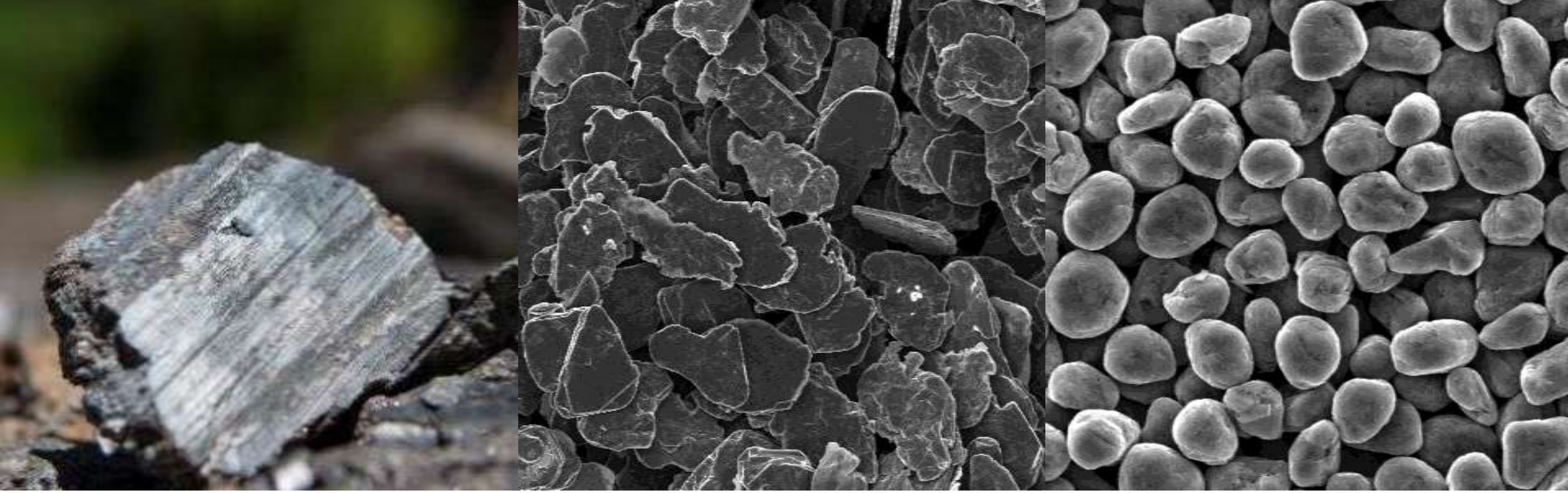

JP Morgan Clean Energy Corporate Day

Christina Lampe-Onnerud
Founder & CEO Cadenza Innovation Inc.
Syrah Resources Non-Executive Director
15 May 2018

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SYRAH RESOURCES

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Lithium-ion battery market

Shenzhen now uses only electric buses (16,500) and also has 62.5% of all taxies being electric (12,518)

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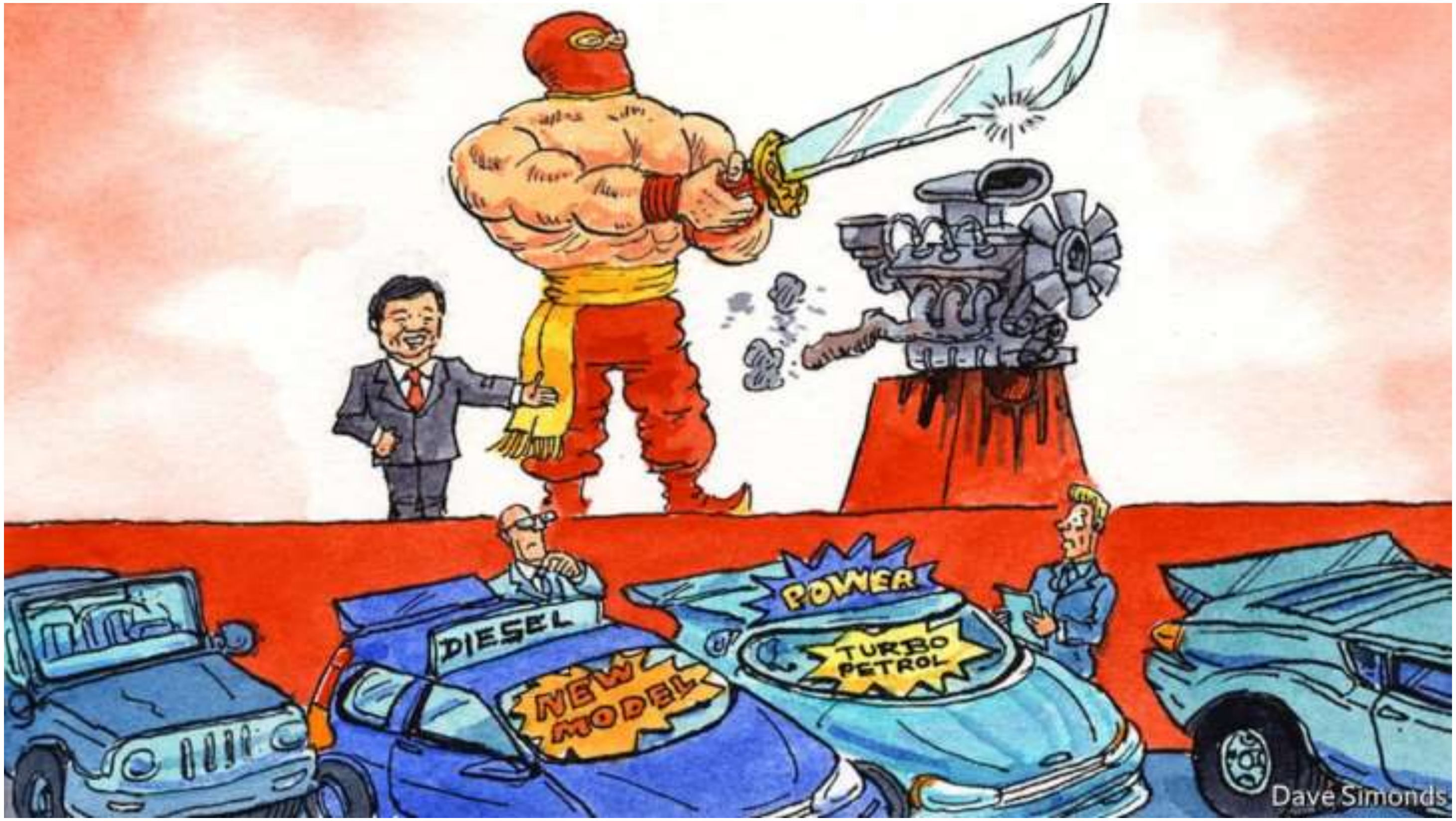
Retrieved: 2018-01-04 https://www.greencarreports.com/news/1114577_shenzhen-now-uses-only-electric-buses-16500-of-them?utm_source=dlvr.it&utm_medium=twitter

The Economist: China moves towards banning the internal combustion engine



Published 2017-09-14 https://www.economist.com/news/business/21728980-its-government-developing-plan-phase-out-vehicles-powered-fossil-fuels-china-moves?fsrc=scn/tw/te/bl/ed/chinamovestowardsbanningtheinternalcombustionengine

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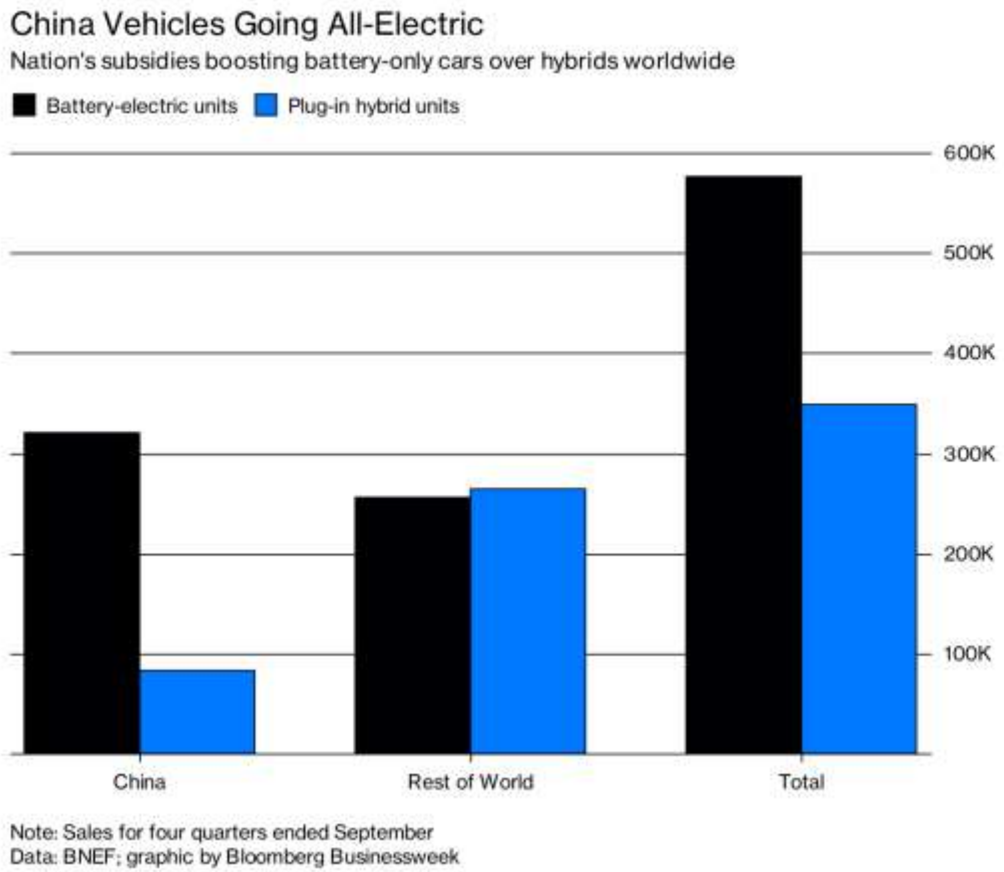
2017 China accounts for >50% all EV sales



Retrieved: 2018-01-09 https://www.bloomberg.com/news/articles/2018-01-09/china-driving-global-battery-electric-vehicle-sales-past-hybrids?cmpid=socialflow-twitter-business&utm_content=business&utm_campaign=socialflow-organic&utm_source=twitter&utm_medium=social

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The xEV opportunity in China is driving market share

Retrieved: 2017-09-01 https://www.ft.com/content/c4c332c4-7036-11e7-aca6-c6bd07df1a3c?accessToken=zwAAAV4-6cewkdPEwzLEcDYR59Ospsa9B98aPA.MEQCIDyKB2Im4l60wa2Ojs7WqXSGl0EqrfEDkqNssYf1oQxFAiAmqvMDEMfE02lS7PcfjbGj58MfQnKaNzNmYrJHg_VTiw&sharetype=gift

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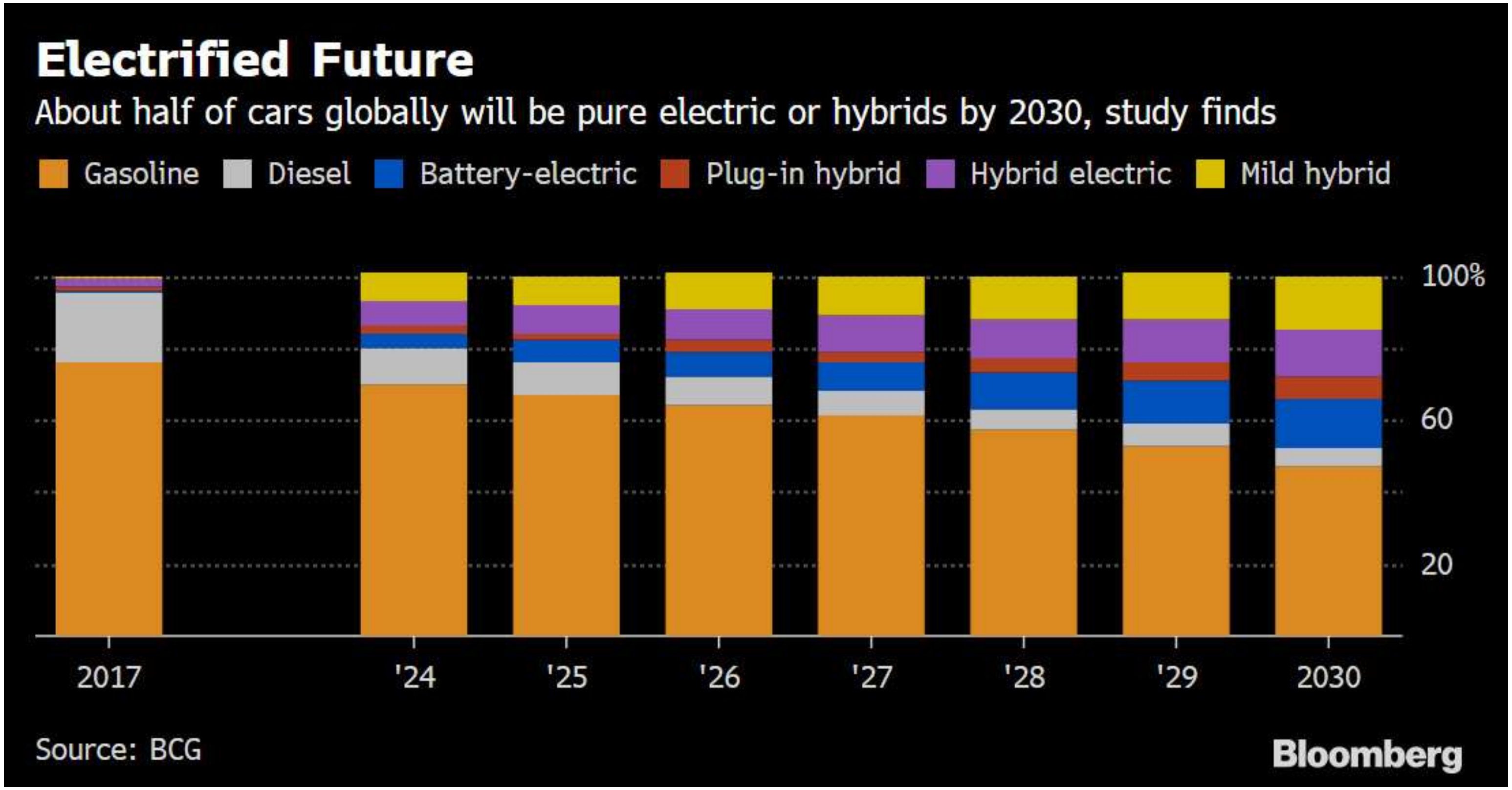
xEVs projected to be 50% of global auto market by 2030



Retrieved: 2017-10-18 https://www.bloomberg.com/news/articles/2017-11-02/battery-powered-cars-to-be-half-of-global-auto-market-by-2030

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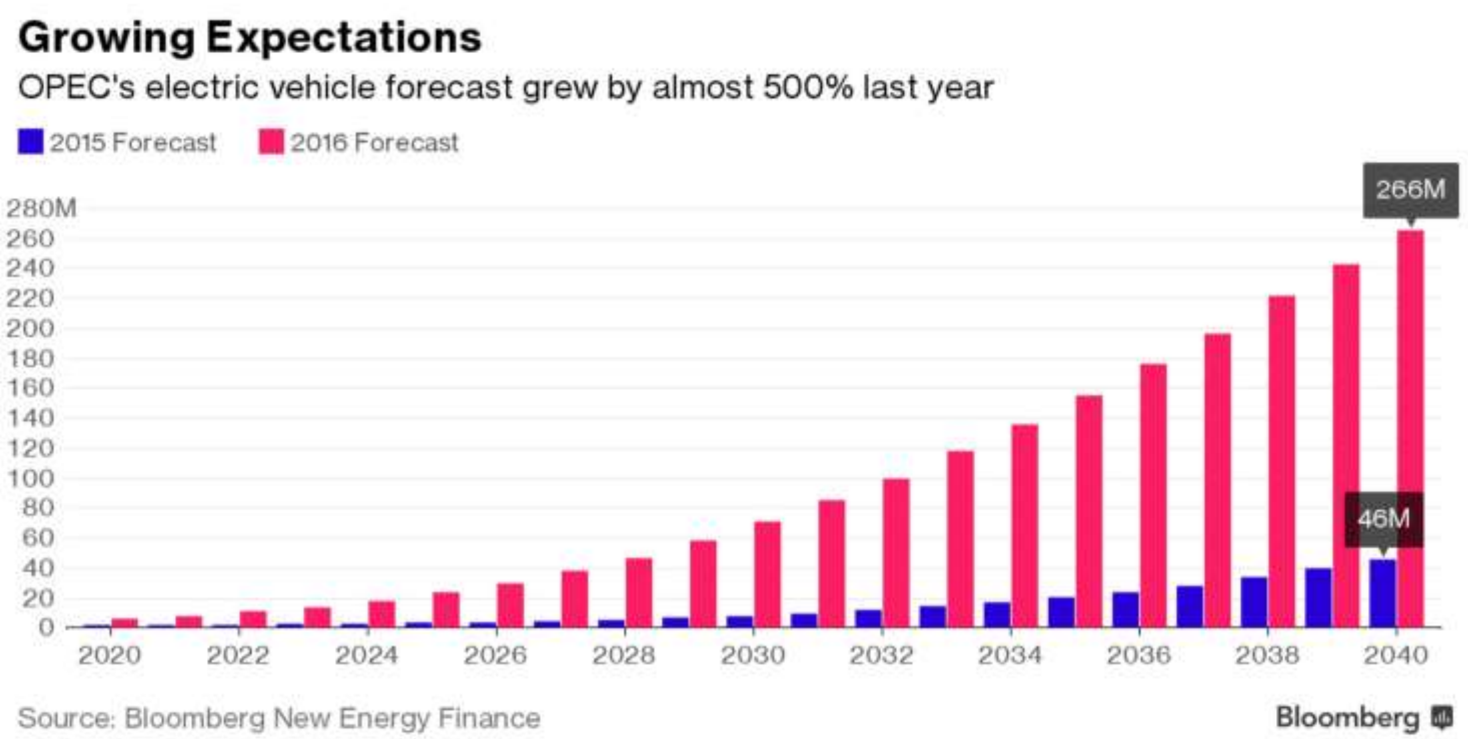
Upward EV forecasting is the new trend



Retrieved: 2018-01-11 https://www.greentechmedia.com/articles/read/everyone-is-revising-electric-vehicle-forecasts-upward#gs.OVFCXQM

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Countries banning new sales of petrol and diesel cars, auto industry starting to respond

2019

VOLVO

UBER (London – 40.000 drivers)

2021

UBER

LAND ROVER

JAGUAR

2025

(Netherlands)

(Norway)

2030

(India – proposal in the works)

(China – working on time table)

2040

(France)

(UK)

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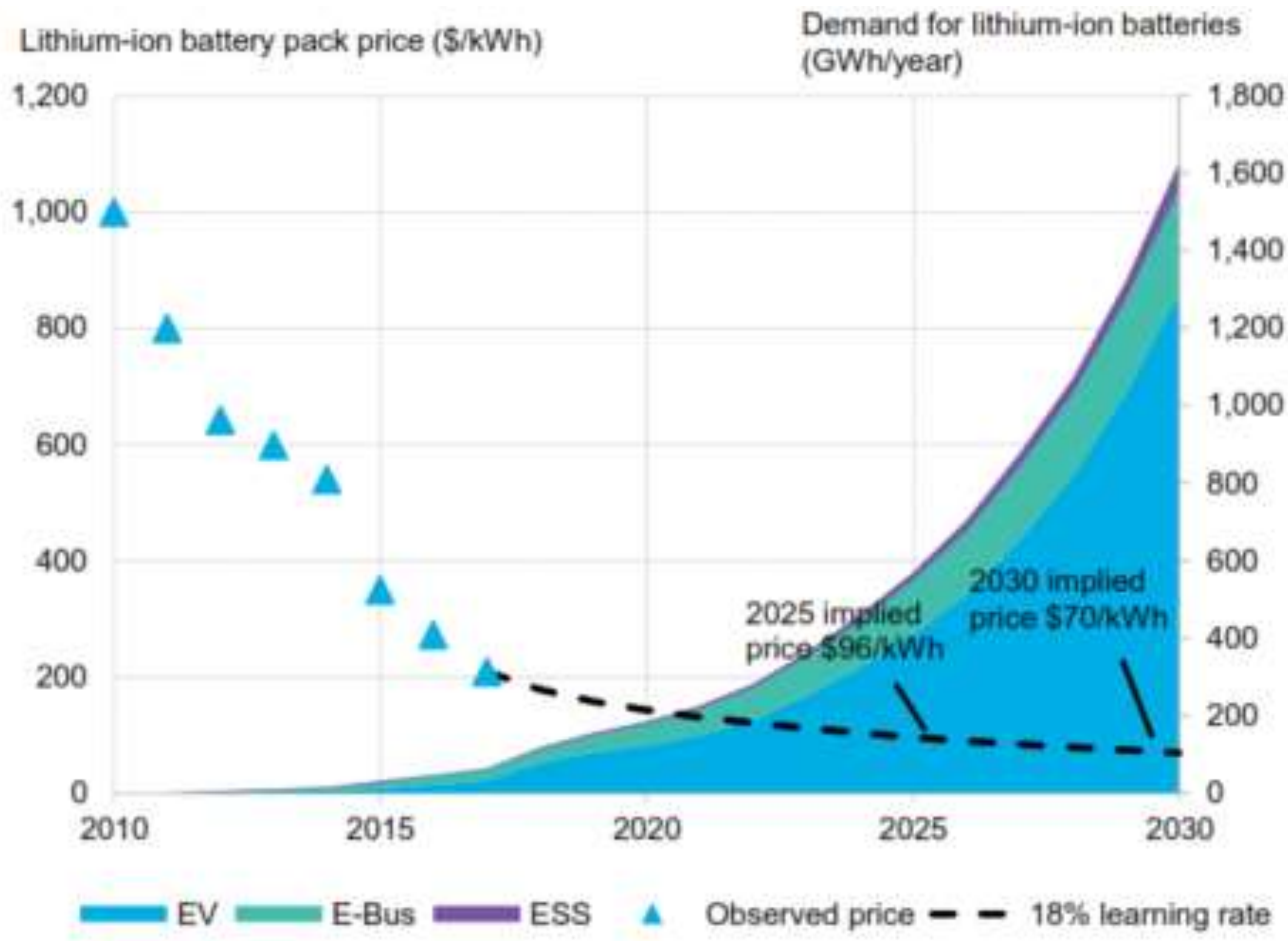
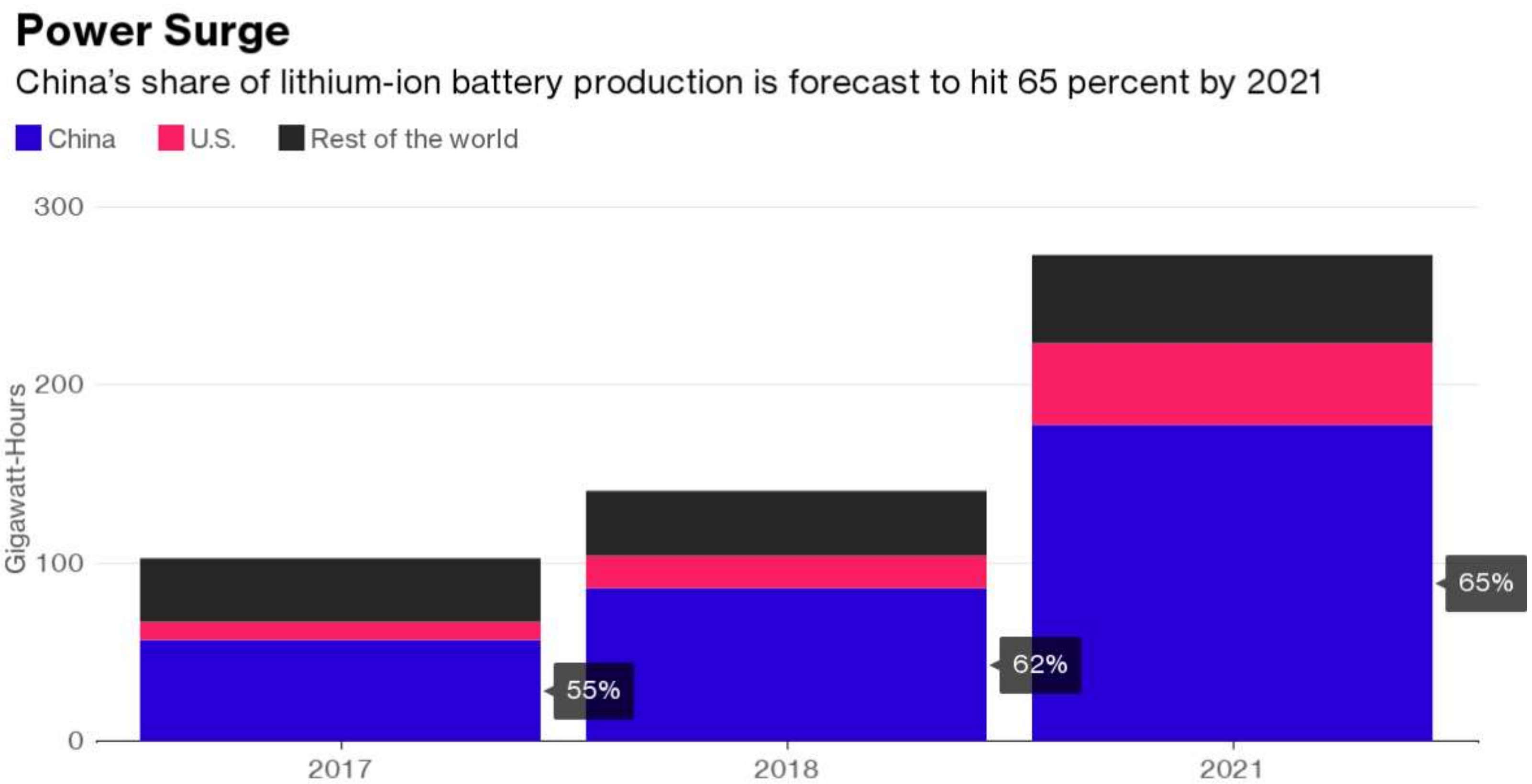
Electric vehicles are driving Li-ion global demand; Li-ion battery technology here to stay



Source: Bloomberg New Energy Finance

~55% of global lithium-ion battery production is currently in China, compared with 10% in the U.S.



Source: Bloomberg New Energy Finance

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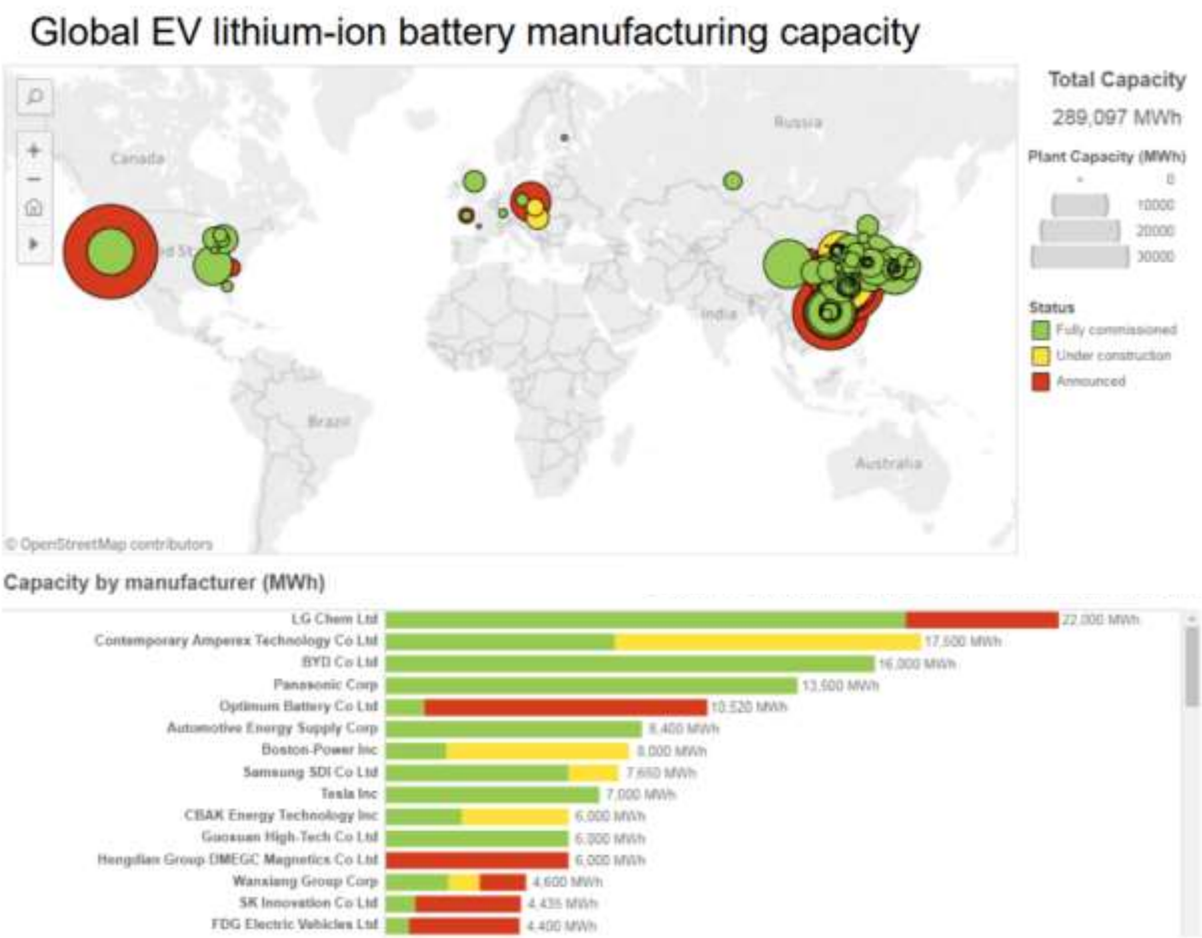
Substantial capacity is under construction or announced



2017 capacity:
90 GWh/year

2021 planned* capacity:
290 GWh/year

Source: BNEF battery manufacturing database.
**Planned = announced or under construction*

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Source: Bloomberg New Energy Finance

Current lithium-ion technology here to stay

History of the battery

1786, Luigi Galvani discovered “animal electricity”

1800, Alessandro Volta built the first practical battery

1859, Gaston Plante invented the first rechargeable battery with lead acid

1899, Waldemar Jungner invented the NiCd battery

1991, Sony commercialized the Lithium - based battery

- 100+ Lithium-ion factories globally
- Mature supply chain
- Wide acceptance into devices

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Lithium-ion in high demand in future markets

1991	2017	2030
Introduced into Portable Power market • Cell phones • Laptops • 3C	Portable power • 100% Lithium-ion • 7B batteries sold globally	Portable Power • No real competition
2000 Introduced in EVs • Personal • Commercial	EVs • 1.5% global penetration	EVs • Significant global penetration
2010 Introduced in ESS • Grid • Commercial • Home	ESS • South Australia grid storage	ESS • Widely adopted

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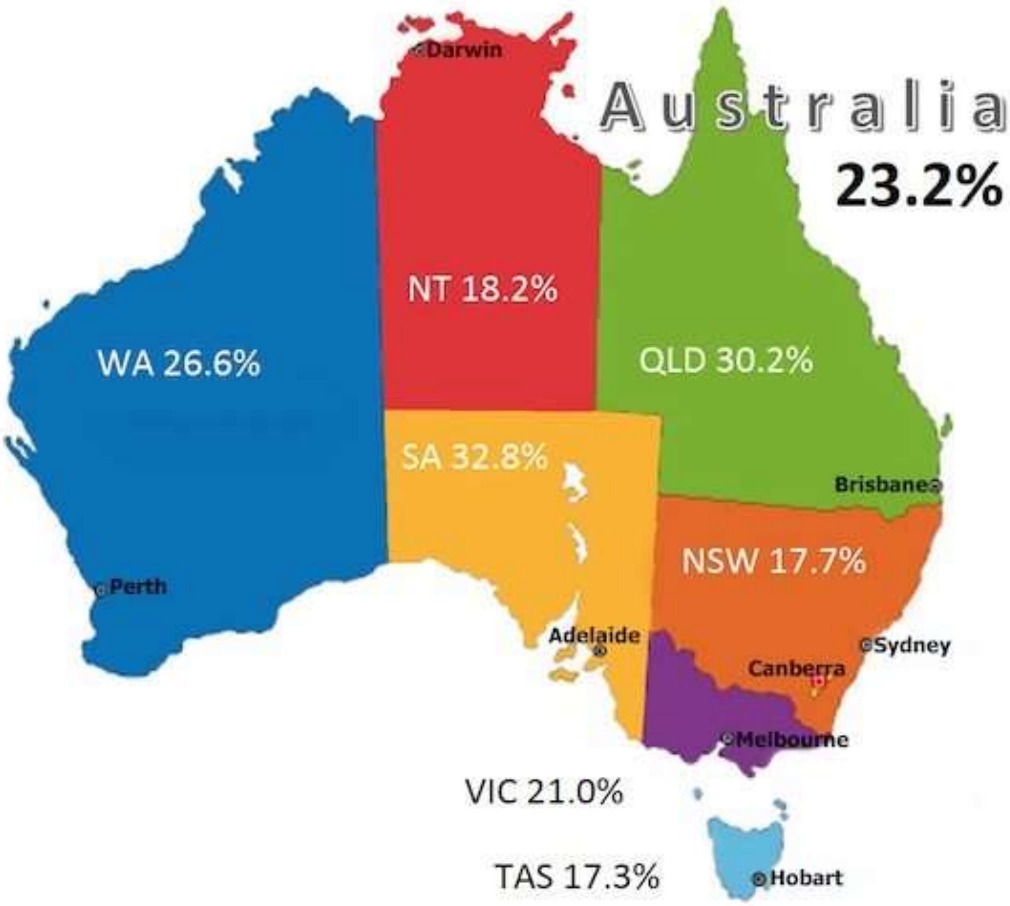
Note: ESS refers to Energy Storage Systems

The Australian energy storage opportunity

One-quarter of Australian homes now have solar



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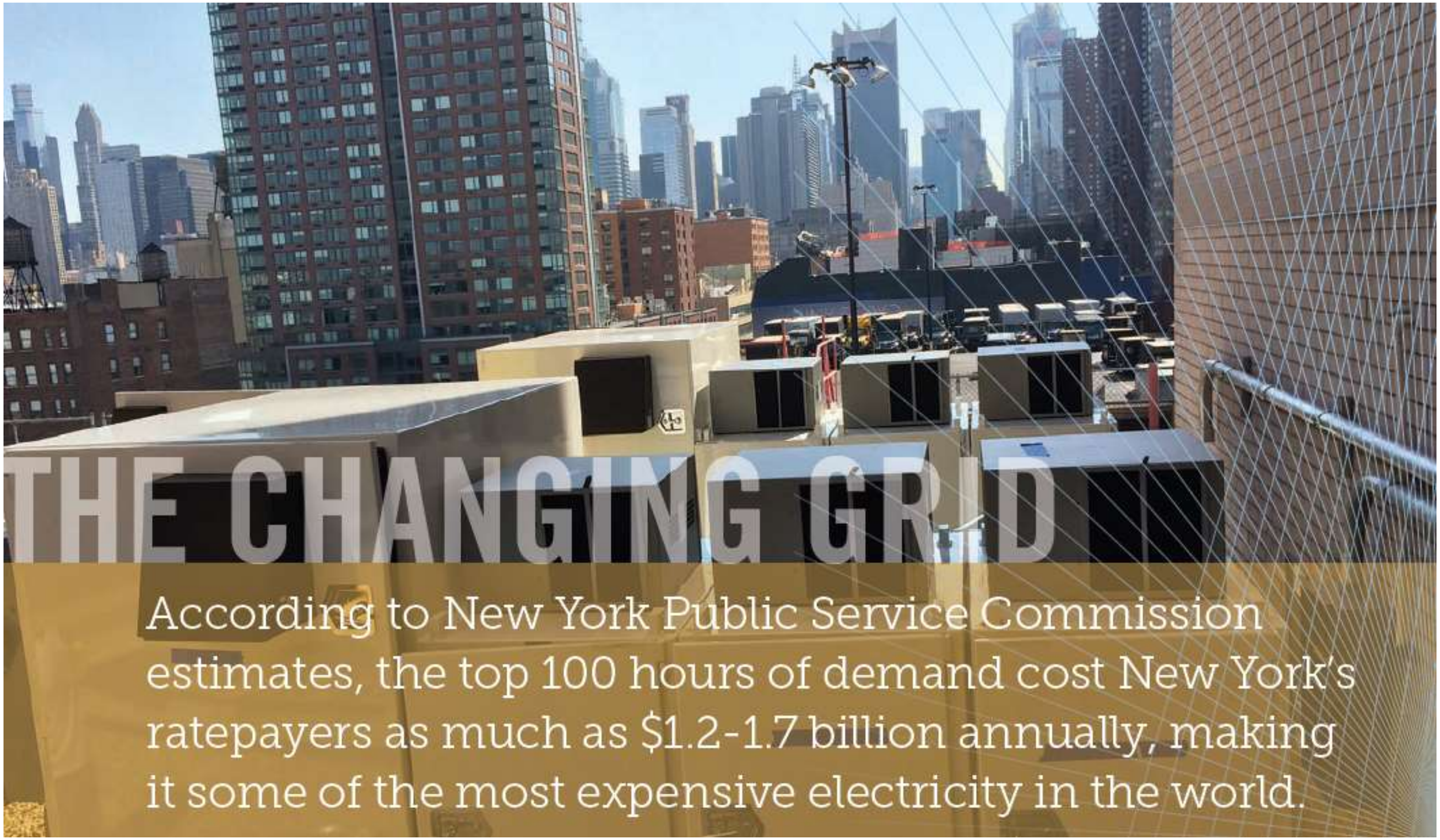
Retrieved: 2017-07-06 http://reneweconomy.com.au/one-quarter-of-australian-homes-now-have-solar-70886/

Changing grid



Challenges for mass market uptake next five years

Price - Performance

- Volume vs. energy density
- Weight vs. range/run-time

Reliability

- Safety - Warranty

Use model

- Battery charging infrastructure
- Harmony with current electricity paradigm

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Syrah and Cadenza Innovation Inc.
- Research and Development

Graphite to maintain dominance in anodes, natural graphite increase market share as cost pressure increases

Artificial Graphite xEV, grid	Natural Graphite xEV, grid, portable electronics	Silicon Alloy Anodes Emerging but mixed with graphite presently

More energy →

← **Better cycle life**

Key Issues

Artificial Graphite	Natural Graphite	Silicon Alloy Anodes
• High cost • High graphitisation energy use	• Low temperature performance	• Cycle life • Electrode expansion/ cell dimensional stability • Low first cycle efficiency

Mitigating solutions

Artificial Graphite	Natural Graphite	Silicon Alloy Anodes
• Mix with natural graphite • Develop low cost graphitisation	• Surface coating/ modification	• Si-nano-particles composite • Mix with larger percentage of natural and/ or artificial graphite • Limit discharge cut-off voltage

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Solid State and Silicon Anode battery technology outlook

Solid State Batteries

- “Solid state” is really two separate technologies
  - Shorter term is polymer electrolytes - still use graphite anodes in cells
  - True solid state with ceramic or glassy electrolytes and likely with lithium metal anodes, carries large challenges
- Feasibility and manufacturability, need to be validated
- Will take at least 10 years to reach commercialisation with significant technical challenges remaining

Silicon Anode Technology

- Most silicon is used as a composite mixed with graphite
- Silicon anode technology has been already commercially introduced
- Today 2-10% silicon being introduced in low volume
- Challenge: Address life and safety issues

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Aims of testing and benchmarking Syrah products

Crystallinity (structure)

- Evaluate spacing between the layers of carbon atoms in the graphite structure and the size of the crystallite domains
- These parameters indicate how close the structure is to a perfect graphite structure and determine the capacity for lithium storage in the material

Capacity (performance)

- Determine the practicable capability of the material to store lithium when formulated as a lithium-ion electrode.
- Theoretical capacity for graphite is 372 mAh/g
- Capacity of the electrode materials determines the energy density of a battery. Using material with higher energy density (volumetric and gravimetric basis) enables longer-lasting batteries – increased range/ time between charging

Shape and particle size distribution

- Determine the morphology of the particles as well as the number and volume fraction of particles of each size
- This determines important performance parameters for the material when formulated into an electrode such as rate capability (power), packing density (energy), and cycle life

Density & surface area

- Ability of the particles to compress to a goal density at a given pressure is an important parameter for manufacturing of electrodes in a high volume plant, the material density affects the battery energy density
- Surface area is important for the balance between battery life, rate capability and energy density, generally high surface area materials have better rate capability but shorter life and lower energy density

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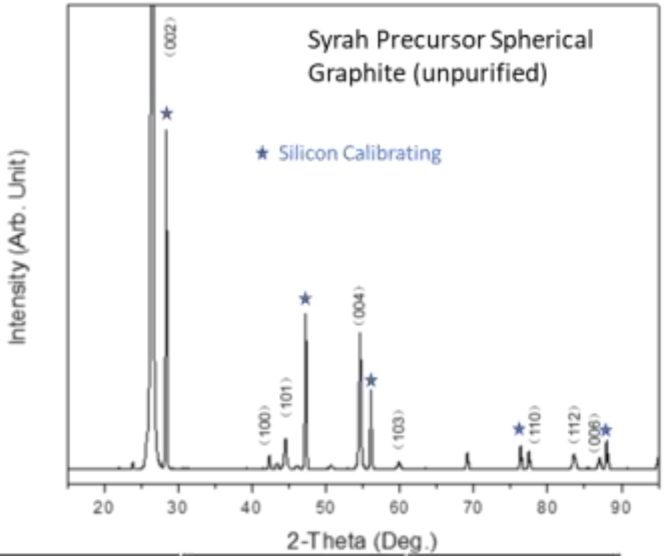
Syrah precursor material crystallinity matches existing Li-ion anode precursors, enabling easy supply chain entry

Unpurified Samples	Syrah Spherical Graphite	Competitor A	Competitor B
d_{002} (Å)	3.3572	3.3574	3.3572
Degree of Graphitization (%)	96.29	96.06	96.24
Lc (002) (nm)	54	52	59
La (101) (nm)	74	82	76

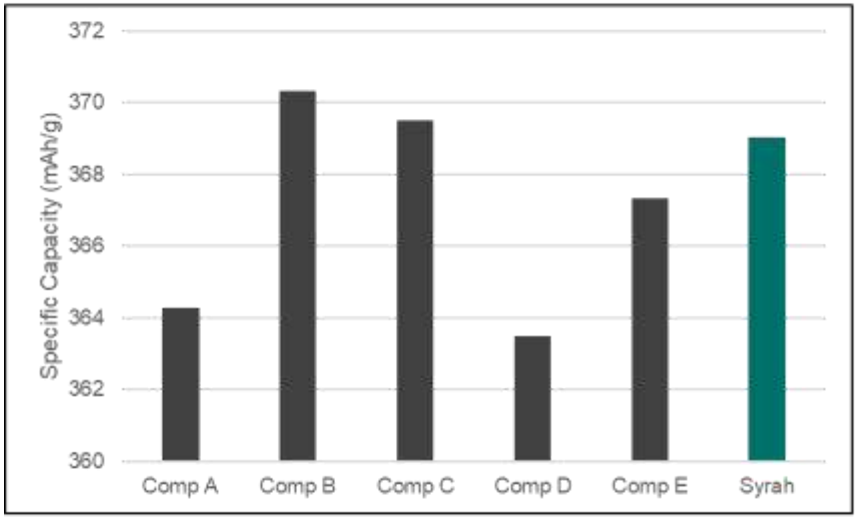


Purified Samples	Syrah Spherical Graphite	Competitor A	Competitor B	Competitor C	Competitor D	Competitor E
d_{002} (Å)	3.3572	3.3572	3.3572	3.3575	3.3574	3.3575
Degree of Graphitization (%)	96.24	96.24	96.34	95.88	96.09	95.94
Lc (002) (nm)	51	45	57	48	56	47
La (101) (nm)	67	77	85	73	72	71

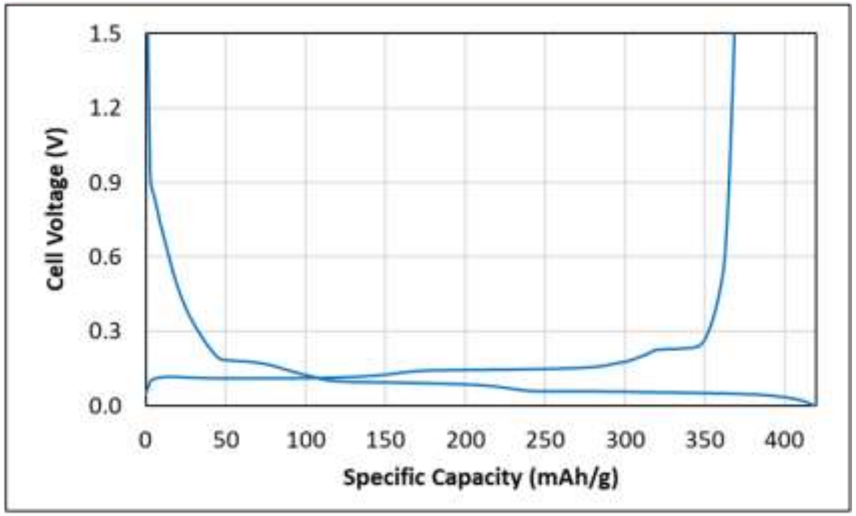
Note: Precursor material refers to uncoated spherical graphite and uncoated purified spherical graphite
Source: Results based on laboratory testing by Cadenza Innovation Inc.

Syrah precursor demonstrates high 365-370 mAh/g capacity – near theoretical maximum capacity of graphite

Comparison of purified precursors



Syrah Precursor Capacity Measurement



Testing conditions:
C/20 charge discharge rate
PVDF electrode formulation
Density 1.65g/cc

Note: Precursor material refers to uncoated spherical graphite and uncoated purified spherical graphite
Source: Results based on laboratory testing by Cadenza Innovation Inc.

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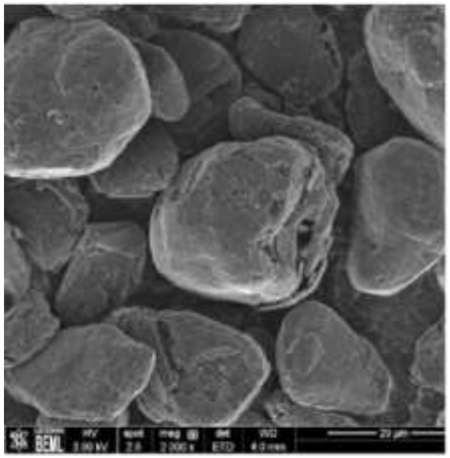
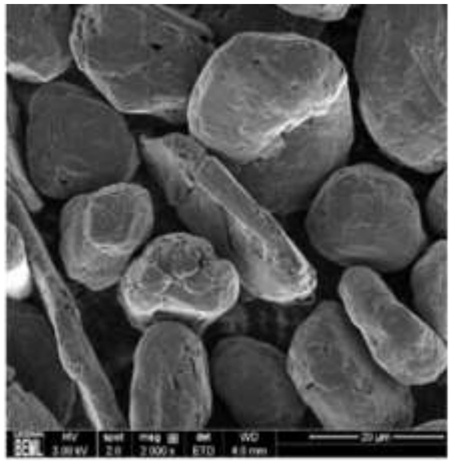
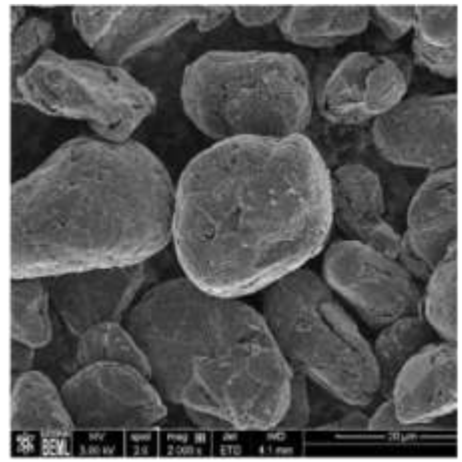
Syrah precursors have similar spherical shape and particle size distribution as industry leading precursor materials



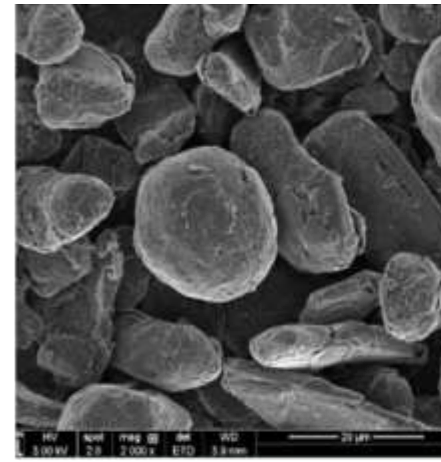
Spherical Natural Graphite
Comp A



Spherical Natural Graphite
Comp B



Spherical Natural Graphite
Comp C

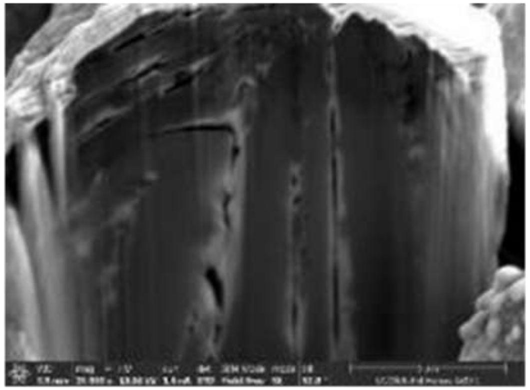
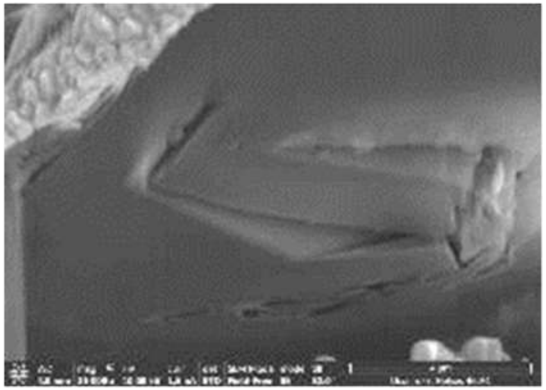
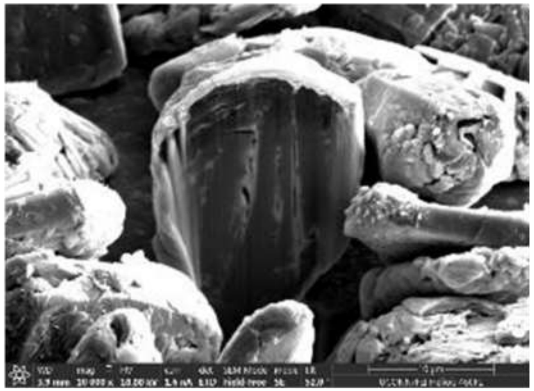
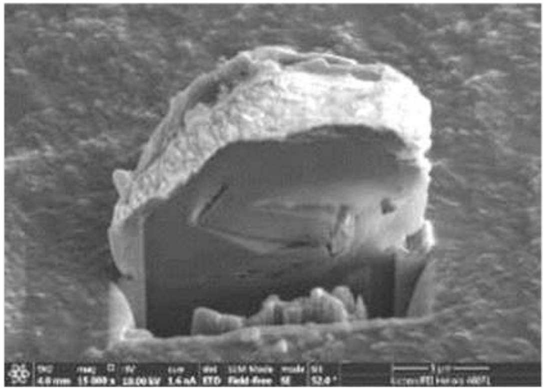


Spherical Natural Graphite
Syrah

Note: Precursor material refers to uncoated spherical graphite and uncoated purified spherical graphite
Source: Results based on laboratory testing by Cadenza Innovation Inc.

Syrah is producing spherical natural graphite with a structure comparable to industry leading competitors

Cross sectioning of particles with Focused Ion Beam SEM analysis

Spherical Natural Graphite Comp A	Syrah Spherical Natural Graphite
	
	

Source: Results based on laboratory testing by Cadenza Innovation Inc.

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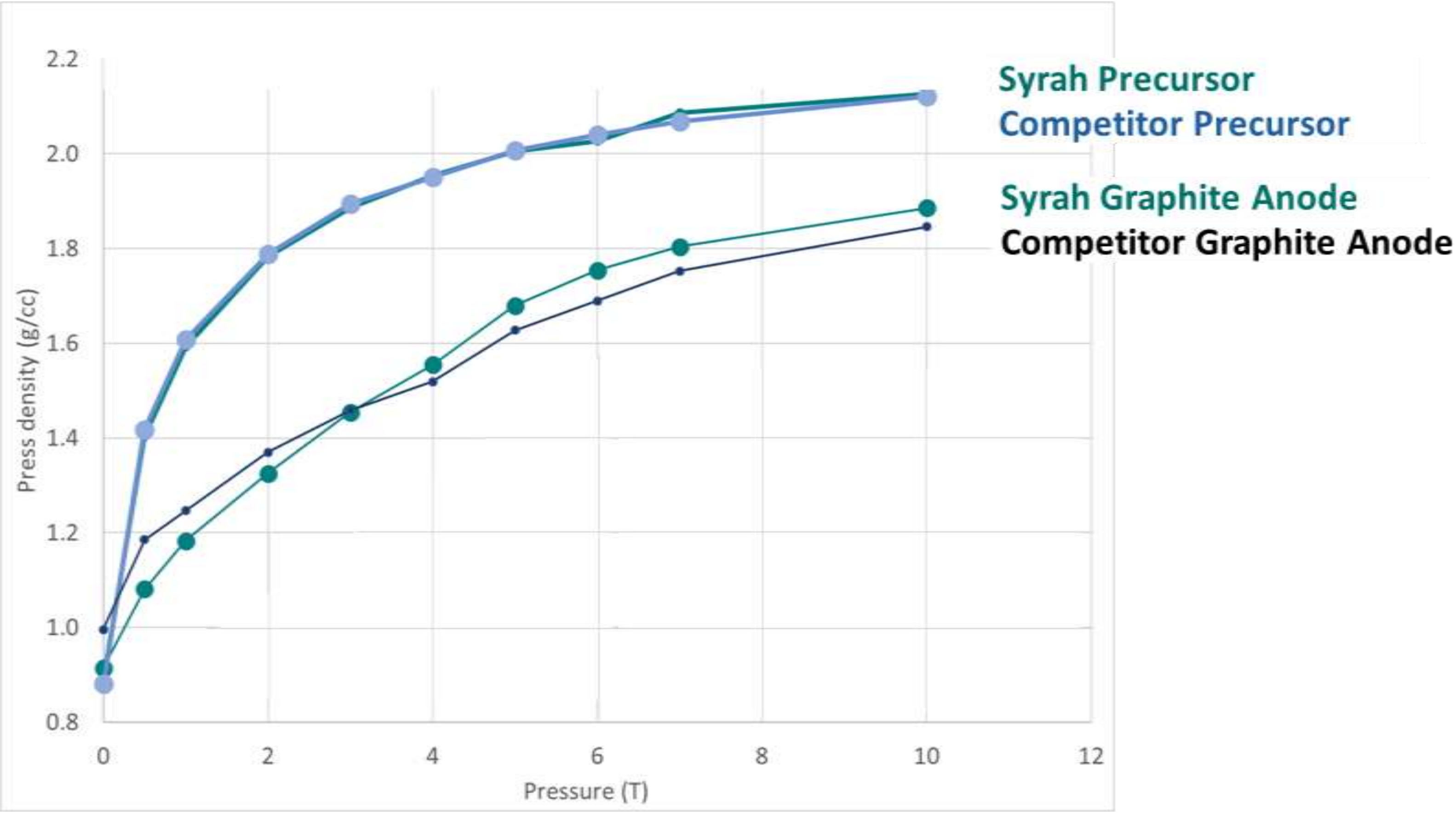
Syrah precursor and finished materials match the density characteristics of industry leading materials



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Note: Precursor material refers to uncoated spherical graphite and uncoated purified spherical graphite. Finished materials refers to coated purified spherical graphite.
Source: Results based on laboratory testing by Cadenza Innovation Inc.

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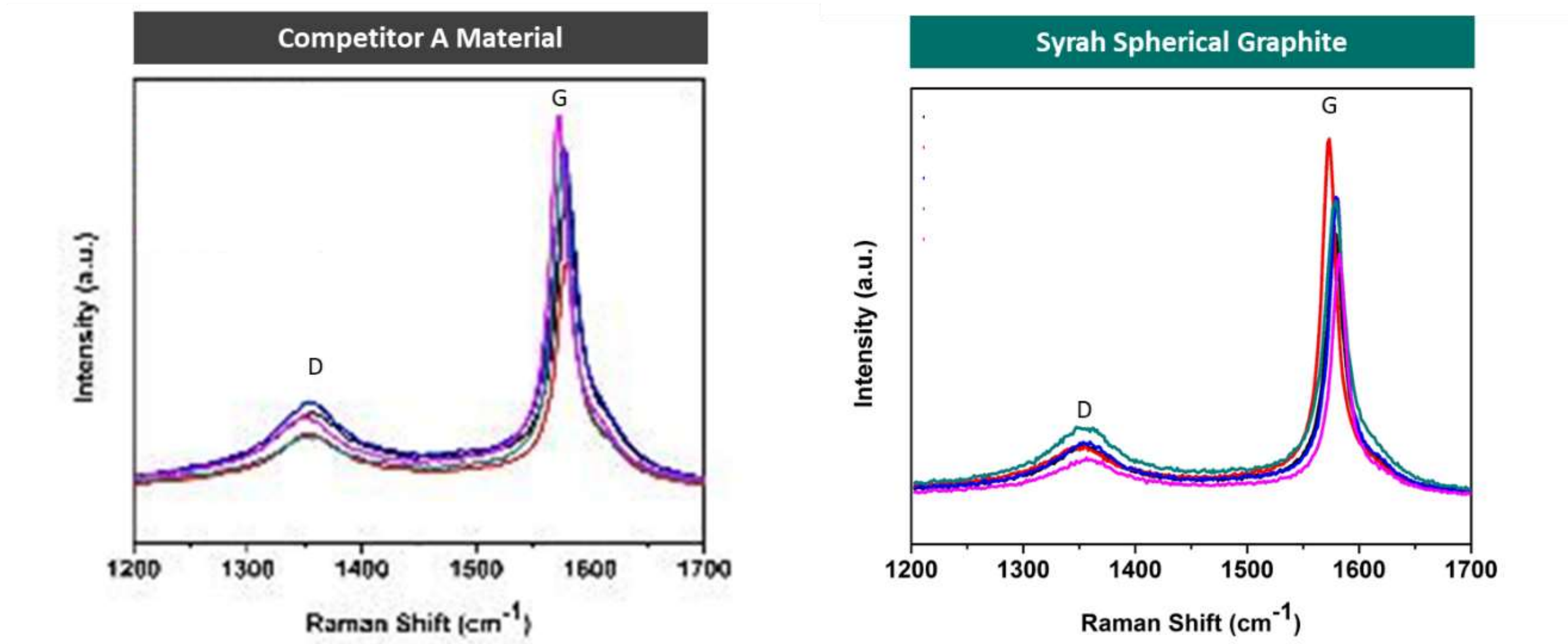
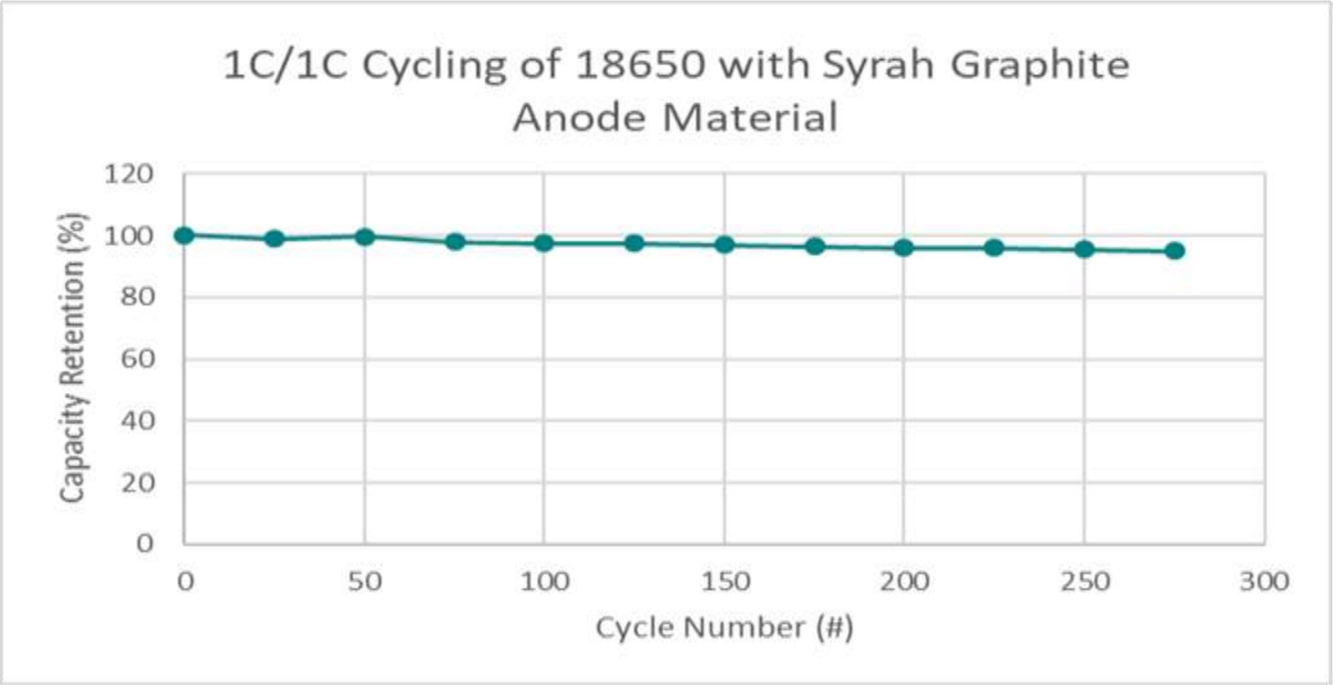
Syrah finished anode material matches key surface and density characteristics of industry leading materials

Raman Analysis



Note: Finished materials refers to coated purified spherical graphite.
Source: Results based on laboratory testing by Cadenza Innovation Inc.

Initial cycle life data of finished anode material from customer trials is promising



- 1C/1C cycle life data in industrial scale cells built with development materials
- Additional testing on pilot scale materials is in progress

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Source: Results based on laboratory testing by Cadenza Innovation Inc.

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Summary

Battery market

- Electric vehicle demand driving global Li-ion demand
- Currently majority Li-ion battery production based in China
- Substantial battery capacity under construction or announced

Anode technology

- Graphite to maintain dominance
- Natural graphite increase market share as cost pressure increases
- Silicon anodes - challenges in life cycle and safety issues

Li-ion technology

- Current Li-ion technology commercialised in 1991
- >100 Li-ion factories globally with mature supply chain
- Wide acceptance into devices
- Solid state batteries – significant technical challenges remaining

Benchmarking reconfirms battery suitability

Testing of Syrah product reconfirms:

- Precursor materials have core properties required by global battery industry
- Finished BAM products using industry standard processing have equivalent electrochemical performance to tier 1 competitors enabling market entry