Mapping Paths to Prosperity

Skills-Driven Workforce Development for Houston's Hydrogen Economy

accenture

GREATER HOUSTON PARTNERSHIP.

UPSKILLHOUSTON
An initiative of the Greater Houston Partnership

CENTER FOR HOUSTON'S FUTURE

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01 Introduction

Houston, Texas, known as the Energy Capital of the World, is embracing a significant development in the energy industry. The city was selected to receive a $1.2 billion grant from the Department of Energy [1] to bolster its hydrogen economy, marking a major milestone towards establishing Houston as a key hydrogen hub.

This development reflects a broader trend in the energy industry toward renewable and low-carbon products, underscoring the growing need for a workforce skilled in new and emerging energy technologies, especially in areas like hydrogen-based energy solutions, and highlighting a skills gap between the current workforce and the skills required for the industry's continued development [2].

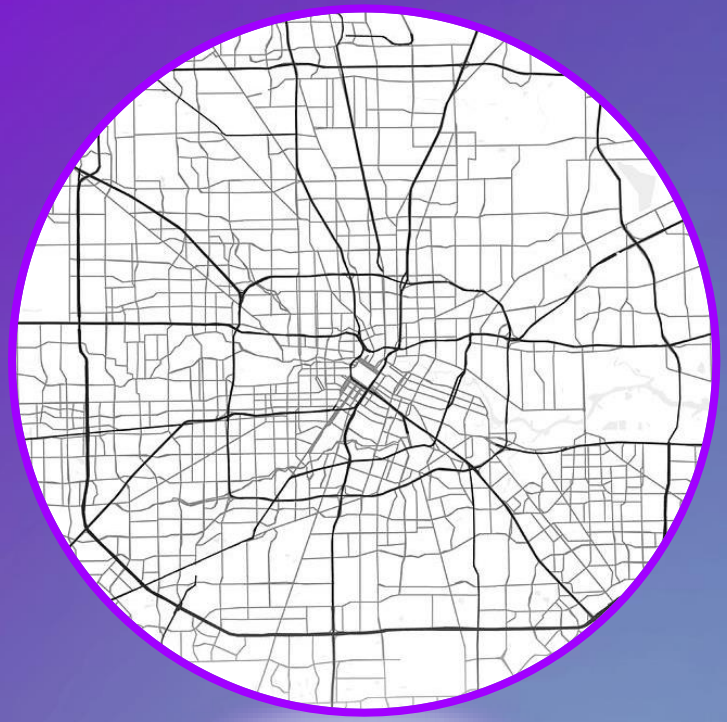
This growing skills gap may threaten the timely implementation of sustainable industrial practices and risks increasing economic inequality for those who don't have access to the training needed to acquire these new skills, potentially further marginalizing some communities.

To address this issue, Accenture, the Greater Houston Partnership, the Center for Houston's Future, and a consortium of companies, educational institutions, and non-profits have launched a workforce development initiative aimed at enabling individuals from disadvantaged communities (DACs) to secure jobs in the emerging hydrogen economy. The program seeks to bridge the skills gap by providing training and skill development tailored to the needs of Houston's communities and fit for the energy industry's future.

This summary outlines the initiative's strategies, providing an adaptable framework and insights for workforce development efforts as well as underscoring the critical role of strategic planning, collaboration, and human capital in driving economic growth and sustainability.

02 Houston in Focus

HOUSTON, TEXAS

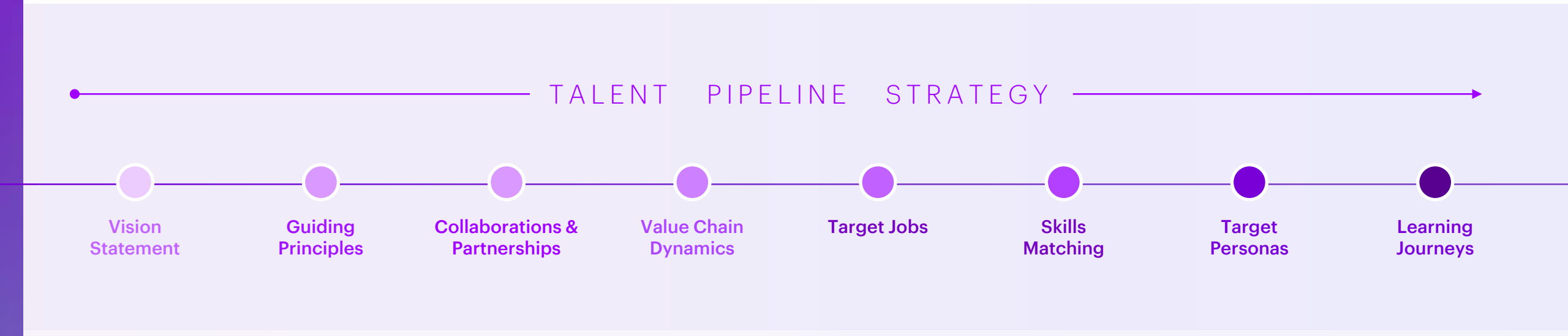


Houston’s position as an industrial hub, combined with its extensive pipeline network and port infrastructure, makes it an ideal candidate for leading the hydrogen economy in the US. **The region anticipates a substantial increase in hydrogen demand by 2050,** which presents a unique opportunity for job creation and economic growth.

The following summarizes the talent development strategy and implementation framework designed to engage Houston's DACs in its emerging hydrogen economy.

Talent Pipeline Strategy

Our strategy targets high-demand, middle-skilled hydrogen jobs and identifies target personas from DACs based on skill transferability and factors that might indicate a readiness or motivation to switch careers. We then align DAC personas to each target job through a skill-matching process and outline tailored learning journeys to provide clear pathways from education to employment.



Vision Strategy

As the hydrogen economy grows, so does the need for skilled workers. Our vision is to connect Houston's DACs to opportunities within this burgeoning sector, building a workforce with skills tailored to employer needs. This commitment is captured in our vision statement:

> “Connect Houston’s disadvantaged communities to demand-driven hydrogen economy opportunities through employer-led skilled workforce development.”

Guiding Principles

Our guiding principles were defined by Houston's specific goals, stakeholder feedback from employers and community colleges, and compliance with the DoE and Justice40 initiative's requirements. These principles include:

Employer-Led

Businesses drive the program, aligning training with real-world job requirements

Inclusive & Diverse

Promotes equal access for all community members

Scalable & Adaptable

Adapts to changing demands and scalable regionally or sectorally

Collaborative

Combines resources from businesses, educators, and community groups

Community-Engaged

Encourages local involvement in economic development

Lifelong Learning

Supports ongoing education and skill development

Skill-Driven

Focuses on enhancing practical, job-ready skills

User-Centered

Tailors programs to individual needs and challenges

Continuously Evolving

Regularly updates to stay relevant to market and technology shifts

Collaborations and Partnerships

The strategy involves collaborating with key stakeholders across the hydrogen economy, including local industry employers, educational institutions with expertise in relevant fields, and non-profits supporting DACs, to ensure our outcomes are practical and market-tested.

Our partners include

Industry

Air Liquide, Bloom Energy, BP, Calpine, Chevron, Dow, HIG, Linde, Shell, SLB

Educational institutions

Brazosport College, Houston Community College, Lee College, Lone Star College, San Jacinto College

Non-profit organizations

United Way, Workforce Solutions

Value Chain Dynamics

We evaluated the various segments of Houston's hydrogen value chain and projected the relative workforce size for each segment over the next decade, estimating the impact of publicly announced capital projects and how the evolution of the hydrogen economy will affect workforce demand and the specific job roles that will be required.

Our research predicts a steady rise in middle-skill jobs within Houston's clean energy hydrogen economy over the next 5-10 years, especially in carbon capture and storage (CCS), alongside consistent growth in manufacturing, application, storage, distribution, and production as demand and technology advances, as illustrated in **Figure 1**.

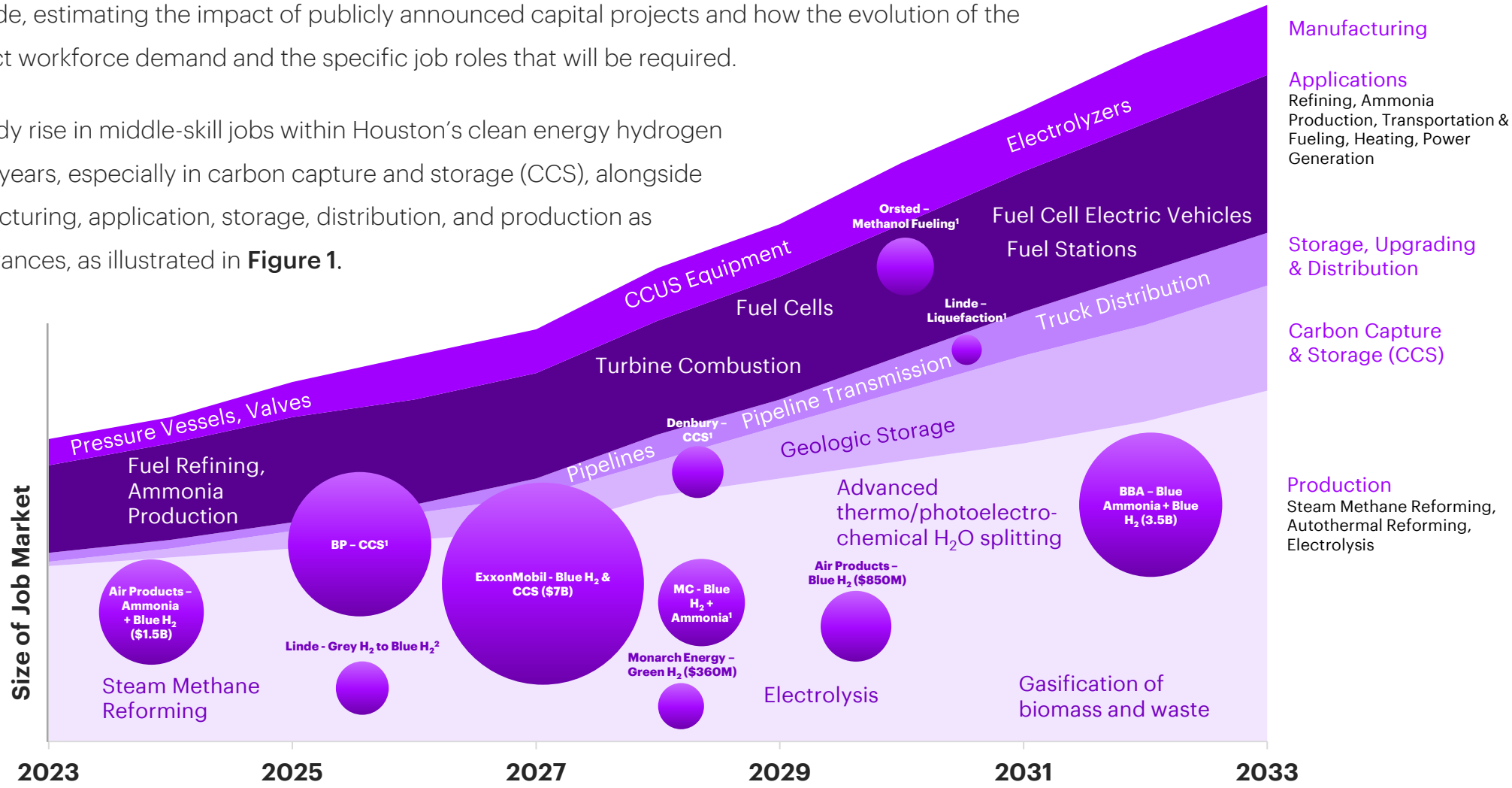


Figure 1: Relative Size of Middle-Skilled Job Market across Houston's H_2 Value Chain

Illustrative

Approximately $1B CAPEX, represented on value chain segment where greatest impact to workforce is expected

1. Estimate based on proposed capacity
2. Insufficient capacity data

Manufacturing

Applications
Refining, Ammonia Production, Transportation & Fueling, Heating, Power Generation

Storage, Upgrading & Distribution

Carbon Capture & Storage (CCS)

Production
Steam Methane Reforming, Autothermal Reforming, Electrolysis

Target Jobs

We used a scoring system to identify the top 10 target jobs for DACs in Houston's hydrogen economy, as shown in **Figure 2**, emphasizing roles with high demand, accessibility, and potential for career advancement, informed by industry experts and AI job data analysis. Additionally, we analyzed qualifications for these roles, focusing on entry-level requirements and hiring pathways to address the skills gap within DAC communities.

Figure 2: Target Jobs

Relative weighting

		Better →									
			Technical					Planning & Scheduling		Analytics & Compliance		
	Prioritization Criteria		H_2 Mechanical Technician	H_2 Plant/Control Room Operator	H_2 Instrument & Electrical Technician	H_2 Welder	H_2 & CCUS Rig Crew Hand	H_2 Scheduler (Pipeline, Trucking, Production)	H_2 Maintenance Planner	H_2 Data Analyst	H_2 Safety Officer/OHS Technician (HSSE)	H_2 Regulatory Analyst and Compliance Specialist
Demand	**Applicability across Houston's H_2 Value Chain**		**High**	**High**	**High**	**Med**	**Low**	**Med**	**High**	**High**	**High**	**High**
Demand	**Projected Growth Rate** 2018-2028		**11%**	**-19%**	**8%**	**13%**	**19%**	**17%**	**13%**	**20%**	**16%**	**14%**
Demand	**Number of Jobs in Houston** 2020		**1,350**	**4,750**	**2,970**	**18,090**	**7,130**	**4,200**	**11,260**	**1,165**	**1,200**	**5,650**
Growth & Security	**Career Growth Potential**		**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**Med**	**Med**
Growth & Security	**Average Salary in Houston**		**$70K**	**$75K**	**$80K**	**$65K**	**$56K**	**$92K**	**$85K**	**$73K**	**$70K**	**$86K**
Growth & Security	**Risk of Automation**		**Low**	**Med**	**Med**	**High**	**High**	**Low**	**Low**	**Low**	**Low**	**Low**
Access	**Time of Attainment** Avg Years for Education + Experience		**1.0**	**0.0**	**1.0**	**.5**	**0.0**	**1.5**	**2.3**	**2.3**	**1.5**	**3.0**

Skills Matching

We created an inventory of key skills for Houston's hydrogen sector jobs and compared them to the estimated skill proficiencies of DAC personas, as shown in **Figure 3**. This comparison highlights accessible job opportunities in the future H_2 economy for DAC members, indicating to employers and community-members alike the alignment of existing skills with industry needs, while emphasizing the areas where further training and upskilling is needed.

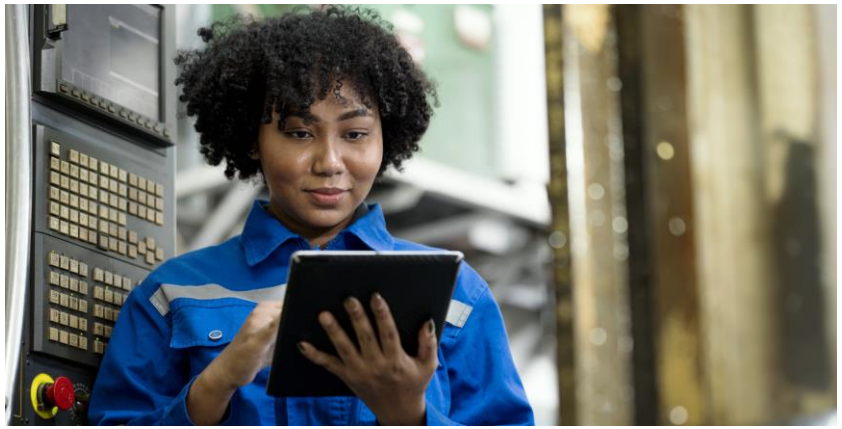


Figure 3: Skills Matching

DAC Persona Occupation	Priority H_2 Job: Hydrogen Data Analyst	Hydrogen Regulatory Analyst and Compliance Specialist	Hydrogen Safety Technician	Hydrogen Instrument & Electrical Technician	Hydrogen Mechanical Technician	Hydrogen Process Palnt Operator	Hydrogen Rig Crew	Hydrogen Welder	Hydrogen Maintenance Planner	Hydrogen Scheduler (Pipeline, Trucking, Production)
Bookkeeping, Accounting, and Auditing Clerks	62%	50%	37%	35%	37%	35%	31%	37%	42%	55%
Cashiers	32%	29%	22%	19%	20%	20%	21%	19%	19%	30%
Construction Laborers	40%	43%	51%	62%	70%	63%	75%	62%	47%	40%
Customer Service Representatives	43%	38%	31%	27%	29%	30%	29%	28%	27%	41%
Fast Food and Counter Workers	41%	39%	35%	33%	36%	35%	40%	34%	33%	42%
Heavy and Tractor-Trailer Truck Drivers	34%	36%	39%	48%	49%	47%	53%	43%	39%	40%
High School/GED/Unemployed	15%	12%	10%	10%	11%	11%	10%	11%	11%	14%
Inspectors, Testers, Sorters, Samplers, and Weighers	29%	37%	37%	37%	38%	36%	32%	45%	32%	30%
Janitors and Cleaners, Except Maids and Housekeeping Cleaners	18%	19%	19%	20%	24%	24%	29%	24%	21%	22%
Laborers and Freight, Stock, and Mateiral Movers, Hand	22%	20%	24%	22%	24%	24%	29%	24%	20%	23%
Landscaping and Groundskeeping Workers	28%	20%	21%	28%	30%	24%	28%	28%	22%	25%
Maintenance and Repair Workers, General	54%	48%	52%	67%	73%	63%	69%	67%	59%	55%
Miscellaneous Assemblers and Fabricators	32%	32%	37%	49%	51%	51%	53%	51%	33%	29%
Office Clerks, General	54%	42%	33%	27%	29%	30%	25%	28%	34%	47%
Receptionists and Information Clerks	38%	36%	30%	24%	25%	28%	26%	25%	27%	40%
Retail Salespersons	35%	30%	26%	24%	25%	25%	26%	24%	24%	34%
Secretaries and Administrative Assistands, Except Legal, Medical, and Executive	63%	50%	41%	36%	38%	40%	38%	36%	42%	56%
Shipping, Receiving, and Invetory Clerks	60%	45%	39%	40%	43%	43%	44%	42%	46%	67%
Stockers and Order Fillers	47%	38%	35%	38%	42%	39%	49%	38%	39%	52%
Waiters and Waitresses	44%	40%	35%	33%	36%	37%	41%	36%	33%	42%

Target Personas

We analyzed Houston's DACs' educational attainment, occupations, geographic population densities, and veteran status to identify effective strategies to engage these communities for targeted hydrogen industry jobs.

Out of the 150 most commonly held jobs in Houston's DACs, we selected the 25 DAC target personas as shown in **Figure 4**. These personas, such as carpenters, electricians, and food service managers, demonstrated high skill transferability, highlighting the potential for these individuals to adapt quickly to hydrogen-related roles.

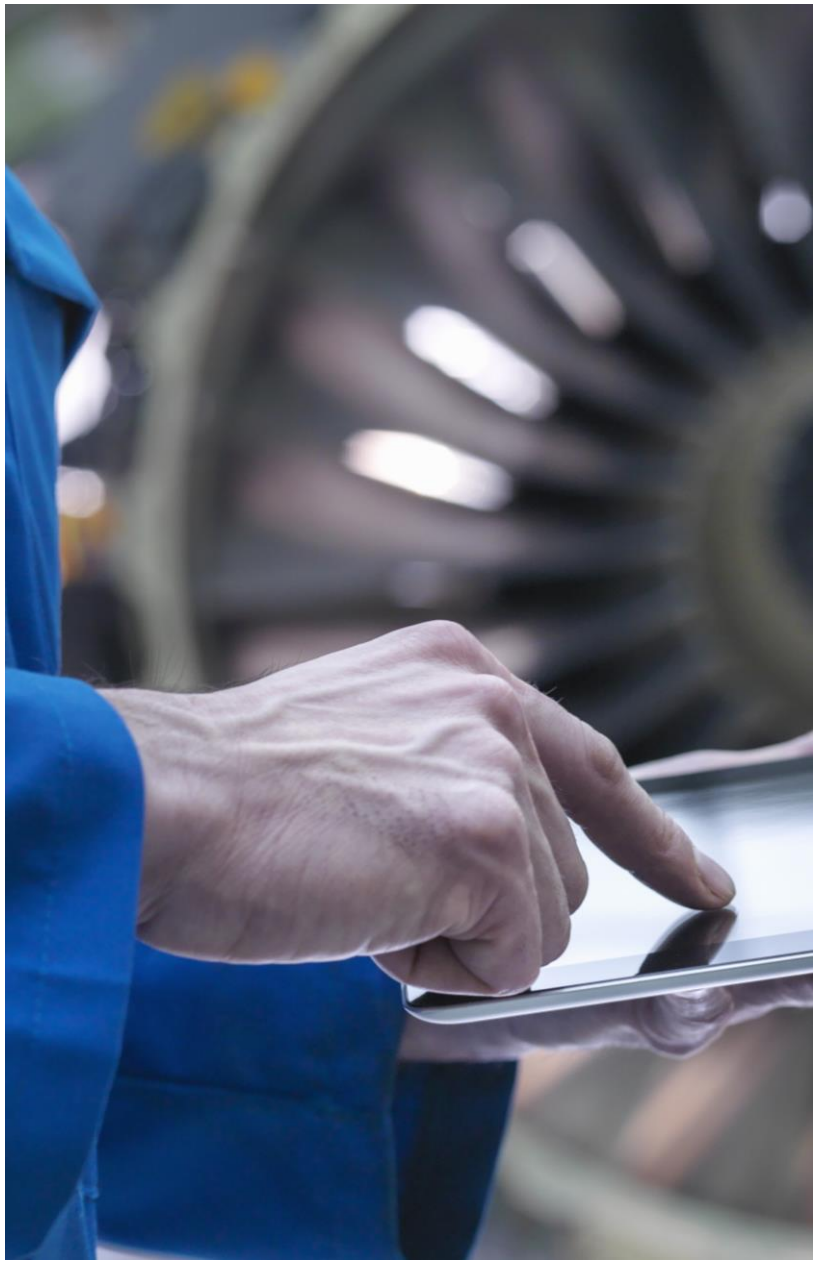
Notably, the average salaries for these personas were lower than the median salary for target hydrogen jobs, suggesting a significant financial uplift for DAC members transitioning into the hydrogen industry.

Figure 4: Selected DAC Personas

Occupation Group	DAC Persona Occupation
Construction and Extraction Occupations	Carpenters
	Construction Laborers
	Electricians
	Operating Engineers and Other Construction Equipment Operators
	Plumbers, Pipefitters, and Steamfitters
	Service Unit Operators, Oil and Gas
Installation, Maintenance, and Repair Occupations	Automotive Service Technicians and Mechanics
	Control and Valve Installers and Repairers, Except Mechanical Door
	Maintenance and Repair Workers, General
Management Occupations	Food Service Managers
Office and Administrative Support Occupations	Bookkeeping, Accounting, and Auditing Clerks
	Dispatchers, Except Police, Fire, and Ambulance
	First-Line Supervisors of Office and Administrative Support Workers
	Office Clerks, General
	Production, Planning, and Expediting Clerks
	Shipping, Receiving, and Inventory Clerks
	Tellers
Production Occupations	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders
	Computer Numerically Controlled Tool Operators
	Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers
	Machinists
	Packaging and Filling Machine Operators and Tenders
	Welders, Cutters, Solderers, and Brazers
Sales and Related Occupations	First-Line Supervisors of Retail Sales Workers
Transportation and Material Moving Occupations	First-Line Supervisors of Transportation and Material Moving Workers, Except Aircraft Cargo Handling Supervisors

Learning Journeys

We designed learning journeys to provide clear, accessible pathways for DAC members to acquire the necessary skills for employment within the hydrogen sector, regardless of their starting point. These journeys outline the key milestones and educational prerequisites required for entry-level positions. Our goal is to offer a direct, feasible route into the hydrogen sector to increase earning potential and career stability for DAC members.



Implementation Framework

Our framework outlines a collaboration model for stakeholders to deliver targeted job training in Houston, improve accessibility of training and jobs, recruit and retain employees from DACs, and monitor program progress.

IMPLEMENTATIONFRAMEWORK

- Stakeholder Engagement
- **Governance Structure**
- **Curriculum Development**
- **Training Delivery**
- **Accessibility**
- **Recruitment**
- **Retention**
- **Evaluation & Reporting**

Implementation Framework

Stakeholder Engagement

Our program emphasizes engaging a wide range of stakeholders, including key employers, relevant colleges near DACs, and non-profits with workforce development expertise. This collaboration helps ensure comprehensive curriculum that addresses skill gaps, supports local talent pipelines, and improves education and employment access for DACs.

Curriculum Development

We defined the fundamental skills and knowledge required for our target jobs, aiming for educational institutions and employers to collaboratively develop detailed curricula tailored to their specific needs, existing programs, and processes. Our analyses revealed the following insights:

- While much of the necessary content for our target jobs already exists in curricula for related positions, hydrogen-specifics are not readily available.
- The timing and deployment of new curricula for hydrogen roles should be strategically planned based on industry demand and the evolving value chain, with development times ranging from 6 months to 2 years, depending on factors such as resource availability and industry alignment on content.

Governance Structure

The governance model for Houston centers on an employer-led program with participation from key stakeholders, organized by the Greater Houston Partnership. This model ensures training aligns with real-world job requirements and industry demands, enhancing program relevance and participant success.

The model fosters adaptable talent pipelines through employer insights on skill needs, on-the-job training, and targeted use of governmental incentives to align training with industry demands. It also emphasizes the role of educational institutions and non-profits in curriculum development and accessibility, ensuring training programs are industry-relevant and actively promoted among DACs to increases career pathway awareness.

Training Delivery

Our training strategy focuses on making education accessible to DACs through "earn as you learn" apprenticeships and stackable credentials for quicker career transitions, combining classroom learning with practical experiences to meet diverse learning needs. Research supports the effectiveness of real-world learning in keeping students engaged and improving their future work performance, highlighting the success of apprenticeships and trade programs in meeting the evolving preferences and accessibility needs of the workforce.

Implementation Framework

Accessibility

Our program focuses on collaborative methods to overcome workforce barriers faced by DACs, including financial limitations, language obstacles, and childcare needs. Key strategies include:

Employer Initiatives
Houston employers offer DACs apprenticeships, flexible working options, mentorship, and skill development partnerships with educational institutions.

Educational Support
Community colleges assist DACs through concise, focused programs and partnerships with employers, facilitating practical experience and swift entry into the workforce.

Non-profit Contributions
Local nonprofits support DAC inclusion by providing services, advocating for their needs, and offering valuable insights for workforce integration.

Recruitment

Our recruitment strategy is based on tailored outreach and inclusive hiring, leveraging various channels and community partnerships to attract diverse candidates and promote equitable job opportunities. We prioritize areas with high concentrations of DAC populations for outreach, utilizing partnerships to connect with specific groups including, high school students, the unemployed, veterans, and ALICE (Asset Limited, Income Constrained, Employed) individuals to enhance engagement and hiring success.

Our strategy also includes evaluating and developing accessible hiring channels to identify and address any accessibility limitations.

Retention

Retention efforts focus on addressing systemic barriers and promoting workplace equality, ensuring long-term career growth for participants. Key strategies include continuous feedback, mentorship, visible career paths, and fostering an inclusive workplace culture.

03 Looking Ahead: Expanding Our Vision

We're eager to continue applying our approach to Houston's hydrogen economy and expanding to other areas and initiatives. As industries adapt to the energy transition, integrating DACs into the renewable sector is key to building a capable, equitable workforce that supports sustainable growth and opens economic opportunities for all.

We call on all stakeholders, partners, and communities to collaborate in making Houston's hydrogen economy a blueprint for inclusive workforce development that can be adapted and scaled elsewhere.

References:

1. DOE Selects Gulf Coast as Regional Clean Hydrogen Hub," Greater Houston Partnership, 2023
2. Houston Energy Companies Need More Advanced Tech Workers. Their Own Culture Could Get In The Way," Houston Public Media, 2021.

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About Accenture

Accenture is a leading global professional services company that helps the world's leading businesses, governments and other organizations build their digital core, optimize their operations, accelerate revenue growth and enhance citizen services—creating tangible value at speed and scale. We are a talent- and innovation-led company with 742,000 people serving clients in more than 120 countries. Technology is at the core of change today, and we are one of the world's leaders in helping drive that change, with strong ecosystem relationships. We combine our strength in technology and leadership in cloud, data and AI with unmatched industry experience, functional expertise and global delivery capability. We are uniquely able to deliver tangible outcomes because of our broad range of services, solutions and assets across Strategy & Consulting, Technology, Operations, Industry X and Song. These capabilities, together with our culture of shared success and commitment to creating 360° value, enable us to help our clients reinvent and build trusted, lasting relationships. We measure our success by the 360° value we create for our clients, each other, our shareholders, partners and communities.

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About the Greater Houston Partnership and Upskill Houston

The Partnership strives to make Houston one of the best places to live, work and build a business. The Partnership is a gathering place for community-minded business leaders who want to be involved in Houston's positive growth and influence our economic trajectory. Through the dedicated efforts of our members, the Partnership addresses Houston's unique challenges, and champions the growth and success of our region. The Greater Houston Partnership strives to make the region the best place to live, work and build a business. We serve 900 member companies in the 12-county Houston region. With roots dating back to 1840, the Partnership as it exists today was formed in 1989 in a merger of the Greater Houston Chamber of Commerce, the Houston Economic Development Council and the Houston World Trade Association. Join us as we work together to make Houston greater.

The Partnership's UpSkill Houston initiative works to help employers find the right talent when and where they are needed and to help individuals gain the right skills and credentials to access the good jobs employers offer.

About the Center for Houston's Future

Center for Houston's Future is a nonprofit that works to understand future global trends and their impact on the Houston region. We focus on issues that are critical to the long-term success of Greater Houston. In short, we aim to ensure Houston remains a great place to live and work for all its residents.

We bring business, government, community and academic stakeholders to engage in planning, research, consensus building and action. Our framework includes three key pillars: strategic initiatives, community outreach/thought leadership and our Business/Civic Leadership Forum. We conduct economic research and strategic planning, hold community events and develop leaders.

Our strategic initiatives currently include energy, climate and the energy transition; health and health equity; and the economic importance of immigration. Much of our strategic work starts with an economic lens and efforts may include road map and project creation.