Welcome to the EISPC and the National Council on Electricity Policy Annual Meeting

The Meeting and Roll Call will begin at 1:00 PM ET Wi-Fi Information: Connect Wirelessly to the network: The Dupont Circle Hotel Then open a new webpage and click on "Connect"

> April 25 – 26, 2016 Dupont Circle Hotel, Washington, DC

NCEP Annual Meeting 4/25/2016

Acknowledgement

Thank you to the U.S. Department of Energy and the National Energy Technology Laboratory for supporting this work



Welcome and Business Items

- Welcome and Overview
- Call Meeting To Order
- Review of NCEP and Guiding Principles
- Discussion and Q&A

Hon. Elizabeth B. "Lib" Fleming South Carolina PSC NCEP President

Discussion: Welcome and Business Items

Hon. Elizabeth B. "Lib" Fleming South Carolina PSC NCEP President

Miles Keogh NARUC Research Lab Director

Jan Brinch EISPC Director

NCEP Annual Meeting 4/25/2016

Re-Launching the National Council on Electricity Policy (NCEP)

A Bit of History

- Eastern Interconnection States' Planning Council (EISPC)
 - ARRA Funded 2009 2015
 - Focus on electric transmission, gas-electric infrastructure, resource diversity, energy resiliency and reliability
 - Convening power across the Eastern Interconnection to provide inputs to the Eastern Interconnection Planning Collaborative (EIPC) and conduct studies on key interconnection-wide issues
 - Collaborative discussion, deliberation, and debate
 - EISPC to continue as a coordinating function of the National Council on Electricity Policy (NCEP)
- *Guiding Principles* approved by the EISPC membership
- EISPC's leadership serves as NCEP Executive Committee, with the addition of Mountain and Pacific Representatives

NCEP's Guiding Principles

To provide technical assistance to states, regions, and multiple stakeholders To improve understanding of electricity technologies, markets, programs, and policies

To support the deployment of clean, reliable, and affordable electricity infrastructure

To improve interstate and intra-state coordination on electricity issues

To continue the activities of EISPC – transmission planning and coordination

National Council on Electricity Policy (NCEP)



NCEP's Benefits

- A "marketplace of ideas" encouraging multiple viewpoints, not requiring unanimity but rather an exchange of perspectives
- A forum for unbiased information, not a policymaking organization
- No lobbying or legislative advocacy
- A place to discuss and debate "outside the box" ideas, for peer exchange, and to improve electricity policy for the betterment of all

NCEP Organizational Structure

Executive Committee: Composed of seven regional representatives, plus one ex-officio EISPC at-large member

 Policy Committee: Self-identifying and composed of participating state officials

NCEP Activities

- Sponsor facilitated meetings, trainings, and other information exchange
- Conduct research and education activities
- Host webcasts and other outreach efforts
- EISPC to continue its interface with EIPC

 Five work areas, identified and supported by EISPC members:

- Air and Energy Resources
- Reliability, Resilience and Recovery
- Resource Adequacy and Diversity
- Transmission

The EIPC and the Transmission Work Group

Jan Brinch EISPC Director

David Whiteley EIPC Director (via the phone)

Denis Bergeron Maine

Hon. Ed Finley North Carolina



State Collaboration with The Eastern Interconnection Planning Collaborative (EIPC) and the Transmission Work Group

Denis Bergeron – Maine Public Utilities Commission

Presentation to NCEP Annual Meeting April 25, 2016



What is the Eastern Interconnection?





What States Does it Cover?





Who Plans It? NERC certified Planning Coordinators. Current members of the EIPC are:

Alcoa Power Generating Duke Energy Carolinas Duke Energy Florida Duke Energy Progress LGE/KU Florida Power & Light Georgia Transmission Corporation ISO-New England JEA (Jacksonville, Florida) Midcontinent ISO (MISO) Municipal Electric Authority of Georgia New York ISO PJM Interconnection PowerSouth Energy Coop South Carolina Electric &Gas Santee Cooper Southern Company Southwest Power Pool Tennessee Valley Authority

(and since Order 890 – their stakeholders)



- FERC Order 890: Coordinated, Open, and Transparent Planning
- NERC "Standard" TPL-001-4: Provides guidelines for transmission reliability planning
- But the planning practices of the Planning Coordinators - in the Interconnect varies substantially
- EIPC is the <u>only</u> opportunity to model the system under a common set of assumptions and methodology to observe how it works as a whole



Why is This Important to States?

- Power doesn't flow in straight lines
- It doesn't stay within state borders
- It doesn't stay within PA borders
- "Stray" power flows can have economic and reliability consequences
- The EIPC roll up provides states an opportunity to observe how the system works as a whole



Update on Current Activities

David Whiteley – EIPC Executive Director

Presentation to NCEP Annual Meeting April 25, 2016

EIPC Formation

- In the east, several Planning Authorities started a dialog in early 2009 to establish an interconnectionwide planning process for the coordinated roll-up and expansion of existing regional plans
- Those discussions evolved into the EIPC
- EIPC as an organization officially formed in the fall of 2009





EIPC Purposes

- Develop an open and transparent process through an interactive planning dialogue with industry stakeholders
- Foster additional consistency and coordination in the Eastern Interconnection
- Provide an interface with other interconnections
- Provide policy makers and regulators with current and technically sound transmission planning information



EIPC Scope of Activities (1)

- Modeling and developing input on regulation and policy issues from an interconnection-wide view
- Serve as a resource to facilitate analysis of FERC, DOE, and even State transmission policy issues, providing a broad interconnection view of the potential impacts resulting from possible regulations
- Focus on interconnection-wide (not regional) similar to the role that WECC and ERCOT play



EIPC Scope of Activities (2)

- Overview and analysis of regional transmission plans using an integrated model of the Eastern Interconnection
- Modeling to help explain broader interconnectionwide impacts and to provide policy makers and regulators with current and technically sound information
- Work closely with state and federal regulators on issues of interest to them



What's a "Roll-up"?

- From the beginning, EIPC has used the term "Roll-up" to described the technical planning activity required to combine the Regional Planning Coordinator transmission system models into a single model for the entire Eastern Interconnection
- The benefits of this process are:
 - Coordination of the Regional plans as they are assembled Do the pieces fit?
 - Analysis of the resulting interconnection-wide model Does the model make sense? Does it perform correctly?
 - Facilitate discussion among Regional planners Learn from others
 - Make the resulting models available for federal, state, and local planning uses as well as for analysis and studies by EIPC



Past EIPC Studies and Activities

- 2010: Roll-up of 2020 Summer regional plans as input to DOE grant work
 - Modify Roll-up case to accommodate Stakeholder Specified Infrastructure
- 2010 to 2015: DOE Interconnection Studies Grant
 - Three distinct parts Phase 1, Phase 2, and Gas-Electric Interface
 - Scenario analysis (aka "planning") vs developing "a plan"
 - Develop process for stakeholders to access study data considered to be CEII
 - Completely transparent process
 - Interface with WECC and ERCOT on their grant work



Past EIPC Studies and Activities (2)

- 2013: Roll-up of 2018 and 2023 Summer regional plans
- 2014: Scenario analysis using 2018 and 2023 cases
 - Heat wave and drought
- 2014 and 2015: Provide input to DOE on the Annual Transmission Data Report
- Provide input to NERC on the revised MOD 32 model development process
- Provide input to DOE-NREL on Eastern Renewable Integration Study and use of EIPC Roll-up modeling as basis for that study



Past EIPC Studies and Activities (3)

- Numerous presentations to industry groups on study results and current work activities
 - Continue to maintain a transparent process through interconnectionwide and regional stakeholder activities
- Provide input to the DOE Quadrennial Review process
- Maintain coordination with EI states through EISPC



Current EIPC Studies

- 2015: Roll-up of 2025 Summer and Winter regional plans
- 2016: Scenario analysis using the 2025 cases
- Provide input to DOE QER version 2 effort
- Provide input to DOE Annual Transmission Data Report
- Development of a new, simplified approach to sharing CEII information for FERC Order 1000 and NERC MOD 32 purposes
- Development of an EIPC-reviewed production cost data base
- Continue interface with industry groups e.g. EISPC and the new National Council on Electricity Policy
- Continue to support FERC staff



2016 Scenario Analysis

- Roll-up of 2025 Summer and Winter regional plans completed in early 2016
 - Gap analysis indicated where solutions would be needed for reliability purposes
- EISPC scenario suggestions
 - Scenario 1 Increased EE, DR, DG
 - Scenario 2 Increased Canadian Hydro imports
- Agreement to put Scenario 1 on hold various reasons
- Scenario 2 still under discussion. Key issues are:
 - Assumptions on sink points in U.S.
 - Test the existing system or hypothesize new transmission?
 - Practical versus theoretical results



Possible Future Directions

- Continued development of Roll-up cases
- Scenario studies based on stakeholder input
- More in-depth analysis of Roll-up cases, beyond power flow reliability studies, possibly to include production cost simulation and sensitivity analysis
- Study of an integrated model based on regional CPP compliance plans when state and regional directives are more clear
- Continue philosophy that interconnection-wide processes supplement regional planning requirements rather than attempt to replace them





Questions

- Call or email Dave Whiteley
- 314-753-6200
- <u>d.a.whiteley@eipconline.com</u>
- eipconline.com





Energy Zones Mapping Tool

Jan Brinch EISPC Director

Vladimir Koritarov Argonne National Laboratory

Update on the Energy Zones Mapping Tool

Eastern Interconnection States Planning Council and National Council on Electricity Policy Annual Meeting

Washington, DC April 25-26, 2016

Presented by:

Vladimir Koritarov, Argonne National Laboratory









Energy Zones Mapping Tool Recent Activities: Webinars

- Webinars include a short presentation and a live EZMT demo highlighting specific model features:
 - -Suitability Modeling of Natural Gas Plants
 - -Corridor Analysis
 - -Generating and Using Reports
 - -New Corridor Route Generation Tool
 - -Planning a Potential Energy Zone
 - -Energy Planning and Climate Change
 - Demonstrated to National Park Service
 Trails GIS group

All webinar recordings are available at: <u>EZMT YouTube Channel</u>



The EZMT was featured in a <u>White House Report</u>



Home Page (http://ezmt.anl.gov)

Energy Zones Mapping Tool Recent Activities: Data Updates and Licenses

- Commercially-licensed data
 - -All previously licensed commercial data content updated through 2015

-March 2016 activities:

- Discontinued AWS TruePower wind resource data
- Added Argonne's wind resource data
- Discontinued Platts power plant, substation, and pipeline data
- Renewed Platts transmission line data
- Added energy infrastructure data from Energy Information Administration (EIA)
- Updated models
- All data updates cover full U.S. extent and sometimes North America
- Report updates are in progress


Energy Zones Mapping Tool Recent Activities: User Interface

- User interface enhancements
 - Added print tool
 - Corridor tools enhanced (details later)
 - New reports added (details later)
 - Models adjusted and recomputed as input data were updated
 - Added "Draft" and "Final" option for model computations
 - Updated Electrical Transmission report for full data extent (North America)

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Print Tool Dialog

Energy Zones Mapping Tool Recent Activities: Corridor Tools

- Corridor tool enhancements
 - Added corridor suitability modeling with three default models
 - Added automated corridor route generation tool
 - Viewshed Analysis: Sample Appalachian Trail (mapping and modeling layers)

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Appalachian Trail - Visual Magnitude



Landscape visibility from the Appalachian Trail (visual magnitude)



Example Route

points

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Energy Zones Mapping Tool Recent Activities: Energy-Water Nexus

New Energy-Water/Climate Data

- Power Plant Water Use
- Projected Temperature Change
- Trends in Flood Magnitude
- Cooling Degree Days (4 layers)
- Aqueduct Water Risk
- Aqueduct Water Stress Projections
- Thermoelectric Power & Thermal Pollution Model results (Northeast)
- Water Availability, Cost, and Projected Future Use
- New Energy-Water/Climate Reports

Temperature Chanc

- Power Plant Water Use
- Climate Change
- Water Availability, Cost, and Projected Future Use

Over the last : emperatures use for cooling from predomin energy deman days, and inco Assessment.	20 years, annual average temperature: were above average during 12 of the is and decreased energy use for health hantly heating to predominantly cooling id for cooling is projected to increase of eased use of air conditioners as peopl bg. 116).	s typically have been higher than the ast 14 summers. Increases in tempe g. These impacts differ among regio g in some regions with moderate clim over the next century due to population le adapt to higher temperatures (Sou	e long-term average; nationally, rature will result in increased energy ins of the country and indicate a shift hates. For example, in the Northwest on growth, increased cooling degree irce: <u>U.S. National Climate</u>
Demands for emperatures oad is distribu or peak elect	electricity for cooling are expected to in and high temperature extremes. The e ited among electricity, natural gas, hes ricity, additional generation and distribut explanations. Electricity at pask demand	ncrease in every U.S. region as a res electrical grid handles virtually the en ating oil, passive solar, and biofuel. In ation facilities will be needed, or dem	sult of increases in average tire cooling load, while the heating n order to meet increased demands and will have to be managed throug
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Sample section of Climate Change report

Cooling Degree Days - Higher Emissions (2070-2099)



Projected average change in cooling degree days for 2070-2099 compared to the period 1971-2000.

Baseline Water Stress



Baseline Water Stress (Withdrawals/Available Flow)

Energy Zones Mapping Tool Recent Activities: Other New Data

- Digital Elevation Model
- American Bird Conservancy
 - Proposed Global Important Bird Areas
 - Global Important Bird Areas
 - Critical Bird Habitat (ESA-Listed)
 - Corridors and Key Bird Habitat Areas
- Offshore Wind Energy Lease Areas



Offshore Wind Energy Lease Areas with Offshore Wind Turbine Model Results



Elevation and Slope



American Bird Conservancy Data

Energy Zones Mapping Tool Recent Activities: Extend Geographic Scope to Entire U.S.

- November 2015: DOE decision to begin extending the geographic scope to the rest of the U.S.
- Phase 1: Mapping Library
 - Approximately 10% of the mapping library extended
 - Prioritized by level of usage of data and use in reports
 - Completed layers
 - Annual average wind speed (80m and 100m) for North America
 - 13 GIS data layers from the EIA, including power plants and pipelines
 - About 25 layers in progress
 - Updated home page and sub-pages to reflect national scope and recent changes
- Phase 2: Power Plant and Corridor Models, and Policy Database (FY17)



Argonne wind speed data for North America



EIA power plants for U.S. and Platts transmission lines for North America

Energy Zones Mapping Tool Planned and Proposed FY16 Activities

- Argonne FY16 Work Plan
 - System Hosting and Data Updates (funded)
 - Energy Corridor Analysis and Modeling Enhancements
 - Energy-Water Nexus Data and Analytics for Western U.S.
 - Commercially-licensed Data (funded)
 - Increase Geographic Extent to All U.S. States (Phase 1)
 - Interoperability Improvements
- Collaboration with Sandia National Laboratory (FY16 Work Plan)
 - Decision Support: Utilize EZMT to investigate potential challenges in power plant siting within the NEEM regions for EIPC development scenarios, including water-related factors at HUC-8 level.
- Bureau of Land Management (BLM): Section 368 Corridor Analysis
 - EZMT demonstrated to BLM and Western Electricity Coordinating Council (WECC)
 - Will be useful for analysis
- Western Regional Partnership
 - EZMT webinar planned for June

Who Uses the Energy Zones Mapping Tool?



- Since public launch: 1,365 registered users
- Recent increase in registrations and renewals, coinciding with:
 - New changes to geographic extent
 - Updates of wind and energy infrastructure data
 - Energy corridor analysis in western U.S.
 - Newsletters and webinars

Energy Zones Mapping Tool Argonne-Sandia Collaboration on EWN Data and Analysis

> Supplemental slides provided by Vince Tidwell (Sandia)

Exceptional service in the national interest





Exploring the Energy-Water Nexus in the Eastern Interconnection

NNS

ENERGY

Vince Tidwell and Barbie Moreland

Sandia National Laboratories

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Pilot Study: Vulnerability of Power Plant Fleet to Extreme Weather

- Pilot study being conducted in Cedar River basin in Iowa.
- Cooperation of DOE National Labs, Corps of Engineers, NOAA and local stakeholders.
- Future scenarios consider changes to:
 - -Climate, and
 - -Land cover/land use
- Multiple, coupled models will be assembled to assess changes to:
 - Water quantity,
 - -Water quality, and
 - Flood vulnerability.
- Assess vulnerability and adaptation strategies for basin energy infrastructure.



Water Supply Availability

- Mapping water availability, cost and future use in East for over 1200 watersheds.
- Four sources considered:
 - Fresh surface water,
 - Fresh groundwater,
 - Wastewater, and
 - Brackish groundwater.
- Western U.S. completed previously.
- Data can be used to inform siting of future thermoelectric power.



Brackish Groundwater



Consumptive Demand 2010-2030



Water Footprint of EIPC Scenarios

- Will calculate changes in thermoelectric water withdrawal and consumption associated with the three primary EIPC/EISPC planning scenarios.
- Estimated changes in water use are due to:
 - -Projected power plant retirements, and
 - -Additions of new generation.
- Will associate changes in projected thermoelectric water use with available water supply to identify potential energy-water nexus issues.

Example from Western Electricity Coordinating Council's long-term transmission planning: Differences in thermoelectric water use for five future planning scenarios



Integration of Data in Energy Zones Mapping Tool



- Adding a range of water-related data to the Energy Zones Mapping Tool:
 - Power plant water withdrawals and consumption,
 - Water availability, cost and future use (by watershed),
 - Climate projections from National Climate Assessment
 - Ambient temperature,
 - Precipitation, and
 - Extreme weather.



Electricity for Water Services

- Mapping electricity use to provide key water services at county level:
 - -Large-scale conveyance,
 - -Agricultural pumping,
 - -Wastewater, and
 - -Drinking water.
- Data helps inform projections of future electricity demand.

Example of Energy for Water Mapping in the Western United States





- Register for, and access the tool here: <u>http://ezmt.anl.gov</u>
- Questions/comments: <u>ezmt@anl.gov</u>

Break

Meet back at 2:45 PM Eastern

NCEP Annual Meeting 4/25/2016

U.S. DOE Laboratory Briefing and the Grid Modernization laboratory consortium (GMLC)

> Jan Brinch EISPC Director

David Meyer U.S. DOE

Vladimir Koritarov Argonne National Laboratory

Stan Hadley Oak Ridge National Laboratory **Update:**

DOE's Grid Modernization Laboratory Consortium

David Meyer Senior Advisor April 25, 2016



GMLC Portfolio: 88 Projects, \$220 Million, 3 years





Office of Electricity Delivery & Energy Reliability

55

Five Questions to Consider re Grid Modernization

- 1. How can we develop an inclusive functional map of our electricity supply system one that shows all of the system's interactive components, and how specific parts strongly influence the operation of other parts?
- 2. Looking ahead five years, what are our system's most important strengths and weaknesses?
- 3. What important changes would we like to see become operational in the next 5-10 years?
- 4. If we decide to make changes, how can we protect ourselves against the risk of triggering unintended consequences?
- 5. How can we devise a least-regrets strategy for going forward?

DOE POC: <u>David.Meyer@hq.doe.gov</u>



Vladimir Koritarov, Argonne NL Slides



DOE Grid Modernization Initiative – Institutional Support Task

EISPC/NCEP Meeting April 25, 2016 - Washington, DC

Vladimir Koritarov Center for Energy, Environmental, and Economic Systems Analysis Energy System Division (ES) ARGONNE NATIONAL LABORATORY 9700 South Cass Avenue Argonne, IL 60439 Tel: 630-252-6711 Koritarov@ANL.gov



Grid Modernization Initiative Focuses on Six Key Areas



Institutional Support Area has Four Main Activities

- Provide Technical Assistance to States and Tribal Governments
- Support Regional Planning and Reliability Organizations
- Develop Methods and Resources for Assessing Grid Modernization: Emerging Technologies, Valuation, and Markets
- Conduct Research on Future Electric Utility Regulations



Activity 1: Provide Technical Assistance to States and Tribal Governments

Target achievements:

- Provide technical assistance to all states and tribes to inform their decision making for electricity policy, accelerating policy innovation in at least seven states.
- Provide technical analyses to at least 10 states—including guidance on how to consider new technologies such as distributed energy resources—allowing them to establish formal processes to review utility distribution system plans.
- Assist at least 10 other states in developing comprehensive energy system

plans.



Technical Assistance to States: Topic Area and Issues

Topic Area	Issues
Cross-cutting Issues	 Resource valuation and cost/benefit analysis Market designs and rules that enable development and appropriate valuation of clean energy resources Future electric utility regulation (see technical area 4) Early-stage planning for electrification of transportation
Energy Efficiency	 EE Policy frameworks (e.g., EERS, requirements to acquire all cost-effective efficiency, IRP) DSM planning processes and administration options for: program design, cost-effectiveness screening, potential studies, EM&V, strategies for financing EE State-administered programs: Energy-saving performance contracting, building codes, benchmarking and disclosure
Demand Response	 Demand Response programs and resources in a post-FERC Order 745 world Policy and market barriers to DR providing ancillary services; DR as enabler for higher levels of variable generation Design and evaluation of time-varying pricing and DR programs with customer enabling technologies
Distributed Generation and Micro-grids	 Policies such as net metering, feed-in tariffs, bi-directional tariffs, CHP solicitations, RPS carve-outs, state tax credits, rebates, utility ownership or leasing, and multi-party micro-grids Treatment in IRP, distribution and transmission system planning Valuation, including locational- and time-based benefits and costs Interconnection standards/procedures and standby rates Interactions and coordination with utility distribution systems under normal and emergency operating conditions

Technical Assistance to States: Topic Area and Issues (table continued)

Topic Area	Issues		
Energy Storage	 Policies, regulations, and market designs that support energy planning Valuation and compensation strategies, including providing an Role in supporting critical service providers (e.g., hospitals and higher levels of renewable resources Role of demonstration projects and incentive programs 	storage; treatment in utility resource and T&D ncillary services, and increased flexibility d fire stations) and as enabling technology for	
Utility-Scale	• State policies (e.g., RPS and renewable energy credits)		
Renewable Resources	Treatment of utility-scale renewable resources in resource pla	anning and procurement	
	Flexibility metrics for resource planning and acquisition		
Fossil Fuel and	• Role of natural gas, including as a flexibility resource		
Nuclear Resources	• Role of nuclear power, including as a clean energy resource		
	Role of coal, including carbon capture and sequestration		
	 Impacts of potential environmental regulations on system reli 	ability and fuel diversity	
	• Treatment of potential future environmental regulations in pla	anning and acquisition of generation resources	
	and analysis of potential power plant upgrades		
Distribution System	 Planning to enable two-way flows of energy and information, 	including integration of advanced monitoring,	
Planning and	controls, volt/VAR optimization, IT management, and commu	s, volt/VAR optimization, IT management, and communications systems	
Operation	Optimizing voltage and reactive power on distribution system.	S	
	 Integration of non-wires solutions, including geo-targeting 		
	 Adapting state utility regulations to changes in distribution system Avaiding adverse offects of distribution level technologies on 	stem operations	
	• Avolaing daverse effects of distribution-level technologies on t	the transmission system	
Transmission System	• Treatment of transmission in utility integrated resource plann	ing	
Planning and	Integration of utility resource planning and sub-regional/reg	 Integration of utility resource planning and sub-regional/regional transmission planning 	
Operation	 Integration of energy efficiency, DR, DG, variable generation, an planning 	Integration of energy efficiency, DR, DG, variable generation, and energy storage in utility transmission planning	
2	Reliability, security, and resiliency	4/25/2016 63	

Activity 2: Support Regional Planning and Reliability Organizations





Target achievements:

- Support regional planning and reliability organizations in developing institutional frameworks, standards, and protocols for integrating new grid-related technologies.
- Coordinate a regional long-term planning process that uses standardized planning assumptions and publicly available databases of transmission topology and regional resource data.
- Facilitate long-term regional planning in each U.S. interconnection.

Activity 3: Develop Methods and Resources for Assessing Grid Modernization

Target achievements:

- Develop new methods for valuing distributed energy resources and services.
- Develop analysis tools and methods that facilitate states' and tribes' integration of emerging grid technologies into their decision making, planning, and technology deployment.



 Track grid modernization progress in states and tribes through standardized data collection methods and performance and impact metrics.



Activity 4: Conduct Research on Future Electric Utility Regulation

Target achievements:

- Provide technical assistance to at least eight state PUCs and utilities on ratemaking alternatives using DOE-supported financial analysis tools, other analytic resources, or stakeholder-convened discussions.
- Provide technical assistance to at least five states and utilities that are considering fundamental changes to the existing regulatory model.
- Provide technical assistance to at least five states that are considering allowing third-party access to customer hourly interval load data and pricing of value-added services, which could spur new energy services



Questions?

THANK YOU!

ALTER PRICE

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ORNL Institutional Support Projects

- Grid Valuation Framework
- Electric Planning Principles
- Project Finance Mapping Tool

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April 25,2016





Grid Services and Technologies Valuation Framework

- Currently many valuation processes are being used
 - Different technologies (solar, wind, hydro, storage, EE, nuclear, smart grid)
 - Different users (DOE, utilities, regulators, consumers)
 - Different value streams (avoided energy, capacity, ancillary services, T&D impacts, environmental
 - Different metrics (affordability, sustainability, reliability, security, flexibility, resiliency)
- Lack of underlying framework
 - prevents comparison or consolidation
 - Causes duplication of effort
 - Leads to conflict over "correct" method

Valuation methods are based on needs, purposes, and resources of the user

 Technology screening or policy analysis will have different data needs and resources available than rate-setting or construction.

	Simple C	omplexity	Involved
Coarse	Purpose: Screening		Purpose: Multi-region evaluation of
	Data required: Low		technologies and services
>		I	Data required: Geographic or
ac			technology high
Inco			
A			
	Purpose: Single Project developer	I	Purpose: Rate-setting, major project
	Data required: High for project, lov	v	construction decision
Precise	for rest of grid		Data required: High



Grid Modernization Project

- Three-year project of seven national laboratories with a stakeholder advisory group including regulators, industry, and advocacy groups
- Two key dimensions to the project
 - Advance the science to develop a clear, consistent, transparent, flexible process for weighing the values of different technologies and grid services
 - Develop the process in an open manner with participation of industry, regulators, and interest groups to ensure a robust, well-accepted process



Overall Project Vision

- Identify a comprehensive strategy for valuation that encompasses generation, transmission, distribution, storage, and distributed energy resources and services (including energy efficiency).
- Develop a process for stakeholders including industry, regulators, policy makers, DOE, and others to examine, compare, and make decisions regarding new and existing technologies.
- Incorporate the institutional and market context so that the majority of these values can be captured to allow new and existing technologies to fairly compete, cooperate, and be compensated.


Outcomes for 3-Year Project

- 1. A compendium of existing valuation methodologies and tools that quantify values of grid-related services and technologies;
- 2. A tested valuation framework that consists of a **set of methodologies to quantify specific values** that a broad stakeholder community will need for investing in modernizing the nation's electric infrastructure; and
- A key resource to inform the DOE R&D agenda for model enhancements and development and serve as a model for state resource planning processes and NERC planning councils.



Provide Architecture for Technology Valuation Process

- Framework provides both a taxonomy and a decision process
- Relate Valuation processes to Grid Architecture from GMLC Project 2
- Coordinate grid services definitions with GMLC Project 18



Framework to use tools to address multiple metrics

- Create process for multi-criteria assessment using metrics and process from GMLC Project 1
- Technologies will have different strengths that will be weighed differently by various stakeholders



Technologies Differ Across Important Metrics

Stakeholders Differ on How They Value Key Metrics

DOE Office of Energy Policy and Systems Analysis Whitepaper on Electricity Planning Principles

- DOE/EPSA whitepaper on planning principles
 - 1. Conduct an open and transparent planning process
 - 2. Consider the regional characteristics and needs of your system
 - 3. Formulate clear reliability questions
 - 4. Leverage previous work from power utility sector organizations
 - 5. Integrate first-hand knowledge with publicly vetted data, assumptions, and methods
- NREL, PNNL, and ORNL researchers adding discussion, checklists, data, and regional highlights for each principle
- Should be useful for stakeholders (e.g., state air offices) who are less familiar with electric sector planning processes



Project Finance Mapping Tool

- The Project Finance Mapping Tool (PFMT) is a visual interface tool for EPSA analysts and others to rapidly explore the impacts of different policies on the financial viability of new power projects in every state.
- Three levels of operation:
 - **Excel** Workbook, written by Stan Hadley
 - Tableau Desktop, written by Supriya Chinthavali
 - Tableau Server, written by Supriya Chinthavali
- Major users include EPSA analysts and potentially other policy analysts



Major Data Inputs

• Eight Technologies modeled currently

Large PV	Small PV	Biomass	Onshore Wind
Geothermal	Gas CC	Gas CT	Offshore Wind

- Includes construction, operating, fuel costs, lives
- Financial parameters include:
 - State and Fed tax rates, debt rates, return on equity, contract terms, system prices
- Policy parameters
 - Investment tax credits, production tax credits, tax depreciation rate, exemptions, REC prices, CO₂ cost



Main Output is on Dashboard

- Map of the US showing power prices, differences, changes, returns, etc.
- Other graphs available show:
 - Time-series cash flow for individual state
 - Scatter-plot of prices compared to state system prices
 - Table of key financial factors
- Dashboard allows user to modify key variables
- Detailed data available from Tableau and Excel



Output Format of Tableau Dashboard





Additional Graphs and Tables

- Other graphs display multiple cases and parameters
- Allows user to examine impacts of parameter changes





National Laboratory

Sensitivity Analyses on various policy parameters (e.g., ITC, PTC, tax rates)





Summary

- The PFMT will be a useful tool for analysts to examine the impacts of policies on energy projects.
 - The assumptions are based on accepted sources while allowing the analyst to test alternatives.
 - The methods provide many of the main financial factors involved though not with the complexity of a full business plan.
 - It can be applied to federal or state tax policies or other finances.
 - Available for broad use through a browser or more intense work through the Tableau Desktop or Excel.
 - Periodic updating of data and model will be needed in this rapidly changing market.



Topics in the Evolving Electricity Sector: EPSA v FERC – Federal and State Simultaneity

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