration of renewable energy in India's power grid; and (3) facilitating exchanges between U.S. and Indian regulators, grid operators, and utilities to strengthen the enabling environment. Access to advanced technology is among the most significant drivers of success in building the capacity of the Indian power system. Therefore, USEA's GTG System Operators Partnership relies on the expertise of U.S. industry partners – power technology providers, system integrators, engineering, procurement and construction companies, and financial entities – to identify peer-to-peer innovations. In 2016, U.S. partners (including National Grid, Con Edison, MISO, the New York Public Service Commission, NYISO, the New York State Energy Research and Development Authority, FERC, DOE, and others) hosted a high-level government of India delegation for a week-long study tour on U.S.-approaches towards renewable energy integration. Later that year, USEA member Xcel Energy conducted peer reviews of two state and regional load dispatch centers evaluating operations and operator tools to better handle large volumes of renewable energy on the grid. USEA also conducted a baseline study of the Indian system operators' readiness and a series of workshops on variable energy integration – all utilizing the expertise of its U.S. industry partners.

ARMENIAN GRID CODE

In 2016 the USAID/USEA Energy Technology and Governance Program completed a final draft of the Transmission Network Grid Code of the Republic of Armenia in cooperation with the Armenian Public Service Regulatory Commission. The Grid Code constitutes an important component of the investment promotion framework for the Armenia electric sector as it codifies in a single document for investors, the rules for establishing new transmission connections, network operations, power dispatch, emergency restoration, and required network planning studies. The draft is expected to be presented to the Armenian Ministry of Energy and Natural Resources for presentation to parliament in 2017.

SENELEC DISPATCH TRAINING

Senegal has actively pursued reform policies in the energy sector with a strong focus on promoting renewable energy. This emphasis on renewable energy has resulted in the adoption of various legislation with and aggressive goal of an electrification rate of 50% in rural areas, 96% urban areas, and 70% of national level by 2017.

As the country of Senegal continues to add additional renewable source of generation onto their grid, it is essential to equip the system operators with the skill of dispatching variable renewable energy onto their transmission grid. USEA organized the training of 12 SENELEC system operators in an extensive eight day training provided by Brussels-based engineering consultancy company, Tractebel Engineering, which has investments in the U.S.

The objective of the training was to understand power system stability strategies, to provide an introduction to the fundamental concepts of power systems and to guide the trainees through the use of didactic and interactive simulation tools in order to experiment, understand and master the phenomena studied. The goal was to enhance the knowledge of the trainees such that the concepts learned can be put to service and leveraged in their day-to-day activities. The initial days of the training focused on the fundamentals of power system operations and then progressed to an advanced training oriented towards real-time simulation training and case studies on the Senegal grid. This simulation training was key to the operators as it showcased particular systemic phenomena on the Senegalese power system.

SENELEC system operators participating in dispatch training.

REGIONAL WORKSHOP ON ADVANCING THE USE OF WIND AND SOLAR FORECASTING

USEA conducted two USAID funded regional workshops in conjunction with the National Renewable Energy Laboratory (NREL) as part of the Greening the Grid initiative. System operators from nine different countries in Latin America and the Caribbean engaged with U.S. and European experts on meteorological forecasting and operational methods for integrating renewable energy into their electricity grid in January 2016. Participants from ten countries in Asia, as well as Senegal, participated in a similar workshop in February 2016. Speakers from the U.S. and Europe included Xcel Energy, Sharply Focused, NREL, Green Powered Labs, and EnerginetDK who emphasized the need to get a forecast as early as possible and urged participants to create a knowledge base, obtain raw data on generators and actual output, and mandate data requirements in vendor contracts and PPAs. If contracts are in place without data requirements, they suggested that operators use it as an opportunity to renegotiate when suppliers ask for something. At the end of the workshop, participants used the knowledge gained during the workshop to create action plans for the immediate, short-term, medium-term, and long-term. As a result of the workshops, USAID India contracted the services of Sharply Focused to present during a follow-on workshop and to provide a report to the Government of India on recommendations as they integrate large scale renewables onto the grid.

USEA SUPPORTS THE PARTICIPATION OF INTERNATIONAL ENERGY EXPERTS AT THE ASIA CLEAN ENERGY FORUM

Thousands of clean energy professionals and government officials throughout Asia, as well as the U.S. and other countries, attended the Asia Clean Energy Forum (ACEF). The Forum is one of the premier events which allow countries invested in clean energy development the ability to network and share their knowledge and experience. As part of the Pre-Forum activities, several key international organizations held Deep Dive sessions focused on an array of topics including clean energy technologies, policy issues, and major challenges ahead.

USEA supported the U.S. Agency for International Development (USAID) in conducting two Deep Dive pre-forum activities that focused on geospatial analysis and renewable energy grid integration. The Deep Dive workshops were organized in conjunction with the National Renewable Energy Laboratory (NREL) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). Through the EUPP, USEA sponsored the participation of 25 clean energy stakeholders from Vietnam, India, Thailand, Laos, Kazakhstan, Indonesia, Bangladesh, and Cambodia.

The Enterprise Geospatial Toolkit (EGsT), developed by NREL, is a desktop and web application framework that makes targeted geospatial analysis simpler for energy stakeholders. Second Deep Dive session focused on early actions that can be taken to facilitate integration of variable renewable energy into power systems.

GCC FUNDING

As part of USAID's Global Climate Change funding, USEA was tasked with organizing a workshop on reverse power auctions in Astana, Kazakhstan. The workshop aimed to introduce entities from Kazakhstan to reverse power auctions, held specifically for renewable energy. Best practices from Brazil, Mexico, and South Africa were shared alongside general worldwide trends in reverse auction systems.

CONTRIBUTING to NATIONAL GOALS

BUILDING CONSENSUS ON CARBON CAPTURE, UTILIZATION AND STORAGE (CCUS) AND CLEAN ENERGY SYSTEMS

To further its initiative in increasing the understanding of energy issues domestically and internationally, USEA launched the "Building Consensus on Carbon Capture, Utilization and Storage (CCUS) and Clean Energy Systems." While dramatic progress continues to be made in developing CCUS and clean energy technologies, neither the progress achieved to date nor the full capability of CCUS and clean energy systems is widely understood - yet it must be if CCUS and clean energy systems are to have a significant global impact. During 2016, the USEA Consensus program participated in numerous activities. Highlights from past year's most successful endeavors are summarized below.

Briefing Series

USEA regularly organizes informational briefings on CCS and CES-related issues that are of interest to our members and the greater Washington, DC CCS/CCUS community. These briefings provide USEA members and DC energy sector professionals with regular opportunities to exchange information, ultimately leading to a greater understanding among sector stakeholders of the developments impacting the CCS/CES community.

In 2016, USEA completed a total of 20 briefings related to CCUS/CES technology or policy. Some notable examples include:

- Howard Herzog, Senior Research Engineer in the MIT Energy, Initiative, "Financing CCS Demonstration Projects: Lessons Learned from Two Decades of Experience"
- Neil Kern, Technology Development Manager in the Duke Energy Emerging Technology Office, "The Changing Utility Industry and How Advanced Fossil Energy Generation Could Fit"
- John Gale, General Manager of IEAGHG, "CCS Post Paris"
- Janet Gellici, CEO National Coal Council, "CO2 Building Blocks: Assessing CO2 Utilization Options"

All presentations are available on our website for future reference.

Carbon Sequestration Leadership Forum (CSLF)

USEA Executive Director, Barry Worthington, and Program Coordinator, Amishi Kumar, supported the 2016 CLSF Mid-year Meeting in London, United Kingdom from June 27th-30th. USEA gathered solicited input from various stakeholders and circulated a draft message to interested parties for further feedback. This stakeholders' message was then delivered by Barry Worthington to the policy working group meeting. USEA furthered this initiative by having hosted a workshop to analyze current CSLF stakeholder relationships and subsequently developed a new method of stakeholder engagement at the request of the CSLF secretariat. The workshop convened approximately 15 key stakeholders to the USEA offices on September 16th. Recommendations gathered from this workshop improved the initial regional engagement model crafted by USEA. The final recommendations were later delivered by Barry Worthington, to the policy taskforce at the CSLF 2016 Annual Meeting in Tokyo, Japan on October 7th.

Research Experience in Carbon Sequestration (RECS)

In 2016, EnTech Strategies, LLC with support from USEA organized the RECS scholarship based educational program. The program is focused on building U.S. excellence and facilitating linkages with key countries to enhance CCUS capacity worldwide and enable more robust international collaborations. In 2016, RECS convened approximately 30 participants for an eight-day interactive and interdisciplinary program with an alumni network comprised of approximately 400 young professionals.

United Nations Economic Commission for Europe (UNECE)

USEA Executive Director, Barry Worthington, was re-elected Chair of the UNECE Group of Experts on Cleaner Electricity Production from Fossil Fuels for a second two year term. During a committee meeting in Geneva in 2015, a work plan was adopted to include a workshop on clean energy from fossil fuels entitled "Critical Element of the Green Bridge Initiative: Advanced Fossil Fuel Technologies," which was held from 9-10 March 2016 in Astana, Kazakhstan.

Wyoming-Shanxi Coal Bed Methane Symposium

USEA organized a two day workshop on Coal Bed Methane in Laramie, WY on June 21st & 22nd, 2016. The Wyoming-Shanxi CBM Symposium convened subject matter experts, industry representatives, federal officials, and state agencies from the US and the People's Republic of China (27 delegates) to discuss coal bed methane. Furthermore, USEA sponsored an academic speaker, Maria Mastalerz, from Indiana Geological Survey to discuss the CBM development in the Illinois basin.

Yanchang Exchange

From December 5th through the 9th of 2016, the Yanchang study tour convened subject matter experts, industry representatives, and government officials from the United States and the People's Republic of China. The aim of the Yanchang Petrochemical Executive Exchange was fourfold:

- to promote technology exchange between the United States and China;
- to advance technology deployment and collaboration;
- to expand opportunities for bilateral commercial project development;
- And to provide technical information specific for the Yanchang CCUS demonstration project.

With support from the U.S. Department of Energy, USEA continues to addresses the need for global public outreach and consensus building on carbon capture, utilization and storage.

WORLD ENERGY COUNCIL | USEA United States Energy Association

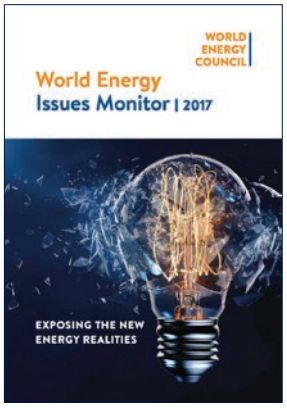
The Council aims to promote the sustainable supply and use of energy for the greatest benefit of all people

The U.S. Energy Association (USEA) is the U.S. member of the World Energy Council (Council). The two have been partners since 1923.

While the global energy landscape has certainly changed and blended, both organizations continue to support the use of all energy sources and a prudent resource management plan.

USEA Executive Director Barry Worthington and WEC Secretary General Christoph Frei, support partnerships and advancement of energy knowledge across the spectrum of issues.

The Council, among its robust research, releases two significant reports — **the Issues Monitor, and the Trilemma Report.**



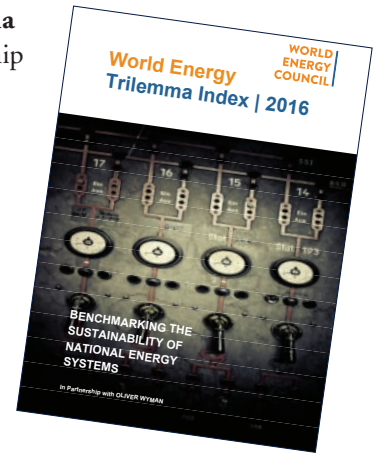
The **2016 Issues Monitor** reflects the views of more than 1,200 senior energy company executives and policymakers in more than 90 countries, and it provides critical intelligence for project developers and policymakers.

The report assesses the degree of impact and uncertainty around more than 40 key issues in the energy sector in four categories: Macroeconomic risks, Geopolitics and Regional Issues, Business Environment, and Energy Innovation and Technologies.

In 2016, industry leaders said they were most concerned about commodity prices, the ongoing effects of economic slowdown and continued climate framework uncertainty, while issues of new market design and electric storage are rapidly gaining prominence.

The report also finds that the ability to finance the transition to a more sustainable energy system keeps energy leaders busy at work.

The Council said there is a growing acknowledgement that adaptation to new resilience challenges (cyber threats, extreme weather risks and the energy-water nexus) will require attention and funding, while smart innovation and regional interconnection are also being recognized as being key parts of the solution. Key regional disparities exist in the Issues Monitor; most noticeably for issues of coal, corruption, large scale hydro and nuclear, but also resilience issues such as the energy-water nexus and cyber threats.



The **World Energy Trilemma Index**, produced in partnership with Oliver Wyman, ranks 125 countries on their ability to provide sustainable energy through 3 dimensions: **energy security, energy equity (accessibility and affordability), and environmental sustainability.**

In 2016, the US ranked 14 overall. It received an "A" for energy security, ranking fourth in the world. It received an "A" for energy equity, ranking 13 among the 125. But the U.S. received a grade of "C" for environmental sustainability ranking 73 out of 125.

https://www.worldenergy.org/data/issues/

HONORING INDUSTRY LEADERS:
2016 UNITED STATES ENERGY AWARD

Rex W. Tillerson

Chairman & CEO
ExxonMobil

Each year, the U.S. Energy Association recognizes one exceptional member of the energy community who has made a significant impact on the industry.

In 2016, ExxonMobil Chairman and CEO Rex W. Tillerson, accepted this award for his leadership in transforming the energy sector.

He became Chairman and CEO of ExxonMobil in 2006 and led the corporation until the end of 2016, after which he was named U.S. Secretary of State.

While accepting his award at the U.S. Energy Association Annual Meeting and Public Policy Forum, Tillerson said the energy revolution is driving economic growth, not necessarily the other way around.

He underscored the need to sustain the revolution with good policies. Those policies would increase energy access and meet existing global climate goals.

Throughout his career, Tillerson has shown his commitment to the mission of USEA and the World Energy Council-to "promote the sustainable supply and use of energy for the greatest benefit of all."

Tillerson said, "This mission statement makes clear the challenges we face as an industry. And it also reinforces a fundamental truth about energy…that energy is the lifeblood of economic growth and the foundation for advancement and improvement in the quality of life of peoples the world over. Our mission has never been more important – especially as economies around the world struggle to grow, and millions of people are unemployed or underemployed."

Former USEA Chairman and President of Bechtel Oil, Gas and Chemicals Inc., Jack Futcher, said "ExxonMobil, through the leadership of Rex Tillerson, takes on the largest and most complex energy projects around the globe and does so successfully. Rex's induction in the National Academy of Engineering is a testament to a distinguished career."

Tillerson was chairman of the American Petroleum Institute and appointed by the U.S. Energy Secretary to the National Petroleum Council. He was also named Energy Intelligence Petroleum Executive of the Year in 2015 and is a distinguished alumnus of the University of Texas at Austin.


USEA
United States Energy Association
United States Energy Award
2016
Rex W. Tillerson


United States Energy Awa
2016
Rex W. Tillerson
Exxon Mobil Corporation
Presented
May 5, 2016
The National Press Club
Washington, DC
USEA

HONORING INDUSTRY LEADERS:
2016 USEA INDIVIDUAL ENERGY VOLUNTEER AWARD

Mr. Theron was the recipient of the 2016 Volunteer of the Year Award.

Willem J.C. Theron

General Manager, Southern African Energy Unit
Eskom

USEA was proud to present the 2016 Volunteer of the Year Award to Willem J.C. Theron. He was instrumental in the development of energy trading in the Southern Africa Power Pool (SAPP) and the implementation of Eskom's strategic direction in Southern Africa and beyond. Mr. Theron has been employed at Eskom for 35 years and holds various tertiary qualifications in engineering and commerce. Prior to establishing Eskom's International Energy Trading function in 1995, he focused on system operations at their National Control Centre.

Mr. Theron is currently accountable for all new business development opportunities in the Southern African Development Community (SADC) region, which include MPNK, STE, and other hydro and gas projects in Mozambique. He also serves as a member and official on various SAPP governance committees and is passionate about the socio-economic empowerment of the African people and industrialization of Africa as a whole.

A major key to the success of USEA's Energy Utility Partnership Program is the willingness of energy professionals to volunteer their time and share experiences and knowledge with developing country utilities. It is through this type of involvement that Mr. Theron and USEA have been able to assist many utilities in developing their energy markets.

In 2006, Mr. Theron began a decade-long relationship with South Asia energy leaders in USEA's South Asia Regional Initiative for Energy program. Through a series of executive exchanges and workshops, Willem showcased the positive impacts that transparent energy markets and cross-border energy trade can have on reaching energy security. Willem demonstrated regional and team approaches to meet energy needs, cope with political and economic boundaries, and overcome the challenges facing South Asia's power-deficit situation. Some of the activities Mr. Theron has helped orchestrate include:

- Introduction to Electricity Markets – Executive Peer Exchange to Southern African Power Pool and Eskom (2014, South Africa)
- Executive Exchange for South Asian energy executives on Cross Border Exchange of Electricity (2012, Bhutan)
- Executive Exchange to the 36th Southern African Power Pool Coordination Meetings (2011, Zimbabwe)
- Executive Exchange on the Southern African Power Pool Cross Border Exchange of Electricity (2010, Botswana & South Africa)
- South Asia Regional Energy Transmission Partnership Executive Exchange on the Cross Border Exchange of Electricity (2009, Nepal)
- Introduction to Electricity Markets – Executive Peer Exchange to the Southern African Power Pool and Eskom Power Pool (2006, South Africa)
- Developing Regional Energy Market for Energy Security Conference (2006, India)

HONORING INDUSTRY LEADERS:
2016 USEA CORPORATE VOLUNTEER AWARD

Midcontinent Independent System Operator, Inc.

The Midcontinent Independent System Operator, Inc. (MISO) is a not-for-profit, member-based organization administering wholesale electricity markets which provide customers with valued service, reliable and cost-effective systems and operations, dependable and transparent prices, open access to markets, and planning for long-term efficiency. MISO ensures reliable operation of and equal access to high-voltage power lines in 15 U.S. states and the Canadian province of Manitoba. As a Regional Transmission Organization, MISO assures consumers of unbiased regional grid management and open access to the transmission facilities under MISO's functional supervision.

MISO exists to provide an independent platform for efficient regional energy markets. Since 2001, MISO has fostered wholesale electric competition in the region, created greater system reliability, and established coordinated, value-based regional planning.

MISO manages one of the world's largest energy and operating reseves markets, with $37 billion in gross annual market charges. It was approved as the nation's first regional transmission organization in 2001. The non-profit organization is governed by an independent Board of Directors and is headquartered in Carmel, Indiana.

MISO has been involved in USEA partnerships since 2000, including:

- Hosted the Western Africa Power Pool to discuss power pool operations and organizational structure.
- Participated in a 5 day workshop and presented on transmission system operations, wind integration, and energy markets to Ketraco in Nairobi, Kenya.
- Hosted an executive exchange for nine high-level officials from the National Transmission & Dispatch Company (NTDC) of Pakistan to review best practices in transmission utility commercial operations, as part of USAID's Energy Policy Program (EPP).
- SECI – transmission system planning in Southeast Europe.
- Black Sea Transmission Project (BSTP).

USEA Celebrates 25 Years of Energy Partnership with USAID

USAID FROM THE AMERICAN PEOPLE

USEA United States Energy Association

SUCCESS STORY

Smart Grid Technology Brings Power to Local Residents Stuck in the Dark

The technology increases the efficiency and speed when responding to power outages.

Ilija Andric,President, Gornij Zovik local community in Brcko, Bosnia and Herzegovina says thanks to the United States, his village enjoys safe, reliable electricity without going dark every time there's a storm.
USEA/Komunalno Brcko

"In the past year, there have been fewer complaints by local residents and therefore, [they enjoy] a better quality of life."

To the people of Brcko, Bosnia and Herzegovina, unpredictable power outages were a way of life that impacted businesses, schools, and homes. Any time there was a storm or technical failure, people could lose power for lengthy periods of time.

Together the United States Agency for International Development (USAID) and its partners, the United States Energy Association (USEA), Schweitzer Engineering Laboratories (SEL) and Brcko Komunalna, the electric utility serving the Brcko District of Bosnia and Herzegovina, supported a smart grid technology pilot project that has dramatically improved the reliability of electricity for families and businesses in Brcko.

Schweitzer Engineering's technology can instantaneously identify the location of power outages caused by storms and technical failures on one of Brcko's distribution lines. When power went out prior to the project, employees would have to drive or walk along the power lines until they found the problem. The new technology not only reduces the number of trucks and employees needed to restore service, but also results in improved customer service and reduced emissions and expenses associated with the use of diesel powered backup generators.

"Thanks to this technology, our engineers know the precise location of a network fault, which improves the speed of repair on the distribution network and reduces the duration of interruptions in the supply of electricity," said Samir Snagic, executive manager of Brcko Municipality's power utility division.

The project has reduced the number, frequency and duration of customer outages compared with the same period last year. Customers on the affected line have experienced a 51% reduction in the number of outages and a 58% reduction – or about 8 hours -- in the duration of outages. The success of the project in Brcko can be applied to other regions with similar issues accessing electricity.

Radivoye Djuric, President of the Potocari local community says the project has significantly improved electricity service. "After years of problems, frequent power cuts and long lasting interuptions, residents in this local community have a regular supply of electricity," he said with a smile.

Telling Our Story
U.S. Agency for International Development
Washington, DC 20523-1000
http://stories.usaid.gov

"When we started, we were working with vertically-integrated, state-owned utilities that were legacies of the Communist era," Polen said. "When we arrived on the scene in 1992, they were bankrupt." *-Will Polen*

Twenty-five years ago, in 1991, two years after the fall of the Berlin Wall, the Soviet Union was dissolving, and the former Soviet republics were just trying to survive.

It's something Will Polen, senior director of the U.S. Energy Association, remembers vividly.

He was on the front lines with the U.S. Agency for International Development as the partners joined to rebuild Europe's electric grid.

The goal was to improve the individual republics' electricity infrastructure and disconnect it from the Soviet grid, which was basic and run-down.

"When we started, we were working with vertically-integrated, state-owned utilities that were legacies of the Communist era," Polen said. "When we arrived on the scene in 1992, they were bankrupt."

"They were cannibalizing their systems because they hadn't been able to afford maintenance. So for probably fifteen years before we arrived, the networks were deteriorating."

Polen said the grid now looks nothing like it did twenty-five years ago. "We were able to help disconnect the utilities in that region from the Soviet grid, and then connect those utilities to the European grid to become a stable part of Europe," he said.

Polen said Eastern European countries and the former Soviet republics responded to a completely different set of incentives and policy drivers for the development of their utilities. USEA, together with other implementing partners of the agency, was tasked to help change the mentality of folks that worked in these utilities.

So, they formed a utility partnership program that was a people-to-people program for utility managers. USAID and USEA began work with Hungary, the Czech Republic, Slovakia, and Poland. A utility from each country was paired with a U.S. utility whose consumers most reflected the culture of a particular European partner.

For example, Commonwealth Edison in Chicago was paired with the Polish Power Grid Company because of the large Polish population in Chicago and at the utility. Utility executives from each country would travel to and from Europe for seminars, workshops and internships. They traveled to exchange information and learn best practices.

The three other partnerships included: Houston Lighting & Power with CEZ, the Czech Republic's utility; Southern Company with Slovakia Electric Power (SEP); and New England Electric System with Hungarian Power Companies Ltd (MVMRt).

From the modest beginnings twenty-five years ago to now, USEA has had more than fifty partnerships in over thirty countries. U.S. electric utilities have voluntarily helped change the world and changed people's lives for the better, he said.

"We found people in Eastern European and the Soviet utilities were really good engineers, probably the best engineers in the world because they had kept those systems running, even though they were cannibalized and hadn't maintained them for twenty-five years before we even came on the scene," Polen said.

We worked with state-owned utilities that were legacies of the Communist era.

"What they were lacking was background of utility management in a democracy with a market-oriented economy. They were lacking everything from human resources and incentivizing people to pull for the best interest of the company, to accounting, to financial control systems, to metering and payment systems and billing systems."

"They had never had any experience with that and never needed to because they were working in a socialist economy and government."

Barry Worthington, USEA's executive director, recalled the team's first trip to Europe with USAID in 1992, which included a colleague from the North American Electric Reliability Council, now the North American Electric Reliability Corporation or NERC. "There were no cell phones, much less smart phones, and we were all at the train station in Bratislava, Slovakia, where no one spoke English. It was interesting."

Worthington said one of his proudest moments was when CEZ, the electric company in the Czech Republic, received its bond rating. "CEZ was the first utility from the region to earn a bond rating. They were partners with Houston Lighting & Power (HL&P), a partnership I was personally very involved with structuring," he said. "The HL&P Treasurer took the CEZ chief financial officer to New York City and introduced him to his Wall Street contacts," Worthington said.

(Cont. on page 43)

Dipka Bhambhani is the director of communications for the U.S. Energy Association, a bipartisan energy advisory representing 151 companies across the energy sector. Dipka manages internal and external communications and media relations.

ing the European Electric Grid
33)

ere three big issues utilities in that region had to
th – cost-based prices, frequency stabilization, and
ntal emissions from coal-fired power generation,
Worthington. While these issues were settled fifteen
day utilities all around the world are trying to figure
integrate wind and solar and other intermittent sources
ower grids.

rogram director Albert Doub joined USEA's team
twenty-five years ago as a temporary employee. He
ion and its electricity grid have changed dramatically
-five years. The most emotionally wrenching thing
from the West was the poverty of the people in the
ublics.

ere very poor. We would walk into their office build-
aint would be peeling off the walls," Doub said. "The
ould be off. The hallways would be dark, and it would
ey wouldn't have the heat on for very long, if they had
Just seeing that was their day-to-day life was hard."
gs have changed. "The energy sector in that region has
ch more sophisticated. The introduction of renewable
focus on climate change, that really wasn't there when
Doub said.

we're doing now is more regionally focused, and it's a
phisticated," he said.

e moved from more basic utility operations to more
tem planning. It has gotten more technical. We do
nalysis, modeling, and planning, human resource
t, customer service, financial management," he added.
, it was more getting their power plants working,
their coal plants up to speed so they could operate.
focusing at all on the climate change aspects of it,"

er century ago, the actual work, arranging meetings,
communicating with various partners had an added
e said.

n't have Internet, or email and the fax machine used
curl-up paper," he said. "When you're dealing with
es to plan these types of activities, it is very different."
re a lot of phone calls and waking up in the middle of the night to communicate. Plus, a lot of these countries would turn their fax machines off at night," Doub said.

Polen said, "Twenty-five years ago, these utilities that we're working with were large, overstaffed legacies of the Soviet and socialist systems they grew up in. They were vertically integrated with generation, transmission and distribution in one single entity. That wouldn't comply with today's marketplace or with European directives that require unbundling of these utilities. We've seen a complete shift in their physical disposition. They are no longer vertically integrated utilities."

"They largely comply with European requirements. We're now seeing competitive electricity trade, which we would never have seen twenty-five years ago. These are tremendous accomplishments the agency should take credit for. I think American expertise has led this change."

Worthington said building energy infrastructure with our allies is critical to our national security. "The region has been known to have unreliable energy supplies which have been used as political weapons. Energy security contributes to national security in every country in the world, particularly Europe and Eurasia," he said.

Eastern Europeans were the best engineers in the world: they had kept those systems running.

Doub agreed. "Europe and Eurasia, those are our strongest allies, and for them to develop their infrastructure and to be more powerful makes all of us more powerful."

Worthington said this has been a successful partnership, and the scope of work has expanded. USAID and USEA work together to build energy infrastructure in more than thirty countries.

And there are two developing trends intertwined, Worthington said.

Deploying advanced technologies is one. Using these technologies to further reduce emissions is the other. "The rate of change in technology development and deployment is unprecedented," he said.

"Electricity generation, nuclear storage, advanced sensors, carbon capture and storage, renewables, and technologies still to be discovered will change every aspect of the electricity business, and the energy business more broadly, very rapidly," Worthington said.

RABLE LINES

"[The linear model of radiation's health effects], LNT, the source of the radiophobia, is a disproven assumption, and it is time to educate the public through a sustained effort to remove LNT from regulations and policies. Experts have collected and analyzed the large quantity of extant data demonstrating that LNT is false non-science."

– Nuclear Energy's Critical Illness. By Charles Pennington and Jeffry Siegel. Last Month's PUF.

"CEZ was the first utility from the region to earn a bond rating. They were partners with Houston Lighting & Power (HL&P), a partnership I was personally very involved with structuring." *-Barry Worthington*

"The energy sector in that region has become much more sophisticated. The introduction of renewable energy, the focus on climate change, that really wasn't there when we started." *-Albert Doub*

Barry K. Worthington

Executive Director

Brian Kearns

Chief Financial Officer

Will Polen

Senior Director

Marjorie Jean-Pierre

Program Director

Albert Doub

Program Director

Andrew Palmateer

Program Director

Dipka Bhambhani

Director of Communications

Sharon Lucas

Senior Accounting Coordinator

Anthony Bitonti

Senior Program Coordinator

Tricia Williams

Senior Program Coordinator

Sarah M. Blanford

Senior Program Coordinator

Caity Smith

Senior Program Coordinator

Natalia Fominykh

Senior Program Coordinator

Beata Bialy

Senior Program Coordinator

Johanna Koolemans-Beynen

Senior Program Coordinator

Sarah Thorne

Senior Program Coordinator

Ashley Ndir

Senior Program Coordinator

Marina Barnett

Senior Program Coordinator

Scena Nayak

Program Coordinator

Sara Burback

Program Coordinator

Heather Greenley

Program Coordinator

Elise Voorhis

Program Coordinator

Toni Lee

Administrative Coordinator

USEA STAFF

USEA employs an experienced group of skilled professionals committed to supporting our organization's mission.

Not pictured: **Linda Lee**, *Receptionist;* **Kim Grover**, *Executive Assistant to Barry Worthington*

A special thanks to USEA Intern, Alyssa Bovitz, for her contribution to this publication.

United States Energy Association

1300 Pennsylvania Avenue, NW
Suite 550, Mailbox 142
Washington, DC, 20004

t: (202) 312-1230

f: (202) 682-1682

reply@usea.org

www.usea.org

@USEnergyAssn