Outline

1. Who is WATT Fuel Cell?
2. Our Technology
3. Development at WATT Fuel Cell
4. Who cares?
5. Q&A

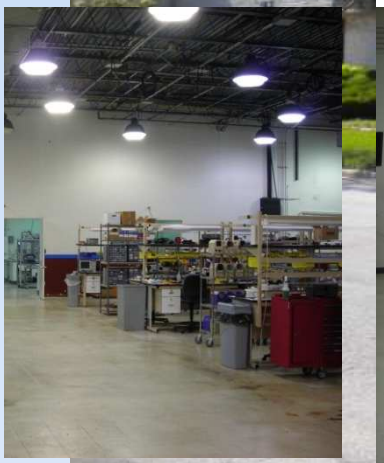
What is WATT?

1. The oldest, newest Fuel Cell Company in NY State

2. 33,000 sq. feet of facility in Port Washington, New York
    1. 6,000 office
    2. 18,000 lab/manufacturing
    3. 9,000 warehouse

3. "Developer and manufacturer of advanced ceramic fuel cell technology used with commercially available fuels"

What is WATT?



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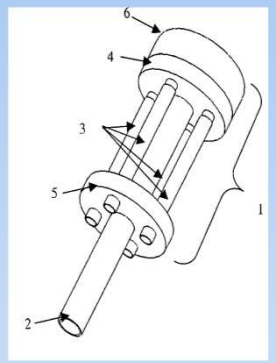
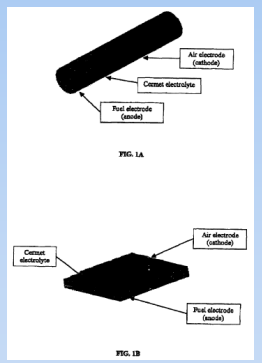
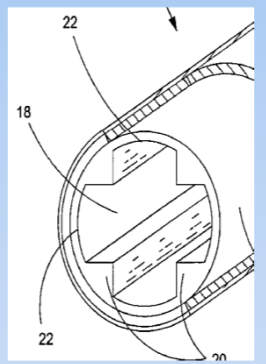
27 Seaview Blvd., Port Washington, NY 11050

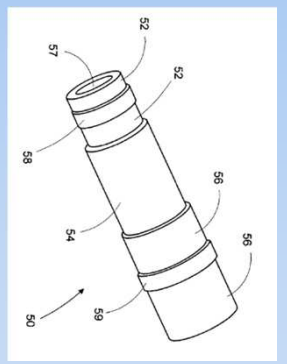
WFC
WATT FUEL CELL

IP Portfolio



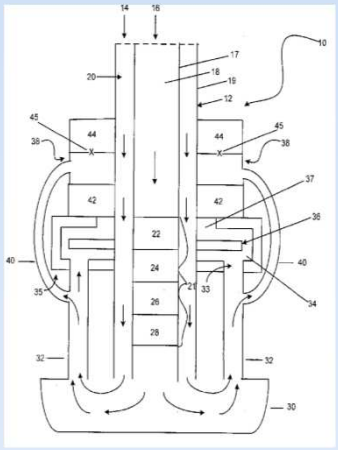


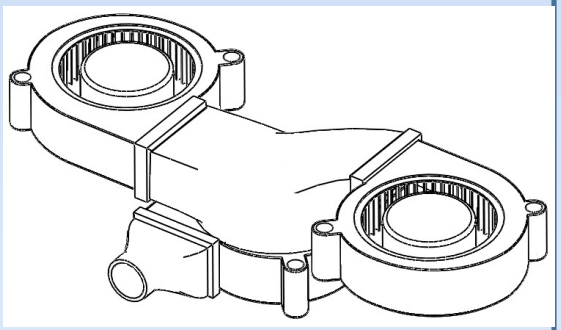




PATENTS ISSUED - 6

- *Solid Oxide Fuel Cells with* ***Novel Internal Geometry***
- *Anode Supported SOFC using a* ***Cermet Electrolyte***
- *Methods for* ***Electrochemical Optimization*** *of SOFC*
- *Solid Oxide Fuel Cell* ***System***
- ***Textile Derived*** *SOFC*
- ***Fuel Cell Element***



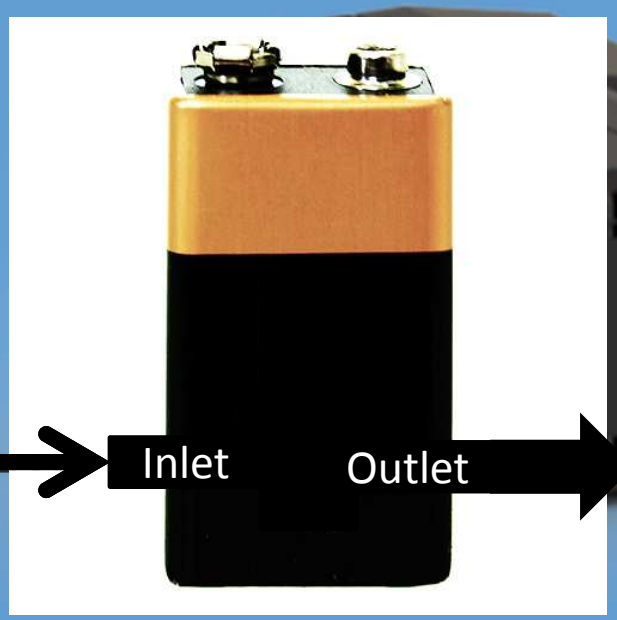


FILED *(Recently)* - 8

- *Solid Oxide Fuel Cell Systems with* ***Improved Gas Channeling and Heat Exchange***
- ***Tubular Electrochemical Cell***
- ***Internal Reforming*** *Solid Oxide Fuel Cells*
- *Electrochemical System having* ***Multiple Independent Circuits***
- *Electrode for a Solid Oxide Fuel* ***Cell and Method for its Manufacture***
- ***Centrifugal Blower System*** *and Fuel Cell Incorporating Same*
- ***Process for Producing Tubular Ceramic Structures***
- *Process for Producing Tubular Ceramic Structures of* ***Non-Circular Cross Section***

WATT FUEL CELL

Fuel Cell Technology

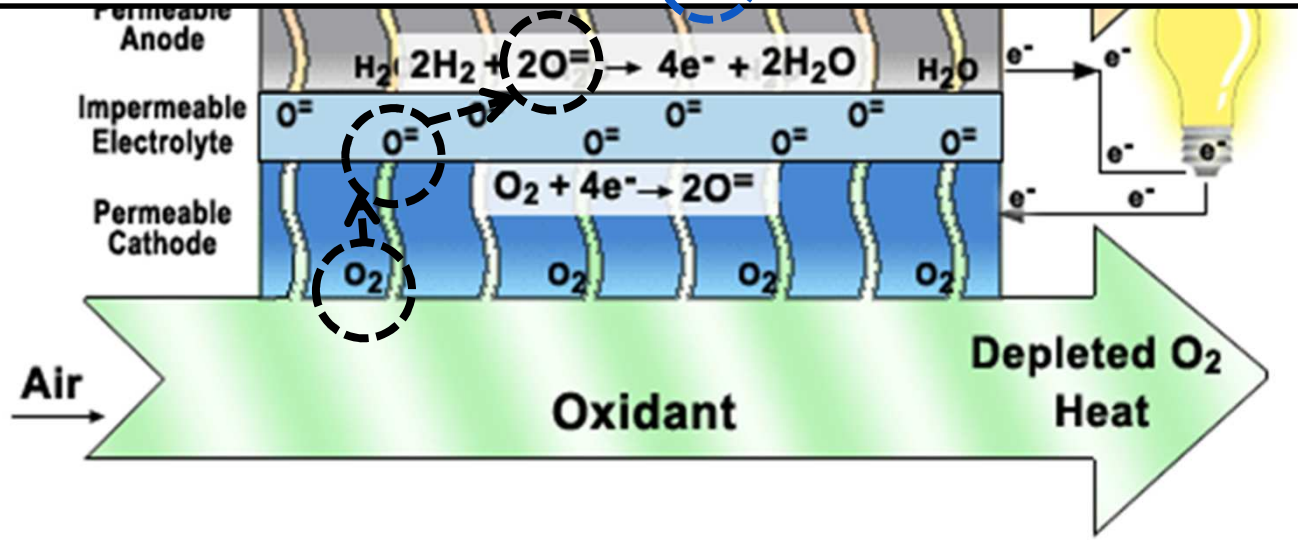


Water and Pure CO_2

WATT FUEL CELL

Oxy-Fuel Cell Technology

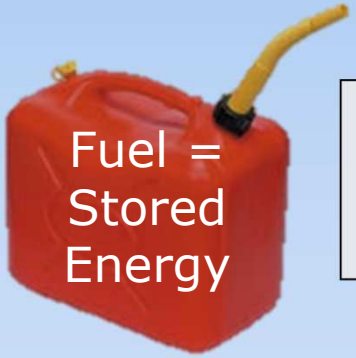
1) $H_2 + O^{=} \rightarrow H_2O + 2e^-$
2) $4CH_4 + O_2 + 2H_2O \rightarrow 10H_2 + 4CO + 14O^{=} \rightarrow 10H_2O + 4CO_2 + 28e^-$
3) $2CH_4 + O_2 + CO_2 \rightarrow 3H_2 + 3CO + 6O^{=} \rightarrow 3H_2O + 3CO_2 + 12e^-$
*4) $2CH_4 + O_2 + \rightarrow 4H_2 + 2CO + 6O^{=} \rightarrow 10H_2O + 4CO_2 + 12e^-$
5) $CO_2 + C \rightarrow 2CO + O^{=} \rightarrow 2CO_2 + 4e^-$



<u>Oxygen</u> is the universal fuel of an Oxy-fuel cell (SOFC)!

Fuel Cells (*in general*)

Conventional Generator



Fuel = Stored Energy

Fuel Cell

Combustion Release energy

Mechanical Convert energy

Mechanical to Electrical Convert energy

Many conversion steps = **Less Efficient**

Chemical reaction Release of Electricity

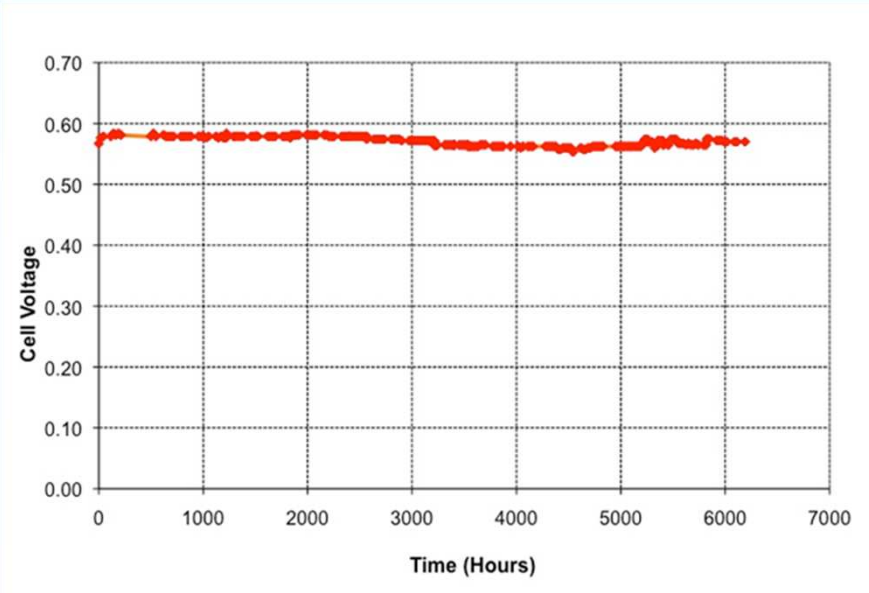
1 step

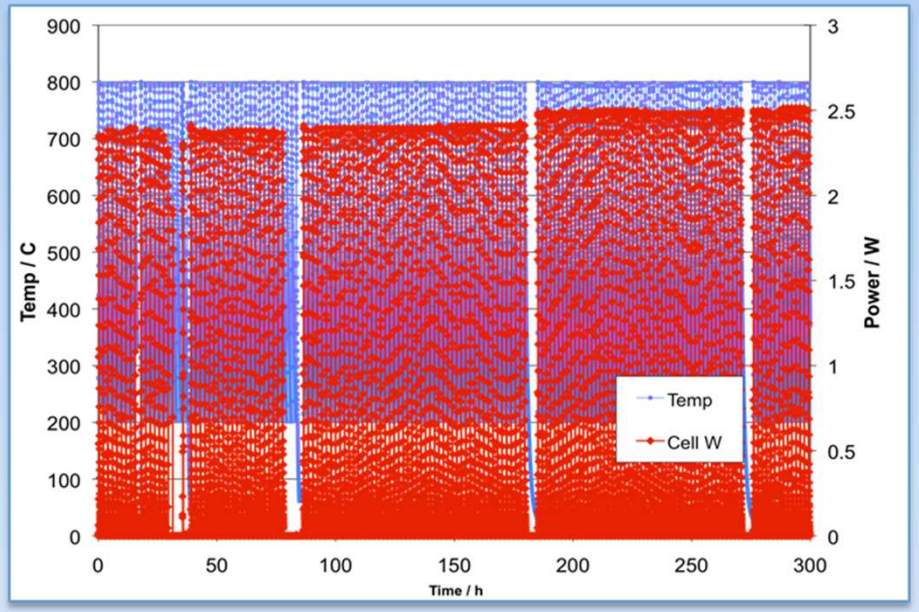
More Efficient

ELECTRICAL ENERGY

WATT FUEL CELL

WATT Performance is Proven

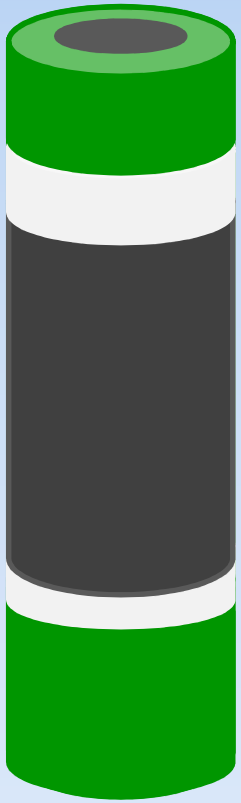




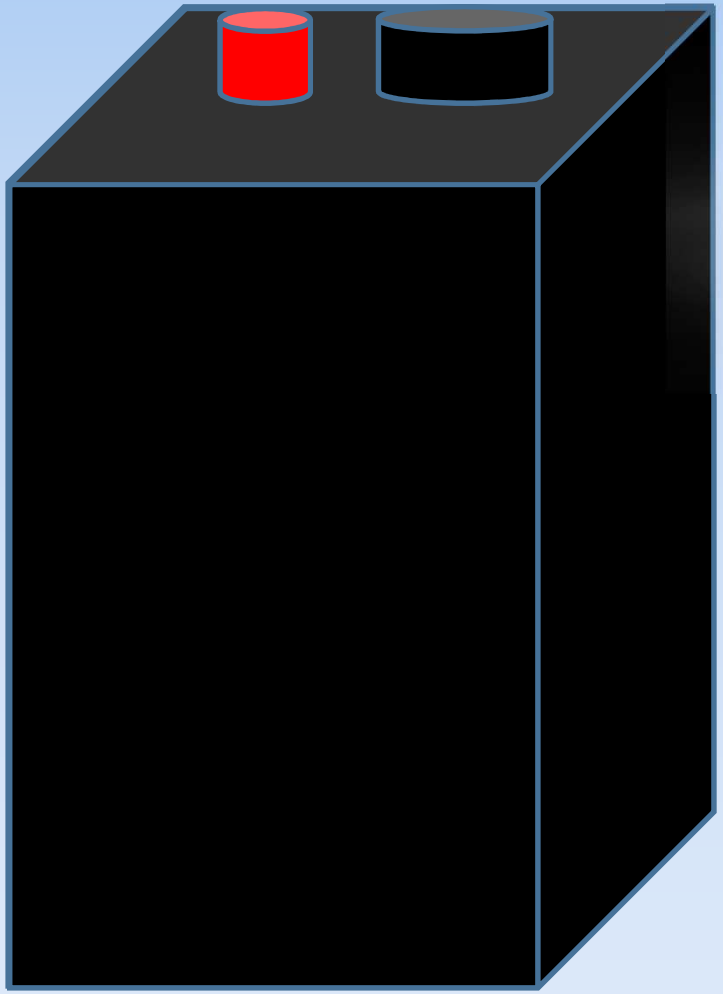
<u>Endurance,</u> constantly running for thousands of hours

<u>Thermal Cycling/ Load Following,</u> demonstrates ability to follow thermal variances due to conditional circumstances or fuel intake adjustments

How do we make our tech?



Cell Technology



Stack Technology

System Technology

Three top level processes at WATT

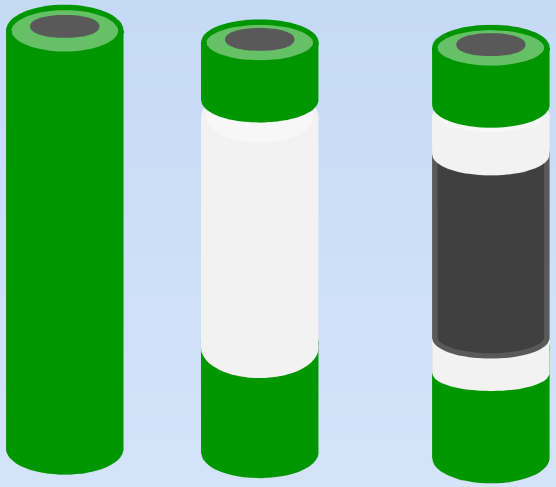
Focus is advanced manufacturing

Development this year

- Cell Manufacturing, *PON 2250*

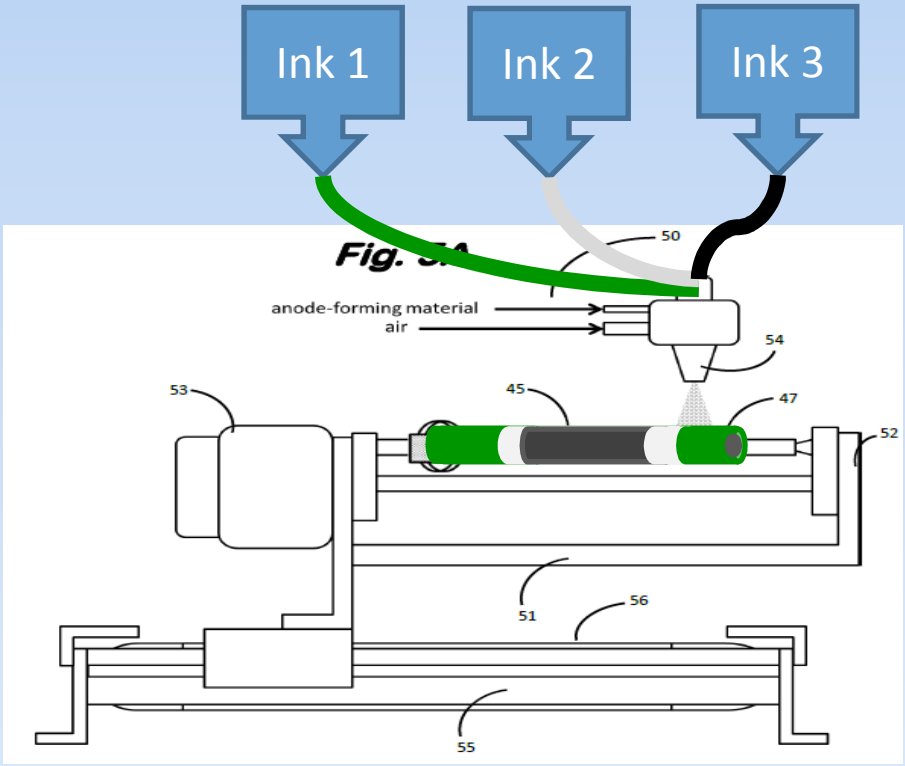
1. Part Formation, Extrusion

3. More coatings



2. Advanced Coatings

Lots of handling and energy



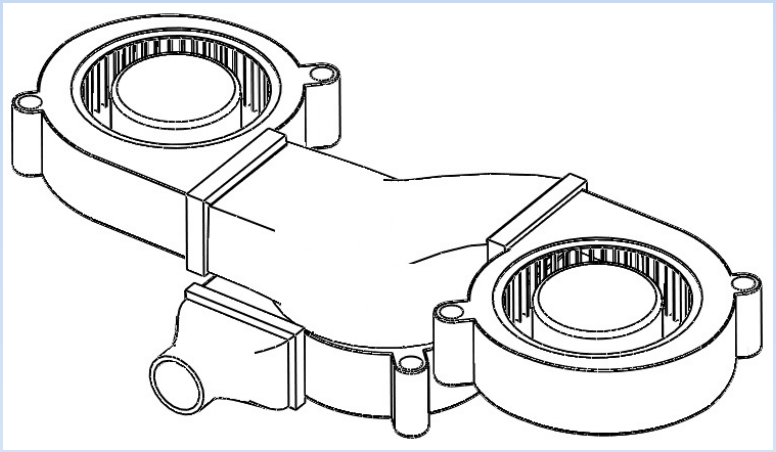
60-75% less energy and
80% less time for manufacture

Development this year

- Stack and System Manufacturing, *DOE FOA570*

Automated manufacture

Cost-effective BOP components



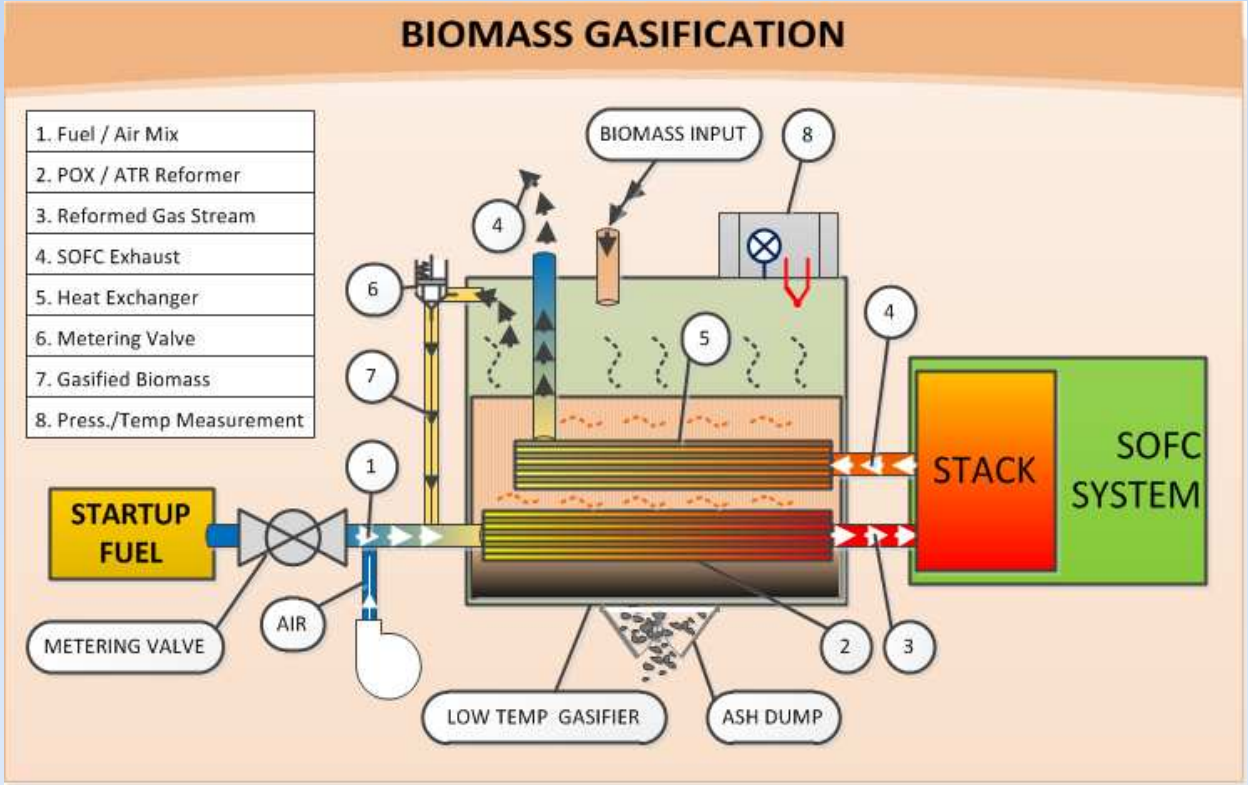
Phase 1. Reduction of parasitic losses from **16% to 3%** to operate the system
Phase 1. Reduction of stack manufacturing time by **80%**
Phase 2. Reduction of system manufacturing time by **99%** (units of days to minutes)

Development this year

- Multi-fuel compatibility, *PON 2271*

Current Fuel Selection

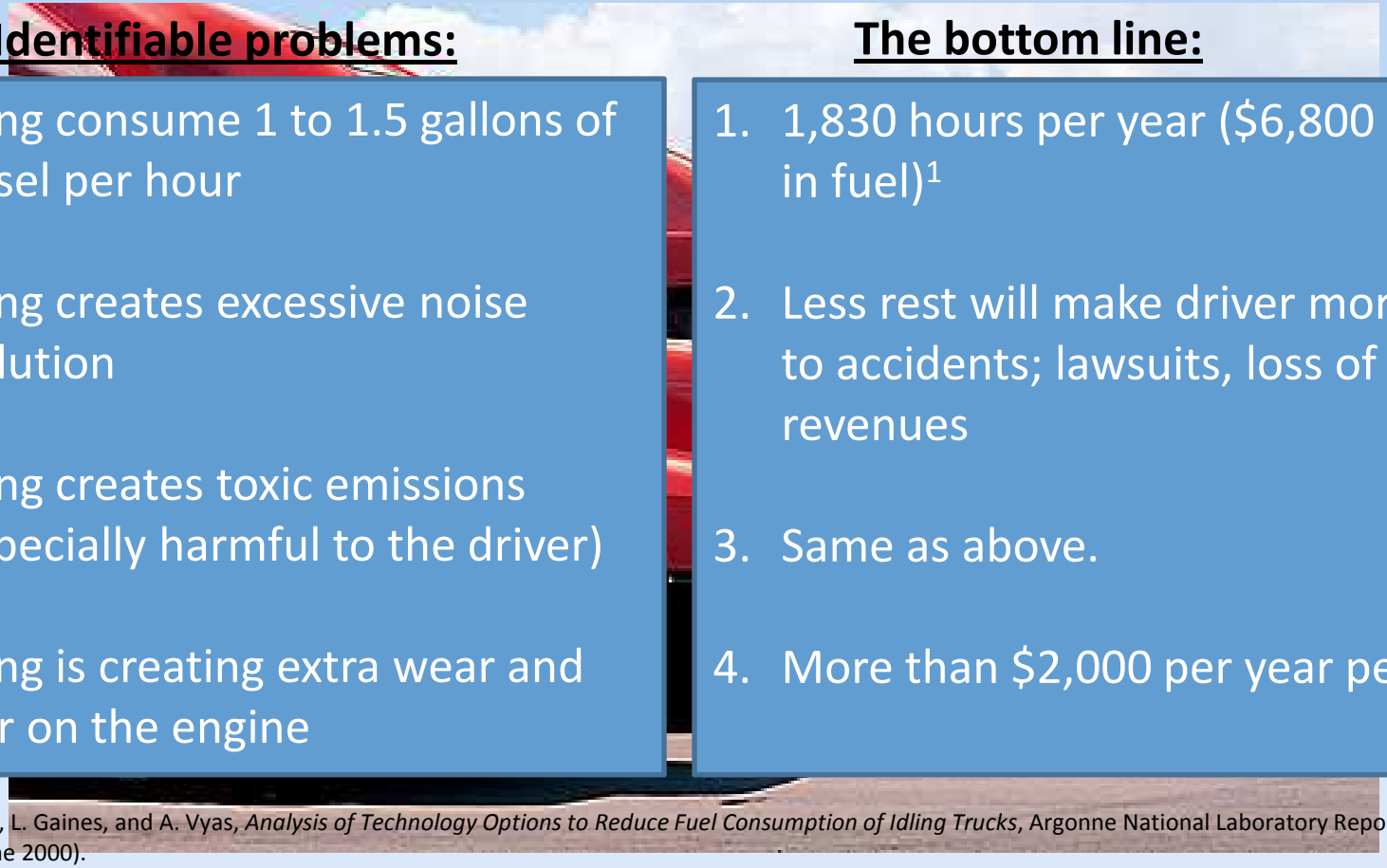
- **Gasoline**
- **Diesel**
- **Propane**
- **Natural Gas**
- **Bio Fuels**
- **Synthetic Fuels**
- **Kerosene**
- **Others…**



Who Cares?

Problem Statement:

Truck Idling at rest stops is a multi-faceted problem that involves a localized energy problem.



Identifiable problems:

1. Idling consume 1 to 1.5 gallons of diesel per hour
2. Idling creates excessive noise pollution
3. Idling creates toxic emissions (especially harmful to the driver)
4. Idling is creating extra wear and tear on the engine

The bottom line:

1. 1,830 hours per year ($6,800 per year in fuel)[1]
2. Less rest will make driver more prone to accidents; lawsuits, loss of revenues
3. Same as above.
4. More than $2,000 per year per truck[2]

1) Stodolsky, F., L. Gaines, and A. Vyas, *Analysis of Technology Options to Reduce Fuel Consumption of Idling Trucks*, Argonne National Laboratory Report NL/ESD-43, Argonne, IL(June 2000).
2) http://www.epa.gov/region1/eco/diesel/pdfs/Diesel_Factsheet_Truck_Idling.pdf

Who Cares?

They Care:

1. $0.88 per Kilowatt-hour for electricity (On Demand); Lap-top and TV example, $0.32 vs. $22
2. WATT Fuel Cell operates less than 45 dB, like a quite library[1]
3. Pure CO_2 and water as exhaust
4. Preserves engine life; separate unit to the engine

We Care:

1. Nice Beachhead Market; 15.5 million trucks, 2.5 million tractor trailers[2] and no good solution
2. Competition: Some other fuel cells in this market space but none close to our cost models
3. Substitution: Portable diesel gen sets are generally noisy, require maintenance and outdoor/isolated operation
4. Success in this market is expected to open doors to other markets
   - Distributed power
   - Back up power
   - Remote power

1) http://www.sengpielaudio.com/TableOfSoundPressureLevels.htm

2) http://www.truckinginfo.net/trucking/stats.htm