



# Mapping Paths to Prosperity

Skills-Driven  
Workforce  
Development for  
Houston's Hydrogen  
Sector



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# Executive Summary

## Introduction

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Houston is positioning itself at the forefront of the clean hydrogen economy, actively driving initiatives to cultivate a workforce with the skills necessary to support and advance the hydrogen ecosystem.

Accenture, in collaboration with the Greater Houston Partnership and its UpSkill Houston initiative, local hydrogen-industry employers, and educational institutions, has crafted a thorough workforce development strategy to meet the needs of the emerging hydrogen economy. The program prioritizes empowering disadvantaged communities (DACs) through an employer-driven, user-centered approach emphasizing skill transferability. This approach is adaptable to other initiatives and geographies, as the accompanying report details.

## Building Tomorrow’s Workforce

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Investing in skills-based workforce and talent development is paramount for industries to keep up with advancing technologies, stay competitive and foster innovation. With a highly trained and adaptable workforce, companies can achieve increased productivity and efficiency, driving growth and success in today’s ever-evolving business landscape.

## Houston in Focus

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This section details the talent development strategy and implementation framework to engage Houston’s DACs in its emerging hydrogen economy. The framework is flexible and can be adapted to various contexts for other initiatives.

**Houston Overview:** Houston’s position as an industrial hub, combined with its extensive pipeline network and port infrastructure, make 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.

**Talent Development Strategy:** The strategy targets high-demand, middle-skilled hydrogen jobs for DACs and identifies personas from DACs based on skill transferability and factors that might indicate a readiness or motivation to switch careers. It then aligns DAC personas to each target job through a skills-matching process and outlines tailored learning journeys to provide clear pathways from education to employment.



**Implementation Framework:** The framework outlines a collaboration model for community organizations to deliver targeted job training in Houston, improve accessibility, recruit and retain employees from DACs, and monitor program progress.



## Looking Ahead: Expanding Our Vision

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The Houston initiative is a model for inclusive workforce development in the energy sector. The program paves the way for the city’s transition to a clean hydrogen economy and serves as a blueprint for other regions and industries aiming to foster a skilled, diverse workforce. Future plans include expanding the program’s reach to other regions and applying the framework to other workforce initiatives.

# 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 towards renewable and low-carbon products, underscoring the growing need for a workforce skilled in new and emerging technologies, especially in areas like hydrogen-based energy solutions.

Workforce development plays a crucial role in addressing the challenges associated with shifting towards more sustainable and low-carbon energy sources and in supporting Houston's economic growth. As the city's industrial landscape evolves, so do the skill requirements for future workers. This change underscores the importance of implementing comprehensive workforce development programs that are in tune with the current and anticipated needs of the economy.

The transition to a new energy paradigm highlights a skills gap between the current workforce and the skills required for the energy sector's continued development [2]. This gap is widened by the rapid pace of technological advancement and the ever-evolving demands of the industry, which may threaten the timely implementation of sustainable industrial practices and risks increasing economic inequality for those who do not have access to the training needed to acquire these new skills, potentially further marginalizing some communities [3].

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

This white paper delves into the strategies and methodologies driving our workforce development initiative. It aims to provide an adaptable framework for workforce training and skills development that can be tailored and applied to other regions or organizations facing similar challenges. The goal is to ensure that employees are not only equipped to meet current industry demands but are also prepared for the challenges and opportunities of the future. This approach is not just about filling jobs; it is about building sustainable careers, enhancing individual livelihoods and contributing to the broader economic and social development of communities.

In summary, this paper highlights the importance of strategic planning, collaboration, and investment in human capital as a key driver of economic growth and sustainability.

# Building Tomorrow's Workforce

## The Importance of Workforce Development

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Workforce development is crucial in adapting to the rapid technological advancements, globalization and demographic shifts that impact the job market and demand for new skills. It prepares individuals for emerging job opportunities, ensuring organizations and economies remain resilient, competitive and innovative. Prioritizing workforce development leads to enhanced business continuity, economic growth and community well-being. It fosters a culture of continuous learning, enabling organizations to stay ahead of change. Moreover, a skilled workforce drives productivity, innovation and economic advancement, while also improving individual living standards and uplifting communities.

### Future-readiness and Resilience

Organizations that prioritize workforce development are not just investing in skills; they are investing in resilience. In an era of rapid technological advancements and changing market demands, workforce development ensures that employees possess the skills to adapt to new technologies and methodologies. This readiness secures jobs and ensures that the workforce can pivot in response to disruptions, thereby maintaining resilience in the face of economic fluctuations, technological changes and global challenges. Training and continuous learning opportunities prepare workers for future roles, making the economy more agile and less susceptible to shocks [4].

### Economic Implications

Investing in workforce development is about more than closing the skills gap and reducing unemployment. It is about increasing labor market participation, a key driver of economic growth. These factors are all interconnected, and by investing in workforce development, we can create a cycle of growth ultimately leading to higher GDP growth rates. Moreover, a well-trained workforce attracts investment, as companies seek regions with a capable and adaptable labor pool, further stimulating economic development and innovation. For businesses, this translates to enhanced competitiveness in the global market [4].

### Organizational Productivity and Innovation

At the heart of every successful organization is its people. By fostering a culture of continuous improvement and learning, organizations can enhance productivity, efficiency and quality of work. Employees with access to training and development opportunities are more likely to introduce innovative solutions, streamline processes and adapt to new market demands quickly. This gives organizations a competitive edge while also enhancing job satisfaction and promoting employee retention, which helps in reducing turnover costs [4].

### Community Enrichment

Beyond the economic and organizational benefits, workforce development plays a significant role in community enrichment. By providing individuals with the skills needed for well-paying, stable jobs, workforce development initiatives reduce poverty and increase social mobility. Educated and employed individuals are more likely to contribute positively to their communities, support local economies and participate in civic activities. By fostering community enrichment, we can build a powerful cycle of progress that leads to a more engaged, productive and prosperous society [4] [5].

## Skills-Based Approach

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A skills-based approach emphasizes abilities over traditional qualifications, fostering agility and inclusivity in talent management. It addresses critical areas such as recruitment, diversity and the alignment between education and employment, setting the stage for long-term growth and competitiveness.

### Agility and Adaptability

In today's fast-paced and ever-changing economic landscape, organizations require a workforce that can quickly adapt to new technologies, processes and market demands. Focusing on skills rather than traditional credentials fosters an environment of lifelong learning, ensuring employees remain agile and can pivot in response to industry trends or disruptions. This agility is crucial for maintaining relevance and competitiveness [6].

### Improved Recruitment and Retention

By prioritizing skills and competencies in hiring and development programs, companies can grow their talent pools, attracting a broader array of candidates. This approach also aids in retention, as it values employees for their abilities and provides clear pathways for growth based on skill acquisition. This alignment between an organization's needs and an employee's skill development fosters a more engaged and loyal workforce [7].

### Diversity and Inclusion

A skills-based approach naturally leads to more diverse and inclusive workplaces. By focusing on what individuals can do rather than solely on their educational background or previous job titles, employers are more

likely to attract a varied set of candidates, including those from underrepresented communities [8].

### Bridging the Gap between Education and Employment

Traditional education-to-employment pathways often leave gaps in skills that are critical for job performance. A skills-based approach encourages closer collaboration between educational institutions and employers to ensure curricula align with real-world needs. This direct link helps students and job seekers acquire the specific competencies required in the workforce, making the transition from education to employment smoother and more efficient [9].

### Long-term Growth and Competitiveness

For organizations and economies alike, a skills-based workforce is a cornerstone of long-term growth and global competitiveness. By continuously developing the skills of their workforce, organizations can innovate, improve productivity and adapt. This drives economic growth and ensures that workers can participate in more fulfilling, high-quality jobs, contributing to a more robust and equitable economy [10].

# Houston in Focus

## Driving the Transition

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### Houston's Position in H<sub>2</sub>

Houston, Texas, is a recognized epicenter in energy and heavy industry, and it is now looking towards a future in hydrogen. The Gulf Coast surrounding Houston boasts a well-established pipeline network and port infrastructure, providing a solid foundation for efficient hydrogen transportation and storage. By 2050, Texas' demand for clean hydrogen alone is expected to surge to 21 MT – a substantial increase from the current 3.6 MT demand for traditionally produced hydrogen. Of this anticipated demand, 11 MT will cater to local consumption, and an additional 10 MT is intended for export [11]. The hydrogen ecosystem is projected to spark the creation of 180,000 direct, indirect and induced jobs [11].

### Accelerating the Clean Hydrogen Transition Across the US Gulf Coast

The potential of clean hydrogen is evident, with estimates suggesting it could add \$100 billion to Texas' GDP by 2050 [11]. The Gulf Coast, which is already responsible for one-third of the US' hydrogen production [12] and possesses most of the country's 1,600-mile hydrogen pipeline network [13], is well-placed to be a leader in this transition. Further bolstering its position, the region was recently selected to receive a \$1.2 billion grant from the US Department of Energy to enhance hydrogen infrastructure [14].

### Workforce Development and Community Inclusion

The region's hydrogen vision centers around inclusivity, with Houston dedicated to ensuring that all parts of the community

benefit from the hydrogen economy. Following the guidelines of the federal Justice40 program, which stipulates that 40 percent of the benefits from climate and clean energy investments are directed to DACs, Accenture and the Greater Houston Partnership have been collaborating with hydrogen employers, local colleges and non-profits to establish an employer-led workforce development program to expand access to training and job opportunities in the emerging hydrogen sector. This initiative has set the strategy for structured learning pathways, stackable credentials and earn-as-you-learn programs, supplemented by support services from existing non-profit organizations.

“The Gulf Coast region, with Houston as its epicenter, is primed to leverage the world's largest concentration of existing hydrogen assets to deliver economic growth and good paying local jobs while reducing significant amounts of emissions from industrial and other sectors,” said Brett Perlman, CEO of Center for Houston's Future, which worked with Accenture and the Partnership's UpSkill Houston initiative to create a blueprint for ensuring residents from historically disadvantaged communities have the opportunity to move into jobs in the hydrogen space. “We appreciate Accenture's innovative way of approaching this work. Going forward, public-private partnerships among communities, business and academic institutions are integral to success.”

While those efforts are underway to ensure an inclusive hydrogen economy through workforce development, there is a broader collaboration to solidify Houston's position as a leading hub in the sector – the HyVelocity Hub.

# Talent Pipeline Strategy

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## Vision Statement

Recognizing the growing significance of the hydrogen economy and the need for skilled labor in this sector, our vision is to connect Houston’s disadvantaged communities with opportunities in the growing hydrogen economy by fostering a skilled workforce led and shaped by employer demands and needs.

*“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 and constraints.

### Employer-Led

An employer-led approach centers on businesses driving the workforce program’s direction, ensuring that training aligns with real-world job requirements. It leverages employers’ insights and expertise into skill demands and workplace trends to effectively tailor education and training for DAC members.

### Collaborative Approach

A collaborative approach brings together stakeholders, including businesses, educational institutions and community organizations, to pool resources and expertise. This collaboration enhances a comprehensive workforce program that tackles the various barriers disadvantaged communities face.

### Skills as Assets

Viewing skills as assets emphasizes the value of practical, job-ready competencies that anyone can bring to the workplace. It focuses on recognizing and enhancing these skills through the program to improve employability and self-sufficiency.

### Diversity and Inclusivity

Diversity and inclusivity ensure that the workforce program reaches and benefits all segments of disadvantaged communities,

regardless of background, gender or ability. This principle advocates for equal opportunity and representation in training and employment outcomes.

### Community-Driven Economic Engagement

Engaging local residents directly in the region’s economic drivers ensures their active involvement in shaping and benefiting from local economic development.

### User-Centered Approach

A user-centered approach prioritizes the individual experiences and needs of those in disadvantaged communities, ensuring the program is tailored to their specific circumstances. This method focuses on understanding the unique challenges, aspirations and lifestyles of these individuals, creating a workforce program that is not only accessible but also resonates with their personal and professional goals.

### Scalability and Flexibility

Scalability and flexibility refer to the workforce program’s ability to adjust its size and methods to meet changing demands and to expand its impact across different regions or sectors. It allows the program to

adapt to industry trends and the evolving needs of disadvantaged communities.

### **Lifelong Learning**

Lifelong learning promotes the idea that education and skill acquisition are ongoing processes, essential for adapting to the changing job market. It encourages continuous personal and professional development, ensuring long-term employability for those from disadvantaged communities.

### **Continuous Evolution**

Continuous evolution calls for regular reassessment and updates to the workforce program, integrating feedback and new information to remain relevant and effective. This principle is about being responsive to technological advances, labor market shifts and the dynamic needs of disadvantaged communities.

## Collaborations and Partnerships

Our approach focused on engaging local industry employers with a stake in the hydrogen economy, educational institutions with experience in related fields and non-profit organizations serving DACs.

### Collective Impact and Strategy Formation

Houston's consortium of stakeholders, including employers, educational institutions and non-profits, guided the development of the workforce strategy. Their collective input is invaluable in forming a comprehensive, industry-aligned and community-focused program united by a common goal for the greater benefit of Houston.

### Engaging Houston-Area Industry Employers

Our collaboration with key hydrogen value-chain employers offered insights into the hydrogen industry's future in Houston and the specific skills needed for workforce development. Through group discussions and 1:1 interviews, employers outlined critical aspects of the value chain and job standards, ensuring the program aligns with industry demands.

An external steering committee of industry experts was formed to provide insights on the hydrogen sector's value chain, key jobs and required skills. This group also reviewed and validated the program's findings, ensuring alignment with industry needs.

The steering committee consisted of hydrogen subject matter experts and human resources professionals from major players such as *Air Liquide*, *Bloom Energy*, *bp*, *HIF*, *Linde*, *Calpine*, *Chevron*, *Dow*, *Shell* and *SLB*.

### Partnering with Educational Institutions

Local community colleges have extensive experience in industry-specific curriculum development and strong connections to Houston's communities. Their in-depth understanding of best practices for

engaging with DACs ensures that outreach efforts are well-informed and impactful.

We engaged with colleges that function as feeder institutions for many of Houston's industrial employers to understand their outreach initiatives for DACs, collaborations with employers in curriculum development, and materials about emerging hydrogen jobs.

*Consulted Institutions:* Brazosport College, Houston Community College, Lee College, Lone Star College, San Jacinto College

### Involving Non-Profit Organizations

Non-profits like United Way and Workforce Solutions (the public workforce system) are essential in understanding and addressing community needs. Their experience in community engagement and knowledge of Houston's DACs informs strategies for community upliftment. These partnerships ensure that the program not only trains individuals but also supports them holistically, considering their broader needs and challenges.

We collaborated with United Way and Workforce Solutions to understand the unique challenges that Houston's DACs encounter, which may prevent them from engaging in training programs or obtaining and maintaining employment, and to learn about the initiatives of their partner organizations that are tackling these challenges.

*Consulted Non-Profits:* United Way of Greater Houston, Gulf Coast Workforce Solutions

### Other Strategic Partnerships

Collaborating with labor representatives, government agencies and industry

associations ensures a comprehensive approach to workforce development. Involving labor union representatives aligns the program with workforce needs, emphasizing worker rights and compliance with labor regulations. Partnerships with government agencies enhance alignment

with economic goals, providing funding and policy support to increase the program's scalability and credibility. Engaging networks from industry associations and chambers of commerce extends industry support, broadening the program's reach and securing sector-wide endorsement.

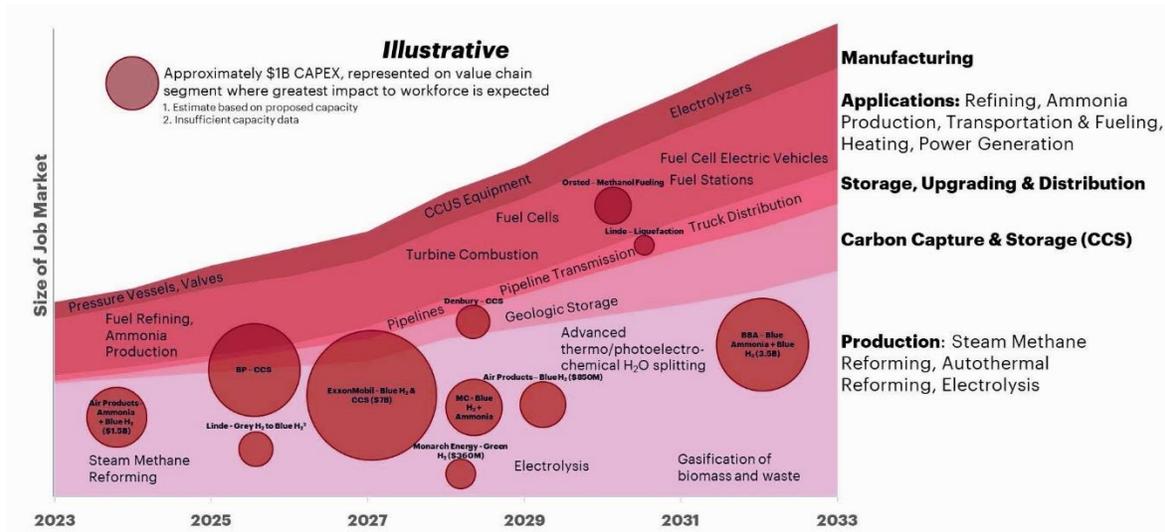
## Value Chain Dynamics

We evaluated the various segments of Houston’s hydrogen value chain and projected the workforce size for each segment over the next ten years, 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.

## Comprehensive Value Chain Analysis

We assessed Houston’s hydrogen economy over a ten-year period, examining its potential growth and the types of jobs that will be required to support that growth, as shown in *Figure 1*. Our analysis included the current state of the industry and the projected impact of approximately \$20 billion in capital investments over the coming decade on the job market, specifically on middle-skilled positions critical for the industry’s expansion. The occupational requirements for the engineering, procurement and construction (EPC) industry and electricity production for electrolysis are not included in this report, although advancing low-carbon hydrogen will also have a positive and sustaining impact on those related workforces. As with any such projections, employment and revenue figures are subject to significant uncertainties.

**Figure 1: Relative Size of Middle-Skilled Job Market Across Houston’s H<sub>2</sub> Value Chain [15] [16]**



## Assumptions

	Present	Mid-term	Long-term
H <sub>2</sub> Landscape	Majority of H <sub>2</sub> produced through steam methane reforming for internal refinery needs and ammonia production, supported by conventional industrial equipment.	CCUS projects boost blue H <sub>2</sub> and ammonia production, with emerging green H <sub>2</sub> projects and applications.	Sustained production of H <sub>2</sub> from hydrocarbons, supporting conventional applications. Green production expands alongside new industrial, energy storage and transportation applications.
Workforce Dynamics	Limited applications and stable operations require few directly employed in H <sub>2</sub> production-associated manufacturing or distribution. Carbon capture (CCUS) impact is minimal.	Escalating use of CCUS in generating blue H <sub>2</sub> and ammonia prompts a gradual workforce increase across the value chain. CCUS and distribution are significantly impacted, while manufacturing sees an uptick due to H <sub>2</sub> -specific equipment production. Workforce needs for new H <sub>2</sub> applications begin to emerge.	Houston remains a production and distribution hub with significant workforce gains. Alongside that growth, some workforce reshuffling occurs as newer technologies gain ground.

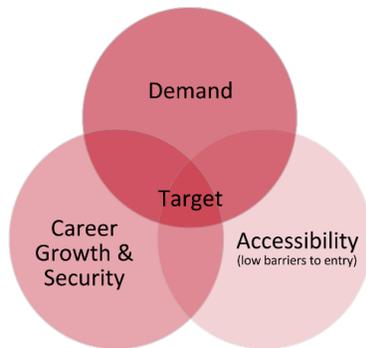
## Target Jobs

We identified the most relevant jobs for DACs considering their projected demand, accessibility, career growth and stability. Our research on these jobs was validated through discussions with industry experts and by employing AI-driven data scraping of job postings and public professional social media profiles.

### Establishing Evaluation Criteria for Priority Jobs

To narrow down the list of hydrogen jobs to those we would focus on, we created a framework to evaluate demand, growth potential and accessibility, as shown in *Figure 2*. This approach enabled us to prioritize roles based on current market needs and future trends and is centered around three categories of criteria, including:

### Figure 2: H<sub>2</sub> Jobs Selection Categories



#### Demand:

- Indicates current and future job market needs.
- Ensures more job openings and better employment chances for DACs.

#### Accessibility:

- Focuses on attainability for those without advanced education.
- Includes middle-skilled jobs with good pay and benefits, offering economic and career mobility.

#### Career Growth and Security:

- Offers long-term employment and economic stability.
- Includes roles with advancement potential.

- Reduces risk of layoffs or job obsolescence.

### Developing a Composite Scoring System

We created a composite scoring system incorporating various proxy criteria to represent demand, accessibility and career growth opportunities, as shown in *Figure 3*. The weighting of these criteria was calibrated to select jobs which would offer the best chances of success for those in DACs, as shown in *Figure 4*.

### Top Priority Hydrogen Jobs

The use of a weighted average approach helped us identify the top ten key roles crucial for driving Houston's hydrogen economy. Half of these roles, as shown in *Figure 5*, are technical in nature, with the other half in planning and scheduling, and analytics and compliance. Notably, they represent approximately 30 percent of Houston's current workforce in the industrial gas sector and are projected to have a high labor demand-to-supply deficit in the region, with 20,000 openings within ten years across all industries [17].

### Skills, Education and Credential Analysis

With the priority jobs identified, we assessed the qualifications these positions demand. Through AI-driven data scraping, we aggregated the typical requirements for entry-level roles to understand the necessary skills, education and credentials that Houston-area employers seek. This helps us to understand the gap between what employers require and what our target communities possess.

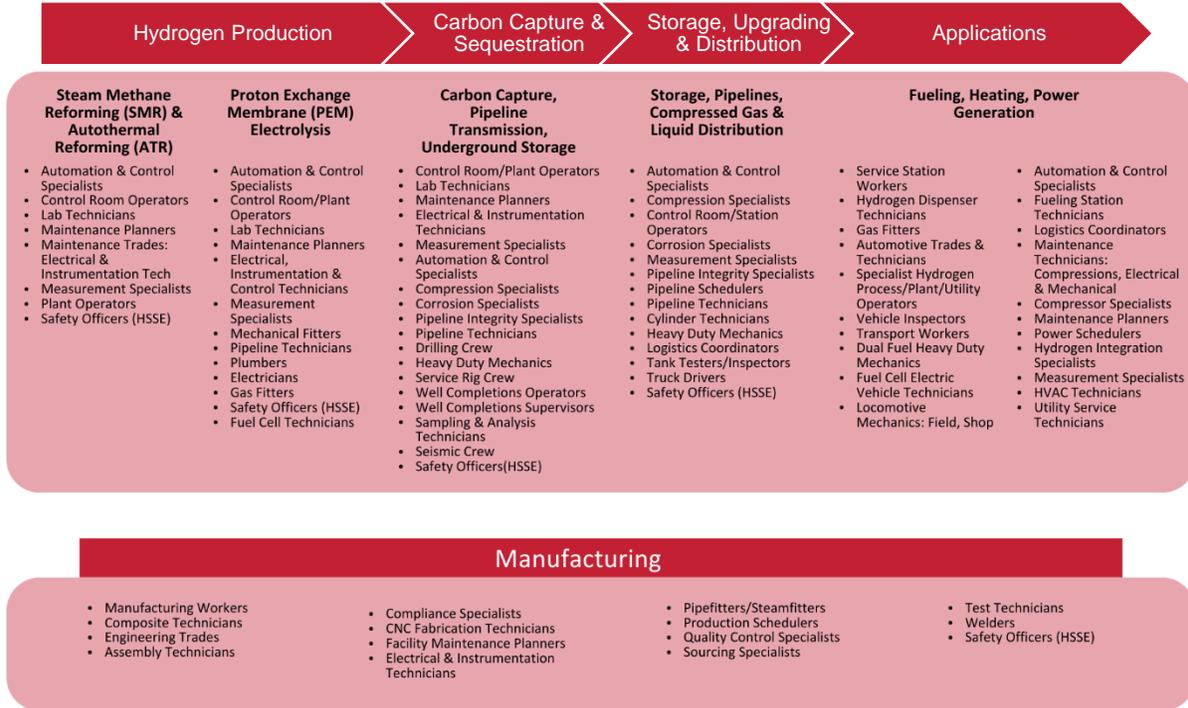
We also assessed hiring pathways through an analysis of online job postings for each

role, including the often-overlooked “hidden job market,” and how the requirements for our target jobs compared to the credentials of those offered by local institutions. This analysis identified potential mismatches between job requirements and candidate

qualifications, highlighting where employers might be overlooking viable candidates.

Accompanying data and analysis can be found in *Appendix A: Target Jobs*.

**Figure 3: Middle-Skilled Jobs Across Houston’s H<sub>2</sub> Value Chain [15] [16]**



**Figure 4: H<sub>2</sub> Job Selection Criteria [17]**

Prioritization Criteria	Prioritization Rationale	Weight	Weight Rationale	Data Source	
<b>Demand</b>	<b>Applicability across Houston's H<sub>2</sub> Value Chain</b>	Broadly applicable jobs offer greater stability due to transferable skills and knowledge across multiple applications in the value chain.	20%	Jobs that are applicable across the hydrogen value chain are often more stable and offer greater opportunities for career growth and advancement as they are less vulnerable to economic downturns or changes in consumer demand.	Accenture analysis
	<b>Projected Growth Rate in TX (2018-2028)</b>	A high projected growth rate suggests increasing demand for skills and expertise, creating more opportunities for career growth and higher salaries.	15%	Job outlook data is from an industry agnostic data set for all of Texas and should not be heavily indexed to determine Houston's H <sub>2</sub> roles.	LaborInsights (Texas Workforce Commission)
	<b>Number of Jobs in Houston</b>	More jobs available means more employment opportunities and variety for job seekers, increasing the likelihood of finding a suitable job according to their skills and experience.	10%	Job outlook data is from an industry agnostic data set for all of Houston and should not be heavily indexed to determine Houston's H <sub>2</sub> roles.	LaborInsights
<b>Growth &amp; Security</b>	<b>Career Growth Opportunity</b>	Career growth potential can help individuals from disadvantaged communities move up the social ladder, acquire new skills and gain new responsibilities for better-paying jobs and a higher standard of living.	20%	Career growth potential is essential for individuals from disadvantaged communities as it can provide economic empowerment, social mobility, positive role models for others to aspire to, and community development through contributions to the local economy.	Accenture analysis
	<b>Average Salary in Houston</b>	Competitive salary jobs can help individuals and families break the cycle of poverty and improve their quality of life.	10%	All jobs were above the average Houston income and therefore this data point is deemphasized.	LaborInsights (BLS)
	<b>Risk of Automation</b>	Automation risk is crucial for job seekers from disadvantaged communities as they may face job displacement, lower wages and reduced benefits.	5%	Selected jobs are entry-level middle-skilled, and it is assumed that job seekers will be able to advance to a point at which the risk of automation is less significant relative to other factors.	LaborInsights
<b>Access</b>	<b>Time of Attainment (Avg Years for Edu + Exp)</b>	Jobs with shorter prerequisites have a lower barrier to entry, making them more accessible to those in disadvantaged communities.	20%	People in disadvantaged communities may have limited financial resources and may be more likely to rely on government assistance or other forms of support while training for a job, which can lead to increased financial stress and can make it harder for individuals and families to meet their basic needs.	Accenture analysis

**Figure 5: Target Jobs for Houston's H<sub>2</sub> Economy [17]**

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

Projected growth rate encompasses all related industries. While operators overall might experience a decline due to factors like automation and remote operations, this does not necessarily reflect the growth expected in H<sub>2</sub>-specific applications.

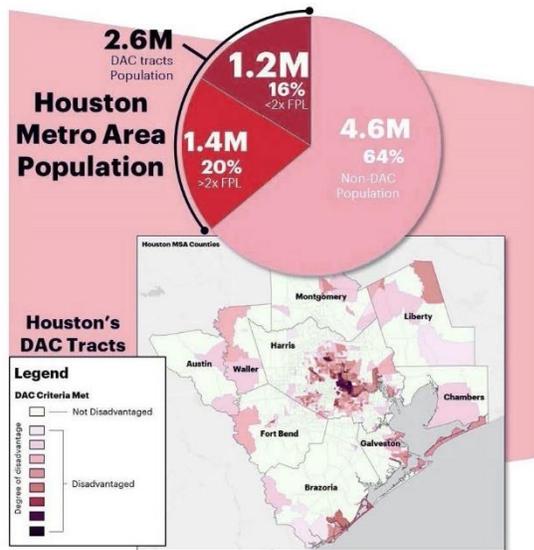
## Target Personas

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.

### In-Depth Community Analysis

We leveraged data from the Climate and Economic Screening Tool and the Census Bureau to identify 2.6 million residents across over 400 census tracts that meet Justice40 criteria, which makes up 36 percent of the nine-county Houston Metropolitan Statistical Area (MSA) population, as shown in *Figure 6*. To address variables in census processes and account for DAC tract households that do not make less than two times the federal poverty line, we examined households that meet this criterion to help understand how many are most in need. This narrowed our focus to 1.2 million residents, representing 16 percent of the Houston MSA population.

**Figure 6: Houston’s DAC Population** [18] [19]

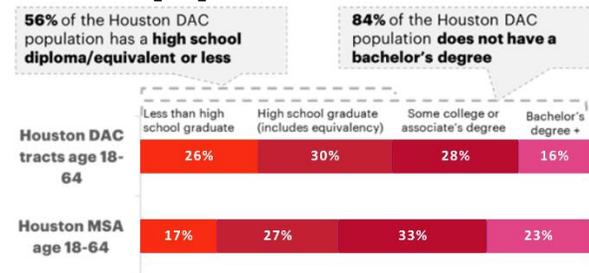


### Identifying Burden Indicators and Educational Background

We identified common burden indicators in Houston’s DACs to inform our understanding of the community’s unique challenges and needs. Some of the most common burden indicators for Houston-area

DACs are low educational attainment, linguistic isolation, proximity to hazardous facilities and housing impact due to climate hazards [19] [20]. The data revealed that 56 percent of Houston’s DAC target population had attained a high school diploma or less, while 84 percent did not possess a bachelor's degree, as shown in *Figure 7*.

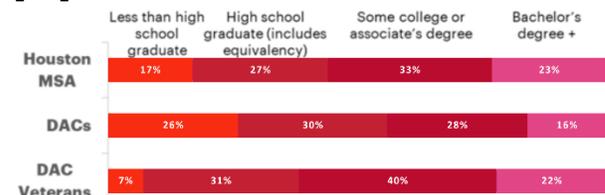
**Figure 7: Educational Attainment in Houston** [21]



### Veteran Inclusion

Houston’s DAC veterans represent a population with advanced or higher education and highly transferable skills to many of the target hydrogen roles, including logistics, heavy equipment operation and regulatory compliance [22]. 5.2 percent of those in Houston’s DACs are veterans, totaling 135,000, and 59 percent are of working age (18-64), as shown in *Figure 8*. In addition, Houston’s DAC veterans have an average annual income significantly above the average income in the Houston MSA and in DAC tracts, as shown in *Figure 9*.

**Figure 8: Houston Veteran Education** [23]



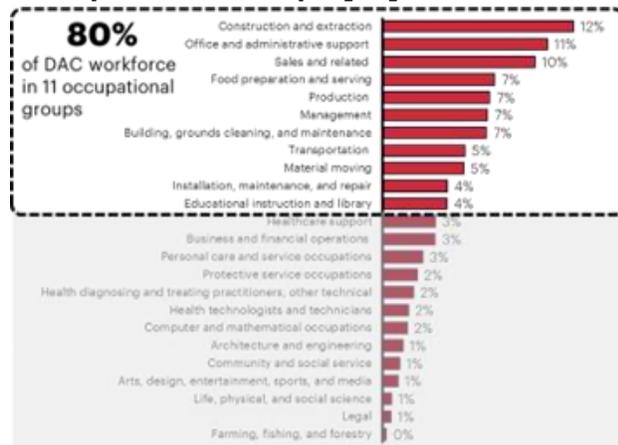
**Figure 9: Houston DAC Veteran Annual Income, Per Capita [23]**



**Occupational Assessment**

In Houston’s DACs, 80 percent of the target population works in eleven key occupational groups, as detailed in *Figure 10*. This indicates the variety of skills they likely have.

**Figure 10: Houston DAC Occupational Groups [24]**

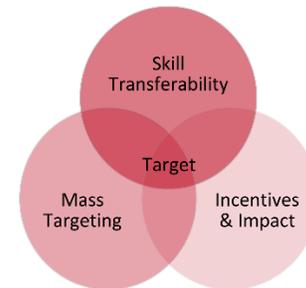


**Weighted Persona Selection**

We adopted a three-pronged approach for persona selection, focusing on skill transferability (detailed in the next section), prevalence within the DACs and motivational factors like relative salary and career growth potential versus target hydrogen jobs, as shown in *Figure 11*. This approach aims to maximize opportunities for DAC members with relevant skills, support the largest number of people in need and

create incentivized career paths with lasting benefits.

**Figure 11: DAC Persona Selection Categories**



Out of the 150 most commonly held jobs in Houston’s DACs, we selected 25 DAC target personas based on our criteria shown in *Figure 12*. These personas, such as carpenters, electricians and food service managers, demonstrated high skill transferability, ranging from 53 percent to 92 percent, highlighting the potential for these individuals to adapt quickly to hydrogen-related roles. This selection does not preclude an individual from other occupations from transitioning to hydrogen; our analysis suggests that these personas would have the most accelerated trajectory for transitioning, but there are transferable skills from every occupation that can be built upon.

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, as shown in *Figure 17*, and demonstrating the ability for a skills-based workforce development approach to maximize opportunities for those in DACs. Personas and related information can be found in *Appendix B: Target Personas*.

**Figure 12: DAC Persona Selection Criteria [17] [24] [25]**

	<b>Prioritization Criteria</b>	<b>Prioritization Rationale</b>	<b>Weight</b>	<b>Weight Rationale</b>	<b>Data Source</b>
<b>Skills Match</b>	<b>Skill Transferability to H<sub>2</sub> Jobs</b>	Leveraging existing skillsets reduces time and resources needed for hydrogen job training, narrowing skill gaps for higher completion rates and career longevity.	50%	Skill transferability addresses the skills gap, lowers the barrier to entry to DAC community members and contributes to the timely development of an H <sub>2</sub> workforce in the near- to short-term.	SkyHive, Accenture analysis
<b>Mass Target</b>	<b>Projected Growth Rate in TX (2018-2028)</b>	Identifying commonly held jobs within DAC communities reveals representative candidate pools.	25%	Capturing the most inclusive occupational information that will be representative of the largest percentage of DAC members possible is critical to community engagement and uplifting.	US Census Bureau
<b>Incentives &amp; Impact</b>	<b>Average Salary in Houston</b>	Lower salary levels may provide greater motivation for career change as an increase in salary can have a more significant impact.	10%	Income is a significant component of the Justice40 DAC criteria and contributes to the identification of the community members most in need. Jobs with salaries >\$65k were excluded from consideration.	LaborInsights (BLS)
	<b>Risk of Automation</b>	High and medium automation risk jobs threaten job security and career outlook, risking displacement and loss of income for DAC community members.	5%	Job outlook data is a composite of equally-weighted factors that impact retention and long-term growth potential.	LaborInsights
	<b>Projected Growth Rate in TX (2018-2028)</b>	Employment change and growth rates of DAC jobs affect job security and outlook. Negative changes risk displacement and loss of income, while positive changes may not require new career opportunities.	5%	Job outlook data is a composite of equally-weighted factors that impact retention and long-term growth potential.	LaborInsights (Texas Workforce Commission)
	<b>Outsourcing Risk</b>	Outsourcing risks job security and outlook for DAC members, potentially causing further marginalization.	5%	Job outlook data is a composite of equally-weighted factors that impact retention and long-term growth potential.	Accenture analysis

## Skills Matching

We created a list of key skills for Houston’s hydrogen sector jobs and compared them to the estimated skill proficiencies of target personas. This comparison highlights accessible job opportunities in the future H<sub>2</sub> economy for DAC members, indicating to employers and communities alike the alignment of existing skills with industry needs while emphasizing the areas where further training and upskilling is needed.

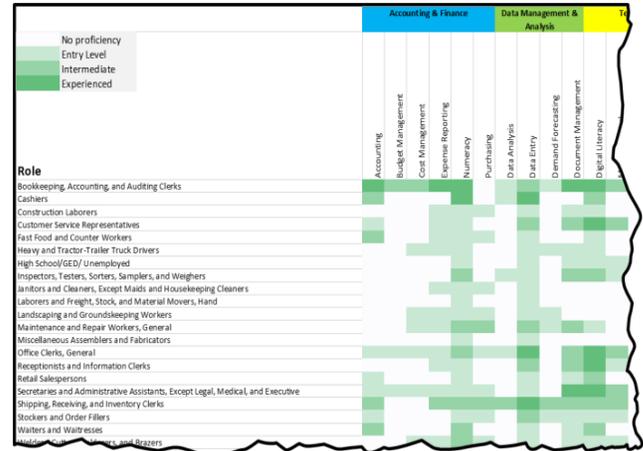
## Identification of Skills for Target Jobs

We compiled a comprehensive list of key skills and proficiencies for entry-level target jobs based on AI analysis of job postings, stakeholder interviews and desk research, as shown in *Figure 13*. This list spanned technical, management and industry-specific skills, and we used a 0-3 scale to rate the necessary proficiency of each skill for our target jobs, where 0=no proficiency, 1=entry-level, 2=intermediate and 3=experienced.

## Assessing Skills of Target Personas

We evaluated the skill sets of DAC target personas using the same 0-3 scale, assessing their expected proficiency for each skill based on their occupation, as shown in *Figure 14*. This assessment helped us create profiles that highlighted their strengths and identified areas for further development.

**Figure 14: Skill Proficiency Assignment**



**Figure 13: Skills Inventory**



## Skills Matching Process

In our skills matching process, we aligned DAC personas with target jobs by comparing their skill profiles to job requirements. We focused on matching personas to jobs where they had a higher percentage of skills at or above the minimum required proficiency, quantifying the compatibility with match percentages, as shown in *Figure 15*.

This alignment highlighted individuals’ suitability for specific hydrogen industry roles based on their current skills, while also identifying the need for additional training to fully bridge any skill gaps. We then took into consideration stakeholder input to refine which personas align to each target job. Additional information can be found in *Appendix C: Skills Matching*.

Figure 15: Skills Matching

DAC Target Job	Hydrogen Data Analyst	Hydrogen Regulatory Analyst and Compliance Specialist	Hydrogen Safety Technician	Hydrogen Instrument & Electrical Technician	Hydrogen Mechanical Technician	Hydrogen Process Plant 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 Material 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 Assistants, Except Legal, Medical, and Executive	63%	50%	41%	36%	38%	40%	38%	36%	42%	56%
Shipping, Receiving, and Inventory 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%
Walters and Waitresses	44%	40%	35%	33%	36%	37%	41%	36%	33%	42%

## Learning Journeys

We created educational pathways to help members of Houston’s DACs acquire skills for hydrogen sector jobs, regardless of their starting point. These pathways, developed in partnership with educational and industry entities, are designed to show at a high level the milestones needed to get the necessary prerequisites for an entry-level job.

### Learning Journeys for Houston’s H<sub>2</sub> Workforce

We designed learning journeys to guide Houston’s DACs through essential milestones to acquire skills and credentials for hydrogen sector jobs. These pathways are intended to illustrate a practical route to employment, as shown in *Figure 16*.

Our development of these pathways involved collaboration with educational institutions, industry partners and non-profits, ensuring alignment with educational standards, industry requirements and support services.

### Tailoring to Job Requirements

The first step was to understand the specific requirements for various hydrogen roles. This involved gathering data from industry

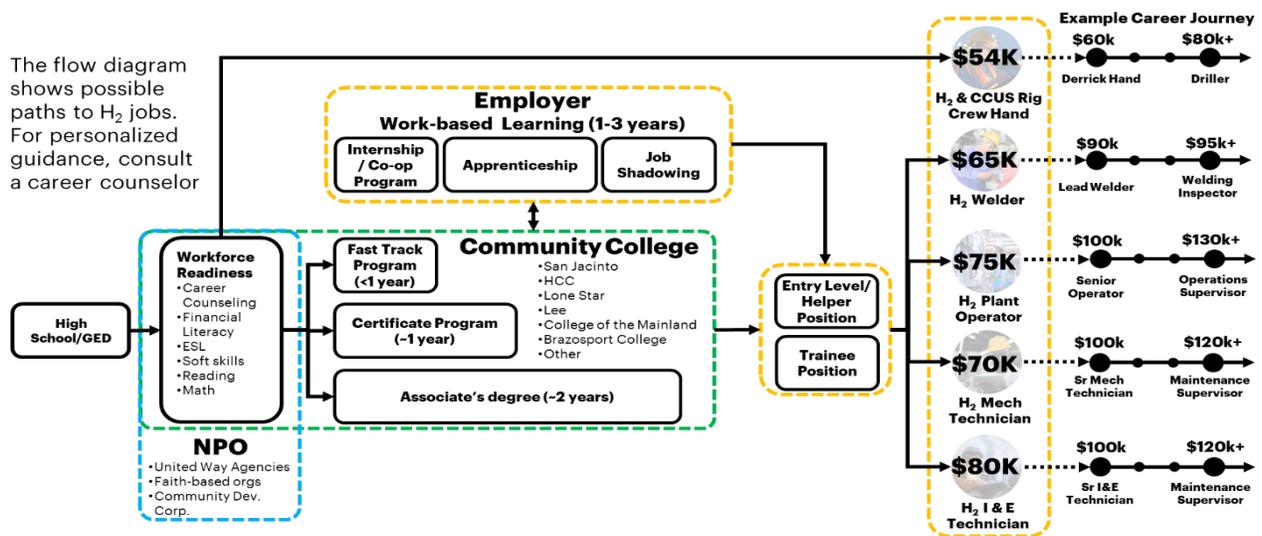
experts and job posting analyses, shown in *Appendix A: Target Jobs*.

We then evaluated the skills and education of our target personas and developed steps for further education, training and skills development. Grouping similar jobs together allowed us to create pathways applicable to multiple personas. We also considered long-term career development, providing a roadmap for future growth and advancement opportunities.

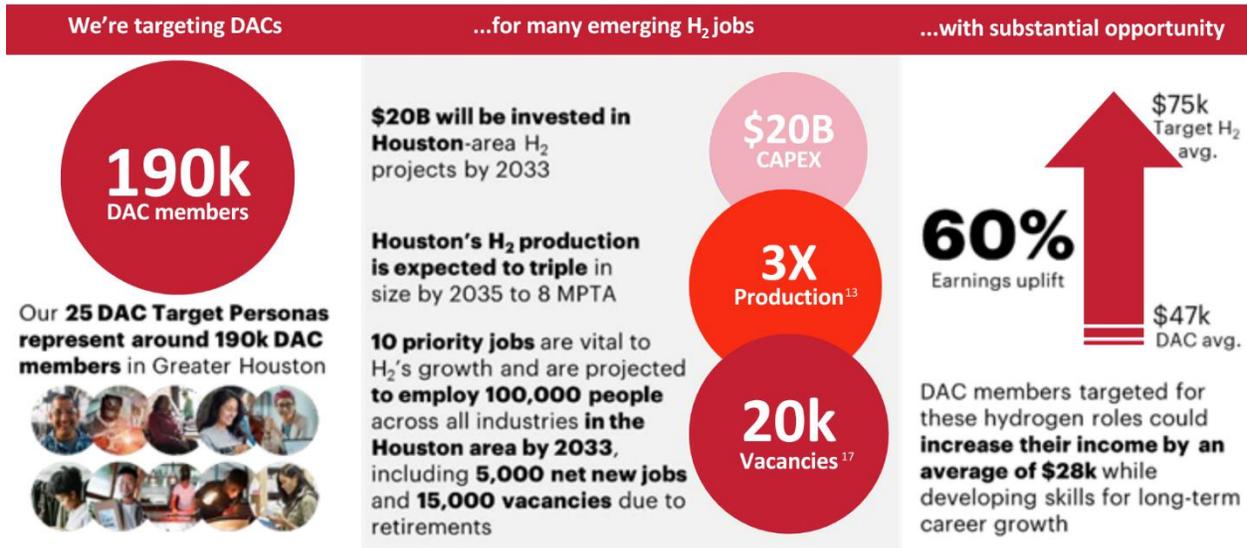
### Outcome and Long-term Goals

These learning journeys aim to offer DAC members a direct, feasible route into Houston’s hydrogen sector. Completing these pathways can lead to a 60 percent average increase in earnings potential compared to the average DAC persona salary, as shown in *Figure 17*.

**Figure 16: Technical Learning Journey for Typical Minimum Entry-Level H<sub>2</sub> Job Requirements**



**Figure 17: H<sub>2</sub> Jobs Represent a Major Earnings Uplift Opportunity for DACs [13] [17]**



# Implementation Framework

## Stakeholder Engagement

Our program engaged a wide range of stakeholders, including local employers, colleges and non-profits. We identified and mapped future stakeholder roles needed for collaboration and implementation, as shown in *Figure 18*, to:

- Develop an effective governance structure,
- Ensure comprehensive curricula that address skill gaps,
- Strengthen training delivery,
- Improve education and employment access for DACs,
- Support recruitment and retention strategies,
- And improve program performance through evaluation.

## Identifying and Recruiting Stakeholders

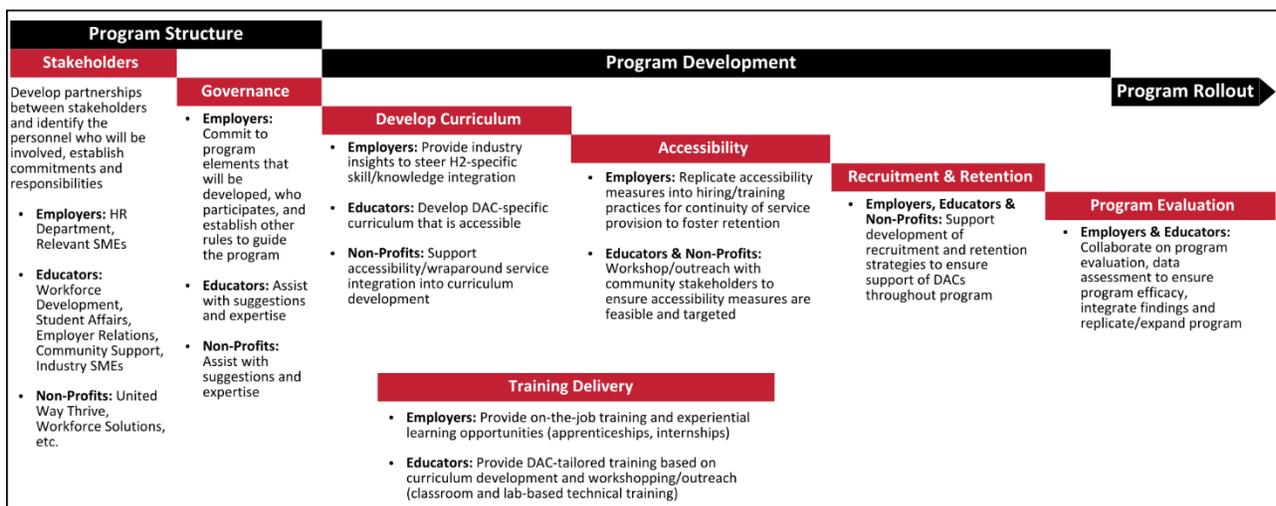
We targeted employers expected to play a significant role in the hydrogen economy. Our focus for colleges was on institutions close to DACs and likely hydrogen job locations, prioritizing those with existing talent pipelines to the oil and gas industry. For non-profits, we chose organizations with a strong local presence and workforce development experience. The Greater Houston Partnership and Center for Houston’s Future, which together comprise

part of the city’s chamber of commerce, facilitated the engagement of these groups.

## Maintaining Involvement

We conducted bi-weekly meetings with a larger steering committee of employers during the twelve-week engagement period and organized periodic on-on-one sessions for in-depth perspectives and reviews. Smaller group meetings with educators and non-profits were held for focused discussion. All stakeholders were regularly updated on progress and final outcomes.

**Figure 18: Stakeholder Roles**



# Governance

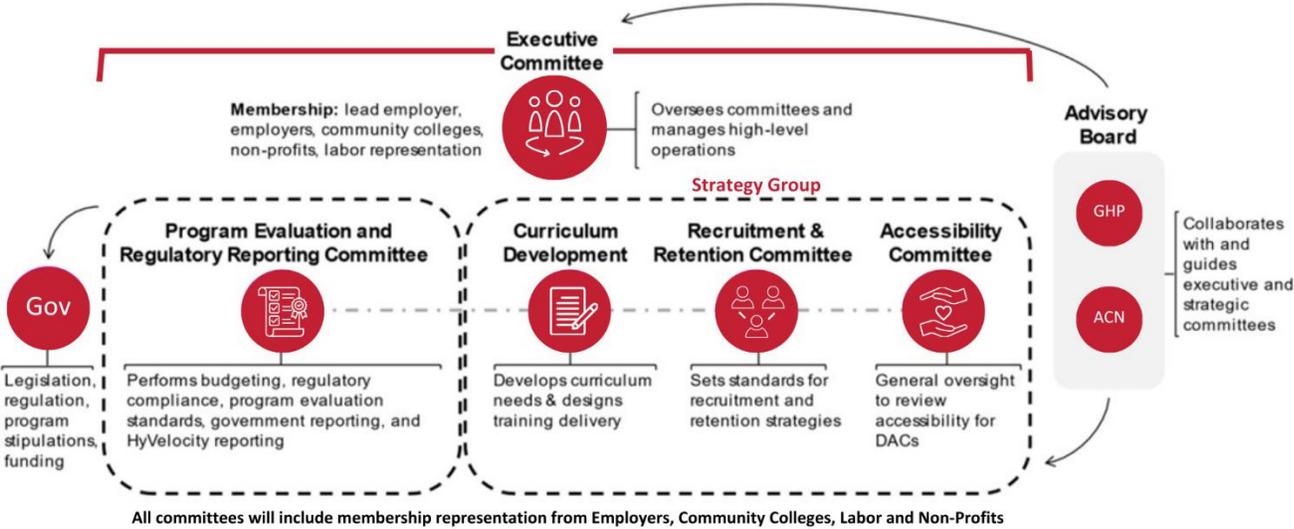
The governance model for Houston centers on an employer-led program with participation from key stakeholders, including educational institutions and non-profits, organized by the Greater Houston Partnership and its UpSkill Houston initiative.

## Employer-Led Approach in Governance

The program is centered around an employer-led governance approach focused on creating talent pipelines that readily adapt to industry changes. Central to the program’s success, employers offer insights into current and future skill requirements, provide on-the-job training opportunities, and are potential employers for graduates. Their involvement is pivotal in aligning training with industry demands, closing skill gaps and enhancing participant retention. Employer-led programs also provide greater control over governmental incentives, including tax breaks and grants, enabling targeted allocation to meet strategic needs.

Our governance model also emphasizes the essential roles of employers, educational institutions and non-profits in developing and implementing accessible training programs. Community colleges, using their expertise in energy and technical programs, work with employers to ensure that their curricula are updated and aligned with the specific needs of the industry. Additionally, outreach groups from community colleges and non-profits can help to actively promote these new opportunities in the hydrogen economy to address the lack of career path awareness among DAC students [26]. The key roles for successful implementation are described in the following sections, including Curriculum Development, Training Delivery, Accessibility, Recruitment, Retention, and Evaluation and Reporting.

**Figure 19: Houston Program Governance Structure**



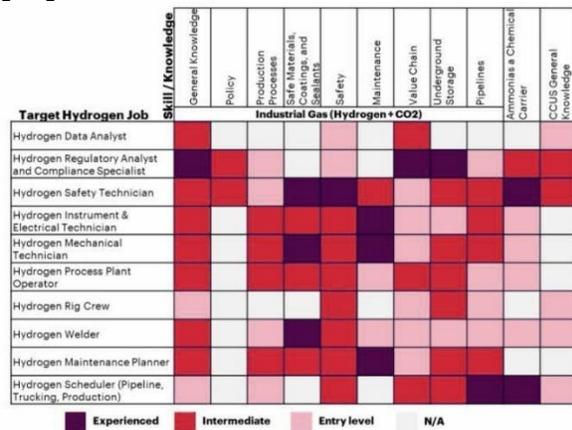
## Curriculum Development

We defined the fundamental skills and knowledge required for our target jobs, as shown in *Figure 21*, aiming for educational institutions and employers to collaboratively develop detailed curricula tailored to their specific needs, existing programs and processes.

## Foundation and Adaptation of Existing Curricula

We first reviewed job postings and stakeholder input to identify the major skill requirements and knowledge needed for our target jobs, as shown in *Figure 20*. We then examined the existing curricula of local colleges to determine their relevance for hydrogen careers and gaps in hydrogen-specific content. Our analysis revealed that much of the necessary content for related positions and hydrogen-specifics for our target jobs may be considered the “last mile” of training and is not readily available. This evaluation provided a foundation for identifying the specific skills and coursework required for the hydrogen learning journeys.

**Figure 20: H<sub>2</sub> Job Skill Requirements [16]**



**Figure 21: H<sub>2</sub> Skill Definitions**

Skill/Knowledge Definitions		
Industrial Gas (Hydrogen + CO <sub>2</sub> )	General Knowledge	Knowledge of properties, uses and production of gases used in various industries, including grey, green and blue hydrogen
	Policy	Knowledge of laws and regulations regarding industrial gases, including related regulations, standards and codes such as environmental
	Production Processes	Knowledge of PEM, SMR, ATR and CCUS processes
	Safe Materials, Coatings and Sealants	Knowledge of materials that can handle industrial gases safely, including selection, design and maintenance of materials

	Safety	Knowledge of safety procedures and precautions when handling industrial gases
	Maintenance	Knowledge of maintenance practices and procedures to ensure safe and efficient operation of gas systems
	Value Chain	Knowledge of the entire industrial gas value chain, including energy sources, production, storage, transportation and distribution
	Underground Storage	Understanding of appropriate well completion solutions for hydrogen, storage site capacity and maintenance, tank/cavern/reservoir maintenance, and general knowledge of hydrogen properties
	Pipelines	Knowledge of pipelines used for the transportation of industrial gases, including equipment operation and maintenance
Ammonia as a Chemical Carrier		Understanding ammonia's use as a carrier of hydrogen in energy storage and transportation, including its production and transport
CCUS General Knowledge		Understand capturing, utilizing and storing carbon dioxide emissions from industrial processes or power generation

## Timing and Deployment of New Curricula

As the program moves forward, the timing and rate of need for new hydrogen roles will be assessed in relation to the evolving value chain. Educators and employers will use this information to schedule the deployment of new curricula, considering both the time required for program completion and the pace of industry demand. According to Lone Star College, development typically takes between six months to two years, depending on resource availability, complexity and scope relative to existing curricula and the necessity of alignment with industry standards and regulations, as shown in *Figure 22*.

**Figure 22: Lone Star Community College’s Workforce Program Development Process [27]**



**Process Steps and Feedback Loop**

*Needs Analysis:* Conducting thorough research to understand the skills and knowledge required for target hydrogen jobs.

*Curriculum Framework Development:* Creating a framework that includes core courses, elective modules and practical training components.

*Content Development and Pilot Testing:* Collaborating with experts to develop course content and materials, followed by piloting and refining based on feedback.

*Accreditation and Compliance:* Ensuring the curriculum meets the standards set by accrediting bodies and maintaining ongoing compliance.

*Regular Stakeholder Engagement:* Holding meetings with stakeholders to discuss progress and make necessary adjustments, complemented by continuous feedback from students and instructors.

## Training Delivery

Our training strategy stresses accessible channels for DACs with a focus on “earn as you learn” apprenticeships and shorter-duration, stackable credentials for faster career transitions.

## Diverse and Engaging Training Methods

Our strategy emphasizes a blend of classroom-based learning and practical work experience delivered through multiple channels to cater to different learning styles and access requirements. This approach is backed by research from the Association for Career and Technical Education, which revealed that 81 percent of high school dropouts say relevant, real-world learning opportunities would have kept them in school [28]. The survey also found that educational experience heavily influences future work experience: participants who had impactful work-study experiences during their time in school were twice as engaged when working. Consequently, we have stressed the importance of trade programs and apprenticeships in our training approach, enhancing practical, real-world experience to create a more engaged, skilled candidate pool.

## Adapting to a Changing Workforce

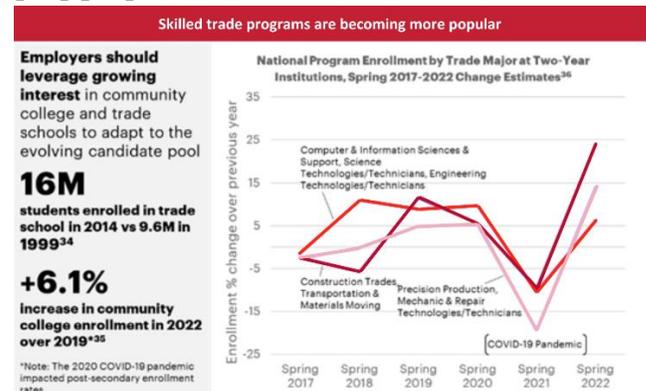
Recognizing the evolving preferences of the next-generation workforce, we noted that over 50 percent of Gen-Z teens are open to post-secondary education options beyond a traditional four-year degree [29], as shown in *Figure 23*.

Apprenticeship programs have shown high effectiveness, with 80 percent of US companies with such programs acknowledging their strategic value in meeting skilled labor needs [30]. The return on investment for these programs averages at 44 percent, factoring in benefits like reduced turnover, increased engagement and improved company culture [31].

Trade schools are another popular option due to relatively lower tuition and associated costs and the ability to enter the workforce faster [32]. Additionally, a 2021 study found

that 25 percent of employees with associate’s degrees earn more over their lifetime than 50 percent of those with bachelor’s degrees [33].

**Figure 23: Trade Program Trends [34] [35] [36]**



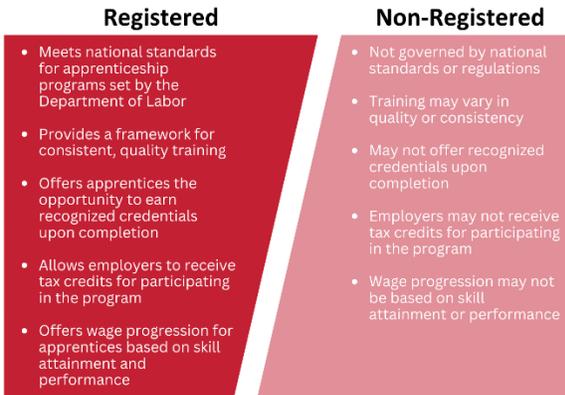
## Industry Apprenticeship Precedence in Houston

There is a strong existing foundation for apprenticeship programs in the Houston area. Out of fifty local hydrogen stakeholders, fourteen had established apprenticeship programs, with twelve registered with the Department of Labor [37]. Many of these programs adhere to national standards, offering credentials and structured wage progression alongside tax incentives for participating employers, as shown in *Figure 24*. Dow’s well-established model is a great example of industry apprenticeship programs, featuring:

- Positions available for I&E Technicians, Chemical Technicians, Production & Planning Clerks, Electricians, Mechanical Technicians and Chemical Operators.
- A mix of practical, hands-on learning and classroom instruction.
- An opportunity to earn an associate’s degree upon completion, along with the prospect of full-time employment.

- A duration of over three years, with increasing emphasis on hands-on experience as time progresses [38].

**Figure 24: Apprenticeship Types**



### Accenture’s Apprenticeship Program: A Case Study

Since its inception in 2016, Accenture’s apprenticeship program has grown from five to over 1,200 apprentices, 80 percent of whom did not hold a four-year degree upon hiring [39]. The “earn as you learn” structure of the six-to-twelve-month program includes formal learning, mentorship and on-the-job training across competitive technical areas including cybersecurity, application development and data, cloud, and platform engineering, which demonstrates Accenture’s commitment to upskilling and hiring based on skills and experience, not just credentials.

## Accessibility

Our program emphasizes collaborative strategies to address challenges DACs have accessing the workforce, like financial constraints, language barriers and limited childcare availability, as shown in *Figure 25*.

### Employer Initiatives

We found that Houston employers already employ a variety of initiatives which can benefit Houston’s DACs. These include offering apprenticeship programs that allow for “earning while learning” and partnering with vocational schools and community colleges for targeted skills training. By providing flexible work arrangements for those with other commitments, mentorship programs, scholarships and financial aid, employers can further support career development. Employers can also engage these communities through job fairs, internships and work-study programs, along with offering transportation assistance and language training.

### Educational Support and Partnerships

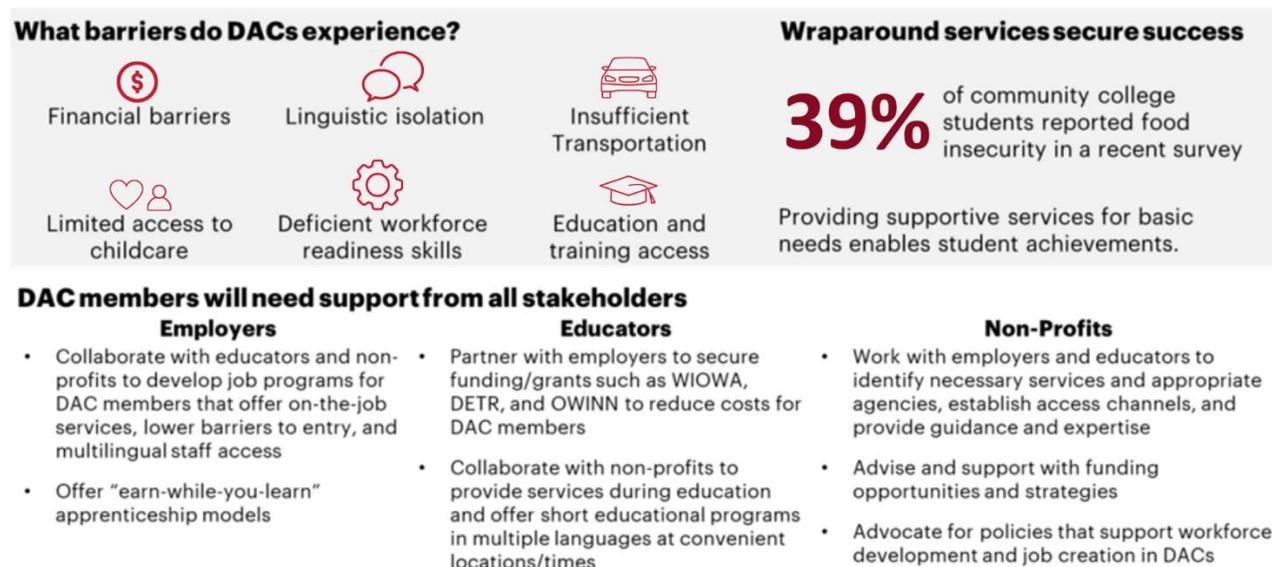
We found that many of Houston’s community colleges already have well-developed outreach programs for DACs and

support accessibility by offering shorter programs and stackable credentials for quick workforce entry and skill progression. Many already have partnerships with employers to offer practical experience and provide career guidance on opportunities in the industry. Community outreach can help raise sector awareness, and networking and job placement services post-graduation further assist in securing industry jobs. We found that this is a program which many two-year institutions may struggle with due to budget constraints and the number of students served.

### Non-Profit Contributions

Houston’s non-profits can collaborate with employers and educators to offer valuable data and insights into DACs. They provide wraparound services, as shown in *Figure 26*, and advocate for workforce development policies in these communities.

**Figure 25: Enabling Role of Stakeholders for Accessibility [40]**



**Figure 26: Houston DAC Challenges and Community Resources [41] [42] [43] [44]**

Challenges			Solutions	Partner
 Financial barriers	<b>44%</b> of Houston's DAC residents live below 200% Federal Poverty Line <sup>41</sup>	-->	Financial aid, grants, and scholarships, earn-while-you-learn apprenticeships and on-the job training, facilitate access to government and private funding	Workforce Solutions, Social Finance, Ampersand
 Transportation challenges	<b>47%</b> of Harris County household budgets are spent on housing and transportation costs <sup>42</sup>	-->	Transportation subsidies, partnerships with local transportation service providers through non-profits, offering geospatially accessible opportunities	Metro, Harris County rides, On the Road Lending
 Lack of access to education and training	<b>26%</b> of Houston DACs ages 18-64 do not have a high school diploma/equivalent compared to 15% Houston MSA <sup>43</sup>	-->	Grant and scholarship programs, partnerships with non-profits for wraparound service support and job placement services	Capital Idea, Baker Ripley, SER Jobs
 Childcare	<b>83%</b> of Harris County childcare markets are in a subsidy-accepting deficit <sup>44</sup>	-->	Partnerships with childcare service providers through non-profits to integrate into individual's comprehensive service plan, flexible work schedules	Collaborative for Children, Workforce Solutions, Out 2 Learn
 Language and basic work skills	<b>19%</b> of Houston DAC households experience linguistic isolation <sup>45</sup>	-->	Integration of ESL and adult continuing education programs to develop workforce readiness prior to the start of education and apprenticeship programs	Community colleges, Easter Seals, Mexican Institute

# 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.

## Targeted Outreach and Community Partnerships

Our recruitment initiatives are focused on areas with significant DAC populations, including our target personas, high school students, the unemployed, veterans and ALICE (Asset Limited, Income Constrained, Employed) individuals through a variety of channels, as shown in *Figure 27*.

### Figure 27: Community Outreach Channels

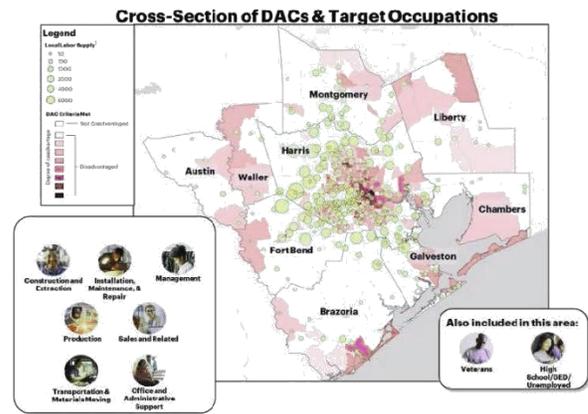
Channel	Impact
<p>Targeted Social Media Advertising</p>	Tailored messaging through social media advertising can connect organizations with diverse candidates from disadvantaged communities.
<p>Targeted Local Media Advertising</p>	Advertising in local media outlets builds credibility and reaches candidates without access to online job boards.
<p>Targeted Job Fairs</p>	Job fairs connect organizations with a diverse range of candidates seeking employment, especially for low-skilled or entry-level positions.
<p>Community Events</p>	Informal community events build trust and establish relationships with potential candidates from disadvantaged communities, including places like faith-based organizations.
<p>Event Sponsorship</p>	Sponsoring important events demonstrates commitment to DE&I while providing opportunities to connect with potential candidates.

## Geographical Considerations in Recruitment

We have identified areas with high concentrations of our target personas, focusing our outreach and partnerships

there to enhance candidate engagement and improve our hiring success, as shown in *Figures 28 and 29*.

**Figure 28: DAC Persona Geographic Density [45]**



## Developing Accessible Hiring Channels

For each target, we plan to evaluate the current hiring methods, such as online portals or through contractor and apprenticeship conversions, to help us understand if these channels have limitations that restrict access and how we can bridge the gap.

**Figure 29: Recruitment Partners [46]**

Working with organizations that can **connect employers to specific DAC populations** can **improve targeted recruitment and bolster DE&I efforts**



## Retention

Our retention strategy focuses on mechanisms that can address systemic barriers and workplace inequalities, ensuring long-term career growth and advancement for DAC members, as shown in *Figure 30*.

**Figure 30: Retention Strategy Mechanisms**



### **Mechanisms to improve retention include...**

**Continuous Feedback** – Regular feedback will boost engagement and reinforce learning.

**Mentorship** – Mentorship supports professional development and builds relationships with senior employees.

**Visible Career Advancement** – Visible career advancement motivates new hires when they see peers advance.

**Inclusive Workplace Culture** – Retain disadvantaged employees by fostering a sense of belonging and respect for diversity.

**Ongoing Training and Professional Development** – Retain disadvantaged employees by supporting their growth and advancement.

### **Continuous Feedback for Engagement and Growth**

Implementing a continuous feedback system is crucial for retention, as it shows employee value and aids in personal growth. A Gallup survey from 2021 revealed that employees receiving regular, constructive feedback are four times more engaged [47]. To embed this practice, our approach includes setting regular feedback sessions and adopting structured models like “SBI” (Situation-Behavior-Impact). Also, training managers to provide balanced feedback and fostering an inclusive culture where feedback is encouraged can significantly enhance employee engagement and performance.

### **Mentorship for Knowledge Transfer and Inclusion**

Mentorship programs help to transfer practical knowledge and integrate new

employees into the workplace culture. Fortune 500 companies widely adopt these programs, with mentorship leading to five times more promotions, according to Forbes [48]. Mentorship can also support diversity and inclusion efforts, uplifting underrepresented groups within the workforce.

### **Visible Career Advancement Pathways**

Clear, visible career advancement pathways are vital for long-term employee retention. According to a LinkedIn survey, lack of advancement opportunities is a major reason for job changes [49]. Outlining clear career progression steps and regularly communicating advancement opportunities can motivate employees and promote longevity with the employer.

### **Inclusive Workplace Culture**

Creating an inclusive workplace culture is essential for employee retention. It promotes a sense of belonging, lowers turnover and boosts motivation. Key steps include implementing diversity, equity, and inclusion (DE&I) initiatives, backing Employee Resource Groups (ERGs) and continuously identifying and overcoming obstacles to inclusivity.

### **Ongoing Training and Professional Development**

Ongoing training and professional development is crucial for retaining DAC employees, necessitating diverse channels like in-person sessions, online resources, industry events and on-the-job learning. Providing financial support for advanced training, such as tuition assistance, further ensures accessibility and encourages employee growth.

## Evaluation and Reporting

The Houston hydrogen workforce development program is committed to thorough program evaluation and transparent reporting to ensure the program’s relevance, effectiveness and adaptability to changing industry trends, as shown in *Figure 31*.

### Mechanisms for Program Evaluation and Success

**Setting Measurable Goals:** Clear, measurable goals will be established to track the program’s progress and success.

**Regular Evaluations:** The program will undergo regular evaluations to monitor these goals, gathering feedback to identify areas of success and improvement.

**Industry Trend Adaptation:** Staying updated with industry and labor market trends ensures the program continuously provides relevant and up-to-date training, fostering an adaptable and skilled workforce.

**Stakeholder Engagement:** Ongoing engagement with stakeholders and participants is crucial for feedback and continuous improvement.

**Feedback and Improvement:** Continuously improve based on stakeholder feedback.

**Figure 31: Program Evaluation Mechanisms**



### Establishing Key Performance Indicators (KPIs)

The program’s goals and federal funding requirements guide the selection of relevant KPIs, which are crucial for federal funding

eligibility, as shown in *Figure 32*. These KPIs are chosen to reflect the program’s multifaceted objectives and include:

**Retention Rates:** Monitoring the longevity of program participants in their roles.

**Full-Time Conversions:** Tracking the transition of participants from training to full-time employment.

**Wage Increases:** Measuring the economic impact on participants’ earnings.

**Partner and Participant Satisfaction:** Assessing the satisfaction levels of all stakeholders involved.

**Placement Rate:** The success rate of program participants in securing employment.

**Diversity, Equity, and Inclusion (DE&I):** Evaluating the program’s effectiveness in promoting diversity and inclusivity.

**SMART Criteria:** All KPIs will be Specific, Measurable, Achievable, Relevant and Time-Bound.

**Regular Review and Adjustment:** KPIs will be reviewed regularly and adjusted as needed to remain relevant and aligned with program goals.

**Figure 32: Example KPIs for Program Success**

KPI	Definition	Value Add	Stakeholder		
			Employers	Community	Funding Agency
<b>Retention Rate</b>	Percent of remaining participants	Program effectiveness and engagement	✓		
<b>Full Time Conversion</b>	Percent converted to FTE for each employer	Proportion of participants receiving full-time employment from apprenticeship	✓		
<b>Wage Increases</b>	Percent salary increase annually	Employer pace with market value salaries		✓	✓
<b>Partner/ Participant Satisfaction</b>	Qualitative insight for program improvements from different perspectives	Provides insight for program improvements from different perspectives		✓	
<b>Placement Rate</b>	Percent graduates employed	Program skill marketability		✓	✓
<b>DE&amp;I</b>	Demographics Surveys Wage gaps	Equity measures, adherence to J40		✓	✓

# Looking Ahead: Expanding Our Vision

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We are eager to apply our approach to Houston's hydrogen economy and expand 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. For involvement opportunities, please contact us.



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## About Us

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### 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 diversity 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. Visit us at [www.accenture.com](http://www.accenture.com).

## **UpSkill Houston**

The Greater Houston Partnership's UpSkill Houston initiative is a nationally recognized, employer-led collaboration that focuses on talent-driven economic development in the greater Houston region. With over a decade of operation and the engagement of more than 200 key stakeholders from business, education and the community, UpSkill Houston mobilizes these stakeholders to address the skills gap and create pathways to opportunity for the greater Houston region. The initiative targets emerging industries such as life sciences, energy, aerospace and aviation, aligning education and workforce development efforts to meet the evolving skills needs of these sectors. UpSkill Houston engages employers and develops industry-led collaborations of employers, educational institutions and community organizations that develop "work-ready" pipelines of skilled talent needed by industry and the region's economy. The initiative brings education and community partners together to adapt and align their programs to meet the skills needs of the employers. It also ensures that the employers are providing relevant information on their skills needs.

# Appendices

## Appendix A: Target Jobs

Figure 33: Job Postings Analysis: Minimum Requirements for Houston-Area Jobs [17]

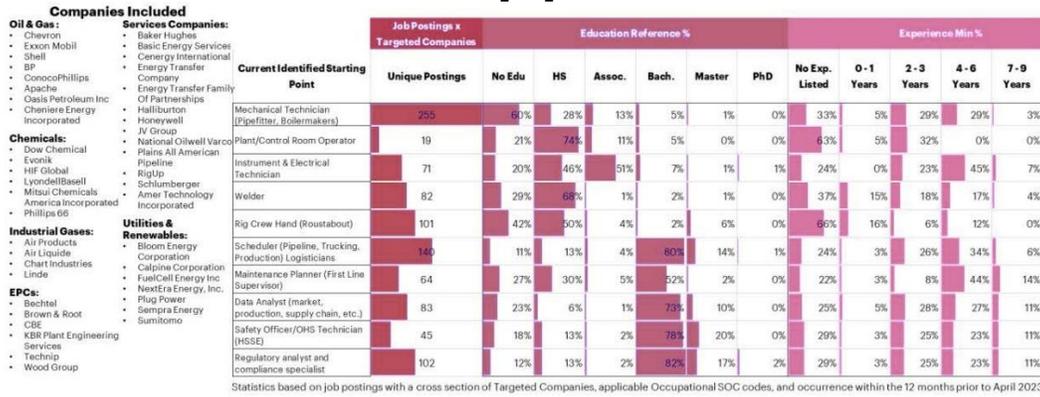


Figure 34: Job Posting and Retirement Analysis [17]

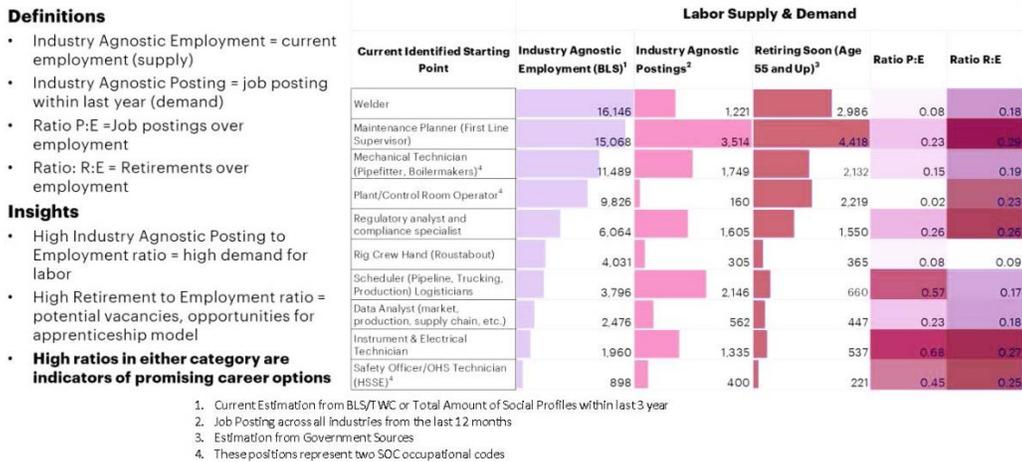
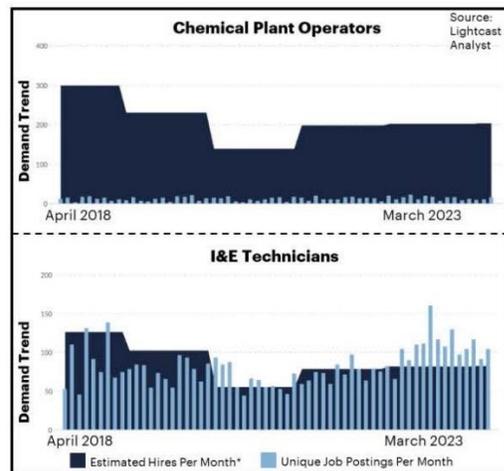
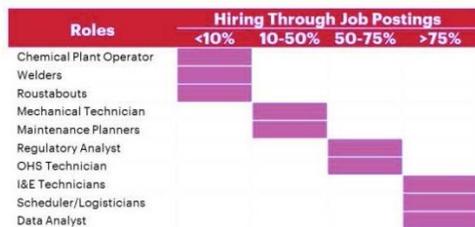


Figure 35: Online Hiring Pathway Analysis [17]

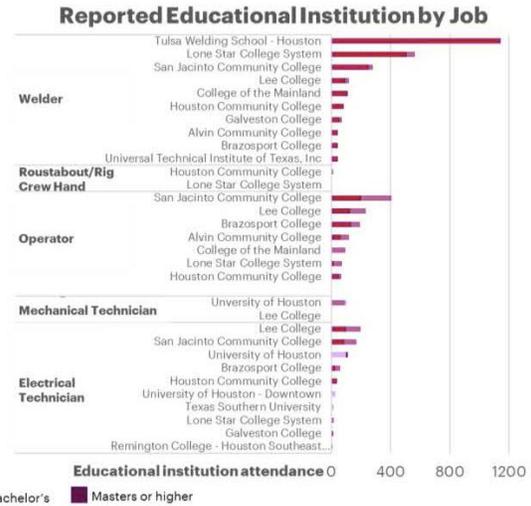
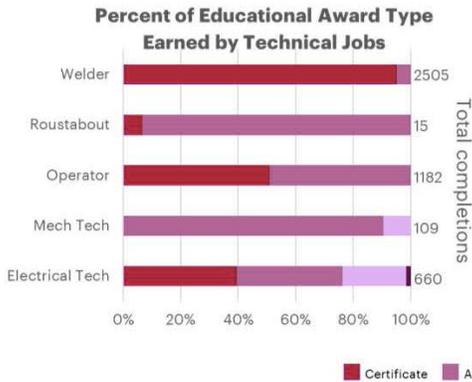
Several positions were determined to be within the "hidden job market," which are jobs that are not typically advertised online or through traditional job postings, and should be reviewed to ensure they are available & accessible to DACs

- Examples of alternative hiring pathways:
- Employee referrals
  - Networking events
  - Contractor conversion
  - Internship/Apprenticeship
  - Conversion
  - Career fairs



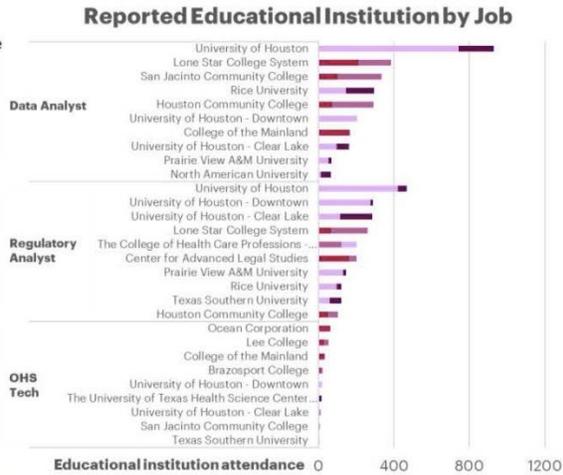
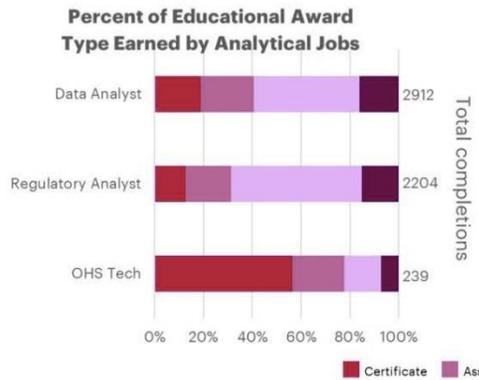
**Figure 36: Education Information for Technical Jobs [17]**

Assessing the credentials earned for target jobs can uncover discrepancies between job requirements and candidate qualifications, highlighting where employers may be overlooking potential candidates in the labor market



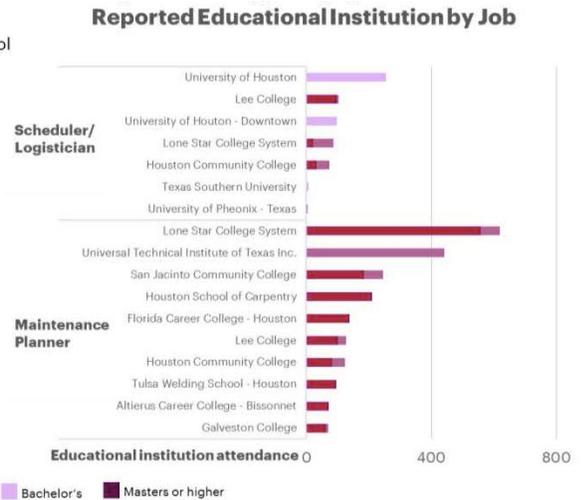
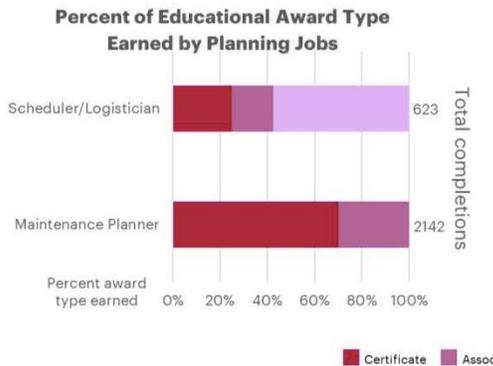
**Figure 37: Education Information for Analytical Jobs [17]**

Identifying institutions that grant credentials for our target jobs can help identify outreach opportunities to make these credentials more accessible to DACs



**Figure 38: Education Information for Planning and Scheduling Jobs [17]**

Educational pathway details, including institution-reported attendance and awards, was compiled via AI data-scraping. The tool utilizes 2021 Integrated Postsecondary Education Data System (IPEDs) data to aggregate relevant education pathways



**Figure 39: Target Job Education Pathways**

Role	Description	Education Pathways	Specific Education
H <sub>2</sub> Mechanical Technician	Inspect, repair and troubleshoot for mechanical components	High school/GED Associate's degree	Certificate of Qualification: Industrial Mechanic/Millwright
H <sub>2</sub> Scheduler (Pipeline, Trucking, Production) Logisticians	Coordinate delivery of pipeline connections/production/trucks; ensure continuous supply by planning, analyzing, optimizing and coordinating distribution	Post-secondary certificate Associate's degree	Certification in business, commerce or related discipline
H <sub>2</sub> Data Analyst	Identify and collect data; clean and analyze data; interpret results; conduct predictive analytics	Bootcamps Associate's degree Bachelor's degree	Computer Engineering Information Technology Engineering Software Development Data analytics bootcamps
H <sub>2</sub> Operator	Oversee day to day operations of hydrogen production/chemical operations/power plant; troubleshoot equipment; issue work permits to maintenance; perform safety responsibilities with assets	High school/GED	N/A
H <sub>2</sub> Maintenance Planner	Develop preventive and predictive maintenance plans for the lifecycle of key electrical and mechanical equipment; track best practices for maintenance	Post-secondary certificate Associate's degree Bachelor's degree Significant experience	Certificate of Qualification: Industrial Electrician, Industrial Mechanic/Millwright or Instrumentation Technician
H <sub>2</sub> Instrument & Electrical Technician	Inspect, repair and troubleshoot for electrical and electronic equipment, components (AC/DC motors, programmable logic controls, wiring, etc.)	High school/GED Post-secondary certificate Associate's degree	Certificate of Qualification: Instrumentation Technician Certificate of Qualification: Industrial Electrician
H <sub>2</sub> Welder	Responsible for welding and joining metal components to construct, repair and maintain equipment, pipelines and infrastructure; ensure that all welding activities meet industry standards and safety regulations	High school/GED Post-secondary certificate	Certificate of Qualification: Welder
H <sub>2</sub> Rig Crew Hand	Operate the machine and equipment used to drill CO <sub>2</sub> injection wells; perform maintenance, known as workovers, on CO <sub>2</sub> wells; perform remedial treatments to ensure well integrity is maintained for the life of the well	High school/GED	Oilfield safety certifications (might be needed)
H <sub>2</sub> Safety Officer/OHS Technician (HSSE)	Develop and implement programs around environment, health and safety systems; monitor compliance with safety legislation; develop emergency response procedures; keep up-to-date with changes in laws, codes and standards	Post-secondary certificate Associate's degree	Occupational health and safety
H <sub>2</sub> Regulatory Analyst & Compliance Specialist	Analyze federal and other regulations to remain in compliance; coordinate compliance submissions to regulators; monitor new and amended laws; engage internal stakeholders to ensure alignment in regulatory applications and responsibilities	Associate's degree Bachelor's degree	Business, Accounting, Environmental and Science disciplines

# Appendix B: Target Personas

Figure 40: Selected DAC Personas [17] [24] [50] [51]

Occupation Group	Target DAC Job	Skills Match		Incentives & Impact			
		DAC Population Estimate	Skill Transferability to H <sub>2</sub> Jobs	Average Salary (k)	Risk of Automation	Employment Change 2021-2031	Outsourcing Risk
Construction and Extraction Occupations	Carpenters	9K	76%	\$45k	Med	15%	Low
	Construction Laborers	28K	74%	\$37k	High	19%	Low
	Electricians	13K	78%	\$53k	Low	14%	Low
	Operating Engineers and Other Construction Equipment Operators	10K	88%	\$48k	High	17%	Low
	Plumbers, Pipefitters and Steamfitters	9K	87%	\$56k	Low	17%	Low
	Service Unit Operators, Oil and Gas	4K	87%	\$48k	High	19%	Low
Installation, Maintenance, and Repair Occupations	Automotive Service Technicians and Mechanics	5K	87%	\$48k	Med	8%	Low
	Control and Valve Installers and Repairers, except Mechanical Door	1K	79%	\$50k	Med	15%	Low
	Maintenance and Repair Workers, General	11K	73%	\$44k	Med	14%	Low
Management Occupations	Food Service Managers	1K	82%	\$59k	Low	21%	Low
Office and Administrative Support Occupations	Bookkeeping, Accounting and Auditing Clerks	11K	60%	\$45k	High	6%	High
	Dispatchers, except Police, Fire and Ambulance	2K	67%	\$41k	High	11%	Low
	First-Line Supervisors of Office and Administrative Support Workers	12K	81%	\$62k	Low	7%	Low
	Office Clerks, General	19K	53%	\$42k	High	4%	Med
	Production, Planning and Expediting Clerks	3K	82%	\$52k	High	12%	Med
	Shipping, Receiving and Inventory Clerks	7K	65%	\$38k	High	8%	High
	Tellers	3K	71%	\$31k	High	4%	High
Production Occupations	Coating, Painting and Spraying Machine Setters, Operators and Tenders	2K	83%	\$40k	Low	12%	Low
	Computer Numerically Controlled Tool Operators	2K	81%	\$43k	Low	-2%	Low
	Electrical, Electronic and Electromechanical Assemblers, except Coil Winders, Tapers and Finishers	2K	69%	\$39k	Med	7%	Low
	Machinists	4K	92%	\$48k	Med	11%	Med
	Packaging and Filling Machine Operators and Tenders	2K	68%	\$33k	High	8%	Med
	Welders, Cutters, Solderers and Brazers	8K	78%	\$49k	High	13%	Low
Sales and Related Occupations	First-Line Supervisors of Retail Sales Workers	12K	74%	\$48k	Low	10%	Low
Transportation and Material Moving Occupations	First-Line Supervisors of Transportation and Material Moving Workers, except Aircraft Cargo Handling Supervisors	6K	76%	\$54k	Low	15%	Low

# Appendix C: Skills Matching

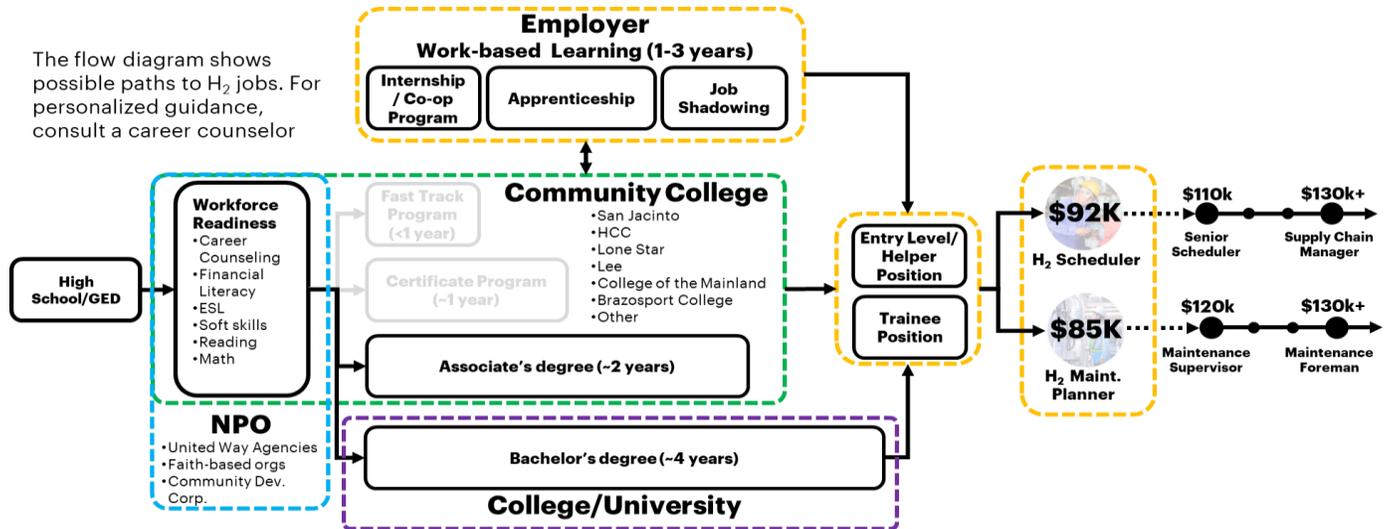
Figure 41: Target Jobs Matched to DAC Personas [17]

H <sub>2</sub> Role	Avg Salary	Risk of Automation	Employment Change	DAC Job Match	Match %	DAC Population Estimate	Avg Salary	Risk of Automation	Employment Change
 H <sub>2</sub> Instrument and Electrical Technician	\$80k*	Med	8%	Electricians	74%	13K	\$53k	Low	14%
				Maintenance and Repair Workers, General	67%	11K	\$44k	High	14%
				Automotive Service Technicians and Mechanics	82%	5K	\$47k	Med	8%
				Computer Numerically Controlled Tool Operators	78%	2K	\$43k	Low	-2%
				Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	67%	2K	\$39k	Med	7%
 H <sub>2</sub> Mechanical Technician	\$70k*	Low	11%	Construction Laborers	69%	28K	\$37k	High	19%
				Plumbers, Pipefitters, and Steamfitters	85%	9K	\$56k	Low	17%
				Automotive Service Technicians and Mechanics	85%	5K	\$47k	Med	8%
				Machinists	92%	4K	\$52k	Med	11%
				Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	83%	2K	\$40k	Low	12%
 H <sub>2</sub> Operator	\$75k	Med	-19%	Operating Engineers and Other Construction Equipment Operators	76%	10K	\$48k	High	17%
				Plumbers, Pipefitters, and Steamfitters	80%	9K	\$56k	Low	17%
				Automotive Service Technicians and Mechanics	80%	5K	\$47k	Med	8%
				Service Unit Operators (wireline), Oil and Gas	83%	4K	\$48k*	High	19%
				Packaging and Filling Machine Operators and Tenders	61%	2K	\$33k	High	8%
 H <sub>2</sub> & CCUS Rig Crew Hand	\$56k	High	19%	Construction Laborers	74%	28K	\$37k	High	19%
				Maintenance and Repair Workers, General	69%	11K	\$44k	High	14%
				Carpenters	76%	9K	\$48k	Med	15%
				Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	82%	2K	\$40k	Low	12%
				Control and Valve Installers and Repairers, Except Mechanical Door	79%	1K	\$50k	Med	15%
 H <sub>2</sub> Welder	\$65k*	High	13%	Construction Laborers	60%	28K	\$37k	High	19%
				Maintenance and Repair Workers, General	65%	11K	\$44k	High	14%
				Welders, Cutters, Solderers, and Brazers	78%	8K	\$49k*	High	13%
				Automotive Service Technicians and Mechanics	74%	5K	\$47k	Med	8%
				Machinists	82%	4K	\$48k*	Med	11%
 H <sub>2</sub> Maintenance Planner	\$85k*	Low	13%	Electricians	59%	13K	\$53k	Low	14%
				Maintenance and Repair Workers, General	57%	11K	\$44k	High	14%
				Plumbers, Pipefitters, and Steamfitters	66%	9K	\$56k	Low	17%
				Welders, Cutters, Solderers, and Brazers	52%	8K	\$51k	High	13%
				Production, Planning, and Expediting Clerks	55%	3K	\$52k	High	12%
 H <sub>2</sub> Scheduler Logistician	\$92k	Low	17%	First-Line Supervisors of Retail Sales Workers	72%	12K	\$48k	Low	10%
				Shipping, Receiving, and Inventory Clerks	65%	7K	\$38k	High	8%
				First-Line Supervisors of Transportation and Material Moving Workers, Except Aircraft Cargo Handling Supervisors	76%	6K	\$54k*	Low	15%
				Production, Planning, and Expediting Clerks	82%	3K	\$52k	High	12%
				Dispatchers, Except Police, Fire, and Ambulance	59%	2K	\$41k	High	11%
 H <sub>2</sub> Data Analyst	\$73k	Low	20%	Office Clerks, General	53%	19K	\$42k	High	4%
				First-Line Supervisors of Office and Administrative Support Workers	81%	12K	\$62k	Low	7%
				Bookkeeping, Accounting, and Auditing Clerks	60%	11K	\$45k	High	6%
				Tellers	71%	3K	\$31k	High	4%
				Food Service Managers	76%	1K	\$59k	Low	21%
 H <sub>2</sub> Regulatory & Compliance Specialist	\$86k	Low	14%	First-Line Supervisors of Office and Administrative Support Workers	79%	12K	\$62k	Low	7%
				Bookkeeping, Accounting, and Auditing Clerks	51%	11K	\$45k	High	6%
				Operating Engineers and Other Construction Equipment Operators	57%	10K	\$48k	High	17%
				First-Line Supervisors of Transportation and Material Moving Workers, Except Aircraft Cargo Handling Supervisors	73%	6K	\$57k	Low	15%
				Service Unit Operators, Oil and Gas	71%	4K	\$54k	High	19%
 H <sub>2</sub> Safety Officer/OHS Tech	\$70k*	Low	16%	Plumbers, Pipefitters, and Steamfitters	79%	9K	\$56k	Low	17%
				First-Line Supervisors of Transportation and Material Moving Workers, Except Aircraft Cargo Handling Supervisors	76%	6K	\$57k	Low	15%
				Service Unit Operators, Oil and Gas	81%	4K	\$54k	High	19%
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				Food Service Managers	77%	1K	\$59k	Low	21%

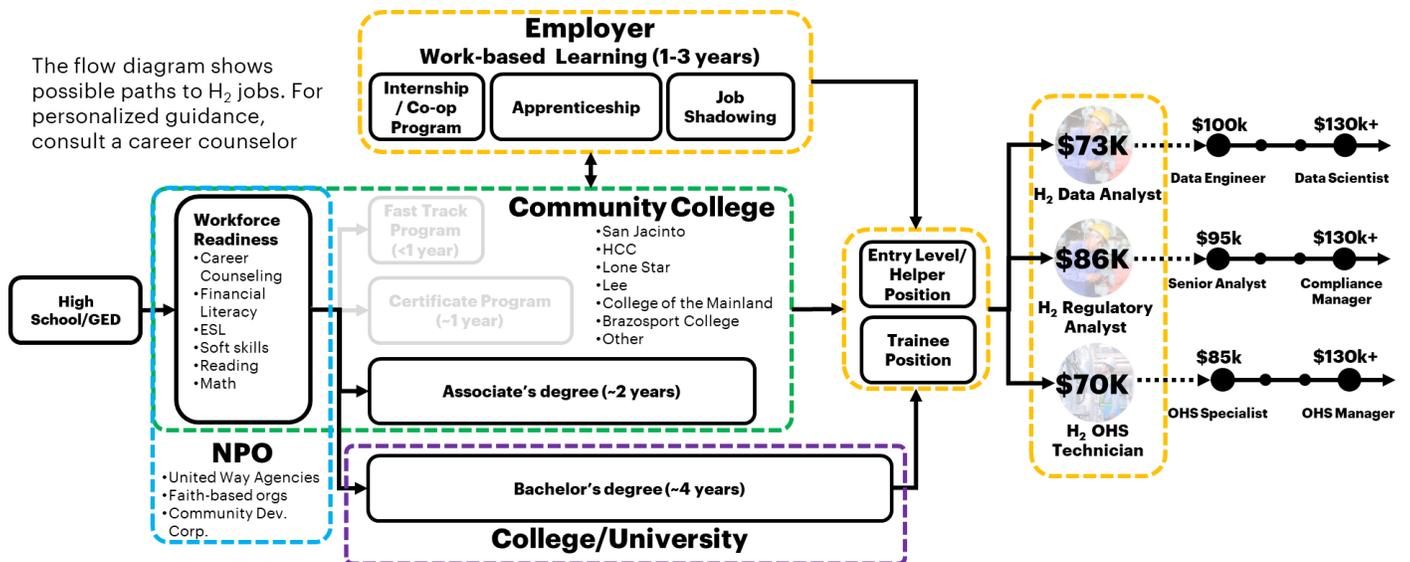
Adjustment made from SME input and Accenture Analysis

## Appendix D: Learning Journeys

**Figure 42: Planning and Scheduling Learning Journey: Typical Minimum Entry-Level Requirements for H<sub>2</sub> Jobs**



**Figure 43: Analytics Learning Journey: Typical Minimum Entry-Level Requirements for H<sub>2</sub> Jobs**



# Glossary

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**DACs (Disadvantaged Communities):** Areas identified by socioeconomic metrics that show significant disadvantages in terms of income, access to education and employment opportunities.

**Hydrogen Economy:** A proposed system of delivering energy using hydrogen. The hydrogen economy encompasses all aspects related to the production, transportation, storage and use of hydrogen as an energy product.

**Workforce Development:** Strategies and practices aimed at enhancing the skills and competencies of the workforce to meet the current and future needs of industries and economies.

**Employer-Driven User-Centered Approach:** A strategy in workforce development that prioritizes the demands and needs of employers while also considering the user experience of employees or job seekers in program design and implementation.

**Learning Journeys:** Tailored educational and training pathways designed to equip individuals with the necessary skills and qualifications for specific job roles, emphasizing a clear route from education to employment.

**Skills Matching:** The process of aligning an individual's skills and competencies with the requirements of available jobs, facilitating effective job placement and career development.

**“Earn As You Learn”:** These programs enable participants to gain skills and earn income simultaneously, facilitating access to new sectors without financial hardship.

**Stackable Credentials:** Flexible, accumulative qualifications that allow for tailored career development, supporting stepwise progression into higher-wage positions.

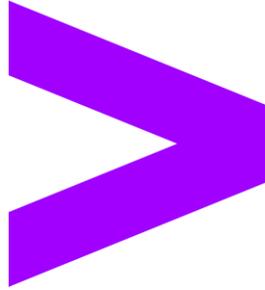
**Hidden Job Market:** The portion of the job market not advertised publicly, often accessed through networking, speculative applications or internal referrals, representing a significant volume of employment opportunities.

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