



Emerging Wastes: Stationary Fuel Cells

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US Environmental Protection Agency

Region 1

ASTSWMO Joint HW & SMM Training

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US Dept of Energy, 2014



Agenda

■ Fantastic *Fuel Cells* and Where to Find Them



WHAT ARE
FUEL CELLS?



HOW DO
THEY WORK?



WHO IS USING
THEM?

■ Practical *Waste Management* and its Use Against the Dark Arts



DESULF
FILTERS



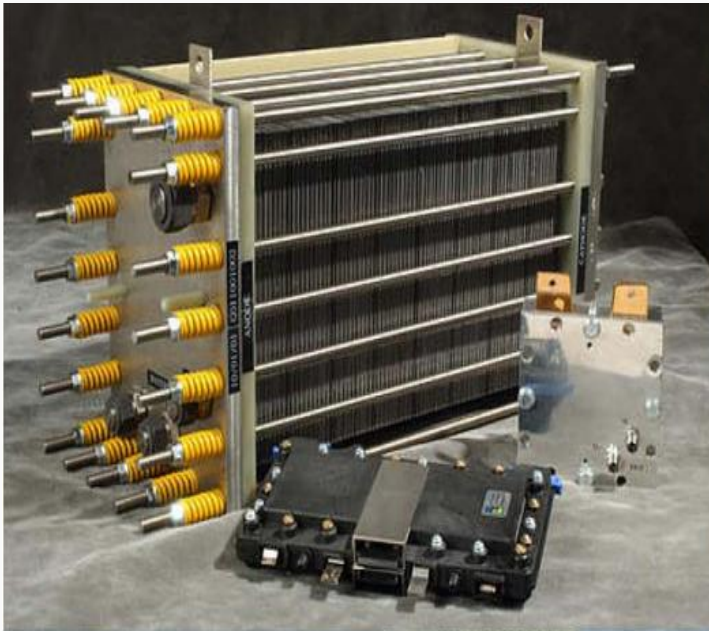
OTHER
COMPONENTS



UPCOMING
CHALLENGES

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What are fuel cells?

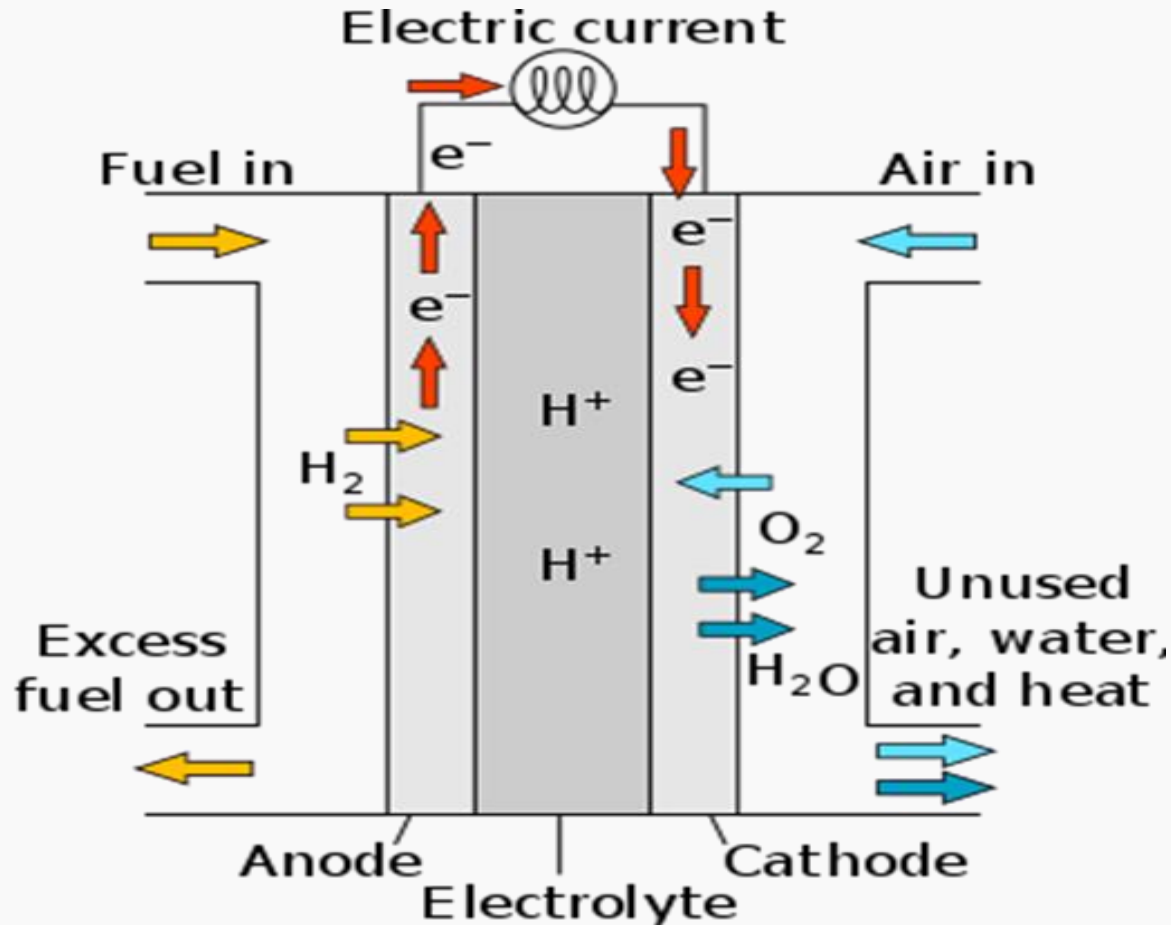


US Dept of Energy, 2014



R. Bunnell, CT DEEP, 2018

How do fuel cells work?



R. Bunnell, CT DEEP, 2018

But really...what are fuel cells?

Diverse Energy Sources & Fuels

Biomass
Natural Gas
Propane
Diesel
Other Hydrocarbons
Methane
Methanol

Hydrogen
from renewables
or low carbon
resources

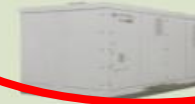
Clean, Efficient Energy Conversion

Fuel Cells

- Alkaline
- Direct Methanol
- Molten Carbonate
- Polymer Electrolyte Membrane (PEM)
- Phosphoric Acid
- Solid Oxide

Diverse Applications

Stationary Power



Transportation



Portable Power



US Dept of Energy, 2014

Who is using stationary fuel cells?



US Dept of Energy, 2018



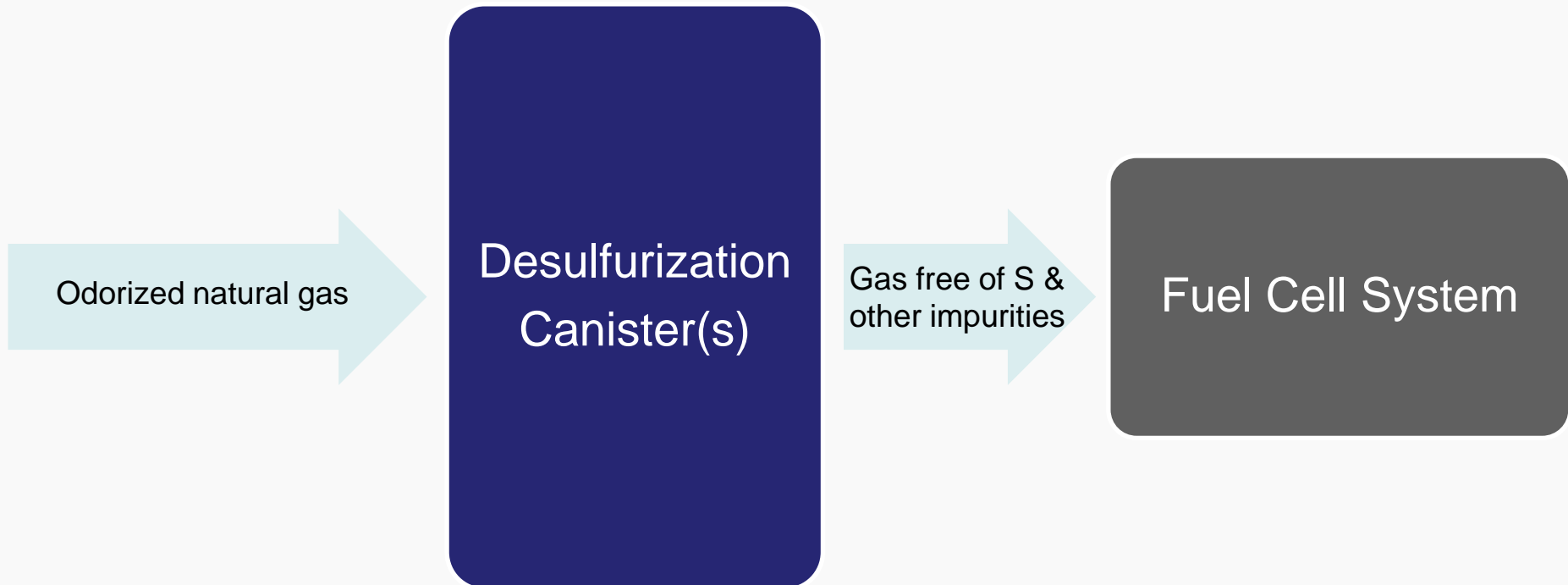
US Dept of Energy, 2017



US Dept of Energy, 2017



Desulfurization filters



Other components



Swiss Federal Office of Energy, 2018



US Dept of Energy, 2017

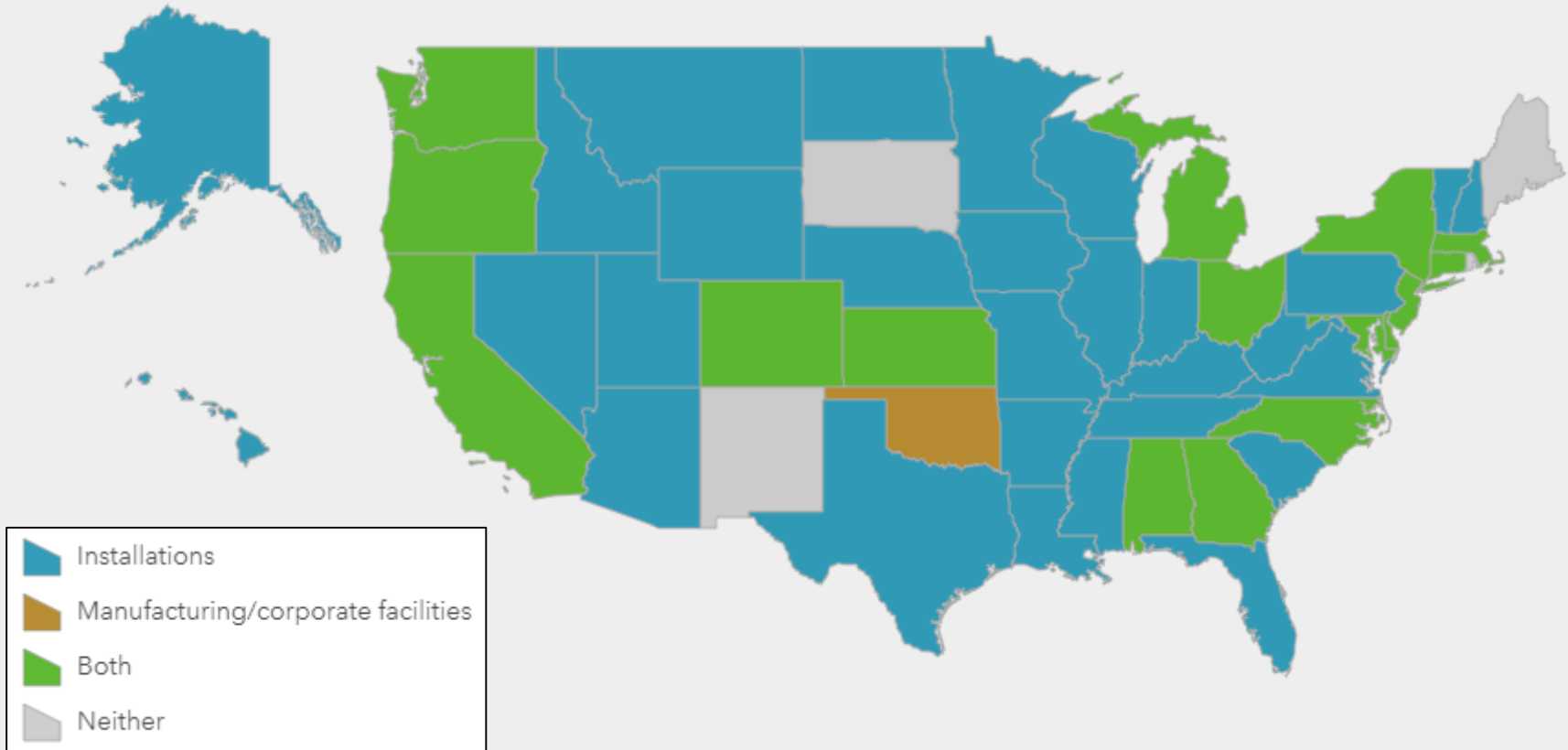


What happens when...





Stationary fuel cell installations and facilities as of 2017



Data from US Dept of Energy, 2018



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Supplemental Slide – EPA Guidance Docs

- [RCRA Online 14884](#) – Barnes Johnson Memo on MPU Exemption, October 2016

Referenced Shawn Garvin Memo, September 2015, available upon request

- [RCRA Online 13374](#)– OSWER Hotline Question on MPU Exemption, May 1990



Supplemental Slide – Dept. of Energy References

- Fuel Cell Technologies Office – General
- State of the States: Fuel Cells in America – Annual Reports
- Fuel Cell Technologies Market Reports