



Sustainable Lithium Supplies through 2020 in the face of Sustainable Market Growth

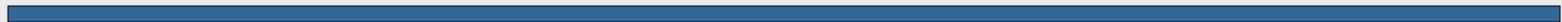
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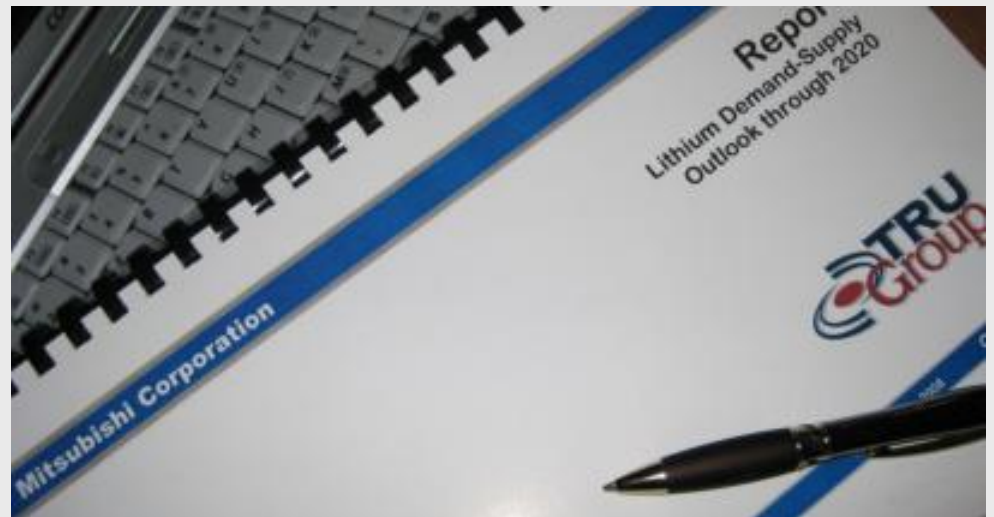
Original Work mid-2008



Mitsubishi Corporation

Strong interest in Lithium -

- ✓ **Materials**
- ✓ **Batteries**
- ✓ **Electric Vehicles**





Objective

To develop a base case demand-supply forecast for the global lithium market through 2020

- lithium consumption by main end-use
- lithium sources of supply
- main determinants of demand and supply
- demand-supply balance scenarios

- main purpose was supply-demand balance through 2020.



Our Approach

❑ Strong Qualified Team

- Brine, Mineral Mining, Extraction and Processing
 - Basic & Intermediate Chemical Processing
 - Lithium End-using Industry Experts
- Modeling, Technology Forecasting, Market Research, Cost Analysts

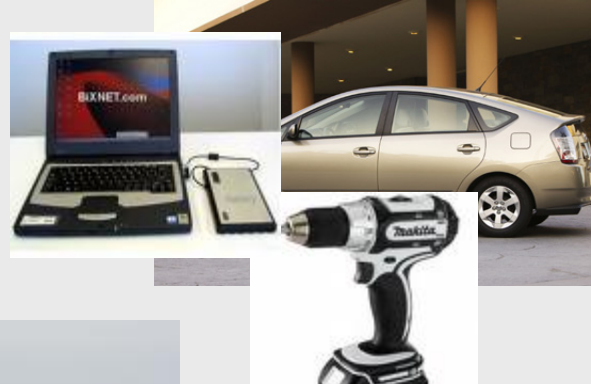
❑ Sustainability on Supply Side

❑ Sustainability on the Demand Side

Mapped Industry Structure



Lithium Carbonate



Lithium Hydroxide

Low Na Lithium Chloride

High Na Lithium Chloride



- Batteries
- Air Conditioning
- Polymers
- Glazing Ceramics
- Aluminum Process
- Other Li Carbonates

- Li Phosphate
- Li Nitrate
- Li Carbonate

➤ Lubricants

- Primary Batteries
- Aluminum Alloys

- Polymers
- Pharmaceuticals
- Chemicals

Other High Na Li Chlorides >

- Glass
- Ceramics



Model Update 2009

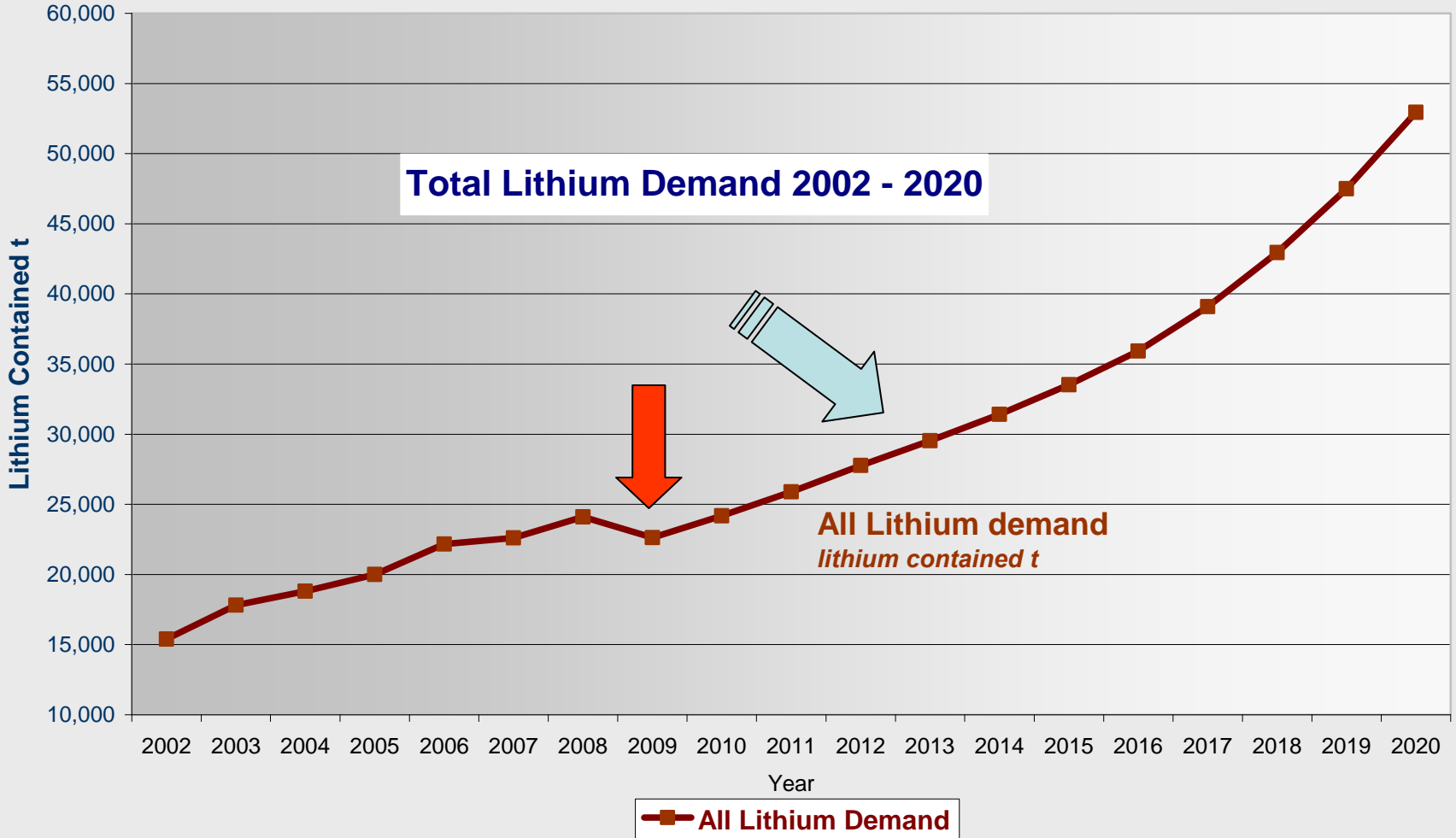
□ Demand Side

- Recession much more serious and more global
 - Credit crunch crisis impact - for how long?

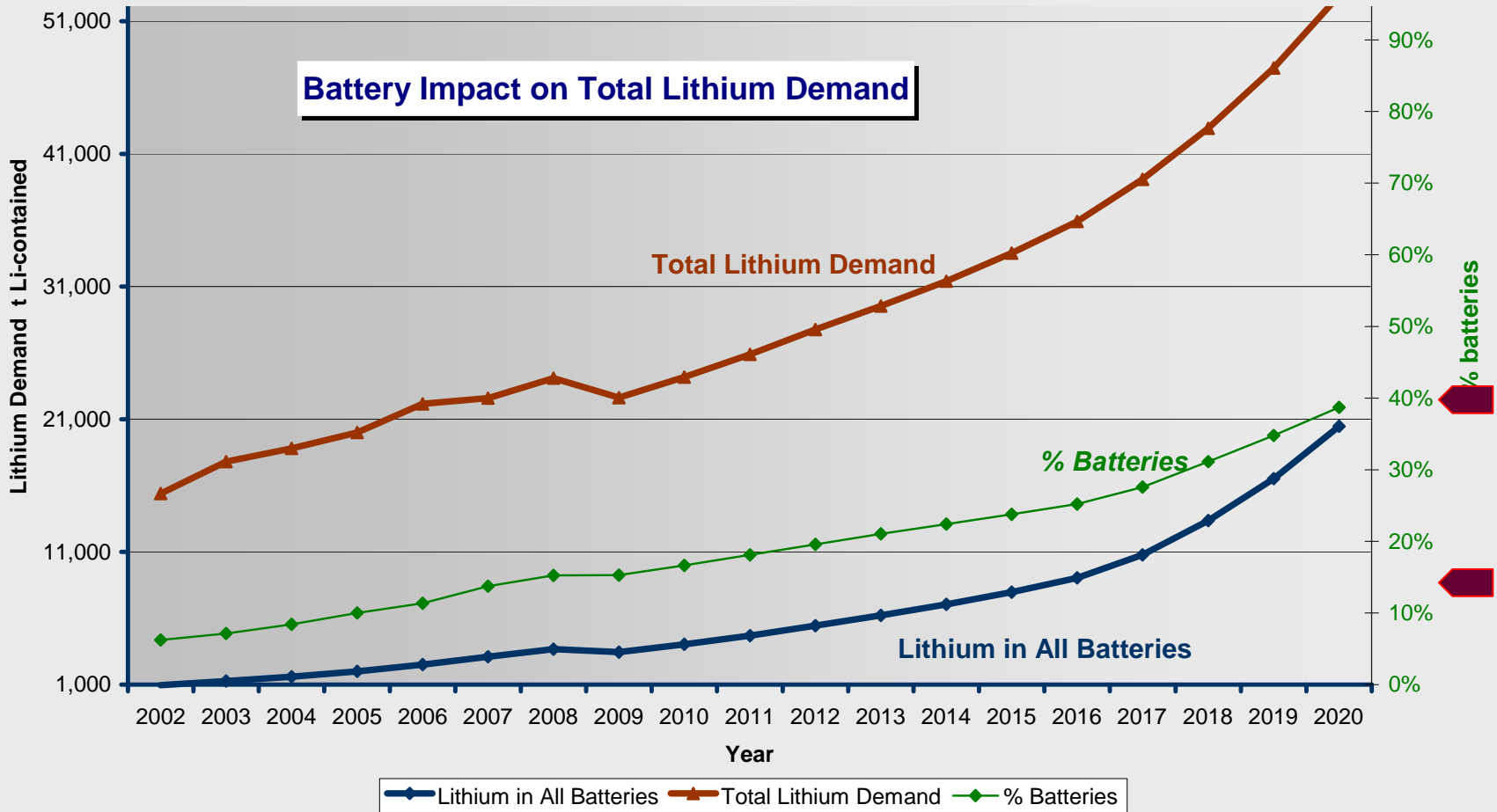
□ Supply Side

- Announced lithium projects delayed?
- Some new information available on producers

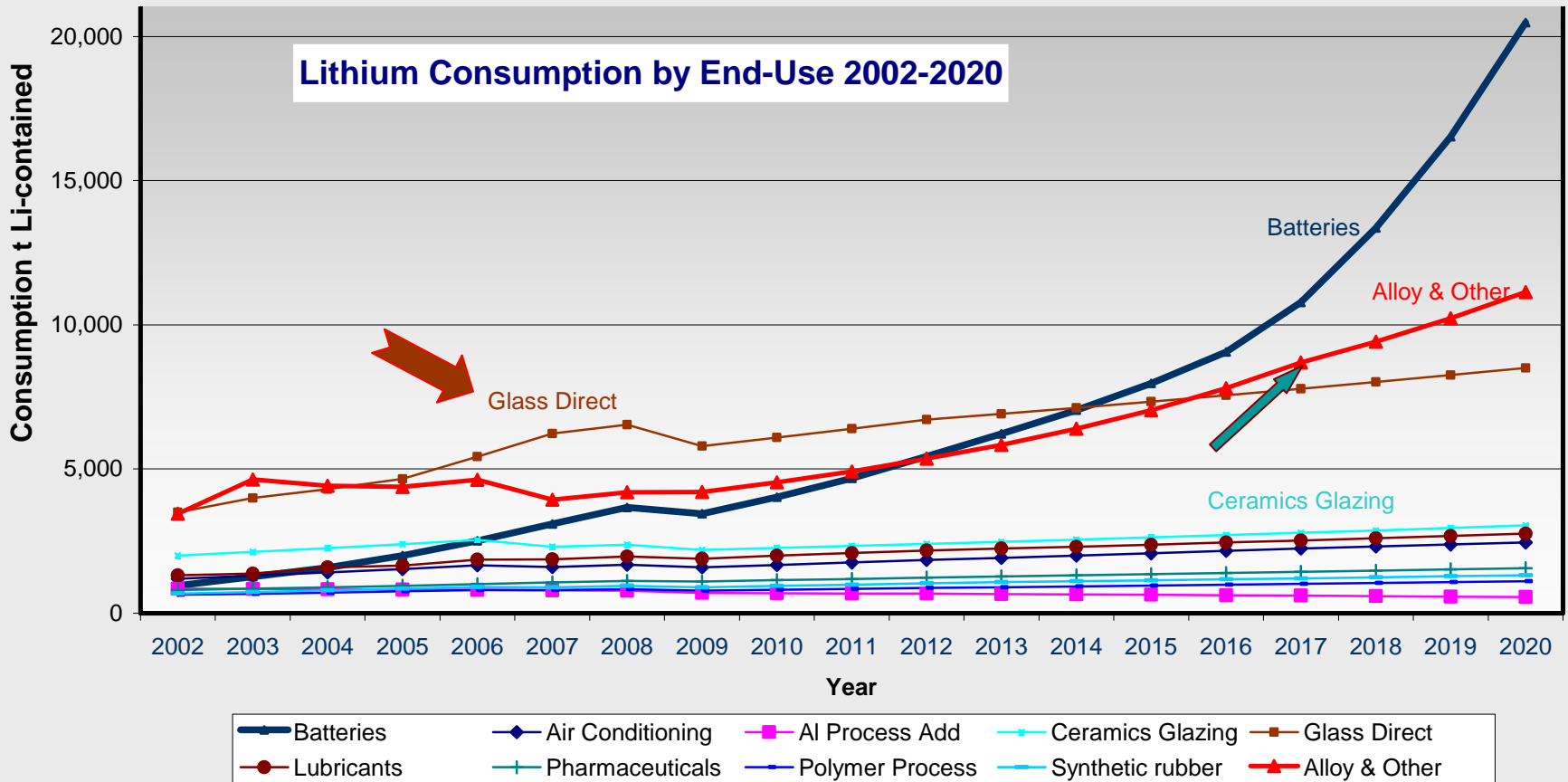
Demand Curve



Batteries Impact High



User Segment Patterns





Alloy Perspective

by 2020 Alloy = 10% of total

Batteries = 14% NOW

Following Same Time Path?



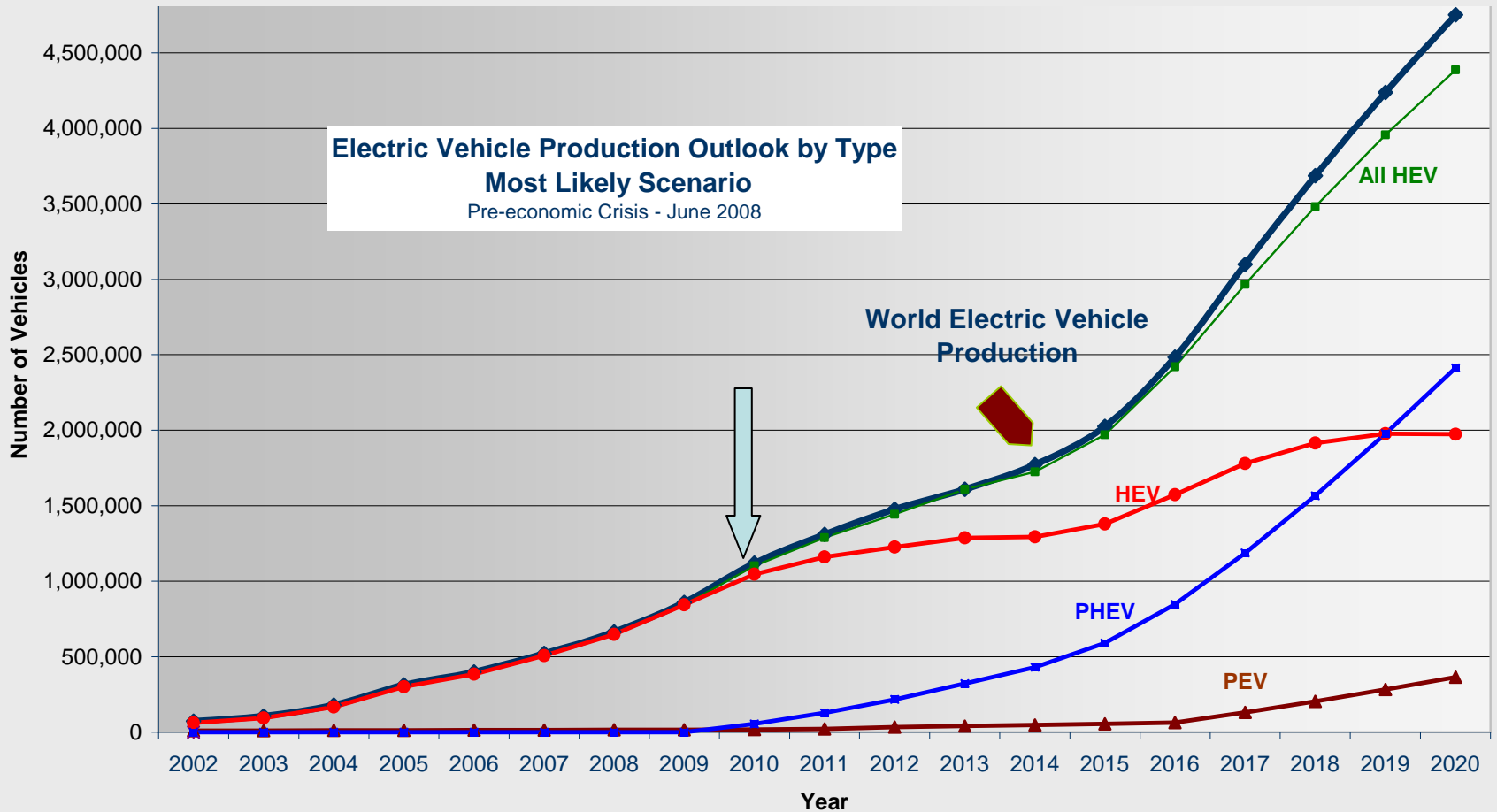


Battery Use of Lithium by Type

Battery Type	2002	2007	2020	% Growth pa	
	% total	% total	% total	02 - 07	07-20
Primary Batteries	40%	21%	8%	11%	8%
Secondary Batteries	60%	79%	54%	33%	12%
EV Batteries	0%	0%	38%	71%	136%
ALL BATTERIES	100%	100%	100%	27%	16%

Electric Vehicle Production Outlook by Type

TRU's Pre-Economic Crisis Forecast



◆ World Electric Vehicle Production
◆ All HEV
▲ PEV
* Series5
● HEV
◆ PHEV





Electric Vehicle Li-Battery Development Fundamentals

Electric Vehicle Type	Year Technical Issues Resolved for Lithium Battery
Hybrid Electric Vehicle	2011
Plug-in Hybrid Electric Vehicle	2014
Plug-in Electric Vehicle	2016
Fuel Cell Vehicles	2018

User Segment Overview

USE SEGMENT	2002	2007	2020	% Growth t per annum	
	% total	% total	% total	02 - 07	07-20
Air Conditioning	8%	7%	5%	5.9%	3.4%
Aluminium Process Add	6%	3%	1%	-1.5%	-2.6%
Batteries	6%	14%	39%	26.5%	15.6%
Ceramics Glazing	13%	10%	6%	2.8%	2.2%
Glass/Ceramic Li Add	23%	28%	16%	12.2%	2.4%
Lubricants	9%	8%	5%	7.3%	3.0%
Pharmaceuticals	5%	5%	3%	6.0%	3.0%
Polymer Process	4%	4%	2%	4.6%	2.6%
Synthetic rubber	4%	4%	2%	5.8%	3.0%
Other Plus Alloy	22%	17%	21%	2.6%	8.3%
ALL USES Li-contained	100%	100%	100%	8.0%	6.8%
<i>Chemical Uses Demand</i>	77%	72%	84%	6.6%	8.0%
<i>Glass/Ceramics Direct</i>	23%	28%	16%	12.2%	2.4%



Supply Classes

- i. Supply from Existing Plants**
- ii. Pipeline Projects Supply**
- iii. New Resource Supply**



Notable Supply Drivers

- i. Existing low cost (brine-based) plants can expand significantly**

- ii. Emerging technologies provide new options for medium-scale lithium developments ***

- iii. Mineral-based supply (for basic Li chemicals) can be economic with price escalation**

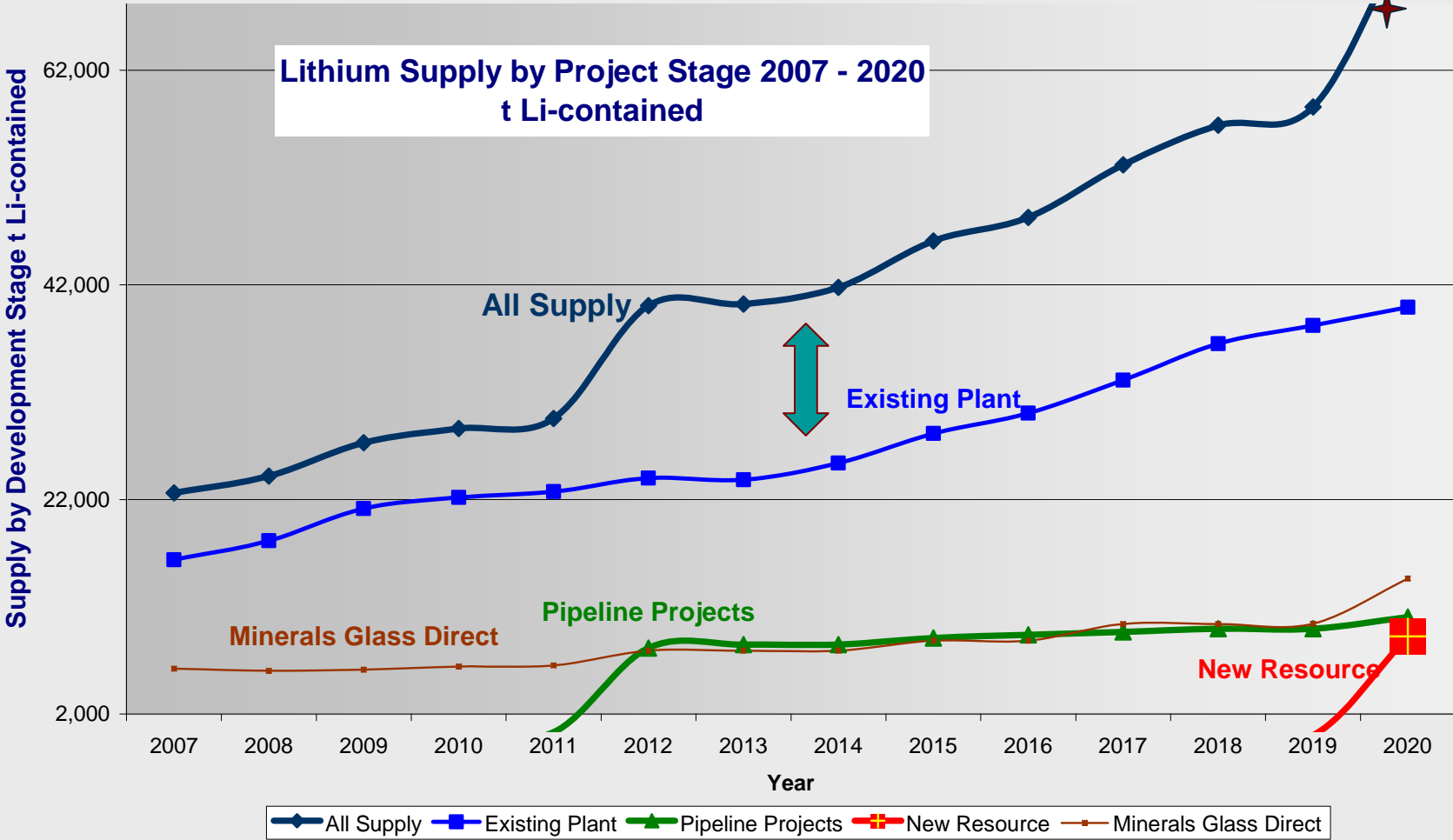
** selective ion adsorption, electrodialysis, nanofiltration, etc*



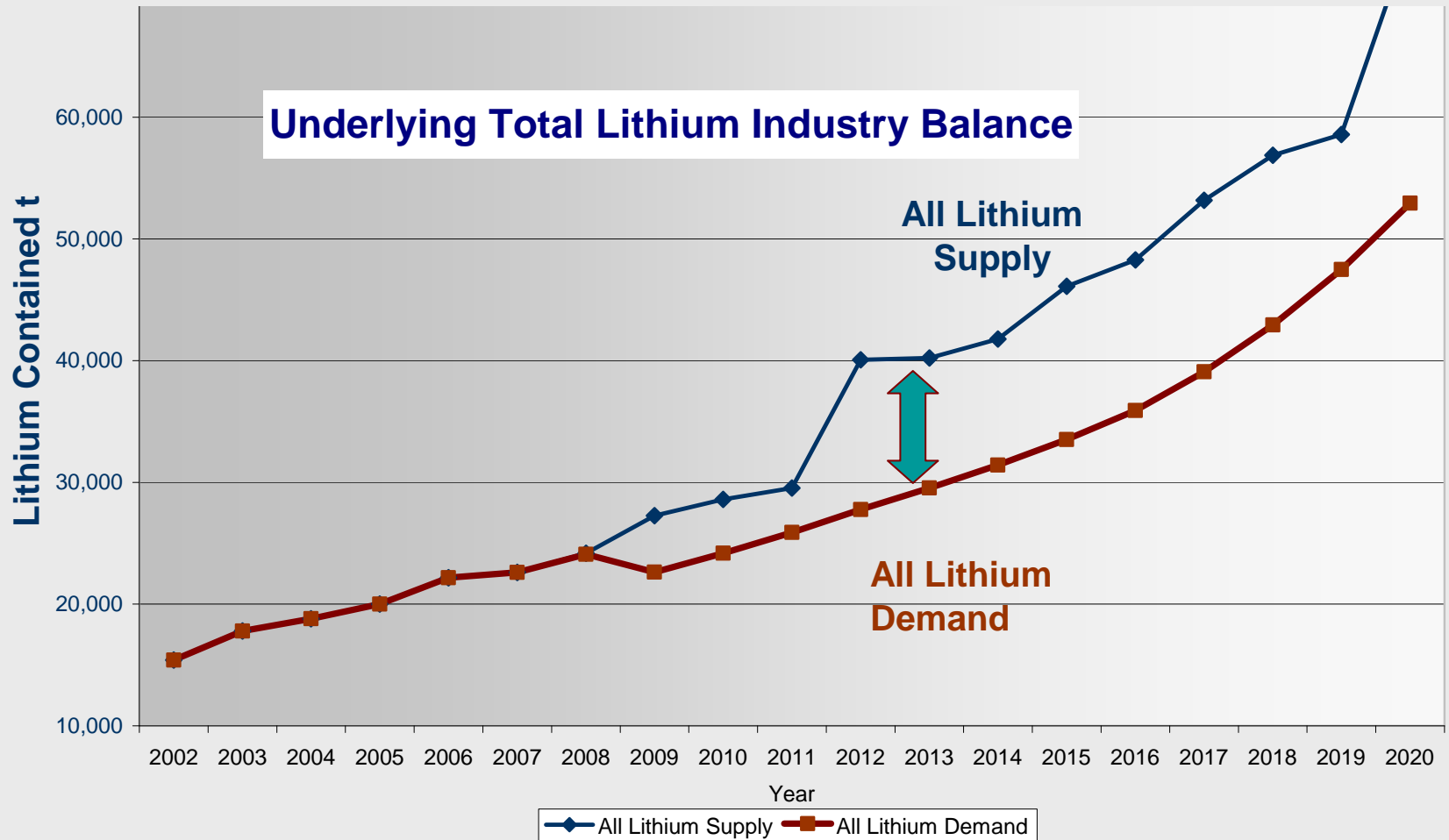
Supply by Stage

Supply Stage	2002	2007	2017	2020	Average % Growth pa			
	% total	% total	% total	% total	02-07	07-12	12-17	17-20
Existing Plants	77%	72%	62%	53%	7%	8%	7%	6%
Pipeline Plants	0%	0%	18%	15%	-	-	3%	5%
New Resources	0%	0%	0%	12%	-	-	-	-
Glass Use Direct	23%	28%	20%	20%	12%	5%	6%	12%
Total Li Supply	100%	100%	100%	100%	8%	12%	6%	12%

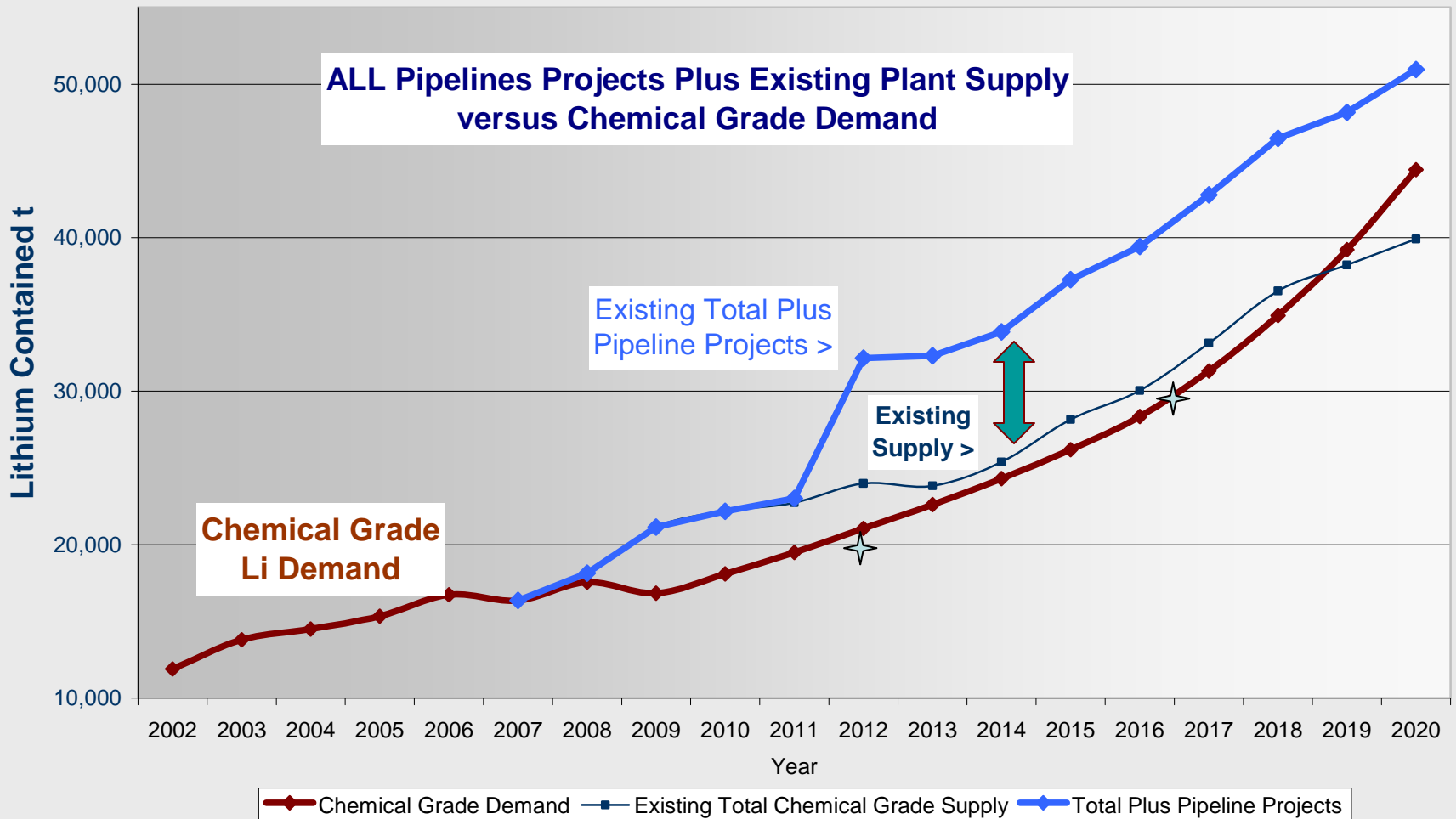
Supply Pattern



All Lithium Supply-Demand



Chemical Grade Lithium Supply Band vs. Demand

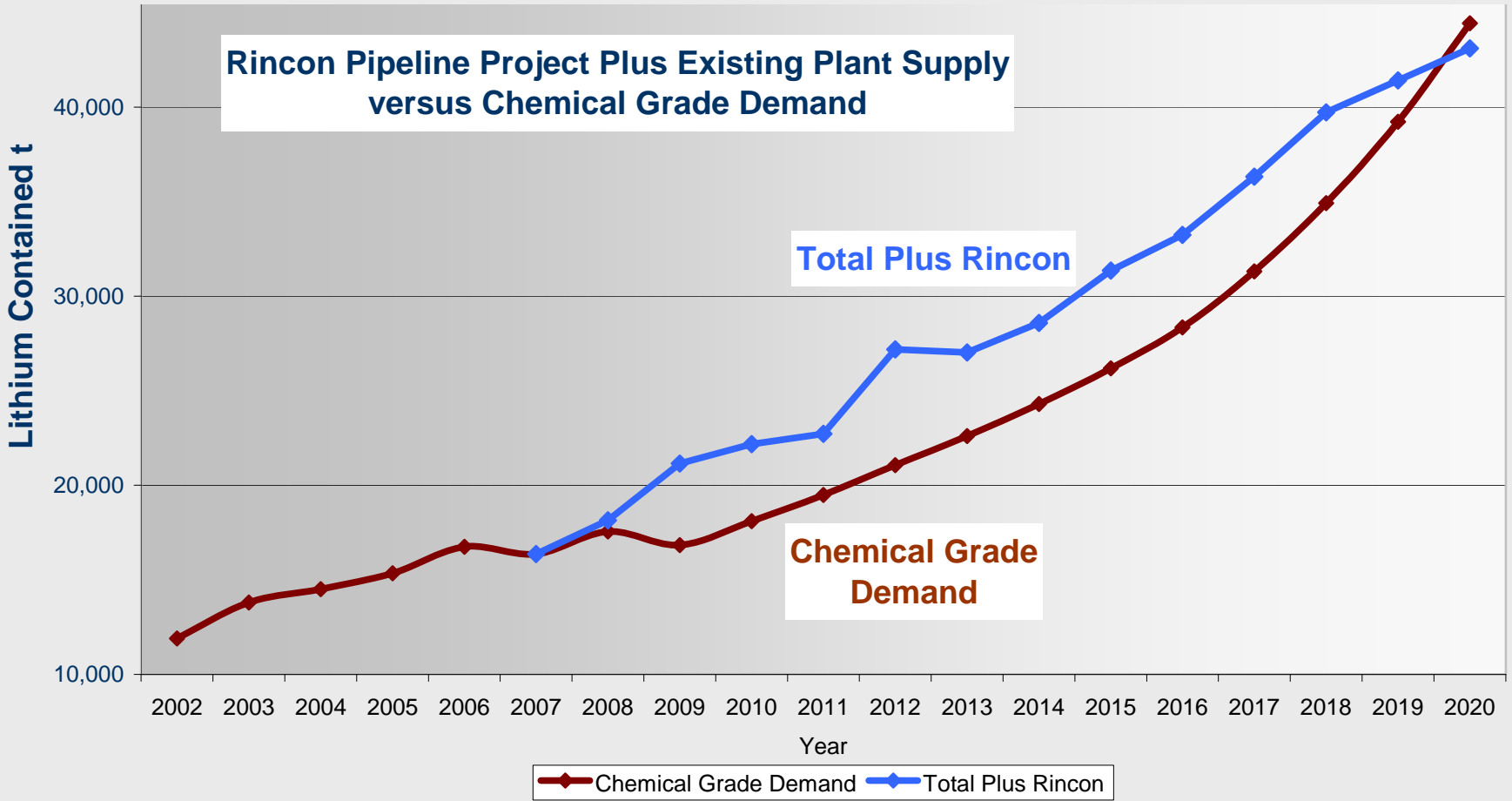




Most Likely Scenario

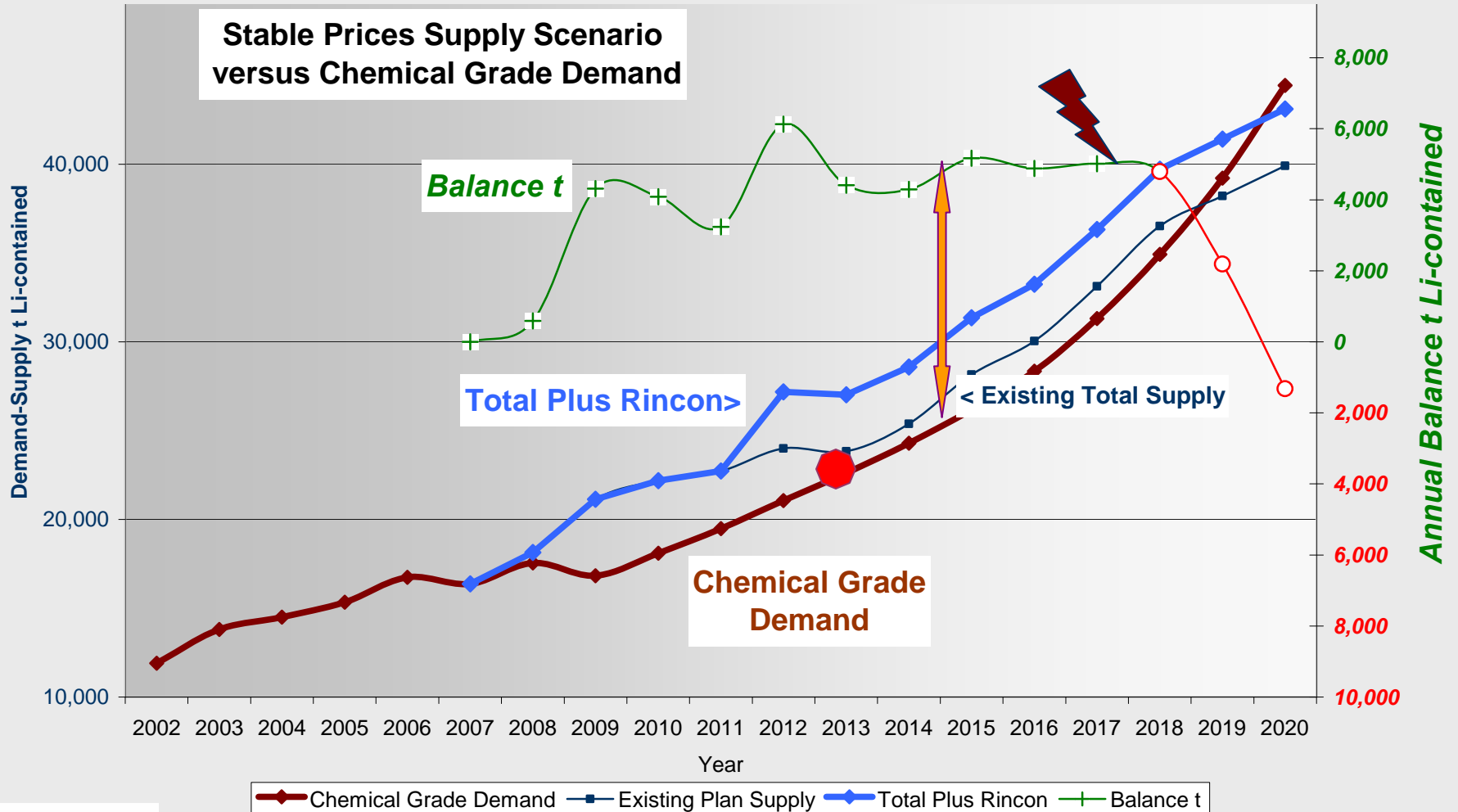
Stable Prices

MOST IMPORTANT



Lithium Market Balance

Stable Prices Scenario





Summary Outlook 2020

Global Recession puts industry
into over-supply through 2013

Market returns to balance 2013-2017

In balance ≠ “Over Supply”

Critical years = 2017-2018

Chemical Li Demand = Potential of Existing Producers



Thank You !

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