Rockwood
Powered by Lithium

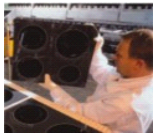
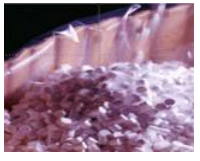
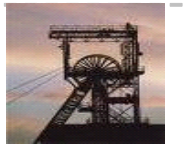
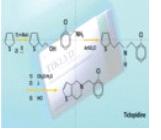
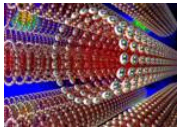
TREM 2011
Washington, DC

March 22-23, 2011

Creativity
Performance
Stability

LITHIUM: The Driver of the Coming Transportation Revolution

Lithium – Selected Applications

Key Products	Key Applications			
Lithium carbonate 	 Li-Ion-Batteries	 Glass ceramics	 Cement	 Aluminum
Lithium hydroxide 	 Li-Ion-Batteries	 Grease	 CO_2 Absorption	 Mining
Lithium metal 	 Lithium Batteries	 Pharmaceuticals	 Al - alloys	
Butyl-lithium 	 Elastomers	 Pharmaceuticals	 Agrochemicals	
Lithium specialties 	 Electronic Materials	 Pharmaceuticals	 Agrochemicals	

Lithium Growth + 10% CAGR in Last 10 Years

- Significant growth of lithium ion batteries for cell phones, laptop computers and other mobile communication devices,
- Penetration of lithium ion batteries for mobile power tools (drills, etc.),
- Pharmaceutical applications,

  and

- Alloys in aerospace structures.

Sources of Lithium

- Minerals – spodumene

  High cost, environmental issues

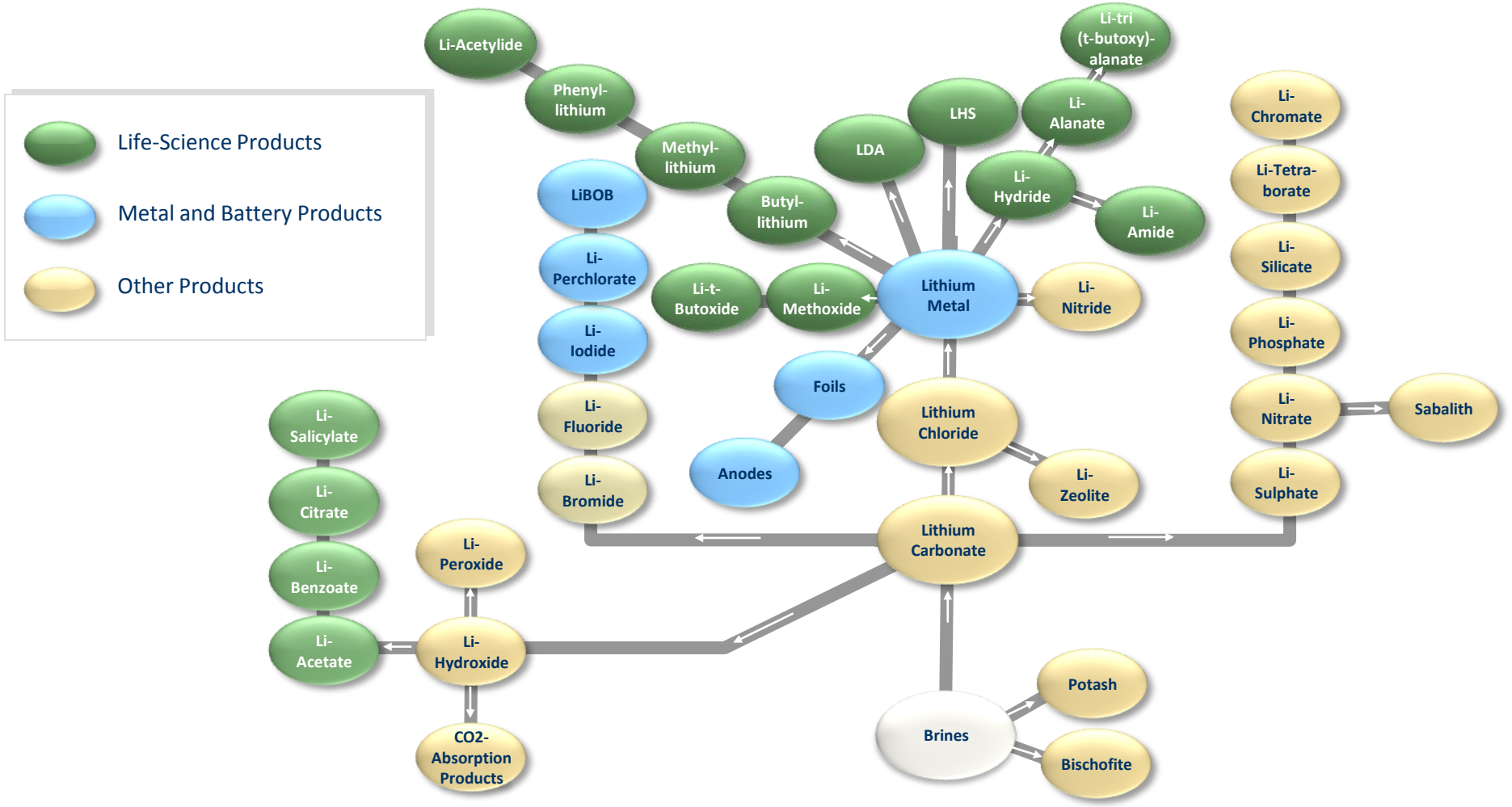
- **Salt form (brine pools)**

  Lowest cost, environmentally friendly

- Embedded in hard clay

  High cost, difficult to extract

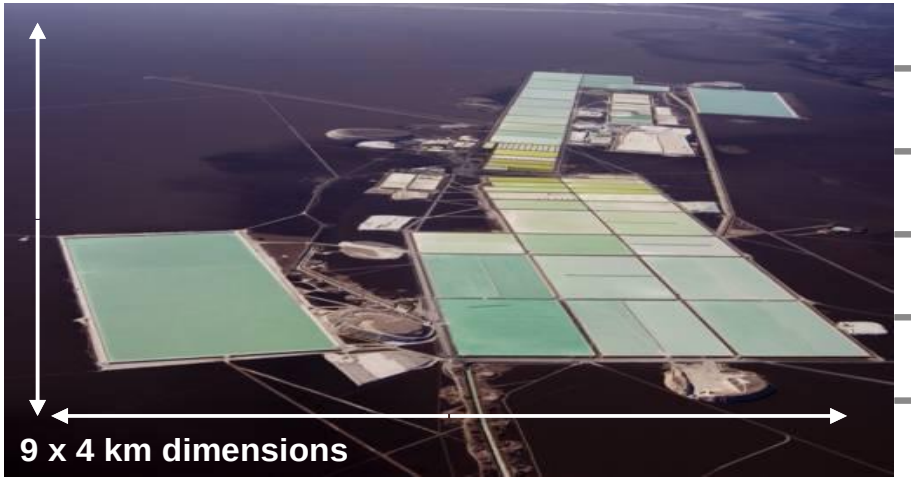
Lithium Value Chain



Operations in Chile

Natural brines from El Salar ~ 0.2% Li

END BRINE 6.0% Li



- $NaCl + CaSO_4 * H_2O$ HALITE
- $NaCl + KCl$ SYLVINITE
- $MgCl_2 * KCl * 6H_2O$ CARNALLITE
- $MgCl_2 * 6H_2O$ BISCHOFITE
- $MgCl_2 * LiCl * 7H_2O$ Li CARNALLITE

Further Purification, Processing, Crystallization

Li_2CO_3
LiCl

Rockwood Lithium Facilities Around the World

La Porte, TX, USA

New Johnsonville, TN, USA

Langelsheim, Germany

Silver Peak, NV, USA

Taichung, Taiwan

Antofagasta, Chile

Kings Mountain, NC, USA

Expansion

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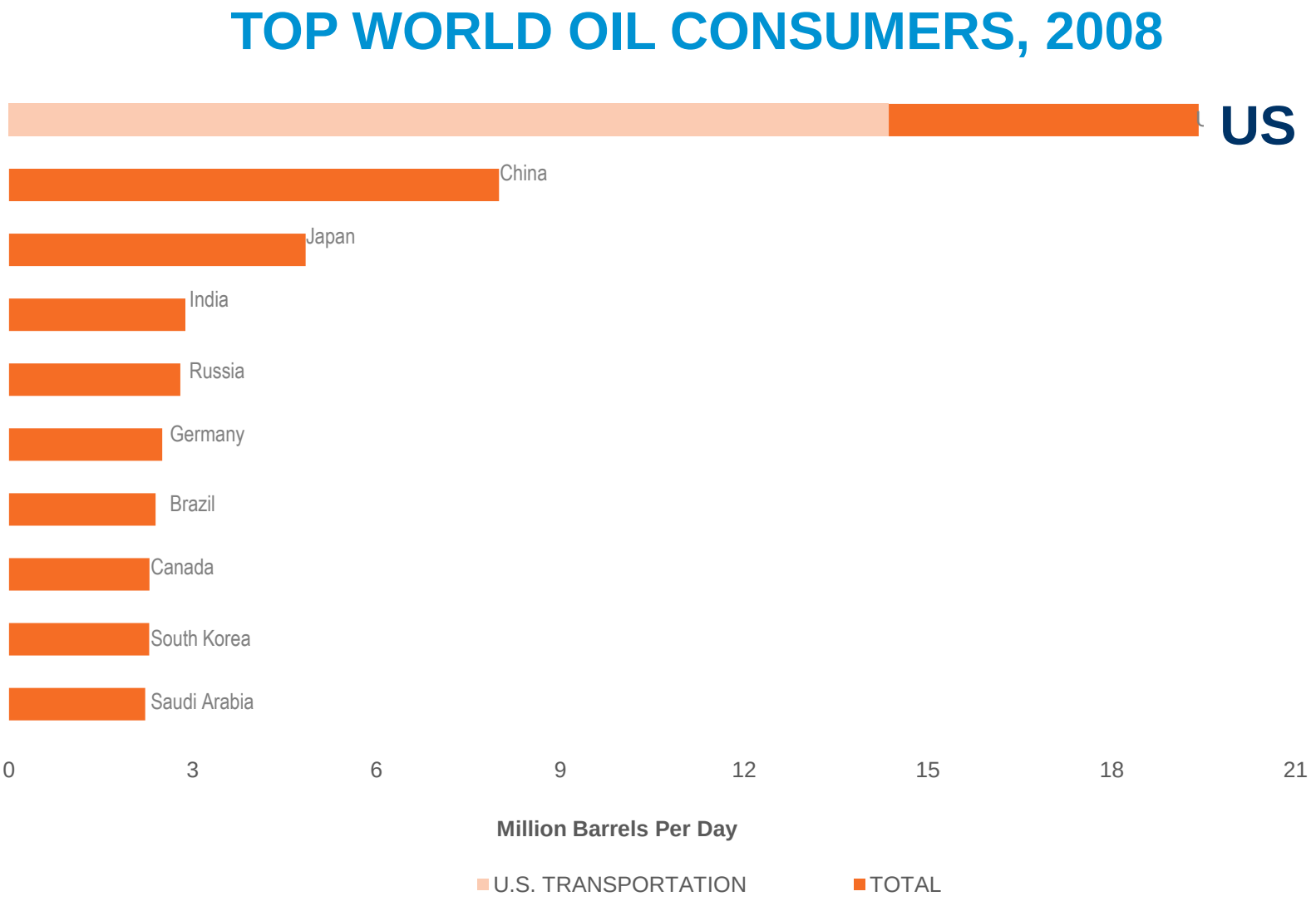
Lithium compounds
will experience significant growth
due to the introduction
of all electric and
plug-in hybrid electric vehicles.

WHY?

World Oil Consumption



Source: BP, plc

The United States of America depends heavily on imported oil from hostile regions of the world. 50% of our oil use is imported.

These hostile states, insurgents and terrorists will use oil as a strategic weapon against the United States.

This dangerous dependence on imported oil has created significant issues of:

- *National Security*
- *Economic Stability*

Issues of National Security

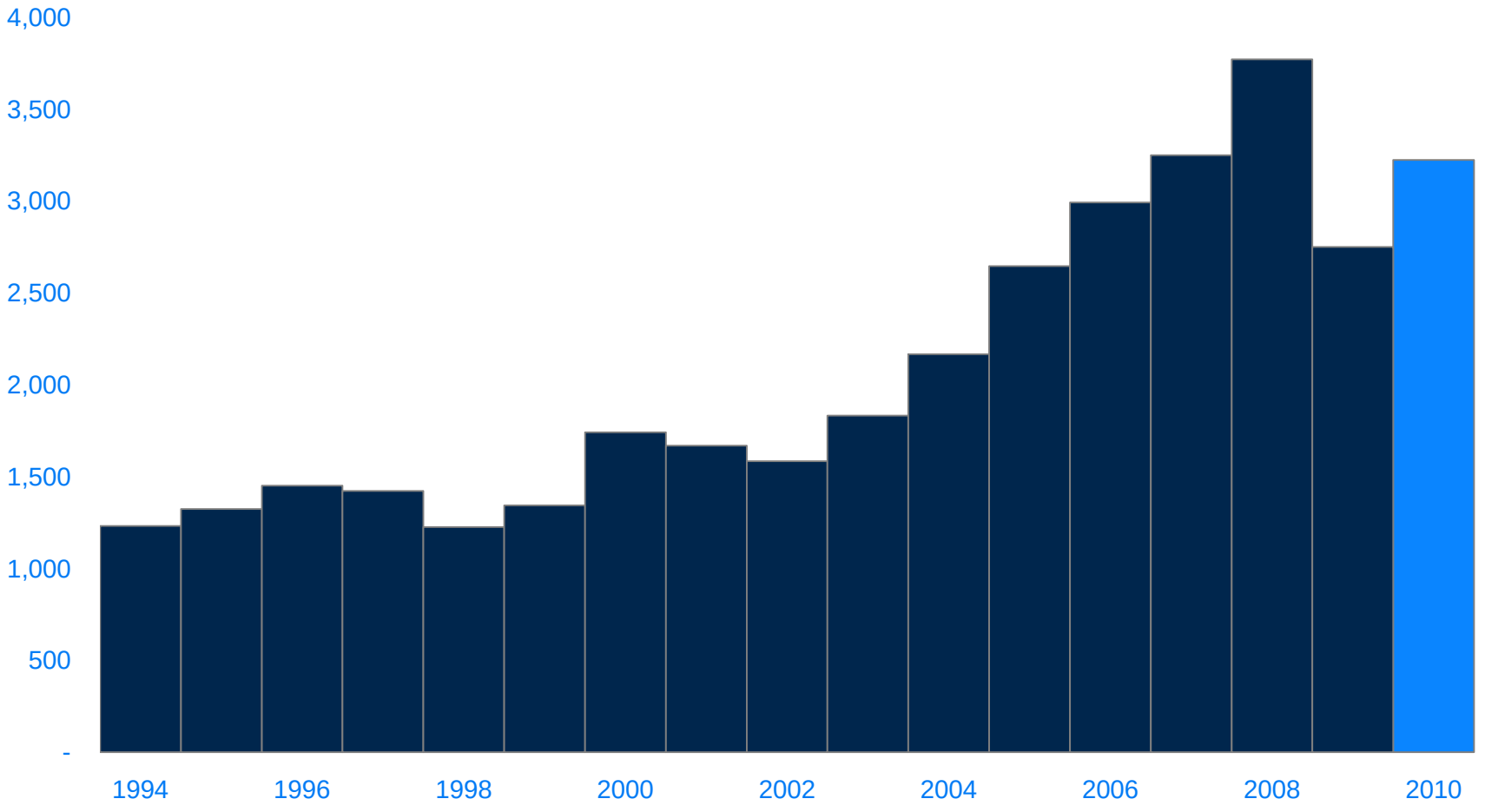
- Dependence on imported oil, mostly from hostile regions, has constrained the totality of US foreign policy.
- To ensure free flow of oil, the US military has to maintain a presence in these hostile regions, at a huge cost in treasure and blood. Total cost of US military presence in these regions is estimated to be $5.0 trillion since the 1970's.

Issue of Economic Security

- The cost of imported oil is more than $400 billion a year which is enriching the sovereign funds of mostly hostile regimes. This is more than half of the total US trade deficit.

US Oil Dependence: Economic Costs

HOUSEHOLD GASOLINE EXPENDITURES (ANNUAL, NOMINAL)



Source: DOE, *AER 2009*; May 2010 *STEO*; SAFE Analysis

Oil Dependence

- 70% of oil consumed in the US is to fuel our transportation system (the internal combustion engine).
- Renewable sources of energy, such as solar, wind or nuclear will not free us from imported oil.

The Problem: Oil Dependence

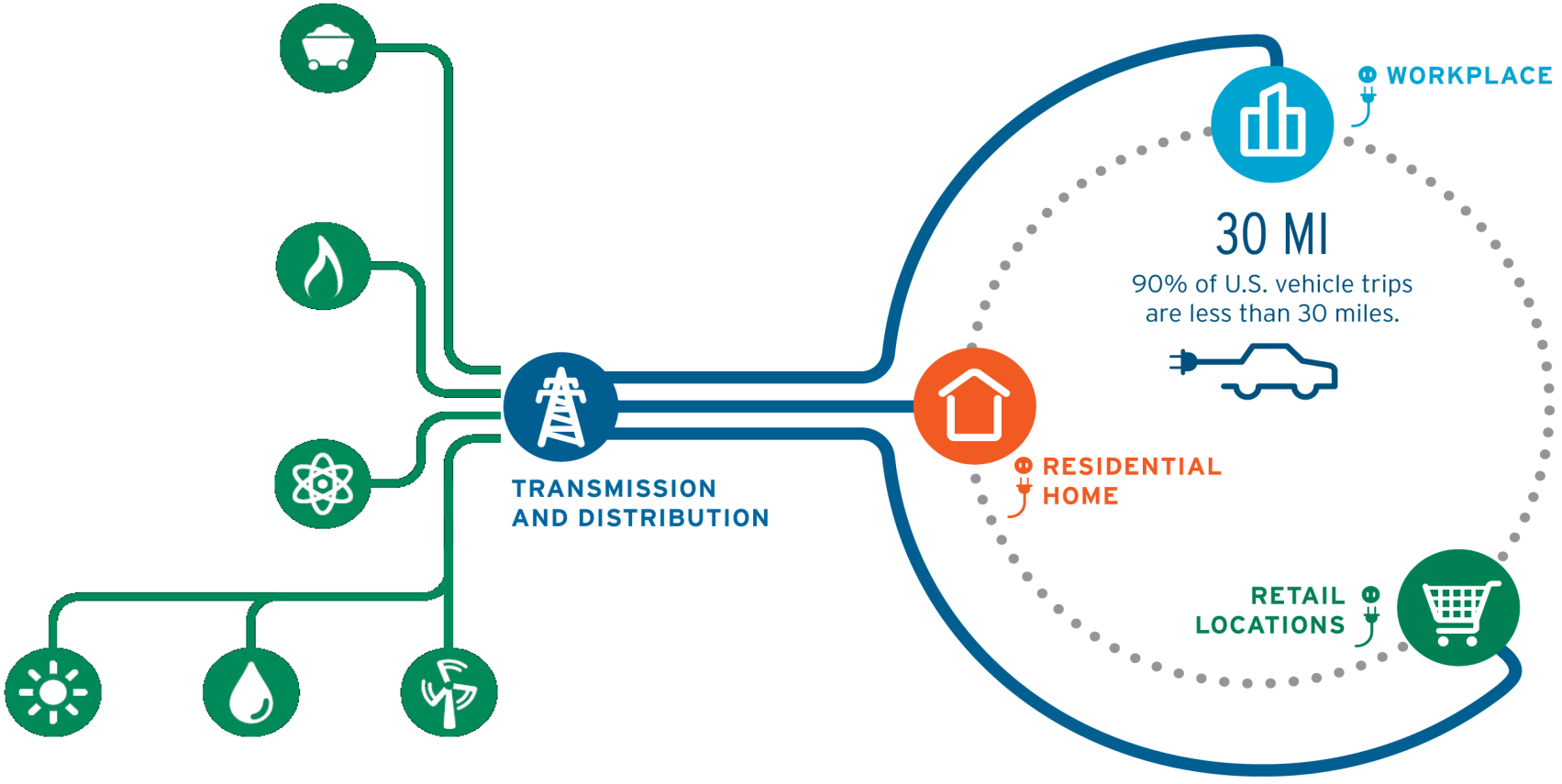
- As long as our cars are powered by the internal combustion engine, we will be dependent on imported oil.

The Solution: Electric Cars

- The only practical and proven solution is to replace the internal combustion engine with an electric motor driven by a *rechargeable* battery.

Electrification of Transportation

ELECTRIFICATION ARCHITECTURE



Benefits of Electric Cars

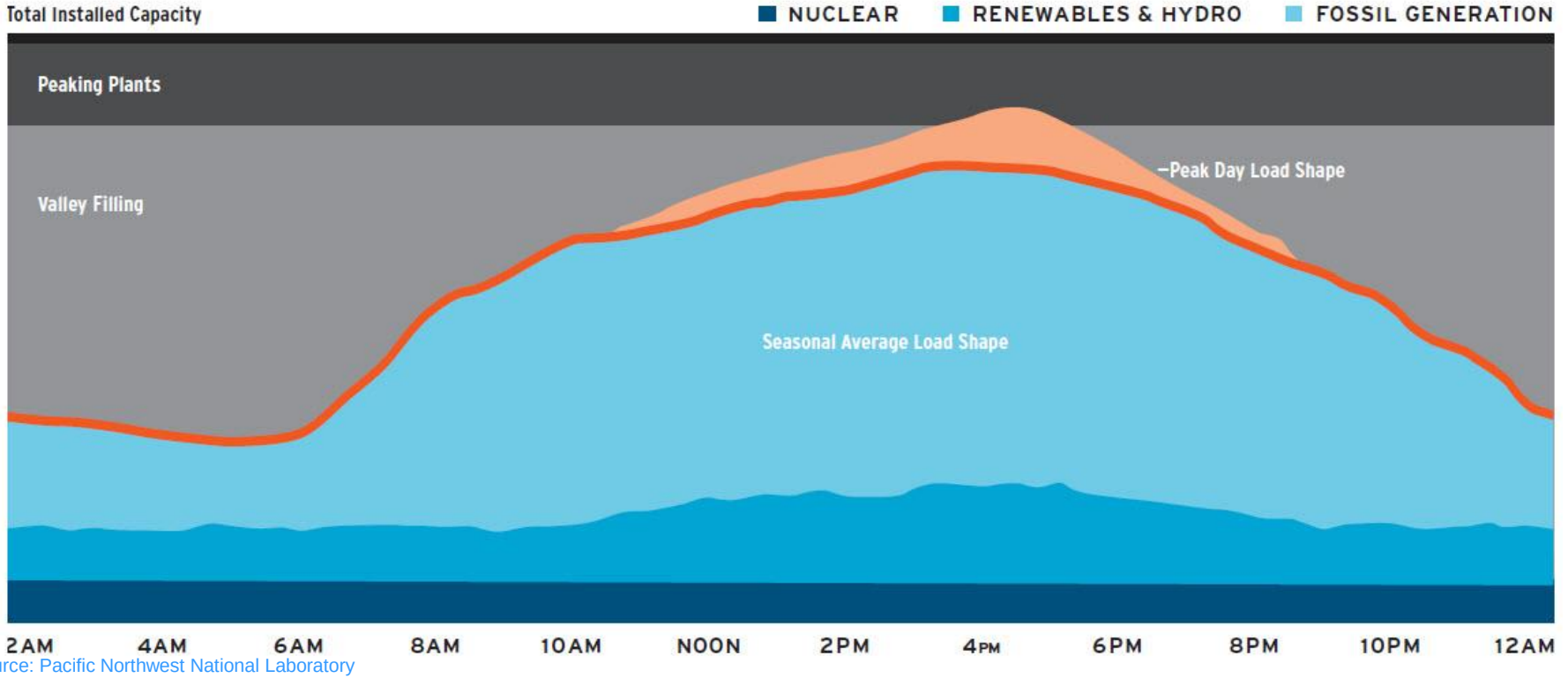
1. Electricity is diverse and domestic.

Benefits of Electric Cars

2. Electric Power Sector: Generation

The electric power sector has substantial spare capacity at night that could be used to fuel electric vehicles.

LOAD SHAPE FOR ONE DAY DURING PEAK SEASON



Source: Pacific Northwest National Laboratory

Benefits of Electric Cars

3. The network of infrastructure already exists.

Benefits of Electric Cars

4. Electric miles are cheaper than gasoline miles:

    2.5¢ vs 10¢ per mile.

Benefits of Electric Cars

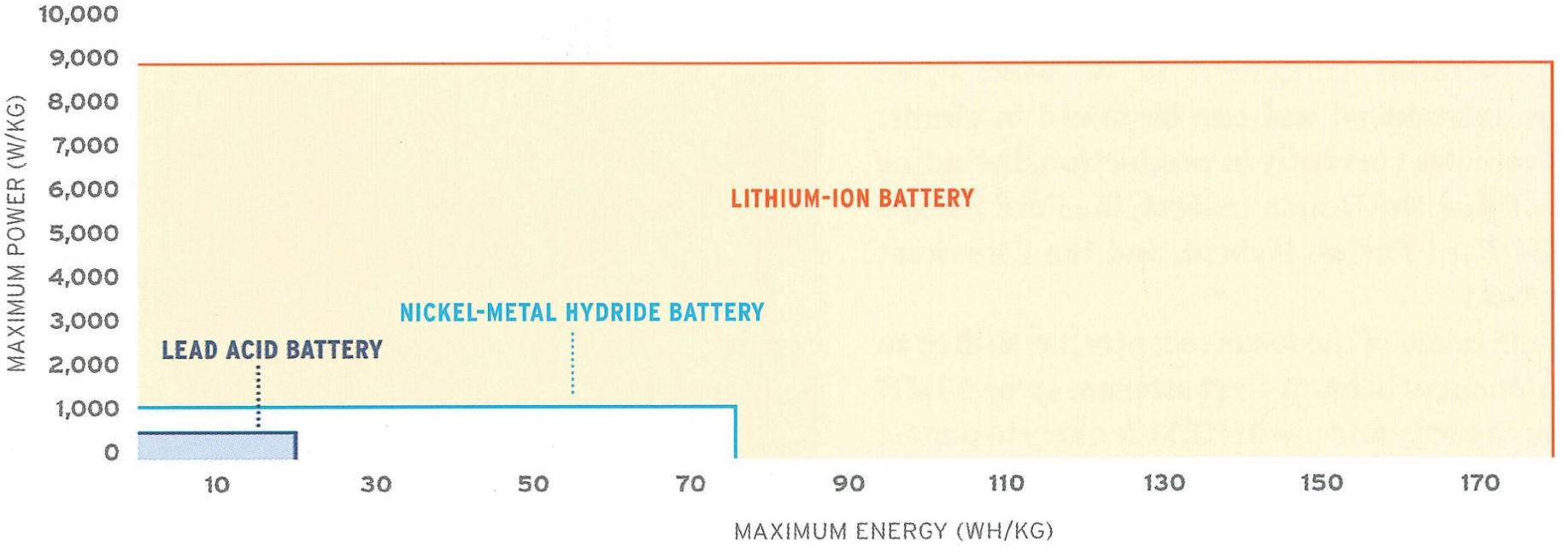
5. Electric miles are cleaner than gasoline.

Key Enabling Technology – Li-ion Batteries:

Lithium ion batteries for mobile phones, laptops, portable electronics and power tools are fully developed and commercialized.

This is Proven Technology

Lithium Ion Batteries



Source: PRTM, SAFE Analysis

What is the Potential for Growth?

Lithium Ion Battery Market

…growing strongly in existing applications

- Over 3 billion lithium ion battery cells for electronic devices are produced every year
- Lithium carbonate and some lithium hydroxide are used for the manufacturing of various cathode materials (mainly lithium cobaltate)
- Historical annual growth rate for lithium ion batteries has averaged over 15% and expected growth in the next few years will be in that range or higher
- Current major market applications for lithium ion batteries are cell phones, notebook computers, power tools, i-pods and other applications

Lithium Ion Battery Market

…emerging application: HEV cars and plug-ins

- All major car manufacturers are working to develop hybrid cars for the future
- Current technology of NiMH in batteries will change to lithium ion batteries due to higher performance and reliability
- Change of battery technology is being developed rapidly
- Chemetall is working with leading battery developers and manufacturers as well as institutes/universities to support the latest technology developments
- Hybrid and electric cars are expected to be the growth driver

Lithium Ion Battery Market

…Lithium Carbonate usage rate in Lithium Ion batteries

Lithium Carbonate usage depends on the type of battery:

Application	Lithium Carbonate Content
Cell Phone	3 grams ~ 0.1 oz
Notebook	30 grams ~ 1.0 oz
Power Tool	30-40 grams ~ 1.0-1.4 oz
Plug-in Hybrid 16 kWh	20 lbs
All Electrical Vehicle (EV) 25 kWh	50 lbs

Lithium Carbonate Equivalent (LCE) Demand

Current global demand for battery-grade lithium-carbonate (LCE) ⇨ 40 million lbs/year

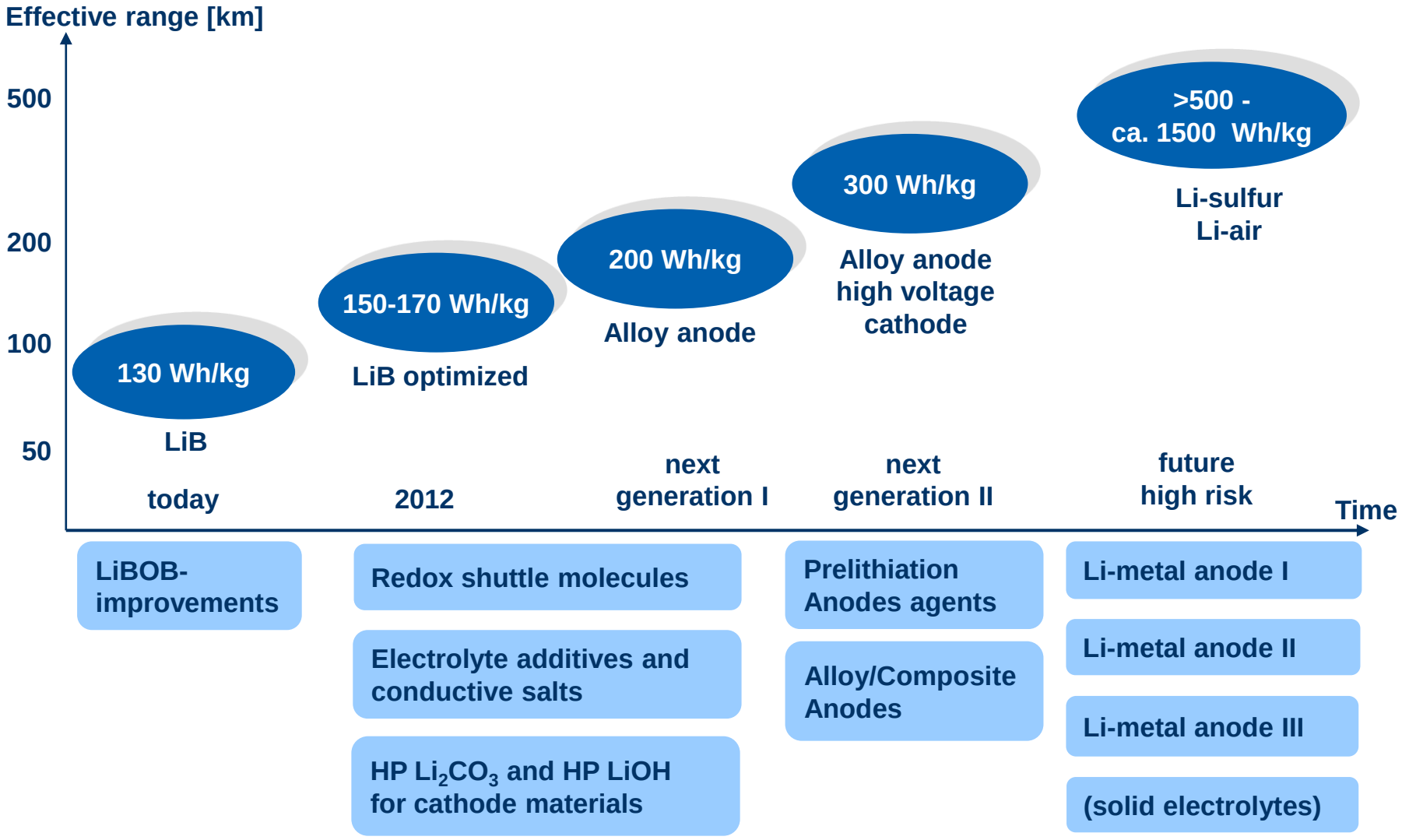
Addition of 1 million all-electric cars will demand (LCE) ⇨ Additional 50 million lbs

Addition of 1 million plug-in hybrids will demand (LCE) ⇨ Additional 20 million lbs

Total Global Auto Production 2010: 60-65 million vehicles

Source: Company Estimate

Chemetall R&D Goals Lithium Batteries



Summary

- Revenue of Rockwood's Lithium business is growing double digit, based on very strong performance in the battery market and strong growth of lithium organic compounds

- Looking out to the future, the increasing use of lithium ion batteries in HEV and electrical cars will be another platform for accelerated growth


electrificationcoalition.org

The Electrification Coalition
is dedicated to eliminating
America's dependence on imported oil
through the
electrification of transportation.
Our primary mission
is to promote government action
to facilitate deployment of electric vehicles
on a ***massive scale***.


The Electrification Coalition Membership

John T. Chambers, Chairman & CEO, **Cisco Systems, Inc.**
David W. Crane, President & CEO, **NRG Energy, Inc.**
Kevin Czinger, President & CEO, **Coda Automotive**
Peter A. Darbee, Chairman, CEO & President, **PG&E Corporation**
Seifi Ghasemi, Chairman & CEO, **Rockwood Holdings, Inc.**
Carlos Ghosn, President & CEO, **Nissan Motor Company, Ltd**
Jeff Immelt, Chairman & CEO**, GE**
Alex A. Molinaroli, Chairman, **Johnson Controls-Saft and President, Johnson Controls Power Systems**
Reuben Munger, Chairman, **Bright Automotive, Inc.**
Frederick W. Smith, Chairman, President & CEO, **Fedex Corporation**
Eric Spiegel, President & CEO**, Siemens Corporation**
David P. Vieau, President & CEO, **A123 Systems, Inc.**

… and several others

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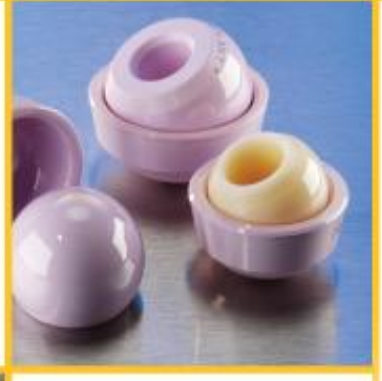

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