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Description:	5C. Shailesh Topiwala, Bosch
Filer:	Raquel Kravitz
Organization:	Bosch
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Advancing Clean Hydrogen Technology for Large-Scale Deployment and Market Growth

WELCOME TO THE NEW H_2



Shailesh Topiwala

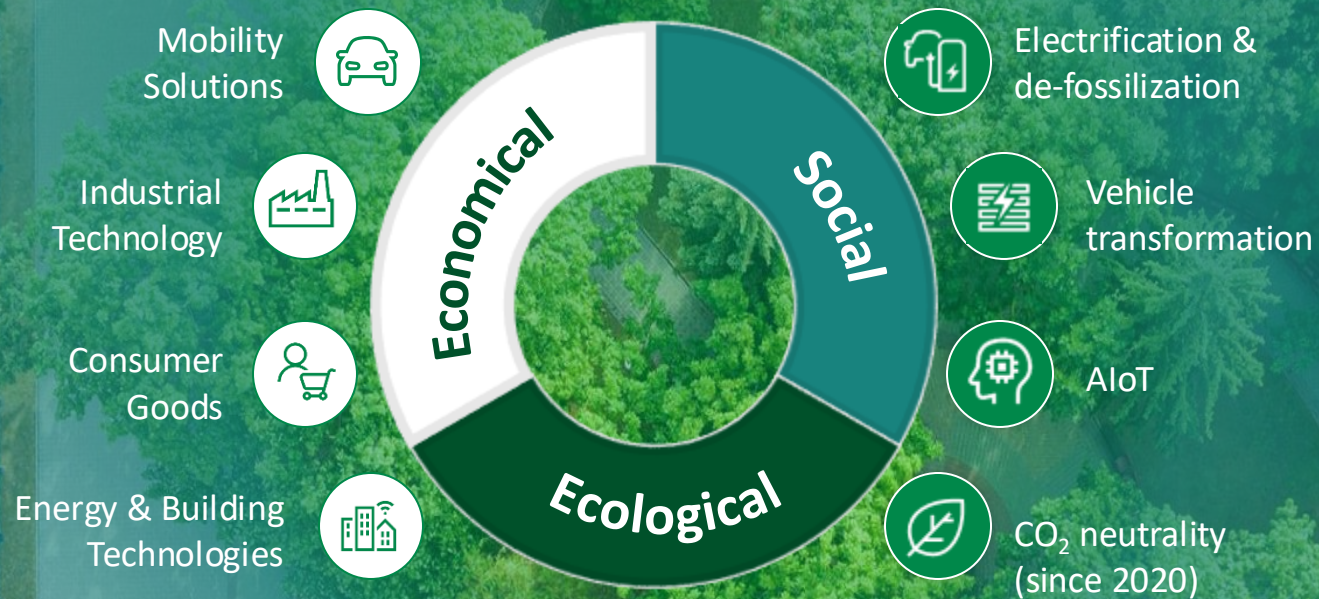
Director – Corporate & Business Development

Robert Bosch LLC

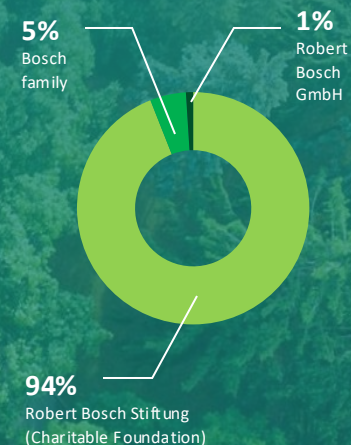
July 29, 2025



Our industry segments & strategic focal areas



Ownership



2024 Figures



~98

billion dollars
sales revenue



~8.4

billion dollars
research and
development



~3.4

billion dollars
EBIT



~417,900

Bosch associates
worldwide at year-end.
~20% women in
management



~470

subsidiaries & regional
companies in more than
60 countries

Motivation

Evolving Energy System in California

Clean Electricity Goals



60% by 2030

100% by 2045

Greenhouse Gas Emission Goals



40% below 1990 level by 2030

Carbon Neutral no later than 2045

Challenges

Severe events



Air quality



Decarbonization



Decentralization



Electrification



Energy storage



Key characteristics of solutions

Reliable power



Ultra-low emissions



Flexibility



Modularity / Scalability



Solve grid bottlenecks



Complement renewables



NA Hydrogen Market

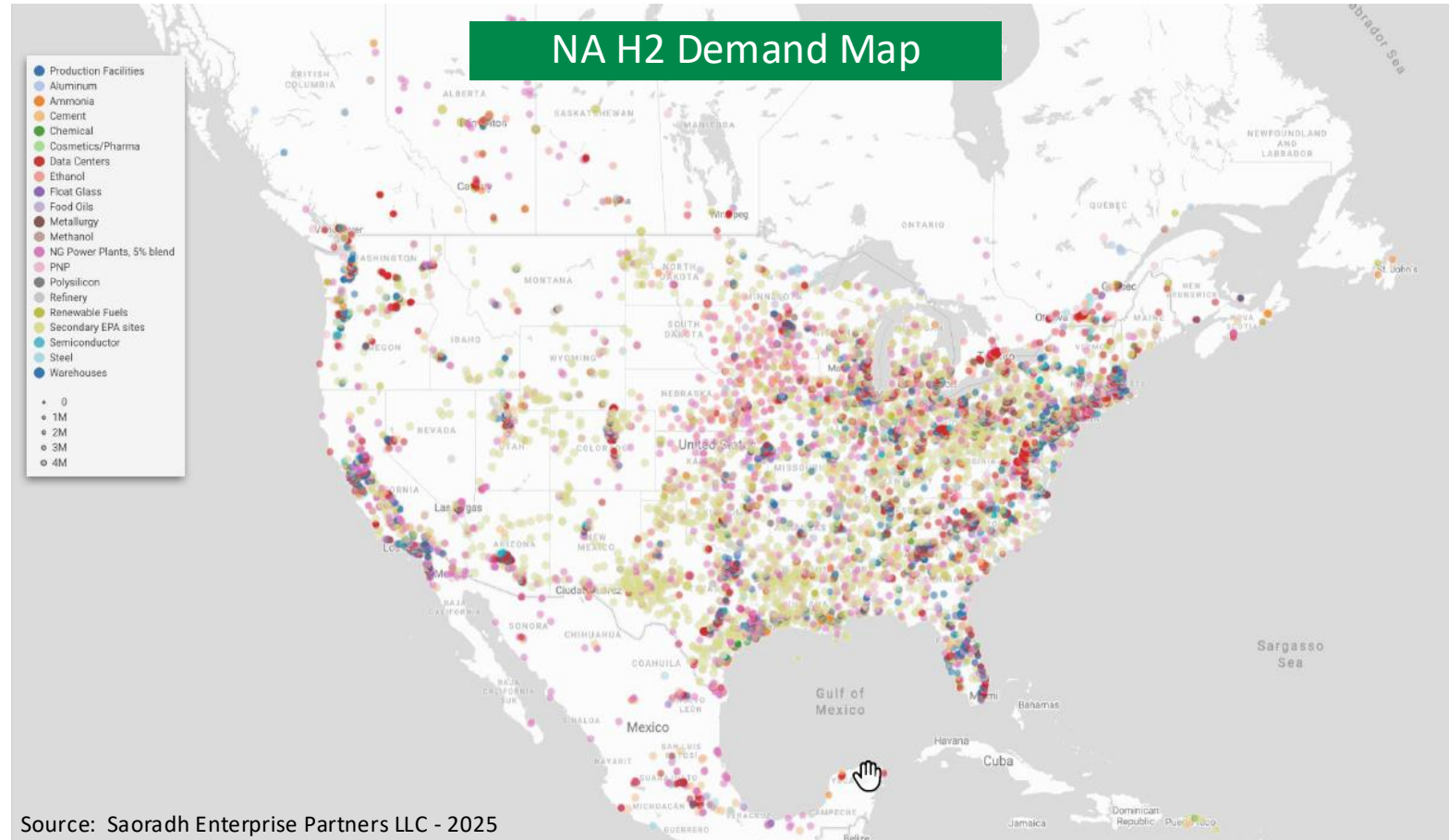
Hydrogen Demand Overview & Drivers for Electrolytic H2

NA H2 Key Points

- +14 MT/a demand (2024)
- Diverse use cases
- Distributed geographical use
- Limited H2 pipelines

Drivers for Electrolytic H2

- Decentralized H2 demand
- High cost to deliver grey H2 to distributed end-uses
- Smaller scale industrial applications (NH3, fertilizer)
- Local H2 fleets (buses, forklifts)
- Corporate sustainability targets



Bosch H₂ Portfolio

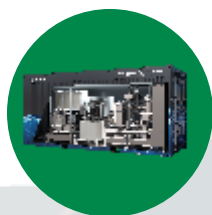
Addressing key challenges across value chain

Production

Storage & Distribution

Usage

Water purifier



PEM electrolysis stack



Optical gas spectrometer



Compact gas compressor



CryoPump



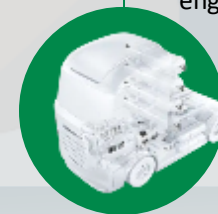
Universal steam boiler



Fuel cell engine



H₂ combustion engine



Advancing CryoPump Technology

Delivering Cost-Effective Scale-Up of H2 Re-fueling

Game changing technology from Bosch Rexroth for Hydrogen refueling stations

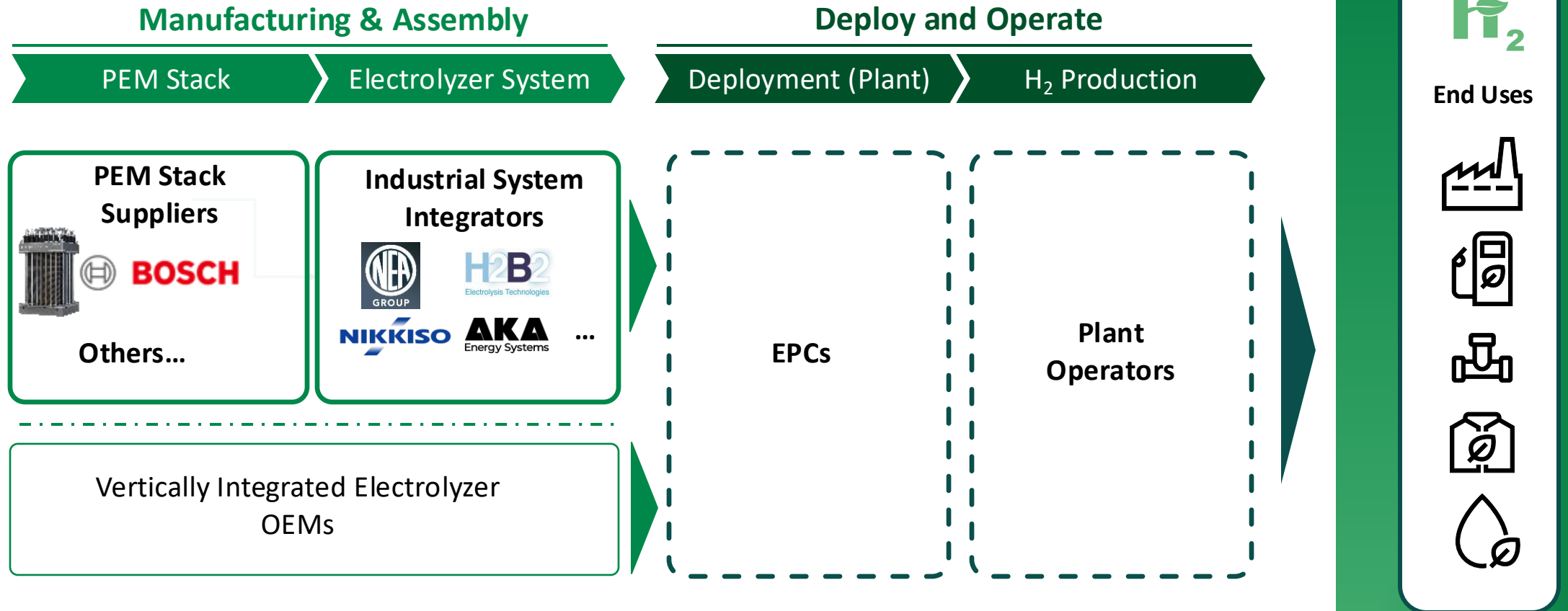
- › **Near zero H2 loss** through entire value chain
- › **Future proof design:** 350bar & 700bar gH2, ccGH2 or sLH2 fills + zero loss transfers from delivery truck to bulk tank from one platform
- › **Multiples options:**
 - › #2 simultaneous class 8 truck fills in **10 minutes** or
 - › #4 simultaneous LD/MD fills possible in an **11 m² footprint**
- › Dramatically **reduced on site construction cost & time to deploy**
- › Designed for **4,000 hour maintenance interval**, more than **10x improvement** over current state of the art
- › **Intertech safety certificate** included



The Bosch Rexroth CryoPump Station as future-proof, compact, all-in-one solution

Advancing PEM Electrolyzer Technology

Optionality to Scale PEM Electrolyzer Deployments



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Shailesh.Topiwala@us.bosch.com



California Energy Commission
50 YEARS OF ENERGY LEADERSHIP

2025 Integrated Energy
Policy Report (IEPR)



NEA NEUMAN & ESSER

FEST

AKA
Energy Systems

ANDRITZ

tj
TECNICAS REUNIDAS

H2 Ready!



 **BOSCH**

CF Pietro
Fiorentini

HYTER
NEW ENERGY ROUTES

H2B2
Electrolysis Technologies



NIKKISO

 **BOSCH**