



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

Edward R Anderson

B.Sc.(Hons)., Dpl.(Marketing Research)., MBA., FCI Arb

TRU Group Inc

trugroup.com

✉ anderson@trugroup.com

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

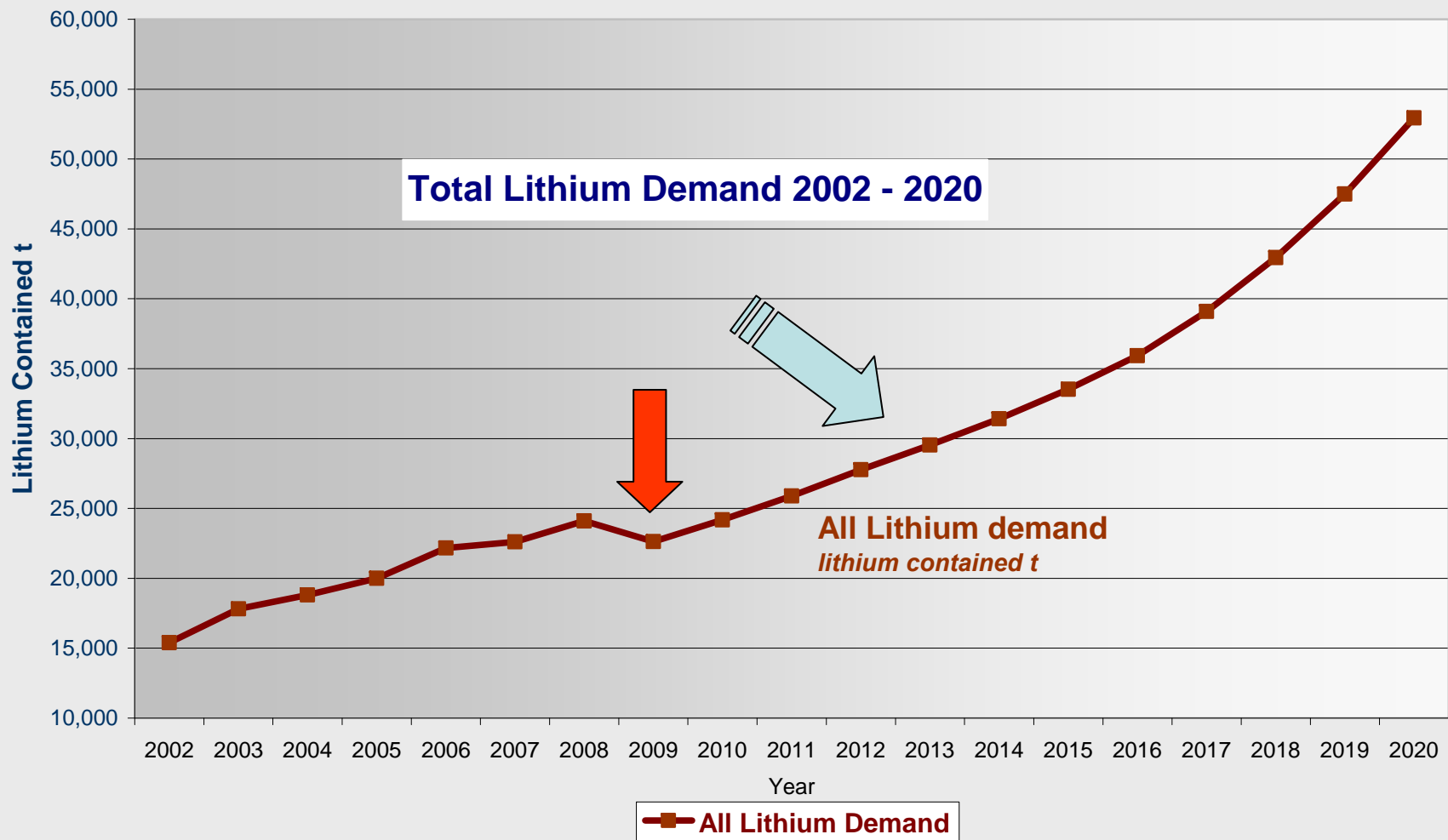
Situation Update 2010

Inserted November 18, 2009

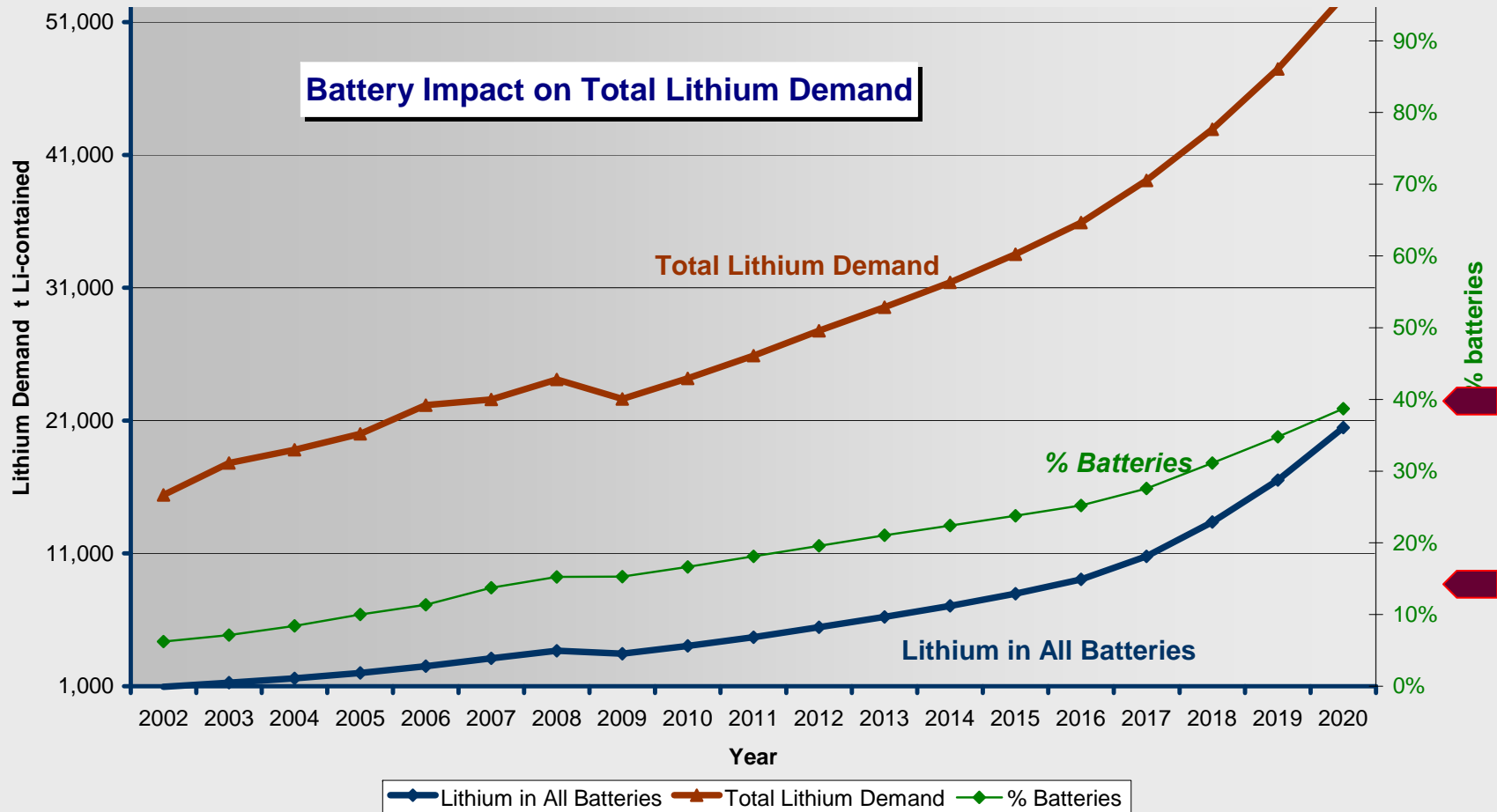
- ❑ Earlier projection for 2009 demand decline for full year now expected to exceed minus 12%
 - ❑ Important distinctive lithium use in electric vehicles (especially plug-in) and lithium metal alloy proving correct
 - ❑ No Changes to Long Range 2020 Projection Required
- ❑ Supply side flood of new projects announced supporting TRU forecasts on the production side
- ❑ Balanced orderly development through 2020 affirmed

Click on Notes below to see TRU Press Statement
Following Slides Remain as at January 2009 and are NOT updated

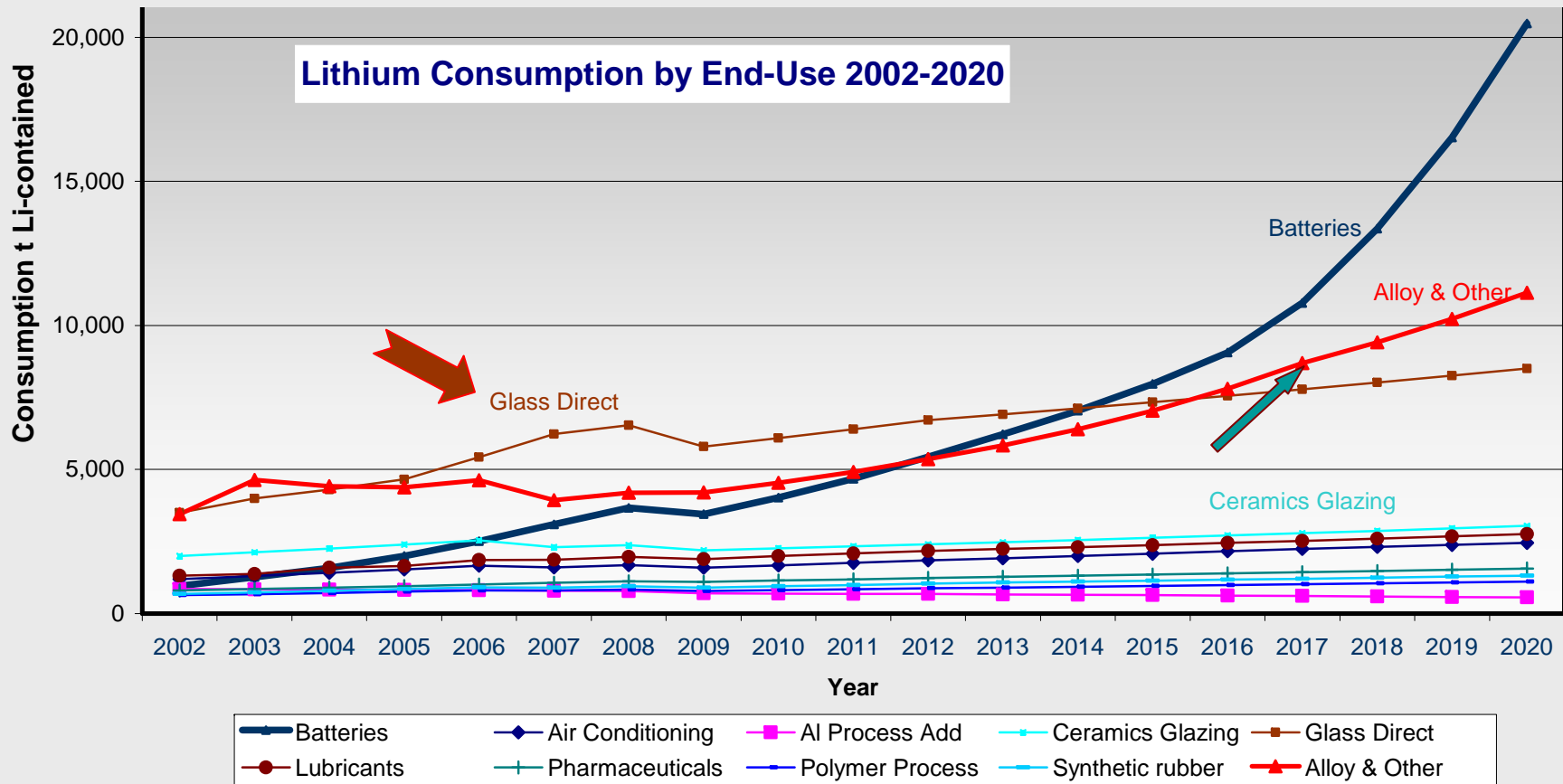
Demand Curve



Batteries Impact High



User Segment Patterns



Alloy Perspective

by 2020 Alloy = 10% of total

Batteries = 14% NOW

Following Same Time Path?

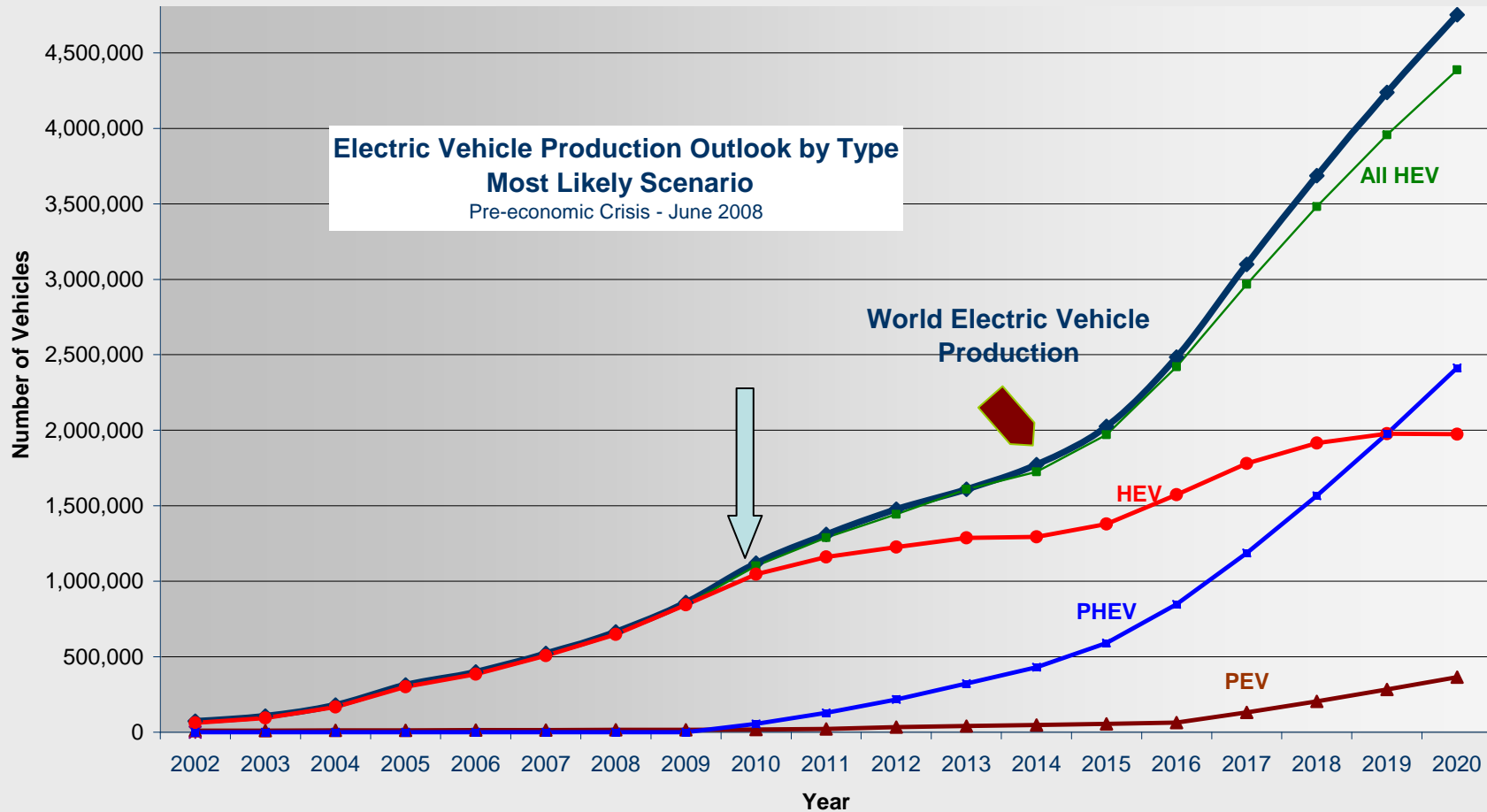


Battery Use of Lithium by Type

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%
Chemical Uses Demand	77%	72%	84%	6.6%	8.0%
Glass/Ceramics Direct	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 ***

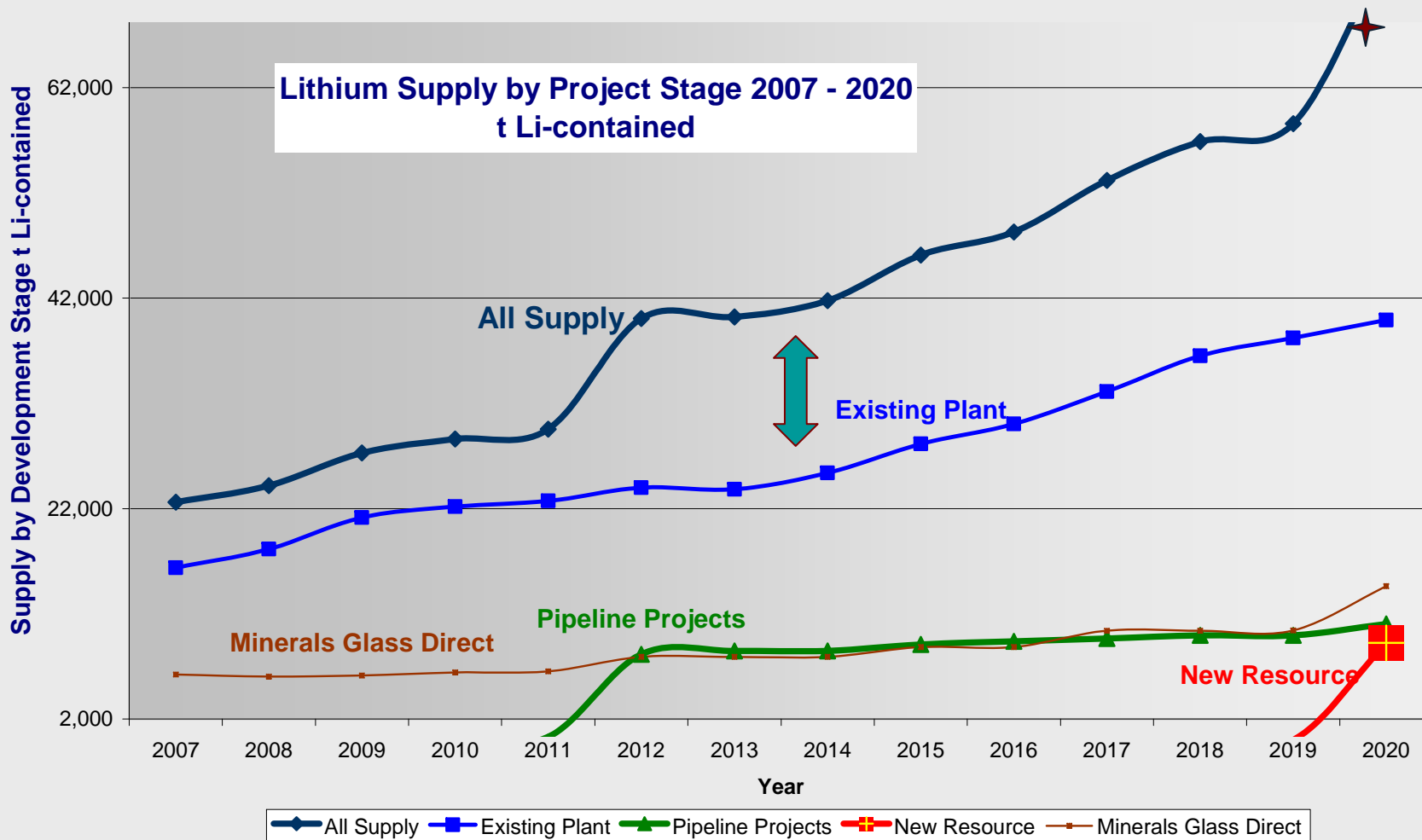
- iii. Mineral-based supply (for basic Li chemicals) can be economic with price escalation**

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

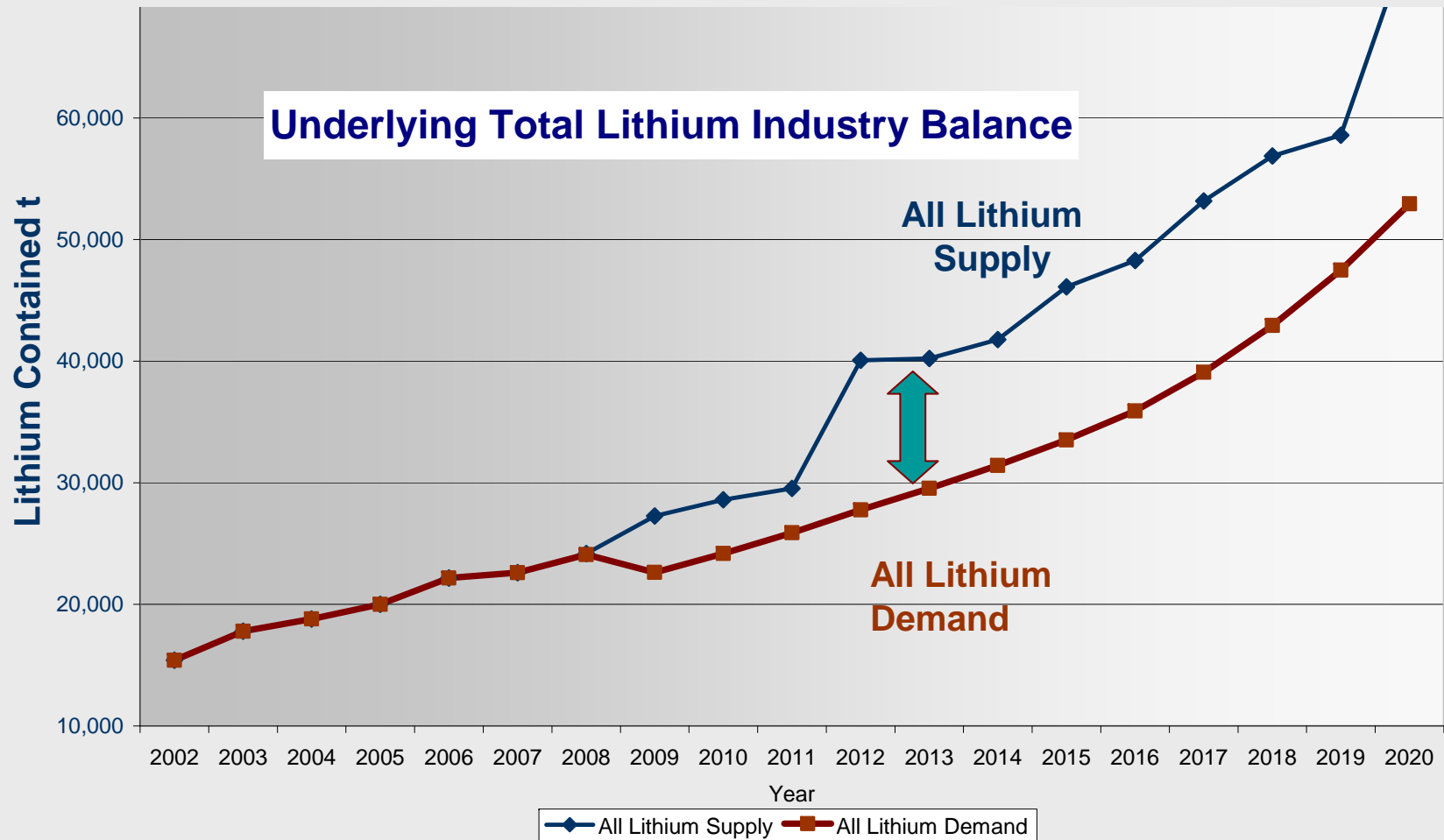
Supply by Stage

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%

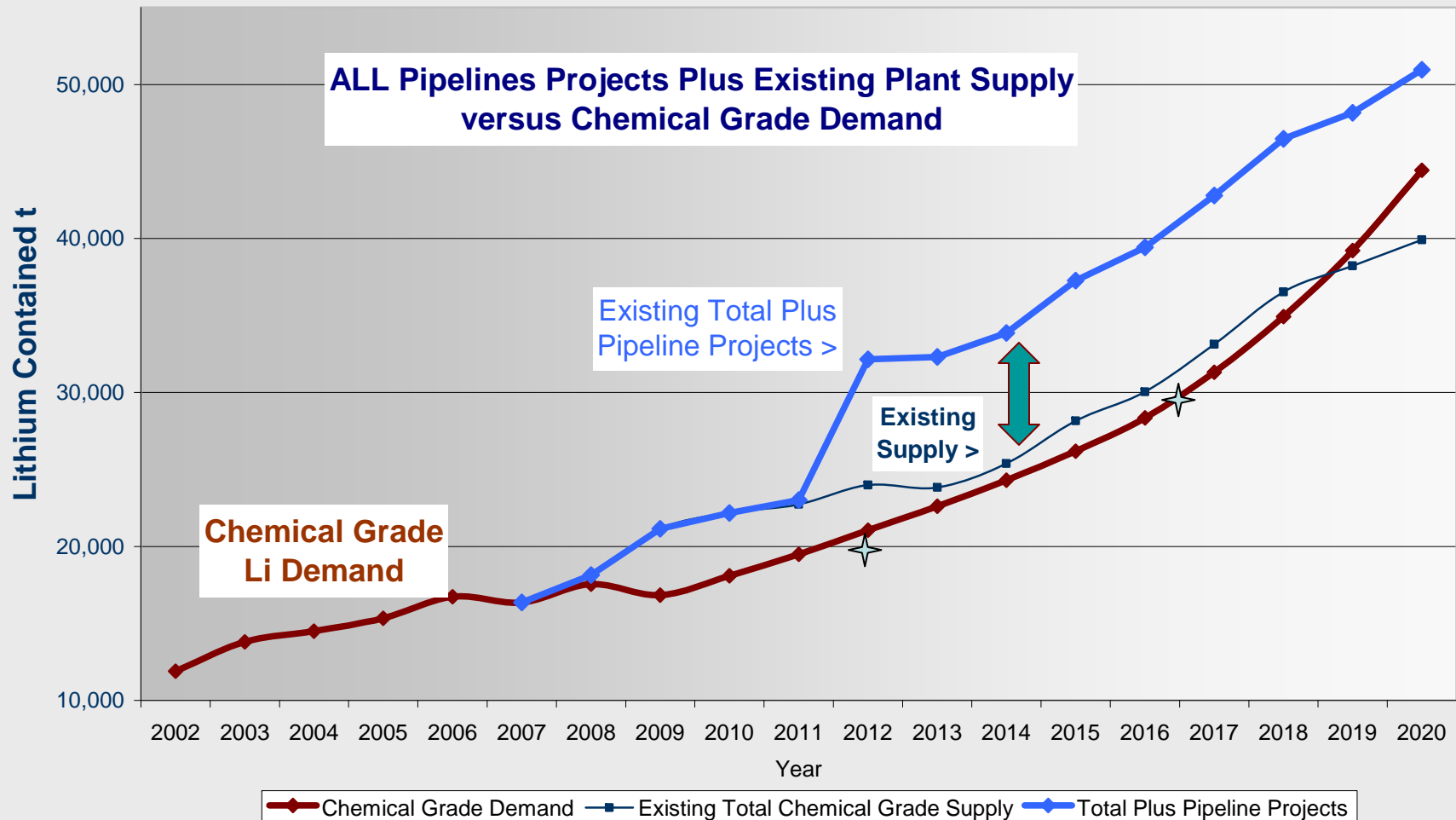
Supply Pattern



All Lithium Supply-Demand



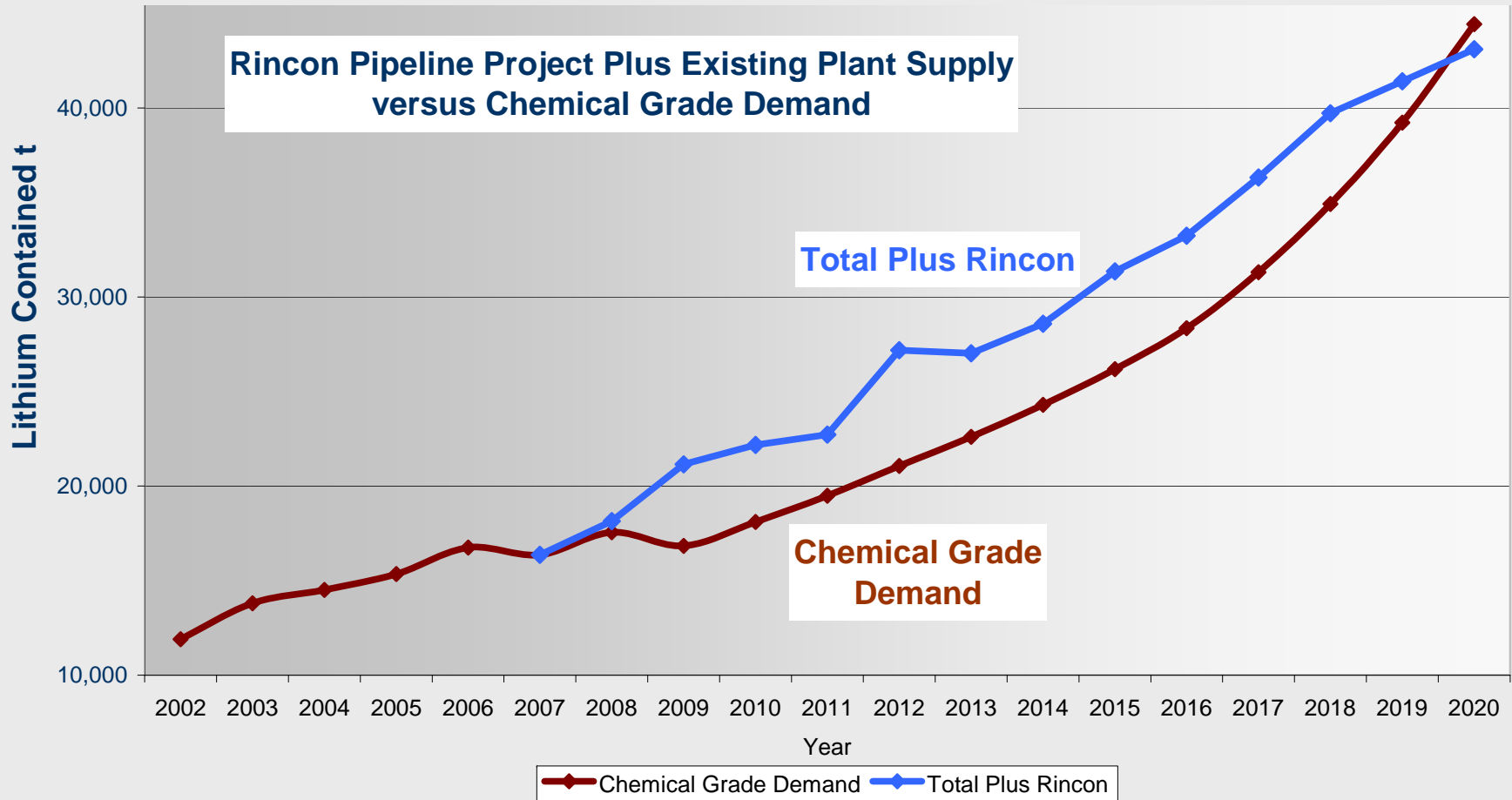
Chemical Grade Lithium Supply Band vs. Demand



Most Likely Scenario

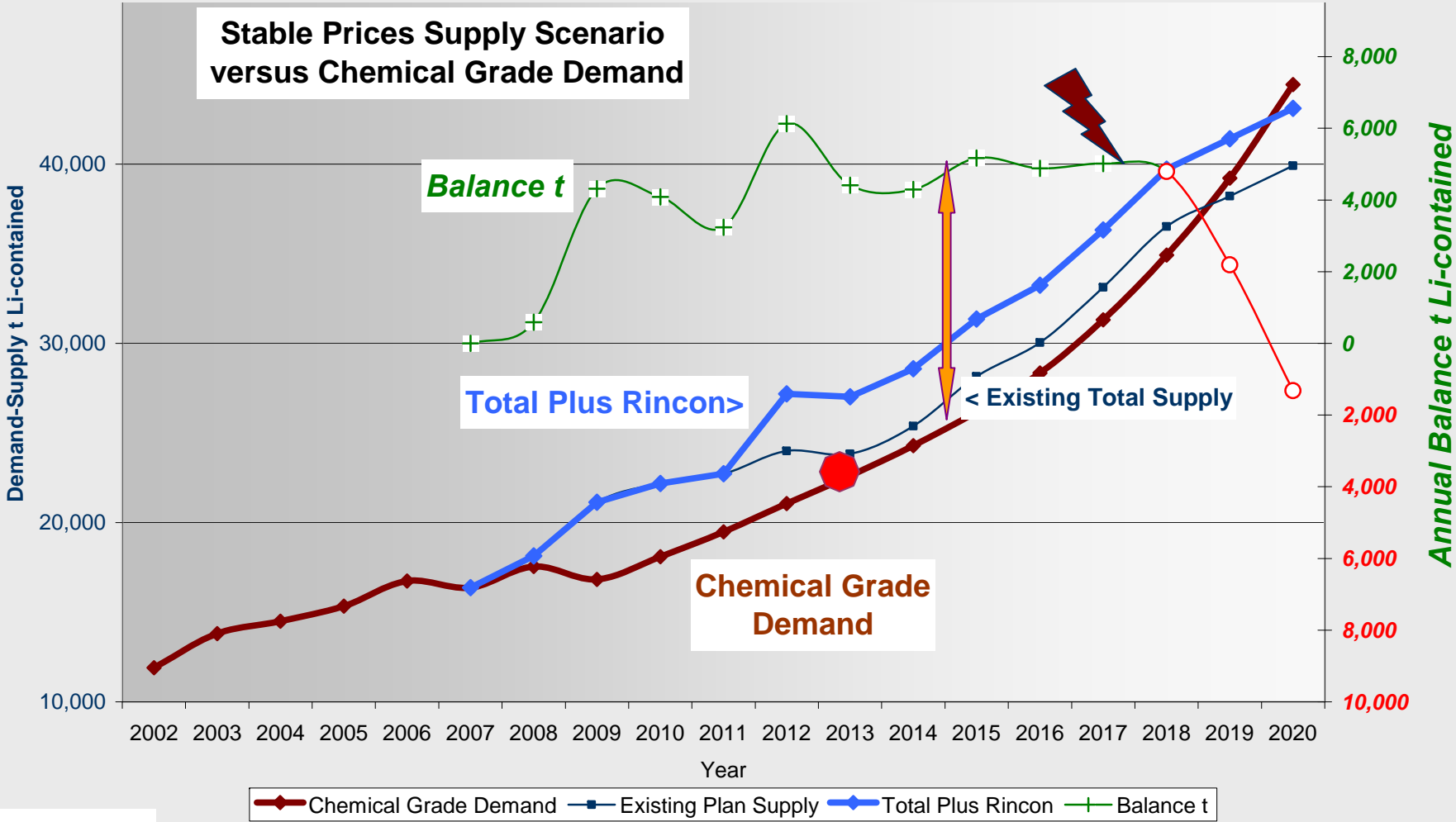
Stable Prices

MOST IMPORTANT



Lithium Market Balance

Stable Prices Scenario



Prices Outlook 2020

Inserted November 18, 2009

Model Suggests: “Stable Prices Scenario”

- ❖ Through 3rd-quarter 2009 prices superficially bolstered by falling dollar
- ❖ SQM 20% reduction – falling prices consistent with TRU over-supply forecast
 - ❖ Stable prices expected long range 2020
- ❖ Transaction prices for lithium chemicals much lower than published by project promoters and ill-informed analysts

Click on Notes below to see TRU Prices Comments
Other Slides Remain as at January 2009 and are NOT updated

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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President & CEO

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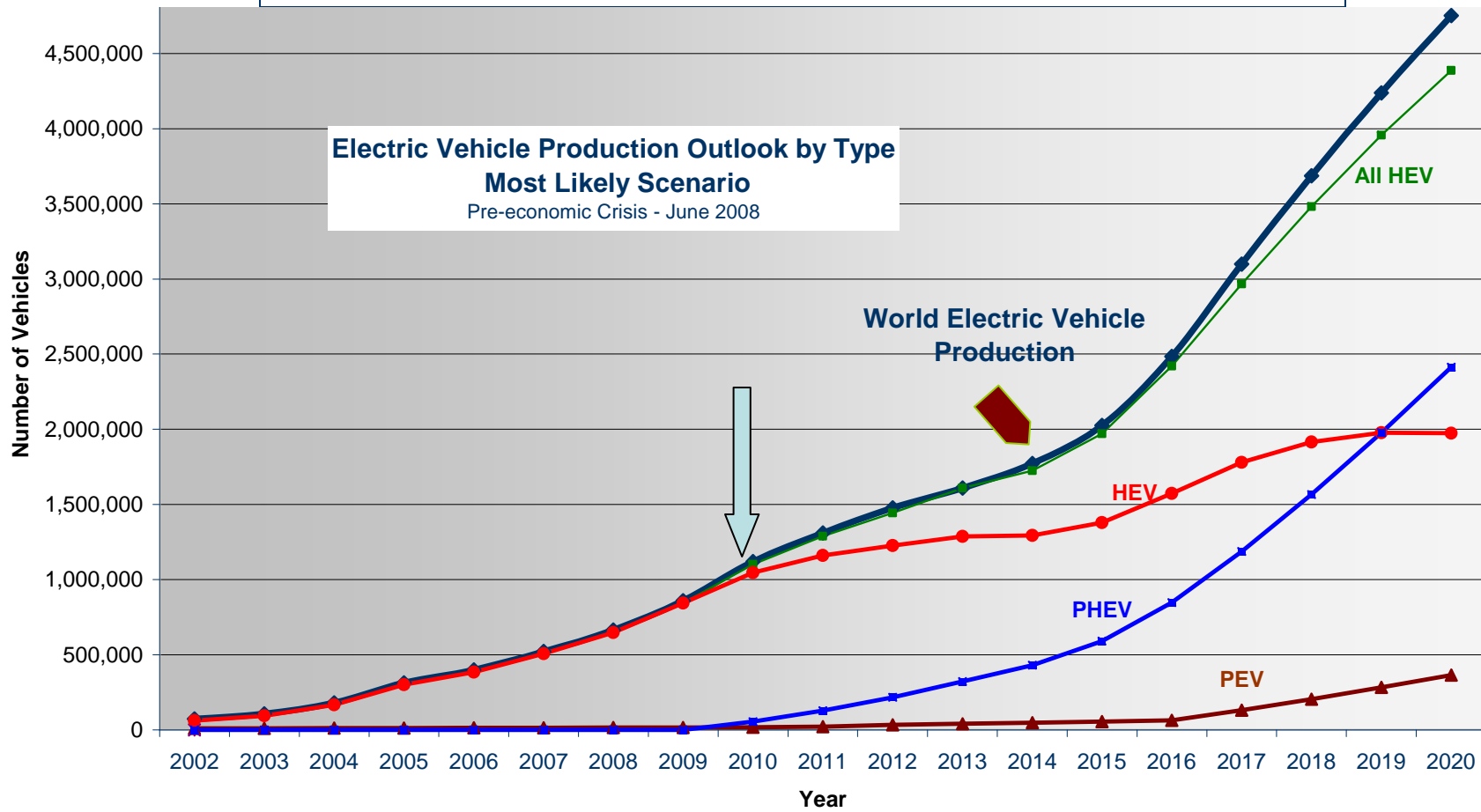
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Toronto 1-416-935-1754

Cell 1-520-229-7836

Electric Vehicle Production Outlook by Type

TRU's Pre-Economic Crisis Forecast



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