

# Hydrogen Roadmap for the U.S. Midwest Region



- Prepared for: **Stark Area Regional Transit Authority**
- In support of the **Renewable Hydrogen Fuel Cell Collaborative**
- Prepared by: **CALSTART** 7/21/17
- Presentation; Fred Silver VP CALSTART

# Purpose

- To develop a template for action to build upon the Fuel cell Economy in Ohio and the Automotive Economy in the Midwest
  - To create jobs and support the local supply chain thru accelerating deployment of hydrogen fueled vehicles
  - Desired outcomes would be
    - 1) create new jobs associated with the hydrogen industry;
    - (2) accelerate the deployment of hydrogen in transportation;
    - (3) provide strong environmental benefits;
    - (4) identify barriers for accelerated adoption of hydrogen infrastructure and vehicles as well as solutions to overcome them; and
    - (5) present a feasible hydrogen infrastructure and vehicle deployment scenario.

# Ohio Based Fuel Cell Economy

- Ohio plays a central Midwest role in the transition to a hydrogen economy
  - Noted as one of the top fuel cell states as it has a robust supplier network of fuel cell component and material suppliers
    - according to U.S Department of Energy: State of the States: Fuel Cells in America 2017
- Ohio Fuel Cell Coalition (OFCC) has helped propel the hydrogen sector forward and is designated as one of four US DOE Fuel Cell Technology Exchange Centers
  - “.....there is not a single fuel cell in the country without a component in it that was manufactured in Ohio”
- SARTA & OSU Joined to Form Renewable Hydrogen Fuel Cell Collaborative (RHFCC) to make hydrogen happen in transportation in the Midwest
  - SARTA rolling out largest Fuel Cell Bus Fleet outside of California
  - Midwest Hydrogen Center of Excellence (MHCoE) created under RHFCC with FTA funding to have transit focus
  - OSU-GTI-CALSTART Teamed to increase supply chain of zero emission bus components



# Vehicle and Station Deployment Roadmap

- Strategy: Early deployment of technology ready commercial vehicles enable the hydrogen refueling infrastructure for the long term deployment of public light duty cars

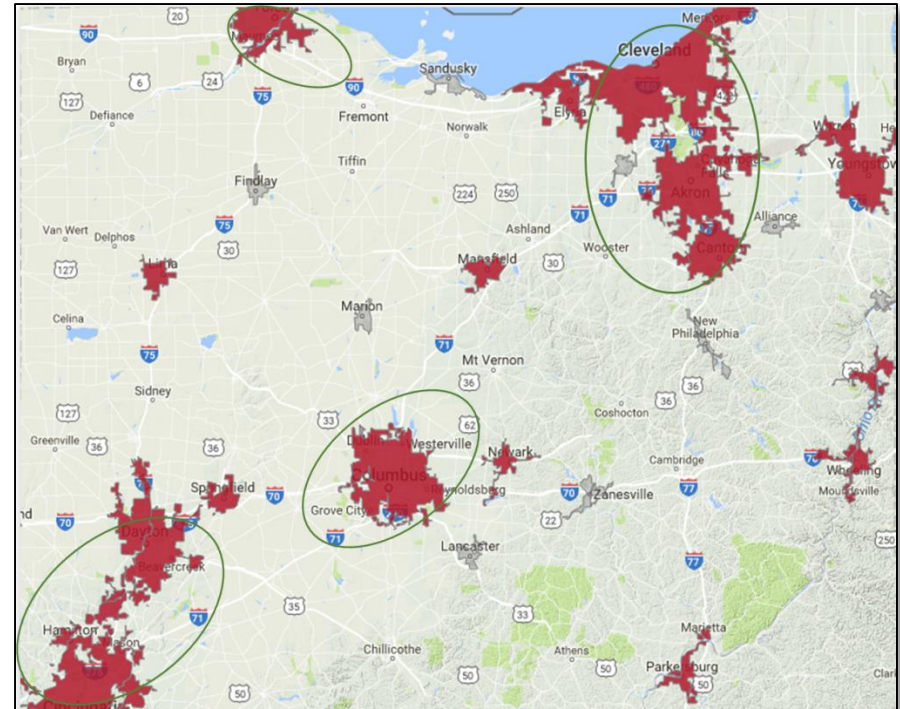


Table 2: Rollout of FCEV in Ohio

Ohio Total	2017	2018	2019	2020	2021	2022	...2032
HD	3	14	19	29	52	73	2106
MD	0	5	17	51	61	92	2647
LD	0	0	0	0	0	0	40500
<b>Total FCEV Count</b>	<b>3</b>	<b>19</b>	<b>36</b>	<b>80</b>	<b>113</b>	<b>164</b>	<b>45252</b>

# Priority Regional Hydrogen Refueling Clusters

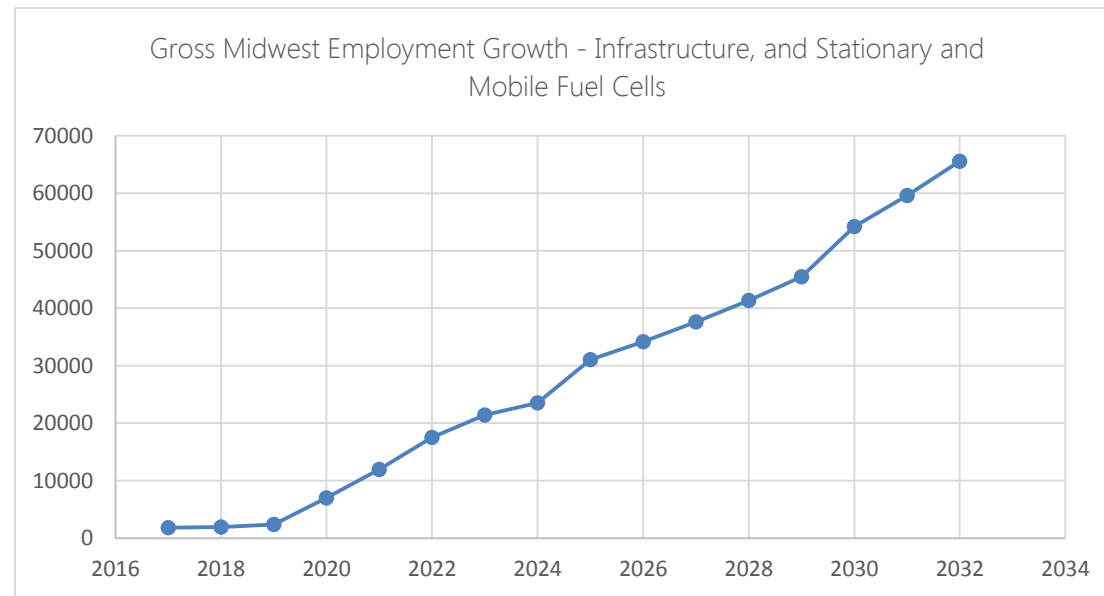
- Main clusters for deployment of hydrogen infrastructure were identified in Ohio and the Midwest regions
- Ohio providing 107 Stations for 45,000 Vehicles:
  1. Cleveland – Akron – Canton
  2. Columbus,
  3. Cincinnati – Dayton; and
  4. Toledo
- Midwest Priority regional clusters providing 251 stations for 136,000 vehicles were:
  1. Ohio,
  2. Michigan,
  3. Illinois,
  4. Indiana
  5. Western Pennsylvania



Priority areas for early deployment of hydrogen infrastructure and FCEVs in Ohio

# Envisioning Jobs Derived from Proactive Vehicle and Station Deployments

- 65,000 Direct fuel cell activities in 2032
  - Annual job growth 27%
- Indirect Jobs due to fuel cell activity
  - Illinois: 38,394
  - Indiana: 88,306
  - Michigan: 125,909
  - **Ohio: 96,238**
  - Pennsylvania: 27,920





# Summary

- Ohio has reputable and strong fuel cell expertise
- Proactive implementation of a
  - Fuel cell vehicle deployment of commercially ready fuel cell vehicles
  - Tied to hydrogen refueling to enable cluster development for larger fuel cell vehicle deployments
- Can enable job growth in the Midwest Region and Ohio

