

Technical Resilience Navigator (TRN) Overview Training

September 9, 2020

Accredited Training



Agenda

1. Agenda and Workshop Objectives
2. FEMP Introduction
3. Technical Resilience Navigator (TRN) Overview
4. TRN Web Tool Overview
5. TRN Modules Overview & Interactive Activities
6. Q&A
7. Conclusion

To Receive IACET-Certified CEUs for a Workshop

To Receive IACET-Certified CEUs, Attendees Must:

- Attend the training in full. No exceptions
- Complete an assessment demonstrating knowledge of course learning objectives **within six weeks of the training**. A minimum of 80% correct answers is required.
- Complete an evaluation of the training event within **six weeks of the training**

To Access the **On-Demand** Workshop Assessment and Evaluation, Visit:

- <https://www.wbdg.org/continuing-education/femp-courses/fempodw057>
- If you do not have a WBDG account created, you will be required to create one.

Interactive Activities in Today's Training

- Today's training has interactive activities for participants to better understand some of the concepts contained within the slide presentations
- In another web browser window or with your smart phone, go to www.menti.com
- If you have questions, please enter them into the WebEx Chat

Interactive Activities for Live Training Only

FEMP Introduction & TRN Overview

Resilience is a Top Priority for FEMP



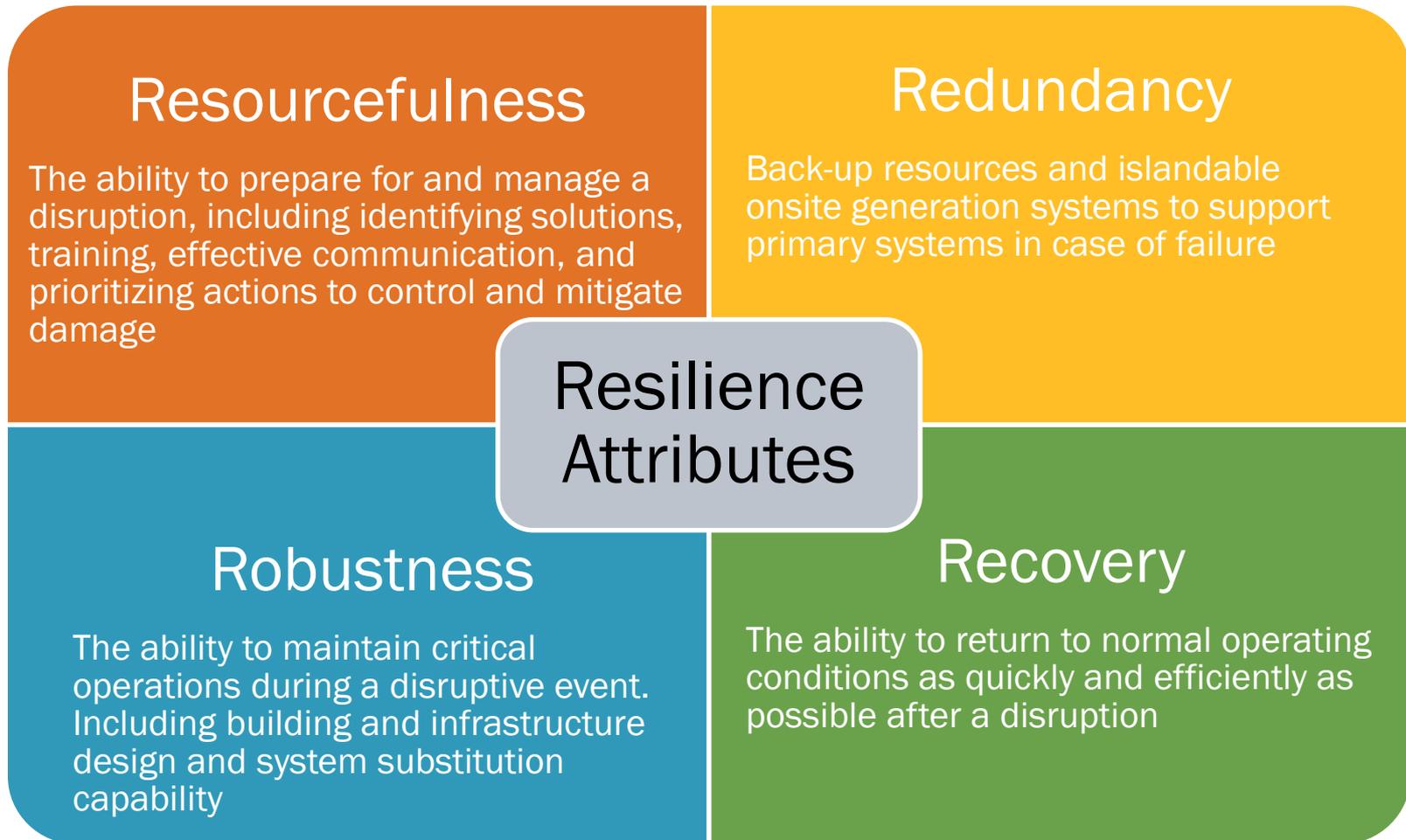
Energy and water resilience is a key component of federal facility infrastructure operations

Resilience is accomplished when operational and procedural elements are able to withstand, adapt to, respond to, and recover from disruption

AP/David Philip

What is Resilience?

The ability to anticipate, prepare for, and adapt to changing conditions and to withstand, respond to, and recover rapidly from disruptions.



Beyond Disaster Preparedness

Resilience planning is distinct from disaster preparedness

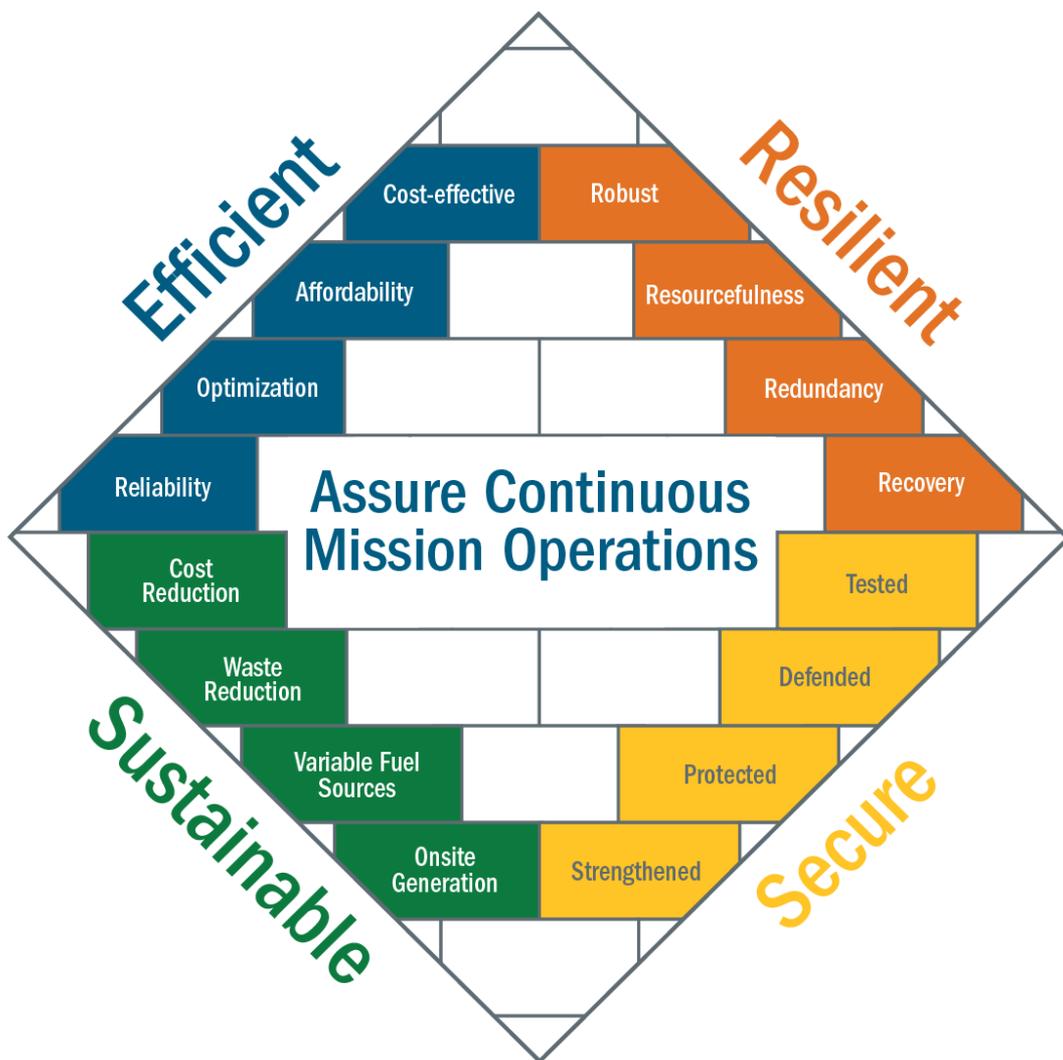
- It emphasizes **proactive** strategies and actions that can be implemented to mitigate the impacts of unplanned disruptions



\$1 spent on resilience is worth \$4 spent on recovery

NIBS, The Natural Hazard Mitigation Saves: 2017 Interim Report

Resilient, Efficient, and Secure Approaches to Strategic Energy Management



Integration Drives FEMP's Resilient-Efficient-Secure Nexus

- Solutions that incorporate energy efficiency, resiliency, security, and sustainability, are essential for agency mission assurance.
- FEMP provides agencies the tools and resources needed to identify, develop and execute integrated solution sets.
 - 50001 Ready Navigator
 - REopt Lite
 - Facility Cybersecurity Toolset
 - Distributed Energy Resources Cybersecurity Framework
 - Procurement
 - Alternative Water

Achieving Resilience Through Proactive Planning

A site that is energy and water resilient has:

- ★ Optimized systems and operations
- ★ Identified risk and consequences
- ★ Trained personnel and capabilities
- ★ Actionable strategies to achieve diverse solutions



AP/Steven Senne

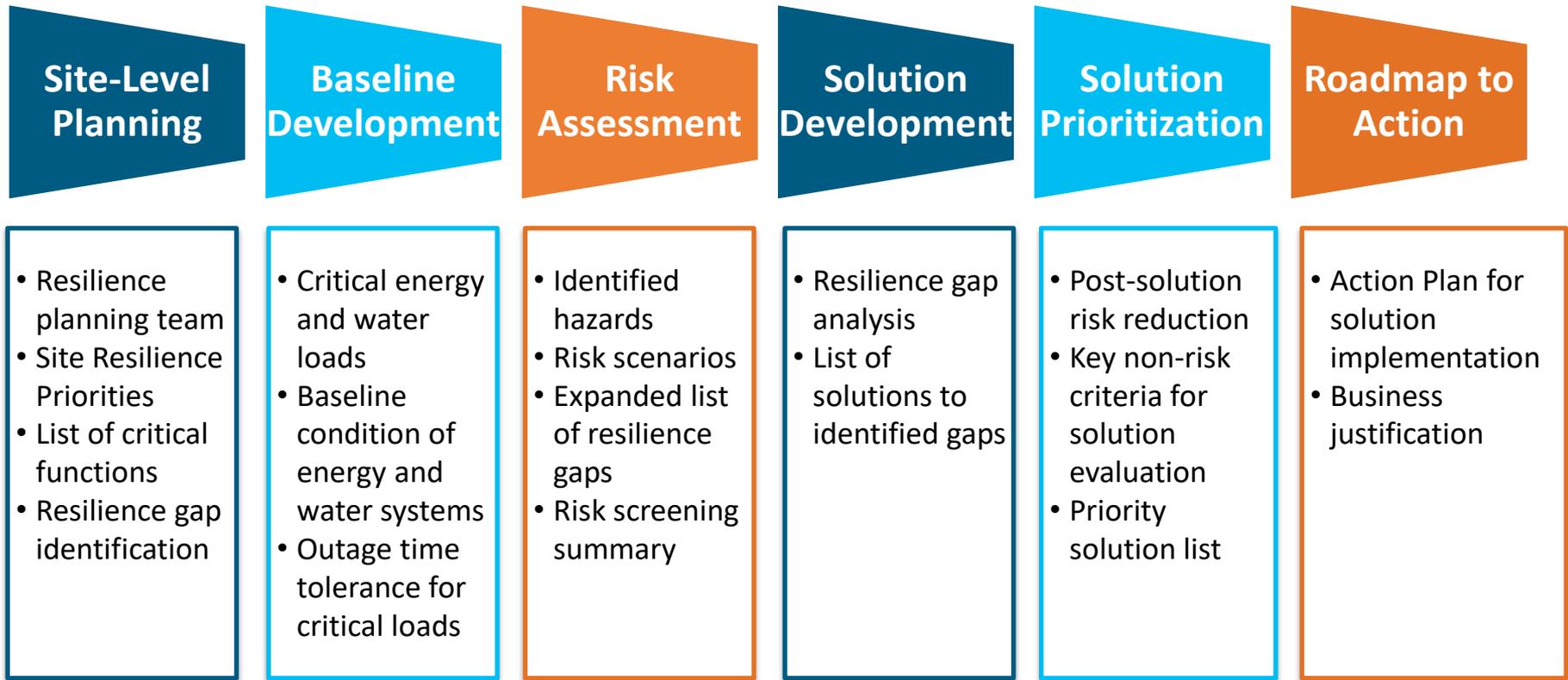
DOE Federal Energy Management Program's *Technical Resilience Navigator*



Key Outcomes

- Identify site hazards and vulnerabilities in energy & water systems, operations and plans
- Establish relative risk from different sources and how solutions reduce risk
- Better integrate planning for energy and water management, continuity of operations, other site priorities

Outcomes from TRN Modules



Web Tool Overview

TRN Web Application



Login & New Account Registration

About

Glossary

FAQ

Modules

The Federal Energy Management Program's **Technical Resilience Navigator (TRN)** helps organizations manage the risk to critical missions from disruptions in energy and water services. It provides a systematic approach to identifying energy and water resiliency gaps and developing and prioritizing solutions that reduce risk.

The TRN enables organizations to be proactive in identifying and addressing vulnerabilities to their critical energy and water systems to reduce outage impacts, and support continuous mission operations.

Register a New Account

E-Mail Address

Password

Remember Me

Login

Forgot Your Password?

Explore TRN content before signing in

Get started at <https://trn.pnnl.gov/>

TRN Web Application: Tips & Tricks



- ✓ Use supported internet browsers for best performance (not IE)
- ✓ Don't forget to validate your email address
- ✓ All team members must create TRN accounts for assignment

- ✓ Choose the level of data sensitivity that's right for your site
- ✓ Don't enter sensitive data into TRN webforms or uploads
- ✓ Downloadable version coming soon

Get started at <https://trn.pnnl.gov/>

Getting Started: Key Steps



Dashboard **78%** Team **4** View Details

Module: **Site-Level Planning**

- 1: Establish Team and Engage Stakeholders
- 2: Collect and Review Relevant Information
- 3: Define Priorities and Scope and Boundaries**
- 4: Identify Critical Functions
- 5: Recognize Resilience Gaps

Module: **Baseline Development**

- 1: Collect & Review Baseline Documentation
- 2: Establish Energy & Water Requirements
- 3: Establish Baseline Conditions

Module: **Risk Assessment** **complete**

- 1: Characterize Critical Loads
- 2: Identify Hazards and Threats
- 3: Assess Vulnerabilities
- 4: Summarize Risk

- Create a TRN Account
- Create (or join) a Resilience Framework
- Build and Manage Resilience Team
- Track Progress as Actions are completed

Getting Started: Completing an Action

Action 2: Collect and Review Relevant Information

 In Progress Assigned to: Julia Rotondo    Action Assigned to You

 TAKE ACTION: 

- Update Action Status. *Offline data entry and track progress through the form*
- Upload Worksheet File. *Offline data entry with ability to upload completed files (visible to entire resilience team)*
- Online Action Worksheet. *Online using integrated web forms*

Select Updated Action Status:

 Not Started

 In Progress

 Ready for Review

 Completed

Getting Started: Key Steps

✓ Track progress via the Dashboard

- Updated automatically as actions are completed



Site-Level Planning

Module 1: Site-Level Planning

Build a foundation for your resilience assessment



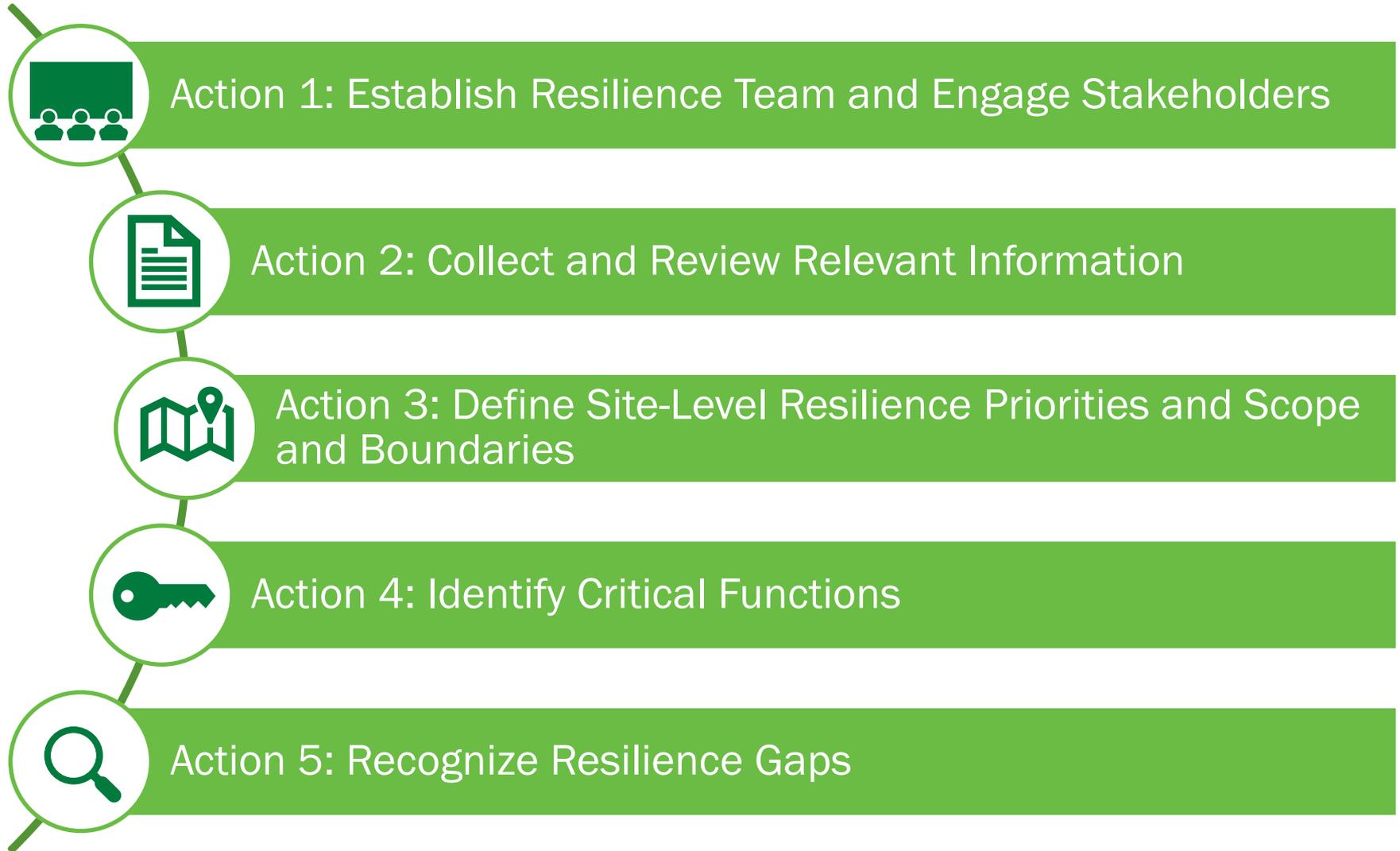
Who are your key stakeholders?

What existing information can you start with?

What are your resilience priorities?

What critical functions do you need to maintain?

TRN: Site-Level Planning Actions



SLP Action 1:

Establish Resilience Team and Engage Stakeholders

Establish Resilience Team

- Lead
- Core Team

Duties of Core Team:

- Identifying and engaging stakeholders
- Defining the scope and boundaries of the TRN effort
- Identifying relevant information and collecting and reviewing data
- Implementing TRN activities and exercises
- Seeking input and subject matter expertise where needed
- Tracking and reporting on TRN progress.



*“The resilience planning team takes ownership of the TRN process, works with all levels of staff to integrate additional expertise, as needed, and reports on progress regularly.”
(from TRN-SLP Action 1)*

SLP Action 1:

Establish Resilience Team and Engage Stakeholders

Example stakeholders:

- Critical mission or function owners
- Facility operators
- Energy and water managers
- Community engagement experts
- Continuity of operations planning (COOP) officers or emergency responders
- Tenant organizations
- External owners and operators if energy and water utility systems that may impact a site's ability to operate during disruptions



SLP Action 2: Collect and Review Relevant Information

Identify and document existing policies and plans that could impact or intersect with resilience planning efforts

- Better understand the site planning context
- Ensure the effort builds upon existing plans
- Identify planning areas that may need to be more robust
- Coordinate resilience efforts with other related initiatives



FEMP
Federal Energy Management Program

Technical Resilience Navigator

Site Level Planning Documentation				
Data	How the information is relevant to resilience planning	Available? Y/N	Point of contact to obtain information	Description (e.g. document title, year updated, key contents)
Resilience Assessments				
Training/O&M Guides				
Environmental Assessments				

FEMP
Federal Energy Management Program

Technical Resilience Navigator

Site-Level Planning Action 2 Worksheet: Collect and Review Relevant Information

Worksheet Last Updated By: _____
Worksheet Last Updated On: _____

Relevant Policy and Planning Information

Use the table below to identify sources of information and documentation required for Site Level Planning. Note the primary points of contact and verify that the documentation is the most recent. Add relevant information and documentation sources to the checklist, as needed. These are examples of the types of information needed for resilience planning and other documents may be necessary to include.

Site Level Planning Documentation				
Data	How the information is relevant to resilience planning	Available? Y/N	Point of contact to obtain information	Description (e.g. document title, year updated, key contents)
Organizational Policies and Plans				
Resilience Policies/Plans				
Cybersecurity Policies/Plans				
Environmental or Sustainability Policies/Plans				
Site-Wide Plans & Facility Locations				
Master plans				
Decommissioning plans				
Real property lists				
Site maps (e.g., GIS files)				
ISO 50001 Energy Management System Assessments				

- Organizational Policies/Plans
- Site Master Plans
- Emergency Management Plans
- Community Plans
- Critical Missions and Functions Documentation

SLP Action 3:

Define Site-Level Resilience Priorities and Scope and Boundaries



Resilience Priorities

- Describe an optimal, desired future state
- Provide context for the TRN process
- Establish a shared vision
- Facilitate coordination toward a common objective or set of targets
- Providing a reference point for future decision-making

Example Resilience Priorities

- Incorporation of community resilience partnerships into standard preparedness plans
- Ensure the most critical infrastructure is secure and able to recover rapidly from disruptions
 - Maintain power to critical loads and functions for at least 14 days
- Increase the amount of onsite renewable energy generation that can support the site during a disruption
 - Incorporation of resilience into daily operational decision-making.

SLP Action 3:

Define Site-Level Resilience Priorities and Scope and Boundaries



Scope and Boundaries

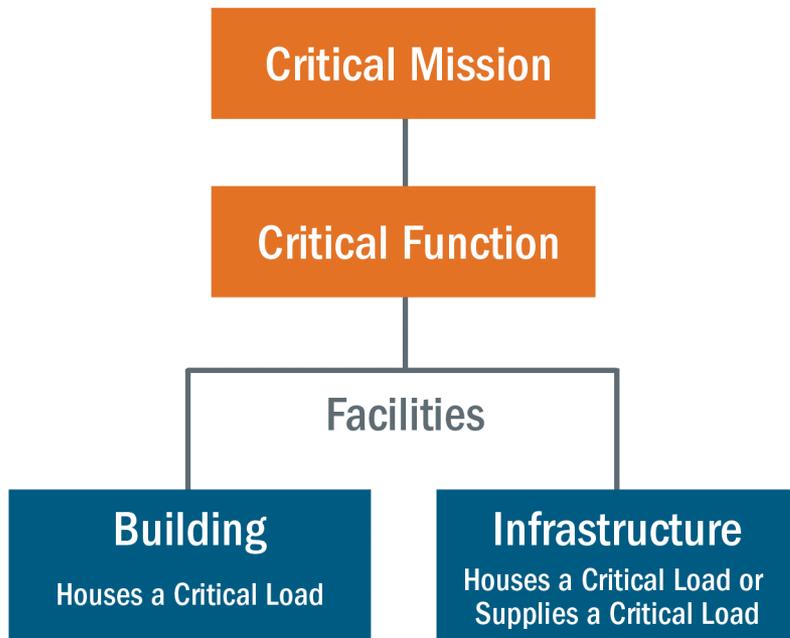
The scope should be defined in terms of:

- 1) Site geographical or operational boundaries and facilities
- 2) Resources assessed (i.e., electric, gas, and/or water)
- 3) Integration points with site priorities (e.g., energy efficiency, cybersecurity, sustainability, water conservation).

SLP Action 4: Identify Critical Functions



Goal is to identify the site's critical functions, and to establish their relative criticality, or importance.



Criticality	Critical Functions	Weighting Factor
Tier 1	<ul style="list-style-type: none">Emergency operationsSecurity operations	50
Tier 2	<ul style="list-style-type: none">Data processingIntelligence analysis	10
Tier 3	<ul style="list-style-type: none">TrainingResearch experiment continuity	1

SLP Action 4: Identify Critical Functions

Where to start: Defining Critical Missions and Functions

Critical Mission

When defining *critical missions*, an organization may look to an organizational goal or set of requirements of such high importance that it must be fulfilled.

Critical Function

Critical functions are the specific procedures, tasks, and decisions that ensure the critical mission will be sustained.

Facilities

Critical functions should be mapped to the facilities that house those function.

Building

Houses a Critical Load

Infrastructure

Houses a Critical Load or
Supplies a Critical Load

The types of facilities that enable critical functions are organization- and site-specific; some common examples include: Mission-specific administration headquarters, Data centers, Emergency operations centers/command and control centers, etc.

SLP Action 4: Identify Critical Functions

Criticality weighting factors

- Not all critical functions may be of equal importance.
- Loss of any one function may have varying degrees of impact on the critical missions.

Resilience planning team action: decide whether all critical functions are of equal importance or to establish tiers of importance.

- These tiers allow the loss of certain functions to be weighted or prioritized above the others when assessing risk.

Criticality	Critical Functions	Weighting Factor
Tier 1	<ul style="list-style-type: none">• Emergency operations• Security operations	50
Tier 2	<ul style="list-style-type: none">• Data processing• Intelligence analysis	10
Tier 3	<ul style="list-style-type: none">• Training• Research experiment continuity	1

SLP Action 5: Recognize Resilience Gaps

A list of identified resilience gaps will help gain a more comprehensive understanding of the resilience needs of the site.

Resilience gaps are documented throughout the TRN process and used to inform the Solution Development, and solution prioritization modules.

Gap Description	Type of Gap			Resilience Attributes Impacted				Critical Functions or Loads Impacted by Gap
	Technological	Operational	Institutional	Redundant	Robust	Resourceful	Recovery	

SLP Action 5: Recognize Resilience Gaps

Gap Types

- **Technological:** Gaps in physical systems including their availability, design, and performance (e.g., vulnerabilities in the systems that inhibit reliable power to a critical load).
- **Operational:** Gaps in existing processes or procedures that ensure energy or water availability (e.g., automatic start-up systems for backup generation or training programs for manual start-up systems)
- **Institutional:** Gaps in organizational or site plans, policies, and other data which have the potential to broadly enhance site resilience.

Interactive Activity



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Baseline Development

Module 2: Baseline Development

Understand your current ability to meet critical energy and water requirements



*What systems require energy or water to enable critical functions?
Do those systems have redundant energy and water sources?
What is the condition of those redundant systems?
Is the site prepared to respond to potential disruptions?*

Baseline Development Actions



Action 1: Collect and Review Baseline Documentation

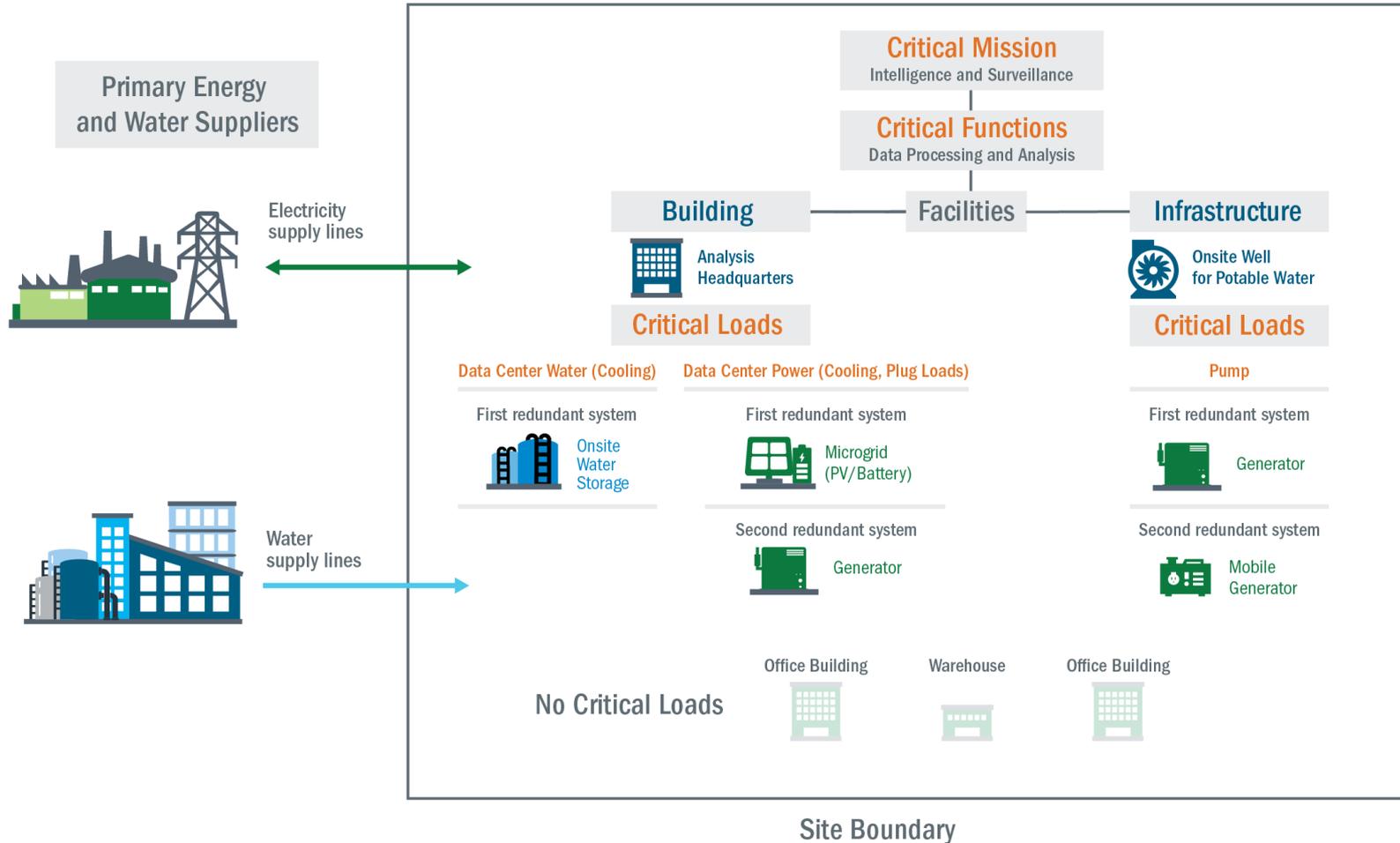


Action 2: Establish Energy and Water Requirements



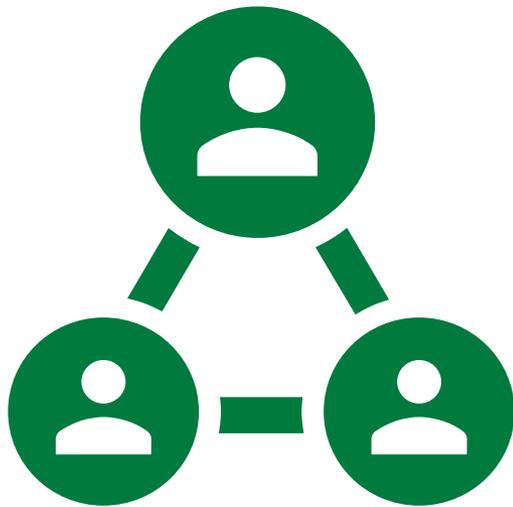
Action 3: Establish Baseline Conditions of Energy and Water Systems

Establish Energy and Water Requirements



Baseline Development

TRN Resource: Interview Protocols



Example questions

- What critical loads require energy to fulfill the critical function (e.g., ventilation, servers)?
- Is the demand for energy or water variable or consistent throughout the year?
- What is the tolerable outage duration for the critical load, before mission failure or degradation would occur?
- What redundant energy systems, such as a backup generator, UPS, or other onsite power supply currently serve the critical load during a utility disruption?

Baseline Conditions

- **Availability:** defines the state of any redundant systems for each critical load identified
- **Design:** defines the design intent of systems, defines operating parameters and environmental conditions under which the system is designed to meet its operational intent
- **Reliability:** defines the operation, maintenance, and testing of the system and other reliability management measures
- **Configuration:** defines the state of the operating processes, procedures and plans in place for the redundant system



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Risk Assessment

Module 3: Risk Assessment

Screening risk assessment identifies relative risks systematically

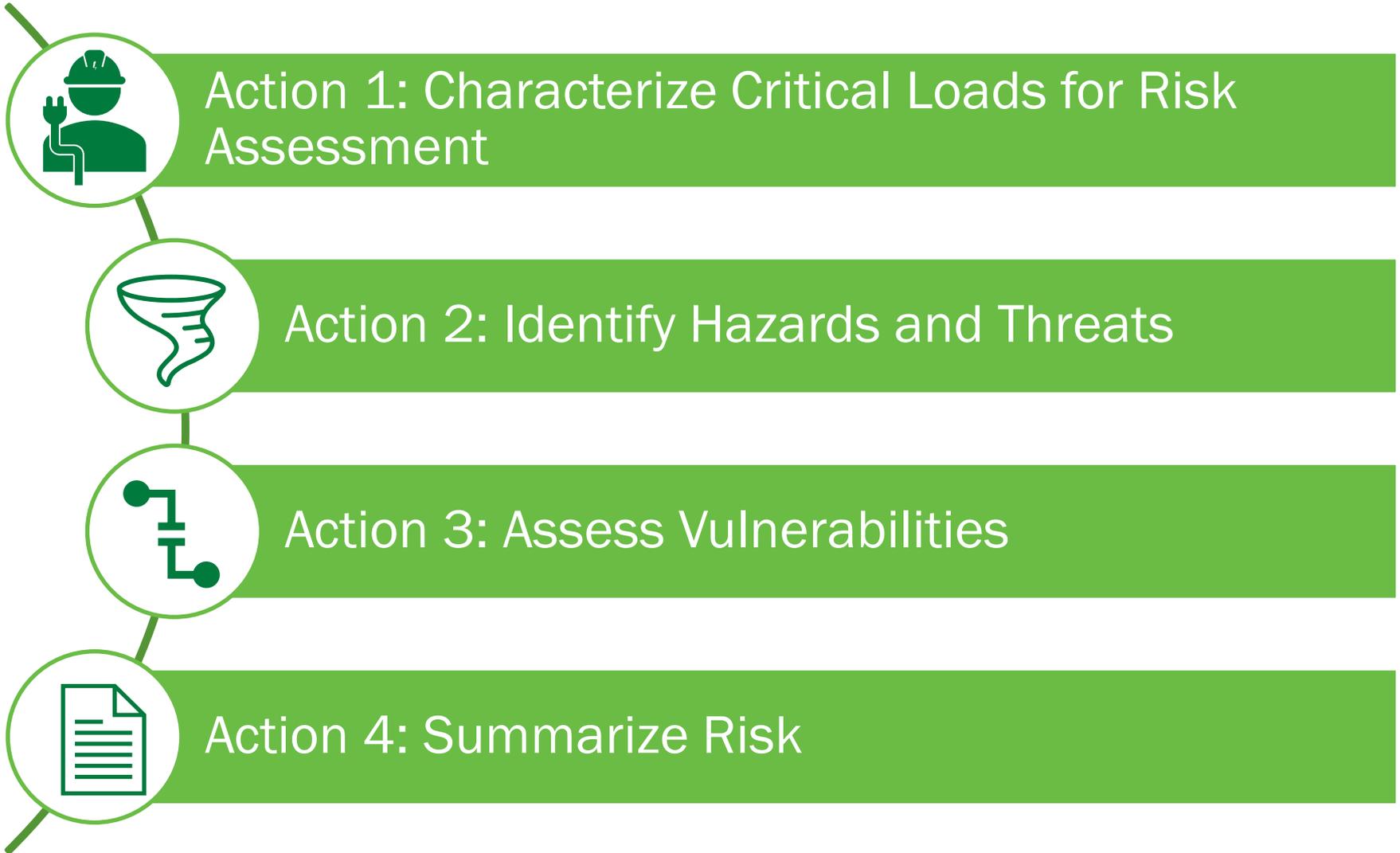


What are the drivers of risk at my site – and where do I most need resilience solutions?

How can I understand how resilience solutions compare?

Photo Credit: WaterOnline.com

Risk Assessment Actions



Risk Assessment Expectations

As screening tool, expectation is inputs are *approximate*

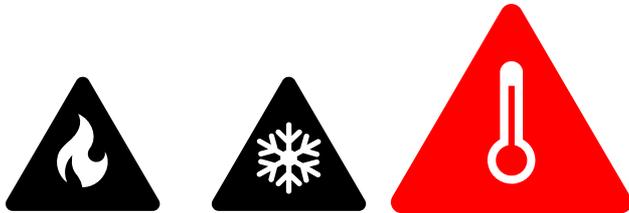
- Rough estimate input data to understand relative risk
- Not intended to generate precise risk estimates

Expectation of *user iteration*

- Use informed judgement to enter “good enough” inputs for preliminary pass
- Revisit as more data available and use comment fields judiciously

Ensure Transparent & Systematic Comparison

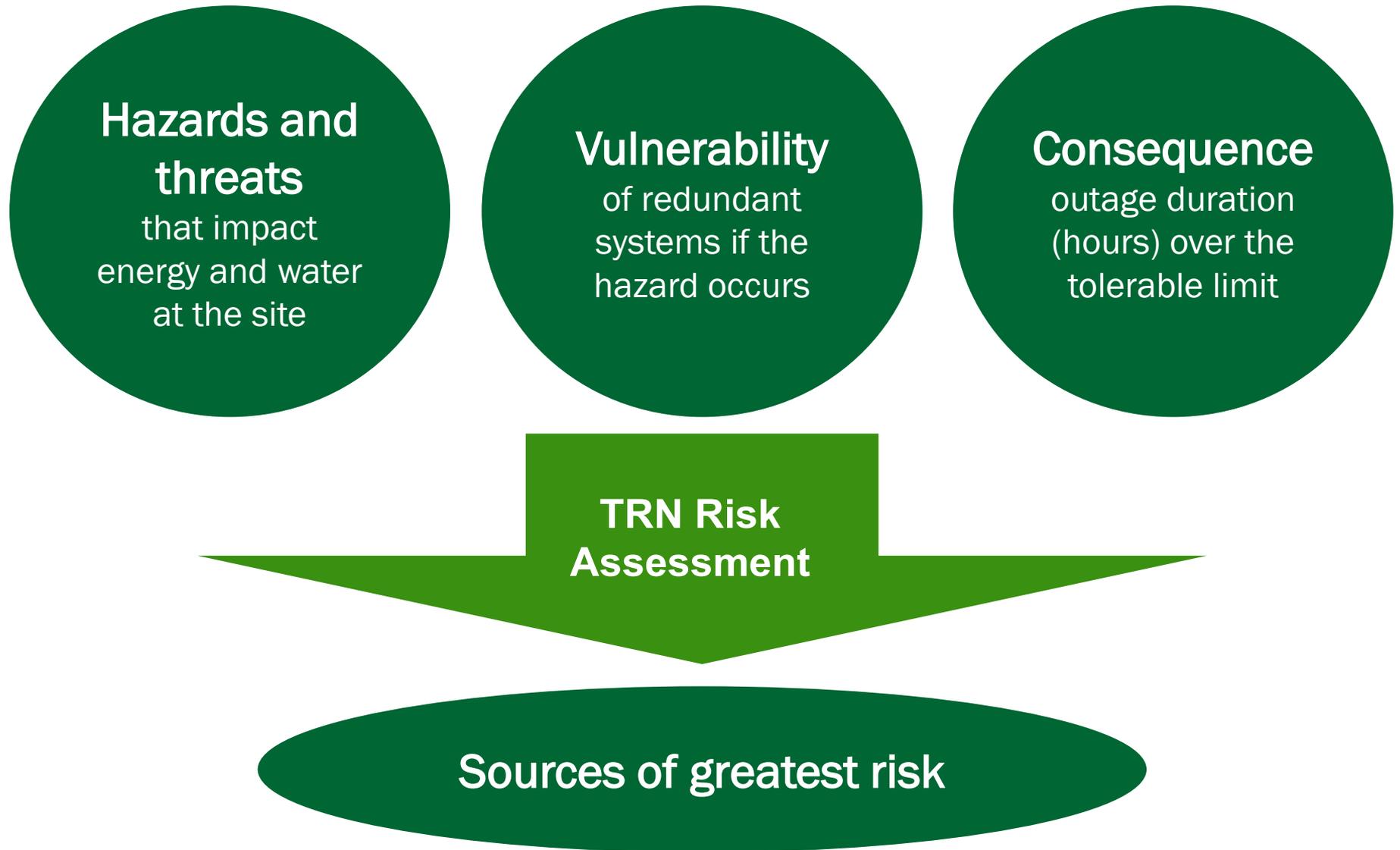
Identify hazards



Understand which hazards drive risk to critical loads – and merit solutions

- **TRN highlights relative risk across:**
 - Critical loads
 - Hazards
 - Types of vulnerabilities
- **Documented assumptions on risk inputs; conduct sensitivity analysis**
- **Directly compare how well different solutions address risk (and other site-specific criteria)**
- **Quantitative, repeatable methodology enhances justification for solutions**

Risk-informed resilience planning



Conduct Risk Assessment

Risk = Hazards and Threats x Vulnerability x Consequences

Frequency of a hazard impacting system

Grouped Hazards
Dual-impact Hazards

Probability that protections fail

State of redundant systems

Severity of impact if protections fail

Outage duration (hours)

Determine weighted risk

Criticality weightings



$$\text{Risk} = \text{Hazards and Threats} \times \text{Vulnerability} \times \text{Consequences}$$



Frequency of a hazard impacting system

Grouped Hazards
Dual-impact Hazards



Probability that protections fail

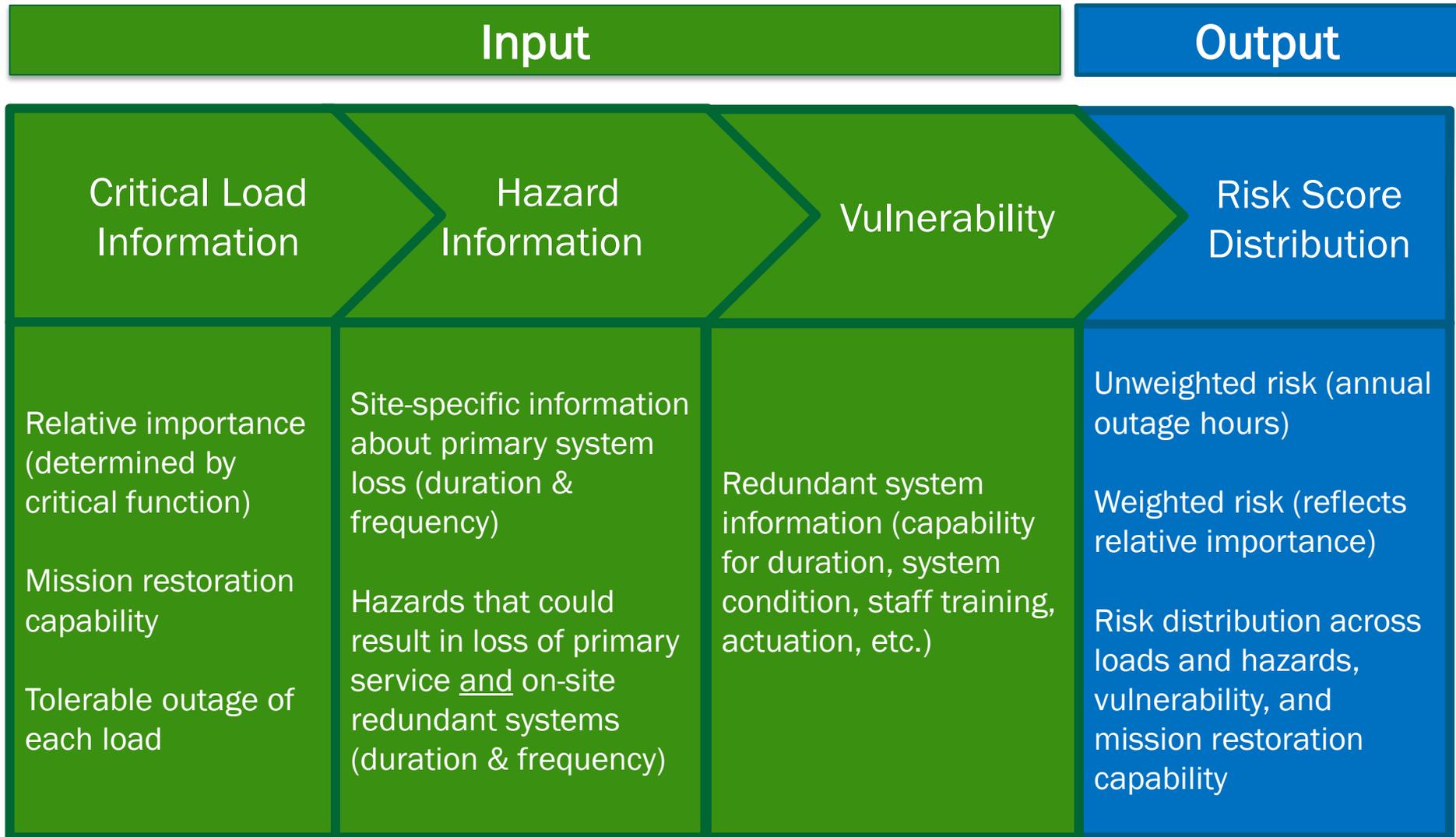
State of redundant systems



Severity of impact if protections fail

Outage duration (hours)

Key Inputs and Outputs for TRN Risk Screening



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Want to Find Out More?



TRN Risk Assessment Training

- ✓ Technical Resilience Navigator - Risk Assessment Overview <https://www.wbdg.org/continuing-education/femp-courses/fempodw058>
- ✓ Developing And Prioritizing Resilience Solutions Within The Technical Resilience Navigator <https://www.wbdg.org/continuing-education/femp-courses/fempodw059>

Solution Development

Solution Development Actions



Action 1: Analyze Resilience Gaps



Action 2: Identify Resilience Solutions

Analyze Resilience Gaps



- Notice areas where no gaps have been identified and think about whether there are gaps that have been missed
- Understand the root cause of the gaps to develop solutions targeted at the source of the gaps
- Identify opportunities for solutions that solve multiple gaps at once

Step 1 and 2: Consolidate and Characterize Resilience Gaps								
Gap Description	Type of Gap			Resilience Attributes Impacted				Critical Functions or Loads Impacted by Gap
	Technological	Operational	Institutional	Redundant	Robust	Resourceful	Recovery	
<i>Data processing does not have enough energy and water to sustain missions for 1 week.</i>	X	X		X				<i>Data processing</i>
Total Number of gaps in type or attribute:								

Identify Resilience Solutions



Resource Impacted	Solution Description	Solution Type	Resilience Attributes Incorporated
Energy	Microgrid serving critical loads with onsite storage and islanding controls.	Technological	Redundancy Robustness
Energy and Water	Recovery plans in place and exercised.	Operational	Resourcefulness Recovery
Energy	Develop strategic investment plan for critical infrastructure and end-of-life replacement with more resilient infrastructure.	Operational Institutional Technological	Resourcefulness Recovery
Energy and Water	Increase site security, remote monitoring, and/or develop robust fence and gate infrastructure for physical security.	Operational Institutional	Resourcefulness Robustness
Energy and Water	Develop pre-event checklist for site preparation.	Operational	Resourcefulness Robustness
Energy	Develop distributed resources for spatial diversity and grid flexibility, implement redundant transmission and distribution lines, and/or diversify energy supply.	Operational Technological	Redundancy Resourcefulness Robustness Recovery
Energy and Water	Utility agreements to allow for islanding and quick recovery on-site.	Operational	Resourcefulness Recovery

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Solution Prioritization

Module 5: Solution Prioritization

Evaluate which solutions best meet your needs



*Which solutions decrease my risk the most?
What priorities should guide my decision making?*

Solution Prioritization Actions



Action 1: Screen Solutions



Action 2: Model Solution Risk Reduction Potential

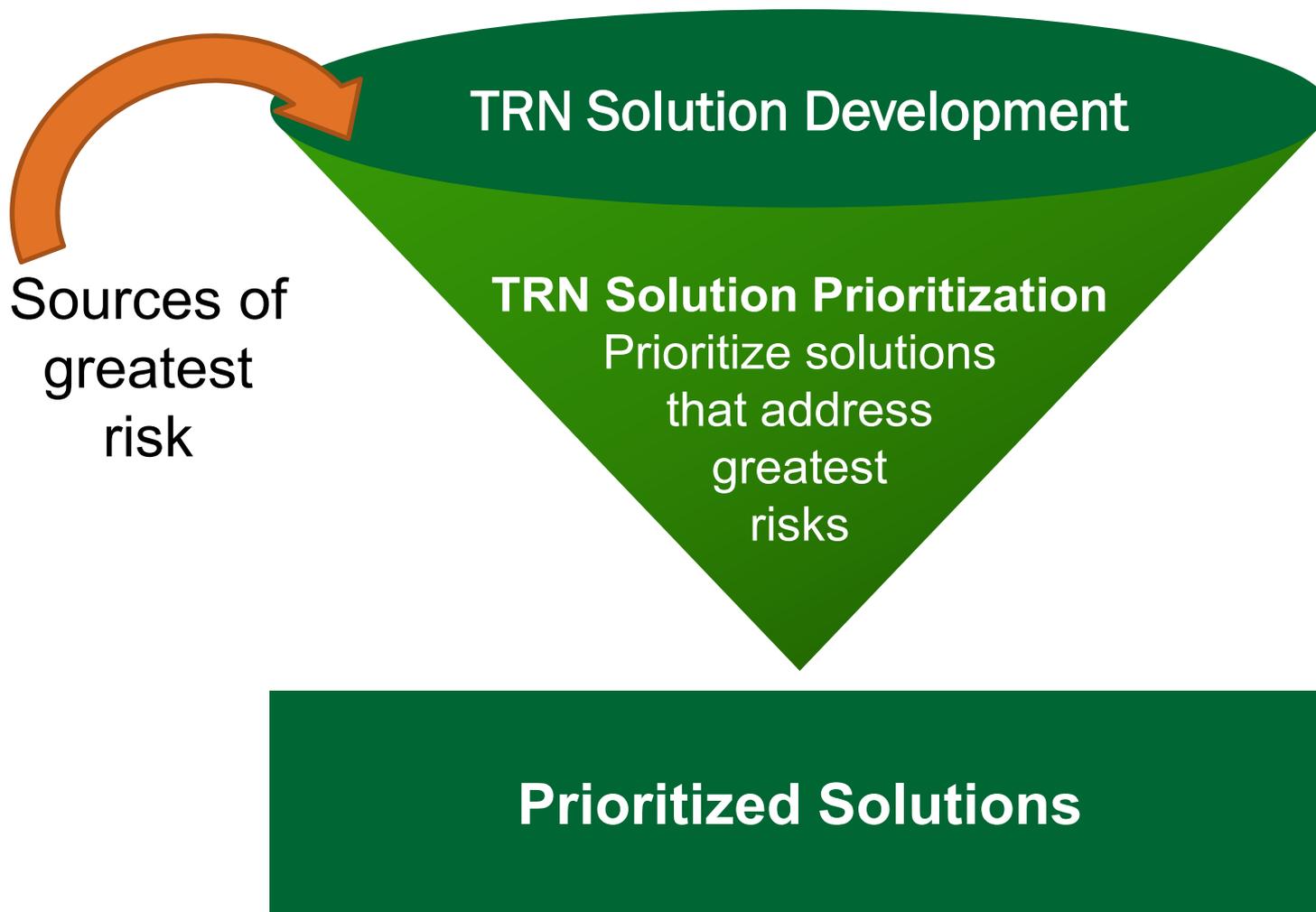


Action 3: Review Priorities and Costs



Action 4: Prioritize Solutions

Risk-informed solution development and prioritization



Generate a Prioritized List of Resilience Solutions

- Prioritize solutions based on:
1. Risk-reduction potential
 2. Site prioritization criteria
 3. Cost of implementation and ongoing costs



Consider cost and other criteria when prioritizing resilience solutions

- **Prioritization criteria can include any decision-making factors important to the site, such as**
 - Addressing efficiency goals
 - Addressing sustainability goals
 - Addressing leadership priorities
- **These criteria are combined with risk-reduction potential to generate the resilience solution benefit potential**
- **Finally, a high-level cost estimate for each resilience solution can be included to help generate a prioritized list of resilience solutions**

Priority Order	Solution	Potential Benefit	Cost Category	Priority	10-Year Total Cost
1	Improve mission duplication capability for data storage and processing. Reduce time to initiate, document and train on process.	Moderate	Low	7	\$200,000
2	Conductivity controller (water efficiency measure, to extend water redundant system capability).	Low	Low	8	\$110,000
3	Solution set: friction damper + conductivity controller + enhancement of mission duplication capability.	Moderate	High	15	\$1,610,000
4	Friction damper: upgrade water redundant system with aseismic design.	Low	High	16	\$1,300,000

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Roadmap to Action

Module 6: Roadmap to Action Coming Soon!

Implement your solutions!



*How do I pitch my resilience solution?
What financing mechanisms can I use?
How do I get started?*

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Questions?

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Technical Resilience Navigator

TRN Benefits

- ✓ Establishes resilience priorities
- ✓ Identifies critical energy/water loads
- ✓ Delivers processes for risk-informed decision making
 - ✓ Prioritized list of resilience solutions
- ✓ Provides resources for continual engagement with leadership and stakeholders

Flexible Approach

- ✓ Allows agency/site priorities to shape assessments and solutions
- ✓ Speaks to all levels of resilience planning expertise
- ✓ Allows users to “drop in” and use modules they find useful
- ✓ Web-based application

Want to Find Out More?



TRN Risk Assessment Training

- ✓ Technical Resilience Navigator - Risk Assessment Overview <https://www.wbdg.org/continuing-education/femp-courses/fempodw058>
- ✓ Developing And Prioritizing Resilience Solutions Within The Technical Resilience Navigator <https://www.wbdg.org/continuing-education/femp-courses/fempodw059>

Thank you!

Create an account TODAY at
trn.pnnl.gov



Website: <https://femp.energy.gov>