Washington’s climate change and manufacturing policy landscape

Building Washington’s Clean Materials Manufacturing Economy

Glenn Blackmon, Hanna Waterstrat, Stephanie Celt, Joel Creswell, and Carolyn Busch

06/28/2022
We strengthen communities
2021 Washington State Energy Strategy: Industrial Sector

Glenn Blackmon, Energy Policy Manager
2021 Washington State Energy Strategy

https://www.commerce.wa.gov/energystrategy
Meeting the state’s energy needs

• Maintain reasonable and fair prices and sufficient supply of energy

• Promote a competitive clean energy economy and workforce development

• Understand and address the needs of low-income and vulnerable populations

• Reach and respond to urban and rural communities
Aligning energy and climate policy

• Align strategy with clean electricity laws
  • Energy Independence Act (I-937, 2006)
  • Clean Energy Transformation Act (SB 5611, 2019)
    • After 2025, no coal in resource mix
    • By 2030, greenhouse neutral electricity supply
    • By 2045, 100% renewable or non-emitting sources

• Align strategy with greenhouse gas emissions limits (HB 2311, 2020)
  • By 2030, 45% below 1990 levels
  • By 2040, 75% below 1990 levels
  • By 2050, 95% below 1990 levels and achieve net-zero emissions.
Ensure equitable transition for communities

• Apply explicit equity principles
• Ensure impacted communities design solutions
• Invest in equitable and inclusive transition
• Support workers in transition
• Universal broadband access as foundation for transition
Final energy demand 2020-2050

COVID-19: 10% drop in demand in 2020 due to COVID impact

Electrification: 90% growth in electricity sector over 2020 levels, displacing fuels

Transport Fuels: Demand for fuels remains in 2050

Buildings: Higher demand for gas due to less electrification

Behavior: Fewer energy services drive demand lower

Cost impacts and economic effects

Average Annual Energy Expenditure (%GDP/yr)

Change in Labor Income, Compared to Reference Case
Five decarbonization strategies

### Energy Efficiency
- Energy Consumption (Gigajoules/person)

### Clean Electricity
- Electricity Carbon Intensity (Grams CO₂ per kWh)

### Electrification
- Electricity Share of Total Energy (% of Final Energy)

### Clean Fuels
- Fuels Carbon Intensity (kG/MMBtu)

### Carbon Sequestration
- (Million tonnes CO₂)

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**Graphs:**
- **Energy Efficiency:** Comparison of energy consumption between 2020 and 2050.
- **Clean Electricity:** Comparison of electricity carbon intensity between 2020 and 2050.
- **Electrification:** Graph showing the share of electricity in the total energy consumption between 2020 and 2050.
- **Clean Fuels:** Comparison of clean fuels carbon intensity between 2020 and 2050.
- **Carbon Sequestration:** Comparison of carbon sequestration between 2020 and 2050.
WASHINGTON STATE 2050

Net-Zero Vision

A blueprint for how we can meet our state’s climate goals to nearly eliminate the use of climate-threatening fossil fuels by 2050, while growing a prosperous economy and maintaining affordable and reliable energy supplies.
Decarbonizing the industrial sector

- Washington’s significant demand for clean fuel requires an investment in clean fuels industry
- Large quantities of synthetic fuels required in 2030 to reach the target of 45% below 1990 emissions by 2045
  - New industrial flexible loads major emerging industry for producing hydrogen through electrolysis
- Significant fraction of carbon stream used to produce synthetic fuels comes from industrial carbon capture
Clean fuels required to achieve decarbonization

- All liquid fuels fully decarbonized by 2050
- Decreasing fuel consumption over time with electrification and efficiency
- Liquid fuels (gasoline, diesel, jet fuel, others) significantly decarbonized by 2030 with synthetic and biofuels
  - Significant growth in clean fuels industries with few current commercial operations; major challenge
- Emerging opportunities for hydrogen solutions
Industrial sector recommendations

- Improve data and analytical capabilities
- Establish technology-neutral regulatory frameworks
- Develop and implement clean energy industrial policy and technical assistance
- Accelerate research and development
- Develop hydrogen and biogenic feedstocks
- Expand policies to consider consumption-based emissions
- Leverage the transition to create new inclusive, living wage jobs
2021 Strategy – Big themes

• Need for planning, data analysis and outreach
• Role of investment in equitable and inclusive transition
• Universal broadband access as a foundation for energy transition
• Transition of the fossil natural gas industry
• Value of comprehensive pricing mechanisms
• Role of research, development and early deployment
• Development of green hydrogen and clean fuels
Buy Clean and Buy Fair
Hanna Waterstrat, State Efficiency and Environmental Performance Office
Embodied carbon policy in Washington

- Legislative “Buy Clean and Buy Fair” efforts
  - 2020 – HB 2744
  - 2021 and 2022 – HB 1103 “Improving environmental and social outcomes with the production of building materials”

- Executive Order 20-01
  - Requires state agencies to “consider embodied carbon” in new construction
  - SEEP has provided guidance and training to project owners

- 2021 State Energy Strategy
Buy Clean and Buy Fair

- **Buy Clean and Buy Fair legislation**
  - Required reporting:
    - Type III supply chain-specific environmental product declarations (EPDs) and labor conditions data
    - Covered products: structural concrete, reinforcing steel, structural steel, engineered wood
  - Focused on state building projects
  - Centralized database
  - Ongoing stakeholder engagement
  - Financial assistance for EPD generation at small and diverse-owned businesses
Current work

• SEEP Buy Clean and Buy Fair proviso
  • Work with University of Washington Carbon Leadership forum
  • Pilot projects
  • Prototype database for project disclosures
  • Progress report available, final legislative report due in November
  • More information available at: https://carbonleadershipforum.org/bcbf-project/
Pilot projects

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Current Stage</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interdisciplinary Engineering Building (IEB) at UW Seattle</td>
<td>Design</td>
<td>Concrete, rebar, structural steel</td>
</tr>
<tr>
<td>Milgard Hall at UW Tacoma</td>
<td>Construction</td>
<td>Concrete, rebar, structural steel, mass timber</td>
</tr>
<tr>
<td>WSDOT Olympic Region Maintenance Administration Facility (ORMAF) fuel island</td>
<td>Design</td>
<td>Concrete, rebar, structural steel</td>
</tr>
<tr>
<td>WSDOT ORMAF radio tower</td>
<td>Construction</td>
<td>Concrete, rebar, structural steel</td>
</tr>
<tr>
<td>Shoreline Community College Allied Health, Science, and Manufacturing replacement</td>
<td>Construction</td>
<td>Concrete, rebar, structural steel</td>
</tr>
<tr>
<td>Western Washington University Sciences Building</td>
<td>Construction Completed</td>
<td>Concrete, rebar, structural steel</td>
</tr>
</tbody>
</table>
Pilot project reporting

**Project data**
- Basic project characteristics
- Material quantities
  - Structural concrete
  - Reinforcing steel
  - Structural steel
  - Engineered wood

**Product data**
- Valid Type III EPD
- Health certifications, if any
- Manufacturer name / location
- Supplier codes of conduct
- Working condition data
Pacific Coast Collaborative

• Low Carbon Construction Task Force
  • Participants:
    • States and Provinces: CA, OR, WA, BC
    • Cities: Vancouver BC, Seattle, Portland, San Francisco, Oakland, Los Angeles
  • GOAL: shared regional strategy to accelerate innovation, investment, and market development for low carbon materials by leveraging the scale of the Pacific Coast regional economy.
    • Advancing policy and program efforts to address embodied carbon
    • Sharing resources and best practices
Up next?

• SEEP pilot projects wrapping up— final legislative report due in November 2022

• 2022-23 legislative session:
  • Buy Clean and Buy Fair (HB 1103)
  • Funding for database development, ongoing stakeholder engagement, EPD generation, policy implementation

Stephanie Celt, Senior Energy Policy Specialist
Hydrogen and clean fuels

• Fuel: Any material substance that can be consumed to supply heat or power. Included are petroleum, coal, and natural gas (fossil fuels), and other consumable materials, such as uranium, biomass, and hydrogen” (Energy Information Agency)
  • Hydrogen: Green, blue, grey
  • Biomethane
  • Synthetic fuels

• H2 – abundant in the universe, energy dense
  • Energy carrier
  • Not naturally occurring in pure form – we have to make it

• Primary uses today:
  • Refinery operations
  • Fertilizers
  • Chemicals
# Hydrogen 101

<table>
<thead>
<tr>
<th>“Colors” of Hydrogen</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gray</td>
<td>Steam methane reforming (SMR), no carbon capture, high emissions</td>
</tr>
<tr>
<td>Blue</td>
<td>SMR with some of the carbon captured by carbon capture and storage</td>
</tr>
<tr>
<td>Green</td>
<td>Electrolysis – splitting of water powered by renewable energy</td>
</tr>
<tr>
<td>Pink</td>
<td>Splitting of water powered by nuclear energy</td>
</tr>
<tr>
<td>Turquoise</td>
<td>Thermal splitting of methane, producing solid carbon instead of CO2</td>
</tr>
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Main way hydrogen is produced today

Best aligned with WA GHG emission limits
Green Hydrogen in the State Energy Strategy

“The deep decarbonization modeling and the state energy strategy identify an important role for clean fuels in every sector of the energy economy. **Green hydrogen is of particular significance**, because it could serve both as a flexible use of electricity when generation exceeds demand and as a feedstock for production of synthetic fuels.” – 2021 State Energy Strategy

- **Flexible load** for the power system, functions as storage
- Replacement for **transportation fuels**: marine, aviation, and heavy-duty trucking
- **Industrial processes**: replace fossil-derived hydrogen, replace fossil fuels for high-temperature processes
SES: Energy Demand by Energy Form

- Steam
- Biomass
- Residual Fuel Oil
- Pipeline Gas
- Other
- Electricity
- Jet Fuel
- Diesel Fuel
- Gasoline Fuel
- Hydrogen
Washington state and federal hydrogen updates:
Recent policy updates
Washington policy context

- **Net zero GHG emission limits**
  - Statutory targets of net zero by 2050

- **Clean Energy Transformation Act**
  - 100% clean electricity standard by 2045

- **Climate Commitment Act**
  - Cap and invest program covering about 75% of emissions

- **HEAL Act**
  - Requirements for state agencies to advance environmental justice and consult with Tribes in environmental work

- **Labor standards incentives**
Hydrogen policy updates 2022

• SB 5910
  • “Green electrolytic hydrogen” definition
  • Authorities and incentives
  • New Office of Renewable Fuels
  • Report and recommendations
  • H2Hub references, including engagement

• HB 1812
  • Siting for clean energy projects, including hydrogen

• HB 1988
  • Clean energy manufacturing incentives, including for hydrogen
  • Labor standards
Green hydrogen capacity and growth

Hydrogen production: Strong steer to move from grey to green.

<1GW installed electrolyzer capacity now – but opportunity for exponential growth.
Federal goals and funding

• **Department of Energy Hydrogen Shot – “1 1 1”**
  - Reduce the cost of clean hydrogen to $1 per kilogram in one decade

• **Infrastructure Investment and Jobs Act**
  - $8 billion Regional Clean Hydrogen Hubs
  - $1.5 billion Clean Hydrogen Manufacturing, Recycling and Electrolysis
H2Hubs key information

• $8 billion to at least four hubs
• At least one each based on:
  • Renewable hydrogen
  • Natural gas with carbon capture and storage
  • Nuclear
• At least one each for different end uses:
  • Electric power generation
  • Industrial sector
  • Residential and commercial heating
  • Transportation sector
• 10 year timeframe
  • Notice of intent released, full applications likely Q1/Q2 2023
  • For work done over 8-10 year timeframe
DOE H2Hub priorities

- **Hydrogen Shot:**
  - Contribute to 80% cost reduction

- **Support clean hydrogen**
  - With intent to evaluate life cycle emissions

- **Align production and use**
  - Avoid hydrogen “stranded assets”

- **Equity, Environmental and Energy Justice, Justice40**
  - Justice40 program
  - Non-GHG air quality improvements
  - Consent-based siting

- **Employment and job creation**
  - Focus on U.S. jobs, manufacturing and existing workforce

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### Justice40 and HEAL Act

40% of overall benefits of certain Federal investments must flow to disadvantaged communities

DOE: “Hub deployment will focus both on reducing harm and increasing benefits to disadvantaged communities”

WA context: Alignment with HEAL Act
First hydrogen projects in WA

Hydrogen Plant Coming to Centralia
Fortescue Future Industries to Build Plant at Industrial Park at TransAlta

Douglas County PUD launches 5-MW green hydrogen pilot in Washington state

Speakers present during a “Hydrogen Symposium” in the TransAlta Commons at Centralia College on Thursday.
JARED WENZELBURGER / JARED@CHRONLINE.COM
What about the end uses?

Clean Hydrogen Ladder: Competing technologies

Unavoidable

Key: No real alternative  Electricity/batteries  Biomass/biogas  Other

A  Fertiliser  Hydrogenation  Methanol  Hydrocracking  Desulphurisation
B  Off-road vehicles  Steel  Chemical feedstock  Long-term storage
C  Long-haul aviation*  Remote trains  Coastal and river vessels  Vintage vehicles*  Local CO2 remediation
D  Medium-haul aviation*  Long distance trucks and coaches  High-temperature industrial heat
E  Short-haul aviation  Local ferries  Commercial heating  Island grids  Clean power imports  UPS
F  Light aviation  Rural trains  Regional trucks  Mid/Low-temperature industrial heat  Domestic heating
G  Metro trains and buses  H2FC cars  Urban delivery  2 and 3-wheelers  Bulk e-fuels  Power system balancing

* Via ammonia or e-fuel rather than H2 gas or liquid

Source: US Department of Energy 2022 Annual Merit Review and Peer Evaluation Meeting

Source: Liebreich Associates (concept credits: Adrian Hiel/Energy Cities & Paul Martin)
Clean power considerations

- **End uses of clean power**
  - Direct use in manufacturing – example: Intalco
  - Green hydrogen for use in industrial sector
  - Many others – buildings, electric vehicles, etc

- **Current renewable power**

- **Siting of renewable projects**
Pacific Northwest H2Hub planning

• Governor request for Commerce to coordinate
• RFI responses
• Established Pacific Northwest Hydrogen Association
• Office of Renewable Fuels
H2Hubs next steps

- Review DOE Notice of Intent (published June 6, 2022)
- Support establishment of Pacific Northwest Hydrogen Association Board
  - NOTE: Current low participation from manufacturing
- Equity, Environmental & Energy Justice Plan
- Workforce Development and Jobs Plan
- Tribal Engagement – multiple pathways
- Funding proposal finalized likely Q1/Q2 2022.
Key questions for Commerce

• How to increase engagement with manufacturing sector in H2Hubs?
• What are power planning and siting opportunities, challenges?
  • Example: Low carbon energy siting study
• What next steps to highlight in BER, legislative session?
• How can Office of Renewable Fuels help?
• How will Clean Fuels Standard help?
• What industries and unions want to partner with the state?
• What public investments are needed?
  • Examples: Highlighted hydrogen/industry/utility partnerships in Sweden, Quebec
• How to address environmental justice?
Partnerships will be key

- Goals: thriving manufacturing sector aligned with SES including economic and environmental justice goals
- Strategic approach to renewable power and renewable fuels
- Need partnerships – with industry, unions, community, Tribes

- Please reach out to discuss H2Hubs or Office of Renewable Fuels and partnership opportunities!
Washington’s Clean Fuel Standard

Joel Creswell, Climate Policy Section Manager

June 28, 2022
What is a Clean Fuel Standard?

Fuels with CI below the standard generate credits.

Fuels with CI above the standard generate deficits.

deficit

credit
What is a Clean Fuel Standard?

Higher carbon fuels generate deficits

Regulated entities buy credits

Lower carbon fuels generate credits
What is Carbon Intensity?

**Carbon Intensity:**

“The quantity of life-cycle greenhouse gas emissions, per unit of fuel energy, expressed in grams of carbon dioxide equivalent per megajoule (gCO$_2$e/MJ)”
Regulated fuels *(must comply)*

Including, but not limited to:

- Gasoline
- Diesel
- Ethanol
- Biodiesel
- Hydrogen (compressed or liquefied)
- Fossil fuel-based compressed natural gas (including fossil CNG, fossil LNG, and fossil L-CNG)
Opt-in fuels (may participate)

Including, but not limited to: any fuel that has a CI at or below the standard

- Electricity
- Alternative Jet Fuel
- Biofuels
- Renewable propane or renewable LPG
- Bio-CNG, Bio-LNG, Bio-L-CNG
In-State Biofuel Requirements

• By 2028, law requires at least:
  • 60M gallons/year of new, in-state biofuel capacity, with at least 10M gallons/year in new facilities
  • 15% increase in biofuel production using Washington feedstocks

• Carbon intensity standard can’t exceed 10% until these requirements are met
Implications for fuel producers

• Credit revenue creates incentive for low carbon fuels

• West Coast clean fuels market
  • CA, OR, WA, and BC all have clean fuels programs

• Production location matters:
  • Fuel transport distance affects credit generation
## Rulemaking Timeline

<table>
<thead>
<tr>
<th>Event</th>
<th>Dates</th>
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</thead>
<tbody>
<tr>
<td>Announce Rulemaking CR-101</td>
<td>July 20, 2021</td>
</tr>
<tr>
<td>Develop Rule</td>
<td>August 2021 – May 2022</td>
</tr>
<tr>
<td>Propose Rule CR-102</td>
<td>July 2022</td>
</tr>
<tr>
<td>Evaluate Comments and Respond</td>
<td>Sept. – Nov. 2022</td>
</tr>
<tr>
<td>Adopt Rule CR-103</td>
<td>July 2021 – August 2022</td>
</tr>
</tbody>
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Washington’s Manufacturing Outlook: The Big Picture

Carolyn Busch, Workforce sector lead & sector lead coordinator
Generations by Year of Birth Described

**GENs at Work**

**Silent Generation (1928-1945)**
- Experienced:
  - The Great Depression
  - WW2
  - Social security
- Characteristics:
  - Dependable
  - Straightforward
  - Loyal
- Work attitude:
  - Follow established rules and policies
- Aspirations:
  - The same loyalty from their employer
- Job changing:
  - Unwise
- Career path:
  - Slow and steady
- % of the workforce*: 6%

**Baby Boomers (1945-1964)**
- Experienced:
  - Civil women’s rights
  - Cold war
  - Moon landing
- Characteristics:
  - Risk-taking
  - Ambitious
  - Work-centric
- Work attitude:
  - Have a strong sense of company loyalty
- Aspirations:
  - To be valued and needed
- Job changing:
  - Sets them back
- Career path:
  - Upward mobility
- % of the workforce*: 35%

**Gen X (1965-1980)**
- Experienced:
  - Fall of the Berlin wall
  - Computer revolution
  - September 11
- Characteristics:
  - Flexible
  - Informal
  - Independent
- Work attitude:
  - Prefer freedom to manage their work
- Aspirations:
  - Work-life balance and independence
- Job changing:
  - Necessary
- Career path:
  - Need to know options now
- % of the workforce*: 35%

**Millennials (1981-1996)**
- Experienced:
  - New Millennium
  - Dot-com bubble
  - 2008 recession
- Characteristics:
  - Goal-oriented
  - Achievement-oriented
  - Digital savvy
- Work attitude:
  - Work collaboratively and are socially engaged
- Aspirations:
  - Seek order in the world and meaning in their work
- Job changing:
  - Part of my daily routine
- Career path:
  - Switch frequently and fast
- % of the workforce*: 24%

**Gen Z (1997-2012)**
- Experienced:
  - COVID-19
  - 2008 recession
  - Rise of social networking
- Characteristics:
  - Progressive
  - Entrepreneurial
  - Technology reliant
- Work attitude:
  - “Techno-hippies”, often entirely depend on IT for doing things
- Aspirations:
  - Security and stability
- Job changing:
  - What’s a job? I have gigs
- Career path:
  - Career “multitaskers”
- % of the workforce*: 24%


trginternational.com | blog.trginternational.com
The Big Picture: Changes in the US Population by Generation
Washington State: Changes in Population by Generation

[Bar chart showing population changes by generation from 2011 to 2021.]

Washington Population by Generation 2021 v 2011
source: US Census

- GenZ
- Millenial
- GenX
- Boomer
- Silent+

2011 WA pop vs 2021 WA pop
Washington State: Changes in Total Workforce by Generation

Washington's Workforce by Generation 2011 vs 2021

source: US Census

- GenZ
- Millennial
- GenX
- Boomer/Silent
Washington State: 2021 Workforce by Generation and Gender

2021 Washington Workforce by Generation and Gender
Source: US Census
Washington State: 2021 Manufacturing Workforce by Generation and Gender

Source: US Census

<table>
<thead>
<tr>
<th>Generation</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>GenZ</td>
<td>17,094</td>
<td>2,902</td>
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<tr>
<td>Millenial</td>
<td>62,740</td>
<td>26,341</td>
</tr>
<tr>
<td>GenX</td>
<td>58,108</td>
<td>44,341</td>
</tr>
<tr>
<td>Boomer/Silent+</td>
<td>16,771</td>
<td>44,587</td>
</tr>
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</table>
Manufacturing Jobs in 2021

• About 260,000 manufacturing jobs in 2021
• By 2031 our goal is about a 520,000 manufacturing jobs
• This is a net increase of 260,000 jobs (easy math but hard to accomplish when workforce shortages abound)
• In 2018, the average salary for this sector was $93,000/year
• SHB 1170 creates a Manufacturing Council (equal Labor and Business representation) with the goal of doubling manufacturing in the next decade
What would it take to double manufacturing jobs \textit{and} reach gender equity in manufacturing job over the next ten years?

GROWTH ESTIMATES: Double Manufacturing Proportionally in Washington over Next Decade with Equal Representation of Men and Women within Generations

Source: US Census
Increasing manufacturing jobs provides a much-needed regeneration of the middle class.

### 2019 WASHINGTON Tax Returns by Income Level

**Source:** IRS

1. Up to $25K
2. $25K-$50K
3. $50K-$75K
4. $75K-$100K
5. $100K-$200K
6. $200K+

Middle class
Where will the growth in manufacturing come from?

- Small and medium sized manufacturers
- New, innovative industries, especially around clean manufacturing
- Existing manufacturers wanting to increase production
- Will require a significantly larger workforce via incumbent worker training, existing training and education programs, including apprenticeships, and new ways of getting workers (labor) and employers ready for a new generation, technology, etc.
Thank you!

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