

CASCADIA SUBDUCTION ZONE (CSZ)

GEOLOGICAL SETTING & MEGATHRUST EARTHQUAKES

Critical Infrastructure Interdependencies *Transportation and Energy Systems*

PNWER Resilience Symposium
July 25, 2017

James Maltby – Lynden Shipping

Pat Griggs – Bonneville Power Administration

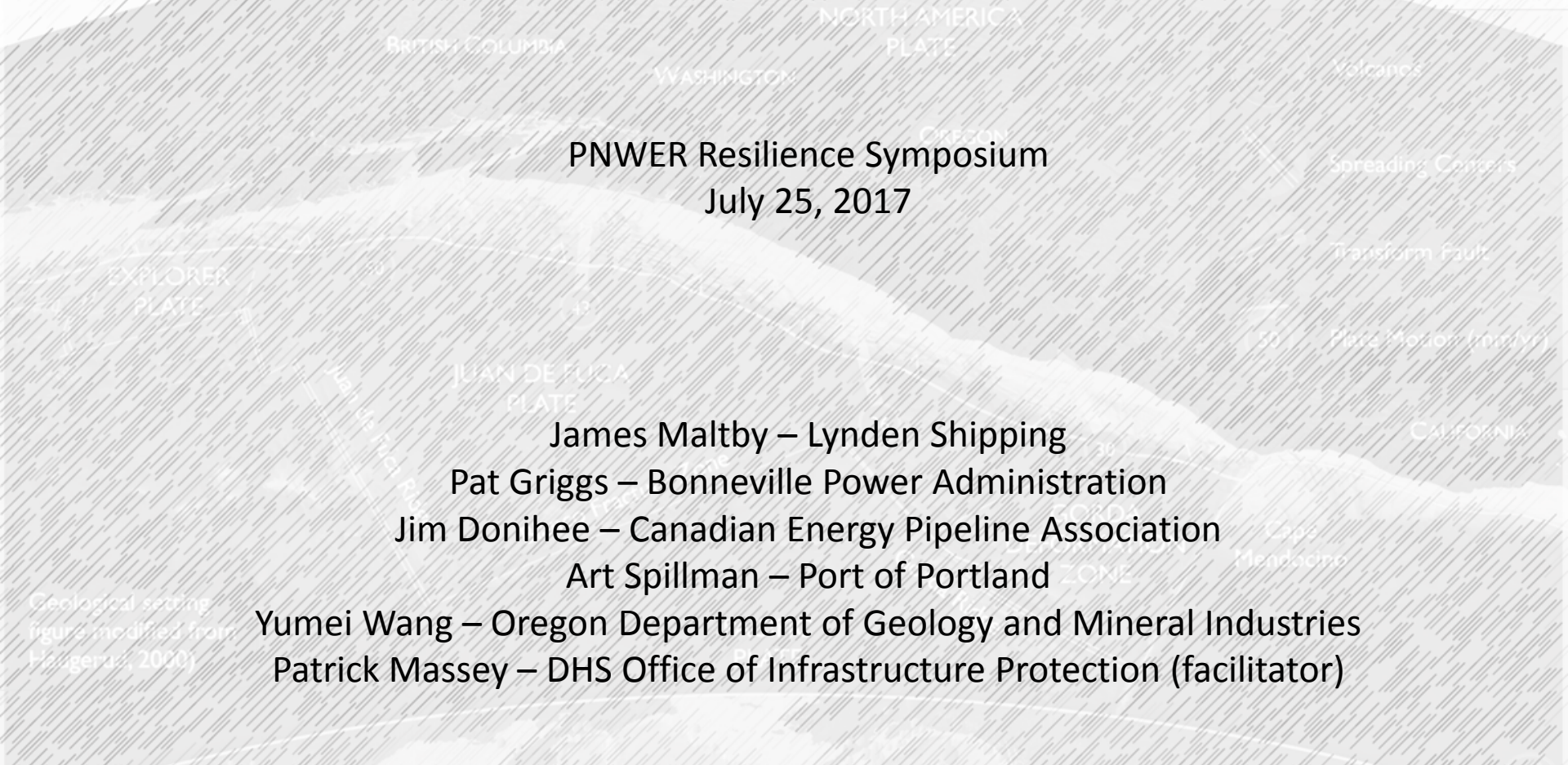
Jim Donihee – Canadian Energy Pipeline Association

Art Spillman – Port of Portland

Yumei Wang – Oregon Department of Geology and Mineral Industries

Patrick Massey – DHS Office of Infrastructure Protection (facilitator)

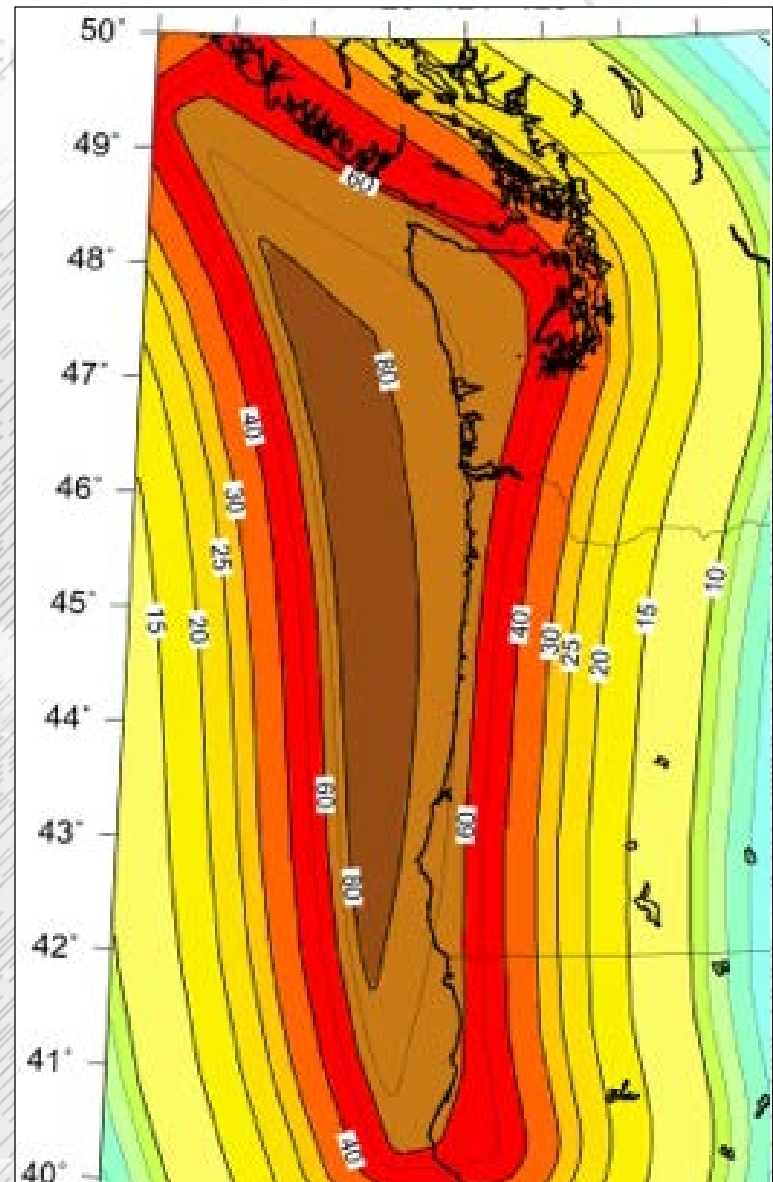
Geological setting
figure modified from
Hageraaf, 2000



CASCADIA SUBDUCTION ZONE (CSZ)



The CSZ Fault

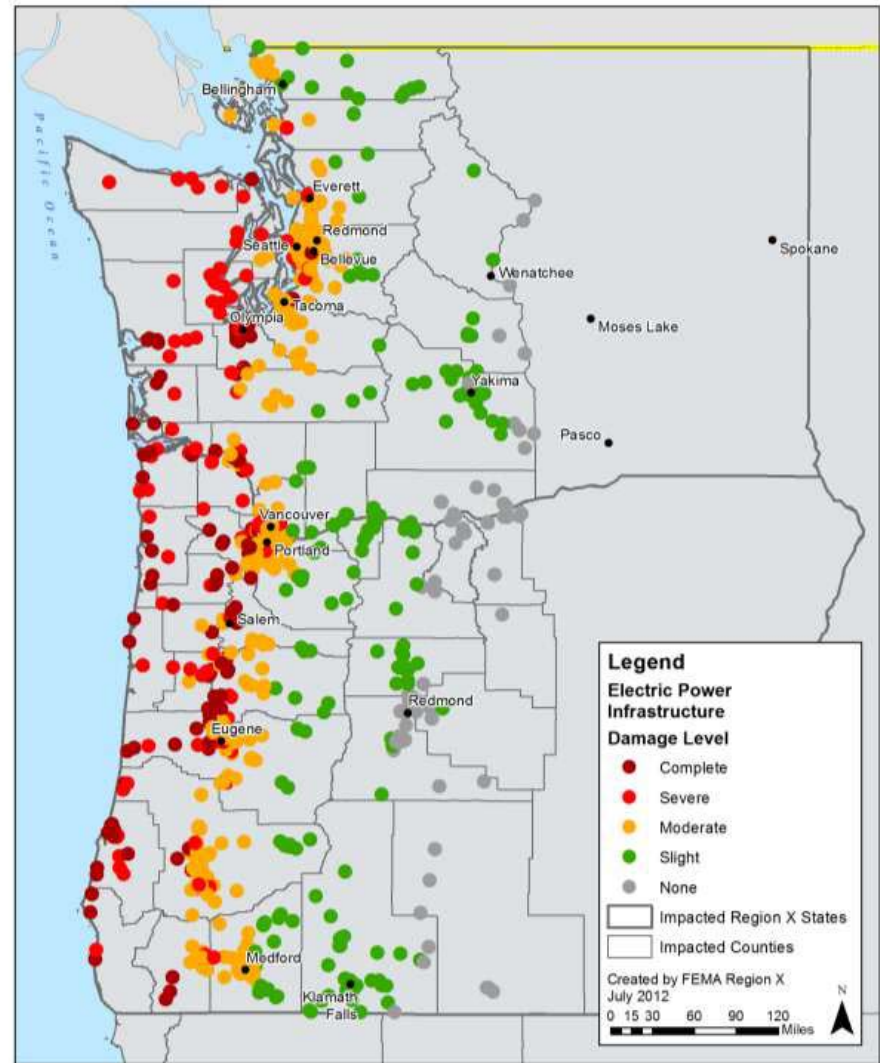


M9.0 Shaking Estimate

CASCADIA SUBDUCTION ZONE (CSZ)



Highway infrastructure estimated damages



Electric Power facility estimated damages

INNOVATIVE

FAST

RELIABLE

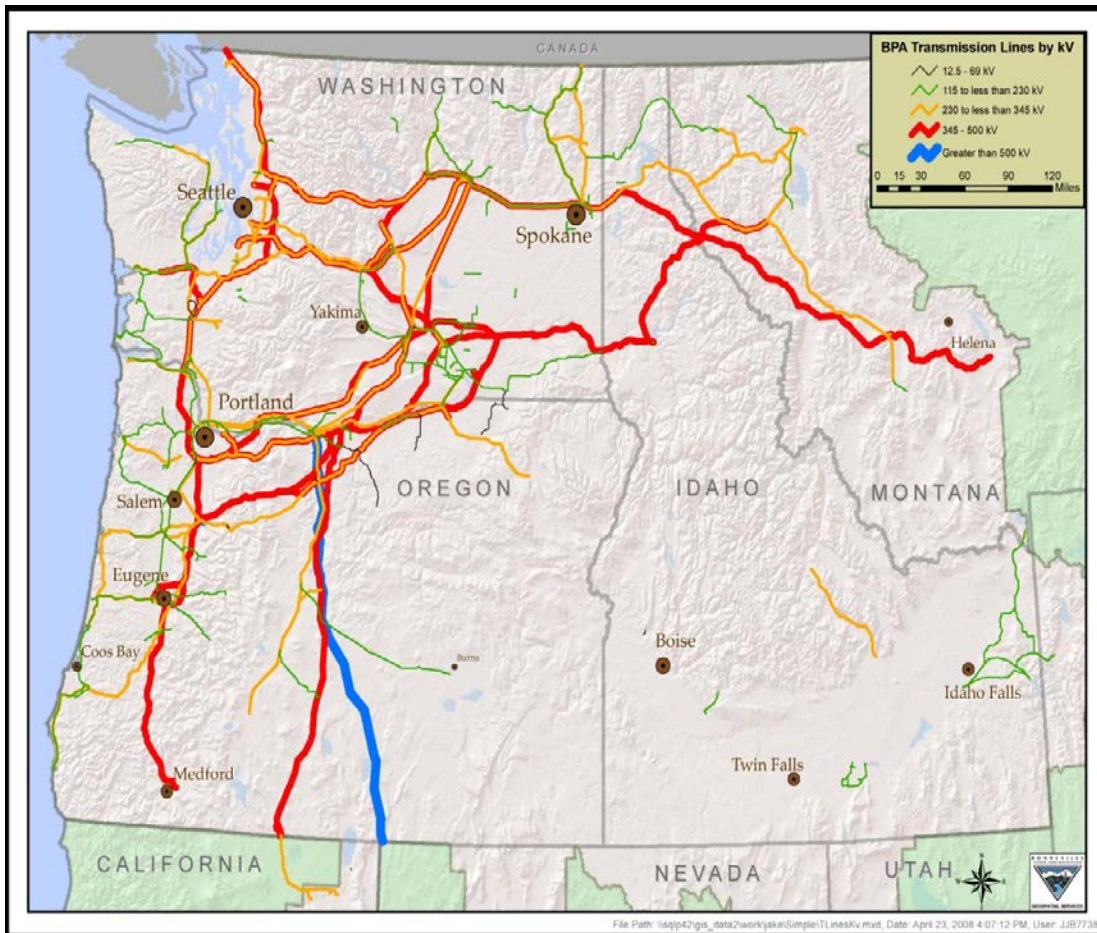
WORLDWIDE

ON-TIME

ECONOMICAL

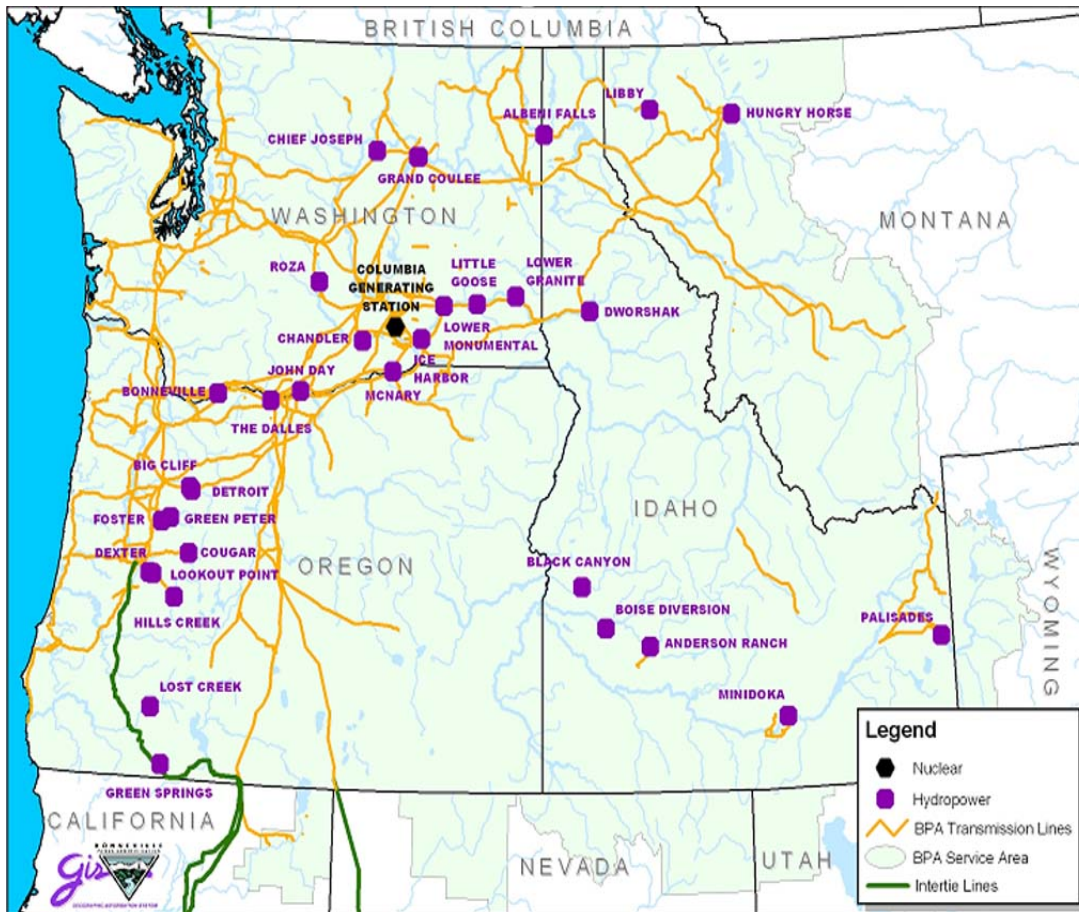
EFFICIENT

BPA High Voltage Grid



- 300,000 Sq. Mile Service Territory
 - Oregon Washington, Idaho, Montana (sections of WY, NV, UT & CA)
- 15,000 circuit miles of High Voltage Transmission (75% of the NW grid)
- Over 285 substations
- 490 Transmission customers

Federal Columbia River Power System



- 31 Hydroelectric dams (21 USACE and 10 USBR) – 22,458 MW nameplate capacity
- 1 Nuclear Plant (Energy Northwest) - 1,120 MW nameplate capacity
- 142 Power customers (54 Co-ops, 42 Muni's, 28 PUDs, 7 fed agencies, 6 IOUs, 2 DSIs, 1 Port district, 2 tribal utilities)
- ~5,100 MW wind integrated into the Northwest Grid for delivery to market



Canadian Energy Pipeline Association

Pipelines - critical infrastructure



canadian energy pipeline association | association canadienne de pipelines d'énergie

| aboutpipelines.com

CEPA

The **Canadian Energy Pipeline Association** (CEPA) represents Canada's transmission pipeline companies who operate about 85,000 miles of large diameter transmission pipeline in Canada and the United States.

VISION

A safe, socially and environmentally sustainable energy pipeline industry for Canadians.

MISSION

We engage and collaborate to continually improve our industry's safety, sustainability and transparency, and the business environment within which it operates.

STRATEGIC PRIORITIES



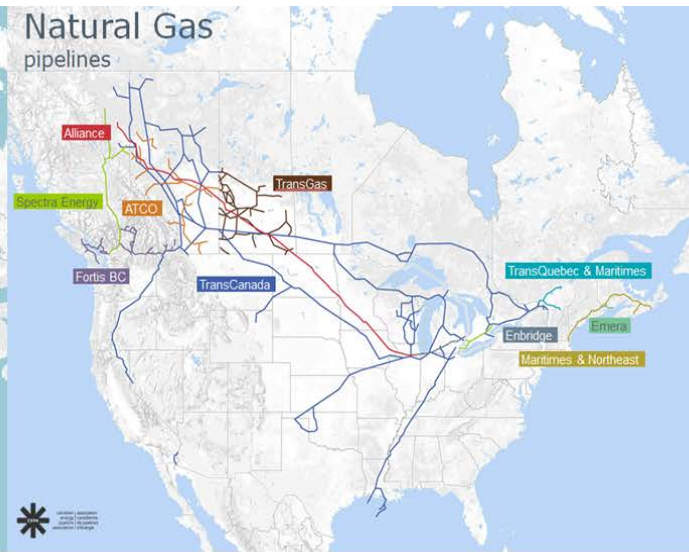
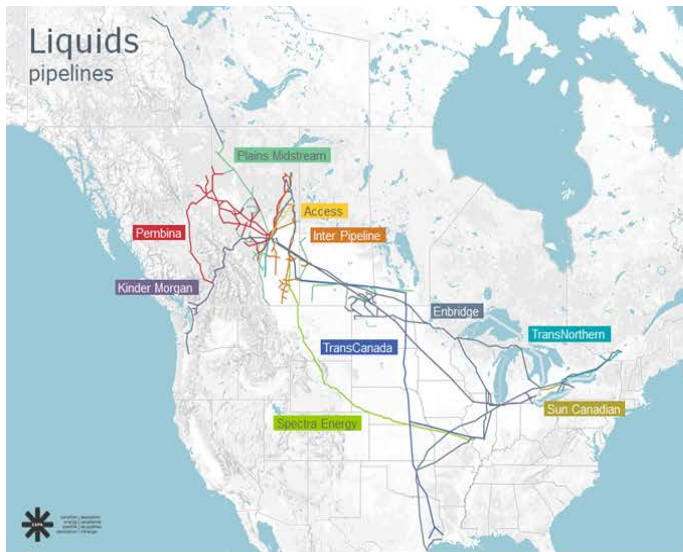
TARGET



canadian | association
energy | canadienne
pipeline | de pipelines
association | d'énergie

| aboutpipelines.com

CEPA members & reach



Canadian Crude Oil Facts

- Production: 3.8 million barrels/day
- Exports: 3.1 million barrels/day
- Value of Exports: \$49.8 billion

2016 data

Canadian Natural Gas Facts

- Production: 15.3 billion cubic feet/day
- Exports: 8.1 billion cubic feet/day
- Value of Exports: \$8.8 billion

2016 data

- Access Pipeline Inc.
- Alliance Pipeline Ltd.
- ATCO Pipelines
- Enbridge Pipelines Inc.
- Inter Pipeline Ltd.
- Kinder Morgan Canada
- Pembina Pipeline Corporation
- Plains Midstream Canada
- TransCanada PipeLines Limited
- TransGas Limited
- Trans-Northern Pipelines Inc.



canadian association
energy | energy
pipeline | pipeline
association | association
de pipelines | de pipelines
d'énergie | d'énergie

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The Mission of the Port of Portland

“To enhance the region’s economy and quality of life by providing efficient cargo and air passenger access to national and global markets, and by promoting industrial development.”



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