

Oregon's Energy Resilience Challenge: *Statewide Disaster at the CEI Hub*

^s
Senate Energy and Environment Committee's
Informational Briefing
Sept 23, 2021



Yumei Wang, PE, F.ASCE

Portland State University

Senior Advisor on Infrastructure Resilience and Risk

Affiliate Faculty in Civil and Environmental Engineering

yumei2@pdx.edu

Overview and Key Points

- State report identified energy sector vulnerabilities (2013)
Fuel disaster during Cascadia magnitude 9 earthquake in Oregon's **Critical Energy Infrastructure Hub** (aka **CEI Hub**), located in Portland
- ****Oregon Energy Disaster Resilience Plan*** needed
- Testimonies from stakeholders

State leadership on:

- 1) High risk situation at Oregon's CEI Hub
- 2) *Fuel storage and availability in communities during disasters

Testimonials

- **Deanna Henry**, Oregon Department of Energy (ODOE). Emergency Preparedness Manager

Topics: ODOE fuel planning; existing gaps as supported by recent disasters; and, 2019 OSSPAC recommendation

- **Andrew Phelps**, Oregon Emergency Management (OEM), Director

Topics: OEM's concerns on CEI Hub vulnerabilities includes statewide consequences

- **Jonna Papaefthimiou**, City of Portland, Chief Resilience Officer and Interim Director of the Portland Bureau of Emergency Management

Topics: City's concerns and actions on the CEI Hub

- **Alex Lopez**, NAACP Critical Energy Infrastructure Hub subcommittee member

Topics: Vulnerable populations in close proximity to CEI Hub

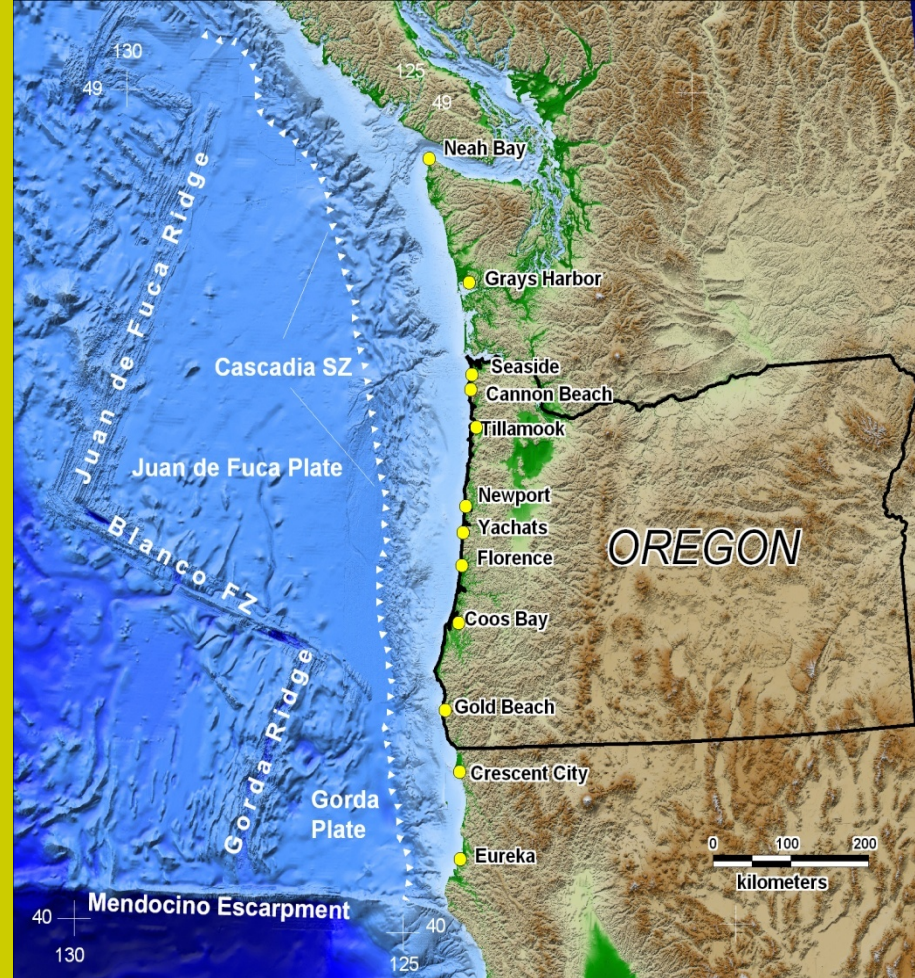
- **Allison Pyrch**, Hart Crowser, Senior Geotechnical Engineers

Topics: CEI hub is not resilient because "all eggs are in one basket" and lack of adequate state oversight

“The Really Big One” An earthquake will destroy a sizable portion of the coastal Northwest. The question is when”



Source: DOGAMI



Source: DOGAMI

*Kathryn Schulz, New Yorker,
awarded Pulitzer Prize 2016*

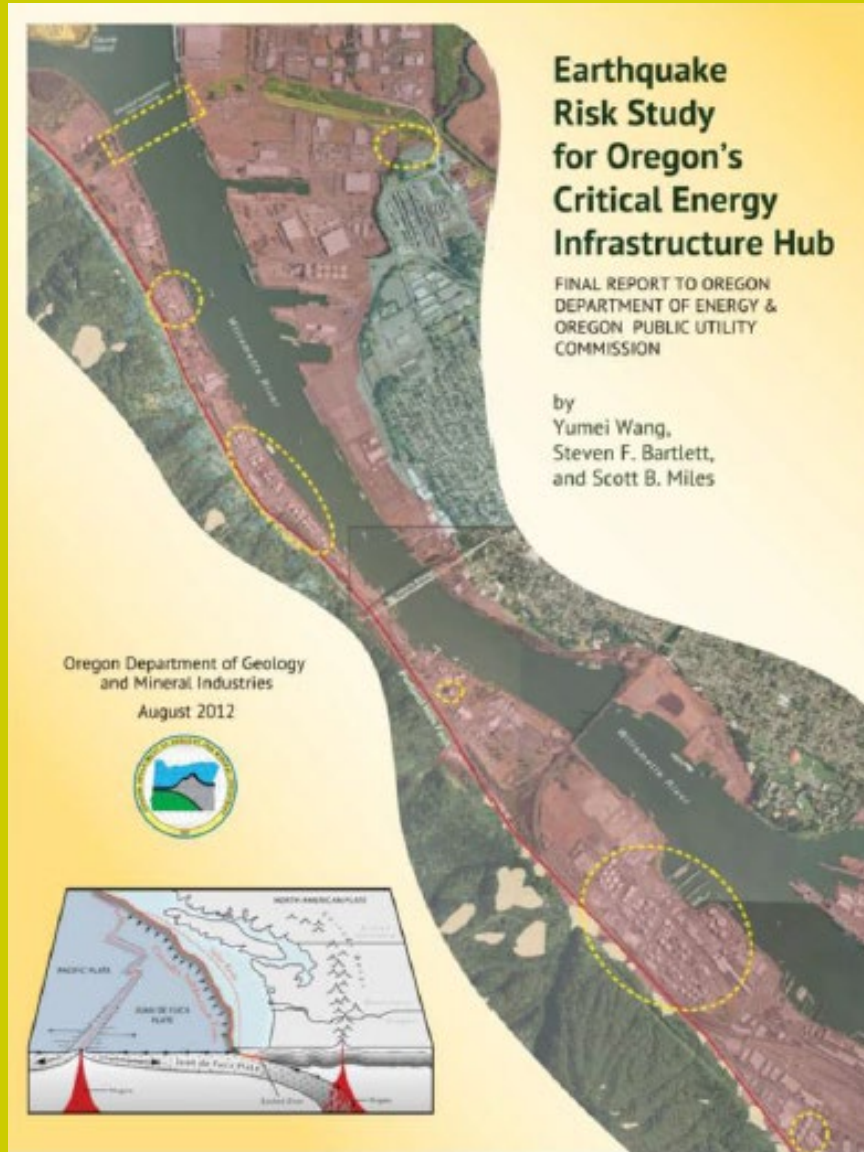
*“The next full-margin
rupture of the Cascadia
subduction zone will spell
the worst natural disaster in
the history of the continent”*

*Magnitude 9 (M9) Cascadia
earthquake and tsunami*

Yumei Wang

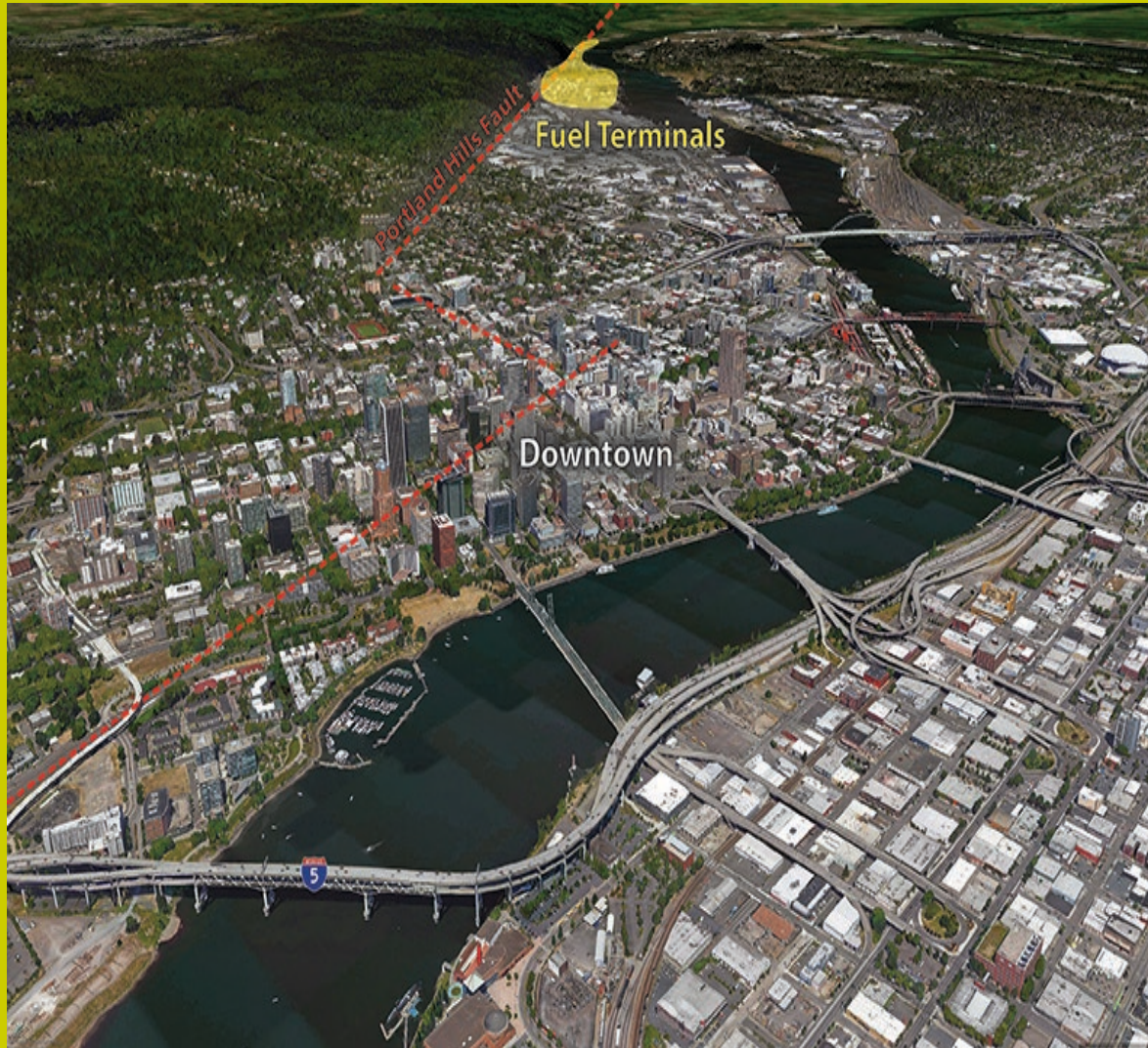
2013

Oregon's Energy Sector



- Society relies heavily on energy
- Statewide multi-hazard evaluation of petroleum fuel, natural gas, electricity
- 5-yr State effort: DOGAMI, ODOE, OPUC
- Identified critically important area: “Critical Energy Infrastructure (CEI) Hub”
- 2013 DOGAMI report O-13-9 free at: www.oregongeology.org

Critical Energy Infrastructure (CEI) Hub



6 mile stretch along lower Willamette River includes:

- Petroleum fuel terminals
- Natural Gas facilities
- Electrical facilities
- **Liquefaction Risk**
(sandy ground turns into liquid)

Oregon's Energy Facilities in CEI Hub

Petroleum fuel



Natural gas



Electricity



CEI Hub: Liquefaction Hazards are Extremely High Facilities Built on Loose River Soils (Hydraulic Fill)



Permission from Oregon Historical Society



Yumei Wang



Private Electricity and Natural Gas Suppliers Regulated by OPUC for Seismic Safety since 2013

2010 Chile



2007 Japan



Kariwa Substation

2011 Japan





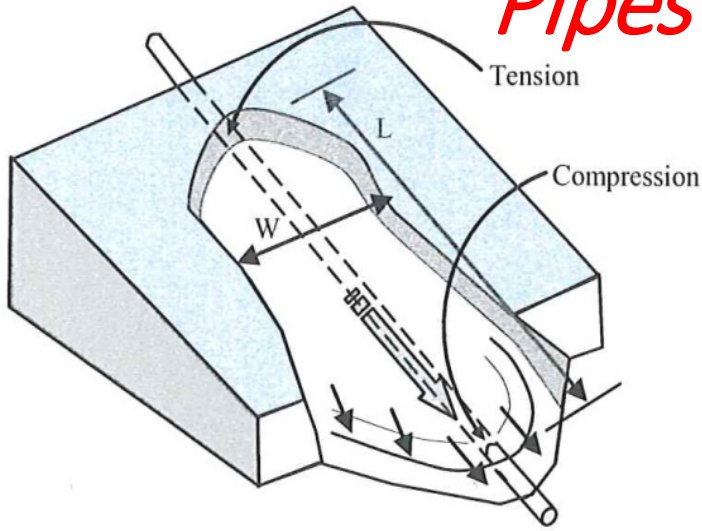
Oregon's Bulk Fuel Terminals in CEI Hub



- **Not** regulated for seismic safety
- Import >90% Petroleum Fuel from WA refineries for statewide distribution
- Linear and non-redundant delivery system relies on vulnerable “aging infrastructure”



Pipes



Valves



Expected Damage: Fuel Supply Chain

- Transmission Pipe from WA to OR
- Columbia River Shipping Channel
 - Tsunami damage at river mouth
 - Channel damage (*e.g., slumping*)
 - Blocked waterway (*e.g., fallen bridges*)
- Fuel Terminals in CEI Hub
 - Waterfront structures (*e.g., seawalls, piers*)
 - Tanks, pipes, valves, loading racks, containment walls, control buildings, more

Example: CEI Hub Fuel Docks are Vulnerable

Close- up



Chile (2010)



(Source: DOGAMI)

Source: TCLEE

CEI Hub: Expect Explosions, Fires & Toxic Fumes

Life safety!

Forest Park
Fuel Terminals
Fuel Loads



Fire boat response oil rig
2010 Deepwater Horizon

(Source: USCG)

CEI Hub Damage ➡ FUEL DISASTER

Fuel shortages harm our security and livability:
impacting response; recovery; rebuilding; economy...
not only Oil Spills into our rivers



SONS = Spill of National Significance (EPA & US Coast Guard lead)

Source: 2 1989 Valdez photos <https://commons.wikimedia.org/w/index.php?curid=57821>;

Resources

1. **DOGAMI's Oregon Risk Study on Critical Energy Infrastructure** (Wang et al, 2013)
<http://www.oregongeology.org/pubs/ofr/p-O-13-09.htm> The State of Oregon study that first defined the 6-mi long CEI Hub area, identified the importance of facilities in the CEI hub, and the serious nature of the vulnerabilities of the facilities
2. **OSSPAC CEI Hub recommendations to Governor and Legislature** (December 2019)
[https://www.oregon.gov/oem/Documents/OSSPAC CEI-Hub report 122019.pdf](https://www.oregon.gov/oem/Documents/OSSPAC_CEI-Hub_report_122019.pdf)
3. **2019 Senate Bill 95** for DEQ to regulate seismic safety of bulk fuel facilities (did not pass). Webpage [SB95](https://www.oregonlegislature.gov/bills_nres/2019/SB/090-099/SB95.aspx)
[2019 Regular Session - Oregon Legislative Information System \(oregonlegislature.gov\)](https://www.oregonlegislature.gov/bills_nres/2019/SB/090-099/SB95.aspx)
4. **OPB Unprepared documentary** about Cascadia earthquakes. Includes CEI Hub (2015) [Oregon Field Guide | Unprepared: An Oregon Field Guide Special | OPB](https://www.opb.org/documentary/unprepared) 6 minute Trailer (includes CEI Hub):
https://youtu.be/g3NICXA6_kE
5. **OPB** article 8/17/2021 on **Multnomah County and City of Portland** CEI hub report including Multnomah County's Links to 2021 draft report and draft presentation
[Report says fuel spills would be massive environmental disaster in Cascadia Subduction Zone earthquake - OPB](https://www.opb.org/article/2021/08/17/multnomah-county-portland-cei-hub-report/)