



*National Association of  
State Energy Officials*

# NASEO Webinar: Clean Hydrogen Workforce and Economic Development Opportunities

November 29, 2022

# Welcome and Zoom 101

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# Speakers

- Stephanie Celt, Senior Energy Policy Specialist, Washington State Department of Commerce – Energy Office
- Dr. Thomas Kriger, Director of Education and Research, North America's Building Trades Unions (NABTU)
- Dr. Alan Rossiter, Executive Director, External Relations & Educational Program Development, UH Energy

# Hydrogen workforce considerations

Perspectives from Washington

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Stephanie Celt

WASHINGTON STATE DEPARTMENT OF COMMERCE – ENERGY OFFICE

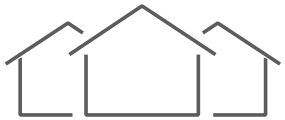
NOV. 29, 2022



Washington State  
Department of  
**Commerce**

# We strengthen communities

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**HOUSING  
HOMELESSNESS**



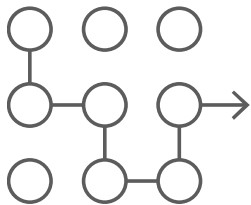
**INFRASTRUCTURE**



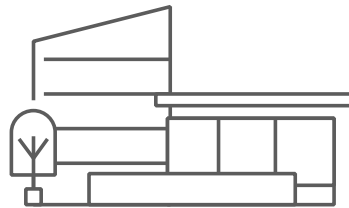
**BUSINESS  
ASSISTANCE**



**ENERGY**



**PLANNING**



**COMMUNITY FACILITIES**



**CRIME VICTIMS &  
PUBLIC SAFETY**



**COMMUNITY  
SERVICES**

# 2021 Washington State Energy Strategy

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Transportation



Buildings



Industry and Workforce



Electricity

[View the strategy online](#)

# Green hydrogen in the State Energy Strategy

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- **Power:** Flexible load for the power system, functions as storage
- **Transportation :** Replace marine, aviation and heavy-duty trucking fuels
- **Industrial processes :** Replace fossil -derived hydrogen, replace fossil fuels for high -temperature processes

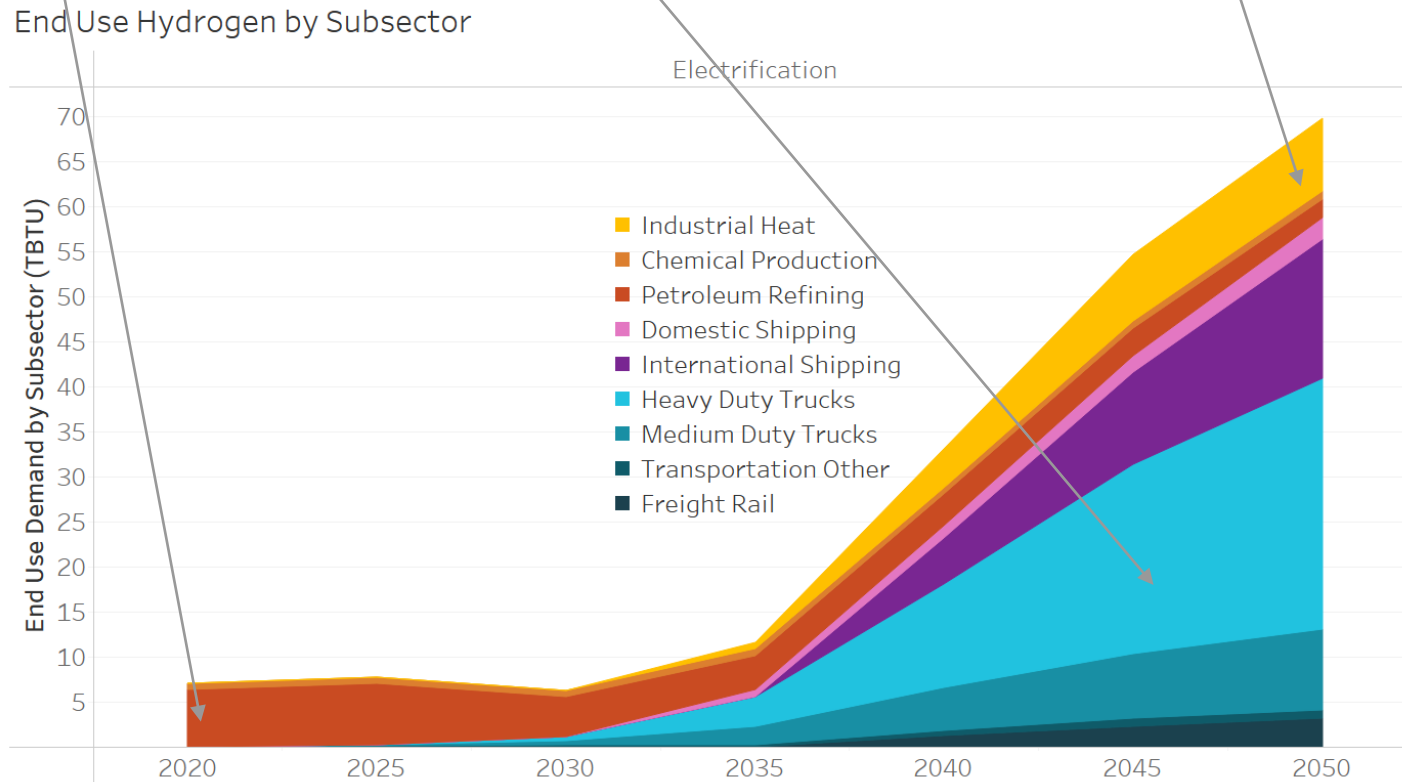
“The deep decarbonization modeling and the State Energy Strategy identify an important role for clean fuels in every sector of the energy economy. **Green hydrogen is of particular significance** , because it could serve both as a flexible use of electricity when generation exceeds demand and as a feedstock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

# Hydrogen end-use demand by subsector

2020 hydrogen demand in petroleum refining and bulk chemicals

H2 consumption grows in transport subsectors in Electrification Scenario

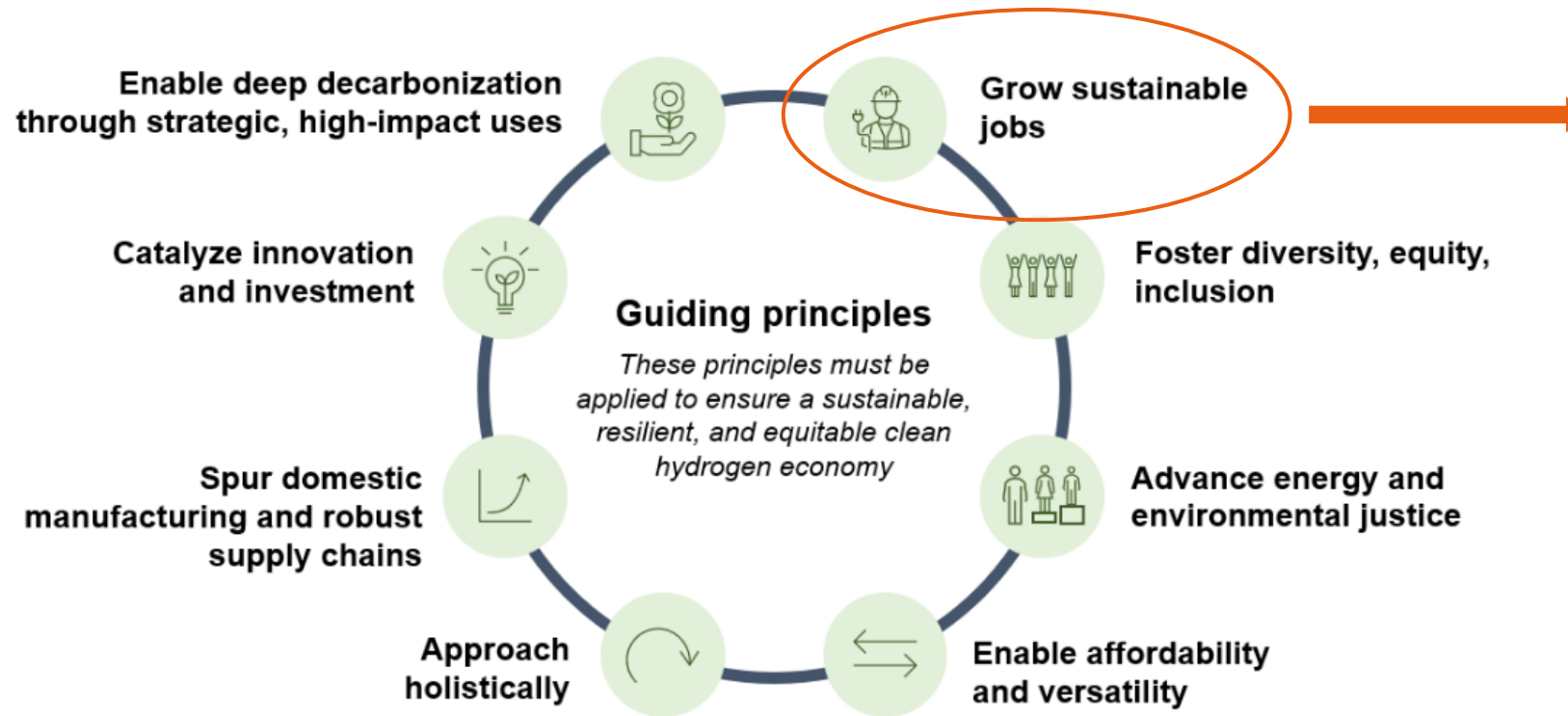
Some H2 assumed in heat, displacing gas in high-temp applications



- Electrification Scenario assumptions just one pathway
- Future H2 consumption may look significantly different
- Applications in transport and industrial heat are nascent and will depend on technology development
- Cost competition between hydrogen and electrification in these sectors will determine future adoption



# DOE Clean Hydrogen Strategy—Principles



**“Grow sustainable jobs:** DOE will focus on preserving and growing sustainable jobs, defined as good-paying union jobs. DOE’s actions will also provide opportunities for workers and communities transitioning away from carbon-intensive sectors, leveraging existing and developing new skills across industries by utilizing and expanding registered apprenticeship programs, developing sectoral strategies for workforce development, and supporting job growth at each step in the hydrogen value chain ...”

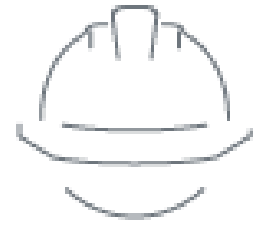
DOE’s eight guiding principles for the development of clean hydrogen production, transport and use

# DOE Hydrogen Hubs and workforce

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Hydrogen Hub proposals will create a Community Benefits Plan that will:

1. Support meaningful community and labor engagement
2. Invest in America's workforce
3. Advance diversity, equity, inclusion and accessibility
4. Contribute to Justice40 Initiative



# Hydrogen workforce questions

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- Who and where are the current hydrogen workers?
- How can new hydrogen jobs utilize existing workforce and skill sets?
- What additional skills or sectors are needed?
- Assess all sectors: production, transportation, storage, end uses
- What steps are needed now to prepare for 2030 sectors?
- What aligned workforce shifts might occur (what will hydrogen replace?)?



# H2 and Clean Energy Workforce Policy

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Washington has a model of connecting clean energy and workforce benefits

- **Clean Energy Transformation Act (CETA)**
  - Labor standards tax incentives for clean energy projects
    - Increase in value when labor standards tools are used
    - These include prevailing wages, community workforce agreement or project labor agreements
  - Equity provisions to benefit disadvantaged communities
- **HB 1988**
  - Clean energy manufacturing incentives, including for hydrogen
  - Extends labor standards tax incentives

Aligned with Healthy Environment for All (HEAL) Act requirements to address environmental justice in state agency operations

# Workers and unions at the table

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- Pacific Northwest Hydrogen Association – labor and workforce participation
  - Association board
  - Advisory committees
- Outreach as projects and regional proposals develop
  - Unions, tribes, community organizations



# Additional local opportunities

- Industry clusters —CHARGE
- Center of Excellence for Clean Energy
  - Global Hydrogen Academia Work Group
  - Exploring Renewable Energy Vehicle and Infrastructure Technician (REVIT) training program
- BlueGreen Alliance
- Tribal workforce development opportunities
- Clean energy jobs statewide assessment

Seeking innovative workforce visions

Interest in connecting new jobs with community transition and revitalization

## Hydrogen Plant Coming to Centralia

Fortescue Future Industries to Build Plant at Industrial Park at TransAlta



Speakers present during a "Hydrogen Symposium" in the TransAlta Commons at Centralia College on Thursday.  
JARED WENZELBURGER / JARED@CHRONLINE.COM

*Screenshot from Centralia Chronicle online*



Washington State  
Department of  
**Commerce**

[www.commerce.wa.gov](http://www.commerce.wa.gov)



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# NORTH AMERICA'S BUILDING TRADES UNIONS



North America's **Building Trades** Unions

*#BuildingTradesWhateverItTakes*

**Building Trades Registered Apprenticeship and  
Apprenticeship Readiness Programs**

**NASEO Clean Hydrogen Workforce Webinar**

**November 29, 2022**

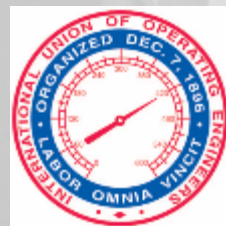
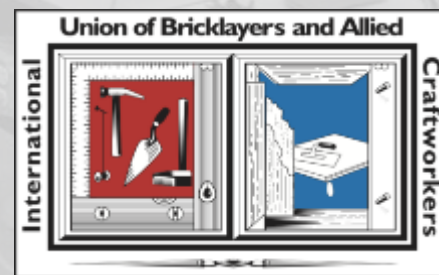


# What are the Construction Trades?

The construction trades build America —our homes, workplaces, hospitals, schools, recreational facilities, bridges, airports and other infrastructure. Construction is a \$1.3 trillion industry, employing nearly 8 million American workers.

We are 15 specialized crafts, each requiring unique skills, training, and expertise:

- Electricians
- Plumbers/Pipefitters
- Carpenters
- Ironworkers
- Sheet Metal Workers
- Bricklayers
- Plasterers/Cement Masons
- Painters
- Roofers
- Boilermakers
- Insulators
- Elevator Constructors
- Operating Engineers
- Laborers
- Teamsters





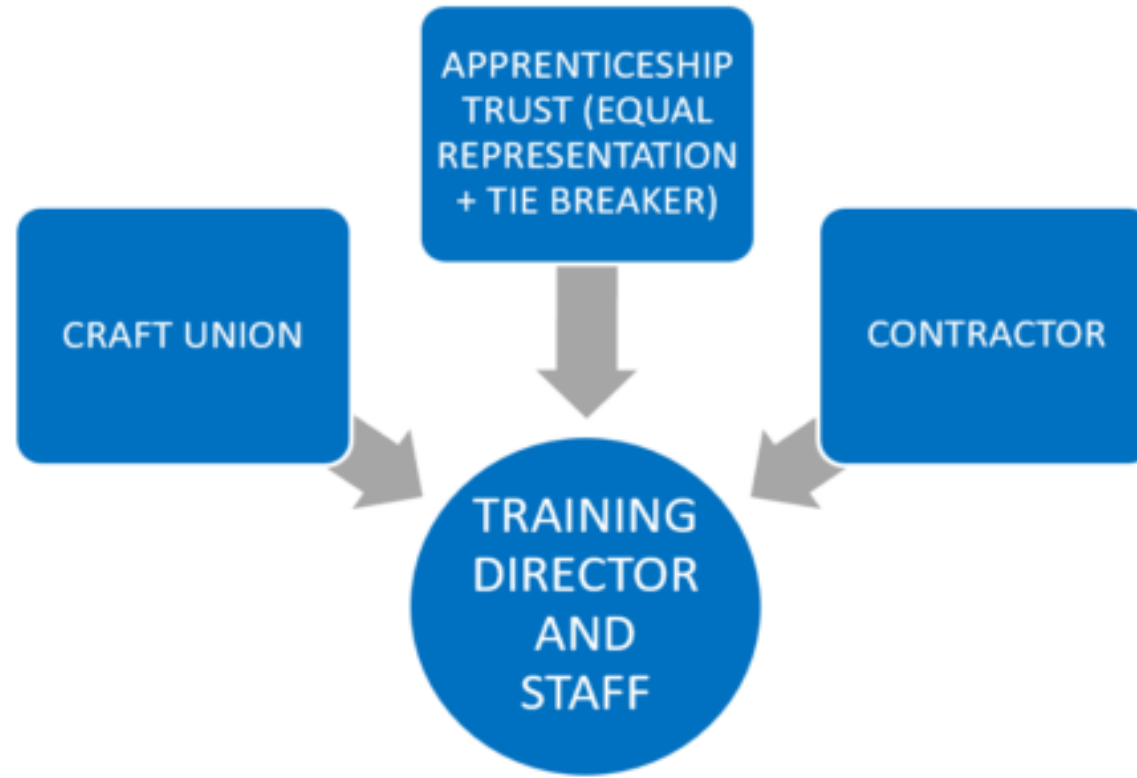
# How do Registered Apprenticeship Programs Work?

- No industry trains more apprentices: 200,000 in any given year, about 2/3 of all Registered Apprentices in the US.
- No industry invests more money in apprenticeship education: nearly \$2 billion annually.
- Building Trades Registered Apprenticeship programs are partnerships between the Building Trades and their signatory contractor partners.
- Apprenticeship training includes learning on the job site AND classroom/laboratory instruction in 1,650 Joint (Labor - Management) Training Centers (JATCs) across the US/Canada.
- Building Trades Registered Apprenticeships meet the highest standards for training, pay, non-discrimination, and health/safety set by US Dept of Labor and/or State Apprenticeship Agencies.



# How do Joint Apprenticeship Committees Work?

## Joint [Labor-Management] Apprenticeship Training Committees (JATCs) Established by CBA



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CBA = Collective Bargaining Agreement





# How Registered Apprenticeship Works

- Each construction Trade operates its own apprenticeship program
- 3 to 5 year programs, depending on the Trade
- Apprentices are taught through a combination of classroom/on-the-job training
- Must meet milestones of classroom proficiency and on-the-job hours
- Upon completion, apprentices reach journey worker status in their Trade
- No cost for the training
- Apprentices work full-time while in the program (with benefits)



# But with those opportunities come requirements and responsibilities

**THE CONSTRUCTION TRADES WELCOME EVERYONE** regardless of race, ethnicity, religion, gender, sexual orientation or justice involvement

## The CONSTRUCTION TRADES have HIGH STANDARDS:

- Apprentices must have a strong sense of responsibility
- Must come to work everyday, on time
- Must be willing to work hard
- Must be open to learning and constructive advice
- Must be mindful of health and safety requirements
- Must be respectful of all co-workers

## OUR REQUIREMENTS For Registered Apprenticeship?

- Be at least 18 years of age
- Possess a high school diploma/GED
- Have a driver's license and/or reliable transportation
- Be able to pass a drug test
- Requirements may vary by Trade





## Ladders to the Middle Class

- NABTU also sponsors comprehensive apprenticeship -readiness training programs (ARPs) throughout the US. These programs provide a gateway for local residents, focusing on women, people of color, transitioning veterans, and the justice involved to gain access to Building Trades' Registered Apprenticeship programs.
- ARPs are administered by state and local Building Trades Councils in partnership with CBOs, government agencies, contractors and CCs/CTE schools. Building Trades ARPs teach NABTU's nationally recognized Multi -Craft Core Curriculum (MC3).

# The Multi -Craft Core Curriculum

## MC3 Required vs. Elective Units/Hours\*

MC3 Required Units/Hours	MC3 Elective Units/Hours
Unit 1 - Construction Industry Awareness- 8 hrs	Unit 4 - Blueprint Reading – 4 or 8 hrs
Unit 1 - Construction Trades Awareness- 8 hrs	Unit 8 – Green Construction – 4 or 8 hrs **
Unit 2 - Tools and Materials - 8 hrs (must include hands on component)	Unit 9 - Financial Literacy – 4 or 8 hrs
Unit 3 - Construction Health and Safety – 20 hrs (CPR/First Aid – 8 hrs/OSHA 10 – 10 hrs/Women's Health and Safety – 2 hrs)	<p><b>*All MC3 programs must have a minimum of 120 instructional hours. Programs may add more hours at their discretion.</b></p> <p>** All California programs receiving SB1 funding <b>MUST</b> include 8 hours of Green Construction</p> <p>School-based MC3 programs in Florida must have a minimum of 150 instructional hours.</p>
Unit 5 - Construction Math - 40 hrs	
Unit 6 - Heritage of the American Worker - 8 hrs	
Unit 7 - Diversity in the Construction Industry - 12 hrs (Diversity Awareness - 4 hrs/Sexual Harassment - 8 hrs)	
<b>Total Required Unit Hours = 104</b>	<b>Total Elective Unit Hours = 16</b>



## How Do Building Trades ARPs Work?

- Apprenticeship Readiness Programs are sponsored by State and Local Building Trades Councils, Training Coordinators, Contractors and JATCs in partnership with local community groups, gov't agencies, workforce development boards and schools – both community colleges and secondary schools
- ARPs prepare men and women for successful entry in Building Trades Registered Apprenticeship programs
- Over the past four years, 10,000 men and women have successfully completed the MC3 from coast to coast – 80% were people of color and 20% were women



## IBEW Clean Hydrogen Training

- Curriculum developed over 10 years ago (early adopters)
- Challenge? Lack of industry demand (projects)
- Part of distributed generation curriculum
- IBEW apprentices broadly trained to install all forms of clean energy – increases workers earning potential
- Typical of Building Trades curriculum development – nuclear was new 60 years ago – now embedded in RA curriculum

## UA Clean Hydrogen Training

- Curriculum developed in recent years
- UA apprentices trained broadly to work on all forms of clean energy – new IAPMO hydrogen standards (March 2022)
- UA members – construction/maintenance on gas -powered turbines for power generation and pipelines that connect them
- Traditional sources of clean energy – wind and solar – typically employ fewer people for a shorter duration – that’s why hydrogen is critical – it allows UA members a just transition – they continue working while we achieve our climate goals



# NASEO Webinar: Clean Hydrogen Workforce and Economic Development Opportunities

Tuesday, November 29, 2022

## The Hydrogen Economy at UH: An Adventure in Micro-Credentials



ALAN ROSSITER  
Executive Director, External Relations &  
Educational Program Development, UH Energy



UH Energy  
UNIVERSITY OF HOUSTON

# THE HYDROGEN ECONOMY at UH

## Two Pieces of Data

- 107,000 OG&C layoffs in March-August 2020 (Deloitte, 2020)
- 188,000 direct or induced jobs in TX by 2050 because of hydrogen (McKinsey, 2022)



# THE HYDROGEN ECONOMY at UH

## Two Pieces of Data

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- 188,000 direct or induced jobs in TX by 2050 because of hydrogen (McKinsey, 2022)

### Conclusions:

1. There is an opportunity for existing energy workforce participants to enter the hydrogen sector.
2. Some skills are transferable. Some new skills are needed.
3. We need to reskill or upskill. But how?

## Micro-Credentials

**Micro-credentials** are certifications for mastery of specific topic areas or skillsets. To earn a micro-credential, learners need to complete a certain number of activities, assessments, or projects related to the topic.

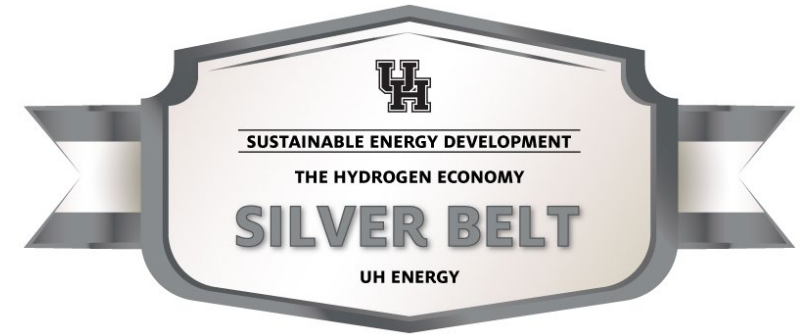
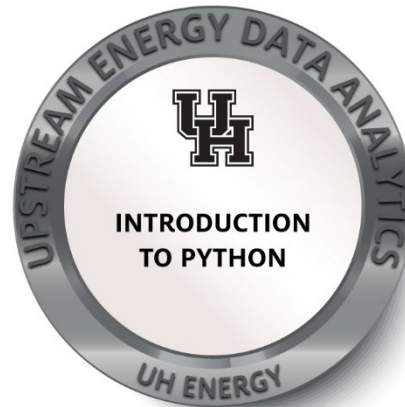
**Digital badges** are a validated indicator of accomplishment or skill that can be earned in various learning environments. Digital badges are now accepted by many employers as “digital transcripts,” which can be linked to digital platforms – e.g., LinkedIn.

## **Micro-Credentials – Use and Acceptance**

- In use >10 years, especially in IT area (IBM, others)
- Short modules for targeted training needs
- Tests to demonstrate mastery of new skills
- Digital badges after successful test results
- Used by many companies, colleges & universities

# THE HYDROGEN ECONOMY at UH

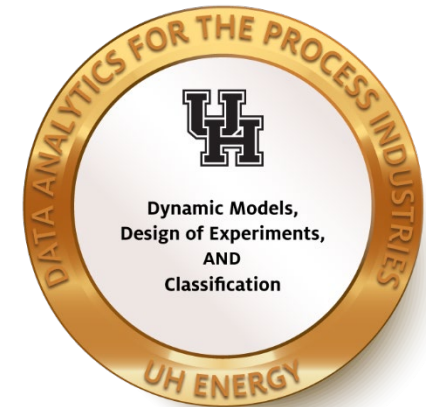
## UH Energy Micro-Credentials Portfolio



Generally:

1 Badge = 15 contact hours + tests

3 Badges → 1 Belt





## **Micro-Credentials – UH Philosophy**

- Stackable badges
- Co-teaching by academic faculty and industry SMEs
- Pedagogy with real-world problems
- Rigorous evaluation
- Interdisciplinary

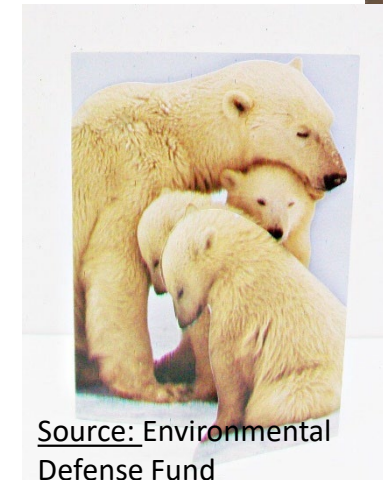
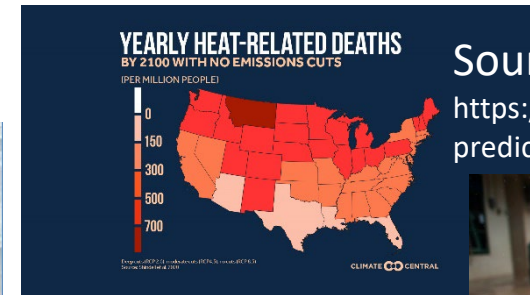
## Micro-Credentials – UH Philosophy

### Delivery Modes

- Virtual
  - Hybrid
  - In-Person
- Stackable badges
  - Co-teaching by academic faculty and industry SMEs
  - Pedagogy with real-world problems
  - Rigorous evaluation
  - Interdisciplinary

# THE HYDROGEN ECONOMY at UH

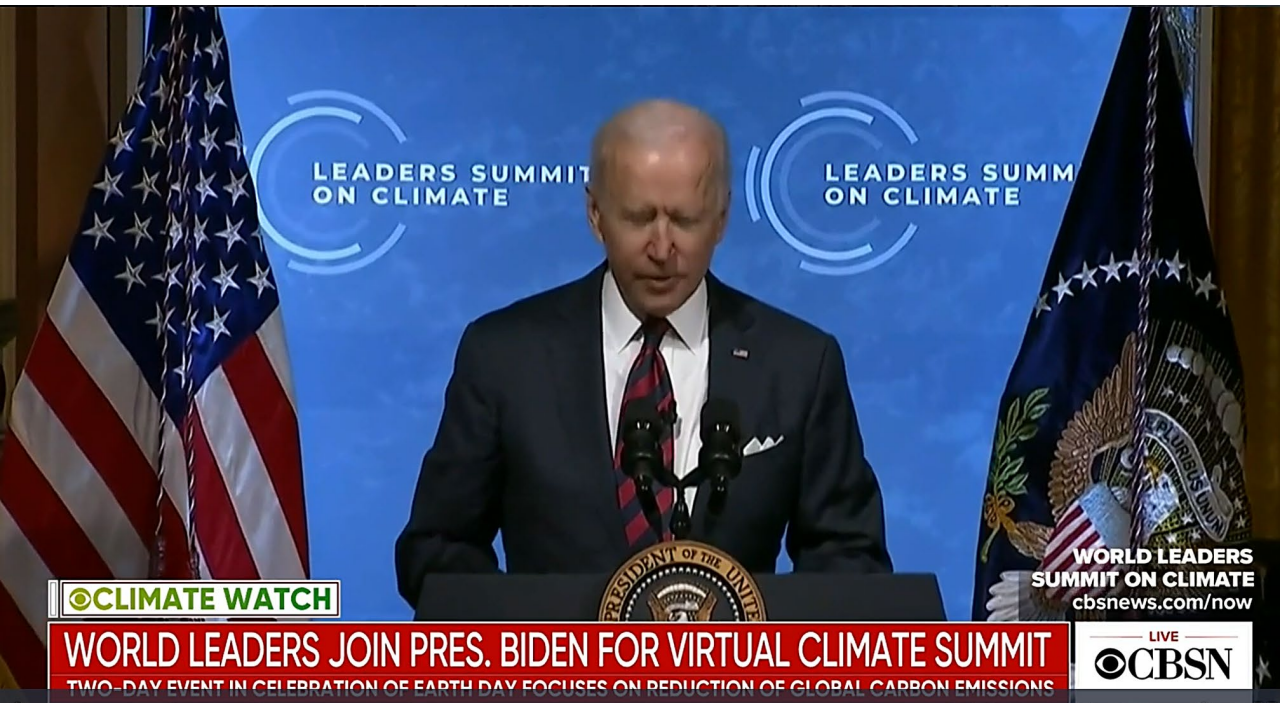
## It's All About Climate Change





# THE HYDROGEN ECONOMY at UH

## It's All About Politics



Tackling climate change is about "growth and jobs" not "expensive bunny hugging", Boris Johnson has said.

# THE HYDROGEN ECONOMY at UH

## It's All About Business

Every company and every industry will be transformed by the transition to a net zero world. The question is, will you lead, or will you be led? - Larry Fink, 2022 letter to CEOs

Larry Fink is CEO of BlackRock, with \$9.46 trillion in assets under management as of September 2021



# THE HYDROGEN ECONOMY at UH

## It's All About Technology



Source: NREL



Source: Climeworks



Photo: California Fuel Cell Partnership

## The Case for Hydrogen is All About

CHEMISTRY

## The Case for Hydrogen is All About

CHEMISTRY

All perspectives have some validity.  
Courses have to be interdisciplinary.



# THE HYDROGEN ECONOMY at UH

## The Hydrogen Economy – By The Numbers

Cohorts Completed	3
Unique Students	89
Badges Awarded	252
Belts Awarded	69
Badge Completion Rate	96%

## Typical Learners:

- Engineers
- Business Planners
- Executives
- Graduate Students

## The road ahead...

Use micro-credentials to train a wider range of clean hydrogen workers

Engage with universities, community colleges, schools, government agencies, etc.

# THE HYDROGEN ECONOMY at UH

## **Alan Rossiter**

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