AEP ENERGY

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Progressing Energy Sustainability

In a Time of Volatility

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Superior insights. Sustainable Solutions. Brighter Future.

Current Energy Sustainability Landscape

A multitude of factors are driving major shifts in supply and demand that are impacting sustainability plans and executions.

- Climate change sense of urgency
- Investor demands for climate-related disclosure
- Extreme weather intensity and frequency
- Supply chain, inflation, and international pressures
- Increased competition and customer choice
- Increased environmental policy and regulation

Today's Renewable Energy Market: Shift from Linearity

Sustainability prioritization and externalities have changed accessibility and market dynamics.

Historical Trends (Linear)

Increasingly accessible renewable energy resources with declining prices, low barriers to entry, stable energy market backdrop.

- ☑ Demand for resources readily met
- ☑ Market stability and predictability
- ☑ Increasing accessibility for renewable products
- ☑ Decreasing costs of assets due to increased suppliers, technology advancements and innovation

Present Conditions (Non-Linear)

High demand, long interconnection timeframes and supply chain issues are creating uncertainty in the market and the ability to meet net-zero targets.

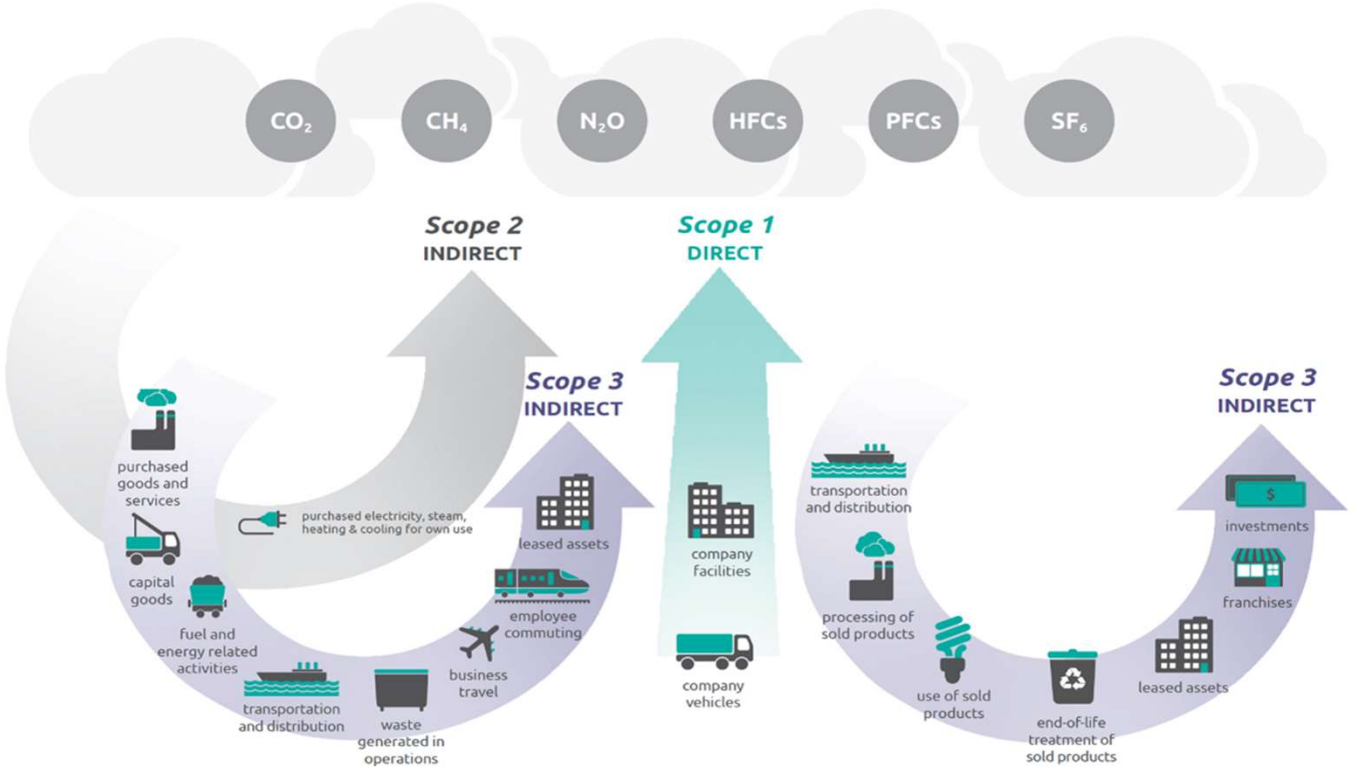
- ☑ Higher solar and wind raw material costs
- ☑ Supply chain, interconnection issues, tariff uncertainty
- ☑ Returns on capital increasing due to supply-demand rebalancing
- ☑ Energy market volatility challenges valuation and risk assessments

Implications of the Current Market Dynamics

The current market is impacting feasibility and economic viability of renewable commitments.

- **Not all organizations will be able to meet targets without market disruption**
- Competition for scarce resources will not solve global environmental and equity issues
- Strategizing for probability and potential market shifts is critical
- Systematically tackling decarbonization and strategic collaborations are essential

Decarbonization Planning Before Target Setting



Develop Plan → Decarbonization Roadmap → **Set Target**

Source: EPA.gov

Adapting to a Non-Linear Space - From Goals to Systems

Define

Strategic Principles, Objectives and Parameters

Delineate

Planning Frameworks and Approaches

Direct

Agile Execution, Feedback and Adjustment

Disclose

Radical Transparency

Define: Strategic Principles, Objectives and Parameters

Strategic Priority Determination

Set out how to consider financial and environmental impacts, provide space for scenario planning and risk analysis, consider stakeholder perspectives, set relative values and priorities

Energy Sustainability Definition

Consider strategy for abatement, offsets or additionality in defining objectives and develop point of view on internal cost on carbon

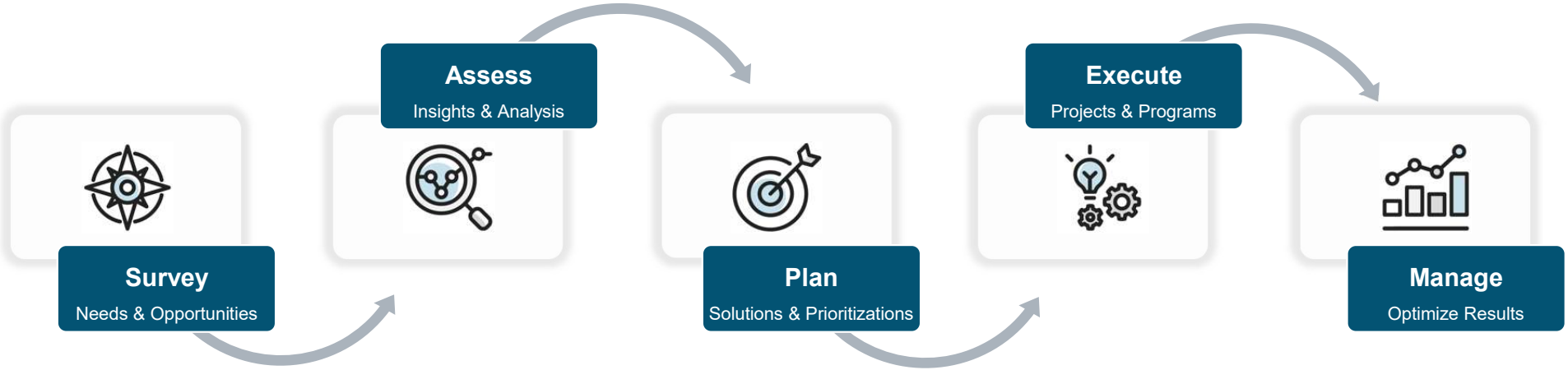
Internal Alignment

Generate buy-in and alignment of approach and values from multiple decisions makers (sustainability, finance, operations) and delegate authority to maximize adaptability, overcome inertia, and avoid second-guessing

Strategic Approach

Determine the organizational readiness to tackle strategic objectives to decide if the organization will incrementally tackle projects, transform internally through building an organization or find a strategic partner.

Delineate: Planning Frameworks and Approaches



Carbon Abatement and Offset Solutions

Energy Conservation Measures

Projects that reduce energy and demand consumption and associated cost

Scope 1 & 2 impact

Onsite Renewables

Behind-the-meter renewable energy assets to offset all or a percentage of load

Scope 2 impact

Offsite Renewables

Virtual purchased power agreements or integrated retail products

Scope 2 impact

Renewable Energy Certificates & Offsets

Ability to claim carbon reduction through purchases of attributes and offsets

Scope 1 & 2 impact

Electrification

Beneficial or transportation electrification to reduce emissions

Scope 1 impact

Putting a Value on Carbon to Evaluate Investments

Developing a carbon valuation standard and using it in ROI calculations for decision-making can help rationalize and unfreeze decision making.

- Monetary value on GHG emissions to factor into ROI and operational decisions
- Internal strategy to evaluate and manage climate-risk related impacts to financials and operations
- Risk mitigation strategy around climate change and environmental stewardship
- Aids in advancements and transparency toward GHG emission reduction targets

Energy Conservation Measures: Start Here

Starting with energy conservation measures is a smart first step in reducing emissions.

Value

- 'Negative cost' carbon reduction
- Highest level and permanent impact with zero ambiguity
- Improved operations
- Intelligent management controls

Challenge

- Overcoming organizational inertia
- Efficiently identifying & screening highest impact opportunities

What's New and Notable in EE:

- Data analytics enables efficient & scalable identification and screening of potential EE operations
- Software & tech innovations drive improved controls & efficiency (including demand management opportunities)
- Waste heat recovery presents a promising efficiency option

Onsite Renewable Energy

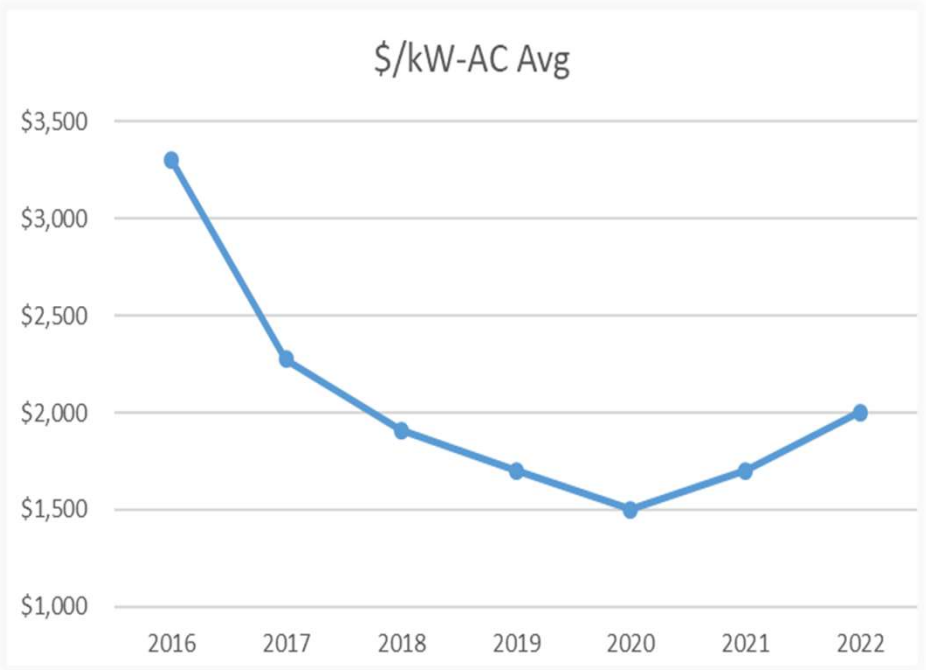
Onsite renewable energy solutions can be a viable investment, but are highly location-dependent and prone to commercial faults.

Value

- Additive renewable resources where available
- Direct consumption of renewable energy production
- Revenue opportunity in favorable markets and environments

Challenge

- Location and natural resource-dependent
- Unfavorable economics in low energy rate markets
- Proper sizing and configuration; ongoing O&M
- High demand, import tariffs



Offsite Renewable Energy

Offsite renewable energy procurement provides opportunity to sponsor new renewable energy investment at scale to meet emission reduction targets.

Value

- Long term, scalable solution with definitive impact
- Upfront investment not required
- Integrated products can operate seamlessly

Challenge

- Lengthy contract agreements, locational considerations and market expertise needed
- Inherent risks depending on configuration
- Requires rigorous financial, accounting assessment

Source*: https://www.irena.org/newsroom/pressreleases/2020/Jun/Renewables-Increasingly-Beat-Even-Cheapest-Coal-Competitors-on-Cost

Renewable Energy Certificates and Offsets

RECs were once viewed as an easy offset solution for energy consumption, but the market is changing.

Value

- Fairly straightforward means to ‘offset’ carbon footprint
- Wide availability and low transaction costs

Challenge

- Increased demand due to carbon reduction commitments leading to increasing price volatility
- Limited outlook for availability
- Dangers of the REC path
- No solid standards for offsets

Electrification

Compression electrification and transportation electrification are effective solutions, but economic viability and feasibility are key considerations.

Value

- Addresses (more difficult) Scope 1 emissions
- Reduced localized emissions (community impact), increased operational efficiency and reduction in maintenance costs

Challenge

- Levelized cost of energy considerations and energy rate locational variability
- Charging infrastructure accessibility
- Incremental capital investment

Sample Opportunity Assessment Report

A comprehensive opportunity assessment survey facilitates decision-making for different decarbonization measures across sites in a region, by filtering on Carbon impact, etc.

Region	Facility	Decarbonization Measures	Reduction Potential (% to baseline)	Reduction Potential (Mton CO^2/yr.)	Cost of Carbon Reduction ($/Mton)
USA Great Lakes	Manufacturing Site 1	ECM*	2%-5% Energy	90-200	($2-$4)
		Electrification	Process Dependent	Process Dependent	($3) - $15
		BTM Solar	Minor	Minor	-
		RECs	100% Electricity; 12% Energy	4400	$2
		Offsite RE	100% Electricity; 12% Energy	4400	$1
	Commercial Space 1	ECM	20%-25% Energy	80-100	($2-$4)
		Electrification**	9% Energy	35	$5
		BTM Solar	Up to and Over 100% Electricity; 50% Energy	400	$4
		RECs**	100% Electricity; 50% Energy	400	$2
		Offsite RE**	100% Electricity; 50% Energy	400	$1

**Focused on Machine Drive, HVAC, and Lighting **Combining Offsite RE/RECs with Electrification would yield greater improvement*

Direct: Agile Execution, Intensive Feedback, Continuous Adjustment

Agile Execution

Established frameworks, buy-in, and detailed planning supports high-speed, agile execution

Intensive Feedback

Set up measurement, monitoring, and evaluation systems that provide a read of current conditions and ‘real-time’ results measured against established interpretive frameworks

Continuous Adjustment

Adjust execution plans continuously based on feedback

Disclose: Radical Transparency

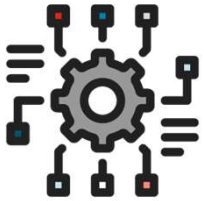
- Determine the best methods for how you will disclose and communicate
- Disclose qualitative and quantitative data to provide transparency
- Provide information on emissions strategy, objectives and governance
- Report on milestones, met and unmet deliverables with transparent narrative
- Disclose tradeoffs, market anomalies and impacts from externalities
- Report on contingency plans and associated risks with emission targets

Marketplace Offerings for Decarbonization

GHG Inventory, Reporting & Program Management

Decarbonization Roadmap & Strategy Development

Technical & Financial Assessment and Valuation



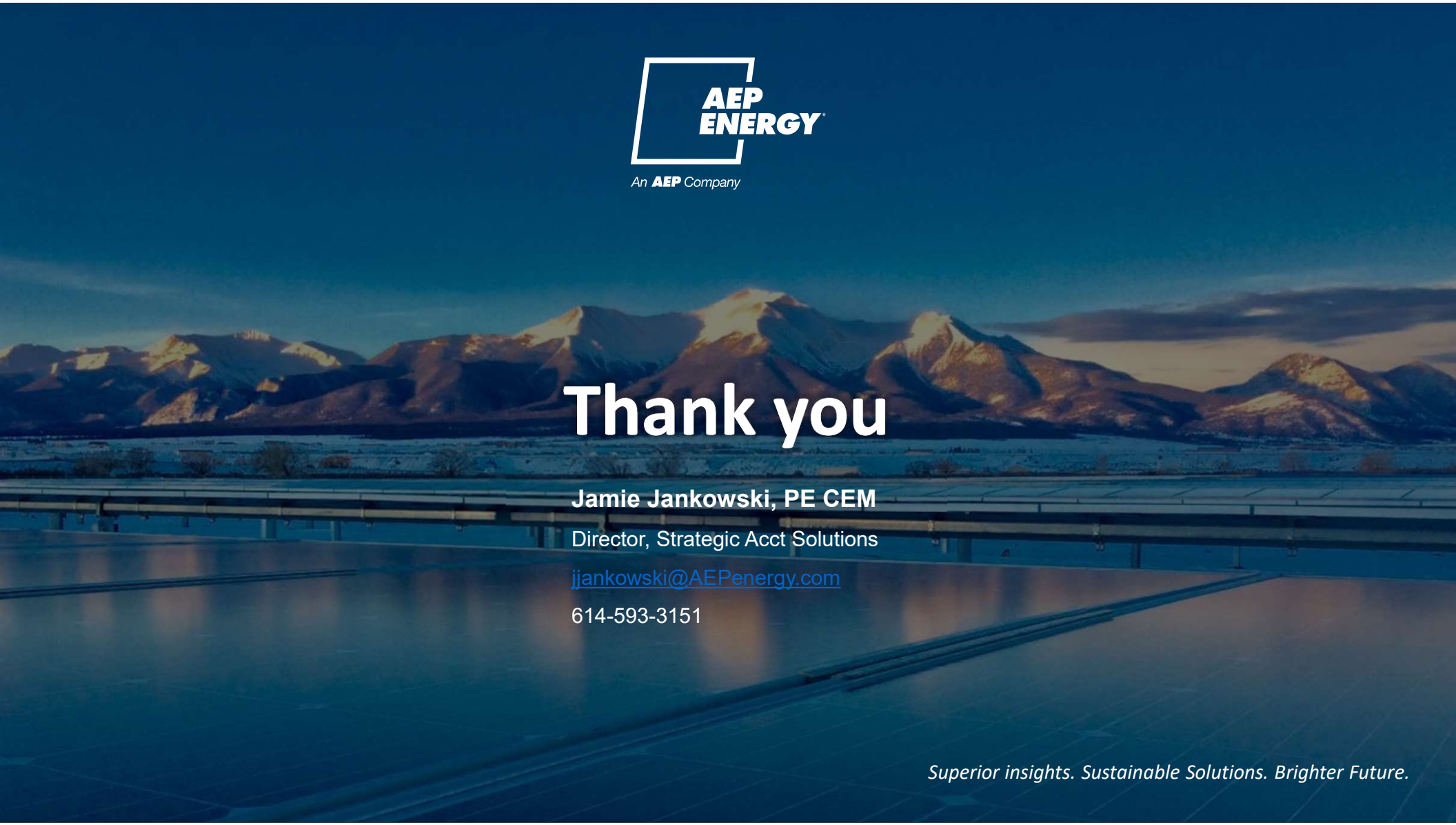
Turnkey Execution on Project Capital, Ownership, Operation and Market Integration

End-to-end Program Development & Implementation

Navigating the New Carbon Economy

Convert carbon from a liability to an asset by making strides toward decarbonization where possible and meet the challenge head-on through a strategic roadmap.

- ☑ Accept the new carbon economy and adapt
- ☑ Develop a principle driven plan and evaluation framework prior to publishing goals
- ☑ Define, Delineate, Direct, Disclose



Thank you

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Biographical Information

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Jamie Jankowski joined AEP Energy in 2012 and has extensive experience in all aspects of developing and delivering customer focused energy solutions. Jamie has led key customer engagements in delivering integrated renewable energy products and services. In his current role, Jamie has a passion developing energy and decarbonization strategies together with organizations, including integration of energy efficiency, energy supply, and onsite/offsite generation.

Jamie earned a Bachelor of Science in Mechanical Engineering from Rose-Hulman Institute of Technology and is a licensed Professional Engineer (PE) and Certified Energy Manager (CEM).

He serves in a volunteer leadership and board position as President of his local Association of Energy Engineers (AEE) chapter.