



⚡ Lightning Round Summary ⚡

Addressing Permitting and Zoning Challenges for a State-of-the-Art Data Center & Power Generation Campus

On March 12, 2025, approximately 225 energy stakeholders from across Pennsylvania gathered for a daylong event in Harrisburg, culminating in a tabletop exercise. Participants worked together to identify and address hypothetical planning and permitting challenges for a cutting-edge data center and power generation campus in southwestern Pennsylvania. The campus is envisioned to integrate multiple energy sources—solar, natural gas, hydrogen, and battery storage—to deliver a reliable, sustainable power supply to meet high data center demands.

Recognizing the unique zoning, environmental, and regulatory challenges of the region, participants were divided into six table groups. Each group, facilitated by a moderator and with the support of a notetaker, was assigned a specific aspect of the overall project to analyze and propose actionable solutions. Participants were tasked with addressing key permitting and zoning issues while considering local, state, and federal regulations alongside community concerns. The objective was to collaboratively outline challenges, propose solutions, and anticipate potential conflicts or trade-offs for this innovative energy and technology project.

Key Themes and Takeaways:

1. Streamlining Permitting and Zoning Processes:

Nearly every group noted that slow, fragmented permitting processes and varying regulatory oversight present major barriers. There is a strong consensus that coordinated, streamlined procedures and pre-identified sites/corridors can help accelerate project timelines. There was also a recurring theme that any project that involves federal permitting for interstate infrastructure (such as new electric transmission or pipeline construction) will implicate a much more difficult process than a state with only intrastate infrastructure.

2. Enhanced Community Engagement:

Participants across all tables stressed the importance of meaningful community engagement. Transparent communication, early involvement, and robust outreach efforts are essential to address local concerns, build trust, and secure public support. Significant discussion focused on the notion that community engagement could be at odds with a streamlined, centralized, state-level permitting process—and, where possible, how balance could be achieved. Table participants also advised that litigation of a project may come despite every best effort to address real concerns from the community.

3. **Balancing Innovation with Environmental and Safety Concerns:**
Integrating diverse energy sources—solar, natural gas, hydrogen, and battery storage—requires innovative solutions that do not compromise environmental integrity or public safety. Each table explored trade-offs and proposed strategies to ensure that technological advancements are harmonized with community and environmental needs.
4. **Collaborative Problem Solving:**
The table discussions underscored the value of diverse perspectives. By bringing together stakeholders from different backgrounds, the event fostered innovative ideas and practical solutions that could inform a comprehensive strategic approach to the project.

Table Summaries:

- **Table 1: Solar Energy**

Participants at this table examined the complexities of installing a large-scale solar array in a landscape characterized by rolling hills, forests, and agricultural zones. Discussions centered on:

- Zoning challenges, land use conflicts (including deforestation and farmland conversion), and community opposition.
- Environmental impacts, such as species protection, erosion mitigation, and aesthetic considerations.
- Innovative solutions like agrivoltaics integration, brownfield redevelopment, and streamlined zoning ordinances.
- Emphasis was placed on local engagement through public education, incentivizing local hiring, and planning for end-of-life decommissioning/restoration.

- **Table 2: Natural Gas Turbines**

This group focused on using natural gas turbines—leveraging local Marcellus Shale resources—to meet peak power demands, while addressing:

- Permitting hurdles such as air quality, water use, stormwater, and zoning issues.
- The need for comprehensive stakeholder identification (municipal and community leaders, state permitting offices, local labor, and utilities) and community benefits packages.
- Strategies for efficient permitting processes and enhanced community communication to balance energy reliability with environmental and community impacts.

- **Table 3: Hydrogen Power**

Discussions here revolved around the integration of hydrogen as a low-carbon energy source. Key points included:

- Establishing statewide standards for permitting and zoning to ensure consistency across jurisdictions.
- Addressing safety concerns and hazardous material regulations, including lessons learned from similar projects in other states.
- Coordinating regulatory frameworks (OSHA, PHMSA, USDOT, and PUC) and overcoming challenges related to fuel blending and pipeline limitations.
- The group recommended developing clear guidelines that integrate hydrogen technology within Pennsylvania's existing regulatory landscape.

- **Table 4: Battery Storage**

Focused on battery storage as a critical component for demand response, load-shaving, and balancing intermittent renewable energy, this table discussed:

- Challenges related to permitting for battery installations, including noise, vibration, hazardous waste, and decommissioning concerns.
- Safety considerations and the need for robust emergency response planning in coordination with local responders.
- Proposals for innovative “permit in a box” approaches, local procurement of expertise, and strategies to mitigate community impacts while promoting job creation and tax revenue.

- **Table 5: Transmission Lines and Grid Interconnection**

Participants addressed the essential task of connecting the campus to the regional grid. Key challenges and solutions included:

- Complex permitting processes and right-of-way issues across various jurisdictions (PJM, FERC, federal, state, and local levels).
- Communication gaps between project benefits and community understanding.
- Proposed solutions such as pre-identifying suitable sites and corridors, engaging grassroots efforts for community outreach, optimizing existing infrastructure through co-location and surplus interconnection service, and developing centralized decision-making criteria to expedite permitting.

- **Table 6: Environmental and Community Considerations**

This group emphasized the importance of addressing broader environmental and community impacts. Discussions highlighted:

- Managing impacts such as dust, odor, noise, traffic, and potential effects on local housing and property values.
- The critical need for early, transparent, and ongoing community engagement to build trust.
- Recommendations for establishing community advisory panels, holding town halls, and creating clear, accessible messaging to control the narrative and pre-empt misinformation.
- Balancing development with ecological and social responsibility through comprehensive environmental permitting strategies.

Conclusion:

The working session provided a forum for detailed discussion and the exchange of perspectives on a variety of issues associated with the development of a hypothetical data center and power generation campus. Participants across six tables examined regulatory, environmental, and community considerations, generating a range of ideas and potential strategies. The insights shared by attendees are documented in this summary to serve as a resource for further review and analysis as the Commonwealth of Pennsylvania’s planning efforts continue.

Overall Problem Statement for All Participants

You are part of a planning team tasked with designing and permitting a state-of-the-art data center and power generation campus in southwestern Pennsylvania. The campus integrates multiple energy sources—solar, natural gas, hydrogen, and battery storage—to ensure a reliable, sustainable power supply for a high-demand data center. Southwestern Pennsylvania's landscape, regulatory environment, and infrastructure present unique challenges, including zoning restrictions, environmental protections, and grid interconnection requirements.

Your goal is to identify and address the key permitting and zoning issues specific to your assigned focus area, considering local, state, and federal regulations, as well as community concerns. Collaborate at your table to outline the challenges, propose solutions, and anticipate potential conflicts or trade-offs in developing this innovative energy and technology project.

Individual Problem Statements for Each Table

Table 1: Solar Energy

The data center campus plans to install a large-scale solar array to provide renewable energy, requiring significant land use in a region with rolling hills, forests, and agricultural zones. Southwestern Pennsylvania's variable weather and limited flat terrain complicate site selection. Your task is to address zoning challenges for siting the solar array, secure permits for land use and potential deforestation, and ensure compliance with erosion and sediment control regulations during construction. Consider how to minimize impacts on local ecosystems and farmland while meeting energy output goals, and anticipate community concerns about aesthetics and land use changes.

Table 2: Natural Gas Turbines

To meet peak power demands, the campus will rely on natural gas turbines fueled by abundant local Marcellus Shale gas reserves. However, this introduces air quality and emissions concerns in a region already sensitive to industrial pollution. Your task is to navigate air permitting requirements under the Clean Air Act and Pennsylvania's Department of Environmental Protection (DEP) regulations, address zoning for turbine placement near the data center, and secure water withdrawal permits for cooling systems. Evaluate trade-offs between energy reliability and environmental/community impacts, including potential opposition from nearby residents.

Table 3: Hydrogen Power

The campus aims to pioneer hydrogen-based power generation as a low-carbon energy source, using either green hydrogen (produced via electrolysis with renewable energy) or blue hydrogen (from natural gas with carbon capture). This requires siting hydrogen production and storage facilities, which pose safety and zoning challenges due to flammability risks. Your task is to identify permitting needs for hydrogen infrastructure, ensure compliance with hazardous materials regulations, and address water use permits for electrolysis if applicable. Explore how to integrate this emerging technology into Pennsylvania's regulatory framework and mitigate public safety concerns.

Table 4: Battery Storage

To balance intermittent solar power and ensure grid reliability, the campus will incorporate large-scale battery storage systems. These lithium-ion or alternative battery installations require

significant space and raise concerns about fire risks, chemical leakage, and end-of-life disposal. Your task is to tackle zoning issues for siting battery facilities, obtain permits for hazardous materials storage, and develop erosion and sediment control plans for construction. Consider how to address local opposition to perceived safety risks and ensure compliance with Pennsylvania’s environmental and safety standards.

Table 5: Transmission Lines and Grid Interconnection

The data center and power campus require new transmission lines to connect to the regional grid, crossing rural and potentially urban areas in southwestern Pennsylvania. This involves securing rights-of-way, permits for wetlands and river crossings, and approvals from the Pennsylvania Public Utility Commission (PUC) and federal agencies like FERC. Your task is to outline the permitting process for transmission infrastructure, address environmental impacts such as habitat disruption for endangered and rare species, and navigate landowner negotiations or eminent domain issues. Assess how delays in grid interconnection could affect the project timeline and energy delivery.

Table 6: Environmental and Community Considerations

The construction and operation of the data center and power campus will impact wetlands, rivers, and local communities in southwestern Pennsylvania. This includes securing wetlands permits, managing water withdrawals for power generation and hydrogen production, and implementing erosion and sediment controls across the site. Your task is to develop a comprehensive environmental permitting strategy that satisfies the U.S. Army Corps of Engineers, Pennsylvania DEP, and local zoning boards. Additionally, address community concerns about noise, traffic, and economic benefits, proposing mitigation measures to balance development with ecological and social responsibility.