

Fuel planning for beginners

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ABSTRACT

As rapid inflation, continuing supply chain disruptions and the war in Ukraine impact petroleum prices worldwide, fuel supply disruptions have become an increasing concern.

This paper describes Washington State's geographical, political and organisational context as it influences fuel disruption planning, as well as the history and philosophy of Washington's fuel-planning programme. Finally, the paper discusses planning best practices and gives some examples of their real-world use.

Keywords: fuel, disruption, emergency, planning

INTRODUCTION

Fuel planning in Washington State begins with careful consideration of the state's unique context. Geography, meteorology, hazard profiles, policy and organisation all influence fuel planning, presenting singular challenges and particular opportunities.

Geography

Washington maintains the fifth largest crude oil refining capacity in the nation, despite zero in-state crude oil extraction.¹ Refineries located along the northern Interstate 5 (I-5) corridor use crude oils delivered mainly via pipeline from Canada, but also via port and rail.

Because it has historically been very difficult to build pipelines across the rugged Cascade Mountains, the mountain range effectively creates a bifurcated system. Negligible amounts of refined product are moved across the mountains via truck



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or rail, but there is no pipeline infrastructure connecting the eastern and western regions.

The eastern portion of the state has no refining capabilities and relies on refined product delivered by pipeline from Montana and Utah (see Figure 1).

Western Washington is home to five operating refineries that produce gasoline, jet fuel and distillate from crude, delivered mostly by pipe from British Columbia. Historically, Washington imported Alaska North Slope crude oil and other waterborne imports by tanker, but recently crude oil production in North Dakota, delivered to Washington via railway, has begun to overtake waterborne imports.² Refined product is distributed by the

Olympic Pipeline southward along the I-5 corridor and extends into Oregon.

Hazards

The weather on the west side of the Cascade Mountains is tempered by the Pacific Ocean — the climate is milder and wetter, with cooler summers. The east side of the Cascades is under a rain shadow, which creates a drier climate with colder, snowy winters and hot, dry summers. The west side is more urbanised, with large swaths of densely grown national and state forests on steep, mountainous land. This serves to isolate some rural communities near the coast and in the mountains. Much of the east side is rural farm and range lands with large

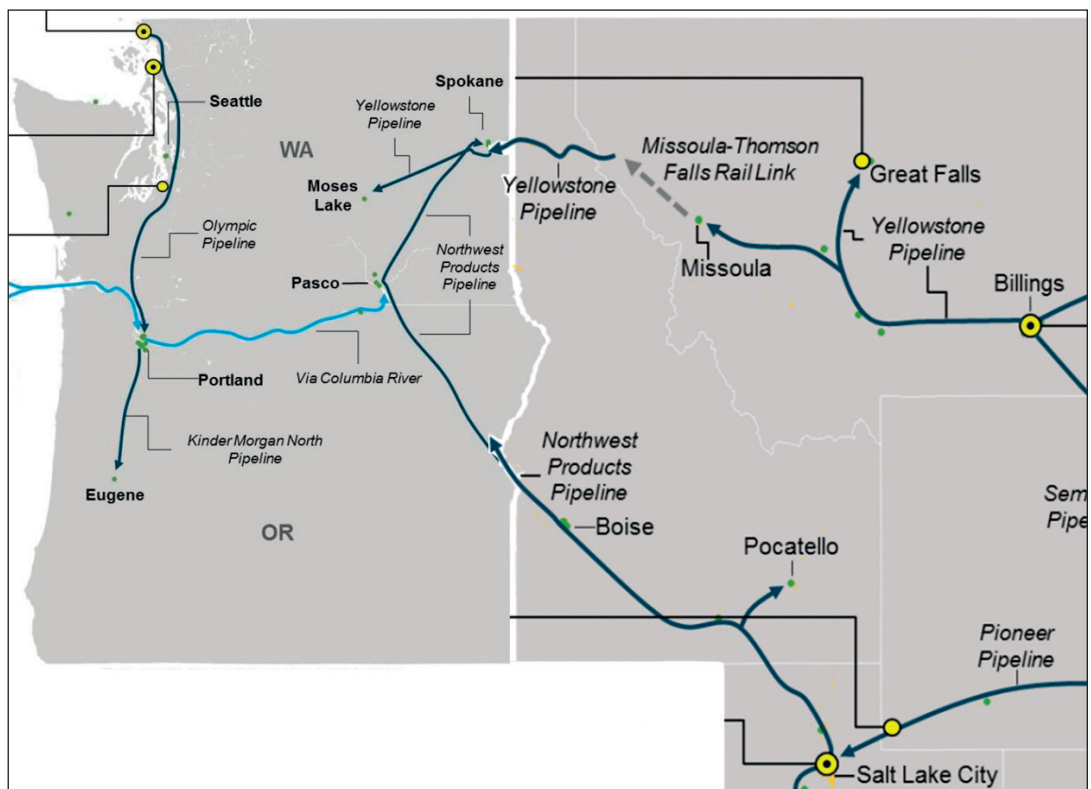


Figure 1 The national pipeline distribution system connected to Washington State

Source: US Energy Information Administration (2015) 'West Coast Transportation Fuels Markets', available at: https://www.eia.gov/analysis/transportationfuels/padd5/pdf/transportation_fuels.pdf and US Energy Information Administration (2017) 'Midwest and Rocky Mountain Transportation Fuel Markets', available at: https://www.eia.gov/analysis/transportationfuels/padd2n4/pdf/transportation_fuels.pdf

areas of dry, accumulated brush and high desert. Due to these varying meteorological conditions, the hazards most likely to influence the west side petroleum supply chain are winter storms, landslides, coastal flooding and earthquakes. The east side is more likely to see wildfires, supply chain shortages and ice storms.

The scenario most likely to affect the whole Pacific Northwest fuel supply chain at once is an earthquake. Washington has several active fault lines that could cause severe or catastrophic disruptions to refineries and distribution infrastructure (Figure 2). The most catastrophic scenario is an earthquake on the Cascadia Subduction Zone (CSZ) off the coast, which has the potential to cause severe shaking, tsunami inundation and liquefaction that will affect large portions of the Pacific Northwest and cause long-term supply chain disruption. According to United States Geological Survey (USGS) estimates, there is an 84 per cent chance of a deep earthquake of magnitude 6.5 or greater over the next 50 years. The CSZ is capable of extreme energy release upon fault rupture, resulting in earthquakes in excess of magnitude 8, large tsunamis,

liquefaction, lateral ground displacement, landslides and rock falls, floods and fires. A CSZ incident would be catastrophic to the Pacific Northwest's fuel supply and distribution system, as all five of Washington's refineries are located along the coastline within tsunami inundation zones and on top of deep sedimentary basins, which amplify and prolong ground shaking.³ Each facility would likely experience structural damages, marine dock failure, pipeline system breaks, hazardous material (HAZMAT) spills and fires.⁴ Restoration of the fuel supply chain after a CSZ event would likely take several months.⁵

Policy and organisation

Fuel planning within Washington is influenced by various laws and regulations unique to the state.

The statutory authority to prepare and execute contingency plans to address energy emergencies and shortages lies with the Washington State Department of Commerce, Energy Resilience & Emergency Management Office (EREMO), which also acts as the lead agency for Emergency Support Function # 12 — Energy (ESF-12). EREMO is the

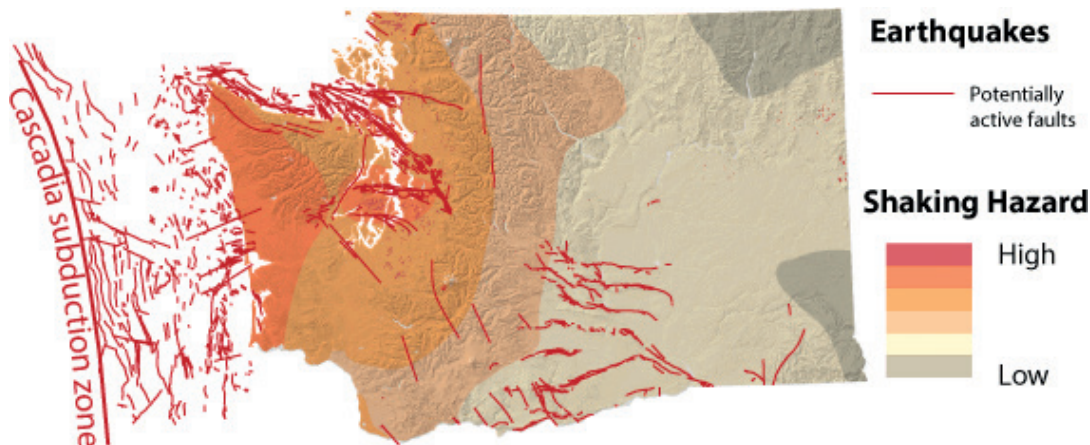


Figure 2 Locations of potentially active fault lines in Washington state

Source: Washington State Department of Natural Resources (2007) 'Earthquakes and Faults', available at: <https://www.dnr.wa.gov/programs-and-services/geology/geologic-hazards/earthquakes-and-faults>

only state entity that is allowed to receive market or business impact data. This makes data security and building trust with private sector partners a high priority, and also positions EREMO as a liaison between private and public sector responders.

Although provided for in law, Washington does not currently maintain an emergency supply of fuel stocks. The state code describing this capability is a result of the oil embargo in the late 1970s but has not been enacted.

Washington is actively transitioning away from fossil fuels toward renewable sources of energy under a series of legislation. EREMO is monitoring this transition as it reduces demand for traditional fuels and increases demand for biofuels and other renewable energies.

Fundamentally, EREMO's goal for the state is to incorporate and share best practices from other parts of the country that have experienced fuel supply disruptions, including how best to embrace public-private cooperation. EREMO's response actions are narrow, as the majority of potential response actions are controlled by the private sector. EREMO's role in a fuel supply disruption is thus to support the private sector with a timely and relevant flow of information; coordinating information across all levels of government; coordinating fuel needs from local jurisdictions, the private sector and other state agencies; and providing subject matter expertise and policy recommendations to executives. The following real-world example illustrates more clearly how this role can positively affect state response to fuel disruption.

THE SALIENCE OF FUEL PLANNING

During July 2021, most of the western USA experienced wildfires, along with a severe Jet A fuel shortage impacting Washington, Oregon, Idaho, Montana, California and Utah. The reason for the Jet

A shortage was two-fold. First, refineries reduced production during the pandemic as travel declined. By summer 2021, travel and commuting were rebounding but supply had not yet met with the increased demand. Secondly, and more importantly, there was a nationwide labour shortage in the trucking industry, which was especially felt on the West Coast. Fuel deliveries to rural airports were delayed and airports struggled to supply fire-fighting aircraft. In previous years, Washington invested in fire-fighting aircraft as fire-fighting personnel had dwindled and many fires occurred in remote, mountainous areas, which are easier and safer to contain from the air. Without fuel, however, these aircraft were grounded.

On 16th July, 2021, Governor Jay Inslee signed a waiver to the motor carrier's hours-of-service rules to improve fuel delivery to fire fighters. ESF-12 was activated to coordinate fuel deliveries with fire-fighting movements.

By 26th July, the difficulties in fuel distribution were starting to affect the agricultural sector, which needed Jet A fuel for crop dusting. The hours-of-service waiver was expanded to include all trucks hauling Jet A instead of only those trucks directly supporting fire-fighting.

Throughout August, demand for Jet A fuel far outstripped supply. Fire response shifted to prevention and containment as flying long distances to large fires became unfeasible. By 18th August, the market had begun to produce more supply, but a simultaneous rise in COVID-19 exposures caused additional staffing shortages for fuel haulers and airports.

Fire activity began decreasing in September. Until ESF-12 was deactivated on 14th September, it worked with Washington refineries, terminals, the Washington Trucker Association and other stakeholders to track the status of priority airports and connect vendors with urgent fuel requests.⁶

After this incident, EREMO gained another full-time employee to focus on fuel planning at both the local and state levels. In what follows, the paper discusses best practices gained from the field.

THE STATE FUEL ACTION PLAN

As the lead agency for ESF-12, EREMO had begun emergency fuel planning in advance of the July 2021 wildfire season. Politically, however, this was a low priority as Washington had not experienced an energy shortage since the 1970s national gas shortages. Because of this, the legislative backbone for fuel planning is focused around the governor's powers and economic concerns. EREMO recognised the need for an actionable fuel plan that would explain in further detail the coordination structure and response actions available to the state.

The resulting State Fuel Action Plan consists of a small fuel profile section that describes the fuel supply chain in Washington, the dependencies with neighbouring states, the interdependencies with other critical infrastructure sectors and the hazards threatening the energy infrastructure. However, the bulk of the plan describes nine priority actions to be taken in the event of a shortage or disruption:

- Activation and notification;
- Situational assessment;
- Damage assessment;
- Fuel needs assessment;
- Temporary waivers;
- Fuel conservation measures;
- Outside assistance;
- Fuel allocation; and
- Recovery.

The plan frames the discussion of hazards and response in terms of the magnitude of disruption including three scenarios: regional, catastrophic and an oversupply. These three

scenarios were chosen because they demand three different response postures.

Regional supply disruptions are more likely, but also easier to resolve through mutual aid and vendor relationships. A catastrophic disruption, however, requires a much broader and quicker response. Washington is invested in catastrophic earthquake planning based on its understanding of the Cascadia Fault, which lies off the coastline from British Columbia to California. Therefore, the plan provides for an immediate collection of fuel needs from local jurisdictions and state agencies coupled with purchasing bulk fuels from federal entities.

Finally, although an oversupply is considered unlikely due to the market forces at play, an oversupply incident could potentially cause an economic problem for the state. As an economic problem is quite different from an infrastructure problem, EREMO's actions would focus much more on waivers and recommendations to the Governor's office.

The State Fuel Action Plan was supported by a broader fuel programme, consisting of:

- The State Fuel Planning Workgroup, which included stakeholders from state agencies and local jurisdictions who guided and approved the planning work;
- New state funding to support the growth of the office through new full-time employees, project positions and consulting services;
- An internship programme, initially funded with project funds and then through partnership with Civic Spark (an AmeriCorps programme), to support the research and development aspects of the plan;
- Local jurisdiction champions who enthusiastically supported the development of toolkits and other local planning guidance; and

- Participation in the Western States Petroleum Collaborative, which was originally founded to share information during the 2021 wildfire season/Jet A shortage. Participating members, all of whom share a supply chain, continue to meet quarterly to maintain contacts and discuss issues related to petroleum in the region. Members include Alaska, Washington, Oregon, California, Idaho, Nevada, Montana, Utah and Wyoming.

Future planning considerations

EREMO expects to publish the first version of the Washington State Fuel Action Plan by Spring 2023. However, planning is an iterative process and EREMO already notes some future planning.

The first version of the State Fuel Action Plan focused primarily on ground transportation and distribution of crude oil and unleaded and diesel fuels. Next, the State Fuel Action Plan will include:

- Aviation and maritime transportation of crude and refined product;
- Biofuels and renewable fuels supply chains (as Washington transitions away from traditional fossil fuels by governor mandate);
- Propane (mostly used for home heating or emergency generation in Washington); and
- Gaining a clearer understanding of state agency emergency fuel consumption.

Additionally, starting in the first quarter of 2023, EREMO will work with the Department of Homeland Security Cybersecurity Infrastructure Security Agency on a Regional Resilience Assessment Program (RRAP) study of the state’s fuel distribution system from terminals to retail stations and government-operated refuelling operations. This effort will help EREMO to better

identify regional fuel points of distribution (FPODs), better understand how to collaborate with the private sector on the broad range of fuel conservation measures, and develop better state-specific fuel conservation guidance.

Most importantly, EREMO is looking forward to hosting and participating in fuel supply disruption exercises across the state with its partners as more counties participate in the planning process.

LOCAL EMERGENCY FUEL PLANNING

As the state’s plan was developed, it became increasingly clear that it would be dependent on an assessment of fuel consumption and emergency needs at the local level. This necessitated the expansion of the second part of the fuel-planning programme: Local Jurisdiction Fuel Planning Guidance. Washington needed to understand how much fuel municipality fleets might consume during the execution of their mission-essential functions. Understanding consumption is the first step to setting accurate triggers for action (for example, how fast does the state need to respond, should a county be cut off from supply) and establishing a baseline for how much fuel Washington might need to source on the market or buy from federal sources should an emergency of that magnitude occur.

EREMO does not have authority to compel counties and cities to conduct fuel planning, so it relied on multiple tactics to encourage participation.

Piloting

First, EREMO informally contacted two counties and a city to act as beta testers.

Clark County, situated just north of the Washington–Oregon border, was chosen because it is part of the Portland, Oregon metropolitan area and

is intimately connected with Oregon during a fuel shortage. Clark County had already begun extensive planning based on its membership in Portland Oregon's Urban Area Security Initiative (UASI) region and helped identify required elements of Washington's Local Jurisdiction Emergency Fuel Plan template. It was also a good example of how some counties prefer to customise plans to make them useful to their unique context. To allow customisation, EREMO created a checklist of essential plan elements that makes it easy for reviewers to verify all required elements are included — even if the template looks different.

Clallam County, situated far northwest in the state, was chosen to participate because it is enthusiastic about catastrophic planning and had previous research that identified 'micro-islands' in the community — that is, areas that would be completely isolated from transportation, communication or electricity after a catastrophic earthquake. Identifying fuel needs was a natural next step in Clallam County's planning process, and the county continues to be an enthusiastic champion of the process. Its participation illustrated counties' diverse planning needs. Clallam County wanted a plan that could expand to include difficult catastrophic planning issues, while other counties wanted to tackle simpler planning issues first.

Seattle, the largest city in the state and a city with a robust emergency management team, also helped pilot the Fuel Needs Assessment process. Normally, cities are encouraged to work directly with their counties, but Seattle leverages an enormous, complex fleet that cares for many people and it was eager to champion planning. Seattle was instrumental in stress-testing the Fuel Needs Assessment Form, modifying it slightly to accommodate the city's large, diverse fleets.

Guidance and planning support

Together, the piloting team helped develop a Fuel Planning Toolkit⁷ that includes:

- *The Fuel Needs Assessment*: An Excel worksheet that walks organisations and agencies through the process of assessing their dependency on fuel. It establishes a minimum requirement of fuel supply for maintaining mission-essential functions during a fuel shortage or other emergency;
- *The Local Jurisdiction Fuel Planning Guidance*: A document that explains how to develop an effective fuel plan based on the Fuel Needs Assessment. It lays out options for policies that could reduce dependency on fuels, contains state-specific guidelines for allocation and distribution of scarce supplies, and tips on how to train on the plan;
- *The Fuel Point of Distribution (FPOD) Site Selection Guidance*: A worksheet for counties that are ready to assess and select FPOD sites. The worksheet describes characteristics for good siting (eg security, ingress/egress, ownership) and contains areas to capture pictures or other documentation related to choosing a site;
- *The Local Fuel Plan Template*: an editable document that jurisdictions can use to customise and complete their fuel plans. EREMO provides a template but does not enforce its use, preferring that counties create a plan that works for their unique context.
- *The Local Fuel Plan Evaluation Checklist*: This is what the EREMO offices use to identify gaps in submitted plans and to ensure that customised plans align with state requirements. It includes resources for jurisdictions to go above and beyond in their planning, such as taking a deeper look at Jet A or maritime fuels. It is offered to local jurisdictions as a means of self-assessment;

After the toolkit was published, EREMO began to socialise the guidance and encourage participation in fuel planning. First, EREMO attended every regional emergency management meeting around the state to introduce counties to the new project. Next, it participated in exercises and socialised the concept of the fuel supply chain and allocation procedures. EREMO presented at conferences and announced the guidance in an external newsletter. Finally, during the summer of 2022, after both the State Fuel Action Plan and the Local Jurisdiction Planning Guidance were complete, EREMO conducted a series of office-hour type meetings in which jurisdictions and agencies could hear from others conducting fuel planning, ask questions and raise feedback. Though attendance was light, it was active. It became a platform through which the team could explain elements of the plan more deeply, inspire momentum and provide gentle accountability.

INITIAL RESULTS

The local fuel planning office hours were critical to gaining a clearer picture of the unique political and philosophical landscapes present among participating counties.

First, as many counties did not have the bandwidth to do extensive fuel planning, planners were encouraged to start with a medium-intensity emergency in mind, such as a winter storm or wild-fire. However, many coastal counties were deep in catastrophic planning and wanted to bundle the fuel assessment with that planning. That was accommodated by creating guidance that could scale with the counties as needed — clearly outlining first step requirements, yet including areas of growth and complexity for those ready to tackle it.

Secondly, it was extremely beneficial for participants to hear from many different

counties. Researchers considered separating counties in Western and Eastern Washington counties due to their different hazards and contexts, but chose to keep the group together due to logistical limitations. Combining them showed how different planning could look from one county to another.

For example, one rural county acknowledged that it did not have municipality owned fuelling stations for its fleets but relied completely on privately owned gas stations. Given this, how could it possibly enforce fuel conservation? Another attendee was curious about whether non-governmental organisations could be used to deliver fuel to critical infrastructure such as hospitals. These topics and others inspired further research into the nuances of contracting and tactics for fuel conservation, which benefited the whole group. It also created cross-pollination of ideas as participants found resources and outside experts for each another. For example, Clark County, which belongs to the Portland, Oregon, UASI region, discussed its work on cross-border issues like fuel planning, local coordination, prioritisation and sharing of resources. This idea has been taken up by Spokane County in Eastern Washington, which sits near Idaho's Kootenai County and will soon implement similar cross-border coordination practices.

Thirdly, it was critical to empower active and enthusiastic members to participate as champions. This could mean simply asking them for their opinions or feedback during the meeting, to present their current planning task or exercise to the group, or to recruit or connect researchers with other jurisdictional planners.

Finally, situating fuel planning firmly in the family of planning and mitigation activities was a successful tactic for recruiting more hesitant planners. This made fuel planning seem more familiar,

less daunting and encouraged buy-in. Some key examples include:

- The fuel assessment results are worded like a Threat and Hazard Identification and Risk Assessment capability goal so fuel planning work can be bundled with other local planning. For example, ‘Maintain Mission Essential Functions for x hours/days without a fuel delivery’;
- The local fuel planning guidance draws a connection between setting fuel conservation tactics and continuity of operation planning;
- The explanation of how the state will supply emergency fuel is connected to ongoing catastrophic planning;
- The state’s fuel plan will be further enhanced by a Fuel RRAP study occurring in 2022/23;
- Local fuel planning data and the data received from the Fuel RRAP will be documented in the Washington Energy Infrastructure Assessment Tool, which is the internal critical infrastructure mapping programme. This map allows EREMO to compare energy infrastructure with hazard areas for both planning and response purposes.

Connecting to the fabric of mitigation activity broadly has made it easier to make the case for fuel planning. It is helpful to illustrate the urgency around this planning topic by exposing the interdependencies of fuel, energy and other mission-essential functions.

STATE AGENCY FUEL PLANNING

The Local Jurisdiction piloting programme and guidance laid the foundation for EREMO to expand fuel planning to state agencies. EREMO began with counties and tribes because their needs were more urgent and less complex, but now EREMO is pivoting to recruit state

agencies to fuel planning. Fuel planning among partner agencies is essential because during a fuel shortage, state agencies are often accidentally in competition for the same fuels. State agencies have also been known to compete with local jurisdictions for fuels due to a more robust contracting position. This lack of coordination can delay disaster response and recovery and is unpleasant for participants.

Additional issues create more urgency for fuel planning at the state level:

- Currently, there is no Master State Contract for emergency fuelling in Washington. This puts emergency responders in a vulnerable position. In emergencies, state agencies often pay extremely high prices for spot-market fuels. Additionally, the supply chain woes experienced after COVID-19 taught the state that without an emergency fuelling contract in place, there is no recourse for when supply is simply not available;
- Many state agencies contract to the Washington State Department of Transportation (WSDOT) or the Washington Department of Enterprise Services (which handles state contracting) for fuels, creating an opaque web of interdependencies. Understanding how fuels are distributed to partner agencies will refine EREMO’s coordination and emergency fuel distribution processes;
- Washington has not yet practised fuel distribution for a catastrophic incident. Most state agencies are unaware of how to ask for, pay for and receive federal fuelling assistance.

Recruitment of state agencies began with allowing impacted state agencies to review the State Fuel Action Plan as part of the State Fuel Planning Workgroup, which included stakeholders from state agencies

and local jurisdictions who guided and approved the planning work. Then, a seminar was held in late 2022 to introduce fuel planning concepts to state agencies. EREMO next intends to partner with WSDOT to further understand sub-contracting within the state and develop planning tactics.

REGIONAL COLLABORATION

A final example of best practice occurred in 2020 at the beginning of the COVID-19 response, when several states from the Petroleum Administration for Defence District 5 West Coast participated in a first-of-its-kind meeting to discuss how to better coordinate emergency fuel planning. Participating states shared the status of fuel planning activities, best practices and goals for better future coordination. From this state-driven conversation, the Western States Petroleum Collaborative (WSPC) was created. The WSPC includes all states that share a single, complex supply chain and is supported by US DOE Office of Cybersecurity, Energy Security and Emergency Response; National Association of State Energy Officials; and the National Emergency Management Association.

The resulting connections made during planning were hugely beneficial in real-world situations such as the 2020 earthquake near Salt Lake City, which could have impacted fuel supply to Idaho and Washington; the 2021 wildland fire season and the Jet A fuel and driver shortage mentioned previously; and most recently during the Portland Fault Exercise that tested the coordination of fuel needs across Washington and Oregon borders during a small earthquake scenario.

The WSPC has since continued the ground-breaking work of developing a framework for a collaborative fuel planning approach that does not affect the individual operations of each state but

acknowledges the interconnectedness of hazards and response actions. This collaboration has become a template for other interdependent regions across the country.

CONCLUSION

Emergency fuel planning is becoming more salient as inflation rates and the war in Ukraine influences petroleum supplies globally. Planning should be undertaken with as much consideration of the unique political, social and geographical context and resources available to the jurisdiction as possible. However, some simple principles might smooth planning efforts:

- Reach for the ‘low-hanging fruit’ first. In other words, write the simplest plan possible and build from there; encourage an iterative writing process;
- Be a vocal advocate for the project, presenting on progress frequently and regularly;
- Solicit and incorporate feedback early, especially seeking out eager participants who may become champions and recruiters;
- Situate fuel planning in the broader context of other planning and mitigation projects to make it a natural next step in the work already underway. This will make it more familiar and encourage buy-in from busy stakeholders;
- Connect with partners regularly and do not be afraid if participation is mostly silent at first. Conversation will warm over time;
- Make networking with partners and stakeholders worthwhile by sharing and soliciting best practices and case studies from the field.

ACKNOWLEDGMENT

Washington State’s emergency fuel planning began in Oregon. Oregon is extremely dependent on the fuels that come from

Washington refineries and thus began its extensive emergency and catastrophic fuel planning many years ago. Washington is honoured to work so closely with Oregon; the State has been and continues to be, a great partner and instrumental in supporting the foundations of Washington State's programme.

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