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## CHARGING PORTFOLIOS WITH LITHIUM

A special report by the Portfolio Advisory Group

There's Wealth in Our Approach.™

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## CHARGING PORTFOLIOS WITH LITHIUM

We believe the market for lithium should enjoy considerable growth in the coming years as applications for the metal are surging.

Key drivers should be the proliferation of smartphones and tablets, combined with the emergence of electric vehicles (EVs). Power grid battery applications are also on the upswing, in particular to smooth out the intermittent nature of green energy sources such as solar and wind.

However, investors also need to be mindful of a couple of factors that may pose challenges. Demand trends largely depend on technology adoption and battery applications, which can be fickle. Moreover, global resources of lithium are widespread. While production is closely held in an oligopoly, demand growth may well be met by new mines and/or the expansion of existing operations.

Market participants interested in lithium can look at a variety of lithium-related investments: one of the major industry producers; junior miners; battery makers; or lithium exchange-traded funds (ETFs).

### LITHIUM 101

Lithium has the highest electrochemical potential and is the lightest of all metals. These properties give it very high

energy densities, which have made it a key component in powering smartphones, tablets, and vehicles. Lithium does not occur as a pure element in nature, but exists in salt form in brine lakes and is contained within a number of mineral ores.

The most significant reserves of lithium are in Bolivia (34%) and Chile (31%), with major deposits also in China, the U.S., Argentina, and Australia.

About 50% of global production is sourced from brine lakes, primarily in Chile and Argentina, with the balance from hard rock mines largely in Australia. Our research sources estimate global production capacity at 185,000 tonnes of lithium carbonate equivalent units (LCE). Lithium carbonate, the industry standard measure, is 18.8% lithium.

Brine in salt lakes, or “salars,” holds lithium leached from volcanic rocks that is concentrated through evaporation. Key brine production sources include the Salar de Atacama in Chile and the Salar del Hombre Muerto in Argentina. According to industry experts, the cost of production from this method is US\$2,000–US\$3,000 per tonne of LCE.

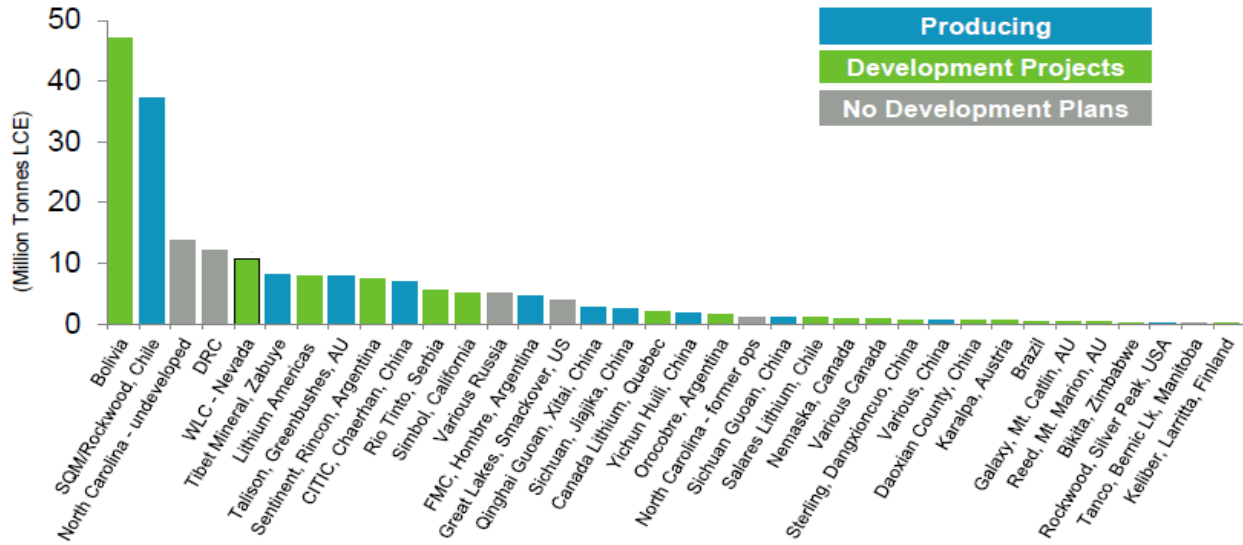
### Global Lithium Deposits



Source - signumBox, 2013

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## Global Lithium Resources



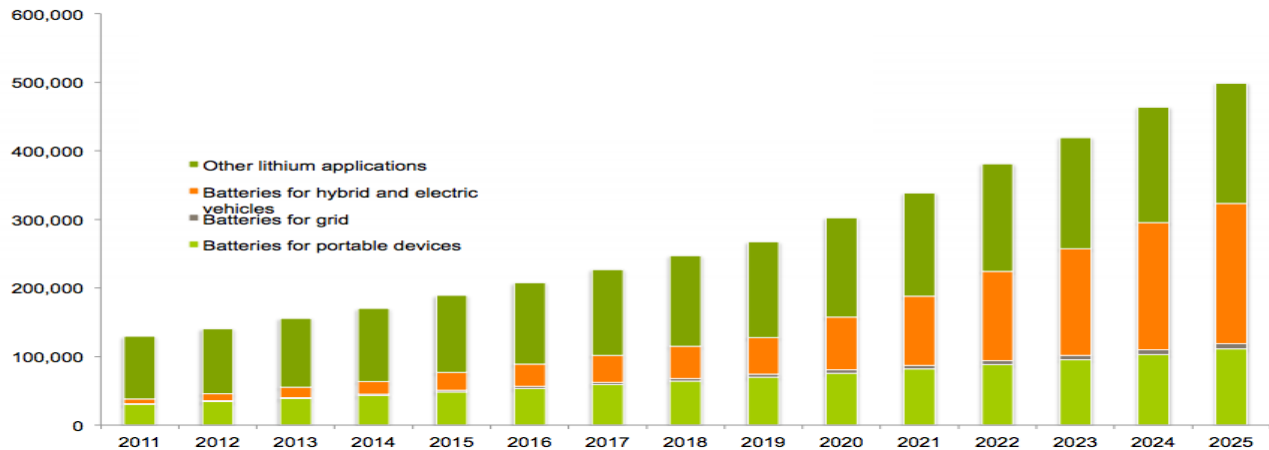
Source - Roskill Information Services

Several ores including spodumene, petalite, and lepidolite are mined; however, spodumene is the most important commercially mined lithium mineral given its higher lithium content. According to industry experts, production costs via this method are US\$3,500–US\$5,000 per tonne of LCE. The lower end of this range is characterized by Australian mines, while the upper end is represented by Chinese mines.

## FOUR PLAYERS CONTROL THE MARKET

The lithium market is dominated by four major producers representing about 90% of global supply: Talison Lithium (recently acquired by Chengdu Tianqi) at 36%, Sociedad Química y Minera de Chile (SQM) at 26%, Rockwood Holdings (recently merged with Albemarle Corp.) at 18%, and FMC Corp. at 10%.

## Global Lithium Consumption



Source - signumBox estimates, January 2012

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Lithium consumption was at about 160,000 tonnes of LCE in 2013, according to our research sources. About one-third of lithium volumes are used in the battery market (laptops, cell phones, tablets, power tools, vehicles, power grid). Approximately 25% is used in the production of ceramics and heat-resistant glass. The remainder is utilized in other industrial applications including greases, metallurgy, polymers, and medicine.

Industrial use will likely grow broadly in line with global GDP.

Batteries have been the primary driver of demand growth; while technology-driven demand is difficult to pinpoint, consulting firm signumBox forecasts battery consumption growth from 2011–25 at 10% for portable devices, 21% for power grid applications, and 27% for hybrid electric vehicles (HEVs) and EVs.

### AUTOMAKERS GETTING GREENER

Spurred by the Tesla Motors story, a number of automakers are looking to take advantage of the popularity of the luxury EV market and get in on the action.

EVs are powered solely by a battery-powered motor, while HEVs are propelled by conventional or alternative fuels as well as a battery. Plug-in hybrid electric vehicles (PHEVs)

are powered the same as HEVs, but can be plugged into an external power source.

Worldwide EV adoption is paramount to the success of lithium producers; full EVs contain 44 pounds of lithium carbonate in their battery packs, compared to one ounce in a notebook computer.

Government policy worldwide has been conducive to EV market growth. (But with only 180,000 EVs in use worldwide, the multi-government Electric Vehicle Initiative’s goal of 20 million vehicles on the road by 2020 seems lofty.)

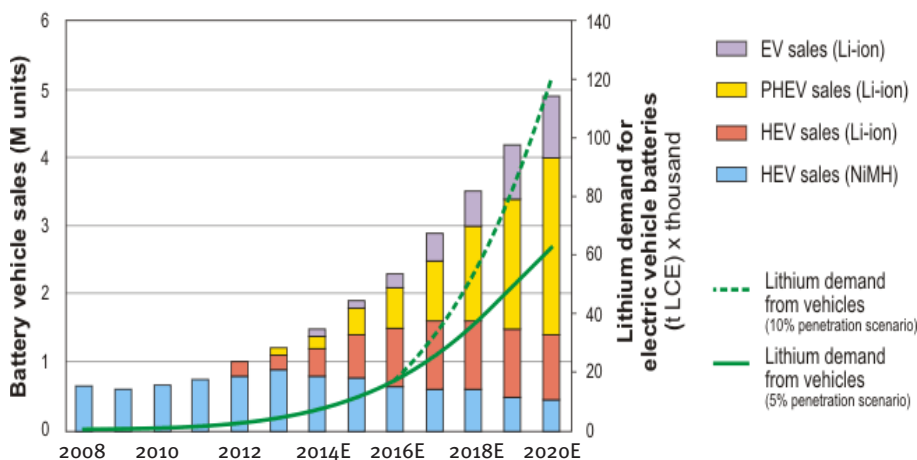
Government subsidies, like a CA\$8,500 tax credit for the purchase of an EV by Ontario residents, are becoming more widespread around the world. In addition to federal initiatives, local governments are pursuing fleet acquisitions and partnering with the private sector on local mobility initiatives, such as car sharing.

Favourable economic terms for charging stations have been catalysts for the EV market as well, with planned expansions in Europe and parts of Asia over the near term.

### BATTERY PRODUCTION COSTS LIKELY TO EASE

Tesla has been one of the leaders in popularizing the EV market.

Estimated Global EV Production and Lithium Demand for EV Batteries (2008–20)



Source - Roskill Information Services

Once the proposed “Gigafactory” is completed in 2017, Tesla, along with its main partner, Panasonic, aims to create 500,000 battery packs/year. The factory may consume as much as 17% of worldwide lithium output.

The plant will likely ease one of the key challenges currently facing battery production—cost.

Tesla expects battery pack cost/kWh to drop more than 30% by the end of the first year of the facility’s operation. In addition, Tesla has stated it will only use raw materials sourced in North America, which could lead to the future acquisition of a small-cap miner in the region.

### RIDING THE SMART DEVICE WAVE

IDC predicts the worldwide smart connected device market will exceed 2 billion units by the end of 2015.

Emerging markets, which were core drivers of the PC market, have experienced slower-than-expected economic growth and significant shifts in technology-buying priorities. The benefactors of this shift include tablets and smartphones.

Tablets are expected to jump to 17% of the global market by 2017 from 12% in 2013. IDC projects the smartphone market to experience the most growth, surging to 71% of the market by 2017 from 60% in 2013.

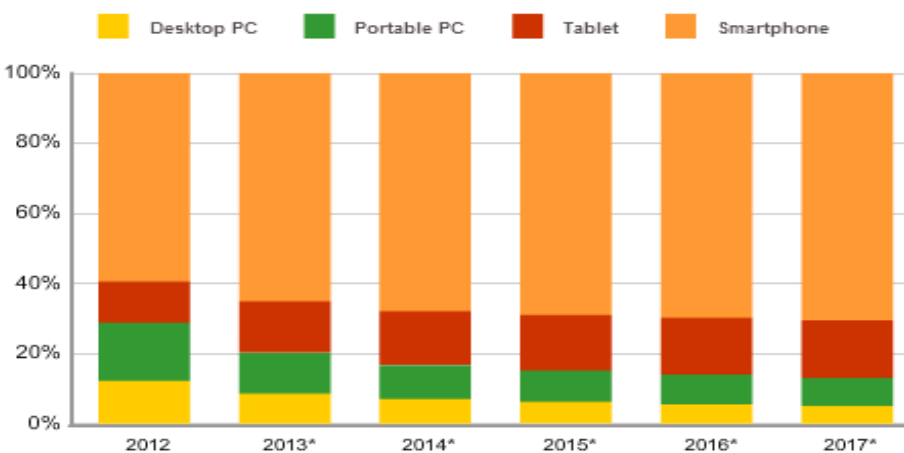
### A JOLT FROM GREEN POWER INITIATIVES

The storage battery market is poised to accelerate, in our view. Main applications for storage batteries include: (1) stabilizing the power grid; (2) exploiting lower cost, off-peak supply; and (3) assisting with the introduction of renewable energy sources.

The U.S. Energy Information Administration (EIA) expects ongoing robust growth for solar power generation, despite accounting for merely 0.5% of total U.S. power generation.

Japan and Germany have introduced initiatives subsidizing storage battery installations for solar power

Global Smart Connected Device Forecast\*: Market Share by Product Category (2012–17)



Source - IDC, 2013

projects. Lithium companies stand to reap significant benefits, in our view, because of the substantial lithium mass required to build the batteries. As compared to a car battery, which requires 44 pounds of lithium carbonate, a one-megawatt lithium grid storage battery requires approximately 1,800 pounds of lithium carbonate.

### WIDE SUPPLY CHAIN TO CHOOSE FROM

The lithium supply chain is intricate and involves scores of players. Clients interested in lithium can invest in one of the major industry producers, junior miners, battery makers, or lithium ETFs.

*Please contact your investment advisor for specific recommendations.*

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			Count	Percent
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