2024 Idaho State Energy Security Plan
"Risk Assessment" and "Energy Resiliency & Hazard Mitigation" sections

For use in Applications for Round 2 of the Energy Resiliency Grant Program

RISK ASSESSMENT

The risk assessment leverages industry subject matter expertise and recommendations from a stakeholder group to inform Idaho's energy security planning efforts. This section supports the State's emergency planning and response and provides information to energy system asset owners.

Methodology

OEMR facilitated a stakeholder advisory group comprised of energy, agency, Tribal, and community stakeholders who advised, supported, and recommended updates to OEMR for the Plan. OEMR hosted three advisory group meetings. At these meetings, the advisory group selected high priority risks, responded to a risk assessment survey, reviewed the scored risks, and provided feedback on the draft Plan.

Advisory group members:

- Avista (electricity division and natural gas division)
- Idaho Consumer Owned Utility Association
- Idaho Power
- Idaho National Lab (INL)
- Intermountain Gas Company (IGC)
- Idaho Public Utilities Commission
- Marathon
- Nez Perce Tribe
- PacifiCorp
- Williams Companies
- Yellowstone Pipeline Company (Phillips 66)
- TransCanada Energy (TC Energy)

Risk Selection

In the first advisory group meeting, OEMR introduced the Plan and a preliminary plan for completing the risk assessment. Members were asked to nominate threats to their communities or organizations along with threats they perceived to be of greatest concern.

In the second advisory group meeting, the advisory group voted to analyze nine of the threats it deemed most pervasive to Idaho's energy security: cyberattack, physical attack, extreme heat, damaging wind, flooding, earthquake/liquefaction, lightning, winter storm, and wildfire.

Assessment of Vulnerability and Consequence

A survey (attached below as Appendix M) was distributed to energy asset owners to collect information regarding asset vulnerabilities, historical consequences, and future consequences. The survey was developed by OEMR and reviewed by the PUC, DOE CESER, and NASEO before distribution. Annualized frequency maps for natural disaster threats were developed using data from FEMA's National Risk Index (NRI). Survey respondents were asked to distribute the survey to subject matter experts in their organizations and were given a period of one week to respond. Responses were aggregated and integrated into risk assessment matrices.

Scoring

Scores were based on the results of the survey. Only publicly available data and self-reported data was used for scoring. The survey was designed to allow respondents to provide non-sensitive information that can be publicly presented. Using data from the PUC, scores were weighted to reflect the number of customers served by utilities. For example, Idaho Power serves 48.56% of customers in Idaho. A vulnerability score of 1 for Idaho Power translates to a weighted score of 0.49. By asset type, the scores of each energy provider were combined to create a statewide score. Once scores were developed by asset type, the average vulnerability scores and consequence scores were multiplied by the threat score to calculate overall risk.

Threat Score × Avg. Vulnerability Score × Avg. Consequence Score = Risk Score

The calculations were plotted on a heat map to display the likelihood of threats across the state. Threat score was plotted on the Y axis and the Avg. Vulnerability Score × the Avg. Consequence Score was plotted on the X axis.

In the third advisory group meeting, members were asked to review and comment on the draft risk assessment.

Other Multiple Sector Threats and Additional Conversation

Energy system asset owners were asked to describe historical impacts of cyber and physical attacks on infrastructure. The approach was intended to use responses to project future frequency of threat occurrence and possible consequences. Responses to the survey did not produce data usable for assessing risk as each data point is not correlated and do not produce observable trends. Statistically, the collected data is random.

In the past five years, the State of Idaho has had cases of vandalism and theft from infrastructure sites. One event was an intentional effort to damage the facility with ballistics. A citizen from Meridian, Idaho, drove to the Hells Canyon Complex and shot at substation infrastructure resulting in damages totaling $546,982.46 and a short disruption of production capability from the Hells Canyon and Brownlee Dams.[63]

Regarding cyberattacks, responses varied in historical exposure to cyberattacks. Of the eight organizations surveyed, three indicated there have been attempts to infiltrate their systems in the past five years. One of the responding organizations indicated that they were aware of daily attempts to breach their systems. Of those three, only one indicated there was a successful attack. In December 2023, Lower Valley Energy, based in Wyoming and serving a small portion of Idaho customers, fell victim to a ransomware attack.[64] The investigation into the incident did not find evidence that personal information of customers was impacted.

These cyber and physical attacks are becoming more prevalent in the threat landscape. Understanding the potential impact to infrastructure, OT, and IT systems is imperative for utilities' preparedness and planning efforts.

Recommendations for Future Risk Assessments

OEMR has identified areas to build upon in future versions of the Plan:

- Refine survey used to assess vulnerability and consequence
- Continue to obtain useful threat data
- Assess threats by region to account for regional differences, such as climate
- Fine-tune natural gas and petroleum methodology

[63] Meridian man sentenced for shooting multiple power stations at Idaho dams in 2022," KTVB 7, June 2024, https://www.ktvb.com/article/news/crime/meridian-man-sentenced-shooting-power-stations-hells-canyon-brownlee-dams/277-2a3a0451-aab2-4f86-9c63-42cf30b50028

[64] "Cybersecurity Incident Update," Lower Valley Energy, December 2023, https://www.lvenergy.com/2023/12/28/cybersecurity-incident-update/

Risk Data

Survey respondents identified the portion of their energy system and the number of customers located in the identified risk regions.

Threats were scored based solely on FEMA's NRI annual frequency data.[65] This data is available by county and was translated into a county level heat map displaying the most at-risk counties in the state. These heatmaps are available in Appendix M.

For exposure to the threat, or vulnerability, respondents could select tiered options of 50% or more, 20% - 49%, 1% - 19%, and 0% of their system. A score of 1 was allocated to the 1% - 19% option, a score of 2 was given to the 20% - 49% option, and a score of 3 was given to the 50% or more option.

Similarly, respondents had the option to select 20% or more, 5% - 19%, less than 5%, or 0% of customers would lose service should their system be impacted by a threat. A score of 1 was allocated to the less than 5% option, a score of 2 was given to the 5% - 19% option, and a score of 3 was given to the 20% or more option.

Electricity

Using data from the PUC, OEMR calculated the total percentage of utility service to Idaho. There is a base number of 1,216,667 electricity customers in the State of Idaho. Idaho Power serves 48.56%, Avista serves 33.48%, Rocky Mountain Power serves 7.27%, and other electricity providers serve 10.69%.[66] The scores from the survey responses were weighted by multiplying the score by the percentage of customers served. To generate a statewide score, the weighted scores were added together. The scores are shown below.

Annual Frequency	Ranking	Threat Score
0.00 – 0.200	Very Low	1
0.200 - 0.400	Low	1.5
0.400 – 0.600	Moderate	2.0
0.600 - 0.800	High	2.5
0.800 – 1.000	Very High	3.0

Threat	State Average Annual Frequency	Overall Rating	Threat Score
Damaging Wind	.2081	Low	1.5
Earthquakes/Liquefaction	.6207	High	2.5
Extreme Heat	.3872	Low	1.5
Flooding	.2966	Low	1.5
Lightning	.2672	Low	1.5
Wildfire	.8310	Very High	3.0
Winter Storm	.4561	Moderate	2.0

Statewide Vulnerability and Consequence Score	Ranking
0 - 0.60	Very Low

[65] "Data Resources," FEMA, 2024, https://hazards.fema.gov/nri/data-resources
[66] "Idaho Public Utilities Commission Annual Report 2023," IPUC, 2023, https://puc.idaho.gov/Fileroom/PublicFiles/annualreports/ar2023/ar2023.html

0.61 – 1.20	Low
1.21 – 1.80	Moderate
1.81 – 2.40	High
2.41 – 3.0	Very High

Vulnerability Scores	Production	Transmission	Storage	Distribution Network	Overall Rating
Damaging Wind	1.1893	1.4030	1.1893	1.4030	1.30
Earthquakes/Liquefaction	1.1893	1.1893	1.1893	1.1893	1.19
Extreme Heat	0.9713	1.3061	0.9713	1.3061	1.14
Flooding	1.6023	1.6023	1.6023	1.6023	1.60
Lightning	1.1893	1.8447	1.1893	1.8447	1.52
Wildfire	0.7281	2.1850	0.0727	2.1850	1.29
Winter Storm	0.5529	1.3591	0.2180	1.3591	0.87

Consequence Scores	Production	Transmission	Storage	Distribution Network	Overall Rating
Damaging Wind	1.6750	2.5583	1.6750	2.5583	2.12
Earthquakes/Liquefaction	1.6750	1.6750	1.6750	1.6750	1.67
Extreme Heat	1.6750	2.0098	1.6750	2.0098	1.84
Flooding	1.6023	1.6023	1.6023	1.6023	1.60
Lightning	1.6023	2.1508	1.6023	2.1508	1.88
Wildfire	0.6939	2.1508	0.1454	2.1508	1.29
Winter Storm	0.8150	2.0000	0.1454	2.0000	1.24

Damaging Wind:

To calculate Statewide Risk, the Threat Score is multiplied by the average Vulnerability Score across asset types and the average Consequence Score across asset types. To this end, to calculate the Risk Score of damaging wind to the State of Idaho's electricity infrastructure, the formula would be 1.5 (Threat Score) * 1.30 (Vulnerability Score) * 2.12 (Consequence Score) = 4.12 points out of 9 possible (Risk Score).

Flooding:

To calculate Statewide Risk, the Threat Score is multiplied by the average Vulnerability Score across asset types and the average Consequence Score across asset types. To this end, to calculate the Risk Score of flooding to the State of Idaho's electricity infrastructure, the formula would be 1.5 (Threat Score) * 1.60 (Vulnerability Score) * 1.60 (Consequence Score) = 3.85 points out of 9 possible (Risk Score).

Earthquake and Liquefaction:

To calculate Statewide Risk, the Threat Score is multiplied by the average Vulnerability Score across asset types and the average Consequence Score across asset types. To this end, to calculate the Risk Score of earthquakes and liquefaction to the State of Idaho's electricity infrastructure, the formula would be 2.5

(Threat Score) * 1.19 (Vulnerability Score) * 1.67 (Consequence Score) = 4.98 points out of 9 possible (Risk Score).

Extreme Heat:

To calculate Statewide Risk, the Threat Score is multiplied by the average Vulnerability Score across asset types and the average Consequence Score across asset types. To this end, to calculate the Risk Score of extreme heat to the State of Idaho's electricity infrastructure, the formula would be 1.5 (Threat Score) * 1.14 (Vulnerability Score) * 1.84 (Consequence Score) = 3.15 points out of 9 possible (Risk Score).

Lightning:

To calculate Statewide Risk, the Threat Score is multiplied by the average Vulnerability Score across asset types and the average Consequence Score across asset types. To this end, to calculate the Risk Score of lightning to the State of Idaho's electricity infrastructure, the formula would be 1.5 (Threat Score) * 1.52 (Vulnerability Score) * 1.88 (Consequence Score) = 4.27 points out of 9 possible (Risk Score).

Wildfire:

To calculate Statewide Risk, the Threat Score is multiplied by the average Vulnerability Score across asset types and the average Consequence Score across asset types. To this end, to calculate the Risk Score of wildfire to the State of Idaho's electricity infrastructure, the formula would be 3.0 (Threat Score) * 1.29 (Vulnerability Score) * 1.29 (Consequence Score) = 4.98 points out of 9 possible (Risk Score).

Winter Storms:

To calculate Statewide Risk, the Threat Score is multiplied by the average Vulnerability Score across asset types and the average Consequence Score across asset types. To this end, to calculate the Risk Score of winter storms to the State of Idaho's electricity infrastructure, the formula would be 2.0 (Threat Score) * 0.87 (Vulnerability Score) * 1.24 (Consequence Score) = 2.16 points out of 9 possible (Risk Score).

Natural Gas

Data from both the PUC and self-reported data from natural gas service providers and product suppliers informed the weighting and development of statewide scores for asset types across threats. In contrast to the assessment conducted for electricity, the natural gas section analyzes threats by the total volume of natural gas serviced. PUC's 2023 Annual Report indicates the State of Idaho consumed about 1,020,000,000 therms of natural gas.[67] Of this number, Avista distributed 154,280,000 therms, or 15.12% of the market. Correspondingly, IGC distributed 862,600,000 therms, or 84.56% of the market.

Due to the sensitivity of some of the data used for score calculation, a detailed description is not shared.

Overall, scoring followed a procedure similar to the electricity scoring. Natural gas companies such as Avista, Dominion, and IGC are not responsible for the production, transmission, or storage of natural gas. Instead, they purchase the product from companies like Williams and TC Energy where natural gas is then pumped into distribution systems. To analyze the consequence of threats to assets, OEMR analyzed the total volume of natural gas TC Energy and Williams distributed to Avista and MDU. From this, OEMR calculated the number of customers that could be impacted. For example, if Avista received 40% of its natural gas for distribution from the Williams Pipeline, and IGC received 50% of its natural gas for distribution from the

[67] "Idaho Public Utilities Commission Annual Report 2023," IPUC, https://puc.idaho.gov/Fileroom/PublicFiles/annualreports/ar2023/ar2023.html

Williams Pipeline, the consequence of the Williams Pipeline being taken offline would be 40% of Avista's service in therms plus 50% of IGC's service.

Annual Frequency	Ranking	Threat Score
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0.200 - 0.400	Low	1.5
0.400 – 0.600	Moderate	2.0
0.600 - 0.800	High	2.5
0.800 – 1.000	Very High	3.0

Threat	State Average Annual Frequency	Overall Rating	Threat Score
Damaging Wind	.2081	Low	1.5
Earthquakes/Liquefaction	.6207	High	2.5
Extreme Heat	.3872	Low	1.5
Flooding	.2966	Low	1.5
Lightning	.2672	Low	1.5
Wildfire	.8310	Very High	3.0
Winter Storm	.4561	Moderate	2.0

Statewide Vulnerability and Consequence Score	Ranking
0 - 0.60	Very Low
0.61 – 1.20	Low
1.21 – 1.80	Moderate
1.81 – 2.40	High
2.41 – 3.0	Very High

Vulnerability Scores	Production	Transmission	Storage	Distribution Network	Overall Rating
Damaging Wind	0	0.0695	0	2.9904	0.76
Earthquakes/Liquefaction	0.9272	0	0.9272	1.6912	0.89
Extreme Heat	0.9272	0.9272	0.9272	0	0.70
Flooding	0.9272	0	0	2.6880	0.90
Lightning	0.9272	0.9272	0.9272	0	0.70
Wildfire	2.7817	2.8513	2.7817	2.5368	2.74
Winter Storm	0.9272	0.9272	0	1.2992	0.79

Consequence Scores	Production	Transmission	Storage	Distribution Network	Overall Rating
Damaging Wind	0.0000	0.0000	0.0000	0.9968	0.25
Earthquakes/Liquefaction	0.927248	0	0.927248	0.8456	0.68
Extreme Heat	0.927248	0.927248	0.927248	0	0.70
Flooding	0.927248	0	0	0.8456	0.44
Lightning	0.927248	0.927248	0.927248	0.1512	0.73
Wildfire	0.927248	0.9968	0.927248	0.9968	0.96
Winter Storm	0.927248	0.927248	0.0000	0.9968	0.71

Damaging Wind:

To calculate Statewide Risk, the Threat Score is multiplied by the average Vulnerability Score across asset types and the average Consequence Score across asset types. To this end, to calculate the Risk Score of damaging wind to the State of Idaho's natural gas infrastructure, the formula would be 1.5 (Threat Score) * 0.76 (Vulnerability Score) * 0.25 (Consequence Score) = 0.29 points out of 9 possible (Risk Score).

Flooding:

To calculate Statewide Risk, the Threat Score is multiplied by the average Vulnerability Score across asset types and the average Consequence Score across asset types. To this end, to calculate the Risk Score of flooding to the State of Idaho's natural gas infrastructure, the formula would be 1.5 (Threat Score) * 0.90 (Vulnerability Score) * 0.44 (Consequence Score) = 0.60 points out of 9 possible (Risk Score).

Earthquake and Liquefaction:

To calculate Statewide Risk, the Threat Score is multiplied by the average Vulnerability Score across asset types and the average Consequence Score across asset types. To this end, to calculate the Risk Score of earthquakes and liquefaction to the State of Idaho's natural gas infrastructure, the formula would be 2.5 (Threat Score) * 0.89 (Vulnerability Score) * 0.68 (Consequence Score) = 1.50 points out of 9 possible (Risk Score).

Extreme Heat:

To calculate Statewide Risk, the Threat Score is multiplied by the average Vulnerability Score across asset types and the average Consequence Score across asset types. To this end, to calculate the Risk Score of extreme heat to the State of Idaho's natural gas infrastructure, the formula would be 1.5 (Threat Score) * 0.70 (Vulnerability Score) * 0.70 (Consequence Score) = 0.73 points out of 9 possible (Risk Score).

Lightning:

To calculate Statewide Risk, the Threat Score is multiplied by the average Vulnerability Score across asset types and the average Consequence Score across asset types. To this end, to calculate the Risk Score of lightning to the State of Idaho's natural gas infrastructure, the formula would be 1.5 (Threat Score) * 0.70 (Vulnerability Score) * 0.73 (Consequence Score) = 0.76 points out of 9 possible (Risk Score).

Wildfire:

To calculate Statewide Risk, the Threat Score is multiplied by the average Vulnerability Score across asset types and the average Consequence Score across asset types. To this end, to calculate the Risk Score of wildfire to the State of Idaho's natural gas infrastructure, the formula would be 3.0 (Threat Score) * 2.74 (Vulnerability Score) * 0.96 (Consequence Score) = 7.90 points out of 9 possible (Risk Score).

Winter Storms:

To calculate Statewide Risk, the Threat Score is multiplied by the average Vulnerability Score across asset types and the average Consequence Score across asset types. To this end, to calculate the Risk Score of winter storms to the State of Idaho's natural gas infrastructure, the formula would be 2.0 (Threat Score) * 0.79 (Vulnerability Score) * 0.71 (Consequence Score) = 1.12 points out of 9 possible (Risk Score).

Petroleum

Due to availability of data, vulnerability to the Southern part of Idaho's petroleum sector is based on natural gas transmission because of similarities such as geographic location and age of the assets. Risks to the distribution system were not analyzed.

The Idaho Fuels Regional Resilience Assessment Program (RRAP) Project from June, 2020 indicates that 70% of fuel coming into Idaho is delivered on the Marathon Pipeline or truck deliveries originating from the cluster of five refineries and pipeline inputs in Salt Lake City, UT. The balance of required fuels comes from terminals in Montana and eastern Washington served by the Yellowstone Pipeline (about 20%) and a small portion delivered by rail and barge from various sources (about 10%).[68]

Annual Frequency	Ranking	Threat Score
0.00 – 0.200	Very Low	1
0.200 - 0.400	Low	1.5
0.400 – 0.600	Moderate	2.0
0.600 - 0.800	High	2.5
0.800 – 1.000	Very High	3.0

Threat	State Average Annual Frequency	Overall Rating	Threat Score
Damaging Wind	.2081	Low	1.5
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Flooding	.2966	Low	1.5
Lightning	.2672	Low	1.5
Wildfire	.8310	Very High	3.0
Winter Storm	.4561	Moderate	2.0

Statewide Vulnerability and Consequence Score	Ranking
0 - 0.60	Very Low
0.61 – 1.20	Low
1.21 – 1.80	Moderate
1.81 – 2.40	High
2.41 – 3.0	Very High

Vulnerability Scores	Production	Transmission	Storage	Overall Rating
Damaging Wind	0.2	0.2	0	0.13
Earthquakes/Liquefaction	0.7	0	0.7	0.47
Extreme Heat	0.7	0.7	0.7	0.70
Flooding	0.9	0.2	0	0.37
Lightning	0.7	0.9	0.9	0.83
Wildfire	2.1	2.3	2.1	2.17
Winter Storm	0.7	0.9	0	0.53

[68] "Resilience Assessment Idaho Fuels RRAP Project," CISA, June 2020, Pages 5-6.

Consequence Scores	Production	Transmission	Storage	Overall Rating
Damaging Wind	0.20	0.20	0.00	0.13
Earthquakes/Liquefaction	1.30	0.60	1.30	1.07
Extreme Heat	0.70	0.70	0.70	0.70
Flooding	1.30	0.60	0.00	0.63
Lightning	0.70	1.30	0.70	0.90
Wildfire	0.70	1.30	0.70	0.90
Winter Storm	0.70	1.30	0.00	0.67

<u>Damaging Wind:</u>

To calculate Statewide Risk, the Threat Score is multiplied by the average Vulnerability Score across asset types and the average Consequence Score across asset types. To this end, to calculate the Risk Score of damaging wind to the State of Idaho's petroleum infrastructure, the formula would be 1.5 (Threat Score) * 0.13 (Vulnerability Score) * 0.13 (Consequence Score) = 0.03 points out of 9 possible (Risk Score).

<u>Flooding:</u>

To calculate Statewide Risk, the Threat Score is multiplied by the average Vulnerability Score across asset types and the average Consequence Score across asset types. To this end, to calculate the Risk Score of flooding to the State of Idaho's petroleum infrastructure, the formula would be 1.5 (Threat Score) * 0.37 (Vulnerability Score) * 0.63 (Consequence Score) = 0.35 points out of 9 possible (Risk Score).

<u>Earthquake and Liquefaction:</u>

To calculate Statewide Risk, the Threat Score is multiplied by the average Vulnerability Score across asset types and the average Consequence Score across asset types. To this end, to calculate the Risk Score of earthquakes and liquefaction to the State of Idaho's petroleum infrastructure, the formula would be 2.5 (Threat Score) * 0.47 (Vulnerability Score) * 1.07 (Consequence Score) = 1.24 points out of 9 possible (Risk Score).

<u>Extreme Heat:</u>

To calculate Statewide Risk, the Threat Score is multiplied by the average Vulnerability Score across asset types and the average Consequence Score across asset types. To this end, to calculate the Risk Score of extreme heat to the State of Idaho's petroleum infrastructure, the formula would be 1.5 (Threat Score) * 0.70 (Vulnerability Score) * 0.70 (Consequence Score) = 0.74 points out of 9 possible (Risk Score).

<u>Lightning:</u>

To calculate Statewide Risk, the Threat Score is multiplied by the average Vulnerability Score across asset types and the average Consequence Score across asset types. To this end, to calculate the Risk Score of lightning to the State of Idaho's petroleum infrastructure, the formula would be 1.5 (Threat Score) * 0.83 (Vulnerability Score) * 0.90 (Consequence Score) = 1.13 points out of 9 possible (Risk Score).

<u>Wildfire:</u>

To calculate Statewide Risk, the Threat Score is multiplied by the average Vulnerability Score across asset types and the average Consequence Score across asset types. To this end, to calculate the Risk Score of wildfire to the State of Idaho's petroleum infrastructure, the formula would be 3.0 (Threat Score) * 2.17 (Vulnerability Score) * 0.90 (Consequence Score) = 5.85 points out of 9 possible (Risk Score).

<u>Winter Storms:</u>

To calculate Statewide Risk, the Threat Score is multiplied by the average Vulnerability Score across asset types and the average Consequence Score across asset types. To this end, to calculate the Risk Score of winter storms to the State of Idaho's petroleum infrastructure, the formula would be 2.0 (Threat Score) * 0.53 (Vulnerability Score) * 0.67 (Consequence Score) = 0.71 points out of 9 possible (Risk Score).

Final Risk Ranking and Scoring Results

Using the corresponding threat and impact scores, threats were placed on the heatmaps below according to the legend. Additionally, the colors in the heat maps denote overall risk of a threat to the state. Green is Low Risk, Yellow is Medium Risk, Red is High Risk, and Purple is Very High Risk. Comparing scores across resources is generally discouraged since each scoring methodology is different.

Legend	Symbol
Damaging Wind	DW
Earthquakes/Liquefaction	E/L
Extreme Heat	EH
Flooding	F
Lightning	L
Wildfire	WF
Winter Storm	WS

Electricity

Threat	3 (Very High)		WF			*Very High Risk*
	2.5 (High)		E/L			
	2.0 (Moderate)	WS				
	1.5 (Low)		EH	DW, F, L		*High Risk*
	1.0 (Very Low)	*Low Risk*				*Medium Risk*
		0.00 - 1.20 (Very Low)	1.20 – 2.40 (Low)	2.40- 3.60 (Moderate)	3.60 – 4.80 (High)	4.80 - 6.00 (Very High)
		Impact (Vulnerability x Consequence)				

Natural Gas

Threat	3 (Very High)			WF		*Very High Risk*
	2.5 (High)	E/L				
	2.0 (Moderate)	WS				
	1.5 (Low)	DW, EH, F, L				*High Risk*
	1.0 (Very Low)	*Low Risk*				*Medium Risk*
		0.00 - 1.20 (Very Low)	1.20 – 2.40 (Low)	2.40- 3.60 (Moderate)	3.60 – 4.80 (High)	4.80 - 6.00 (Very High)
		Impact (Vulnerability x Consequence)				

Petroleum

Threat	3 (Very High)		WF			*Very High Risk*
	2.5 (High)	E/L				
	2.0 (Moderate)	WS				
	1.5 (Low)	DW, EH, F, L				*High Risk*
	1.0 (Very Low)	*Low Risk*				*Medium Risk*
		0.00 - 1.20 (Very Low)	1.20 – 2.40 (Low)	2.40- 3.60 (Moderate)	3.60 – 4.80 (High)	4.80 - 6.00 (Very High)
		Impact (Vulnerability x Consequence)				

ENERGY RESILIENCY & HAZARD MITIGATION

Resiliency and hardening efforts provide stability and progress for the people of Idaho. As the threat landscape evolves, response and mitigation techniques must adapt quicker. Employing a variety of risk mitigation measures not only strengthens infrastructure, but it also ensures systems are not reduced to a single point of failure. Public agencies and private utilities should collaborate on effective and economical strategies to ensure reliability for ratepayers. These multitude of options are described below.

Robustness

Measure	Description	Sector
Demand Response Programs	Demand response programs relieve pressure on electric or natural gas delivery systems by reducing or time shifting customer energy usage. Demand reduction during peak periods reduces the chance of system overload and service failure. In addition to enhancing reliability, demand response can also help reduce generator or supplier market power and lessen price volatility.	Electricity Natural Gas
System Segmentation	Energy systems (power grids, gas pipeline networks, and liquid fuels pipeline networks) can be subdivided to more efficiently isolate damaged areas, allowing undamaged segments to continue serving customers. By segmenting networks, service isolations can be more targeted and affect fewer customers.	Electricity Liquid Fuel Natural Gas
Underground Power Lines	Placing transmission lines underground protects them against external threats, including high winds and falling branches, wildfires, extreme heat or cold, icing, dirt/dust/salt accumulation, and animals. Buried lines may be more vulnerable to flooding if located in low-lying areas and may be more difficult and expensive to maintain and repair.	Electricity

Redundancy

Measure	Description	Sector
Backup Generators	Fixed or portable backup generators can provide backup power to critical facilities when grid-supplied power is interrupted. Backup generators may be designed to power emergency functions, such as emergency lighting, fire suppression, or stormwater removal, or may be designed to power some or all of a facility's operational functions. Mobile generators can power utility or emergency responder base camps (sites where response personnel and equipment are staged). Backup generators require adequate fuel supply to operate.	Electricity Liquid Fuels Natural Gas
Battery Storage	Battery energy storage can be used to provide limited duration backup power during electric grid outages. Batteries can be deployed at utility-scale as front-of-the-meter systems, providing services like utility load peak shaving or behind-the-meter by customers. Batteries are often paired with solar photovoltaic systems and included in microgrid designs.	Electricity
Microgrids	A microgrid is a group of interconnected loads and distributed energy resources that acts as a single controllable entity with respect to the grid. It can connect and disconnect from the grid to operate in grid connected or island mode. Microgrids can improve customer reliability and resilience to grid disturbances.	Electricity

Ties between gas pipelines	Natural gas system operators can add ties between gas distribution lines or "mains" to diversify the transmission system and allow additional pathways to route natural gas in the event some sections of transmission mains are damaged.	Natural Gas

Rapid Detection/Recovery

Measure	Description	Sector
Advanced Distribution Management Systems	Advanced distribution management systems integrate numerous utility systems and provide automated outage restoration and optimization of distribution grid performance. These functions improve the resilience of the distribution system and decrease the length of customer outages.	Electricity
Artificial Intelligence Analysis	Artificial intelligence analysis can augment the abilities of subject matter experts to prioritize transmission line operations, identify defects, and update asset management systems.	Electricity Liquid Fuels Natural Gas
Distribution Automation	Distribution automation uses digital sensors and switches with advanced control and communication technologies to automate feeder switching; voltage and equipment health monitoring; and outage, voltage, and reactive power management.	Electricity
Drones for Asset Inspection	The use of drones to inspect pipelines, transmission lines, or other assets allows for safer and more frequent inspections, enhanced asset information, reduced operational costs and failure rates, and extended asset lifetimes.	Electricity Liquid Fuels Natural Gas
LIDAR for vegetation management	Vegetation is the primary cause of overhead power line outages. "Light Detection and Ranging" (LiDAR), is remote-sensing technology that can measure how close vegetation is to power lines. LiDAR units can be deployed on the ground, drones or aircraft, to enable more effective vegetation management reducing the impact of storms on electric infrastructure.	Electricity
Remote-operated valves	Remote-operated valves more efficiently isolate systems during disruptions or peak event load management (e.g., temporarily disconnecting gas customers).	Liquid Fuels Natural Gas
Advanced Metering Infrastructure	Advanced metering infrastructure (AMI) is an integrated system of smart meters, communications networks, and data management systems that enables bi-directional communication between utilities and customers. Smart meters can provide near-real-time visibility into customer outages and help utilities allocate resources and restoration activities more efficiently.	Electricity
Supply Chain Resilience Planning	Assessing current supply chains and working with relevant stakeholders to strategically plan for the continuity and rapid restoration of those supply chains after major disruptions improves supply chain resilience.	Electricity Liquid Fuels Natural Gas

Cold Weather Protection Measures

Measure	Description	Sector
Pipeline Insulation & Trace Heating	Fiberglass insulation used to enclose piping can protect against freezing. Additionally, an electrical heating element installed along the length of a pipe and covered by thermal insulation can be used to maintain or raise the temperature of the pipe during cold weather	Liquid Fuels Natural Gas
Water line Management	Draining water lines prevents rupturing that would otherwise be caused by the freezing water caught inside. Water lines that cannot be	Liquid Fuels Natural Gas

	drained can be set to drip. The small amount of flow caused by the steady drip can help prevent the water inside the lines from freezing and rupturing the lines.	
Heating & Pitch Adjustment for Wind Turbines	Wind turbine blades and lubricant housings can be fitted with heating elements that prevent ice accumulation that would otherwise impair operations. Wind turbines can also be configured to operate in winter ice operation mode, which changes the pitch of the blades to allow continued operation as they accumulate ice.	Electricity
Thermal Enclosures	Instrumentation can be enclosed and heated to ensure functionality and operational continuity during extreme cold conditions.	Electricity Liquid Fuels Natural Gas

<u>Extreme Heat & Drought Resistance Measures:</u>

Measure	Description	Sector
Advanced Water-Cooling Technologies	Power plants require significant volumes of water for thermoelectric cooling. Asset owners can employ approaches to reduce their water use to make them more resilient to drought conditions. Alternative approaches include recirculating cooling, dry cooling (highlighted below), and wet-dry hybrid cooling technologies. Cooling equipment capable of using alternative water sources (e.g., brackish water, wastewater) can reduce the impact of droughts.	Electricity
Dry Cooling	Nearly all thermal generation, including nuclear and coal-fired power plants, requires large quantities of water for cooling. Extreme heat can lead to water shortages or make the water used for cooling too warm, forcing power plant operators to curtail electricity output. Dry cooling technologies use air-cooled heat exchangers and other technologies to significantly reduce water use.	Electricity
Hydropower Reservoir Capacity	Increasing reservoir storage capacity at hydroelectric power plants can offset the effects of precipitation variability.	Electricity
Turbine Efficiency	Higher-efficiency hydroelectric turbines require less water per unit of electricity generated and are more resilient to drought.	Electricity

<u>Flood Protection Measures</u>

Measure	Description	Sector
Elevate Equipment	Elevating equipment located in low-lying areas can protect it from flooding that would otherwise damage or destroy it.	Electricity Liquid Fuels Natural Gas
Environmental Management	Preserving certain kinds of natural habitats (e.g., coastal wetlands) provides a natural barrier to lessen the impact of storm surge.	Electricity
Flood walls/gates	Installing flood walls, gates, and/or barriers can protect essential equipment in flood prone areas from water intrusion and avoid restoration delays after major storms and floods.	Electricity Liquid Fuels Natural Gas
Relocate Assets	Relocating energy assets away from flood-prone areas can reduce or eliminate their exposure to flooding and inundation threats	Electricity Liquid Fuels Natural Gas
Stormwater Pumps	Stormwater pumps can remove flood water and help prevent equipment from being submerged.	Electricity Liquid Fuels Natural Gas

Submersible Equipment	Equipment located in flood-prone areas, such as underground power distribution systems in low-lying areas, can be modified or replaced with equipment that is designed to continue functioning when subjected to flooding from water containing typical levels of contaminants such as salt, fertilizer, motor oil, and cleaning solvents.	Electricity Liquid Fuels Natural Gas
Vent line Protectors	A vent line protector (VLP) protects gas regulator vent lines from encroaching water. The VLP is usually open, but if water enters the vent line via the VLP, a float will seal the vent line shut. The float will drop when the water recedes, re-opening the vent to its normal position.	Natural Gas
Vented Manhole Covers	In flooding scenarios, manhole covers can dislodge, and the exposed manhole creates a hazard for pedestrians and vehicles. Proper vent design can allow for the flow of excess water without dislodging the cover	Electricity

<u>Seismic Protection Measures</u>

Measure	Description	Sector
Base Isolation Transformer Platform	Substation transformers can be placed on platforms designed to absorb the shaking from earthquakes that would otherwise damage the equipment.	Electricity
Culverts	Placing fuel pipelines within buried concrete trenches, called culverts, significantly reduces the fracturing, buckling, and other damage caused to buried pipelines during an earthquake	Liquid Fuels Natural Gas
Flexible Joints	Flexible joints between steel pipe segments absorb the deformations caused during an earthquake and lessen the damage caused to pipeline infrastructure	Liquid Fuels Natural Gas

<u>Wildfire Protection Measures</u>

Measure	Description	Sector
Covered Conductors	To mitigate wildfire risk, utilities can replace bare wire overhead conductors on high-voltage transmission lines with conductors that have a plastic covering (also called tree wire). Covered conductors greatly reduce the number of faults, and the risk of ignition. Similar products include spacer cables and aerial cables.	Electricity
Fire-resistant Poles	Wood poles can be replaced with ones made from fireproof materials, or wrapped in fireproof sheaths (e.g., wool-ceramic fiber).	Electricity
Line-break-protection Systems	Automated monitoring equipment, called phasor measurement units, installed on transmission lines can detect a voltage change associated with the breakage of a power line. The system can respond in near real-time by deenergizing that segment of the transmission line so that the broken power line does not spark a fire as it falls to the ground.	Electricity
Pre-treat assets in path of fire	Pre-treating infrastructure (e.g., by applying flame retardant coatings or wrapping assets such as utility poles in flame retardant sheaths) decreases wildfire damage and expedites restoration of service.	Electricity
Reconductoring	Reconductoring is the process of installing new conductor wires on existing towers to increase transmission capacity, thus reducing propensity for high loads and line sag, which can cause ignition. Reconductoring typically involves replacing traditional steel-reinforced lines with composite core lines.	Electricity

Wind Protection Measures

Measure	Description	Sector
Breakaway Service Connectors	A breakaway service connector is designed to disconnect when the power line it is attached to is pulled by a falling limb or other debris. This avoids damage caused when a service wire is pulled down in a way that damages the meter receptable. Meter receptables are not owned by the utility, and a private electrician is needed to first make repairs, delaying service restoration	Electricity
Dead-end Towers	Dead-end towers (also called anchor towers or anchor pylons) are self-supporting structures made with heavier material than suspension towers. Dead-end towers are used at the end of a transmission line; where the transmission line turns at a large angle; on each side of a major crossing such as a large river or highway, or large valley; and at intervals along straight segments to provide additional support. Suspension towers are typically used when the transmission line continues along a straight path. When weaker suspension towers are compromised or topple, the stronger dead-end structures can stop a domino effect that takes down multiple towers. Reducing the spacing between dead-end structures can limit the impacts of domino effect failures.	Electricity
Stronger Utility Poles	This can involve reinforcing wood poles, replacing wood poles with concrete ones, or replacing wood crossarms with fiberglass ones.	Electricity
Vegetation Management	Clearing vegetation away from transmission and distribution lines helps prevent damage (e.g., falling tree branches) to power lines that cause outages.	Electricity