



Critical Energy Infrastructure Hub

Assessment Findings

May 2019



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Cover photo

Site map of the critical energy infrastructure (CEI) hub on the western bank of the lower Willamette River area in northwest Portland, Oregon. The CEI hub, outlined in red, stretches for six miles. (Source: Oregon Department of Geology and Mineral Industries. Base map, Google Earth.)

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1. INTRODUCTION

During summer 2018, city of Portland’s Bureau of Emergency Management (PBEM) requested that Oregon Solutions conduct an assessment to determine potential avenues for collaborative action that might increase resiliency of the Critical Energy Infrastructure (CEI) hub located in northwest Portland. This request came after several meetings between members of the Portland City Club’s Earthquake Resiliency Advocacy Committee (CCERAC) and staff from the Governor’s Office, Oregon Solutions, and PBEM. According to a February 14, 2017, Portland City Club report, “approximately 90 percent of the liquid fuel for the entire state of Oregon and 100 percent of the jet fuel for Portland’s airport comes through the CEI hub.” But the tanks on this site are vulnerable to a Cascadia Subduction Zone event (CZE) given their age and that they were constructed on seismically vulnerable soils susceptible to liquefaction, which could potentially cause the tanks to “sink, split, tilt or leak.” Additionally, risks to the environment, life, safety, and property at and near the site from a CZE are unclear.

PBEM requested Oregon Solutions conduct an assessment focused on determining potential avenues for collaborative action that might increase resiliency of the hub. Specifically, this assessment looked at the following areas of inquiry:

- What ideas could reduce the risks associated with seismic activity impacting fuel storage facilities in northwest Portland at the CEI hub?
- What are the long- or short-term incentives, regulations, agreements, or other creative approaches that could be identified in order to bring all relevant parties to a collaborative table to improve resiliency?

The goal of this assessment interview process was to determine if there was enough substantive interest from stakeholders to work in a neutral process, such as an Oregon Solutions process, to look for ways to improve

ABOUT OREGON SOLUTIONS

Oregon Solutions is the state of Oregon’s program to help communities address community-based problems and opportunities through sustainable solutions. We do this by creating a neutral forum for collaboration where businesses, governments, nonprofits, community-based organizations, sovereigns, and other stakeholders can align resources and pool efforts to achieve desired results.

OREGON SOLUTIONS PROCESS

Oregon Solutions’ engagement starts with an assessment. When invited, Oregon Solutions begins an assessment to explore whether and how a collaborative approach might be structured to address a particular community issue. The assessment is composed of a series of one-on-one or small group interviews. If an assessment finds there is a project that can be conducted by Oregon Solutions, it will go before the governor for consideration of a designation as an Oregon Solutions project.

seismic resiliency at the CEI Hub. This report reflects the findings from our assessment interviews.

1.1. Methods

This assessment report is the product of interviews conducted by Oregon Solutions with parties and stakeholders representing key interests related to the CEI hub. Between July 2018 and January 2019, Oregon Solutions interviewed thirty-two individuals representing city, county, state, and federal government, as well as civic groups, energy associations, and the energy sector. Initial interviews for this assessment were conducted from July 2018 through January 2019. The overarching purpose of our assessment is to gauge stakeholder interest in a collaborative approach, such as an Oregon Solutions process, to address identified issues.

The team was not able to interview everyone with an interest in the CEI hub. Some requests that Oregon Solutions staff made for assessment interviews went unanswered even though several attempts were made over several months. We made every effort to reach out to stakeholders with an interest in the seismic resiliency of the hub. Our goal with assessment interviews is to have all interested parties feel their perspectives and interests will be represented by those interviewed. A list of those interviewed and their affiliations can be found in appendix A.

Most interviews were held in person—a few by phone. Before each interview, individuals were briefed about the purpose of the assessment. All interviews were voluntary and lasted approximately one to one-and-a-half hours. Interviewees were informed that the final report would aggregate responses into key issues without individual attribution.

1.2. Intent of this report

This report is *not* intended to be a comprehensive review of all issues published, reported on, or discussed about the hub. Instead, this assessment report reflects what Oregon Solutions heard from interviewees at a single point in time, and it is an overview for stakeholders and policy makers about the key topics of interest to parties engaged in the hub.

2. BACKGROUND

2.1. History

The state of Oregon and the greater Pacific Northwest are vulnerable to an earthly force little understood until the end of the twentieth century: powerful subduction zone earthquakes and coastal tsunamis that occur with periodic frequency along the Juan de Fuca and North American plates.

In the past, both the HUU-ay-aht First Nation peoples and the Makah tribe shared similar stories of lost land and peoples as a result of these earthquakes and tsunamis. But as recounted in a 2015 *The New Yorker* article, their stories were long overlooked as fact until scientific research paired Japanese tsunami records with on-the-ground geologic field

research to reconstruct the Cascadia earthquake of 1700.¹ What this research unveiled was that subduction zone earthquakes have occurred along the Pacific Northwest with relative regularity over the last 10,000 years, and if averages from past events are predictive, the region could be overdue for another powerful subduction zone earthquake.²

2.2. Critical infrastructure and community resiliency

Many of the region's buildings and critical infrastructure were built before the region's seismic exposure was widely understood.³ This infrastructure includes Oregon's primary liquid fuel storage facility, the CEI hub. This hub is located in northwest Portland and receives 90 percent of the state's liquid fuel supply either via pipe or marine vessel.⁴ One interviewee for this assessment noted that roughly 70 percent of the fuel arrives by pipe and another 30 percent arrives by tanker barge.

The CEI hub is considered by many experts to be vulnerable to failure in the event of a CZE event. A 2012 Oregon Department of Geology and Mineral Industries (DOGAMI) study notes that the hub has a "significant portion of Oregon's electricity, natural gas, and fuel oil infrastructure."⁵ Specific to the liquid fuel, DOGAMI's high-level findings spelled out the following areas of vulnerability:

- *General.* The facilities on the site range in age from a handful of years old up to one hundred years old; consequently, they range from "[infrastructure] built to no or very antiquated standards to new infrastructure built to the current state-of-practice standards."
- *General.* "Current building codes do not adequately address the seismic deficiencies in existing CEI hub facilities."
- *Liquid fuel pipeline.* "Liquid fuel pipeline was largely constructed in the 1960s when the regional seismic hazards were unknown and state-of-practice construction techniques at that time did not include any reference to seismic standards."
- *Marine terminals.* "All of the port facilities in the CEI hub have significant seismic risks due to liquefaction, lateral spreading, and seiches." Also, some "older piers were constructed without any seismic protection, have deteriorated, and are likely to fail in even a moderate earthquake."
- *Fuel supply.* At the time when the report was published, only "three existing tanks [were] known to have addressed liquefaction vulnerabilities." Moreover, the hub

1. Kathryn Shulz, "Annals of Seismology: The Really Big One," *The New Yorker*, July 20, 2015, <https://www.newyorker.com/magazine/2015/07/20/the-really-big-one>.

2. Ibid.

3. US Department of Homeland Security website, Cyber and Infrastructure, Overview, What is Critical Infrastructure? <https://www.dhs.gov/what-critical-infrastructure>.

4. Oregon Seismic Safety Policy Advisory Committee, "The Oregon Resilience Plan: Reducing Risk and Improving Recover for the Next Cascadia Earthquake and Tsunami," Energy chapter, February 2013, https://www.oregon.gov/oem/Documents/06_ORP_Energy.pdf.

5. Yumei Wang, Steven F. Bartlett, and Scott B. Miles, "Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub: Final Report to Oregon Department of Energy and Oregon Public Utility Commission," Oregon Department of Geology and Mineral Industries, August 2012.

has on average a “three to five day supply... for regular unleaded and diesel fuel,” with premium gasoline subject to daily delivery.⁶

A 2013 Oregon Resilience Plan echoed concerns from the DOGAMI report raising questions about the sturdiness of facilities constructed on soils susceptible to liquefaction, and infrastructure not built to current standards given the hub’s age-range of structures.⁷

These vulnerabilities mean that in the event of a CZE, Oregon communities dependent on fuel to respond to a disaster could struggle for adequate supply, and environmental and safety risks would be likely for people and natural places near the hub. Further, if the hub was majorly damaged, “operations could be degraded for months or years, with complete repairs and equipment replacement potentially taking many years.”⁸

In recent years, a great deal of research has been conducted into how crises or disasters (e.g., earthquake, hurricane, tsunami, and terrorism) are made worse by a failure or disruption of critical infrastructure.⁹ Pescaroli and Alexander researched how a breakdown in one critical sector, like energy, “can rapidly create much broader effects by cascading throughout the network and possibly...over into other networks...which may cause great harm and may become full-blown transboundary catastrophes.”¹⁰ They use the 2003 power outage in Italy and Switzerland to illustrate their point:

On the night of 28 September 2003, electricity was being imported into Italy from Switzerland via three routes. A short circuit occurred when one transmission line overheated and touched the branch of a tree. Transmission automatically switched to the other two lines and then shut itself down to prevent them from overheating too. A series of blackouts propagated from the Swiss-Italian border progressively as far as Sicily and Geneva, affecting 56 million people. Trains were marooned in tunnels, and people were trapped in elevators. Civil aviation was briefly shut down...transportation, health systems, the Internet and building maintenance were affected, and lack of refrigeration put foodstuffs at risk.¹¹

This real world example shows how a “very localized fault” can “rapidly spread to the level of international system-wide effects.”¹²

6. Yumei Wang, Steven F. Bartlett, and Scott B. Miles, “Earthquake Risk Study for Oregon’s Critical Energy Infrastructure Hub: Final Report to Oregon Department of Energy and Oregon Public Utility Commission,” Oregon Department of Geology and Mineral Industries, August 2012.

7. Oregon Seismic Safety Policy Advisory Committee, “The Oregon Resilience Plan: Reducing Risk and Improving Recovery for the Next Cascadia Earthquake and Tsunami,” February 2013, https://www.oregon.gov/oem/Documents/Oregon_Resilience_Plan_Final.pdf.

8. US Department of Homeland Security, “Columbia River Basin Petroleum and Refined-Product Supplies: Disruptions and Mitigations Under Cascadia Subduction Zone Earthquake Scenario,” July 2016.

9. Gianluca Pescaroli and David Alexander, 2016, “Critical Infrastructure, Panarchies and the Vulnerability Paths of Cascading Disasters, *Natural Hazards* (82) 1, 175–192, <https://link.springer.com/article/10.1007/s11069-016-2186-3>.

10. Ibid.

11. Ibid.

12. Ibid.

Professor Stephanie Chang, another leading researcher in disaster preparedness and community resilience says today’s “infrastructure services are so ingrained in modern life,” they are “both ubiquitous and taken for granted.” Because these systems are “highly interdependent,” damage and ensuing losses from outages are often substantial and disproportionately large. A community’s ability to manage the severity of impacts of a disaster also depends “not only upon the occurrence and duration of infrastructure loss but also upon preparedness and response actions undertaken by governments and individuals.” To that end, she says “reducing the likelihood of damage through pre-disaster mitigation, reducing the duration of outage through rapid restoration, and enhancing the capacity of people and businesses to withstand outage disruption through preparedness and emergency response planning will all enhance disaster resilience.”¹³

These and other examples speak to the importance of shoring up critical infrastructure, understanding how interdependent critical infrastructure is as part of emergency preparedness planning, and preparing communities to be as resilient as possible in case of a disaster that impacts essential services.

3. FINDINGS

3.1 Introduction

This section details findings from assessment interviews. **Note:** Findings do *not* reflect a point of view of the National Policy Consensus Center or any of our team members. Instead, findings reflect what we heard from interviewees.

We asked interviewees their perspectives on a variety of substantive issues during these interviews, including ideas to mitigate risk at the hub, perceived challenges that need to be addressed, thoughts on incentives and a distributed system of hubs, and interest in a collaborative approach to work through these issues. Interviewees were also asked to identify and consider how to overcome perceived challenges to collaboration. Interview questions can be found in appendix C.

Many ***substantive issues*** or themes emerged, which the assessment team saw as being related to the key assessment questions. These themes were described explicitly and implicitly by many interviewees. We have incorporated content from interviews, and these responses are listed in no particular order. We did not include comments that were not germane to the scope of this assessment. We note areas where lack of shared knowledge may currently impact individual perceptions about how a sector works and/or its capacity. We have also listed brainstormed ideas offered by interviewees related to incentives, and general interest in an Oregon Solutions-like collaborative process that could identify mitigation approaches.

13. Stephanie E. Chang, (2016), “Socioeconomic Impacts of Infrastructure Disruptions,” Oxford Research Encyclopedias (online), Natural Hazard Science, DOI: 10.1093/acrefore/9780199389407.013.66, [http://oxfordre.com/naturalhazardscience/oso/viewentry/10.1093/acrefore/9780199389407.001.0001\\$002facrefore-9780199389407-e-66;jsessionid=23E71F730780B95766656C3731E0B749](http://oxfordre.com/naturalhazardscience/oso/viewentry/10.1093/acrefore/9780199389407.001.0001$002facrefore-9780199389407-e-66;jsessionid=23E71F730780B95766656C3731E0B749).

3.2. Substantive findings

3.2.1. Likelihood of CZE event well understood

We found most interviewees had a good understanding of the risks associated with a CZE event, the potential risks to the hub, and the larger systems that the hub relies on (e.g., pipelines, docks, roads, bridges, and highways). This was significant since some interviewees noted that knowledge of a potential CZE event was not well understood—across sectors—even a handful of years ago.

There is also confidence that, in the event of an accident involving a single tank or a few tanks, emergency responders could respond well. But when it comes to a worst-case disaster like a CZE event, we found little clarity for how an emergency response would work. We found there to be speculation about what resources the public and private sectors have when it comes to a worst-case scenario event.

3.2.2. Shoring up the hub versus moving it

One of the main areas of interest for CCERAC and PBEM was to find out what people thought about the possibility of moving the hub from its current site to a more seismically-resilient location. With a few exceptions, most interviewees felt that moving the hub was not feasible because it would cost billions of dollars and it was unclear if there was a better location. Some interviewees noted a hub would still need to be accessed by river, proximate to existing pipeline infrastructure, and relatively close to the population center to have a rational product distribution mechanism. In light of that, some interviewees also questioned what other stretch of river would be safer for siting a hub facility.

We note a few interviewees felt a hub could be moved to eastern Oregon. These interviewees said an eastern Oregon hub would be safer and less exposed to earthquake east of the Cascades. In this example, other interviewees who were not as interested in moving the hub said, depending on the proposed location, new pipelines would likely need to go on tribal and public lands, which could be controversial. Oil would also still come via the traditional delivery methods of pipe, barge, rail, and truck—and river and pipeline access would remain essential.

The majority of interviewees felt that shoring up the existing site and mitigating for a CZE event was the best approach. Some even said a few other sites for oil storage inside and outside the Portland area should be considered. But a wholesale move of the hub was not seen as practical.

3.2.3. Long- or short-term incentives, regulations, agreements, and other approaches

Another main area of interest for CCERAC and PBEM was what, if any, *incentives* might bring parties to the table to work on the hub's resilience. When asked about incentives, we found interviewees to be creative and inventive. Interviewees saw incentives not simply as cash (although that was brought up as an important option). The following is a compiled list of the multitude of ideas offered in the spirit of brainstorming. We did not screen or vet them with subject matter experts as to the merit and feasibility of these ideas. Rather, we

share the ideas we heard as an illustration of the creativity of interviewees and potential for many good ideas for consideration as part of any collaborative effort:

- Be open to options for some kind of cost recovery models like those seen with regulated utilities under Public Utility Commission purview.
- Look at state and federal regulations for incentives or flexibility.
- Look at permitting issues for incentives or flexibility. For example, consider allowing an entity to submit a twenty-year plan for retrofitting that, if approved with measures for seismic resiliency, would allow for easing of the permitting process. (Changes to permitting processes could be made legislatively, by contract, or both.)
- Offer tax credits to a company that moves tanks or builds more seismically-sound tanks.
- Explore public/private partnerships as a way to set up infrastructure with shared ownership and responsibility.
- For improvements in Portland, be open to increasing capacity for storage to help pay for new facilities that are seismically sound.
- Increase funds for seismic improvements by considering expanding Oregon Department of State Land's moorage fees to include companies that are exempt.
- Offer back-up generators to oil companies located at the hub.
- Use tank consolidation as a "carrot" and regulations as a "stick."
- Provide financing for facilities.
- Look at other properties in the region where tanks could be located to gain seismic improvements; exhaust private- and publicly-owned properties.
- Consider a business license tax.
- Create a seismic resiliency fund at Business Oregon that could be used by facilities like the hub.
- Create incentives for storage of a cache of usable fuel around the state. (Industry would need to advise how to do this strategically.)
- Look at ideas from other states like Florida, which is studying the possible construction of additional petroleum distribution centers around the state as a way to improve access to fuel during large-scale emergencies. (Florida's Legislative Office of Program Policy Analysis and Government Accountability is conducting the research.)
- Look at flexibility related to the low carbon fuel standard.
- Look at who should have authority over seismic issues to rationalize how critical infrastructure is regulated and managed.

Some interviewees also felt that for incentives to be viable at the end of any collaborative process, the support of elected officials at the local and state levels (mayors, councils, legislators, etc.) will be needed. Also, other interviewees felt strongly that a collaborative process that looked at incentives would be seen as positive and a high priority for industry in order to help balance out long-term return on investments.

3.2.4. Importance of defining regulatory authorities

Several interviewees noted state agencies have limited regulatory authority over liquid fuel hubs, and that what exists is not well understood. Some interviewees report they know of no authority to make fuel companies mitigate for a CZE event. They offered ideas on regulation as a potential task/incentive for a collaborative effort. The following is a compilation of the suggestions interviewees presented during our interviews:

- Some interviewees felt that if it's not already being done, a collaborative process could work to clarify regulators' road map and oversight. For example, a process could work through the difference between the scope of federal, state, and local regulations, and programs, including the Oregon Department of Environmental Quality's oil spill program, the Oregon State Fire Marshal's inspections of tank farms, and the Oregon Public Utilities Commission's oversight of regulated utilities.
- An interviewee felt collaborative process could include a review of the scope of the Oregon Seismic Safety Policy Advisory Commission to better understand how it could help on mitigation issues specific to a hub.
- Any process could explore recommended changes to federal, state, or local regulations. Some interviewees stressed any proposed regulatory change should be clear-eyed about what it does, how it works, how it fits, who owns it, and do its best to consider unintended consequences.

3.2.5. Need to address gaps in emergency response, recovery planning, and coordination

Interviewees felt a collaborative table across sectors could be a helpful place to work on gaps of knowledge across sectors related to emergency response, recovery planning, and coordination at the hub. For example, while interviewees understand that industry and emergency responders train for traditional events, there is no clear understanding how a coordinated emergency response would work at the hub in a worst-case CZE scenario. Interviewees questioned whether entities are even prepared: what is the plan, who needs it, and, if there is no plan, how can a plan be achieved?

Some interviewees said they are concerned industry and emergency responders cannot provide the necessary response to a worst-case CZE. An example was given related to the six fire stations around the CEI hub. These are traditional fire stations designed to respond to their fire management area. We were told they would likely respond to their management area for triage in a CZE event. Some interviewees expressed interest in developing a fire brigade model around the CEI hub for response during a CZE-like event.¹⁴

14. For an example of a fire brigade model, see <http://www.iturri.com/en/solutions/fire-fighting-solutions/fire-fighting-solutions-in-industrial-plants>.

Portland International Airport Fire Department was shared as another fire house model for structuring day-to-day work.¹⁵

Some interviewees were specifically unclear what provisions industry could bring to respond during a worst-case scenario. Other felt assumptions are being made on how quickly industry could recover from a CZE. For example, some interviewees feel there is an assumption they could recover quickly, while others said depending on damage, it could take months or years. There is also concern about the maritime damage from a CZE event that could hinder river travel and delay recovery. Some suggested that wildland interface protection of nearby Forest Park needs to be part of any discussion about reducing the risks of a CZE to the hub. Finally, some suggested a process to address incorporating concepts of Shake Alert (earthquake early warning system) to provide facility managers more time to implement quick prevention measures in case of near-term incident.

3.2.6. Conversation needed on mitigation

Interviewees said they need a better picture of the overall capacity to do specific mitigation projects, resources to do mitigation work at the site, and gaps that could prevent work on mitigation from happening. Some said that recent ideas implemented in singularity, such as providing industry with portable generators, which is appreciated, does not represent a robust mitigation effort. They hoped for more global conversations to outline mitigation needs of the hub.

3.2.7. Need for shared information across sectors

On a related topic, interviewees said there is a lack of a general knowledge about the basic interworkings of a sector. This has led to a sense that there are misperceptions and poor information, and in some instances mistrust, between sectors. For example, we heard a concern that since sectors are not sharing emergency response plans with one another, it is creating a “we don’t know what we don’t know” climate. Others say there is limited understanding in Oregon of how the macro fuel sector works and limited awareness of infrastructure improvements already completed at the hub.

To confront this information issue, there is an interest in educating relevant parties on these issues to create a shared base of knowledge and better understanding of the unique challenges facing each sector. Examples of misperceptions shared by interviewees include the belief that industry has “limitless pockets,” or that public sector emergency responders already have resources to protect the hub. There is awareness between sectors that misperceptions are out there. We found that many interviewees have a genuine interest to learn more about other sectors and share information from their sector at a collaborative table. This was seen as a way to build knowledge, verify information, and build trust.

15. Port of Portland website, <https://www.portofportland.com/PublicSafety/Firedepartment>.

3.2.8. General support for a collaborative effort

The primary purpose of an assessment like this one is to determine what would be needed for a productive, collaborative process to succeed. This section outlines what we heard from interviewees directly.

We did find that interviewees generally felt a neutral, non-political process, such as an Oregon Solutions process, would be a good way to get parties to the table to layout issues and to begin relationship building seen as critical to successfully implementing solutions. This was seen as potentially helping with trust issues, gaps of knowledge, and general understanding of how sectors work.

3.2.8.1. On the political climate

Some told us they prefer a third-party collaborative effort where all key parties are at the table working collaboratively instead of a political body taking the lead. The presumption is that it would lead to better outcomes. There was a general concern from most interviewees that the current politic climate related to liquid fuel vs. a greener economy has had an unintended consequence of introducing high political risk for efforts to mitigate the seismic risks of the CEI hub. Put another way, the need to improve safety of the hub site is seen as having statewide significance, but the politics of liquid fuel is a challenging environment for emergency responders to navigate. Some are concerned that political actions involving the hub could be seen by industry as burdensome.¹⁶ There is also a concern that any exploration of a diverse array of potential incentives as a way to improve seismic resiliency would be frowned upon by some political jurisdictions. Even with these challenges, interviewees see value in participating in a collaborative process to proactively work on this significant infrastructure challenge.

3.2.8.2. On the focus of a collaborative effort

We heard that any process should keep to a specific agenda focused on resiliency and mitigation for the hub in preparation for a CZE event. Some interviewees told us that focusing beyond liquid fuels could be unwieldy for the group and of no interest to industry. Interviewees also expressed interest in being clear what success looks like for minimizing environmental disaster, creating structurally-sound infrastructure that can withstand a CZE, planning properly for sequenced infrastructure improvements, and creating clarity on needs for resources and response during a CZE. A few interviewees also said that, while their organization might not play a lead role at a collaborative table, their organization would want to participate nonetheless.

3.2.8.3. On teeing up a process and what it would take to bring people together

We heard that taking the time to set up any neutral process would be essential. *Process development* in this case would be complex, and all stakeholders would want to confer on the structure of a process. Any actual process should also be well-framed, well-timed, and well-structured. Also, a process should not be rushed. We found from our interviews that

16. Note: Industry has been wary of participating in past stakeholder research efforts as those efforts were perceived as adversarial.

interviewees feel investing front-end time in building trust, relationships, and shared knowledge would give any process a better chance for long-term success on mitigation and infrastructure improvements.

We also note that some interviewees said no one wants to throw good money after bad in a process that is not well thought out or infrastructure investments that are not strategic. Some also said if lawyers were involved, conversations might not be frank.

3.2.8.4. On potential activities for a neutral process

Some interviewees began to brainstorm approaches for consideration by a collaborative, neutral table during our interviews. For example, some interviewees said it would be important to develop a group agreement on what the hazards and threats are in order to establish a baseline on mitigation. Another interviewee mused that a group could work on a phased approach to make infrastructure improvements based on the hub-based experts' estimate of a CZE event occurring in a fifty-year horizon. Such an approach could have immediate approaches (one to ten years, focus on trust building, resiliency, education, research, planning, infrastructure improvements, and drills), intermediate approaches (ten to twenty years, focus on mitigation, next-phase infrastructure improvements, research, and drills), and long-term approaches (for twenty to thirty years, focus on next-phase infrastructure improvements, research, and drills).

Other interviewees said it could be helpful to get an agreement among parties on geotechnical studies and their findings as a way to advance shoring up the hub. This is considered important because there is perception that research conducted by a party considered a stakeholder would be discounted by other parties or stakeholders regardless of the quality of the research. Finally, some interviewees also said a group could consider going through the recommendations in the Oregon Resilience Plan (2013) to identify actionable items.

3.2.8.5. On potential obstacles to a collaborative process

A number of potential obstacles were identified. The following is a list of what we heard:

- Some expressed the need for a place in a process where they could freely speak to express points of view without attribution. Some worried that if comments were attributed to them before they could run them by their organizations, it could stymie their involvement. These interviewees said having comments attributed to them out of context could hurt their relationships with peers and within their sector.
- Interviewees said there is a perception that additional fuel infrastructure is never a good thing. Related to this, some interviewees said Portland's limitation on tankage is politically charged for some and could be an obstacle.
- Many interviewees said that in the past, industry has said that antitrust regulations prevent them from participating in work related to CZE resiliency efforts; this

concern would need to be addressed as part of any new effort going forward if industry is to participate.

- Clarifying the regulatory roadmap at the outset of a process was also seen as helpful because it has been an obstacle to past efforts. For example, some are concerned there is no state agency with direct regulatory authority or oversight of a liquid fuel storage facility like the CEI hub. Others are more specifically concerned that the lack of clarity about the current regulatory roadmap has created misperceptions and misunderstandings about current authorities that public entities have today.
- One final obstacle that was raised was lack of clarity how the Portland Harbor Superfund cleanup might impact CEI hub mitigation work. No one had a resolution for this obstacle, but many were mindful that is an overlay to any work at the hub in the future.

3.2.9. Other considerations of note raised by interviewees

The following considerations did not fit neatly into other categories; so they are listed here in an effort to comprehensively capture what we heard:

- It is unclear what impact increasingly fuel-efficient vehicles and alternative fuel vehicles will have, if any. These vehicles could result in less oil coming to the region and may mean less revenue for seismic improvements.
- Even if markets shift to renewables, the oil industry has all of the existing infrastructure that could serve that market.
- Interviewees noted that industry staff live here, too, and felt they (individually and at the corporate level) want to do the right thing.
- Pump stations for the pipeline are at the hub; a critical item could also be work on pump stations and preparation of the system that connects to Eugene.
- The CEI hub has other gathering lines from other terminals that should be strengthened—doing so would help the overall state system.
- We were told it is important not to lump industry together as a monolith; each company operates differently and some said trade associations don't necessarily represent individual company perspectives.
- We were told by some interviewees that industry is interested in having safer assets.
- Some experts told us they believe the pipeline system will do well during a CZE event in existing soils; the system will float during a CZE and oil lost from pipes will be more recoverable because the steel pipes have been replaced with cast iron. (Uncoated older steel was brittle.)
- Many interviewees said it is unlikely that oil will not be an important energy source over the next 50 years—even with current efforts to transition to alternative fuel

sources. Therefore, resiliency of the hub remains important and any investments to shore up the infrastructure for seismic resiliency would not be in vain.

- That utilities and emergency response entities will need access to liquid fuel during a disaster is on the top of the list of needs in order to respond to a CZE event.
- Fuel associations are stepping up outreach on the importance of resiliency planning.

3. ASSESSMENT RECOMMENDATIONS FOR AN OREGON SOLUTIONS/COLLABORATIVE PROCESS

Oregon Solutions found that among those we were able to interview there is significant interest in proceeding with a collaborative process, convened by a neutral third party, to explore mitigation, trust building, education, and incentives discussed in this report.

3.1. Recommendation one: Continue to engage critical parties

Despite the interest in collaboration, we did not find conditions exist at this time for a collaborative effort based on the scope.¹⁷ ***Specifically, we were unable to secure enough responses from critical parties who have a direct interest in the hub to recommend going forward with a collaborative process as outlined in the scope at this time.*** We found some of our requests for assessment interviews were met with silence, confusion, and even mistrust, because of sensitivities surrounding the hub. Even so, we do believe ***a collaborative table is within reach.*** With more time, efforts to engage those parties could be successful.

3.2. Recommendation two: Convene an education-focused collaborative table

We did, however, find other areas where we feel it would be beneficial to begin a collaborative process now. Given the consistent concerns voiced about lack of trust and need for relationship building, we find one way to begin testing the waters for working together would best be focused around information sharing and mutual education. Some of the ideas generated during our interviews included the following:

- Do cross-sector education on how each sector works. Work through worst case scenario emergency response planning across sectors for a CZE event. As part of this effort, identify gaps of knowledge across sectors related to emergency response, resources that currently exist that could help a response effort. Outline recovery planning and coordination at the hub.
- Clarify regulatory authority and oversight of hubs, either through ongoing work through state commissions, and/or through work of a collaborative table. For example, a process could work through the difference between the scope of federal,

¹⁷ 1) What ideas could reduce the risks associated with seismic activity impacting fuel storage facilities in northwest Portland at the CEI hub? 2) What are the long- or short-term incentives, regulations, agreements, or other creative approaches that could be identified in order to bring all relevant parties to a collaborative table to improve resiliency?

state, and local regulations as it relates to the hub. This effort could also explore programs at the Oregon Department of Environmental Quality's oil spill program, the Oregon State Fire Marshal's inspections of tank farms, the Oregon Public Utilities Commission's oversight of regulated utilities, and a review of the scope of the Oregon Seismic Safety Policy Advisory Commission to better understand how it could help on mitigation issues specific to a hub.

- Identify initial mitigation options, resources, and gaps in order to protect human and natural resources beyond the hub; longer-term planning could be part of this effort if there is ***adequate participation across sectors***.

These ideas could start a conversation, but we emphasize that part of the convening effort would be for the convened group to identify areas where to start with sector education.

3.3. Recommendation three: Convene to explore incentives

As a second phase building off of an education-focused effort, we do believe a collaborative table effort, working on an exploration of incentives, would be beneficial. We found those we interviewed to be creative when asked to provide off-the-cuff ideas, and we think a collaborative table could further explore and vet more ideas. We also think, if such a table proves beneficial, it could attract those entities that did not respond to our request for interviews as part of this assessment process, and could lead to the needed level of engagement on mitigation efforts.

3. FINAL COMMENTS

We acknowledge that securing the interviews we did for this assessment took significantly more time than we anticipated from the outset. We appreciate that the city of Portland team gave us more time to make additional attempts to secure interviews for this assessment report.

Finally, we want to recognize and acknowledge the support of the staff at the City of Portland and the representatives of the Portland City Club in this effort. City emergency response staff, in particular, has been invaluable in ensuring that the hard work to ensure the issue of seismic preparedness of the CEI hub remains on the forefront of policymakers' and industry leaders' agendas. This assessment process, while not leading to an immediate recommendation for an Oregon Solutions process at this time, demonstrated the strong interest in a collaborative effort to improve seismic resiliency of the CEI hub. This was unclear prior to this assessment process.

APPENDIX A: INTERVIEWEES

Raihana Ansary
Regional Solutions Coordinator Metro Region

Denise Barrett
Regional Disaster Preparedness Organization Manager

Chief Sara Boone
City of Portland

Kevin Brice
US Army Corps of Engineers

Abby Boudouris
Oregon Department of Environmental Quality

Tom Dyke
Portland City Club

Barnes Ellis
Portland City Club

Allen Fore
Kinder Morgan

Mark Fritz
Star Oil

Rob Fullmer
Portland City Club

Bruce Gilles
Oregon Department of Environmental Quality

Mike Harryman
Oregon Governor's Office

Deanna Henry
Oregon Department of Energy

Jeff Hibner
NuStar

Andrew Holbrook
Kinder Morgan

Holli Johnson
Western States Petroleum Association

Joe Karney
NW Natural Gas

Leon Kempner
BPA

Lori Koho
Oregon Public Utility Commission

Suzanne Lemieux
American Petroleum Industry

Lance Lindsey
US Army Corps of Engineers

Jim McKenna
Oregon Governor's Office

Carmen Merlo
City of Portland

Jim Merten
US Coast Guard

Chief Mike Myers
City of Portland

Jonna Papefthimiou
City of Portland

Andrew Phelps
Oregon Emergency Management Department

Dan Pippenger
Port of Portland

Danelle Romain
Oregon Fuels Association

Marianna Ruiz-Temple
Oregon State Fire Marshal's Office

Kristen Sheeran
Oregon Governor's Office

Yumei Wang
Oregon Department of Geology and Mineral Industries

APPENDIX B: CRITICAL PLAYERS

Federal Agencies

Pipelines & Hazardous Materials Safety Administration PHMSA (within US Department of Transportation)
Federal Energy Regulatory Commission
US Coast Guard
Bonneville Power Administration
Department of Homeland Security
US Geological Survey
Federal Emergency Management Administration
US Army Corps of Engineers
Environmental Protection Agency (if there is a connection to Portland Harbor Superfund)

State Agencies/Tribes

Oregon Public Utilities Commission
Oregon Department of Environmental Quality
Oregon Department of Energy
Oregon State Fire Marshal
Oregon Department of State Lands (they own riverbeds)
Oregon Department of Geology and Mineral Industries
Oregon Department of Consumer & Business Services—State Building Codes
Oregon Emergency Management
Oregon Department of Transportation
Oregon Health Authority
Oregon Tribes
Oregon Department of Land Conservation & Development

Local/Regional Agencies

City of Portland
City of Salem
City of Eugene
City of Medford
Firefighting divisions
Regional Disaster Preparedness

Other

Individual oil companies
Conservation groups
Public leaders, including leaders from Eugene, Salem, and Medford (see this as a statewide issue)
Western States Petroleum Association
Oregon Fuel Association
Community groups
Utilities
Port of Portland

APPENDIX C: OREGON SOLUTIONS ASSESSMENT INTERVIEW QUESTIONS

QUESTIONS PART A

- What has been your level of involvement in this issue?
 - If not at all, what information would you need in order to effectively engage in a process to improve resiliency at the hub?
- From your perspective, what could be done to minimize the risk at the CEI hub from a Cascadia Subduction Zone event; (e.g., replacing, retrofitting, or consolidating of tanks, barriers, building code changes, pipelines crossing the river, liquefaction, general public's available knowledge of risk, etc.)?
 - Of these, what is your *highest priority*?
- Are there external factors that could impact the need for the hub in the mid-term future (e.g., transition to alternative fuels/energy, unforeseen decommissioning of tanks)?
- Would a distributed system of hubs be possible in the future to minimize risk?
 - If yes, what would need to be done to move a hub? What barriers do you foresee?

QUESTIONS PART B

- From your perspective, where might there be an opportunity to work together to impact this issue?
- What unforeseen *opposition* or *conflict* might there be for a project like this?
- What unforeseen *support* might there be for a project like this?
- What incentives are needed to *get the parties together* to work on improving resiliency at the CEI hub (e.g., from funding to backup generators for tanks that currently do not have them)?
- Are there (other) critical issues/challenges/hurdles that might need to be resolved in order to bring people to the table? How would you suggest going about addressing these challenges/issues/hurdles?
- Who are the *critical* players in relation to this issue (e.g., federal, state, local, private)

- How willing do you think they would be to engage in an Oregon Solutions process focused on incentives to improve the resiliency of the CEI hub?
- How might you/your organization be willing to participate in an Oregon Solutions process?
- Who else would you recommend be interviewed for this assessment?
- If an Oregon Solutions project moves forward, who do you think has the credibility and gravitas to be a convener who could engage diverse partners to accomplish a project like this?
- Is there anything else you want to address that wasn't addressed already?

APPENDIX D: OREGON FUEL REPORT, LIQUID FUEL INFRASTRUCTURE

The following is an excerpt from “Earthquake Risk Study for Oregon’s Critical Energy Infrastructure Hub,” August 1, 2012, by Yumei Wang, Steven F. Bartlett, and Scott B. Miles of the State of Oregon Department of Geology and Mineral Industries.

PLANNING BASIS: WORST CASE SCENARIO

The Pacific Northwest region’s most likely catastrophic event is the 9.0 Cascadia Subduction Zone (CSZ) earthquake and tsunami. Expected impacts include ground shaking for 4 – 6 minutes causing massive critical infrastructure damage along with a tsunami reaching some parts of the Oregon coast within 15 minutes of the quake.

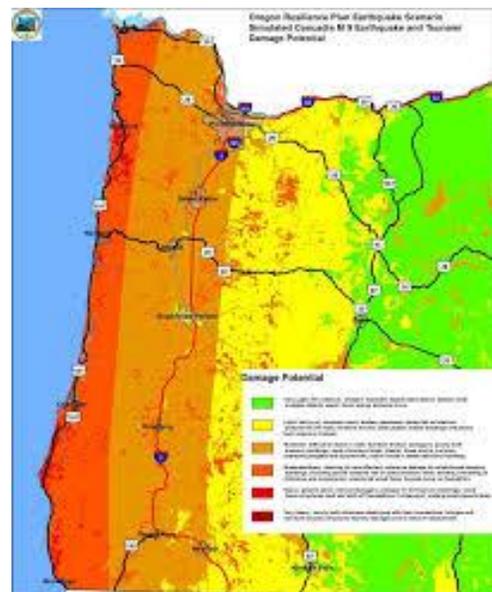


The Federal Emergency Management Agency (FEMA) anticipates up to 25,000 fatalities, tens of thousands of people in need of shelter, and \$30+ billion in economic losses.

Oregon counties in the high impact areas along the coast include: Clatsop, Tillamook, Lincoln, Lane, Douglas, Coos, and Curry counties. Mid-range impacted areas include the

Portland metropolitan area with Washington, Multnomah, and Clackamas counties. Additional counties west of the Cascades in the mid-range impact areas include: Columbia, Yamhill, Polk, Marion, Benton, Linn, Jackson, and Josephine counties.

This event would devastate the region’s petroleum supply and distribution system. Oregon can expect to lose most of the normal incoming supply of fuel. The Oregon Department of Geology and Mineral Industries (DOGAMI) 2013 Seismic Study found that the region’s refineries and petroleum distribution terminals are expected to sustain moderate to significant damage. The facilities will have tank farm failures, marine dock failures, pipeline system breaks, hazardous material spills, fires, and structural damages onsite. Restoring the region’s petroleum infrastructure would likely take months if not longer. In addition, the Olympic Pipeline that transports the majority of gasoline, diesel, and jet fuel to Oregon is projected to suffer as many as 250 breaks and 82 leaks.



ODOE has no regulatory authority to require its private sector partners to make seismic upgrades to their fuel tank farms, pipeline systems, marine docks, or other facilities. However, ODOE is responsible for ensuring the state can

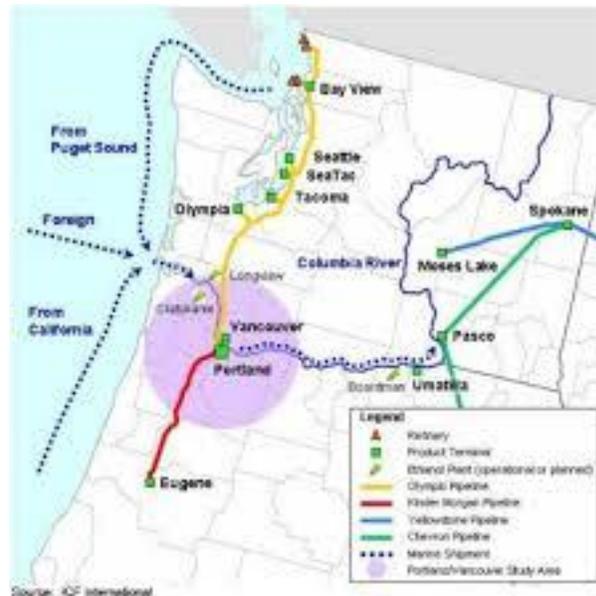
respond to a catastrophic event whenever it may happen and is prepared to address the impacts to the fuel infrastructure in its current state with all of its vulnerabilities.

OREGON PETROLEUM INFRASTRUCTURE

Oregon does not have refining capabilities and imports 100 percent of the refined petroleum products used in the state. That is an estimated three billion gallons of fuel each year or roughly 250 million gallons each month.

Gasoline & Diesel Supply and Distribution System

More than 90 percent of the refined petroleum product used in Oregon come from four refineries located in the Puget Sound area of Washington State. Product is transported from the refineries in Washington to Oregon via the 400 mile Olympic Pipeline (est. 90 percent) and barges (est. 10 percent) entering the state at the Port of Portland where seven petroleum distribution terminals are located in what is called the Portland Fuel Hub.



Oregon receives the remaining less than 10 percent of the state's refined petroleum products from refineries in Salt Lake City, Utah and the California Bay Area. From Salt Lake City, the refineries transport product via Tesoro's Salt Lake Products Pipeline System to a distribution terminal in Pasco, Washington. From the Pasco facility, fuel is trucked into Oregon to service eastern Oregon communities. California Bay Area refineries supply minimal quantities of fuel to a Chico, California terminal and then product is trucked into Oregon to supply southern Oregon communities.

Portland Distribution Terminals (Fuel Hub)—From the Portland Fuel Hub, product is distributed throughout Oregon by:

- Two Pipelines—Kinder Morgan's pipelines link petroleum terminals in the Portland Fuel Hub with the petroleum distribution terminal in Eugene, Oregon and provide jet fuel to the Portland International Airport.

- Barges—Product is loaded onto barges from the BP, Chevron, and Phillips 66 marine docks and delivered up the Columbia River to Pasco to service eastern Oregon communities.
- Tanker Trucks—An estimated 1,500 tanker trucks deliver fuel throughout the state to about 2,400 fueling locations.

Jet Fuel and Aviation Gas Supply & Distribution System

Oregon imports about 15 million gallons of jet fuel each month (about 180 million gallons of jet fuel annually) from the refineries in Washington State. An estimated 90 percent of the jet fuel is transported via the Olympic Pipeline to the petroleum distribution terminals located at the Port of Portland Fuel Hub. The remaining estimated 10 percent of the jet fuel is transported by ship or barge directly to the Port of Portland.



From the Fuel Hub, the Kinder Morgan Pipeline transports the bulk of the jet fuel to the Portland International Airport. Jet fuel is delivered by truck to other airports and air fields in the state from the Fuel Hub.

Oregon also imports up to 170,000 gallons of aviation gasoline (AVGAS) each month (just over two million gallons annually) from Canada and Texas. AVGAS is transported by rail to the Chevron and Kinder Morgan terminals in the Fuel Hub then trucked to airports and airfields throughout Oregon.

Constraints and Limitations

The petroleum industry exercises a “just in time” business strategy. Refineries and distribution terminals maintain adequate supplies to meet expected demands under normal conditions. Because of this, a significant increase in demand regardless of the cause will likely result in a fuel disruption or shortage.

Crude Supply in Alaska—At any given time, there is less than one week of crude oil available at the Alaska Terminal that supplies Washington’s four refineries.

Refineries in Washington—Refineries located in the Puget Sound area of Washington State also have about a one week supply of product on hand. These refineries have been operating above 90 percent capacity for decades. The refineries have no plans to increase capacity and cannot accommodate a dramatic demand increase.

Portland Petroleum Distribution Terminals—The seven terminals located in the Fuel Hub in Portland are on a six-day refueling cycle. At any given time, the Fuel Hub has only a one week supply of refined gasoline and diesel reserves on hand.

Retail Service Stations—Depending on the storage capacity and refueling cycles, retail service stations throughout the state have about a two to three day supply on site.

PETROLEUM SECTOR INTERDEPENDENCIES

The rapid recovery of the region’s petroleum supply and distribution system is heavily dependent on other critical lifeline services. The fuel sector is reliant on other ESFs to gain situational awareness; conduct damage assessment; obtain and transport fuel to priority users; and support recovery operations in the aftermath of a Cascadia earthquake. These interdependencies include:

ESF 1: Transportation—Viable roads, highways, bridges, and waterways are essential to supporting fuel deliveries to priority users.

ESF 2: Communications—Viable communications are essential to ODOE’s ability to: 1) assess impacts to the petroleum supply and distribution system; 2) work with USDOE and petroleum industry partners to obtain fuel from outside the region and transport it into Oregon; 3) facilitate emergency fuel requests and deliveries to priority users; 4) provide fuel sector situational awareness to key federal, state, and local emergency response agencies and other critical stakeholders; and 5) provide emergency information and instructions regarding critical fuel conservation measures to the news media and public.

ESF 12: Energy (Electricity) —Operators at the petroleum terminals need electricity to conduct damage assessments to the facilities, tanks, equipment, and systems. Power is essential to getting the fuel out of the storage tanks into delivery trucks. Electricity is also needed at designated fuel distribution points and emergency fueling locations for responders to fuel up their response vehicles. Electric power is also required for pipeline operation.