



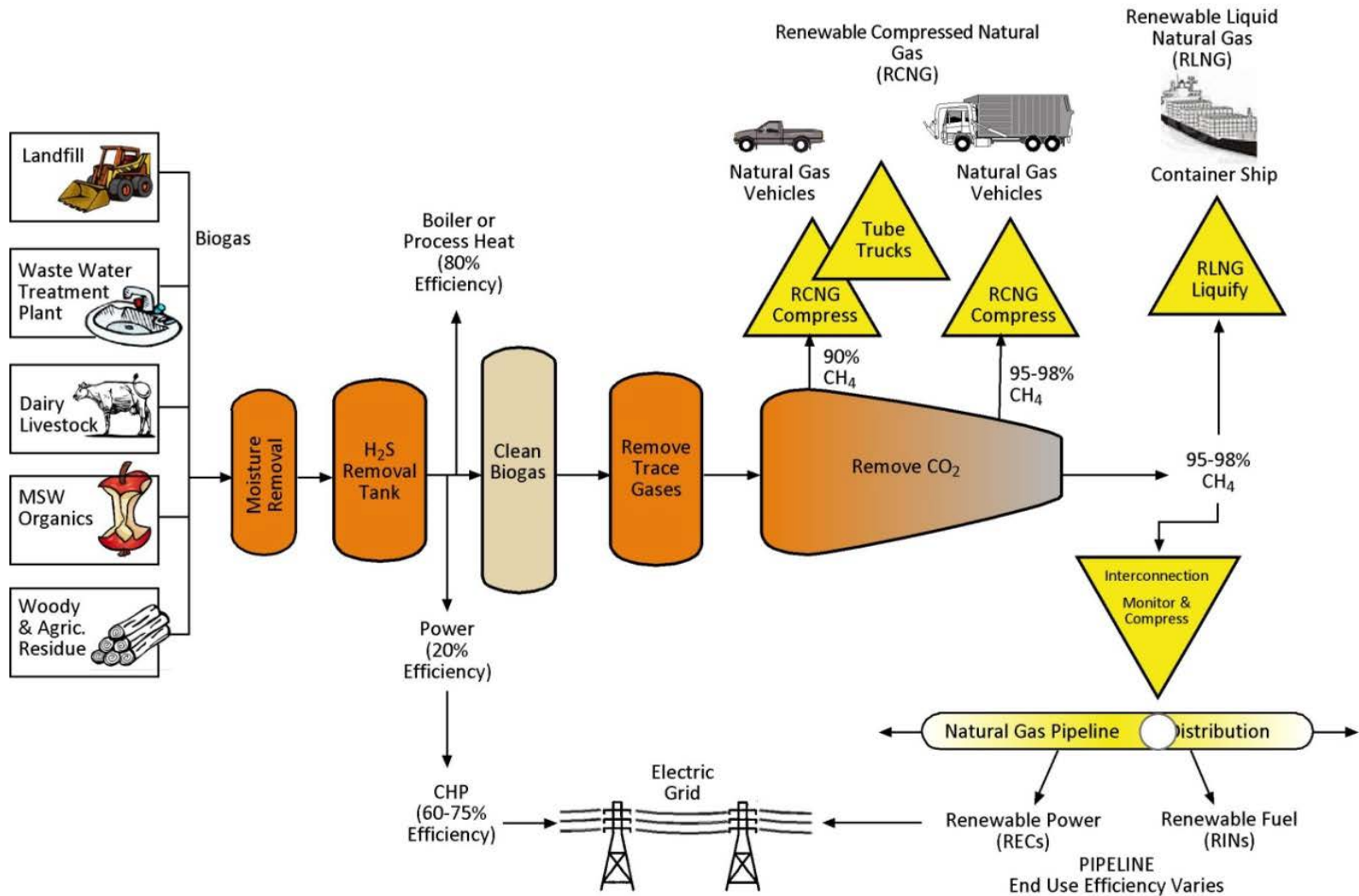
Department of Commerce

RNG Development in Washington: Supply & Standards

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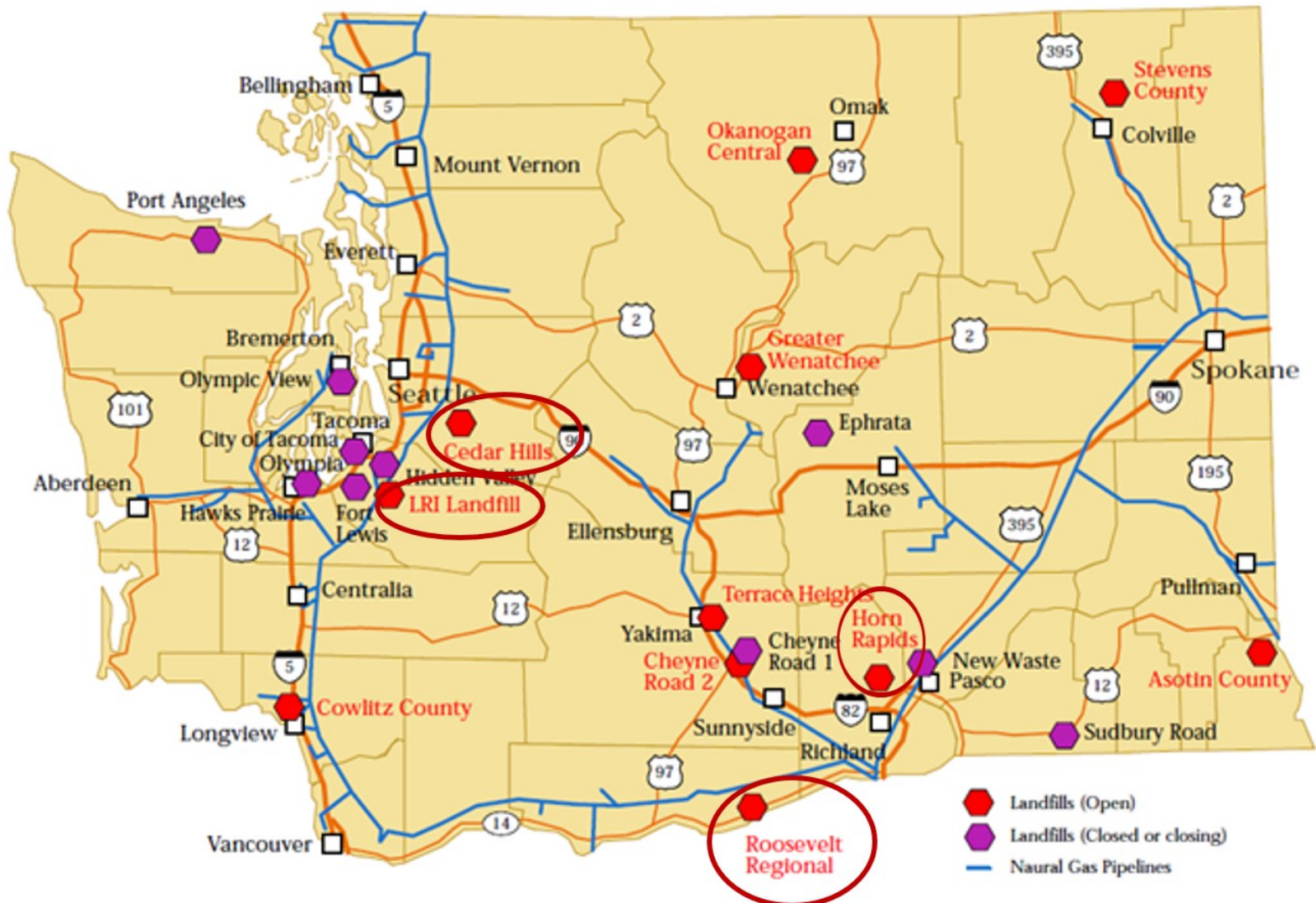
Renewable Natural Gas via Anaerobic Digestion



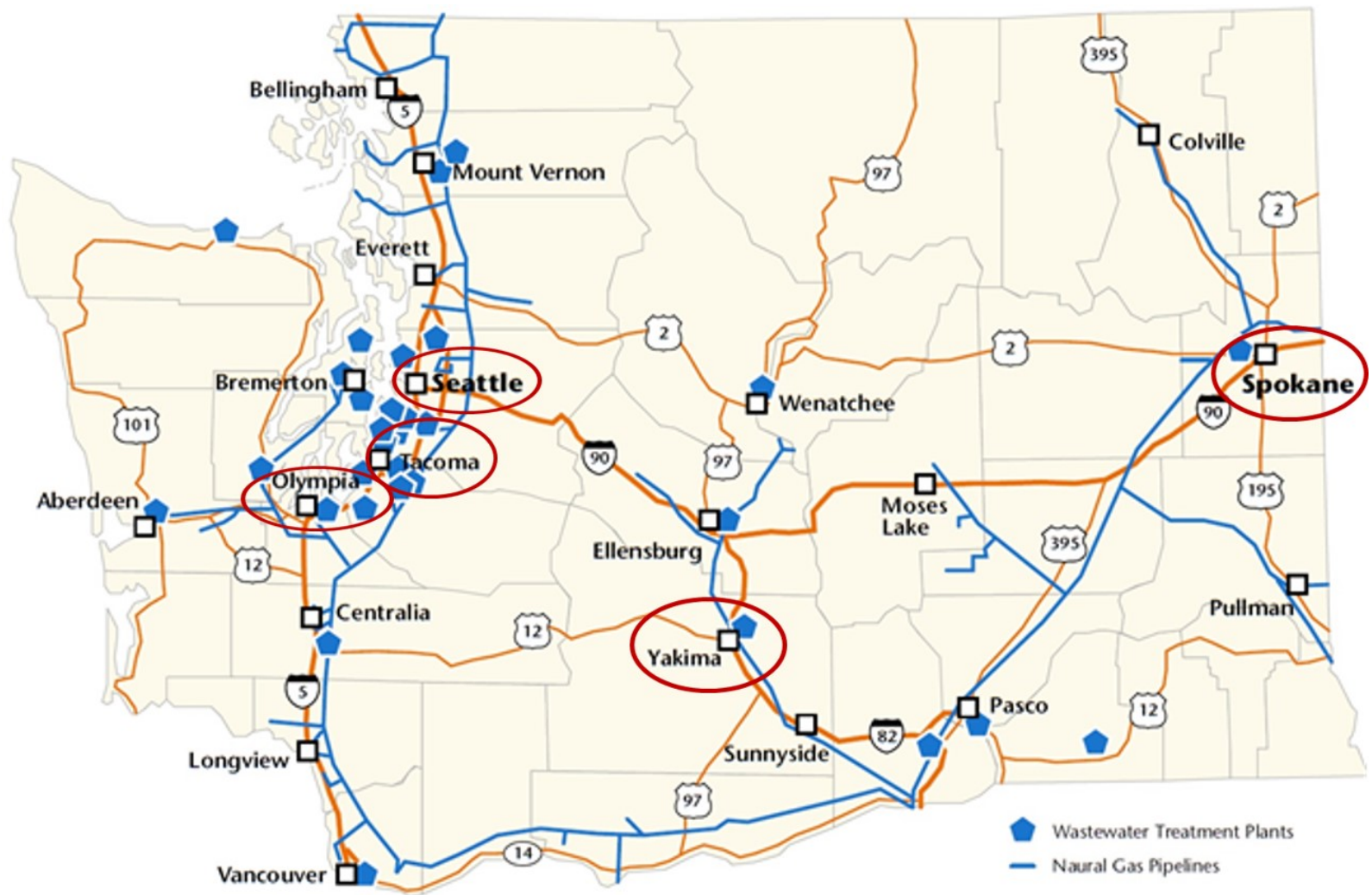
Dairy Digesters: Stable, Innovating, but Stalled



Landfills: Making Progress, Unique Challenges



Wastewater Treatment: Emerging Opportunities



2017 Roadmap: RNG Potential

Source	Energy (MMBtu/yr)	Electricity (MWh/yr)	Fuel (DGE/yr)
Landfills	16,519,219	1,738,865	122,364,586
Wastewater Treatment	1,716,062	180,638	12,711,571
Dairies	3,011,250	316,974	22,305,566
Food Processing & Municipal Organics	5,430,198	571,600	40,223,692
Urban Wood Gasification	23,376,197	2,460,652	173,157,015

Current: 8-9% power and direct use, ~20% diesel consumption

Advanced: 16-17% power and direct use, ~37% diesel consumption



2017 Roadmap: Key Findings

Power Sales Model Mature

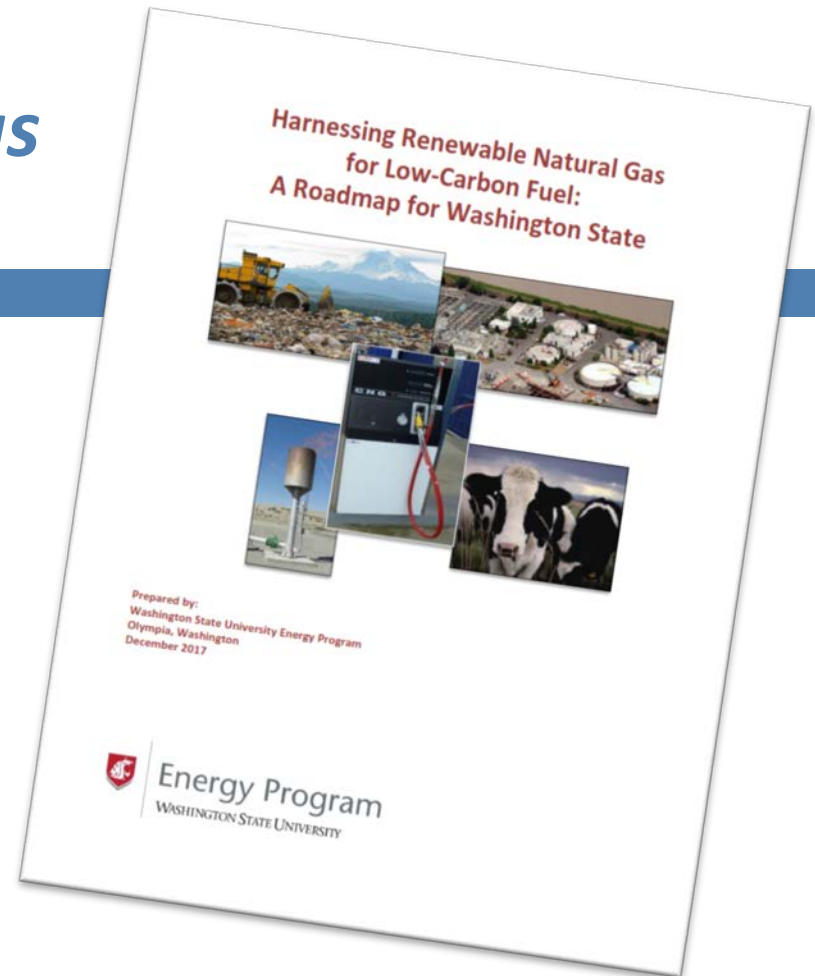
- Utility RPS targets met
- RNG market moving to transportation

Incentives Need an Overhaul

- Previous tax breaks expired
- Definitions dated, conflicting, incomplete

Pipeline Quality Standards

Uncertain Policy Framework



2018 Legislation (HB 2580)

- Restore and expand production incentives
- Broader techno-economic assessment
- Update policy options
- Public sector preferential purchasing
- Regional voluntary pipeline standards

Energy Division - State Energy Office
**HB 2580/SB 6449:
Incentives for
Renewable Natural Gas**
Creating value from organic wastes
Department of Commerce

VALUE OF RENEWABLE NATURAL GAS – Economic and environmental benefits
Renewable natural gas (RNG) is produced by removing contaminants from the biogas that naturally results from the decomposition of organic materials in landfills and anaerobic digesters at wastewater treatment plants, food processing facilities, and farms. RNG is equivalent to conventional natural gas and can be used on-site to generate heat and electricity, or be incorporated into the existing natural gas supply system, with many added benefits:

- Waste management for agriculture, especially dairies and food processors
- New revenue sources and job creation for private and public facilities
- Extended life expectancy for landfills through organic waste diversion
- Lowest carbon intensity of any transportation fuel
- Improved community resilience by diversifying natural gas supplies

Maximizing yields of RNG from the most common public and private sources in Washington through existing technology could replace 8-10 percent of the natural gas consumed by Washington homes and businesses. If RNG were converted to vehicle fuel, it could displace roughly 20 percent of current diesel consumption.

LEGISLATIVE PROPOSAL – The importance of incentives
To fully realize the benefits available from developing Washington's RNG resources, public support through government policy is necessary:

- **Reinstate and expand tax incentives:** Cash-strapped agricultural enterprises and public waste management facilities can move away from the ineffective power sales model of digester development by tapping value-added markets for low-carbon transportation fuels and new fertilizer products.
- **Assess site-specific opportunities and develop quality standards:** A more detailed assessment of RNG production opportunities will help guide financial and technical assistance throughout Washington state, and a collaborative effort with natural gas utilities will help define appropriate quality standards for RNG before it enters the natural gas supply system.

Commerce's work to prepare an assessment and develop quality standards requires a general fund appropriation of \$178,000 in FY 2017-2019.

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OUR MISSION
Grow and improve jobs in Washington State by championing thriving communities, a prosperous economy, and suitable infrastructure.

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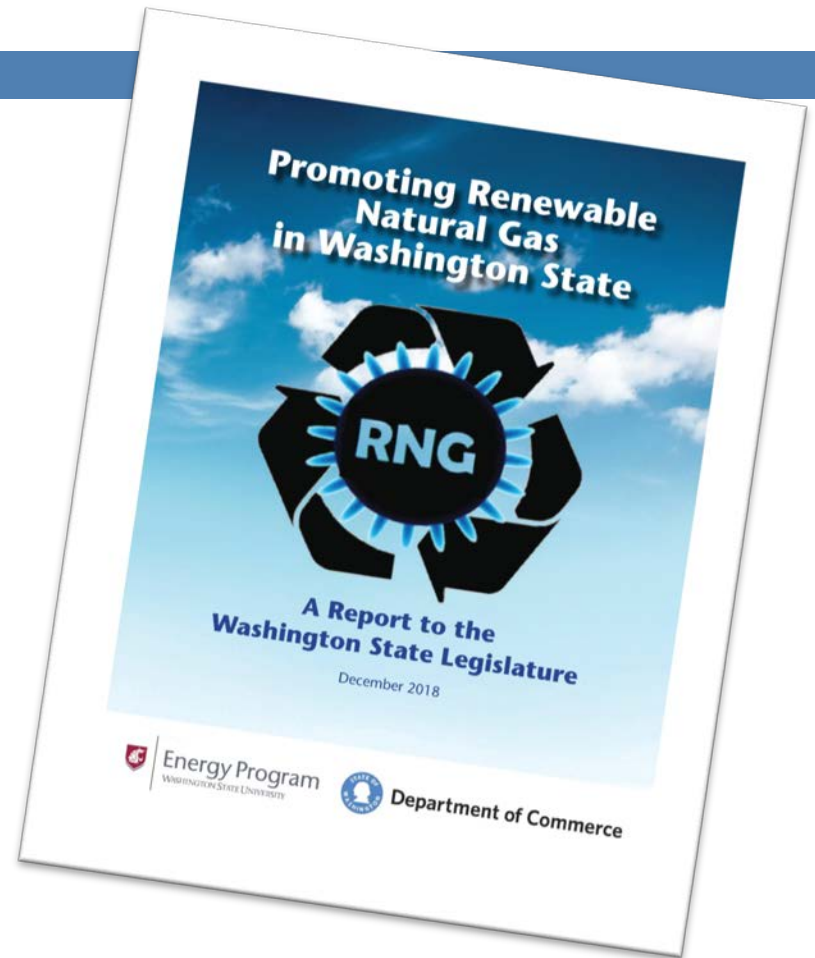
WASHINGTON CONNECTIONS
Numerous Washington companies supply systems and equipment for RNG. Many are already doing business in other states:

- Biogas Energy, Seattle
- Cedar Grove Composting, Seattle
- DartTech, Lynden
- Edaleem Cow Power, Lynden
- Environmental Energy & Engineering, Olympia
- FFE Renewables, Lynden
- IGI Resources, Kirkland
- Impact Bioenergy, Shoreline
- Organic, Walla Walla
- Promus Energy, Seattle
- Regenix, Ferndale
- Raincountry Industrial, Arlington
- Trident Processes, Sumas
- Vaughan Company, Montesano
- Whole Energy Fuels, Bellingham
- Yield Biogas Solutions, Blaine



2018 Roadmap: Promoting RNG

- Refine previous production estimates
- Cite economic and environmental benefits
- Integration with natural gas utilities
- Policy options, especially incentives



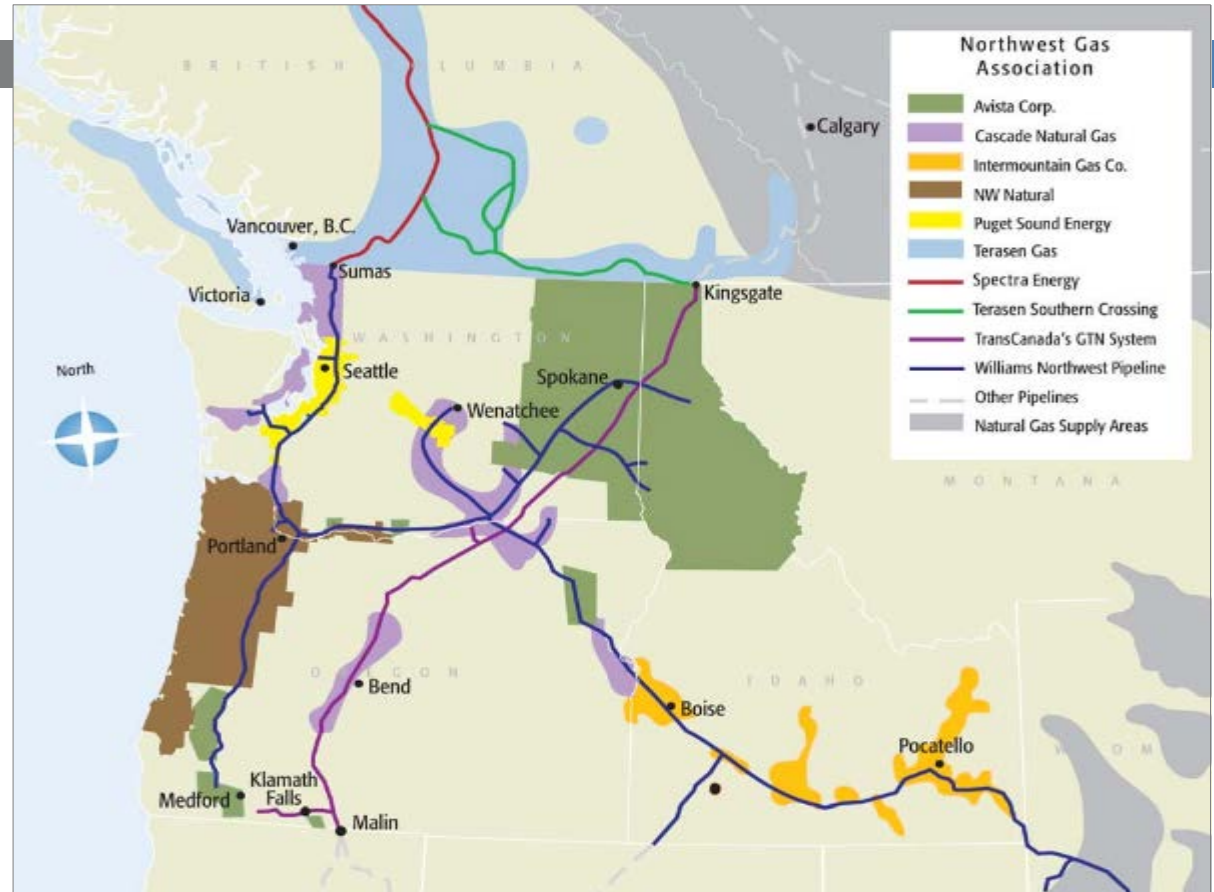
www.commerce.wa.gov/wp-content/uploads/2019/02/COMMERCE-RNG.pdf



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First Step: Better data, focus on pipeline grid




- Facilities within 5 miles
- Feedstocks within 30 miles
- Public-private partnerships, priorities for public funding
- Data sets dated, incomplete and/or inferred

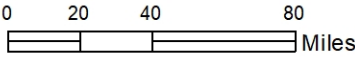


Start with larger dairies...



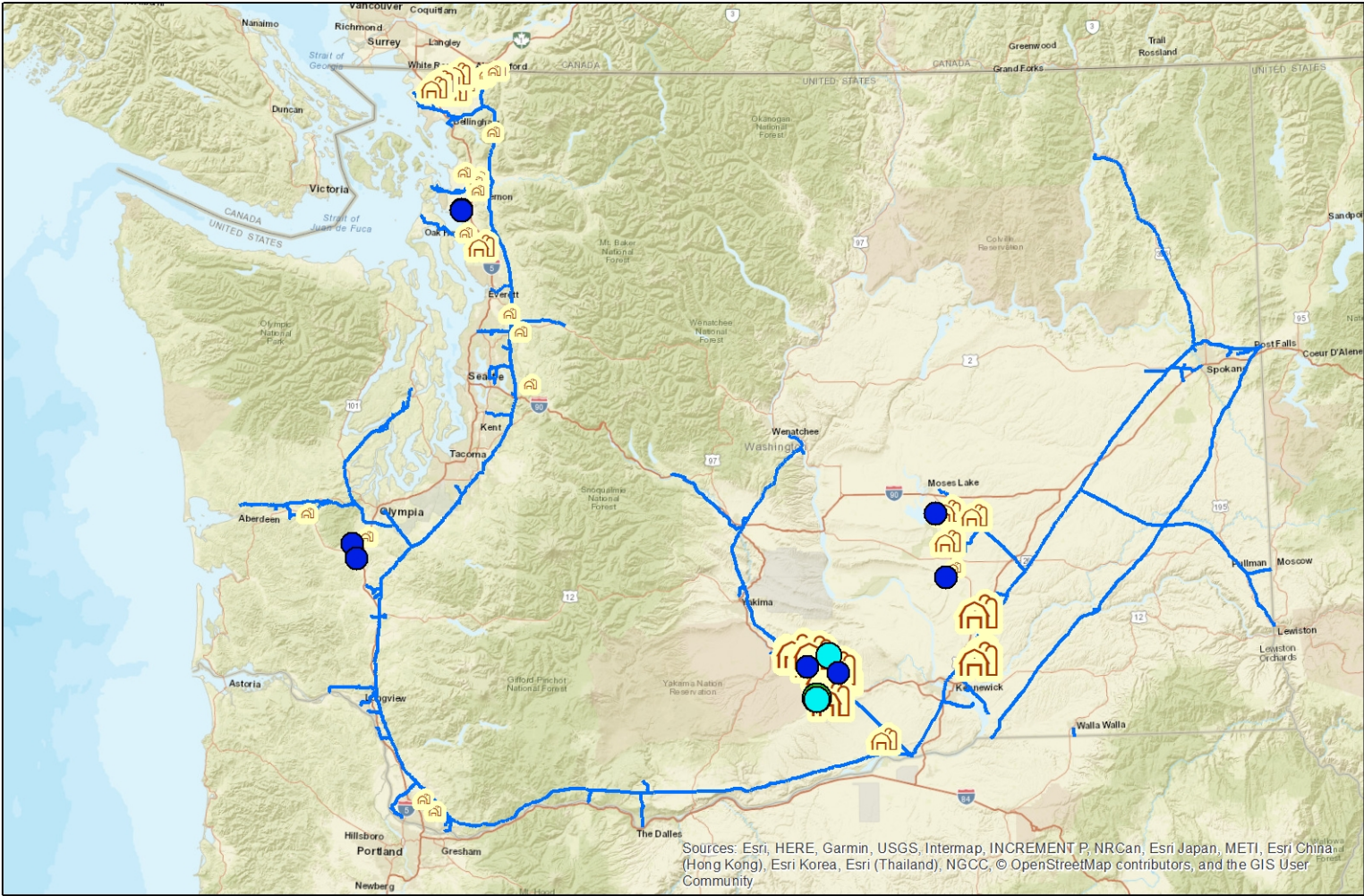
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community

- Primary Dairies**
-  >100 scfm
-  >50 scfm
-  >200 scfm






Source: Washington State Energy Office

...add dairies in close proximity...






Secondary Dairies

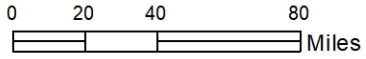
 >200 scfm

 >100 scfm
 >50 scfm

Primary Dairies

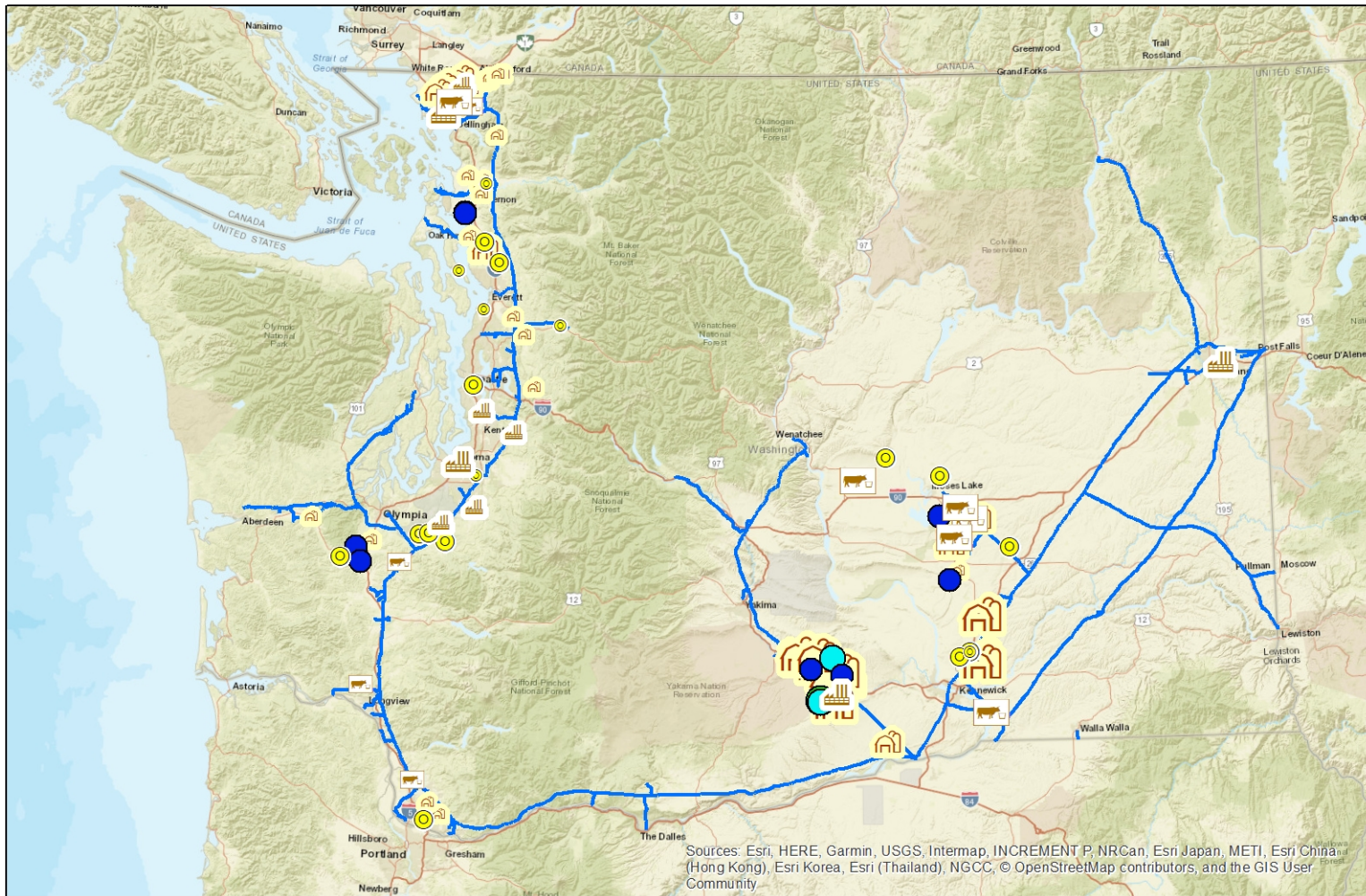
 >200 scfm

 >100 scfm
 >50 scfm

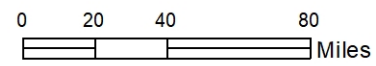
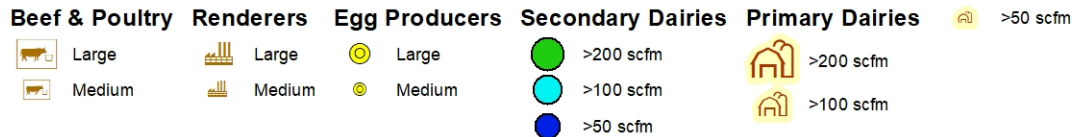


Source: Washington State Energy Office

...and other sources of animal waste

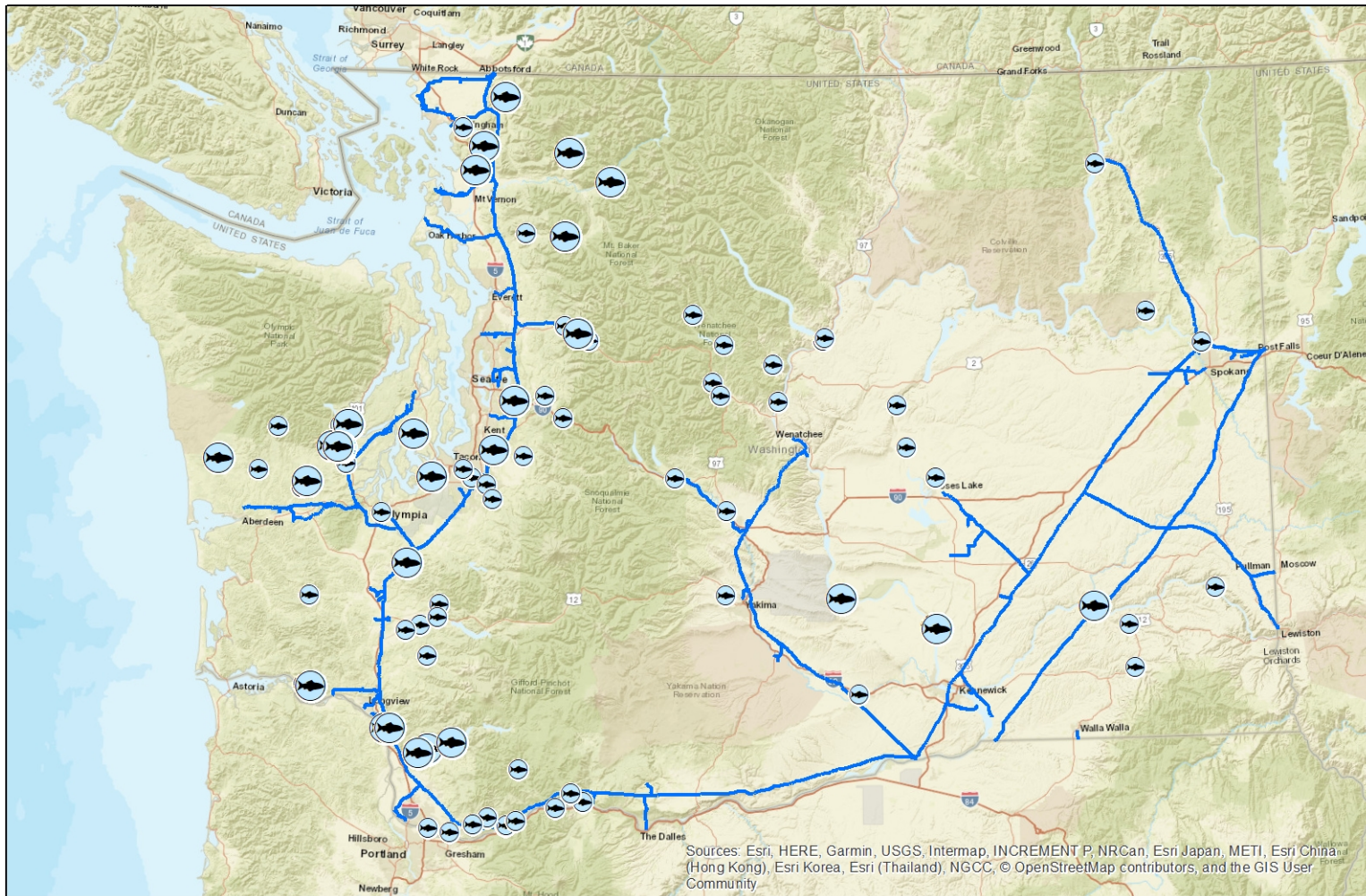


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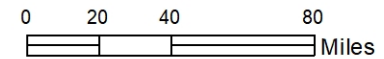
Source: Washington State Energy Office

Don't forget hatcheries...



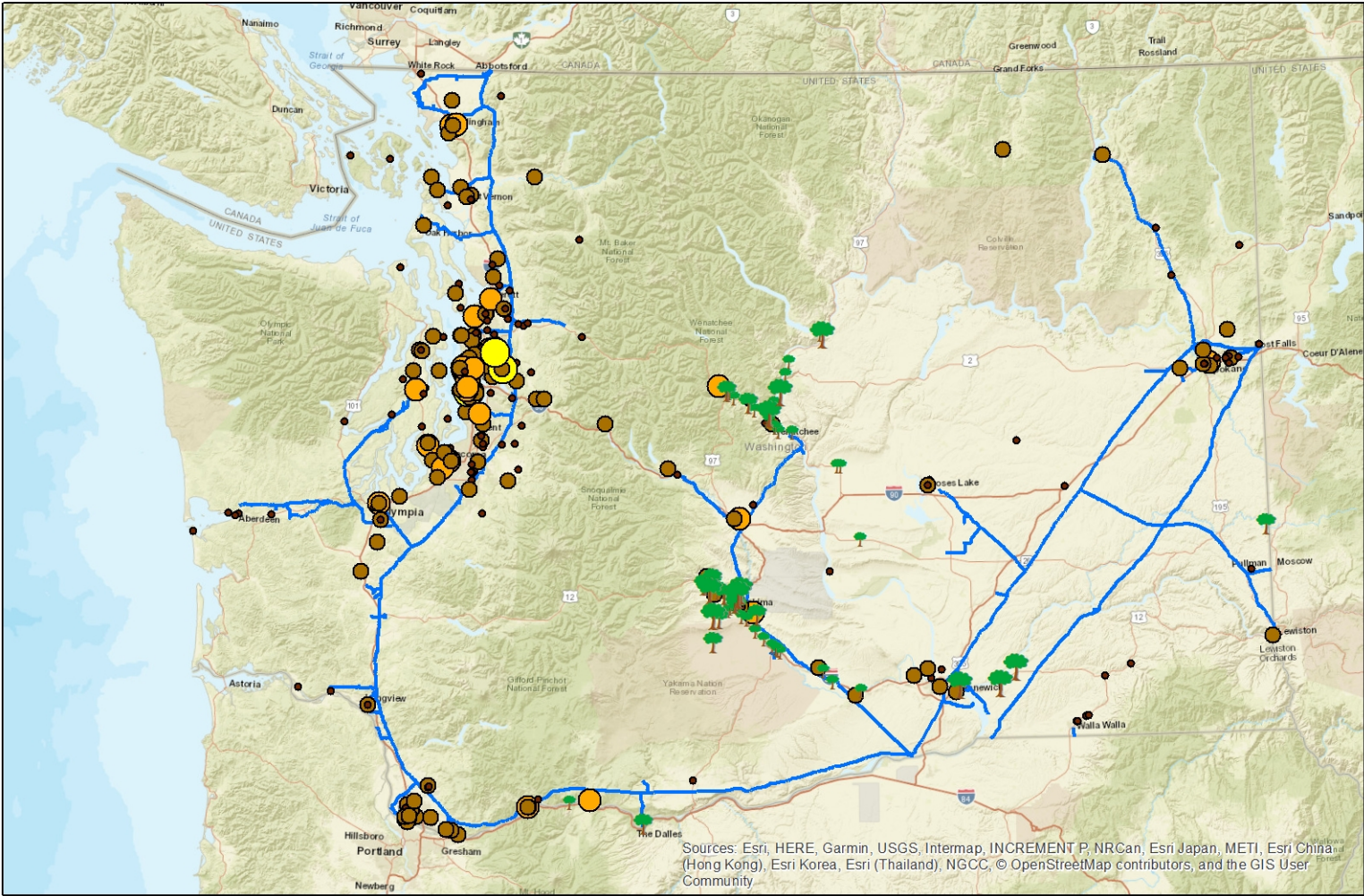
Fish Hatcheries

-  Carcass waste reported
-  No report






Source: Washington State Energy Office

...fruit growers, brewers and distillers...







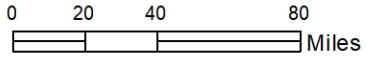
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Tree Fruit & Vineyards

-  >100k tons/yr and/or >50 employees
-  >50k tons/yr and/or >10 employees
-  Smaller packers

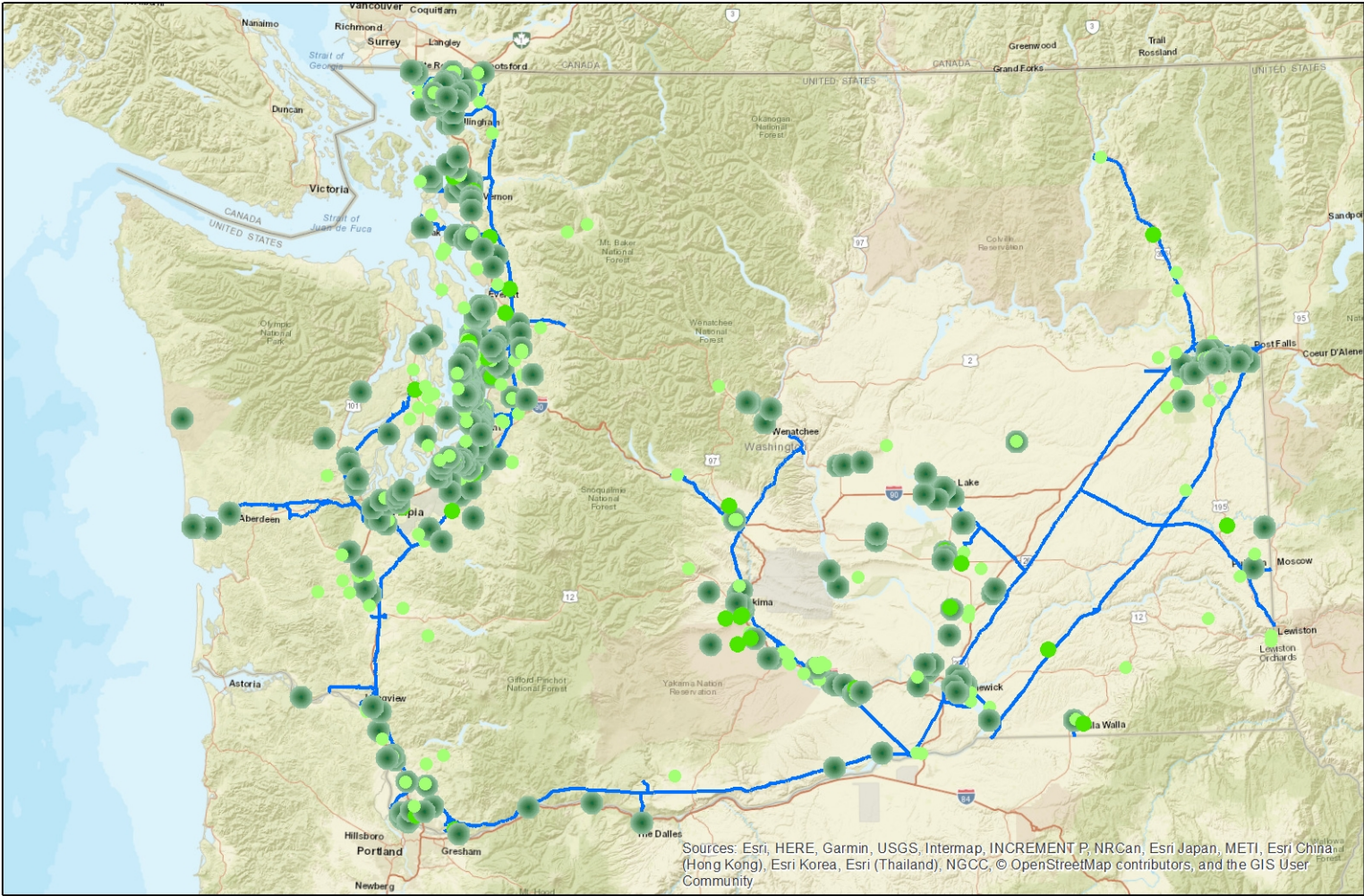
Breweries & Distilleries

-  >1m gal/yr beer or >100k gal/yr spirit
-  >100k beer or >10k spirit
-  >10k beer or >1k spirit
-  >1k beer or >100 spirit



Source: Washington State Energy Office

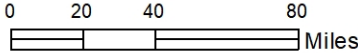
...and larger-scale food processors



Food Processors

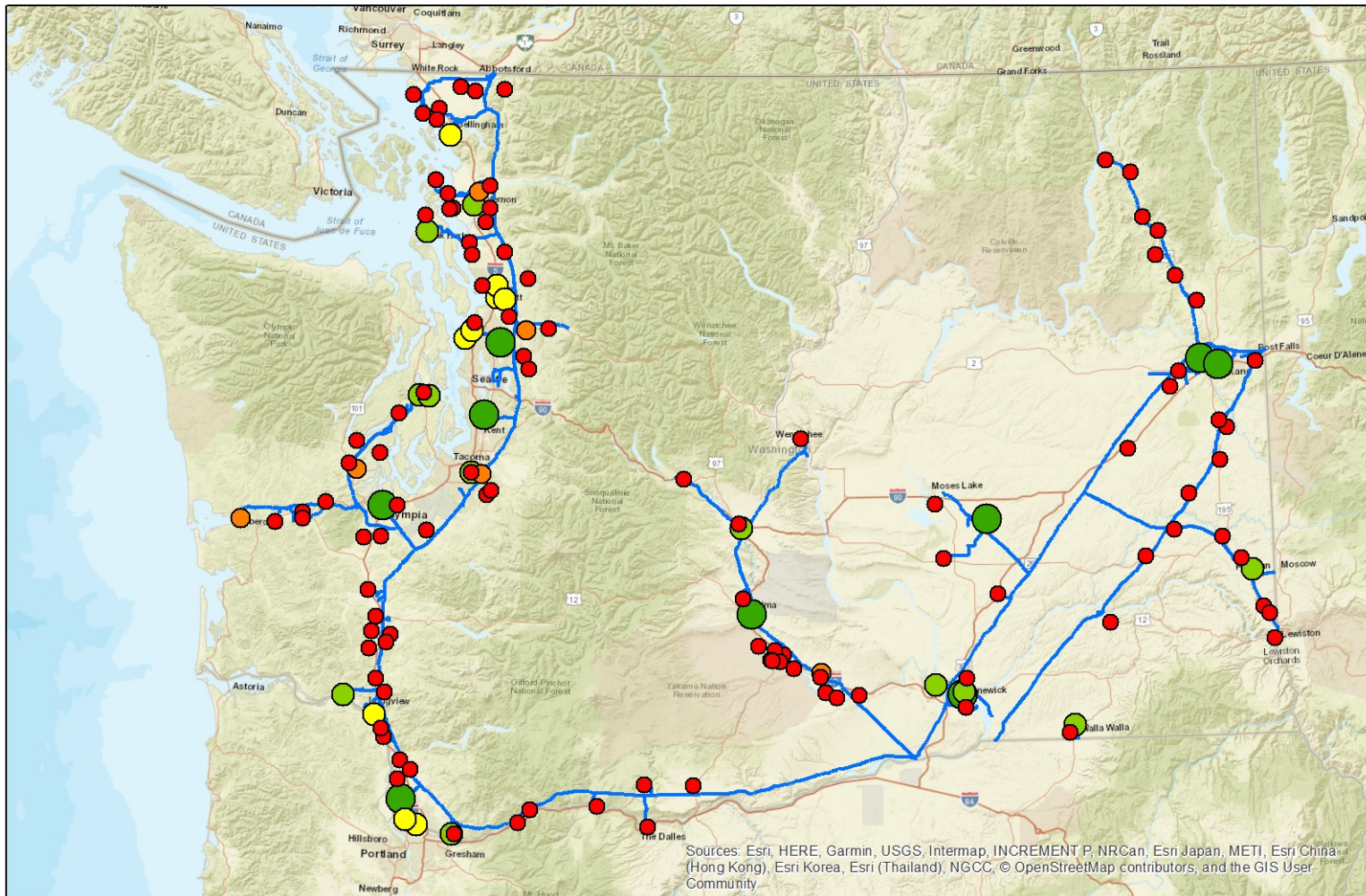
- High sales volume or employment (high energy value)
- Medium sales volume or employment

● Other processors



Source: Washington State Energy Office

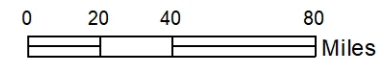
Facilities start with wastewater...



Wastewater Treatment Facilities

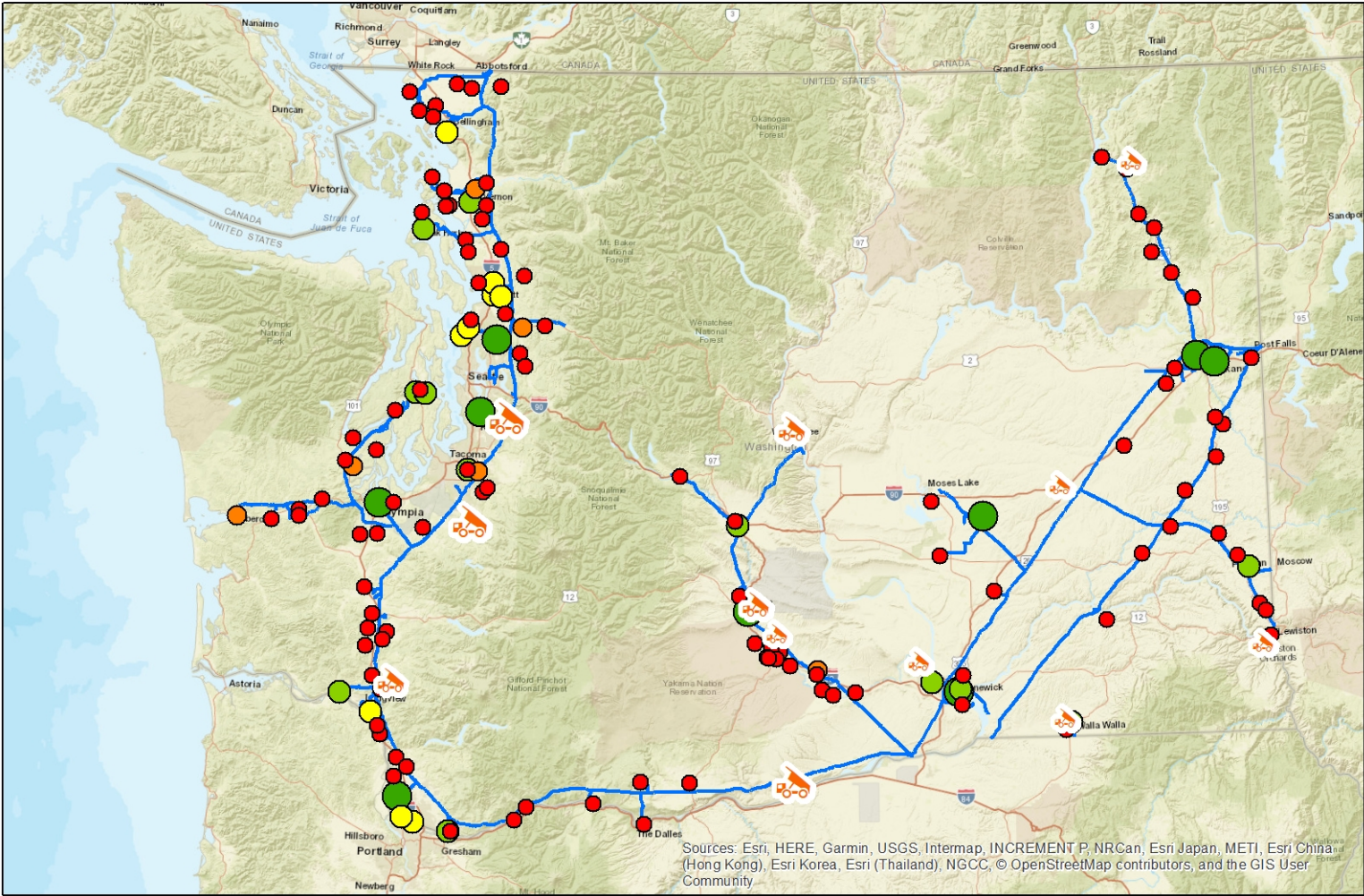
- Digester, >100 scfm and/or biogas capture
- Digester, 30-100 scfm



- No digester, >30 scfm
- Digester, 10-30 scfm
- Others

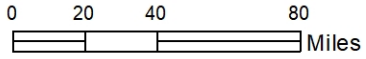


Source: Washington State Energy Office

...and add open landfills

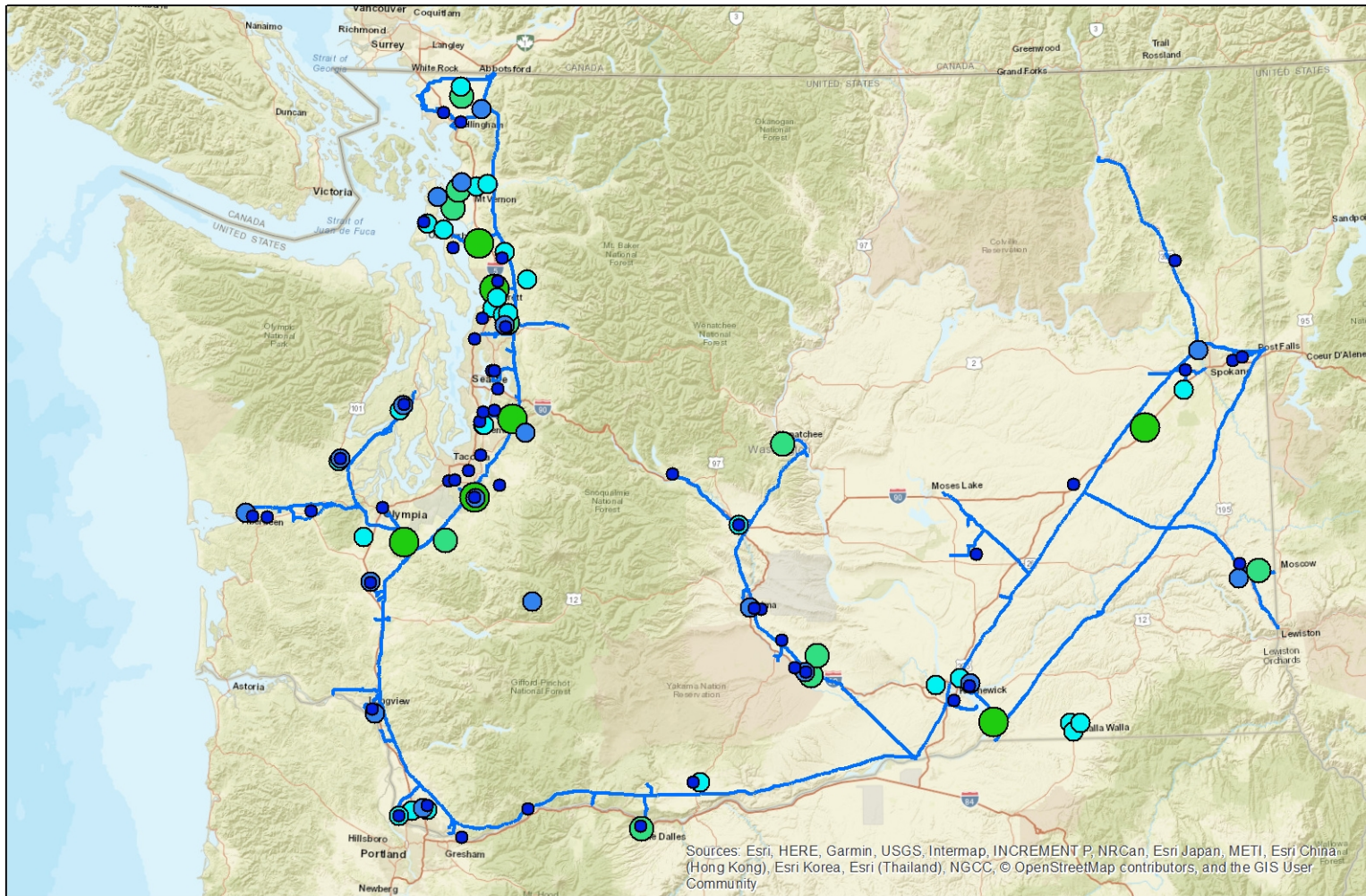


- Open Landfills**
-  >1,000 scfm
-  >300 scfm
-  <300 scfm
-  <300 scfm



Source: Washington State Energy Office

Consider composters and public infrastructure



Other Infrastructure



Compost (>50k tons/yr)



Compost (>10k tons/yr)



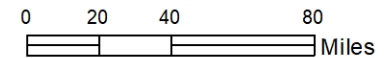
Compost (<10k tons/yr)



Closed Landfill



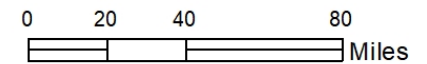
Transfer Station



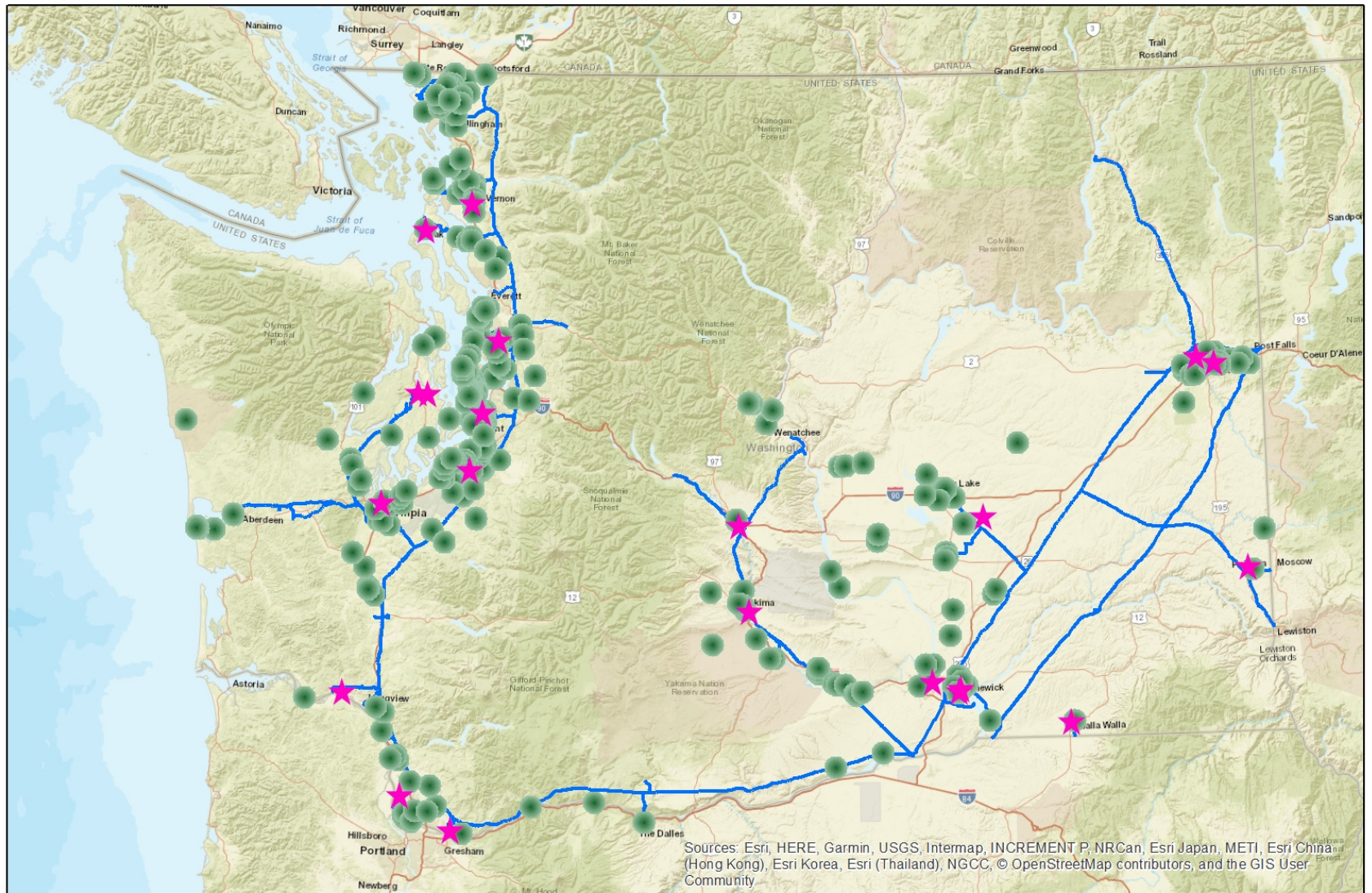
Source: Washington State Energy Office



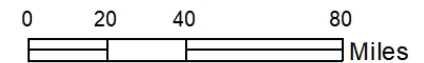
High Volume Animal Waste



Source: Washington State Energy Office



High Volume/Value Food Processors (relative to wastewater treatment with AD)



Source: Washington State Energy Office

2018 Roadmap: RNG Potential

Current (Cedar Hills LF, Roosevelt LF, South WWTP): 1.3%

- All currently “wheeled” into California CNG transportation market

Near-Term (~5 years, ~\$680 million CAPEX): 1.8%

- One LF, two WWTPs, and eight dairies generating power converted to RNG
- Three landfills in Chelan, Cowlitz and Yakima counties
- Nine WWTPs w/digesters in Benton, Clark, Grant, King, Snohomish, Spokane and Yakima counties
- 19 additional dairies statewide (primarily Yakima, Grant/Adams and Whatcom counties)
- 50% of post-consumer organic wastes in King, Snohomish and Pierce counties

Medium-Term (5-10 years): 1.9%

- Five landfills in Asotin, Benton, Grant, Yakima and Walla Walla counties
- 27 WWTPs, nine of them upgraded with digesters
- ~200 dairies with adequate biogas potential
- Balance of post-consumer organic wastes from central Puget Sound, plus food waste for next 14 counties with highest RNG potential
- Significant diversion of food processing residuals, AD added to composters



New Directives & Pending Initiatives

- **Natural Gas Conservation Standard:** Utilities identify and acquire all available cost-effective measures; include social cost of carbon; UTC targets by 2022
- **RNG Programs:** Utilities may propose RNG program for compliance, must offer voluntary RNG service
- **Low-Carbon Fuel Standard:** State vs Puget Sound
- **Public Preferential Purchasing:** RNG and nutrients
- **State-level Pipeline Standards:** UTC exploration
- **Clean Energy Fund:** \$1m Dairy Digester Grants
- **Food Waste Reduction Plan: 2020**



Regional Standards Discussion

“...explore development of voluntary gas quality standards for the injection of (RNG) into the natural gas pipeline system. ...identify acceptable levels of constituents of concern for safety and environmental purposes, including ensuring pipeline integrity, while providing reasonable and predictable access to pipeline transmission and distribution facilities.” – HB 2580

Topics: Gas Quality, Pipeline Integrity, Public Health

Protocols: Constituents, Frequency, Tiered Approach

Variables: Transmission vs Distribution, Agricultural vs Post-Human Sources, Seasonality of Production/Demand, Steady vs Transient Injection, Injection Rate



Regional Standards Discussion

Work Group: Three states, one province, ~65 participants

Scope: Technical requirements (dew point, heating value, gas composition, hazardous components, pressure, temperature, mixing rate, other operational concerns), not business relationships (insurance, warranties, indemnification, metering, who pays for what) or standards for direct fueling of CNG vehicles

Inquiry: Comparison matrix (incl. CA PUC standards), technical resources, participant survey

Results: Too divergent, science and policy environment unsettled, liability concerns





Department of Commerce

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