WIN WORKFORCE INTELLIGENCE NETWORK

MAGMA Advisory Council Meeting

Academic Programs to Enhance the H2 Economy

December 12, 2025

University of Michigan
Master of Business Administration

Eight years of opinion research and survey analytics

With WIN since Oct. 2022

Kevin L. Cranick

Economic Research Manager

WIN WORKFORCE INTELLIGENCE NETWORK

OVERVIEW

- ❑ Lessons and Experience in Hydrogen
- ❑ Research Methodology
- ❑ Network Mapping
- ❑ Surveys 1 and 2

WIN WORKFORCE INTELLIGENCE NETWORK

LESSONS AND EXPERIENCE IN HYDROGEN

An Examination of Social Network Analysis

WIN WORKFORCE INTELLIGENCE NETWORK

Methodology

- Social Network Analysis research begins with a focus on open-source data, including articles, company sponsored websites, and available meeting information
- These materials were obtained and reviewed between October 2024 and February 2025. A list of keywords and key phrases was developed to streamline this process.
- The sampling method used is commonly known as snowball sampling. This technique starts with a focus node, i.e. “University of Toledo” and expands using a rolling list.

Methodology

Researchers used the following keywords to search for applicable articles:

1. Hydrogen
2. Hydrogen Production
3. Hydrogen Industry
4. Hydrogen Economy
5. Hydrogen Emissions
6. Hydrogen Fuel Cell
7. Hydrogen Energy
8. Hydrogen Research
9. Clean Hydrogen
10. Hydrogen College Programs
11. Hydrogen Distribution
12. Hydrogen Hub
13. Hydrogen Delivery
14. Hydrogen Storage
15. Hydrogen Transportation
16. Hydrogen Chemical Industry
17. Hydrogen Cement Production
18. Hydrogen Glass Making
19. Hydrogen Semiconductor Manufacturing
20. Hydrogen Safety

WIN WORKFORCE INTELLIGENCE NETWORK

INDUSTRIAL HYDROGEN USE

• Transportation: Hydrogen can be used as a fuel in fuel cells to power vehicles, offering a zero-emission alternative to traditional gasoline and diesel.

• Ammonia Production: Hydrogen is a key component in the Haber-Bosch process, which is used to synthesize ammonia, a vital fertilizer. This process consumes a large portion of the world's hydrogen production.

• Energy Storage: Hydrogen can be used to store energy generated from renewable sources, such as solar and wind power, through a process called Power-to-Gas (P2G).

• Power Generation: Hydrogen fuel cells can be used to generate electricity, providing a clean and efficient energy source for homes, businesses, and industrial facilities.

• Methanol Production: Hydrogen is used in the synthesis of methanol, which is a versatile chemical used in various applications, including fuel production.

• Other Industrial Uses: Hydrogen is also used in steel production, glass purification, semiconductor manufacturing, and various other industrial processes.

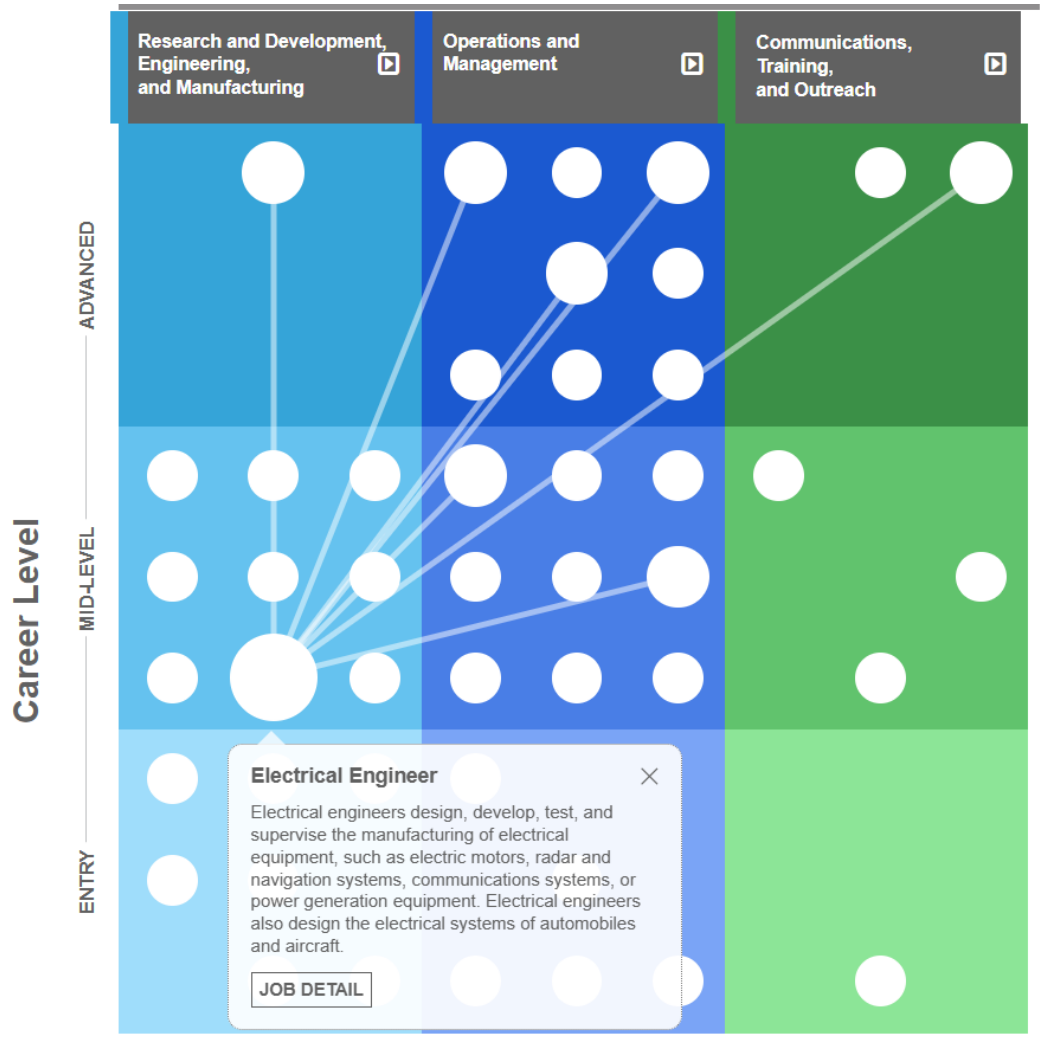
• Petroleum Refining: Hydrogen is used in processes like hydrocracking, hydrotreating, and desulfurization to improve the quality of petroleum products.

SEMCA WIN WORKFORCE INTELLIGENCE NETWORK

CAREERS IN HYDROGEN

[HYDROGEN AND FUEL CELLS CAREER MAP | DEPARTMENT OF ENERGY]

[CAREERS IN FUEL CELL TECHNOLOGIES]



SEMCA WIN WORKFORCE INTELLIGENCE NETWORK

CAREERS IN HYDROGEN

1. 19-2030 Chemists and Materials Scientists
2. 11-3071 Transportation, Storage and Distribution Mangers
3. 13-1041 Compliance Officers
4. 49-9041 Industrial Machinery Mechanic
5. 49-9071 Maintenance and Repair Workers, General
6. 51-9161 Computer Numerical Control Operator
7. 51-2090 Miscellaneous Assemblers and Fabricators
8. 17-3026 Industrial Engineering Technologists and Technicians
9. 17-3023 Instrumentation and Electronics Technician
10. 47-2111 Electrician
11. 17-2141 Mechanical Engineer
12. 17-2070 Electrical Engineer
13. 17-2081 Environmental Engineer
14. 15-2031 Operations Research Analysts (Research Engineer)
15. 17-2051 Civil Engineer
16. 15-1252 Software Developer
17. 19-2041 Environmental Scientists and Specialists, Including Health
18. 17-2041 Chemical Engineer
19. 11-9041 Architectural and Engineering Managers
20. 47-2061 Construction Laborers
21. 17-2112 Industrial Engineer
22. 19-5011 Safety and Occupational Health Specialist
23. 51-8010 Power Plant Operators, Distributors, and Dispatchers
24. 47-2221 Ironworkers
25. 47-2152 Plumbers, Pipefitters and Steamfitters
26. 49-3023 Automotive Service Technicians and Mechanics

SEMCA WIN WORKFORCE INTELLIGENCE NETWORK

SOCIAL NETWORK ANALYSIS

- Definition: transforms information about relationships into visual maps that reveal the dimensions of relationships (shape, depth, and concentration)
- Purpose: Informing curriculum development for the next generation of hydrogen-skilled employees
- Process: Employers -> Jobs -> Employer validated skills -> Curriculum planning
- Results: The Hydrogen SNA revealed a total of 739 nodes within the Michigan-Ohio ecosystem with 2,317 total connections

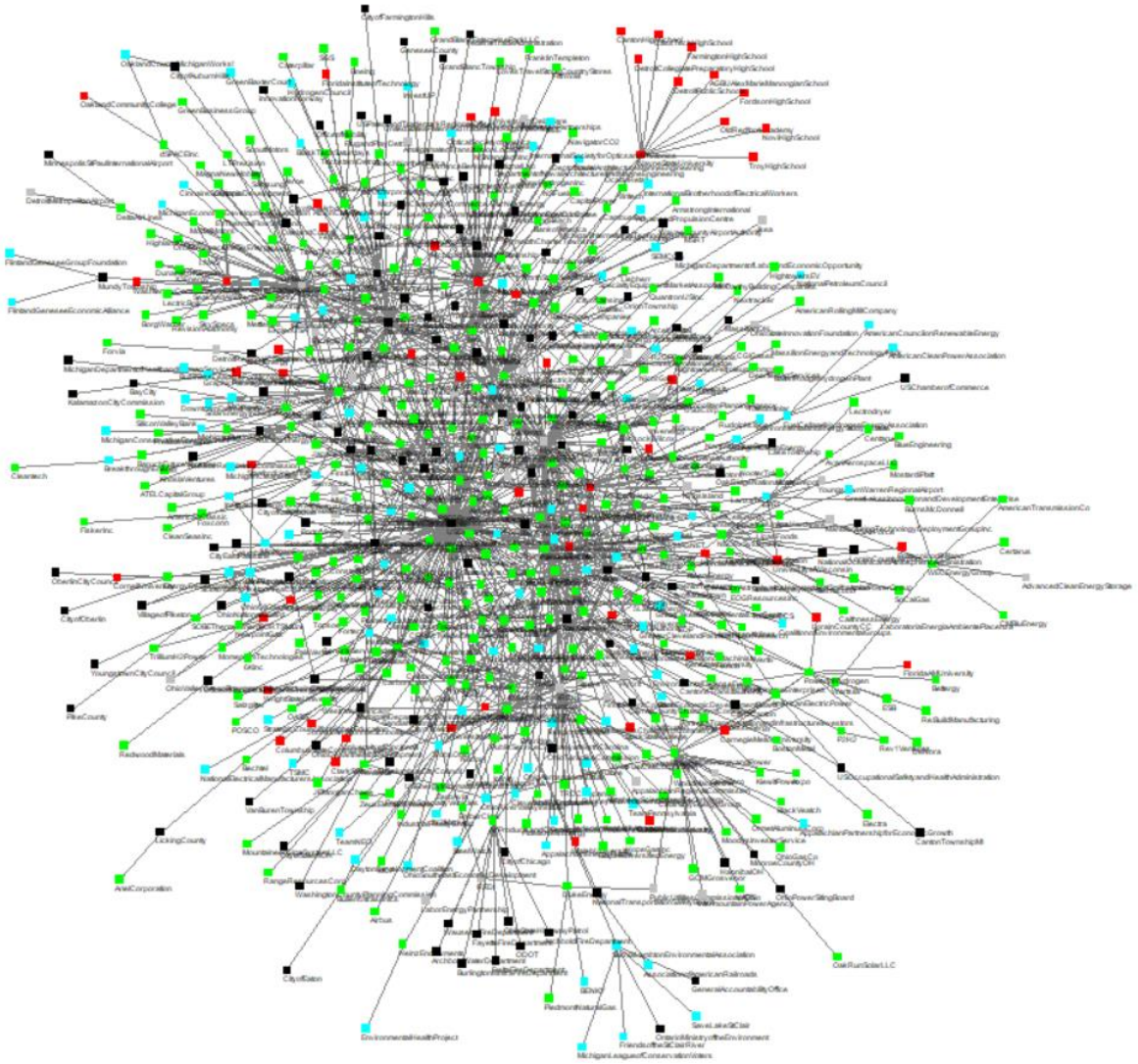
SEMCA WIN WORKFORCE INTELLIGENCE NETWORK

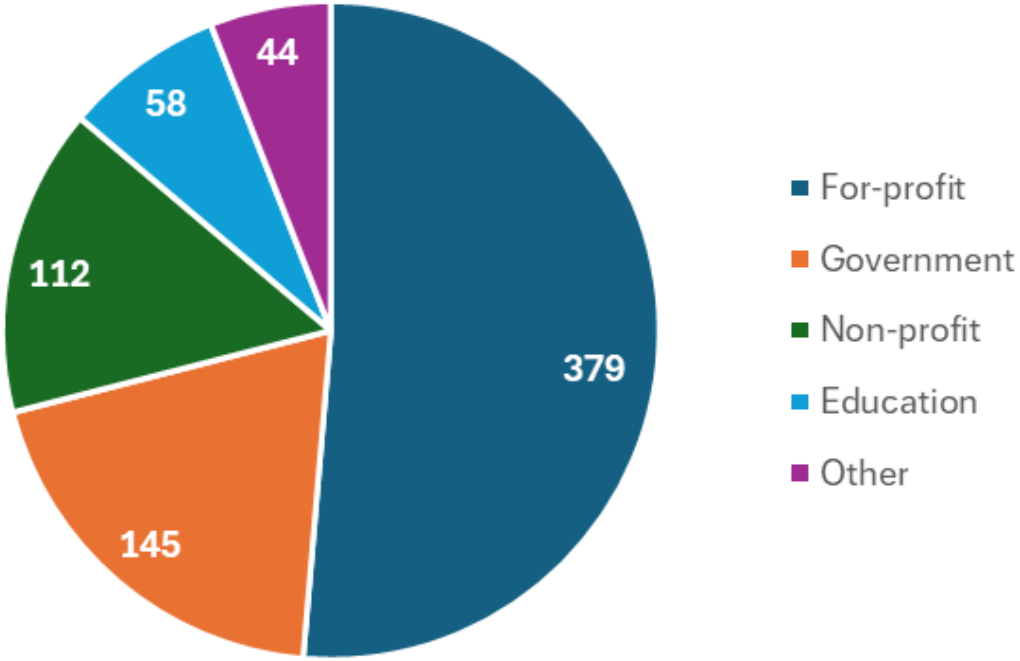
SNA MEASURES

- Node-Level Measures (Centrality Measures): These metrics quantify the "importance" or "influence" of individual nodes (actors, individuals, or entities) within the network.
  - Degree Centrality: Measures the number of direct connections a node has. A high degree centrality indicates a node is well-connected and potentially influential.
  - Betweenness Centrality: Indicates how often a node lies on the shortest path between other nodes. High betweenness centrality suggests a node acts as a bridge or gatekeeper, controlling information flow.
  - Closeness Centrality: Measures how quickly a node can reach all other nodes in the network. A node with high closeness centrality can disseminate information quickly.
  - Eigenvector/Power Centrality: Measures a node's influence based on the number and quality of its connections, where connections to important nodes are weighted more heavily.

SEMCA WIN WORKFORCE INTELLIGENCE NETWORK

Network Mapping

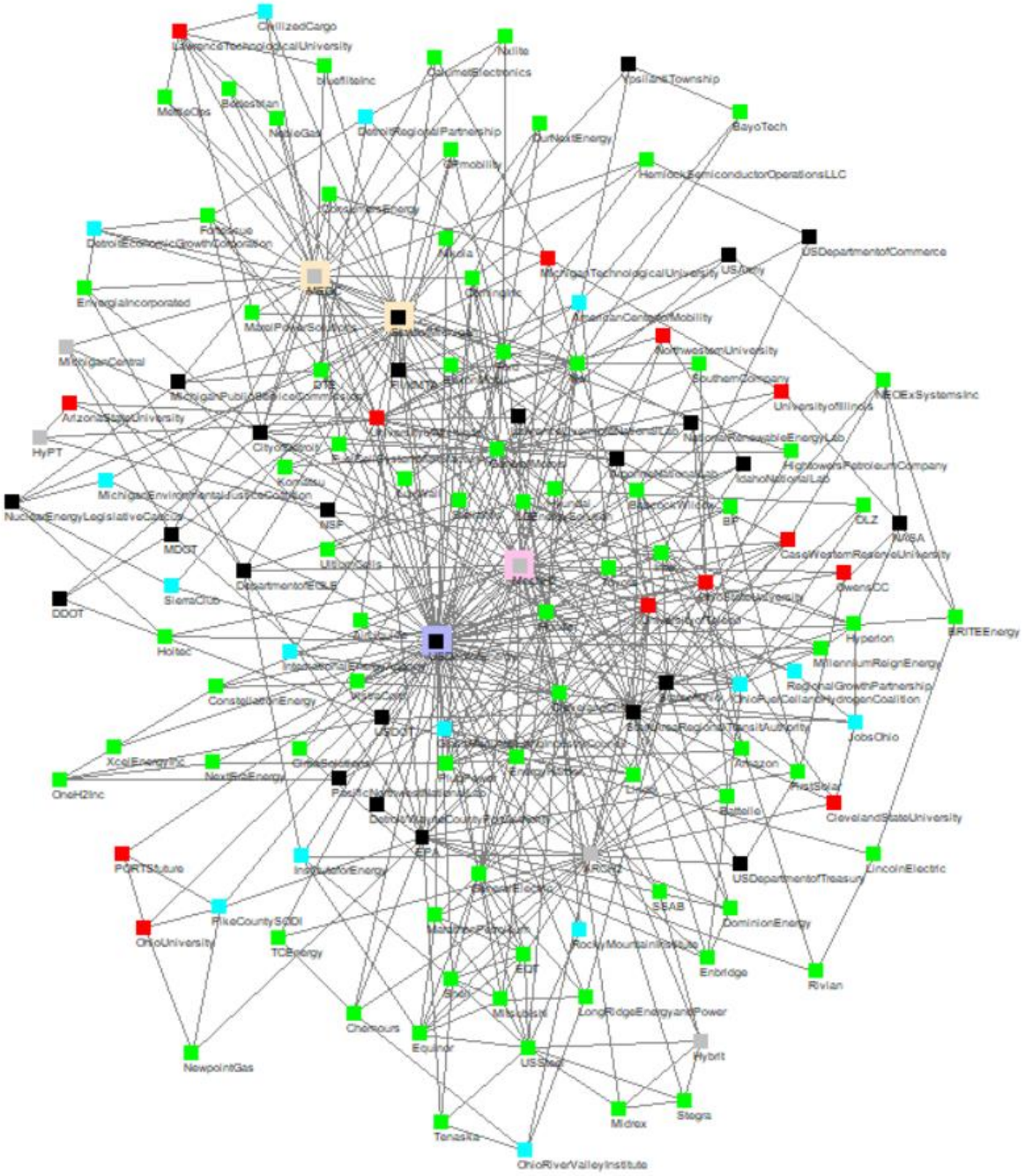




WIN WORKFORCE INTELLIGENCE NETWORK

Network Core

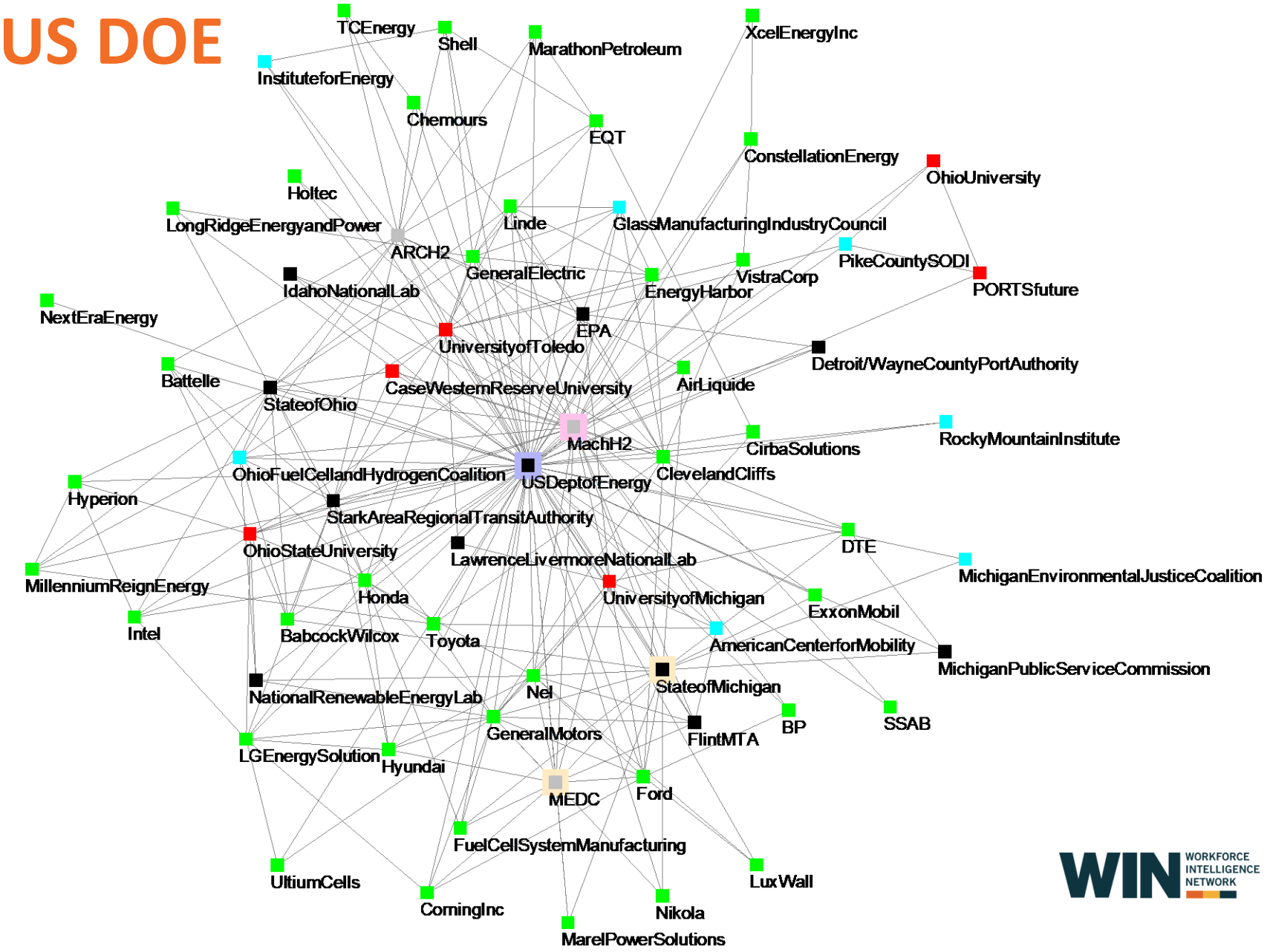
- EDUCATION
- FOR PROFIT
- NONPROFIT
- GOVERNMENT
- OTHER



WIN WORKFORCE INTELLIGENCE NETWORK

Influencer #1: US DOE

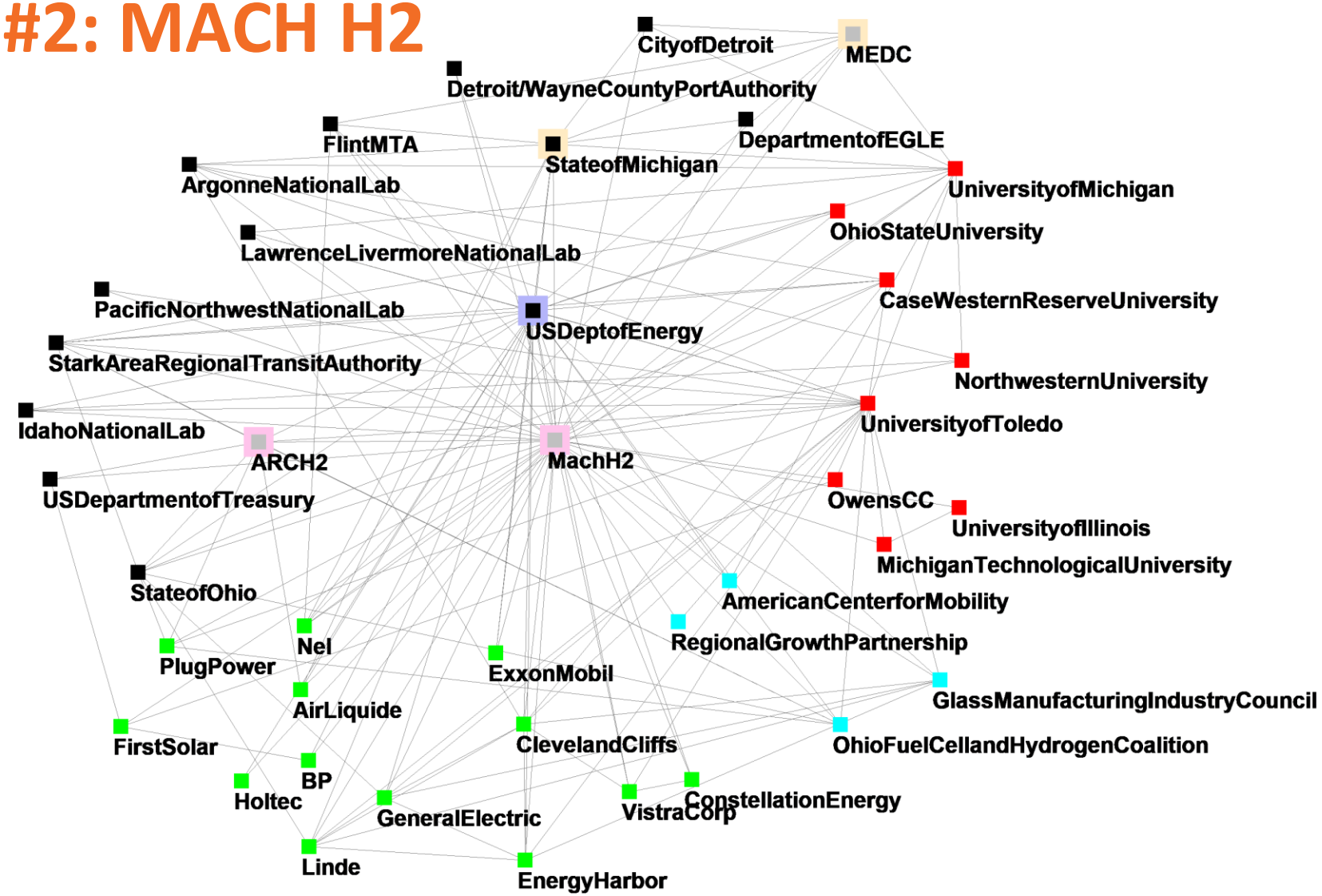
- EDUCATION
- FOR PROFIT
- NONPROFIT
- GOVERNMENT
- OTHER



WIN WORKFORCE INTELLIGENCE NETWORK

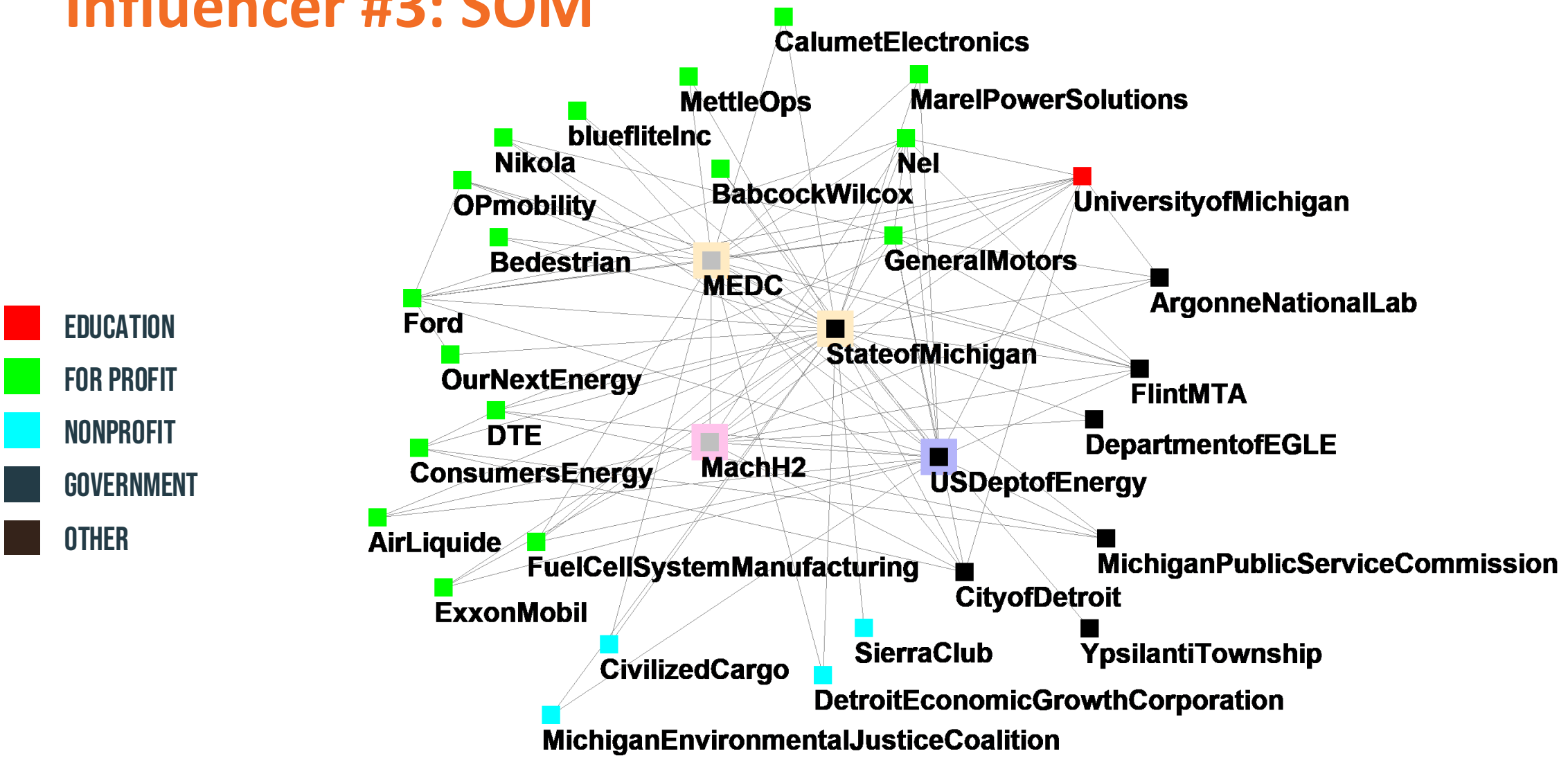
Influencer #2: MACH H2

- EDUCATION
- FOR PROFIT
- NONPROFIT
- GOVERNMENT
- OTHER



WIN WORKFORCE INTELLIGENCE NETWORK

Influencer #3: SOM



WIN WORKFORCE INTELLIGENCE NETWORK

Survey One: Social Network Analysis

Social Network Analysis Survey Findings

- 51 responses received
- 38 unique organizations
- Sectors represented:
  - Industry
  - Government
  - Research
  - Workforce Development

WIN WORKFORCE INTELLIGENCE NETWORK

Survey One: Social Network Analysis

- EDUCATION
- FOR PROFIT
- NONPROFIT
- GOVERNMENT
- OTHER

WIN WORKFORCE INTELLIGENCE NETWORK

SURVEY TWO

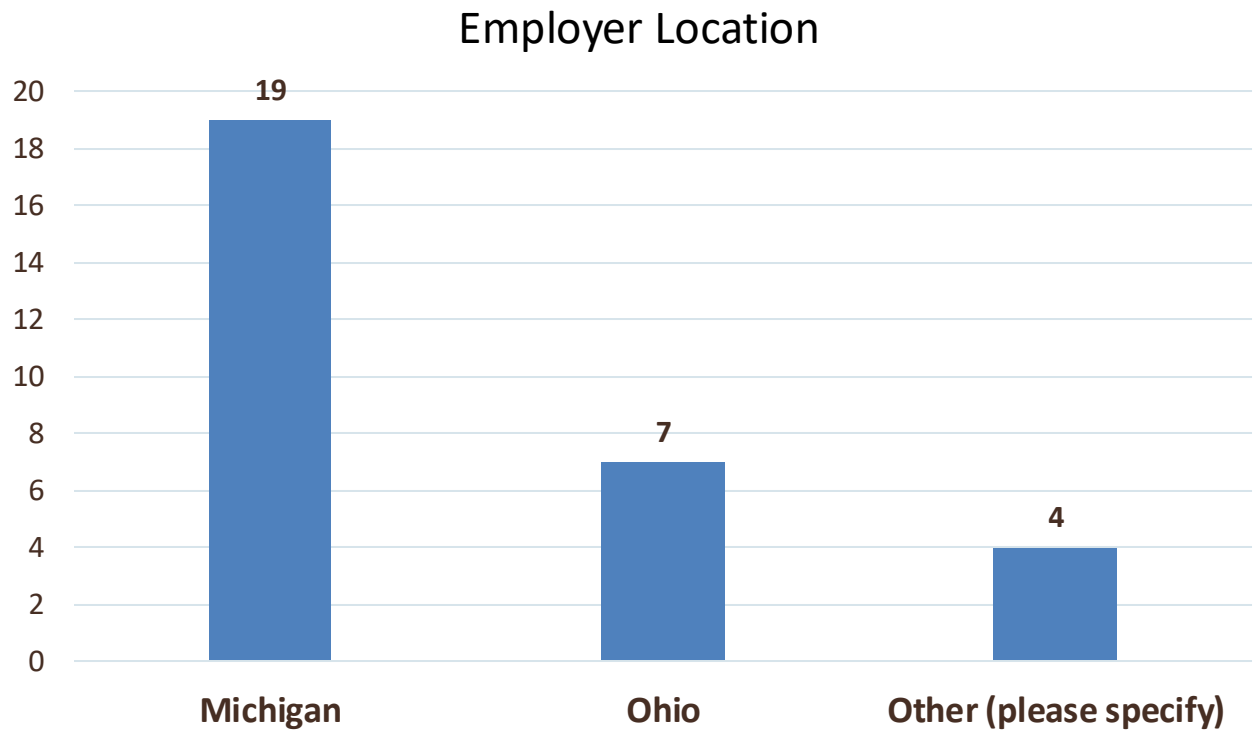
Occupational Skills & Labor Analysis

WIN WORKFORCE INTELLIGENCE NETWORK

Survey Two: Occupational Skills & Labor Analysis

Respondent Profile

- 31 completed responses
- 30 unique organizations

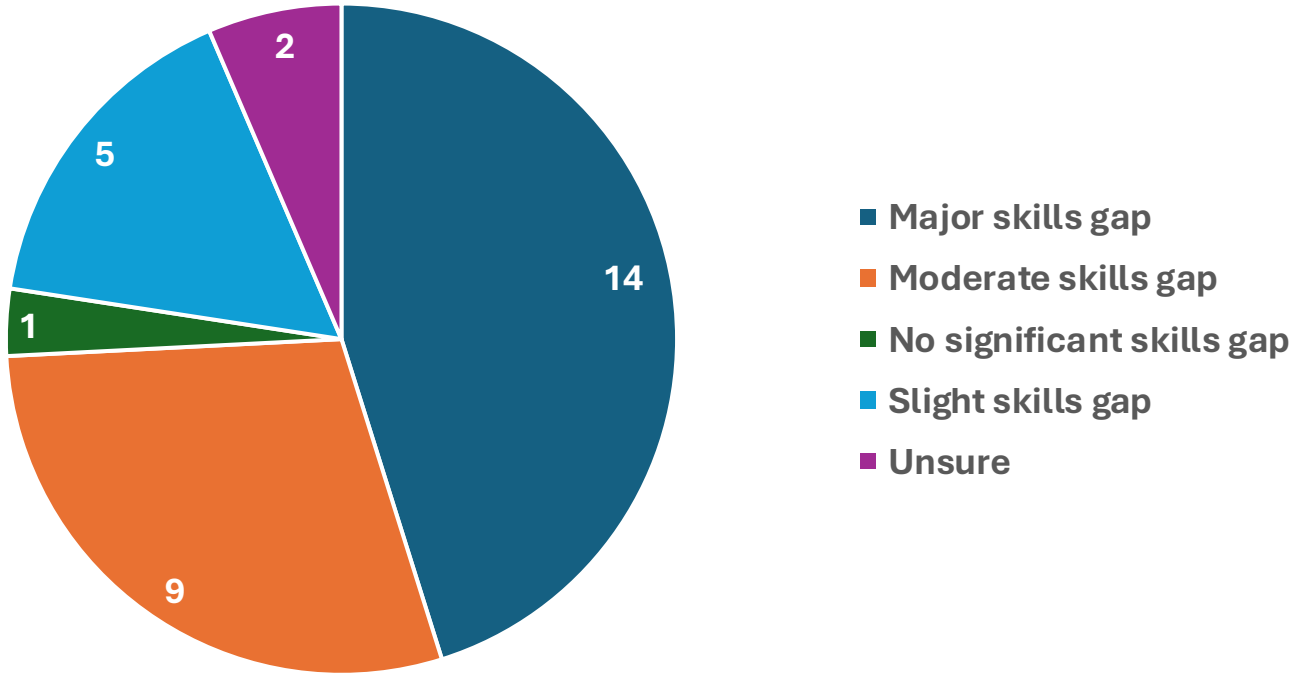


WIN WORKFORCE INTELLIGENCE NETWORK

Survey Two: Occupational Skills & Labor Analysis

Key Findings

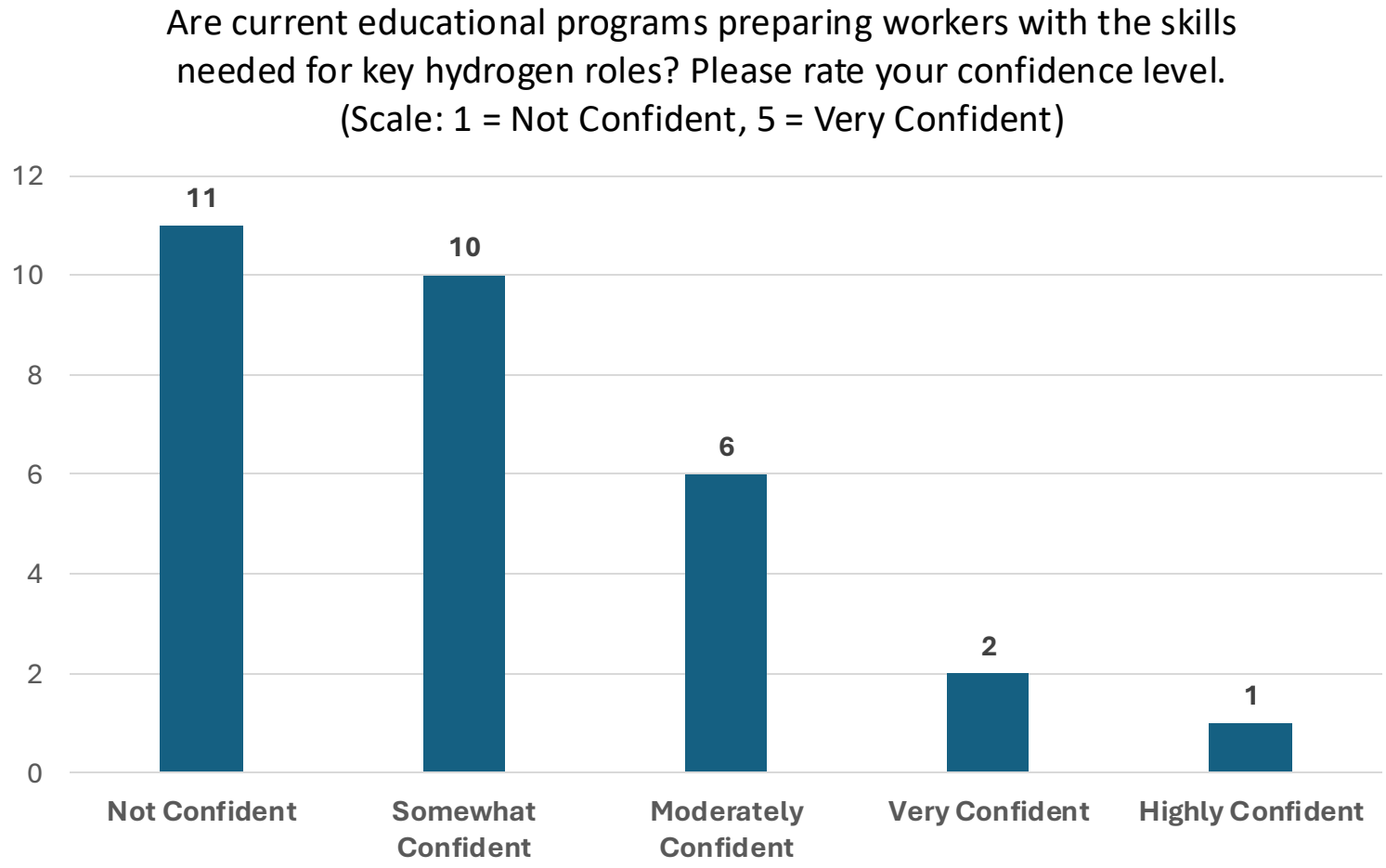
To what extent do you feel there is a skills gap in the current workforce for your hydrogen-related operations?



WIN WORKFORCE INTELLIGENCE NETWORK

Survey Two: Occupational Skills & Labor Analysis

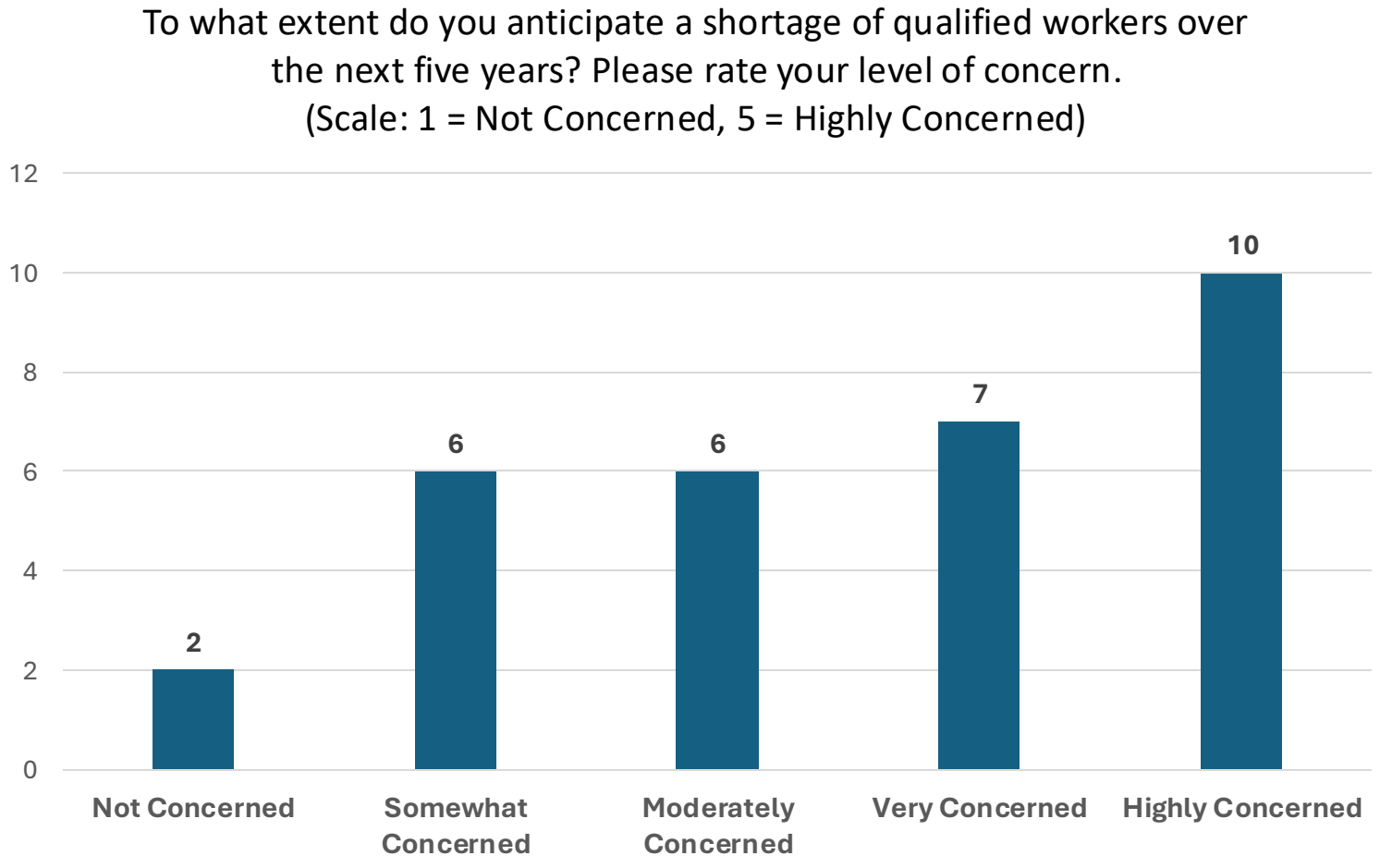
Key Findings



WIN WORKFORCE INTELLIGENCE NETWORK

Survey Two: Occupational Skills & Labor Analysis

Key Findings



WIN WORKFORCE INTELLIGENCE NETWORK

Survey Two: Occupational Skills & Labor Analysis

Key Findings

Please identify the top three job roles in your organization where you anticipate the greatest need for new or upskilled talent in the next 3-5 years. (e.g., H2 Technician, Process Engineer, Safety Manager)

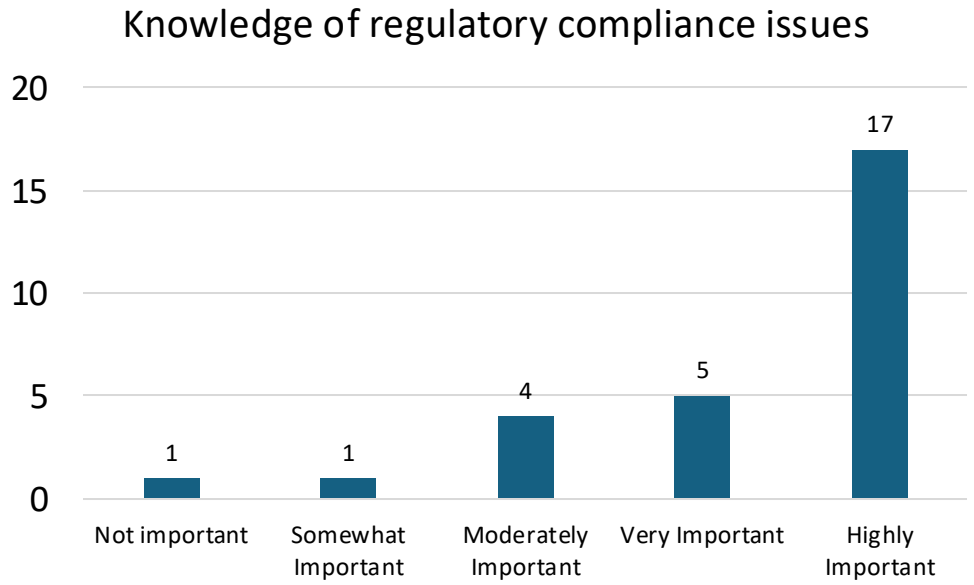
H2 Technician	12
Safety Manager	6
Process Engineer	5
Engineer	3
Technician	2

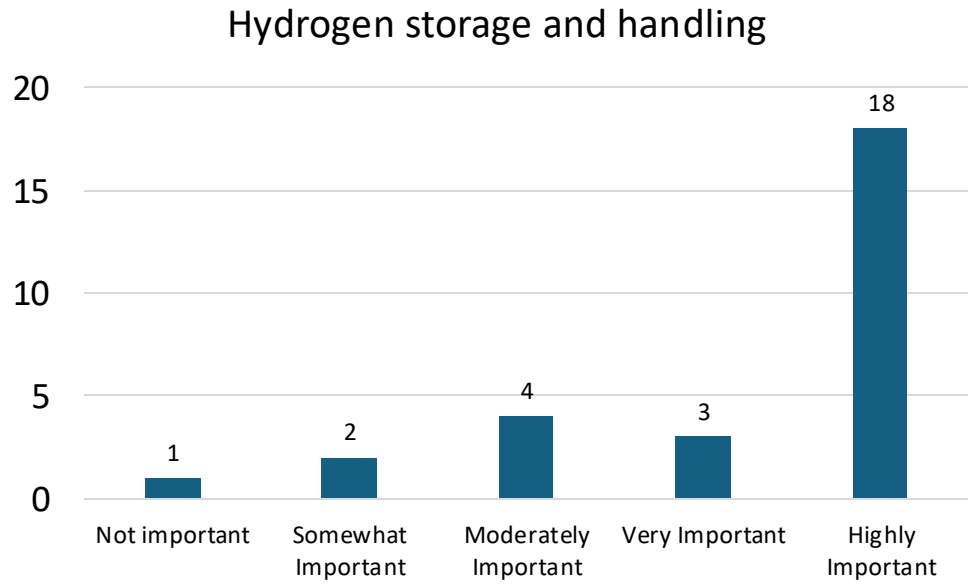
WIN WORKFORCE INTELLIGENCE NETWORK

Survey Two: Occupational Skills & Labor Analysis

Key Findings

Based on your organization's current and future needs, please rate the importance of the following technical skills for your workforce:
(Scale: 1 = Not important, 5 = Essential)





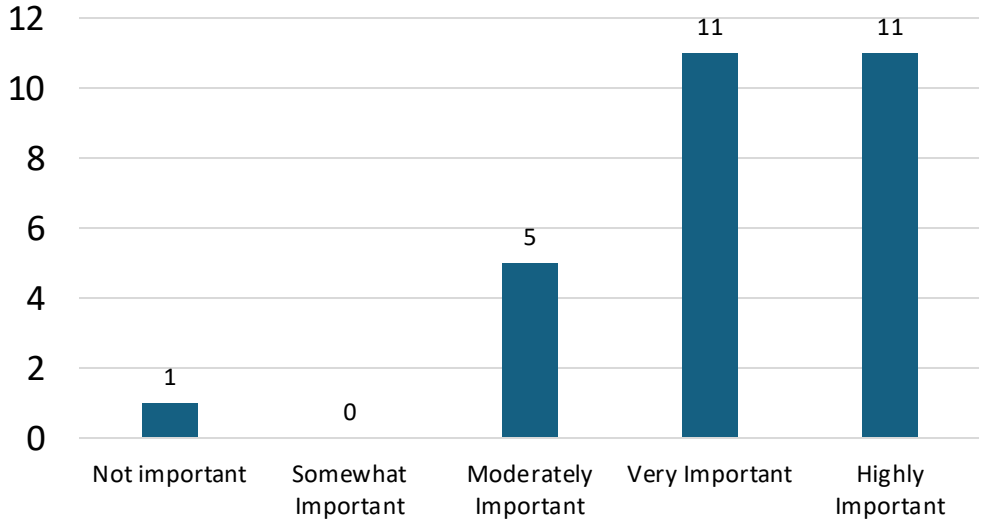
WIN WORKFORCE INTELLIGENCE NETWORK

Survey Two: Occupational Skills & Labor Analysis

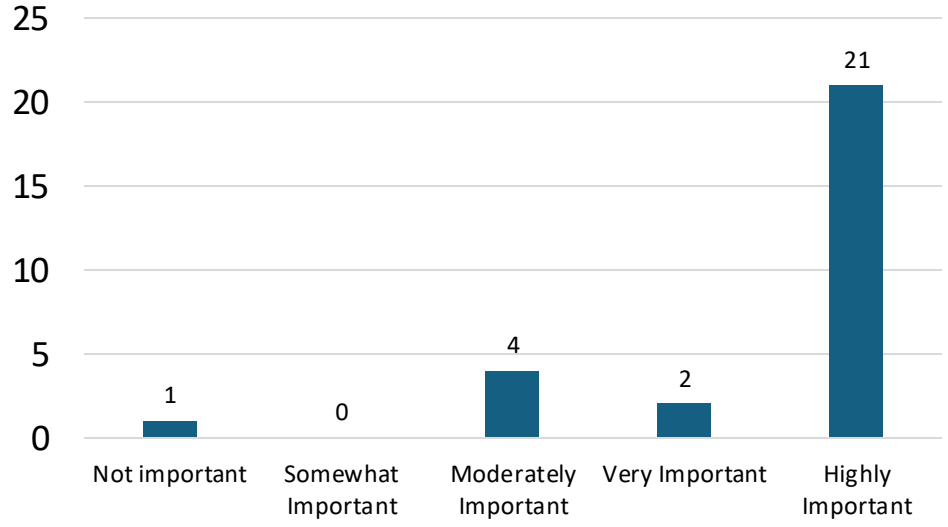
Key Findings

Based on your organization's current and future needs, please rate the importance of the following technical skills for your workforce:
(Scale: 1 = Not important, 5 = Essential)

Fuel cell system integration and operation



Hydrogen safety protocols and risk analysis

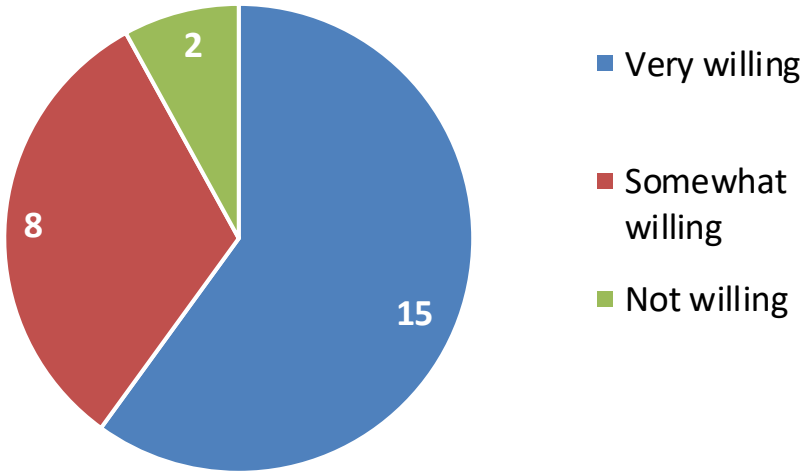


WIN WORKFORCE INTELLIGENCE NETWORK

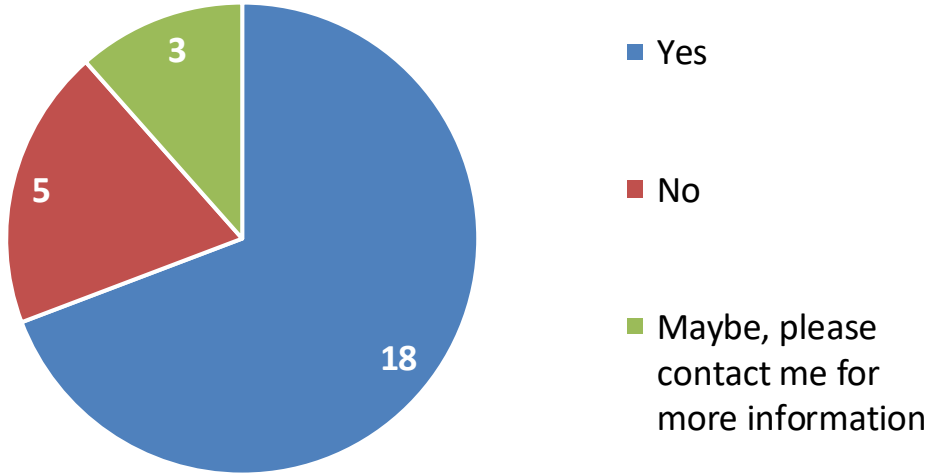
Survey Two: Occupational Skills & Labor Analysis

Key Findings

How willing is your organization to partner with an educational institution to develop and implement new reskilling or upskilling programs for the hydrogen workforce?



Would your organization be interested in partnering with an educational institution to help develop a curriculum for hydrogen-related jobs?



WIN WORKFORCE INTELLIGENCE NETWORK

WIN WORKFORCE INTELLIGENCE NETWORK

QUESTIONS? & THANK YOU!

WEBSITES

WINintelligence.org

EMAIL

Kevin.cranick@winintelligence.org