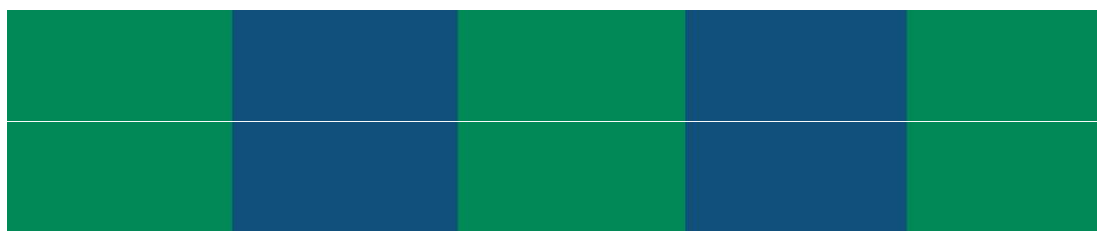
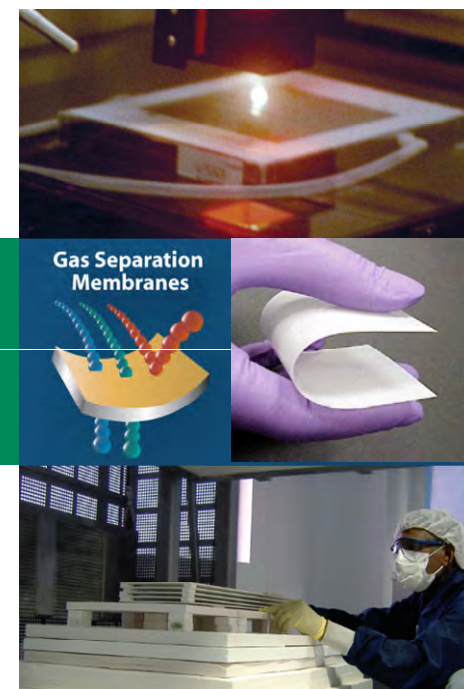




Ceramic Technology for Clean Energy



Ceramics for Energy
John Olenick
President
8/3/11



155 Rano Street, Suite 300

Buffalo, NY 14207

Phone 716.873.2939

www.enrg-inc.com

Cell Phones – Two Decade Society Integration



Post-Quake, Japanese Fuel Cell Credits Used Up

The Nikkei July 26 evening edition

- The pool of money that the government set aside to subsidize household purchases of fuel cells through March 2012 has already dried up amid surging demand driven by fears of electricity shortages.
- The subsidy quota for fiscal 2011 was 8,000 fuel cells. Although that figure was about 60% larger than in the previous year, it had already been reached early this month.
- Osaka Gas Co. sold about 1,300 fuel cells in the three months through June, up 80% on the year, while Tokyo Gas Co. has sold more than 4,000 since April 1. The fiscal 2011 sales figure at JX Nippon Oil & Energy Corp. had reached about 550 units by early July, up roughly 400% on the year.

American Energy Priorities

True or False?

The US spent more on potato chips in 2010 than on Federally funded energy R&D?



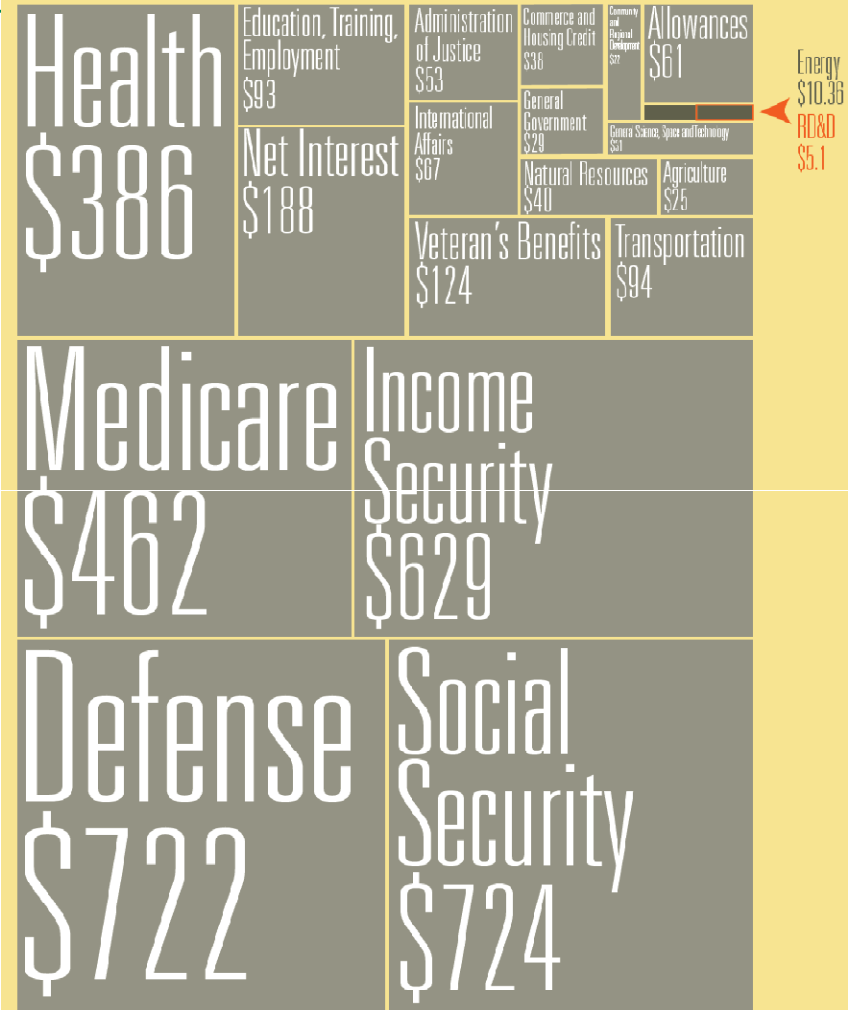
Energy Priorities?

\$7.1B versus \$5B

Sadly, America spends more on potato chips than we do on our new energy RD&D.

<http://www.americanenergyinnovation.org/>

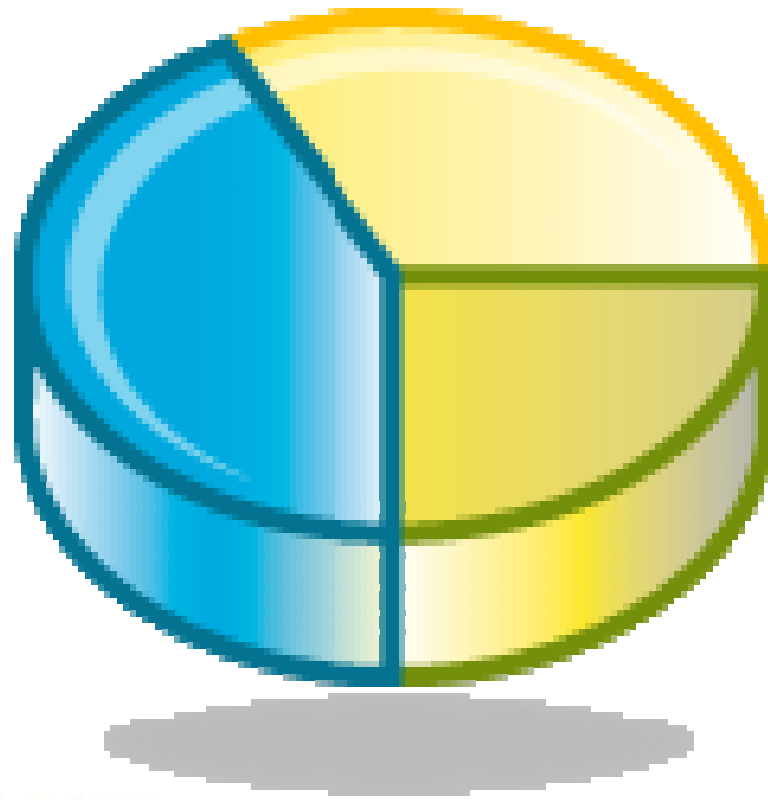
2010 Federal Budget \$3.60 Trillion (in billions)



<http://www.americanenergyinnovation.org/>

Agenda

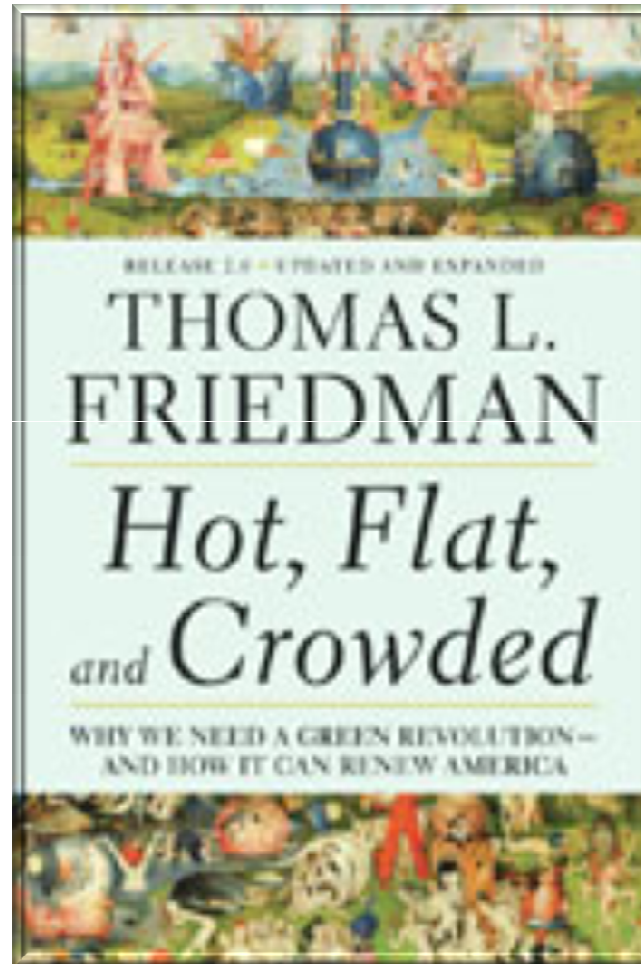
Politics



Tech

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Hot, Flat, and Crowded



<http://www.thomasfriedman.com/>



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<http://macmillan.hosted.panopto.com/Panopto/Pages/Viewer/Default.aspx?id=610215c3-a3c8-429c-9dcd-3f8b72ee8a99>

THOMAS L. FRIEDMAN *Hot, Flat, and Crowded*



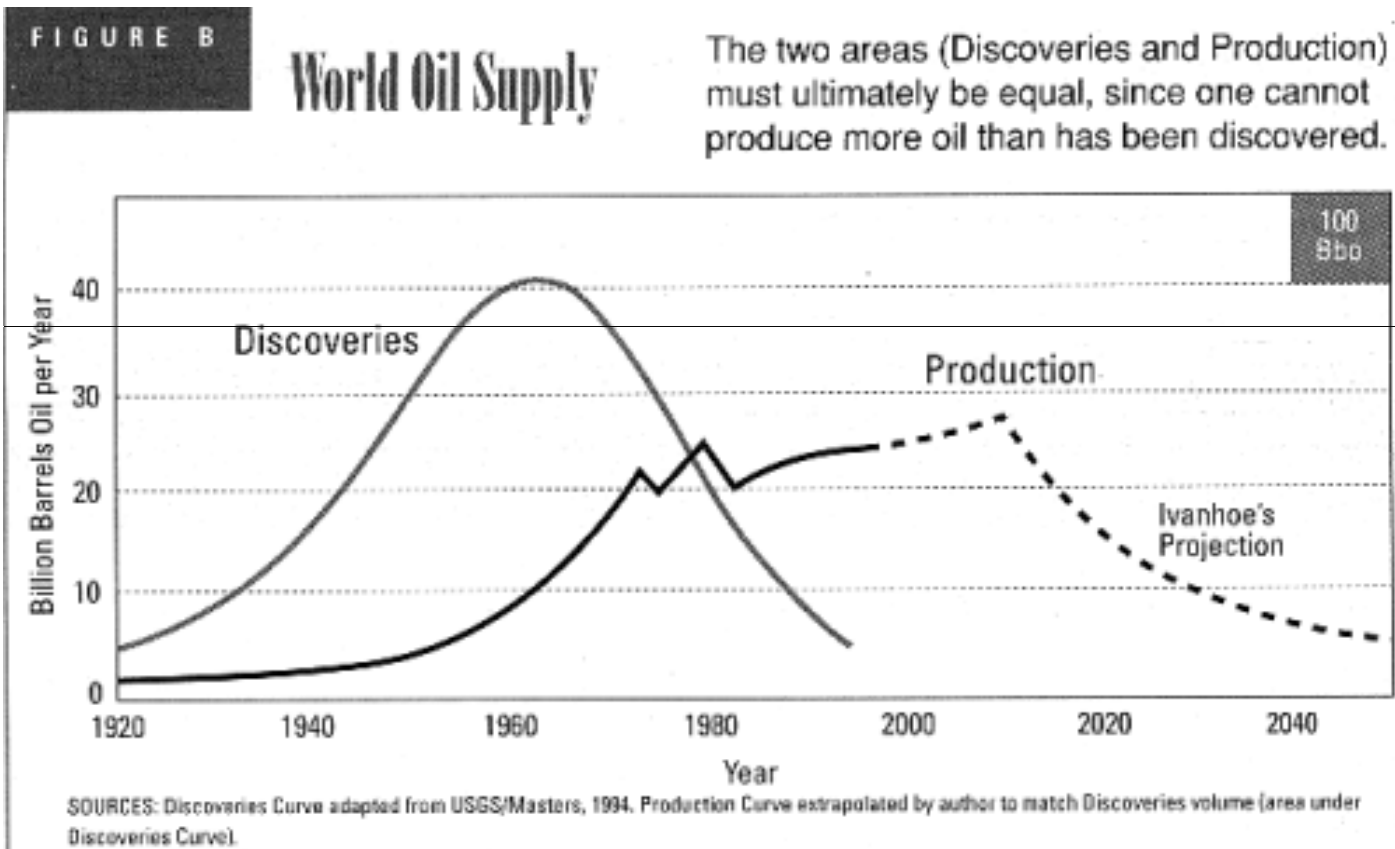
- **Energy and Natural Resources Supply and Demand**
- **Petrodictatorship**
- **Climate Change**
- **Energy Poverty**
- **Biodiversity Loss**

The First Law of Petropolitics

Iran's president denies the Holocaust, Hugo Chávez tells Western leaders to go to hell, and Vladimir Putin is cracking the whip. Why? They know that the price of oil and the pace of freedom always move in opposite directions. It's the First Law of Petropolitics, and it may be the axiom to explain our age.

http://www.foreignpolicy.com/articles/2006/04/25/the_first_law_of_petropolitics

Worldwide Oil Supply & Demand



<http://macmillan.hosted.panopto.com/Panopto/Pages/Viewer/Default.aspx?id=610215c3-a3c8-429c-9dcd-3f8b72ee8a99>

**Build Absolutely Nothing
Anywhere Near Anything**

Results in 5% grid Eff.

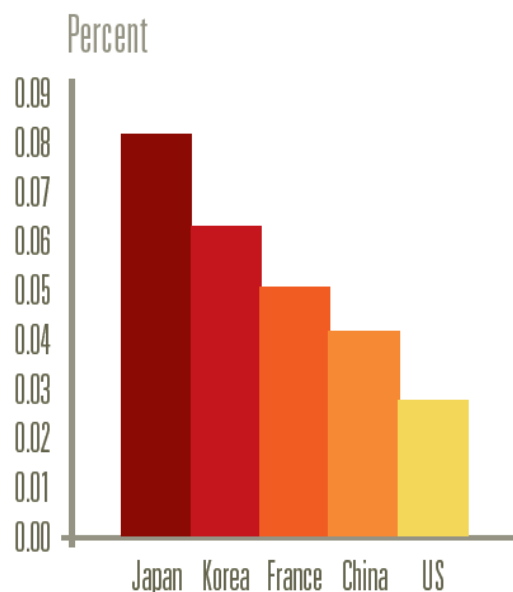
AEIC: The Grid Is Old

If today's computer chips were the same size and cost as they were in 1975, Apple's iPod would cost \$1 billion and be the size of a building.

<http://www.americanenergyinnovation.org/>

AEIC: Move the Budget to \$16B

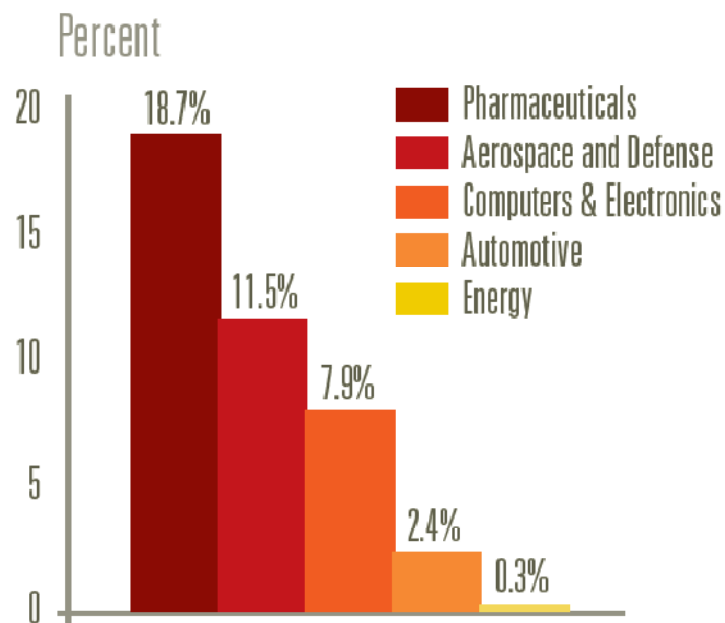
Public Energy RD&D Spending as a Share of GDP, 2007



Among its major trading partners and competitors, the United States spends the smallest fraction of its GDP on energy RD&D.⁷

<http://www.americanenergyinnovation.org/>

R&D Spending as a Share of Sales



Of all major technology-dependent sectors, the energy sector spends the smallest portion of its sales on research and development.¹

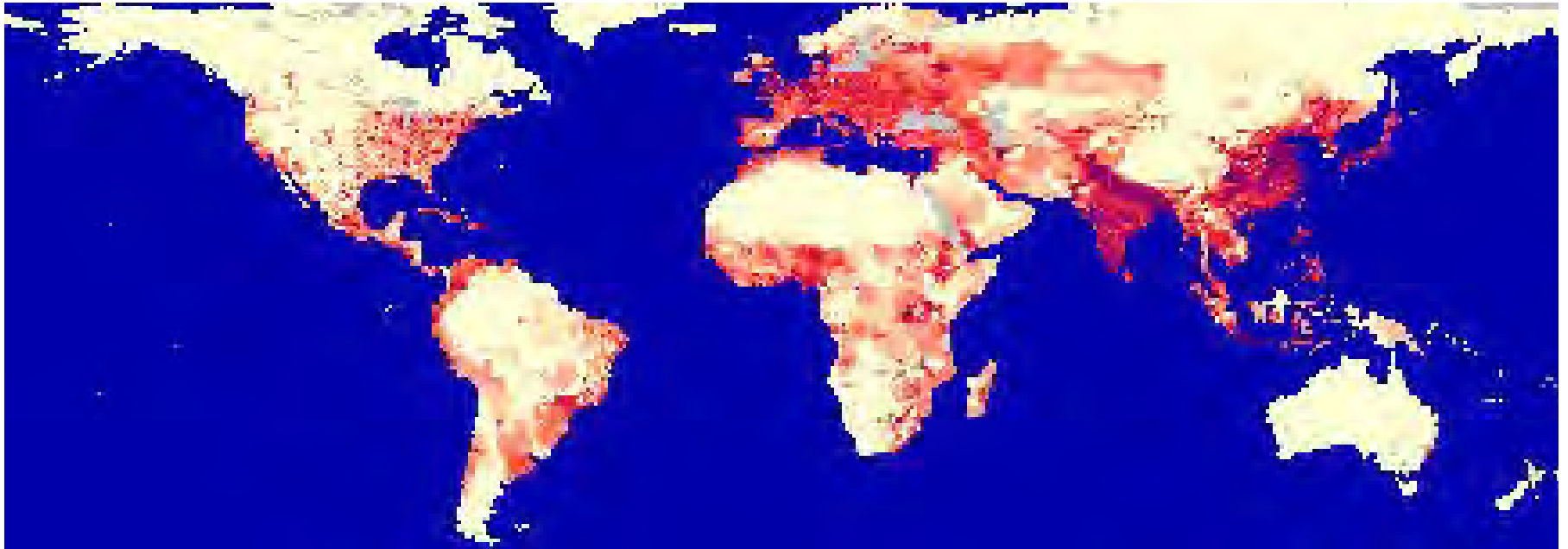
Crowded, reference Friedman

Now: 1+2+3=6B people

- **1B live well, all comforts**
- **2B want to join the 1B**
- **3B live without comforts**

By 2050 =9B people

Worldwide Population

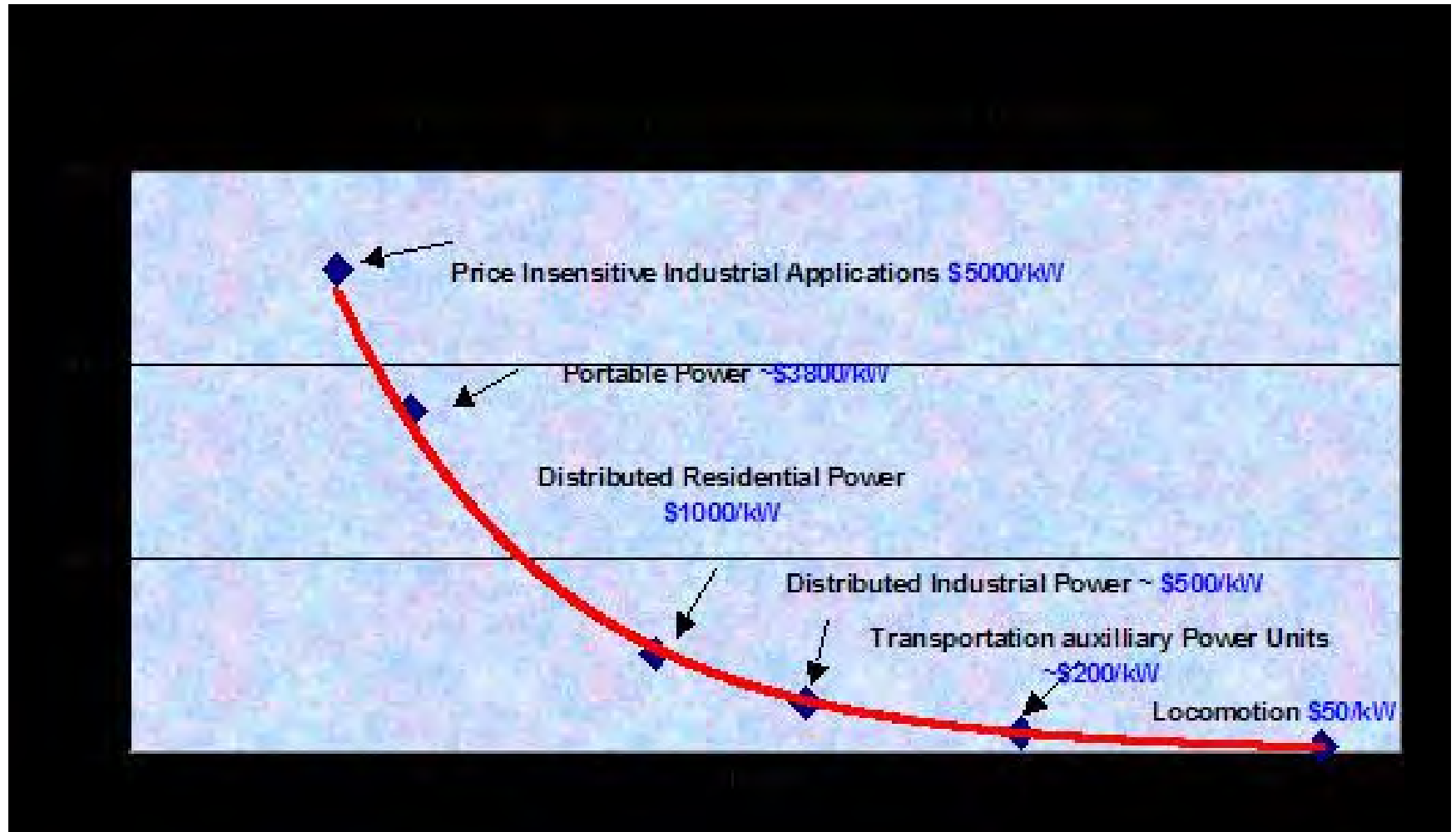


Watch what disappears at night.

Worldwide Population

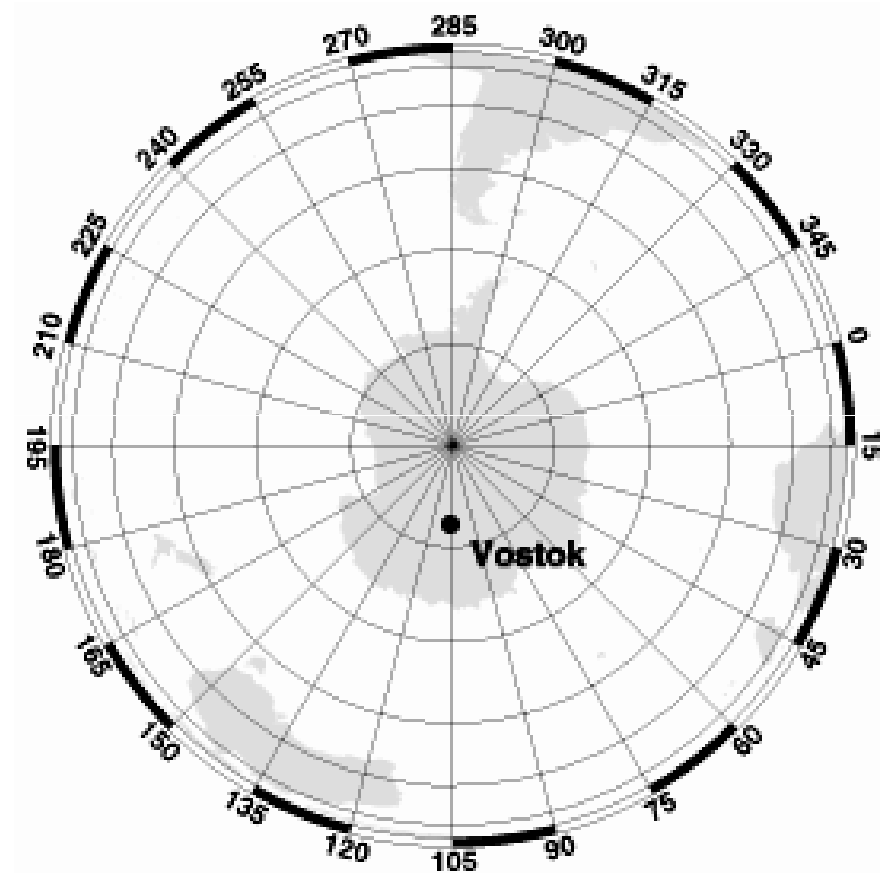


Market Structure – Who is the customer?



Vostok Ice Core Data

8 Books, 4 pro and 4 neg



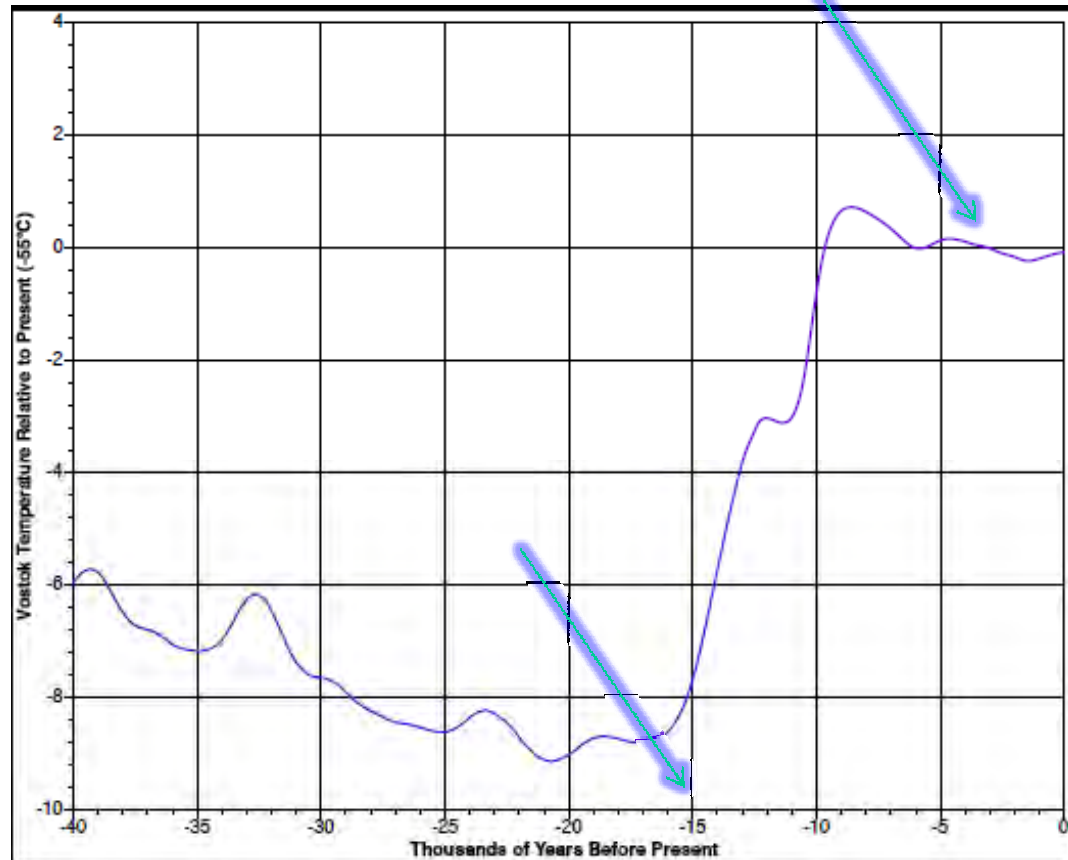
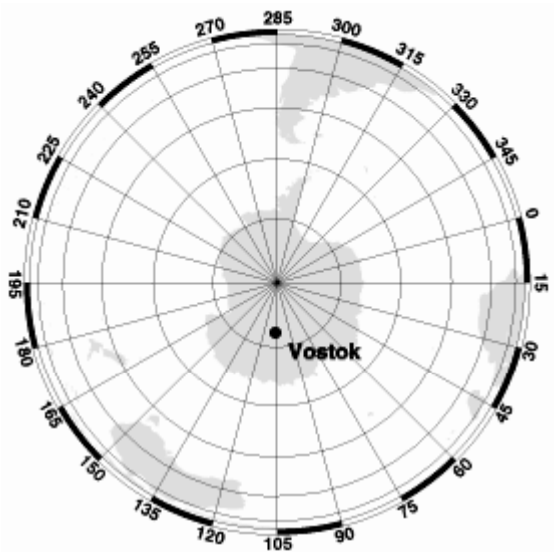
<http://cdiac.ornl.gov/trends/co2/vostok.html>

Man?

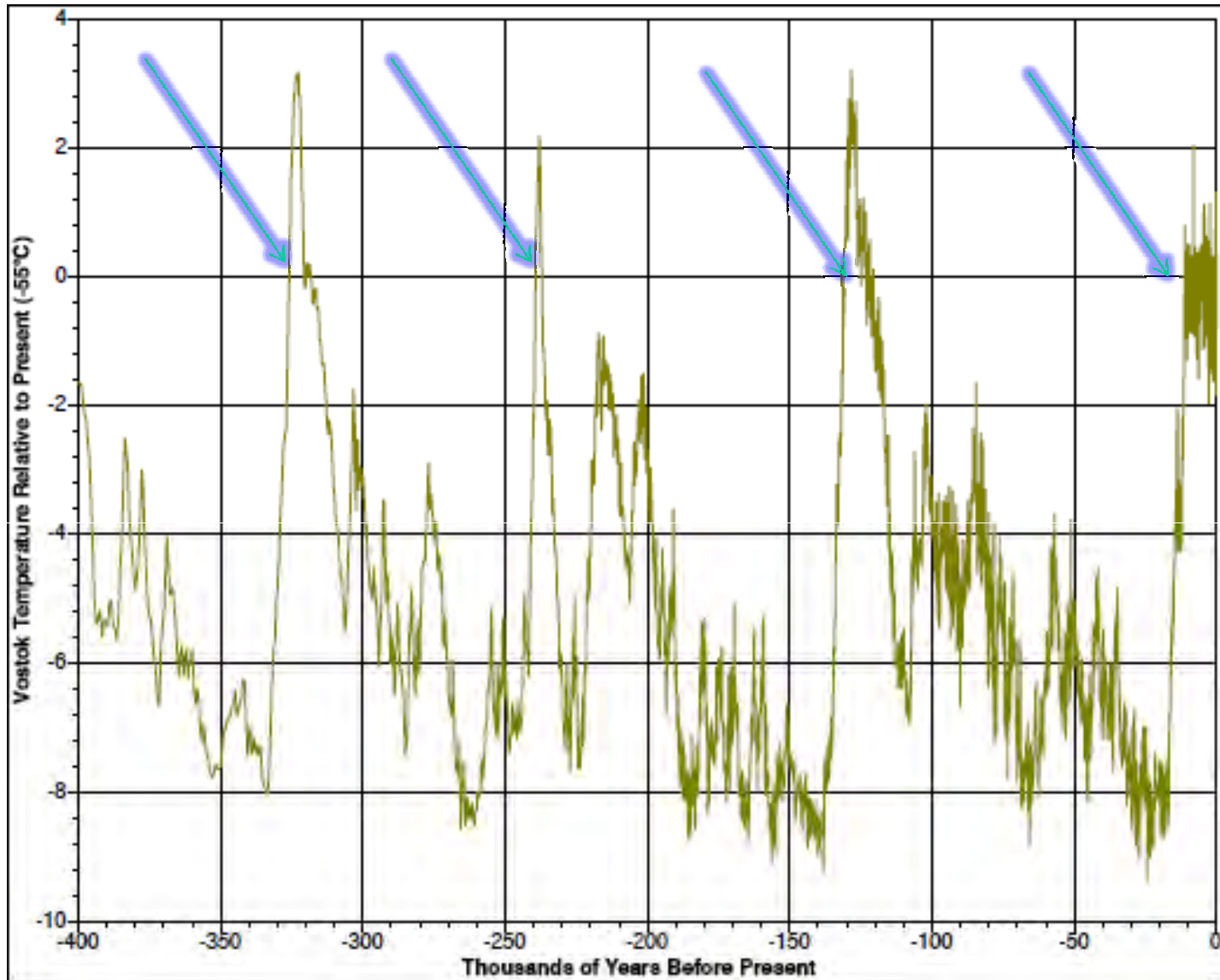
200,000 years ago, humans started looking like they do today.

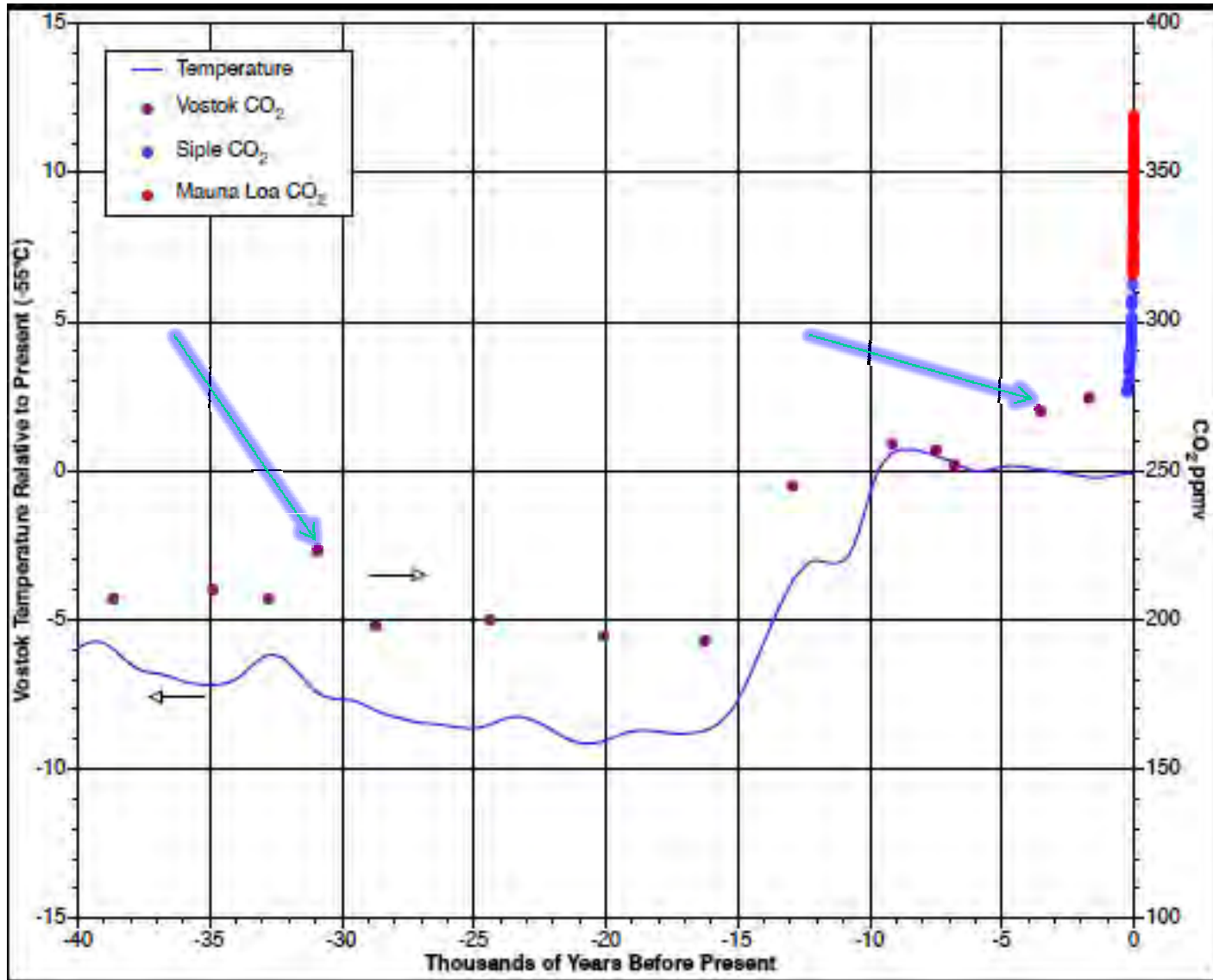
25,000 years ago, Neanderthals went extinct

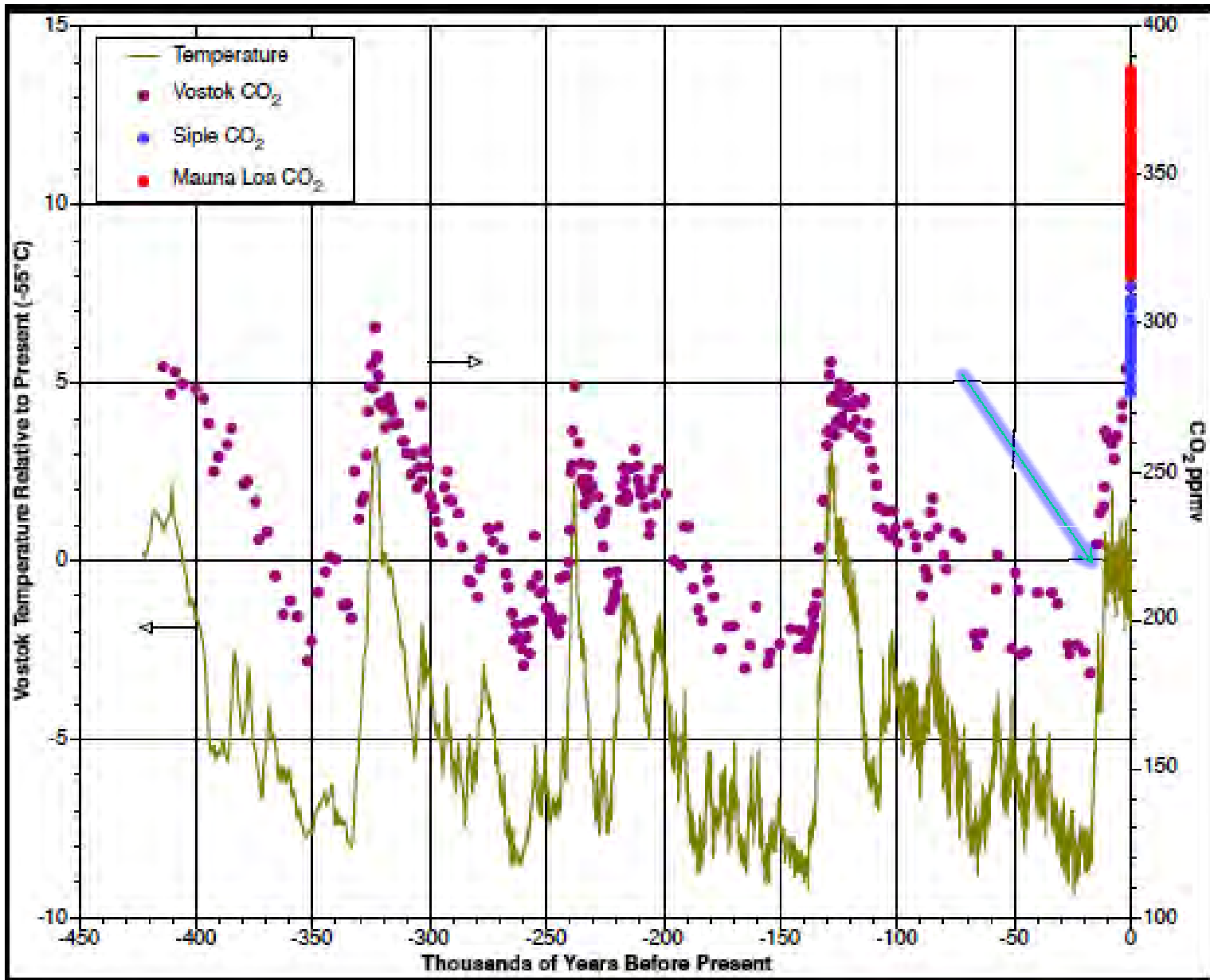
Vostok Ice Core Data

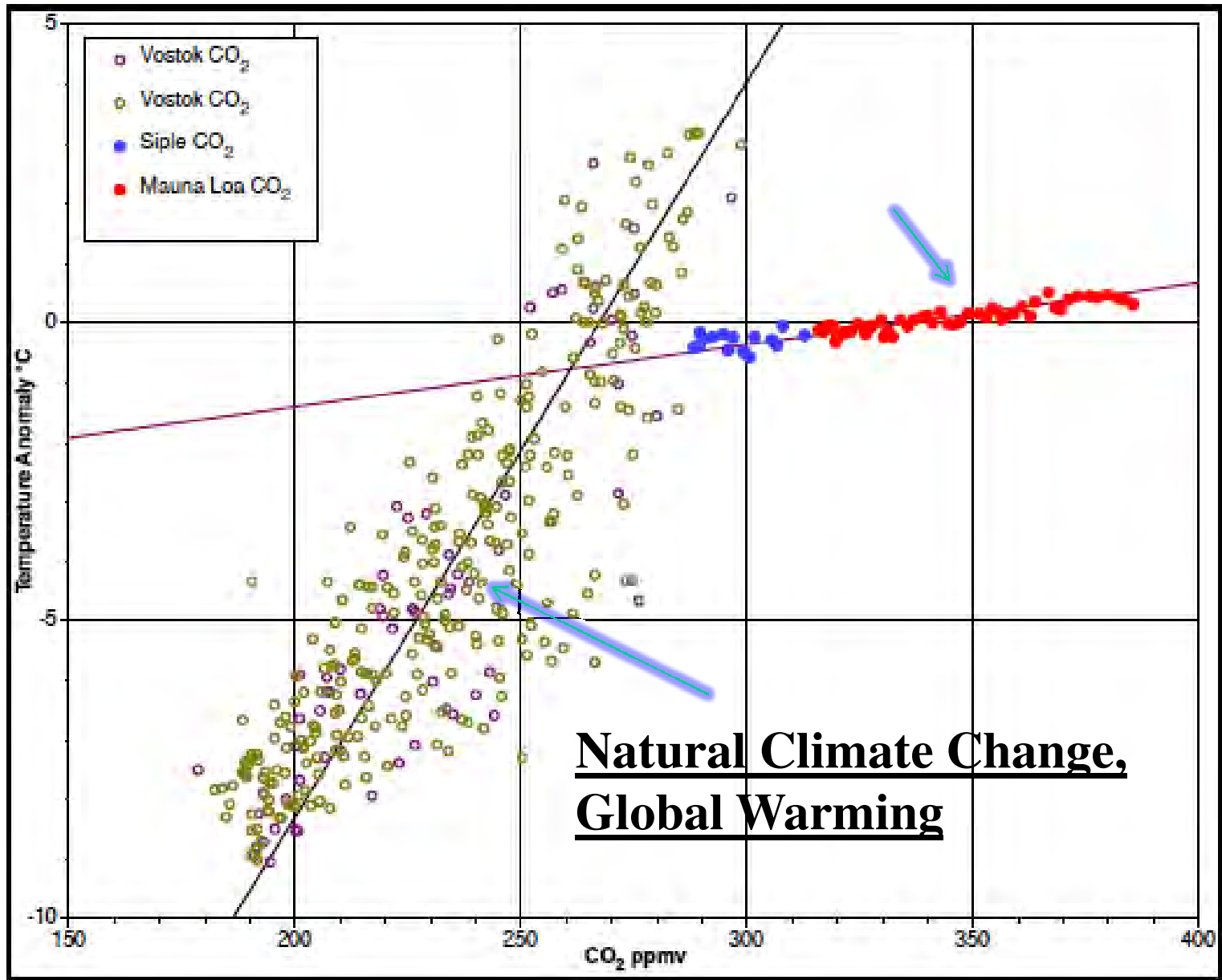


<http://cdiac.ornl.gov/trends/co2/vostok.html>

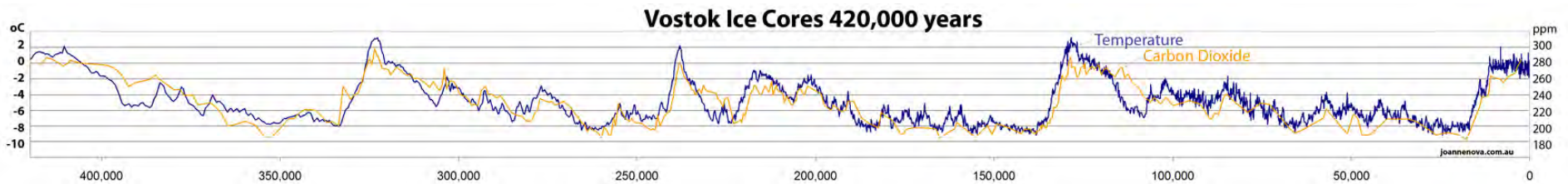








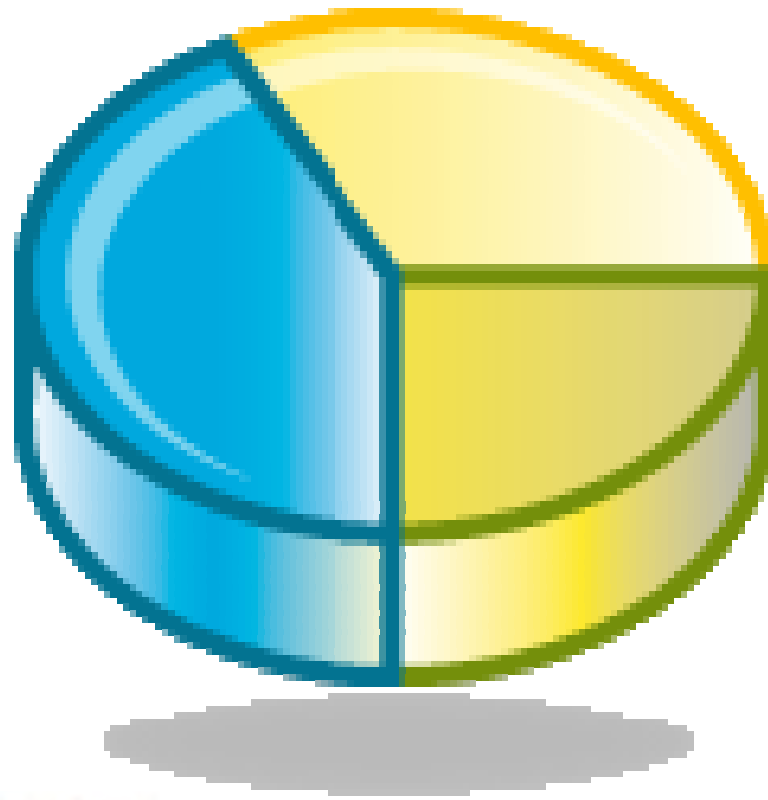
CO2 Lags Temperature



<http://joannenova.com.au/global-warming/ice-core-graph/>

Agenda

Politics



Tech

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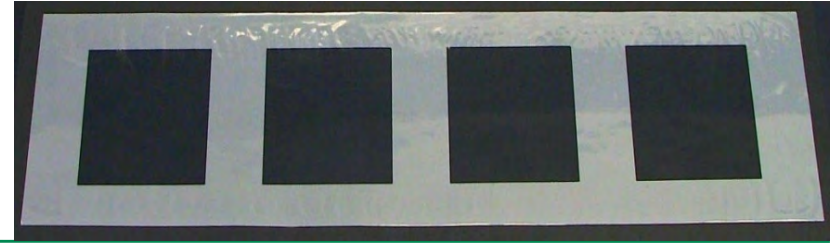
Who We Are



- Specialists in ceramic membranes, coatings, and catalysis technologies
- Components for fuel cells, gas separation, thermal management and batteries



Problems Solved



- Problems:
 - New Green Tech systems cost too much
 - Need lighter, smaller, more robust, more efficient
 - Need a membrane, but need it to stay out of the way
- Solutions:
 - Large area membranes, 2-5x others
 - Multi-up manufacturing, unique
 - Higher rate of oxygen extraction and transport, 2x
 - Thermal modulation, 3 in 1 component

Executive Team

John Olenick, CEO & President

- 32 years in electronics, ceramics, and energy
- 2 internal, 2 external startups, commercialized product

Bill Sunderlin – Operations

- 27 years in avionics, electronics and manufacturing
- 3 startups, sold or IPO

Dr. Viswanathan Venkateswaran – Technology

- 30 years developing new ceramic products
- Involved in 7 launched products and processes

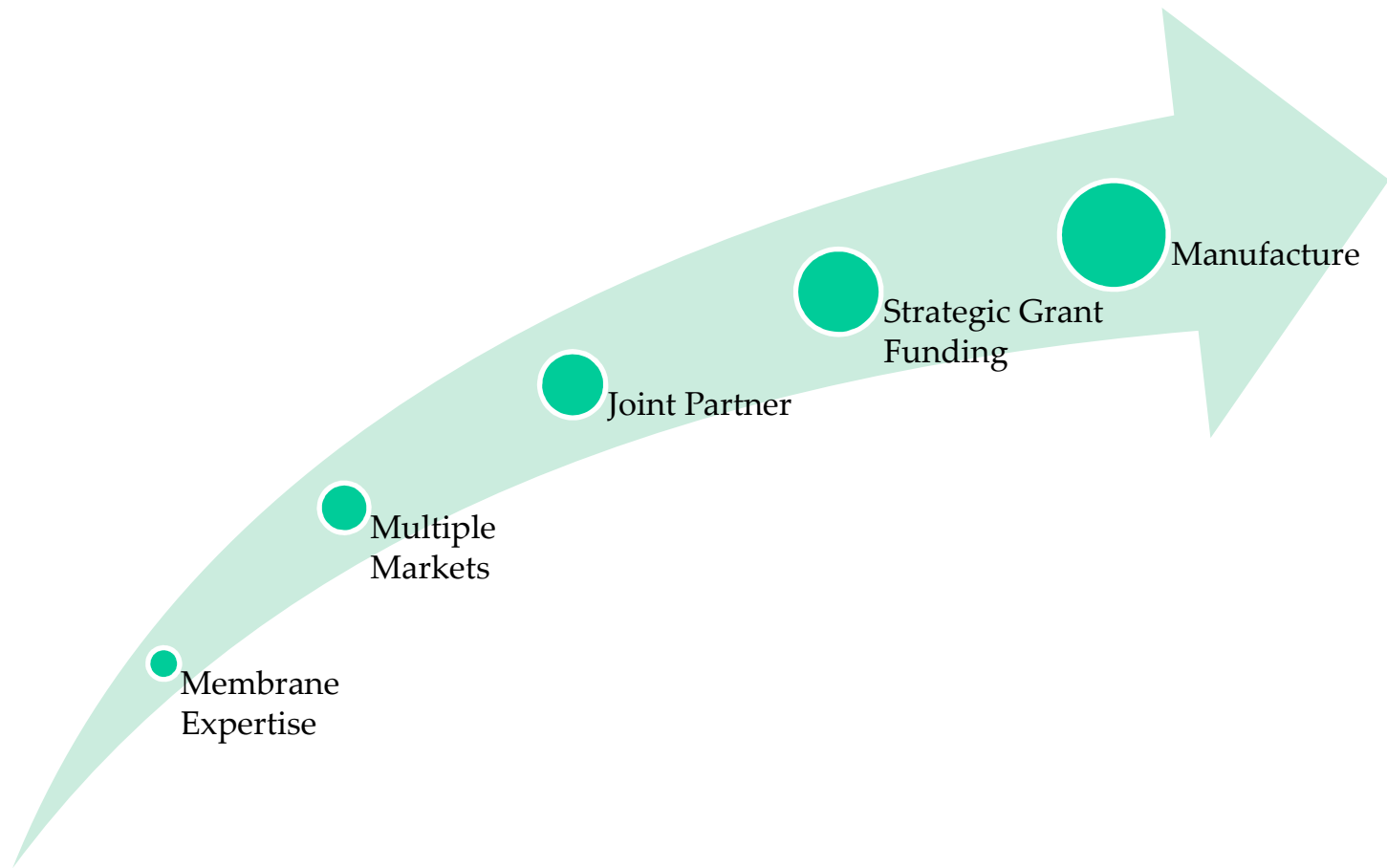
Kathy Olenick – GM - Products

- 31 years in ceramics and electronic packaging
- Initiated internal startup on camera in a cell phone

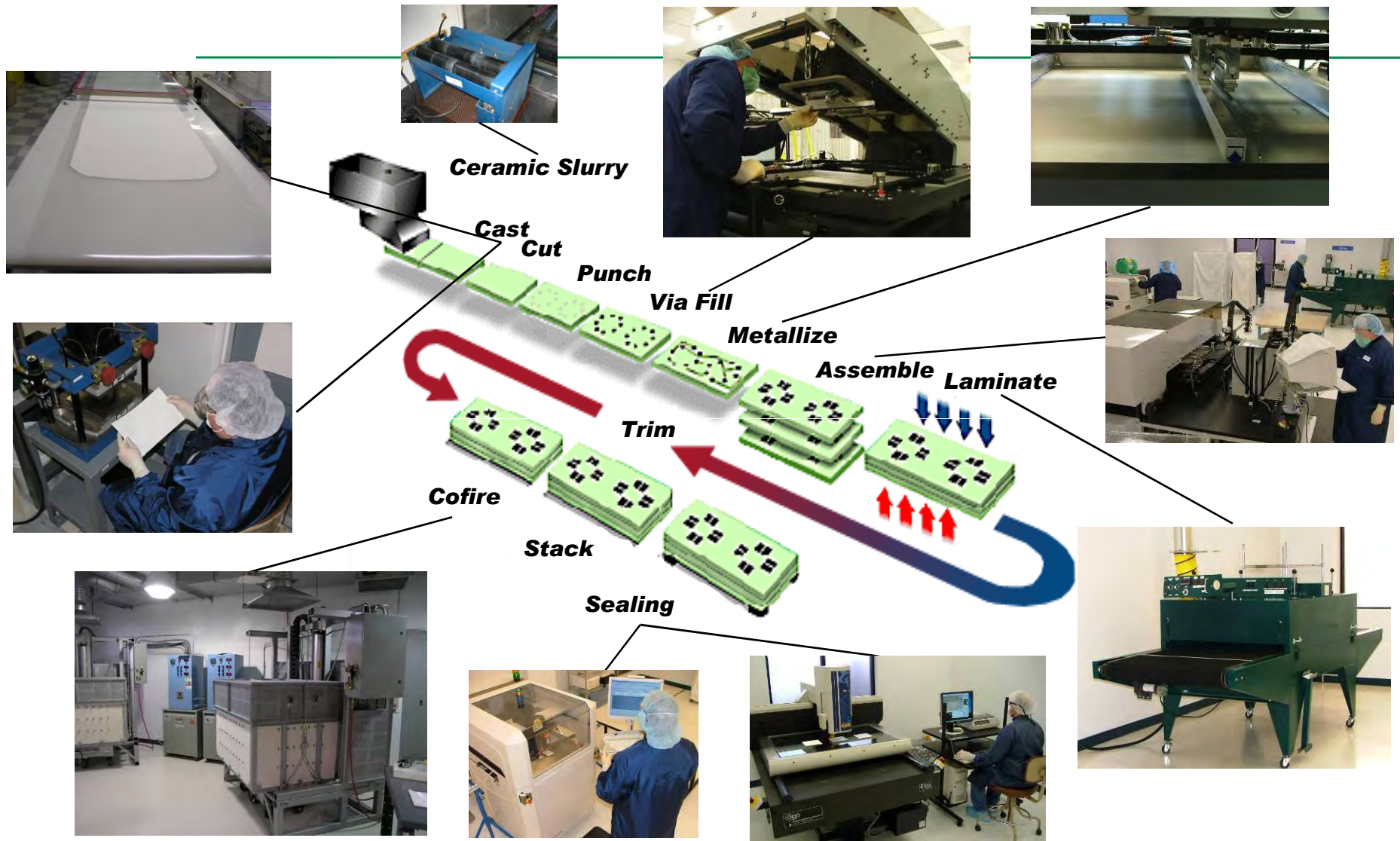
James Newkirk – GM - Systems

- 39 years in new product and process generation and management
- Involved in 14 launched products and processes

Business Model – Where's the pain?

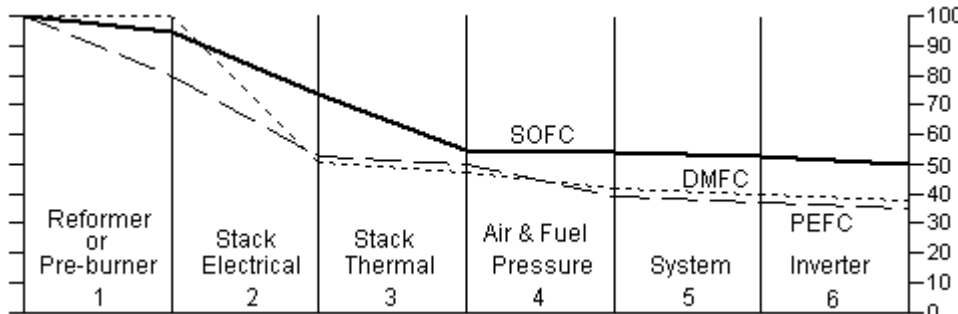


ENrG's Technology & Facilities



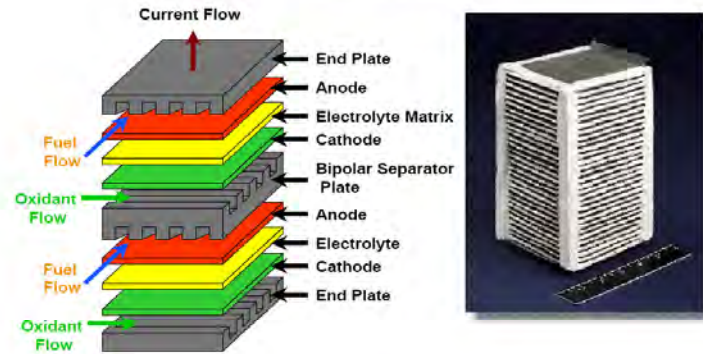
Energy Generation Trends

- More efficient
 - Steam 5-25%
 - IC Engine 28-37%
 - Microturbines 28-33%
 - Photovoltaic 4-36%
 - Wind Turbines 0-60%
 - **Fuel Cells 30-70%**

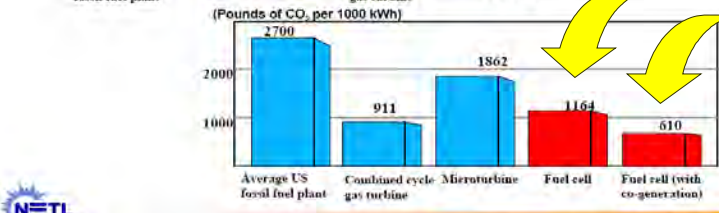
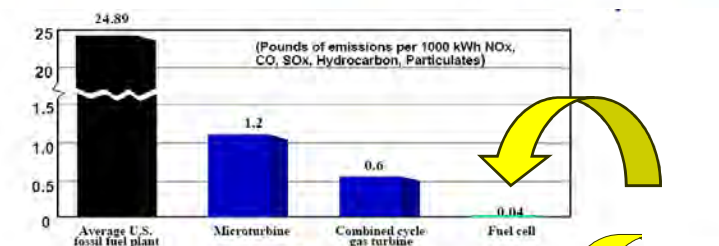


- Clean alternative fuels
- Reduced dependence on oversea supply

Planar Cell

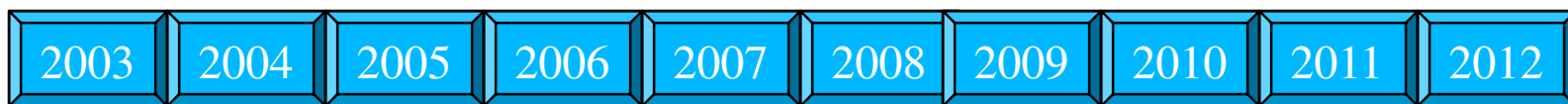


NETL Strategic Center for Natural Gas



NETL Strategic Center for Natural Gas www.enrg-inc.com

Company Overview



Start

Seed Round, \$100K

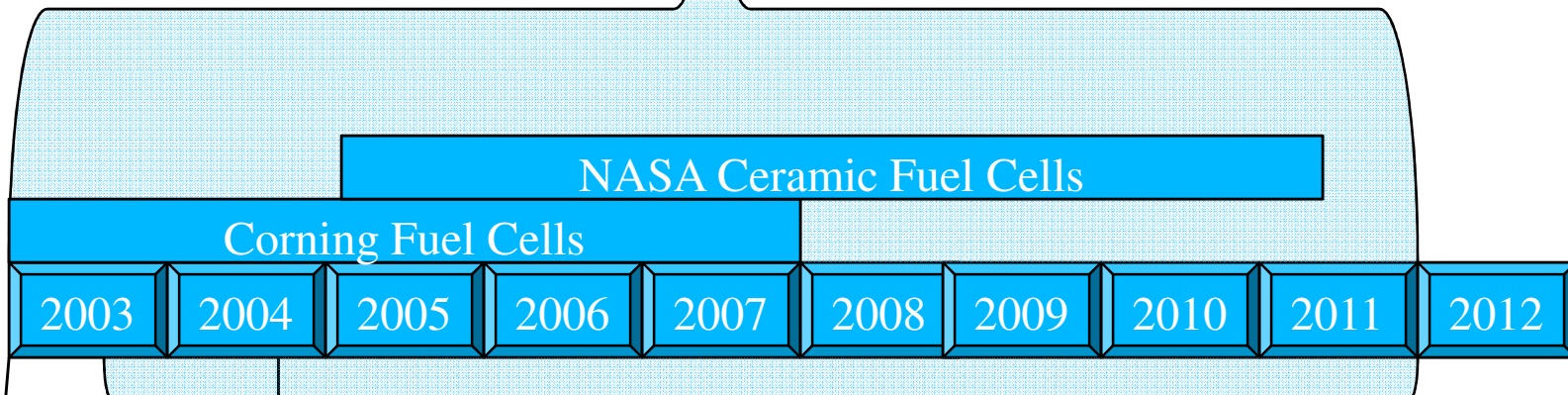
\$10.5MM Grants,
\$11MM Corporate Support

Principals together from 2000

Company Overview



Install Technology & Value,
Dense & Porous Ceramics



Start

Principals together from 2000

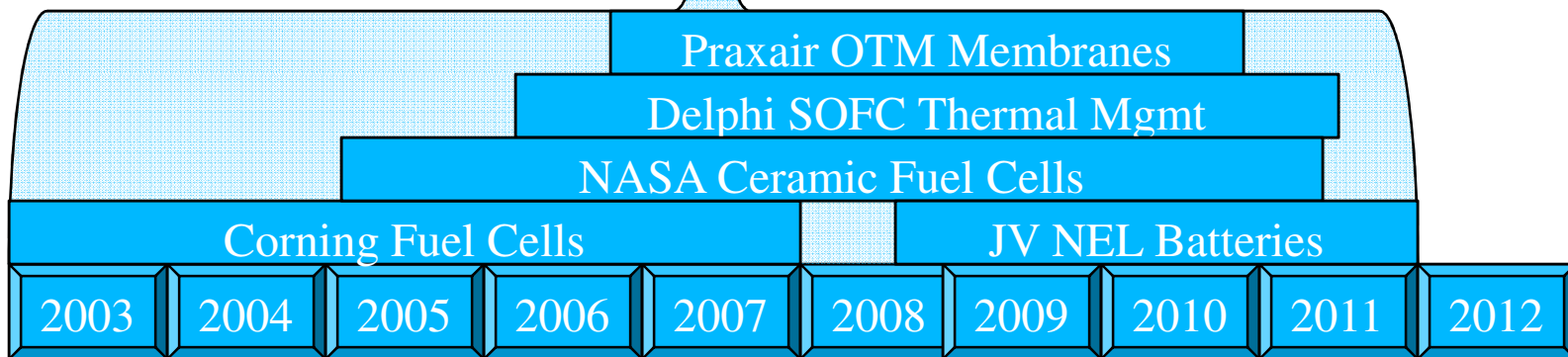
Seed Round, \$100K

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Company Overview



Install Technology & Value,
Dense & Porous Ceramics



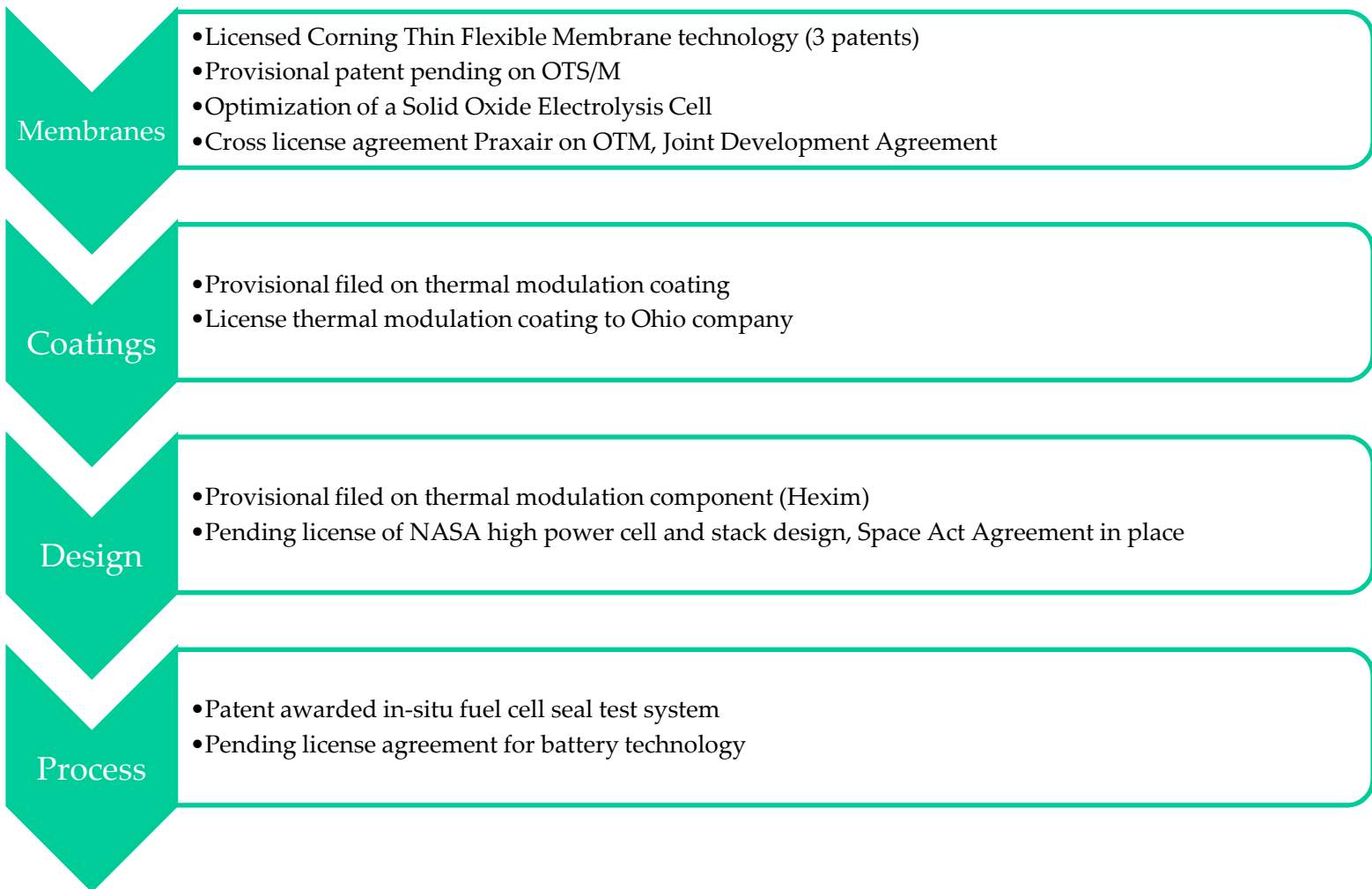
Start

Seed Round, \$100K

\$10.5MM Grants,
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Principals together from 2000

Intellectual Property





Idea to Reality

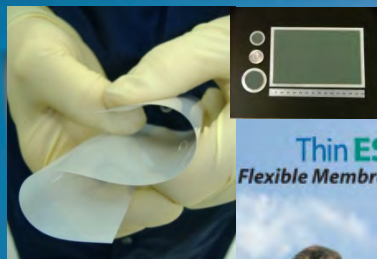
Ceramic Technology for Clean Energy To Products

www.enrg-inc.com



Power Generation

Durability When You Need It



Thin ESC™
Flexible Membrane

Thin E-Strate®

HiSPD Stack™
Small is Powerful

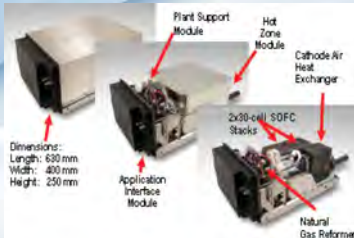


Ceramic Technology for Clean Energy

System Management

Integrated Packaging

HEXIM™
1 component - 3 Functions



- Recapture and store power to increase efficiency
- Maximize renewable energy generation

Power Storage

On Demand Power



Environmental Control

Separation Membranes



- Capture CO2
- Transport Ions
- Remove Contamination



Ceramic Technology for Clean Energy

www.enrg-inc.com



Idea to Reality

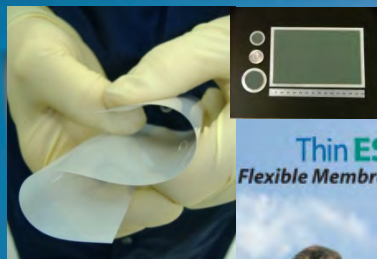
Ceramic Technology for Clean Energy To Products

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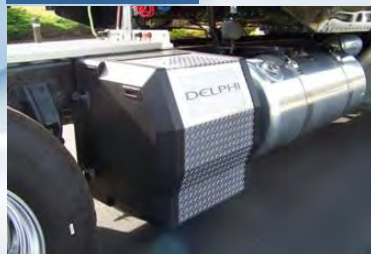
Ceramic Technology for Clean Energy

System Management

Integrated Packaging

HEXIM™

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Power Storage

On Demand Power



Recapture and store power to increase efficiency
Maximize renewable energy generation

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Ceramic Technology for Clean Energy

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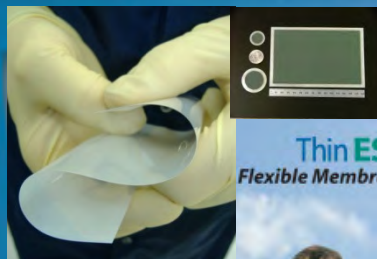
Ceramic Technology for Clean Energy To Products

www.enrg-inc.com



Power Generation

Durability When You Need It



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Flexible Membrane

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Ceramic Technology for Clean Energy

System Management

Integrated Packaging

HEXIM™
1 component - 3 Functions



Power Storage

On Demand Power



- Recapture and store power to increase efficiency
- Maximize renewable energy generation

Environmental Control

Separation Membranes



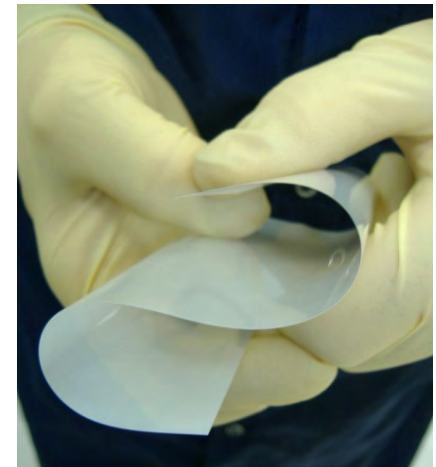
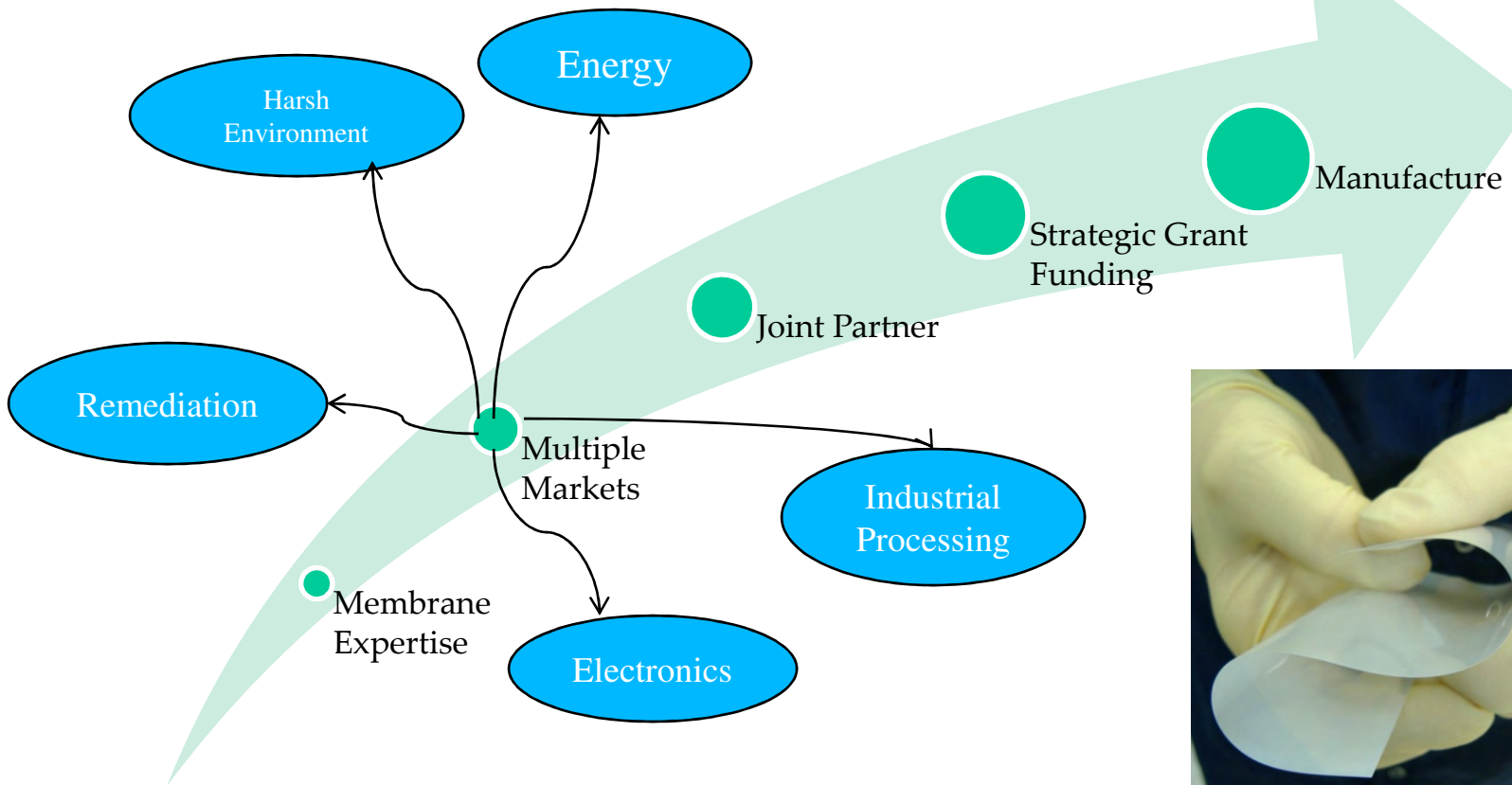
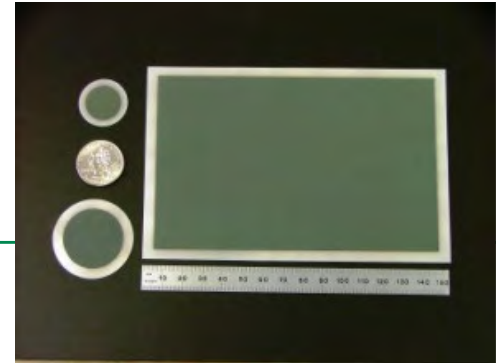
- Capture CO₂
- Transport Ions
- Remove Contamination



Ceramic Technology for Clean Energy

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Thin E-Strate®, ThinESC®



Market Forecast

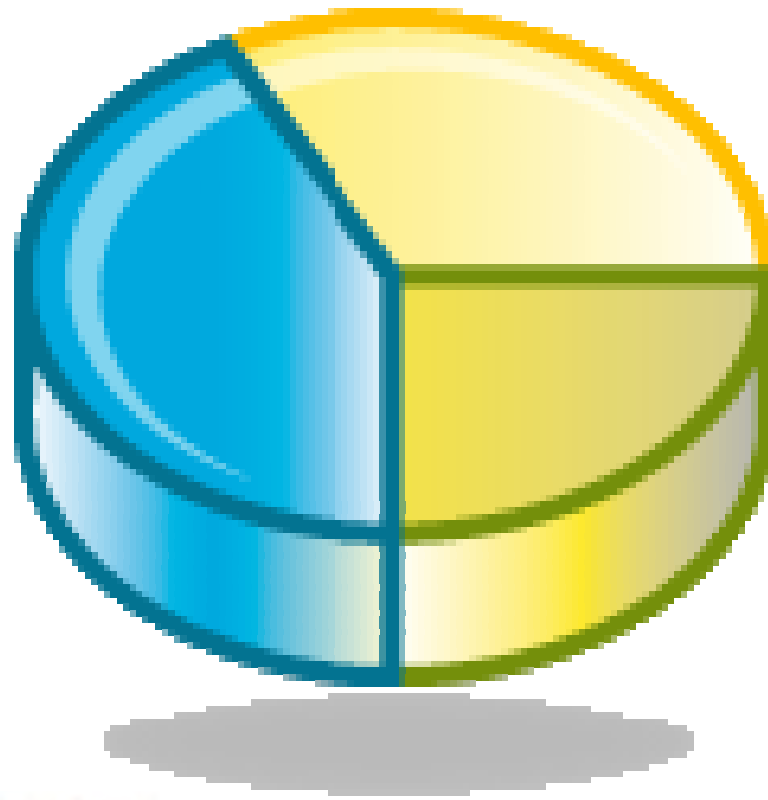
WORLD COMMERCIAL FUEL CELL DEMAND BY APPLICATION & PRODUCT (million dollars) 2003 - 2018

Item	2003	2008	2013	2018	% Annual Growth	
					08/03	13/08
Commercial Fuel Cell Demand	330	570	1880	5100	11.6	27.0
By Application:						
Electric Power Generation	131	260	825	2000	14.7	26.0
Industrial Stationary/Motive Power	40	110	510	1450	22.4	35.9
Motor Vehicles	105	100	185	560	-1.0	13.1
Other Transportation Equipment	46	80	145	200	11.7	12.6
Portable Electronics & Other	8	20	215	890	20.1	60.8
By Product:						
Systems	190	308	995	2640	10.1	26.4
Other Products & Services	140	262	885	2460	13.4	27.6

Source: The Freedonia Group, Inc.

Agenda

Politics



Tech

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State Initiatives

- California
- Hawaii
- Massachusetts
- Michigan
- New York
- Ohio
- South Carolina

Federal Efforts

- Department of Energy
 - Freedom Car - H₂
 - FutureGen - clean coal conversion
 - SECA - solid oxide fuel cells
- National Institute of Standards and Technology
- Department of Defense
- Homeland Security



American Energy Innovation Council (AEIC)

We have had the great privilege, as business leaders, of building companies that have become leaders in their respective fields, and employ hundreds of thousands of American workers. Our experience in building these companies has given us a common and unshakable belief in the power of innovation.

This council is composed of Norman Augustine, Ursula Burns, John Doerr, Bill Gates, Charles Holliday, Jeff Immelt, and Tim Solso.

AEIC: Developed Energy Business Plan and Recommendations

Recommendations:

1. Create an independent national energy strategy board.
2. Invest \$16 billion per year in clean energy innovations.
3. Create Centers of Excellence with strong domain expertise.
4. Fund ARPA-E \$1 billion per year.
5. Establish and fund a New Energy Challenge Program to build large-scale pilot projects.

As business leaders, we feel that America's current energy system is deficient in ways that cause serious harm to our economy. To correct these deficiencies, we must make a serious commitment to modernizing our energy system with cleaner, more efficient technologies.

Thank You from The Team!



Questions?

