

# Workforce Development for the Future of Energy



**UH Energy**  
UNIVERSITY OF HOUSTON

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# About

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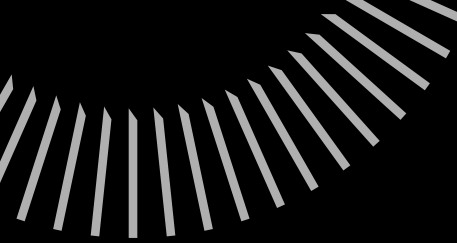
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The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of the state of Texas or the Department of the Treasury.



# Executive Summary: Workforce Development Supporting the Energy Mix of the Future

Energy has long been the workhorse of the Houston regional employment base, led by oil and gas. Even after decades of work to diversify the economy, energy retains a significant role, accounting for a quarter of GDP in the 12-county region.

But Houston, long known as the energy capital of the world, is now at a crossroads as efforts ramp up to avert the potentially catastrophic consequences posed by a warming climate, caused in part by carbon dioxide and other emissions stemming from the use of fossil fuels. Governments, industry, and nonprofit organizations are leading a global push for low-carbon alternatives to the fossil fuels that have been the bedrock of Houston's energy economy. If the region is to recast itself as the clean energy capital, it will have to straddle present and future, continuing to capitalize on its historic relationship with the traditional industry even as the energy transition changes what that industry looks like and how it operates.

Of immediate concern is what the transition will mean for the workforce – what jobs will be lost and gained, and how will workers, including a younger generation that is more diverse and more likely to be economically disadvantaged than previous generations, gain the skills needed to compete for jobs in the new energy ecosystem? How will leadership in those job training programs even know what skills to teach? And how should we go about ensuring that this new energy economy provides benefits for the widest range of workers, including those from communities that were previously left behind?

Details of the transition to a low-carbon energy system are still evolving. Many stakeholders see eliminating coal, oil, and natural gas as the only way to avoid damaging carbon dioxide and methane emissions. In that view, zero or low-carbon fuels, including hydrogen, solar, wind, and geothermal, will be the energy sources of the future. Others, however, contend the focus should be not on specific fuels but rather on eliminating harmful emissions through the use of carbon capture, utilization, and storage and other emerging technologies. Under both scenarios, oil and gas operations will continue for years, perhaps decades, and will continue to employ substantial numbers of Houston-area residents.

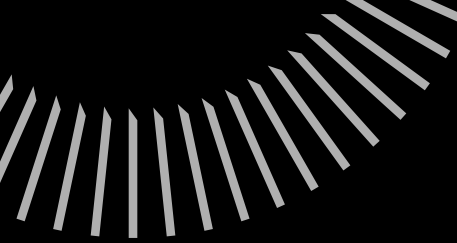
Still, change is coming. Both the expanded use of clean fuels and low-carbon versions of traditional fossil fuels will require new types of jobs, and new skillsets. Employers looking to fill the jobs will have to compete for workers. To better understand the workforce

If the region is to recast itself as the clean energy capital, it will have to straddle present and future

needs of the energy transition, the University of Houston Division of Energy and Innovation convened a workshop in June 2023, attended by more than 50 experts, including industry leaders, academics, and community leaders, along with a select group of UH students. This white paper draws from that conversation and additional research.

While employment in the oil refining and petrochemical industries has remained stable, employment in other energy sectors has declined even as production has grown, in part because of automation. New and emerging fuels and technologies promise to reverse that trend – the hydrogen sector alone has the potential to create 180,000 jobs by 2050.

Those jobs will require a variety of educational backgrounds, according to work on the topic done by the Greater Houston Partnership, the Houston Energy Transition Initiative, and Accenture. While that seems to be a good fit for Houston – about one-third of residents 25 and older in the metro area have at least a bachelor's degree, according to the U.S. Census Bureau, and another 28% have an associate degree or at least some college – it is likely to leave workers behind, especially if we are unable to make significant inroads into disadvantaged and underrepresented communities. As the energy transition advances, it will be important to ensure those communities have equal opportunity to benefit from the transition.



## Future Skills

Technology is changing rapidly, meaning skill requirements for future jobs are expected to change quickly, too. Job training and retraining must emphasize a core set of skills that allows workers to adapt to a changing workplace. But in general, employers said it is important for employees to have:

- Digital literacy, including a basic understanding of artificial intelligence and how to use AI technology to reduce waste and increase productivity.
- A basic understanding of the business, including its commercial drivers.
- An agile mindset, able to adapt to changing requirements.
- A sustainability perspective.
- Good interpersonal communication skills.
- English-language proficiency is often required for employment at U.S.-based companies.

## Delivering Job Training

Preparing the workforce to fill these new jobs won't be met with a one-size-fits-all approach. Industry will need to continue to provide in-house training opportunities. Secondary schools, community colleges, and four-year colleges and universities must step up, offering necessary training and ensuring students and the community at large are aware of future job opportunities and of the skills needed to succeed in them. Community-based training programs can provide another avenue.

It's not just about job training for entry level workers. The changing energy industry will displace a significant number of current workers, accelerating the demand for reskilling or upskilling to ensure they are able to move into new jobs.

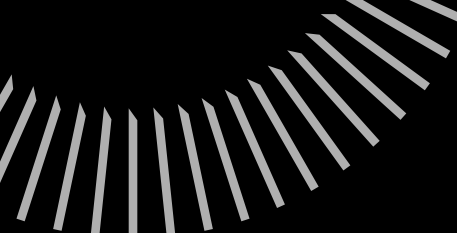


## Future skills needed:

- Digital literacy
- Business understanding
- Agile mindset
- Sustainability perspective
- Good communication skills
- English-language proficiency

These options offer an opportunity for industry to expand its workforce reach into traditionally underrepresented and disadvantaged communities, which have higher rates of unemployment, underemployment, and skills gaps than other groups, raising barriers to entry into the workforce. We should prioritize workforce development pathways that can tap into these communities. Beyond job training, that may include the need for wrap-around services, to include:

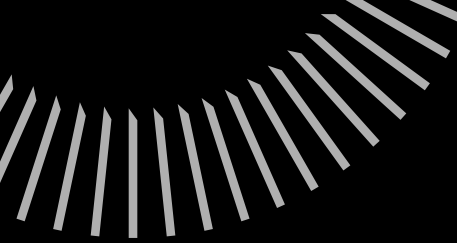
- Outreach to help students and their families understand what jobs are and will be available as part of the energy transition and what academic, training, and other preparation students and other potential workers need to qualify for them.
- Help with childcare, transportation, and applying for financial aid.
- An understanding that people from disadvantaged communities may be hampered by a lack of softer skills, such as understanding how to act and dress for a business meeting and filling that gap.



## Recommendations

We propose a collaborative approach among government, academia, community groups, and industry to take this analysis of the workforce issues associated with the energy transition and adopt specific tactics and strategies to address the issues. Among our recommendations:

- Industry must take the lead in working with secondary schools, post-secondary institutions, and other training organizations to communicate what energy jobs will be available and what skills will be needed.
- Internships, apprenticeships, pre-apprenticeships, and similar programs offer high success in providing hands-on training, including paid training opportunities. More should be encouraged and funded.
- Community colleges should create systems that allow students to convert completed non-credit training to college credits.
- Wrap-around services to help job seekers with childcare, transportation, and other barriers to employment should be funded and expanded.
- Outreach to students and their families should begin earlier, ensuring they are aware of future career opportunities and needed steps to get there well before a student reaches the final years of high school. That includes things like career fairs and STEM outreach programs.



# 1. Background

Since early in the 20th century, the Houston region has been known as the energy capital of the world. Based on data from the Greater Houston Partnership (GHP), which defines the region as the 12 counties surrounding metropolitan Houston, 25% of the region's GDP comes from various sectors of the energy industry; the area is home to more than 4,700 energy companies, including 18 listed among the Fortune 500.<sup>i</sup> Almost half, or 44%, of the nation's publicly traded exploration and production companies call Houston home.

Historically, the oil and gas industry has held an outsized role in that energy picture. Houston-based companies own 63% of U.S. natural gas pipelines and 33% of U.S. oil pipelines. Among downstream industries, 45% of total U.S. refinery production is in Texas, and 44% of the U.S. total base petrochemical manufacturing capacity is here. There are 591 chemical manufacturing establishments in the region.<sup>ii</sup>

The potentially catastrophic consequences of a warming climate, caused in part by carbon dioxide emissions stemming from the use of fossil fuels, is seen globally as an existential threat. Both governments and industry, spurred by citizen activists and investors, are working to address the challenge, with increasing attention to the excessive levels of greenhouse gases in the atmosphere.

As a result, the energy system is in transition, moving to cleaner sources of fuel. In the Houston region, both local governments and nonprofit organizations, along with energy companies based here, are moving to reduce emissions and adopt a new, low-carbon energy system.

In 2022, renewable energy accounted for 13.1% of total primary energy consumption and about 21.5% of total utility-scale electricity generation in the U.S.<sup>iii</sup>, and that is growing rapidly. According to the GHP, Houston had more than 150 solar-related companies and more than 15 battery storage companies in 2023.<sup>iv</sup> Texas ranks first among the states in the U.S. for wind capacity, both installed and under construction, and second in the U.S. for solar capacity.<sup>v</sup>

# 13.1%

Renewable energy accounted for 13.1% of total primary energy consumption

# 21.5%

Renewable energy accounted for about 21.5% of total utility-scale electricity generation in the U.S.

## Renewable Power's Rise in the United States and Texas' Role

# #1

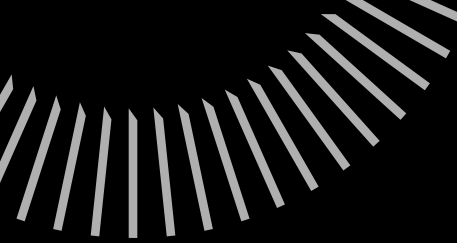
Texas ranks **1st** among the states in the U.S. for wind capacity.



# #2

Texas ranks **2nd** in the U.S. for solar capacity.





Oil and gas companies in the region have also launched efforts to decarbonize the energy system. Projects to reduce emissions and improve efficiency throughout the oil and gas value chain are ongoing, with fresh impetus coming from federal reporting requirements for methane and other greenhouse gas emissions. In addition, the skills and experiences of the incumbent energy industry are being deployed to develop new components of the energy system, including as hydrogen fuels, carbon capture use and sequestration (CCUS), geothermal energy, and many forms of long-duration energy storage.

The energy transition is stimulating significant technology innovation in the region, with over 220 venture-backed clean-tech and climate-tech startups and companies based here; 35+ incubators, accelerators and programs that support energy innovation and start-ups, and more than a dozen colleges and universities developing the research and talent needed to support the transition. Clean energy ranked fourth in funding among tech verticals in the region in 2021, surpassing the oil and gas industry. More than \$4.3 billion in venture capital has been invested over the past five years, and the Houston metro area is home to more than 8,800 tech-related firms.<sup>vi</sup>

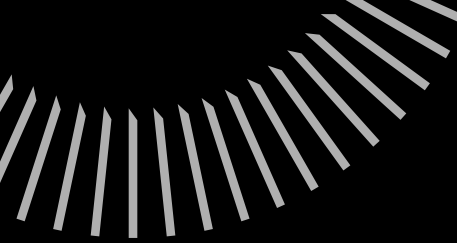
To sustain this growth and ensure that Houston becomes the clean energy capital of the world, the workforce needed to support the transition must change and grow. To explore the workforce needs of the energy transition, the University of Houston Division of Energy and Innovation convened an Energy Conversation on the topic in June 2023, drawing more than 50 experts, including industry leaders, academics, and community leaders, along with a select group of UH students. This white paper flows from that conversation and additional research; the workshop was governed by Chatham House rules, thus, speakers and organizations will not be identified. Keynote presentations were provided by McKinsey and Accenture. (For a copy of the agenda, see Appendix A.)

Topics included:

- Workforce Needs for the Future Energy Mix
- Preparing Workers
- Reskilling and Upskilling Displaced Workers

This paper focuses on how to most effectively meet the workforce needs of the energy transition in the Greater Houston area and beyond, ensuring the greatest possible number of career opportunities flow to members of traditionally underrepresented and disadvantaged communities. We provide concepts that point the way, preliminary outlines for potential programs, and recommendations for future work based on insights that emerged from the workshop.





## 2. Setting the Stage

For several years now, Accenture, the Greater Houston Partnership, the Houston Energy Transition Initiative (HETI), and McKinsey have provided direction and insight into what the energy transition means for Houston and its workforce. Key data provided by these organizations included:

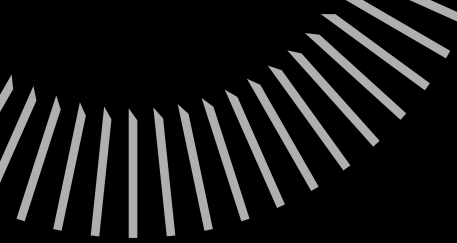
- 40% of Houston's employment is tied directly or indirectly to energy.
- Employment in the refining and petrochemical industries has remained stable. Outside of these sectors, 125,000 primary energy jobs and 66,000 induced energy jobs have been lost since 2014.
- The hydrogen economy alone has the potential to create 180,000 jobs by 2050.
- Roughly 921,000 energy-related jobs (30% of the total) are considered mid-skill, i.e., those that require a high school diploma or equivalent.
- 855,000 Houstonians aged 25 or older do not have the minimum credentials for mid-skilled jobs.

# 40%

of Houston's employment is tied directly or indirectly to energy.

# 180,000

jobs could be created by the hydrogen industry by 2050



### 3. The Energy Transition Opportunity

Any discussion of the energy transition, especially as it is expected to impact the Houston region, must start with a clear understanding of the current energy situation. Houston is known as the energy capital of the world, and in practice that means that it plays a leadership role in the oil and gas industry. The fact that the world is transitioning to low-carbon sources of energy in order to limit future warming – and that Houston strives to become the clean energy capital of the world – does not mean that oil and gas will disappear anytime soon.

Oil and gas upstream, midstream, and downstream efforts will continue to provide a significant number of jobs. At the same time, the growth of renewable electricity production, distribution, and use has and will continue to be a major source of new jobs for energy workers.

Workforce opportunities linked to the energy transition are in addition to those and will transform the workforce and all sectors of the economy. UH Energy's analysis of workforce development, in both traditional energy industry sectors and in new and emerging sectors, including those involving technologies that can support the state's transition to net-zero, found that the largest workforce gains will be supported by the pursuit of an all-of-the-above energy strategy, rather than through selectively prioritizing capacity additions in either renewables and storage or liquid fuels and carbon capture, utilization and storage (CCUS). The highest gains for the workforce and economy are achieved when the capacity addition of renewables is balanced with that of liquid fuels, biomass, hydrogen, CCUS, and carbon dioxide removal (CDR). New and emerging technologies like hydrogen, CCUS, and CDR can be supported with a highly skilled workforce from the coal, oil, and natural gas sectors, which will lose jobs through the transition. The emerging hydrogen ecosystem alone is expected to create about 180,000 new jobs in the Greater Houston area. Of these, about 20,000 jobs will be in the mid-skills segment, offering an average annual income of approximately \$75,000.

According to the work done by the GHP, HETI, and Accenture, jobs in the hydrogen industry will span a variety of educational backgrounds. But while overall educational attainment in the Houston region might be sufficient to meet the requirements for these jobs, workshop participants noted that is unlikely to hold true in disadvantaged and underrepresented communities, presenting an impediment if we are concerned about not leaving workers behind.



The emerging hydrogen ecosystem alone is expected to create about 180,000 new jobs in the Greater Houston area.



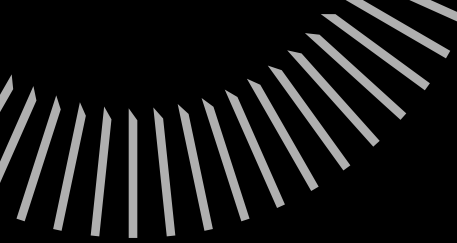


Figure 1. A variety of educational backgrounds will prepare workers for the hydrogen economy.

## H<sub>2</sub> jobs are suitable for varying edu. backgrounds

Roles	Descriptions	Education Pathways	Specific Education
H <sub>2</sub> Mechanical Technician	Inspection, repair, and troubleshooting for mechanical components	High School/GED Associate's degree	Certificate of Qualification in Industrial Mechanic or Millwright
H <sub>2</sub> Scheduler (Pipeline, Trucking, Production) Logisticians	Coordination 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 data, analyze data, interpret results, conduct predictive analytics	Bootcamps Associate's Degree Bachelor's Degree	Computer Engineering, Information Technology Engineering, Software Development; Data analytics bootcamps <sub>H<sub>2</sub></sub>
H <sub>2</sub> Operator	Oversee day to day operations of hydrogen production/chemical operations/power plant, troubleshoot equipment, issues 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	Industrial electrician, Industrial mechanic/Millwright or Instrumentation technician
H <sub>2</sub> Instrument & Electrical Technician	Inspection, repair, and troubleshooting 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 in Instrumentation technician; Certificate of Qualification in Industrial Electrician
H <sub>2</sub> Welder	Responsible for welding and joining metal components to construct, repair, and maintain equipment, pipelines, and infrastructure. They must 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 implement programs around environment, health, and safety systems, monitor compliance with safety legislation, develop emergency response procedures, keep update with changes in laws, codes, and standards	Post Secondary Certificate Associate's Degree	Occupational health & safety
H <sub>2</sub> Regulatory Analyst and Compliance Specialist	Analyze federal and other regulation to be 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 & Science disciplines

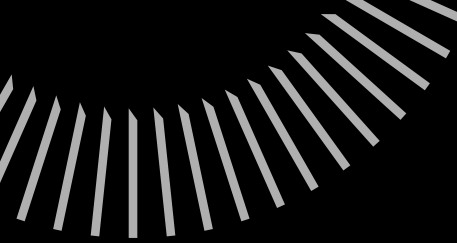
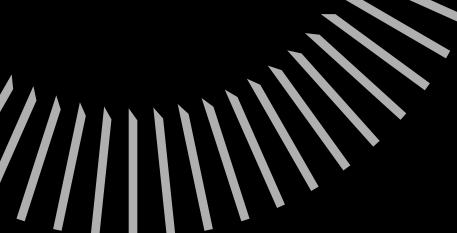


Figure 1 continued. A variety of educational backgrounds will prepare workers for the hydrogen economy.

## Job duties & typical educational attainment align well with the requirements for target H<sub>2</sub> jobs

Job	BLS Title	Description <sup>1</sup>	Education Pathways <sup>1,2</sup>
Automotive Service Technicians and Mechanics	Automotive Service Technicians and Mechanics	Repair and maintain vehicles	Technical program preferred, High school diploma or equivalent
Bookkeeping, Accounting, and Auditing Clerks	Bookkeeping, Accounting, and Auditing Clerks	Maintain financial records and ensure accuracy of financial transactions	No formal educational credential, high school diploma or equivalent
Carpenters	Carpenters	Construct and repair building frameworks and structures	Apprenticeship or OTJ training
Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	Set up and operate machines that coat, paint, or spray products and surfaces	High school diploma or equivalent
Computer Numerically Controlled Tool Operators	Computer Numerically Controlled Tool Operators	Use computer-controlled machines to produce precision metal parts and components	High school diploma or equivalent
Construction Laborers	Construction Laborers	Assist in physical construction tasks on job sites	No formal educational credential, high school diploma or equivalent
Control and Valve Installers and Repairers	Control and Valve Installers and Repairers, Except Mechanical Door	Install and repair control and valve systems used in various industries	High school diploma or equivalent
Dispatchers	Dispatchers, Except Police, Fire, and Ambulance	Coordinate transportation or emergency services	High school diploma or equivalent
Electrical, Electronic, and Electromechanical Assemblers	Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	Assemble electrical and electronic components	High school diploma or equivalent
Electricians	Electricians	Install and maintain electrical systems in residential, commercial, and industrial settings	High school diploma or equivalent, apprenticeship or vocational school
First-Line Supervisors of Office and Administrative Support Workers	First-Line Supervisors of Office and Administrative Support Workers	Supervise and coordinate the activities of administrative and clerical staff	High school diploma or equivalent
First-Line Supervisors of Retail Sales Workers	First-Line Supervisors of Retail Sales Workers	Supervise and coordinate the activities of retail sales staff	High school diploma/GED or Associate's degree

Source: 1. Occupational Outlook Handbook, Bureau of Labor Statistics 2. LaborInsights  
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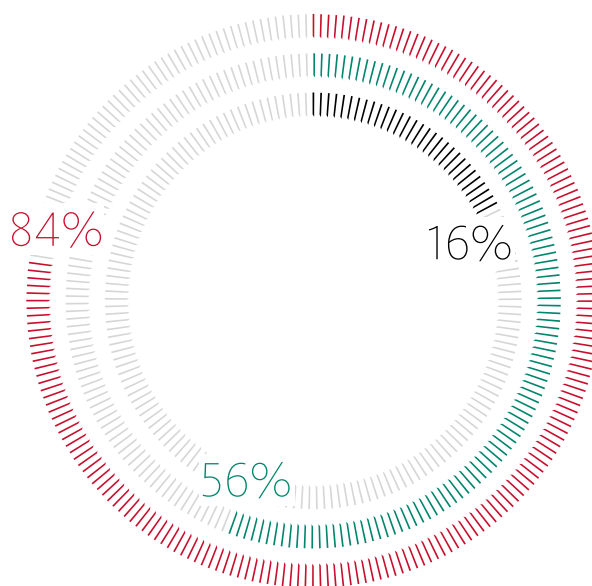


## 3.1 Focusing on Disadvantaged Communities

Workforce needs will change as the energy economy evolves. Although that presents a challenge, it also provides an opportunity to ensure that people living in underrepresented and disadvantaged communities (DAC) can participate in the progress. Traditionally, these communities have faced higher rates of unemployment, underemployment, and skills gaps than other groups, and they will continue to face higher barriers to entry into the workforce and social mobility if we do not prioritize workforce development pathways to tap into these communities during the energy transition.

Just more than half, or 56%, of adult Houstonians living in a disadvantaged community have only a high school diploma/equivalent or less, and 84% lack a bachelor's degree. An Accenture/GHP study provided a summary of challenges for these communities that includes childcare (which impacts 83% of the population), access to transportation (47%), financial barriers (44%), and language and basic work skills gaps (19%). Actionable steps to alleviate the childcare challenges for disadvantaged communities include partnering with local nonprofit childcare organizations and offering flexible work schedules. Similarly, improved public transit and transit subsidies can address transportation challenges; grants, scholarships, internships, and earn-while-you-learn programs can lower financial barriers, and the integration of English as a Second Language (ESL) and adult continuing education in the workplace with flexible schedules can offer better learning outcomes for language and basic work skills. In addition to these broad and general recommendations, we discuss more ways to bring workforce opportunities to disadvantaged communities in the region.

Education and economic challenges in Houston's disadvantaged communities



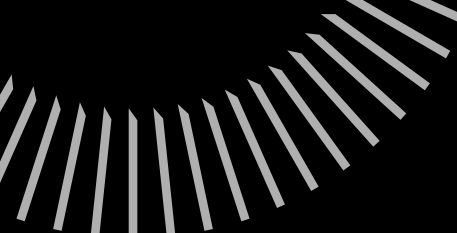
- **84%** lack a bachelor's degree
- **56%** have high a school diploma/equivalent or less
- **16%** have a college education



## 4. Workforce Needs to Support the Energy Transition

Workforce development goes well beyond merely identifying the jobs that will be available in the future. Preparing our workforce to fill those jobs, boosting the regional economy even as the focus shifts to encompass new, lower-carbon energy systems, won't be met with a single approach. Industry will need to continue to provide in-house training opportunities. Secondary schools, community colleges, and four-year colleges and universities will have major roles to play. And community-based training programs will offer other potential workers a way into fast-growing and important fields. Relevant issues and solutions discussed at the workshop included:

- Need for employer-led strategies
- Critical skills needed for professional development
- Adjusting to demographic and generational shifts in the workplace
- Need for wrap-around community services
- Upskilling and reskilling programs
- Assisting displaced workers
- Keeping early-career employees engaged
- Assisting underemployed workers
- Focusing on underserved and disadvantaged communities
- Importance of career awareness
- Mentorships, apprenticeships, and internships
- Creating career paths



## 4.1 The Role of Educational Institutions

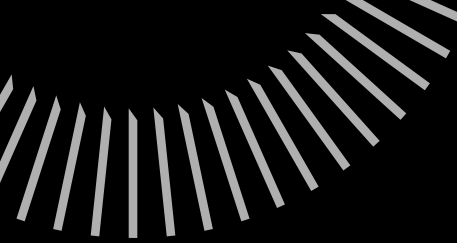
Especially at this early stage of workforce development for the energy transition, collaboration is foundational. Community representatives expressed the need for companies to develop a strategic view of their workforce needs and share it with the other stakeholders. Industry must work with K-12 institutions, community colleges, and training programs. Middle and high school faculty and counselors must also understand the “marketplace for human capital” in their communities, that is, they must understand the world their students will be entering. Community colleges and universities must share this understanding.

Houston area community colleges and trade schools already offer programs tailored to our region, preparing students for jobs in local industries. They serve a wide range of student populations and remain the primary source of postsecondary education for underrepresented and disadvantaged communities. Through carefully designed transfer programs easing the path between community college and four-year schools, community college systems in the state serve as a pipeline for four-year colleges and universities, especially public universities. Four-year colleges and universities are engaged in helping mid to senior-level employees map evolving energy needs and anticipate the needs of the future workforce. University programs can provide the current and future energy workforce with new competencies and skills, including an entrepreneurial perspective and the technological proficiency necessary for the transition. Academia has and will continue to play a vital role in bridging the skills and knowledge gap in the energy industry.



Academia has and will continue to play a vital role in bridging the skills and knowledge gap in the energy industry.





## 4.2 A Major Role for Employers

Employer-led strategies are also needed. Training in the energy industry traditionally has been employer-led and often involved classroom-based sessions combined with on-the-job learning to foster an environment of continuous learning, increased productivity and employee engagement, and employee loyalty. Experienced supervisors have been critical to the success of these programs by providing workers with accurate, first-hand information about job roles, responsibilities, and qualifications, and they will continue to shape workforce development through the energy transition.

But the employers' role in workforce development will also change as a result of the energy transition, and the major energy companies have begun to anticipate the relevant guidance and training that will be needed. They can effectively align the workforce development strategies of academia and community-based organizations with the evolving needs of the business. Close collaboration with employers must be a key plank in any strategy that flows from the current initiative. While job postings and other labor market data provide a good indication of current employment opportunities, meaningful discussions with employers are needed to validate the data and determine future employment opportunities and needs in greater detail.

Employers must clearly define job qualifications at every stage. In an industry as rapidly evolving as energy, precise job descriptions and clear articulation of the required and desired qualifications is crucial. Clear delineation of roles helps prospective workers understand what skills they need to develop or enhance. This clarity should guide training programs, both those offered by the companies themselves and those offered by outside organizations and institutions, ensuring they are focused, efficient, and lead to a pathway to careers.

However, not all companies will have the same strategies or advantages. While the major energy companies have more resources, talent, and dedicated teams for workforce development, smaller companies often lack the resources to provide the kind of employee development discussed here. A regional supportive workforce development ecosystem could address this challenge by providing resources and a shared platform for learning, aiding smaller companies in staffing for the energy transition. Strategic planning and collaborative efforts among all stakeholders to map skills, competencies, and analyze gaps will help smaller companies better adapt to changing workforce needs and ensure that resource limitations do not hinder their growth.



Close collaboration with employers must be a key plank in any strategy that flows from the current initiative.







## 4.3 Critical Skills Needed

Workforce development starts with communicating a clear vision of the nature of future work, a reasonable forecast of salary and benefits, and the skills and experiences needed to succeed. Understanding this across the value chain as projects are conceived, planned, and executed is crucial. Precisely and accurately defining skills needed for a particular job will be important. Often industry's default position is to require an associate or bachelor's degree, when it may not be required and may not be an accurate predictor of future success.

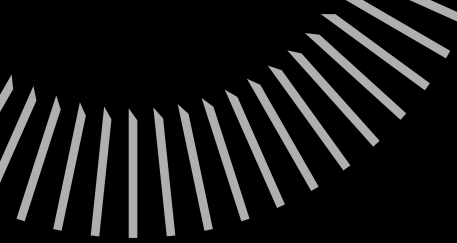
It is also critical for employees to understand the value drivers of the business, in addition to the technical skills or competencies of a particular job. Employers who participated in the workshop said it is important that job seekers have the following:

- Commercial perspective – understanding how companies make money and how they make economic decisions.
- Digital literacy – including a basic understanding of artificial intelligence and how to leverage that technology to reduce waste and increase productivity.
- Agile Mindset – Be flexible with an ability to adapt to the changing requirements of work.
- English language proficiency is often required for employment for U.S. based companies.
- Sustainability perspective – in today's world of work, sustainability is everyone's job.
- Personal effectiveness – developing and maintaining good interpersonal communication skills is essential both inside and outside the company.



### Critical skills needed:

- Commercial perspective
- Digital literacy
- Agile Mindset
- English language proficiency
- Sustainability perspective
- Personal effectiveness

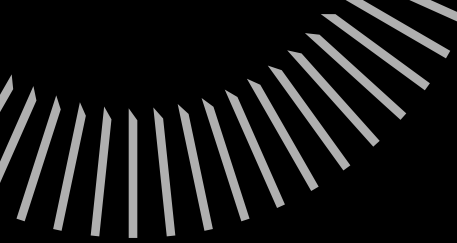


Future workers also need to be continuous learners to accommodate the change the energy transition is bringing. Technology is moving rapidly; therefore, job requirements will change quickly, too. Employees must have a core set of skills that allow them to grow and adapt to the changing workplace.

Several studies, frameworks, and programs already exist, and where appropriate these can inform the current work. Examples include:

- U.S. Department of Energy Community Benefit Plan resources offer documents, examples, and recommendations on meeting requirements for community benefit plans as a part of most federally funded programs.
- Texas Pathways Institute - Mapping Pathways to Student Post-Completion Goals (<https://tacc.org/tsc/texas-pathways-institute>) provides training and thought leadership for community colleges seeking to meet the reskilling and upskilling needs of the Texas workforce.
- Texas Higher Education Coordinating Board offers programs to help working Texans identify an education path that will lead to lasting careers with greater earning potential and low or no debt.
- Pre-apprenticeship training programs are designed to prepare individuals to enter and succeed in a registered apprenticeship program.
- Registered apprenticeship programs provide a way to learn a skill while getting paid. Participants learn on the job and take classes related to the work.
- Gulf Coast AFL-CIO apprenticeship programs – Harris County, Texas, has approved a \$9.1 million contract to double enrollment in local union apprenticeships in the building and construction trades, as well as creating two new apprenticeships in the entertainment and transportation industries.
- Texas Workforce Commission (TWC) Skills Development Fund allows public community colleges and technical colleges to apply for funding to upgrade the skills and wages of the Texas workforce.
- U.S Workforce Innovation and Opportunity Act (WIOA) provides funding and other resources to individuals and employers and provides individualized career and training services to recipients of public assistance, other low-income individuals, and those who lack basic skills.
- High School Career Technology Education programs provide students with in-demand skills while preparing them for post-secondary degrees in technical fields. Programs include career-oriented classes, internships, apprenticeships, and in-school programs designed to foster work readiness.
- Brazoria County Program Demand Gap Analysis – This analysis was undertaken by the Economic Development Alliance of Brazoria County, Texas, and provides an understanding of the county economy, and the demand for skilled labor and the training resources needed.
- U.S. Chamber of Commerce Talent Pipeline Management program provides employers and their education and workforce development partners with strategies and tools to co-design talent supply chains that connect learners and workers to jobs and career advancement opportunities.

Each of these programs and tools are beneficial, but they tend to be top-down in their approach. Not all address the root causes of the disconnect between some communities, especially those that are disadvantaged and underrepresented, and the labor market. Additional work on the causes and wrap-around services to address these issues is warranted.



## 4.4 Adjusting to Demographic and Generational Shifts in the Workplace

Numerous factors contribute to an evolving workforce landscape, including generational differences, societal changes, political climate, industrial competition, and globalization.

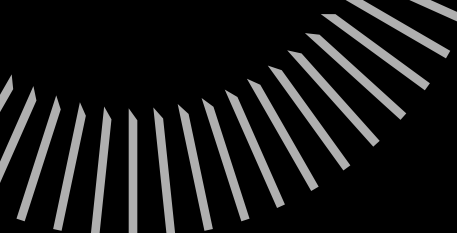
For example, students today who are interested in and concerned about sustainability want a job or career that contributes to a low-carbon future. This is just one example of the importance of linking the job/career to the values of the potential worker. Workshop participants observed that students from Gen Z, today's high school and college students and young adults, see climate change as an existential threat, with the traditional energy industry as a principal cause. Therefore, it is a challenge to make employment in the energy transition desirable to a sustainability-driven student, especially while the energy transition is still highly connected to the traditional energy industry. However, many energy companies today are seeking employees who can help them reduce emissions and operate more sustainably. In this way, a perceived industry deficiency can be turned into an opportunity.

Interestingly, here too the employer plays an important role in the workforce development process. The entire workforce development community depends on a clear understanding of the jobs that will be needed in the future. While traditionally job opportunities have spurred efforts to improve the supply of skilled workers, it will take time to create awareness of these new energy transition jobs and for workers to gain the skills to fill them. We can't afford to wait for demand for these jobs to develop in the old way – instead it will be critical to work with employers to clearly identify future demand, inverting the process so that workers with the appropriate skills and experiences are ready when the jobs emerge.

As part of that, it is important to understand the demographic shift underway in the U.S. In Texas, there are a growing number of people looking for work for whom English is not their first language. Reaching them will require extra consideration for dual language outreach and a variety of communication vehicles to ensure that prospective workers are aware of the opportunities. There are a variety of programs available to address the language barrier, both for younger students and for adults. Dual Language Immersion (DLI) programs have been a part of Texas public education since 1973.

Currently, the state runs six programs to support bilingual students.<sup>vii</sup> Houston Independent School District (HISD) also supports dual-language instruction in its classrooms where a combination of native speakers of the partner language and English speakers are taught together in to develop full bilingualism and bi-literacy for both groups of students.<sup>viii</sup>

The Texas Workforce Commission also helps adults learn new skills by teaching reading, writing, math, and English through its Adult Education and Literacy programs and helps students earn a high school diploma or its equivalent and prepare for college and jobs.<sup>ix</sup>



## 4.5 Wrap-Around Community Services

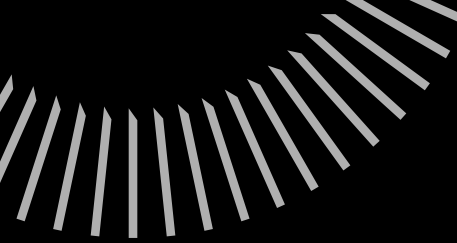
Workshop participants recognized job training alone won't be enough to ensure all potential workers are able to participate in the energy transition workforce. Community based wrap-around services are needed to remove obstacles and properly connect workers to job opportunities. Some students, for example, need to enter the job market before or immediately after completing high school in order to help support their families, with no opportunity to continue job training without financial assistance. Family immigration status may complicate applying for financial aid. Resolving these types of issues can smooth entry into the skilled workforce.

Students from underserved communities may also lack softer skills, and their backgrounds and diverse perspectives of work must be understood and accommodated to set them up for success. "If you've never known anyone who goes to a business meeting in the workplace, you likely have no understanding of what a meeting is, how it works, how you participate, what behavior and outcomes are expected, and how you can fit into that rubric," workshop participants were reminded. For prospective employers, being willing to share the lessons from their early experience in the workforce, understanding diverse perspectives, and "connecting the dots" between education/training/experience and work, is critical. This is a massive challenge, especially for small and medium size companies.



For prospective employers, being willing to share the lessons from their early experience in the workforce, understanding diverse perspectives, and "connecting the dots" between education/training/experience and work is critical.





## 4.6 Reskilling and Upskilling

The energy transition portends accelerated changes in an already cyclical industry. As the market, supply chain, technologies, and regulations change, companies large and small must adapt. Inevitably, this means that some jobs will morph into something for which the current job holder is either unqualified or uninterested; other jobs will be eliminated. The workforce development community must find ways to reskill or upskill displaced workers.

Upskilling is the practice of acquiring new skills or enhancing existing skills to stay competitive or rise in the job market. Upskilling is specifically focused on obtaining knowledge, expertise, or capabilities related to the employee's current field or industry, to advance their careers or adapt to changes in the job market.

Reskilling refers to the acquisition of entirely new skills. Reskilling is often pursued to pivot to a different career or industry due to changes in job demand or personal career goals. It can also be initiated by an organization to shift an employee's responsibilities to help meet changing goals.

With rapid and constant change, it is essential to have a set of core transferrable skills and experiences that allow an employee skilled and experienced in one technology or approach to use that background in another industry or, with minimal development, adapt to the changed environment.

Workshop attendees agreed that "Houston is resource-rich, but system poor." While the region has a strong and growing economy, a foundation in the energy industry, strong academic and training institutions, and a vibrant nonprofit community to support workers and a growing population, a coordinated regional effort from all stakeholders is lacking. UpSkill Houston, launched by the GHP a decade ago, is a noteworthy effort but needs broader engagement and the ability to address programs across all value chains.

**Upskilling:** acquiring new skills or enhancing existing skills

**Reskilling:** acquisition of entirely new skills



## 4.7 Assisting the Displaced Worker

Working with displaced workers is not as simple as helping them write a resume. It is a highly individualized process. Displaced workers often experience a loss of self-worth. They have suffered the economic consequences of job loss and may face having to uproot their families in order to get another job. At a time when income is cut off or severely restricted, they are required to “reinvent” themselves for a new job.

A “whole worker” approach can alleviate some of these challenges. Competency mapping, or skills mapping, can provide a better understanding of what skills the individual already possesses. Along with understanding the worker’s goals and expectations and the needs of employers, the competency map allows the worker and any support system to know what additional actions or support are required.

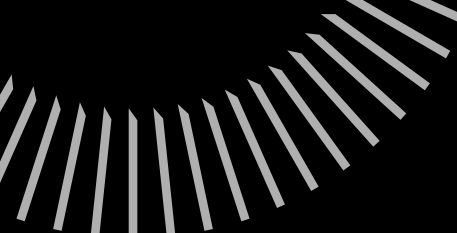
Dealing with displaced workers, especially in disadvantaged communities, sometimes requires access to wrap-around services. The lack of childcare and transportation can be significant impediments to completing the education or training needed. Flexibility in when, where, and how training is provided is important. Displaced workers often take one and sometimes multiple low-wage jobs to keep their family together and meet their basic needs. Training and development opportunities must accommodate this reality and be available on a more flexible basis than the traditional training model.

Lately, there has been government interest in providing funding for wrap-around services. For example, the U.S. Department of Labor (DOL) provides grants to help unemployed and underemployed workers to enter, return to, or advance in good jobs. Career Employment Recovery Dislocated Worker Grants are aimed at expanding the service capacity of programs for dislocated workers in response to unexpected economic events causing significant job loss. Recently DOL announced an increased \$90 million in grants targeted at re-employment opportunities for displaced workers, historically marginalized communities, and the long-term unemployed. These grants are available to industries and agencies that support workers, especially displaced workers or those from underserved communities, and can fund wrap-around services.

Additional programs target hard-to-serve populations at heightened risk of being left behind. That includes the 2021 federal American Rescue Plan - Homeless Children and Youth (ARP-HCY), which expanded services that state and local educational agencies provide to children and youth experiencing homelessness by partnering with community-based organizations, using 25% of the funding from each installment for state activities for training, technical assistance, and capacity building.<sup>x</sup> Programs such as the Youth

Empowerment Services Waiver, funded by a 1915(c) waiver in the Medicaid program, allow children between the ages of 3 and 18 diagnosed with a serious emotional disturbance to get medical help and build a family-centered, coordinated community of care. In Texas, the program aims to reduce the amount of time children are out of their homes because of mental health needs, expand available mental health services and supports, and improve the lives of children and youth with the help of a wraparound facilitator, professionals, family, friends, coaches, or teachers.<sup>xi</sup> Similar programs in the Houston Independent School District implement campus-specific plans to assess students’ needs and integrate high-quality instruction, non-instructional support, and the delivery of resources and services to students, families, and schools to mitigate barriers to academic success.<sup>xii</sup>

Participants in the workshop and those who reviewed this paper before publication recognize the importance of these and other programs. Finding ways to integrate these efforts into a coordinated approach that meets a worker’s needs can increase the effectiveness and reach.



## 4.8 Keeping Early Career Employees Engaged

Continuous employer engagement is a significant success factor for early-career employees. Maintaining an active role with their employees allows the employer to create a plan to meet the company's future workforce needs and to ensure all employees are given an opportunity to gain the needed skills and experiences. Energy companies have historically done well at this with "professional" employees, but the blue collar workforce is less likely to receive the support and guidance needed to succeed. Put simply, innovation in dealing with human capital is necessary. Creative strategies for recruitment, training, retention, and career progression are integral to adapting to the industry's rapidly changing landscape, both in terms of the evolving workforce and the evolving skills that workforce will require. Trust and collaboration are key elements of a creative strategy.

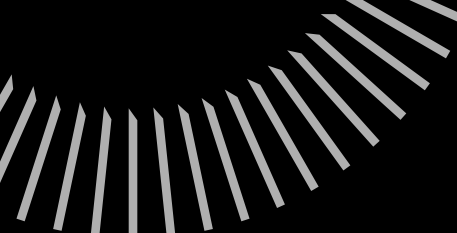
These collaborations can occur across various dimensions – among employers, between companies and educational institutions, or within community organizations. Resources can be leveraged more effectively, and best practices can be shared, ultimately contributing to a more resilient and versatile workforce.

It is essential for employers to build and maintain trust with their employees. Trust can be fostered by early, transparent, and timely communications, consistent support, and equitable practices. Establishing a trusting and collaborative workplace helps to ensure that employees grow and contribute in more senior roles, ultimately aiding in the success of the company.



Establishing a trusting and collaborative workplace helps to ensure that employees grow and contribute in more senior roles, ultimately aiding in the success of the company.





## 4.9 Assisting the Underemployed Worker

Employers looking to fill the high-demand, mid- and high-skilled jobs needed for the energy transition will have to compete for workers, offering opportunities for a segment of the workforce that has traditionally been overlooked – the underemployed worker, who has been unable to find fulltime paid work or jobs that take full advantage of their skills. Workers from traditionally underserved and disadvantaged communities, for example, are more likely to hold multiple jobs in order to make ends meet, with little time to search for a better job and little ability to take time off to interview. Multiple low-skill jobs which don't require transportation, tools, and shift work may be more attainable than a single job which requires all three. Transportation, shift work, childcare, and elder care are often cited among the reasons that people remain underemployed and unavailable for higher-skilled, higher-paying jobs.

Houston has a significant underserved community. According to HISD, last year about 75% of their students qualified for free- and reduced price lunch programs – a factor that is an indicator of poverty and suggests the student is at increased risk for academic struggles.

A network of support services can help eliminate these impediments and allow the industry to achieve a fully diverse workforce while benefiting the communities within which it operates. Traditionally, industry has not seen that as its responsibility, and workshop participants agreed collaboration between employers, government, academia – including middle school and high school leaders – and the community will be required to help these workers ascend the career ladder. That would spread opportunities offered by the energy transition to communities that previously may have been ignored or bypassed.



Transportation, shift work, childcare, and elder care are often cited among the reasons that people remain underemployed and unavailable for higher-skilled, higher-paying jobs.



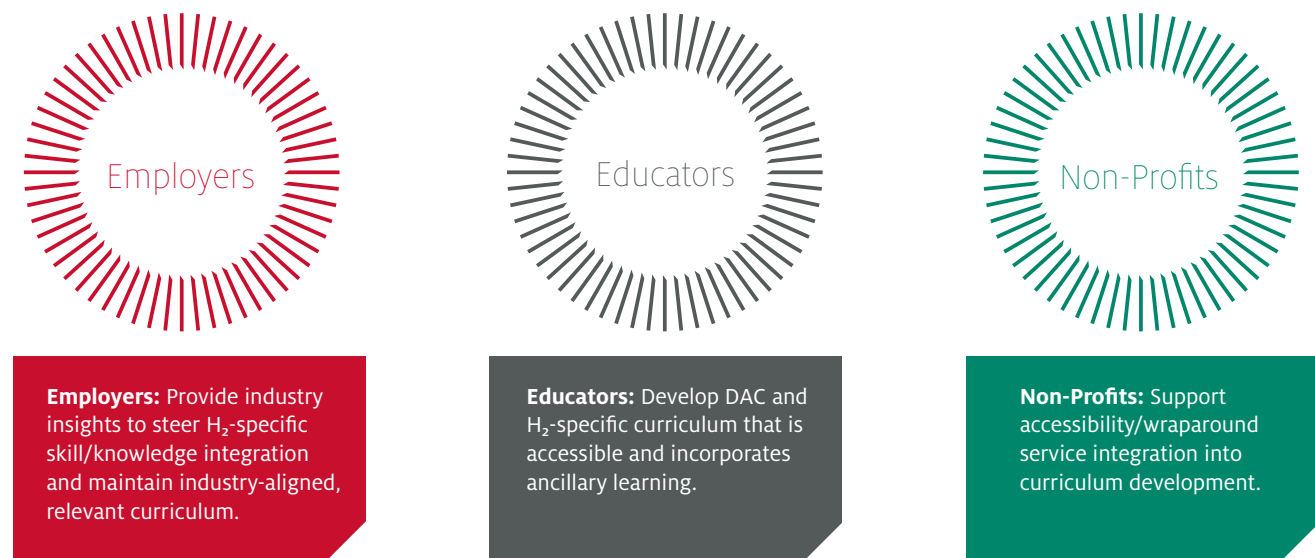


# 5. The Role of Post-Secondary Education

Community colleges, universities, and workforce development practitioners are key stakeholders who join employers in the preparation phase of workforce development. Figure 2 illustrates how that collaboration might work in creating a curriculum to train workers for jobs in the hydrogen industry.

Figure 2. Developing the curriculum for job training will require collaboration.

### Employers, educators, and non-profits all play a role in curriculum development



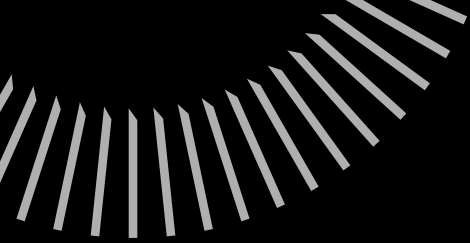
#### Working together with curriculum at the core.

Developing H<sub>2</sub>-specific curriculum with input from employers, educators, and DAC members, and support from non-profits will:

- Close the skill gap for DACs, lowering barriers to entry
- Provide the opportunity for employers to give curriculum design input and ensure their future workforce is adequately prepared without having to solely rely on their own resources to support efforts
- Gain valuable insight from community members on program strengths and improvements

**\$1,000,000+** in scholarships for community college students raised by the petrochemical manufacturing industry with support from partners<sup>1</sup>

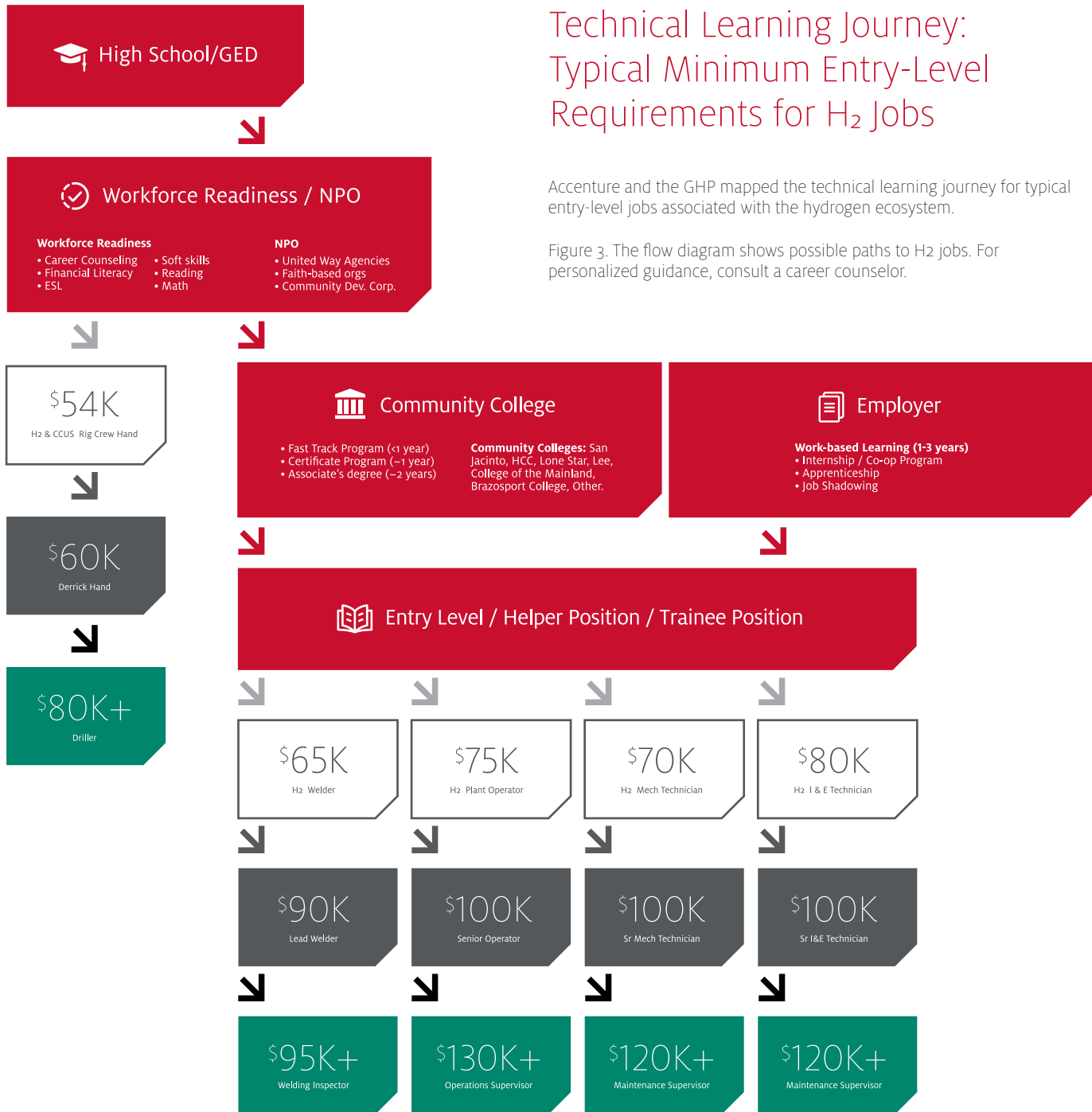
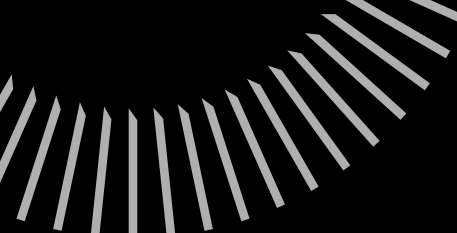
Source: The Greater Houston Partnership: Strengthening the Talent Pipeline, Forward on Talent. Copyright © 2023 Accenture. All rights reserved.



The future workforce in Texas offers several challenges. By 2036, it is projected that 60% of students won't be on grade level in math; 48% will be unable to read on grade level; and only 22% of 8th graders will earn a post-secondary degree or credential within six years of graduation. Meanwhile, 70% of the jobs in Texas will require a post-secondary credential.<sup>xiii</sup> About 85% of the underserved population doesn't currently have a post-secondary credential, according to Accenture.

Several key areas need action. They include:

- Reaching 16–24 year olds who are disengaged from education, training, and the workforce.
- Identifying community influencers and bringing them into the system.
- Creating a collaborative ecosystem that includes students, families, community influencers, and employers to help motivate and guide the prospective worker.
- Clarify the role of community colleges in providing training that both students and employers see as relevant to the careers of the future.
- Many skilled trades provide compensation and benefits that provide a sound financial future and quality of life, yet blue-collar jobs are often seen as less desirable by both potential workers and families. How can that be changed?
- Ensuring students have “green science skills” – described by the United Nations Industrial Development Organization as including the knowledge needed to live in, develop and support a sustainable and resource-efficient society – as well as data management, communication, and collaboration skills that are workplace ready.



## Technical Learning Journey: Typical Minimum Entry-Level Requirements for H<sub>2</sub> Jobs

Accenture and the GHP mapped the technical learning journey for typical entry-level jobs associated with the hydrogen ecosystem.

Figure 3. The flow diagram shows possible paths to H<sub>2</sub> jobs. For personalized guidance, consult a career counselor.



## 5.1 Importance of Career Awareness

Students and parents have varying degrees of understanding of the future of energy and the energy workforce. Ensuring that they have a full perspective on future job and career opportunities provides the best chance to motivate them to acquire the needed education and skills. Creating awareness will require coordinated strategies such as career fairs, field trips, and other hands-on opportunities.

Additional elements could include:

- Review of basic work skills – e.g., work etiquette, dress codes, being on-time, etc.
- Career exploration (K-8)
- STEM events and summer camps focusing on energy jobs
- Classroom packages (non-STEM jobs in energy)
- Community engagement
- Influencers – provide training to help them convey appropriate messages
- Community-based organizations, including churches and youth groups
- Take programs into the communities, rather than expecting them to come to other locations
- Collaborate and share resources wherever possible
- Potential collaborators could include Tech Fest Live (<https://techfestlive.com>), Consumer Energy Education Foundation, and teacher/instructor internships

Likewise, teachers, instructors, counselors, and advisors should participate in all workforce development discussions to gain exposure to how the critical thinking skills and development, math and science courses, and communication practice that they teach are used on the job today, as well as how that is expected to change in the future.

The rationale is simple: Students who see a path to a job or career that interests them are much more likely to acquire the skills needed for success. Awareness programs in middle school and early high school can capture these students before they disengage. Teachers, counselors, parents, and community influencers can serve as both motivators and role models.

Although work remains to be done to develop actionable strategies, some things are clear. We know providing specific data about the nature of future energy jobs – and organizing that data in a way that will be meaningful to students and their families – is important, but it is not enough. Real efforts will be needed to communicate this information directly to students and parents at locations and in a manner that meets their needs. The UH workforce collaboration recognizes this gap and will address community workforce needs, the energy transition jobs of the future, and the education and skills training resources available today and needed for tomorrow, and we will do so in direct engagement with students and families.

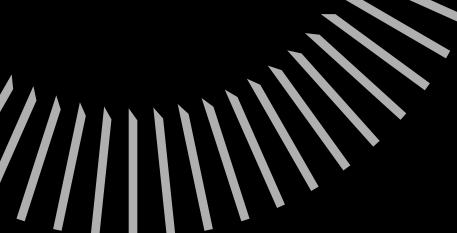





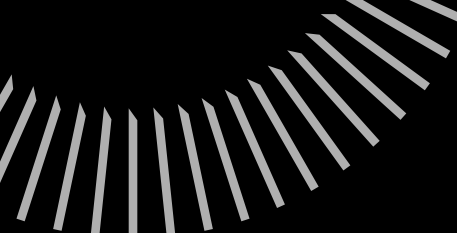


Figure 4. People from disadvantaged communities will face additional challenges

## Addressing challenges is critical to improve outcomes for disadvantaged workers

Challenges	Solutions	Partner
 <p><b>Financial barriers</b> 44% of Houston's DAC residents live below 200% Federal Poverty Line<sup>1</sup></p>	<p>Financial aid, grants, and scholarships, earn-while-you-learn apprenticeships and on-the job training, facilitate access to government and private funding</p>	<p>Workforce Solutions, Social Finance, Ampersand</p>
 <p><b>Transportation challenges</b> 47% of Harris County household budgets are spent on housing and transportation costs<sup>2</sup></p>	<p>Transportation subsidies, partnerships with local transportation service providers through non-profits, offering geospatially accessible opportunities</p>	<p>Metro, Harris County rides, On the Road Lending</p>
 <p><b>Lack of access to education and training</b> 26% of Houston DACs ages 18-64 do not have a high school diploma/equivalent compared to 15% Houston MSA<sup>3</sup></p>	<p>Grant and scholarship programs, partnerships with non-profits for wraparound service support and job placement services</p>	<p>Capital Idea, Baker Ripley, SER Jobs</p>
 <p><b>Childcare</b> 83% of Harris County childcare markets are in a subsidy-accepting deficit<sup>4</sup></p>	<p>Partnerships with childcare service providers through non-profits to integrate into individual's comprehensive service plan, flexible work schedules</p>	<p>Collaborative for Children, Workforce Solutions, Out 2 Learn</p>
 <p><b>Language and basic work skills</b> 19% of Houston DAC households experience linguistic isolation<sup>1</sup></p>	<p>Integration of ESL and adult continuing education programs to develop workforce readiness prior to the start of education and apprenticeship programs</p>	<p>Community colleges, Easter Seals, Mexican Institute</p>

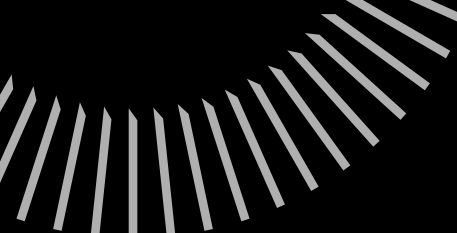
Source: 1. Climate and Economic Justice Screening Tool, Council on Environmental Quality, 2. Accessing Opportunity: Employment and Commuting Patterns among Low-, Medium- and High-Wage Workers in Houston, Kinder Institute for Urban Research, 3. Educational Attainment, US Census Bureau 4. Harris County Child Care Supply and Demand Analysis, Texas Policy Lab  
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Regardless of where students and other potential members of the new energy workforce live, there are common strategies that can serve as pathways to acquiring basic academic skills and employment success. Among them are:

- Integrated Education Training (IET) – Teaches both technical skill and education literacy in a relevant manner. For example, a welding course is taken with a contextualized industrial math course, using the same book and materials. The approach adds value and relevance for the student.
- Internships – Should be designed to provide fundamental math/reading and other skills while working and earning a wage.
- Non-Course Based Options (NCBO) – These are creative ways to offer courses that teach job skills but do not provide traditional course credit. Colleges have limited funding to create these developmental classes. Industrial partnerships can generate creative ideas where NCBO offerings can be useful, and they can provide funding, equipment, mentorships, and internships.
- Cross walking non-credit courses to credit courses – Community colleges offer technical instruction, usually in a compressed time period, through their corporate training and/or community education divisions. Students completing these non-credit courses should be able to convert these non-credit courses to credit courses through Prior Learning Assessments or Credit for Prior Learning processes.

There is often a serious disconnect between academic offerings and the “real world of work”. Workshop participants noted that students do not see how course materials are relevant to finding and keeping a job. Bringing career professionals into the academic environment can help. Adjunct faculty from industry and career days are additional strategies that can be employed to expose students to the widest range of careers.



## 5.2 Mentorships, Apprenticeships, and Internships

Mentorships, apprenticeships, and internships are all important ways to reskill and upskill the workforce and are integral to creating a workforce prepared to navigate the energy transition.

Mentorships can provide personalized guidance and support, aiding in the transition from old roles to new ones. By learning from those with experience in the sector, mentees can gain insights, guidance, and encouragement, accelerating their journey toward proficiency in their new roles.

Registered Apprenticeships Programs (RAPs) are Department of Labor-approved programs that combine paid on-the-job training with classroom instruction to prepare workers for highly skilled careers. Workers benefit by receiving a skills-based education that prepares them for good-paying jobs. Apprenticeship programs help employers recruit, build, and retain a highly skilled workforce. Some states, including Texas, also recognize Industry Registered Apprenticeship Programs (IRAPS). Federal and state funding is available to support both RAPs and IRAPS.

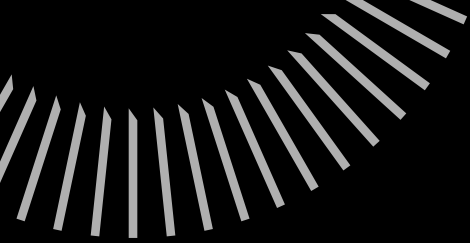
Houston is already well-equipped to deliver registered apprenticeships in the industry sector. The Gulf Coast Apprenticeship Network, an employer-led network sponsored by the Greater Houston Partnership, has catalyzed opportunities to engage with local training providers and potential apprentices in starting new RAPs. A case study by the Department of Labor concluded that the program promotes immediate employment and other benefits for employers and employees. It lowers the cost of recruitment, helps create a diverse and highly skilled workforce, improves productivity and profitability, increases worker retention, and minimizes liability costs while maximizing safety for the employer. Given the earn-and-learn model, employees gain workplace-relevant skills while avoiding student debt. They also receive an industry-recognized and nationally portable credential that can translate into college credits.<sup>xiv</sup>

Internships, boot camps, and other forms of experiential learning are additional tools. These provide hands-on exposure to the energy sector's changing environment, enabling workers to gain practical skills and experience.



Houston is already well-equipped to deliver registered apprenticeships in the industry sector.





## 5.3 Creating Career Paths

Existing practices to attract new workers may not be sufficient for future needs, which will require robust new strategies. For example, emphasizing not only the immediate job but the creation of a career path can help prospective employees understand the upward mobility a company offers. Tied to the career path should be a clear outline of any additional certification, experience, or education required to progress. Only in that way can a candidate understand the full potential of the opportunity.

At the outset, the emphasis must be on clearly defining entry-level jobs suitable for different sets of qualifications, especially for jobs open to high school graduates. This ensures potential employees understand the requirements and expectations associated with various roles.





## 6. Engaging Stakeholders to Create Change

It turns out that a lot of people care about this topic. Representatives from industry, academia, government, the nonprofit sector, and underserved communities are all passionate and engaged. Clearly these stakeholders are challenged by the problem. But the key question remains: “What do we do now?”

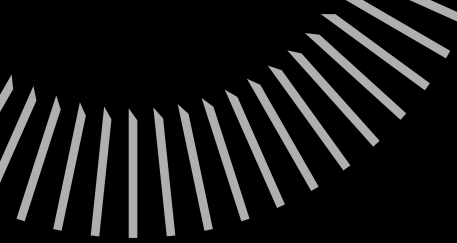
Community colleges, universities, and training institutions all are available. Industry and industry groups want to engage. Leaders in underserved communities see the need and want to help. The challenge is moving beyond words to build sustainable actions. The consensus of workshop attendees was that we must create pathways for action. A few efforts underway are worthy of mention.

MRSW Management has partnered with the International Brotherhood of Electrical Workers (IBEW) Local 479 to create a pre-apprenticeship boot camp to develop foundational skills for adult learners and graduating high school students with barriers to employment. Upon completion, trainees transfer to the Joint Apprenticeship Training Committee (JATC) apprenticeship program. MRSW is also training pre-apprenticeship pipefitters, scaffold erectors, heavy equipment operators, insulators, and carpenters. The apprentices are then hired by contractors through a registered apprenticeship program, spending part of the day receiving related training instruction and the other part of the day receiving on-the-job training.

The University of Houston has also begun to focus on this area. We have established a collaboration to work on the issue involving MRSW Management, Brazosport College, the College of the Mainland, San Jacinto College, and Houston Community College, funded by a grant from the RESTORE Act through the Texas Commission on Environmental Quality.

UH is also leading a group consisting of Lamar University, Houston Community College, MRSW Management, and the Houston Advanced Research Center (HARC), which has responded to a Department of Energy Funding Opportunity Announcement regarding workforce development. The concept paper submitted to DOE was “encouraged” and the full proposal was submitted in March 2024. A decision is expected in July 2024.

The University also conducts STEM Zone Saturday, a hybrid monthly program that provides engagement in the sciences and engineering fields for 3rd–12th grade local, state, national, and global students who interact with UH STEM faculty, the UH STEM Center Outreach Squad, undergraduates, industry partners, and like-minded peers.



## 7. A Synergistic Approach

The programs and actions referenced above are examples of the collaborative actions the academic community can bring to workforce development. But UH and its collaborators recognize that strategies and tactics identified in this paper will vary depending on the nature of the community and the workforce barriers. Therefore, based on this analysis of Workforce Development for the Future Energy Mix, the UH Division of Energy and Innovation and its collaborators will use funding provided through the RESTORE Act by TCEQ to develop a comprehensive, unified, diverse, and collaborative set of methodologies to address Houston/Gulf Coast region workforce development needs.

The plan will engage with all stakeholders and/or their group representatives to incorporate and build upon existing efforts, such as the Upskill Houston program sponsored by the Greater Houston Partnership, the Houston area Workforce Solutions, the Global Energy Transition (GET) initiative and others, as well as identify new programs and opportunities to address the issues. We will focus on hydrogen and CCUS as the most relevant and immediate regional opportunities.



UH and its collaborators recognize that strategies and tactics identified in this paper will vary depending on the nature of the community and the workforce barriers.





# Appendix A

## Workforce Development for the Energy Transition: A University of Houston Energy Conversation

### June 1, 2023 - June Workshop Agenda

<b>8:30 AM</b>	Registration
<b>9:00 AM</b>	Welcome and Outline of the “Conversation” – Doucette
<b>9:10 AM</b>	Welcome to UH Energy – Krishnamoorti
<b>9:20 AM</b>	Workforce Development Keynote –Center for Houston’s Future
<b>9:40 AM</b>	Industrial Panel – “Workforce needs of the Energy Transition.” -UH Moderator – Ram Seetharam -Fredy Sanches – Enbridge -Ann Pham – Worley -Kirby Brown – BP
<b>10:15 AM</b>	First break out session – Exploring Workforce Needs -Tables of 6-10 (UH moderator and rapporteur) -Participants from various backgrounds, to provide diversity of thought. -Report out to the whole group.
<b>10:45 AM</b>	Networking Break
<b>11:00 AM</b>	Table Report Out – 3-5 minutes per table
<b>11:30 AM</b>	Academic/Training Panel – “Preparing Workers” -Moderator – Melvin White -Kris Hartwick – Training 4 Earth -Rocky Barney – College of the Mainland -Anne Bartlett – Brazosport College
<b>12:05 PM</b>	Second Breakout Session – Preparing Workers -Tables of 6-10 (UH moderator and rapporteur) -Same Table Teams -Report out to the whole group.
<b>12:35 PM</b>	Lunch
<b>1:00 PM</b>	Table Report Outs
<b>1:30 PM</b>	Reskilling and Upskilling Displaced Workers -Sonia Clayton – GET -- Moderator -Jay Culver – San Jacinto Community College -Ken Williams – Grow Houston -Mark Guthrie – Gulf Coast Workforce Board
<b>2:00 PM</b>	Third Breakout Session -Tables of 10 (UH moderator and rapporteur) -Same Table Teams -Report out to the whole group.
<b>2:30 PM</b>	Table Report Outs
<b>3:00 PM</b>	Wrap-Up and Adjourn



# Appendix B

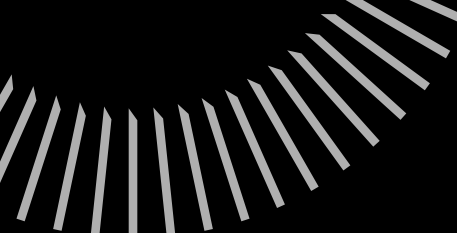
## Workshop Participants

1. Ali Fares – PVAMU
2. Lealon Martin – PVAMU
3. Anne Bartlett – Brazosport College
4. Leslie Ruta – Port of Corpus Christi
5. Rosaura Bailey – Port of Corpus Christi
6. Andrew Vanchau – Fort Bend County
7. Glenda Wylie – Texas Tech
8. Sonia Clayton – GET
9. Peter Beard – GHP
10. Jay Culver – San Jac
11. Tyler Padgett – San Jac
12. Kris Hardwick – Training for Earth
13. Melvin White – MRSW Management
14. Paul Doucette -- UH
15. Ramanan Krishnamoorti – UH
16. Ram Seetharam – UH
17. Chuck McConnell - UH
18. Suryanarayanan Radhakrishnan - UH
19. Aparajita Datta - UH
20. Freddy Sanches – Enbridge
21. Bernice Herbert – Jackson State University
22. Andy Meyers – Fort Bend County Commissioner
23. Darrell Hill - Clergy
24. Nissy Hamilton- Not for Profit
25. Melvin Wrenn - community organizer
26. Catherin Dorsey - Acres Home neighborhood association
27. Latisha Grant - Acres Home neighborhood association
28. Edna Griggs - Community advocate
29. Hallie Graham – National Academies Gulf Research Program
30. Mark Guthrie – Chair, Gulf Coast Workforce Board
31. Eric Goodie – Houston Area Urban League – [ericg@haul.org](mailto:ericg@haul.org)
32. Ann Pham – Worley
33. Ken Williams – Grow Houston
34. Paige Parrish – College of the Mainland
35. Rocky Barney – College of the Mainland
36. Kirby Brown – BP
37. Greg Bean – UH
38. Christine Ehlig-Economides UH
39. Stacey Camille – Baker Ripley
40. Graig Harrington – Baker Ripley
41. Scott Nyquist – McKinsey & Company
42. Antabho Chatterjee – Student
43. Paul Byaruhanga – Student
44. Gautam Kakati – Student
45. Candace Qamer – Student
46. Prashan deMel -- Student



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UH Energy is an umbrella for efforts across the University of Houston to position the university as a strategic partner to the energy industry by producing trained workforce, strategic and technical leadership, research and development for needed innovations and new technologies. **That's why UH is THE ENERGY UNIVERSITY®.**

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