



Energizing Innovation™

February 2020

Safe Harbor Statement

This report includes forward-looking statements covered by the Private Securities Litigation Reform Act of 1995. Because such statements deal with future events, they are subject to various risks and uncertainties and actual results for fiscal year 2017 and beyond could differ materially from the Company's current expectations. Forward-looking statements, including estimates of capacity, selling price and other material considerations, are identified by words such as "anticipates," "projects," "expects," "plans," "intends," "believes," "estimates," "targets," and other similar expressions that indicate trends and future events.

Factors that could cause the Company's results to differ materially from those expressed in forward-looking statements include, without limitation, variation in demand and acceptance of the Company's products and services, the frequency, magnitude and timing of raw-material-price changes, general business and economic conditions beyond the Company's control, timing of the completion and integration of acquisitions, the consequences of competitive factors in the marketplace including the ability to attract and retain customers, results of continuous improvement and other cost-containment strategies, and the Company's success in attracting and retaining key personnel. The Company undertakes no obligation to revise or update forward-looking statements as a result of new information, since these statements may no longer be accurate or timely.

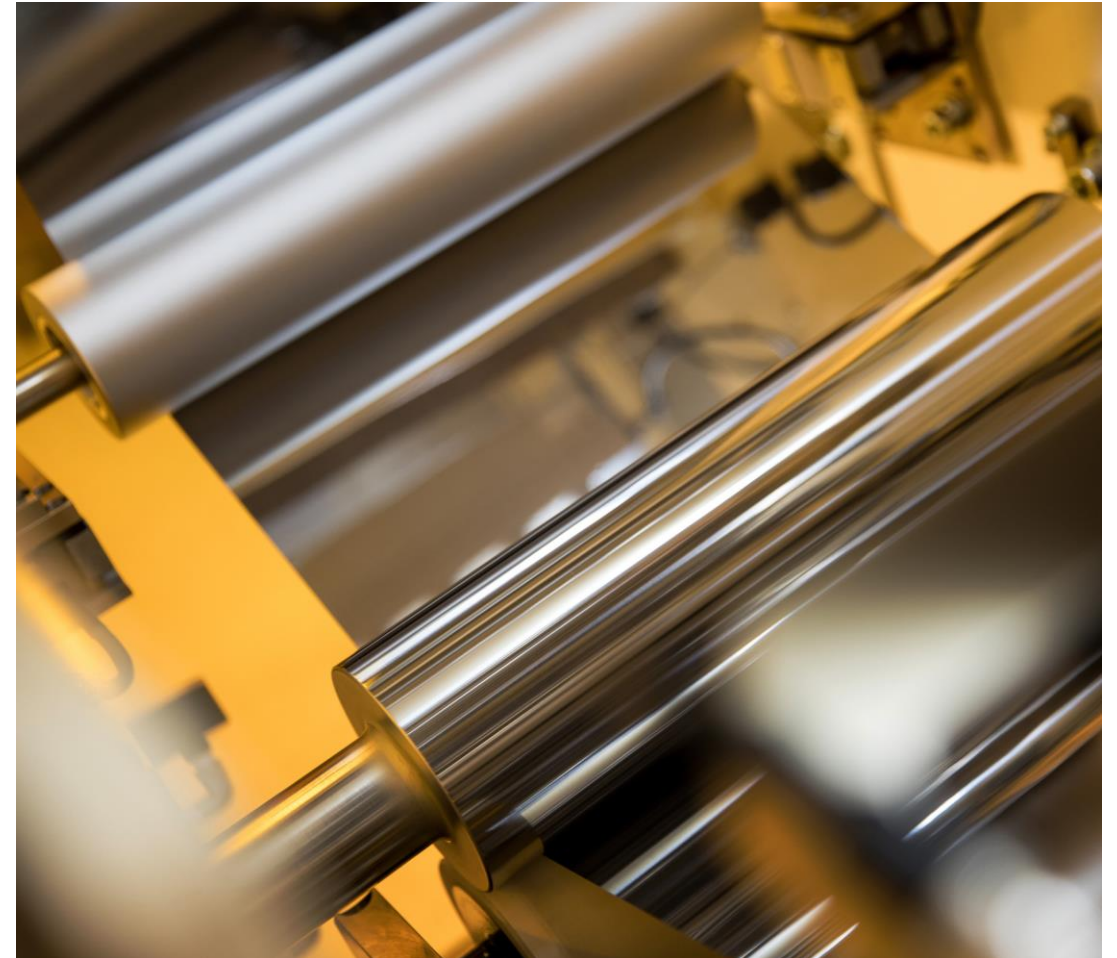
Thinfilm financial reports may be accessed via the following web page:

<https://thinfilmsystems.com/investor-relations/presentations-webcasts/>

Thin Film Electronics ASA

World-class flexible electronics manufacturing for thin & safe battery solutions

- Fully equipped, production-grade roll-to-roll clean room facility
- Extensive IP portfolio covering flexible electronics, materials, substrate, barrier, encapsulation expertise
- Publicly listed OSE / OTCQX



Delivering thin & safe solid-state lithium batteries

- Developing family of **rechargeable solid-state lithium battery (SSLB) products**
- Addressing **existing and expanding markets**, including the \$64 billion wearable devices market, initially focusing on **medical applications**
- Leveraging **Thinfilm core assets and IP** in materials and process innovation, including R2R manufacturing on flexible metal substrates
- Significant **cash generation potential** based on **premium pricing** and **> 80% contribution margins** leveraging existing fixed assets

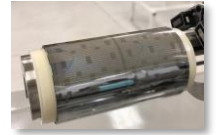
Delivering thin & safe SSLBs at scale

PREMIUM PRODUCT

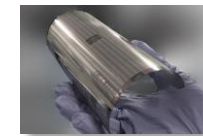
- On-body applications require thin, safe batteries
- Customized form factors required for next-generation wearable devices



MANUFACTURING



- Capable of producing 10s of millions of units per year
- Validated sheet- and roll-based manufacturing lines



IP & INNOVATION

- Patented steel substrate barrier materials
- Encapsulation technology applicable to battery manufacturing
- Process development partner with demonstrated SSLB experience accelerates timetable and reduces risk

Evolution of Thinfilm strategy

NFC strategy

- Creating new market
- Required shift in consumer behavior
- Dependent on TTF standard adoption
- Required production of billions of units for economic R2R costs
- Post R2R process added significant cost
- Single-digit penny ASPs

SSLB strategy

- Address existing & expanding markets
- B2B sales model
- Established technology
- Cashflow breakeven at significantly lower factory utilization
- Primary manufacturing within R2R line
- Single-digit dollar ASPs

Investment opportunity

Opportunity

Become the world's premier provider of thin and safe solid-state lithium batteries at scale required for wearables and connected sensors, with initial focus on medical applications

Unique Thinfilm position

- Leverage globally unique factory, ~\$35M capital investment
- Steel barrier patents & IP enable optimized solid-state battery manufacturing

Key milestones

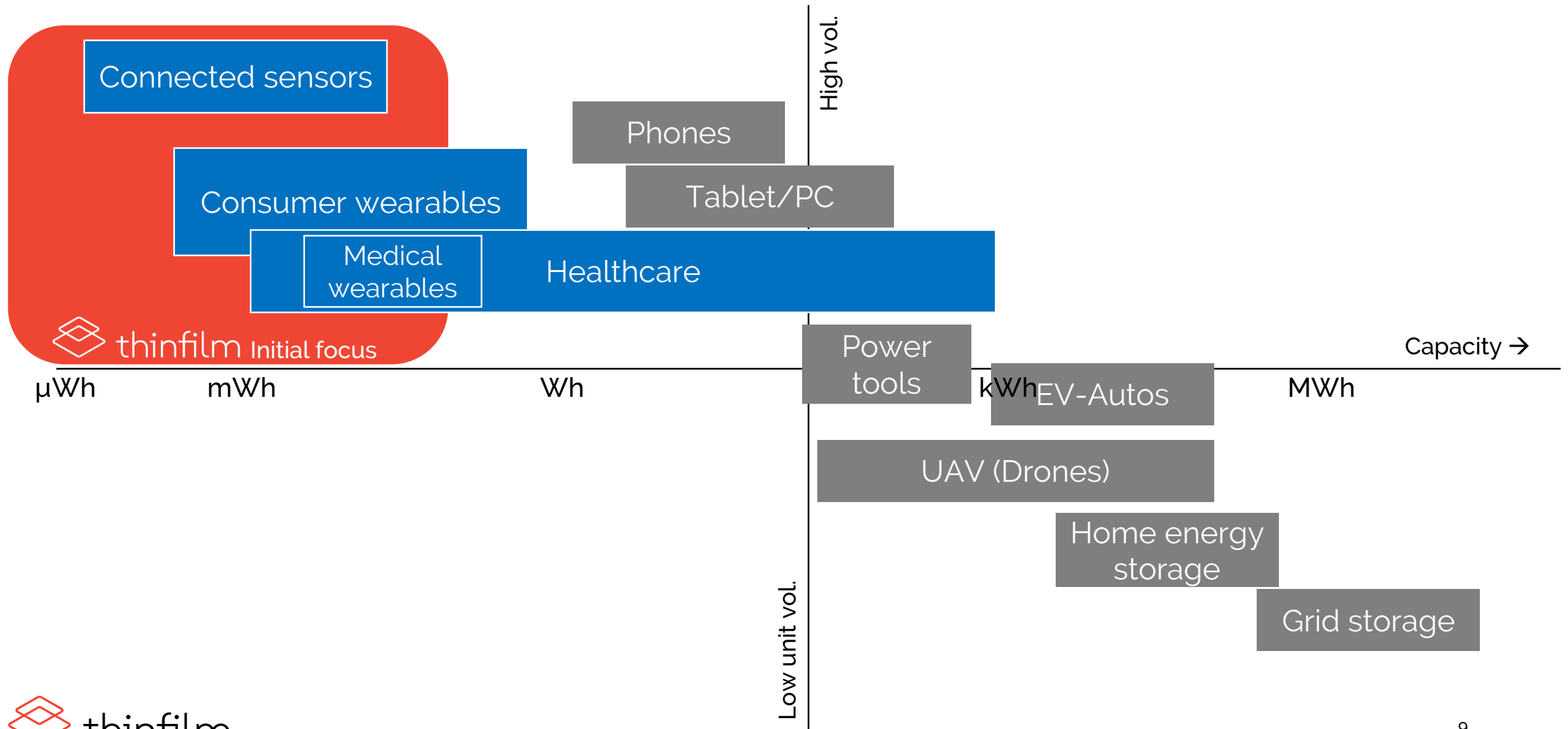
- Q2: multiple battery-specific IP filings
- Q2: demonstrate complete battery on Thinfilm equipment
- Q3: customer engineering samples
- Q4: customer design-ins (2+)
- 2H 2021: first SSLB product revenue
- End-2022: cashflow breakeven
- 2023+: increasing volumes (10M+ units) drive strong cash generation

Robust and sustained cash generation based on unique, defensible position and manufacturing leverage







Energy storage market

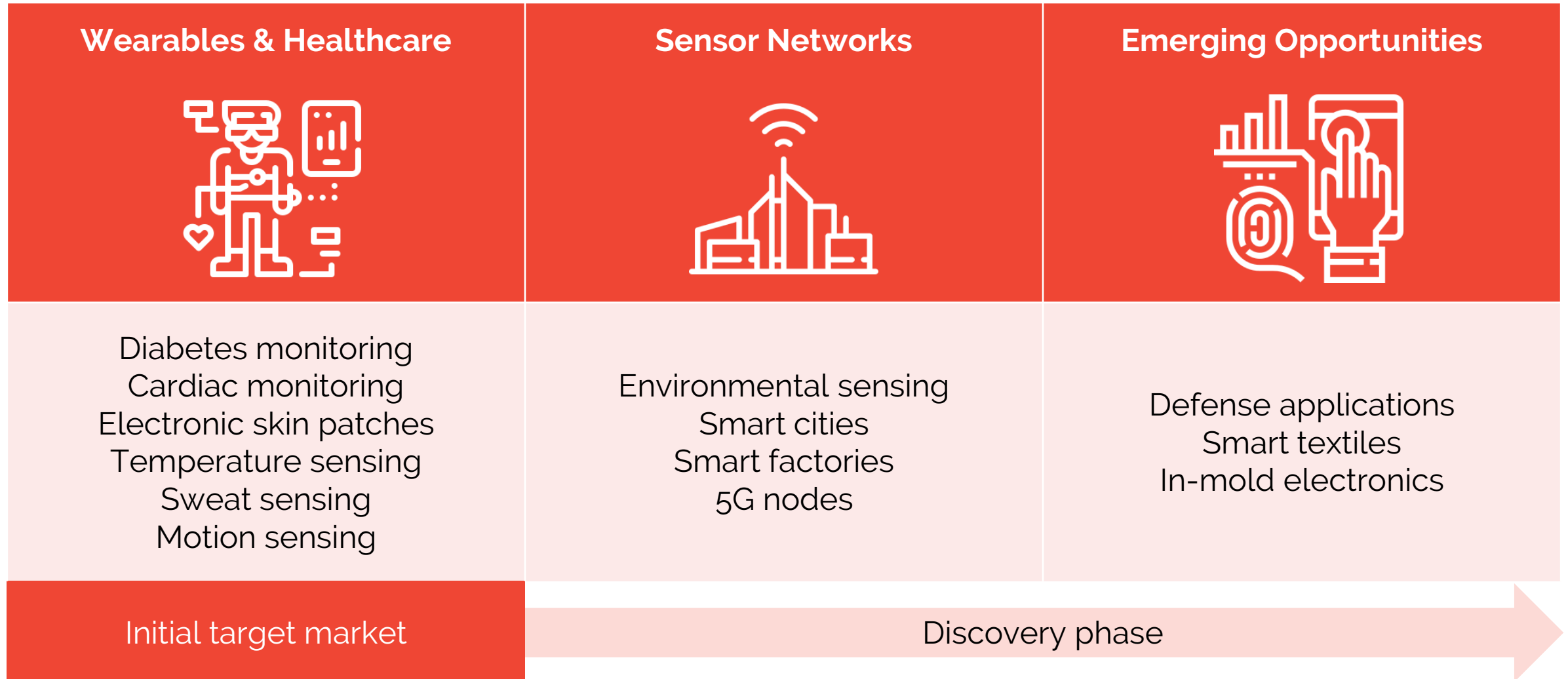
Thinfilm energy storage focus



Trends driving Thinfilm focus markets

5G devices	Safety	Distributed vs. centralized energy	New form factors
			
<ul style="list-style-type: none">• Ubiquitous sensing and wireless comms• Small, distributed end nodes• Long deployment lifetimes• B2B & consumer applications	<ul style="list-style-type: none">• Consumers aware of safety incidents• On-body wearables increase risk	<ul style="list-style-type: none">• Local energy storage needed at each node• Energy harvesting needs backup power	<ul style="list-style-type: none">• Users need comfortable wearables• Custom shapes• Compatibility with in-mold processes

Targeting connected applications



Established and expanding markets

Wearables

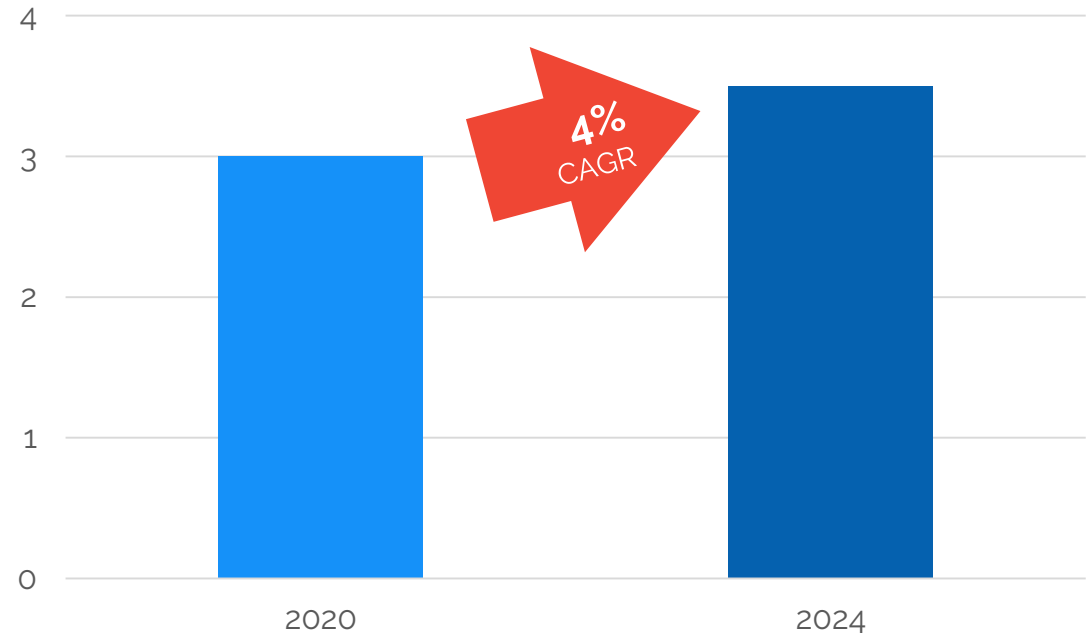
\$92 billion by 2024 at 9.5% CAGR

Continuous glucose monitoring (CGM)

units doubling to 100M by 2023

Emerging opportunities in cardiovascular monitoring, skin patches, “smart soldier”, defense applications

Addressable Market: Thin, Flexible Batteries (\$B)



Source: IDTechEx, 2019

“Batteries are the main bottleneck of wearables”

“Current batteries have the shortcomings of low capacity, large volume, bulky, heavy and rigid disadvantages”

-- Dr. Xiaoxi He, IDTechEx, 2019

Key priorities for energy storage in wearables

	Market priority	Manufacturer demand on battery
On-body sensing priorities	Safety	Eliminate risk of excessive heat / fire / explosion
	Form factor	Maximize comfort with ultra-thin devices in custom shapes
	Product lifetime	Consistent performance across up to 1000 cycles (daily charging over ~3 years)
	Charging time	Enable fast charging (~75% charge in 30 minutes)
	Wireless functionality	Support high peak currents during transmission
	Battery life	Store more energy in same or smaller volume
	Commercial viability	Production scale, reasonable cost

Significant opportunities for SSLB



Wearables

\$64B¹



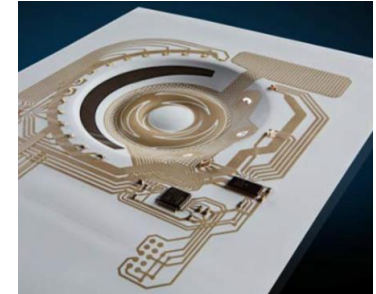
Connected sensors

\$11.6B²



Defense

\$1.7B³



In-mold electronics

\$1B⁴

Market
size

Multiple existing and expanding markets need battery innovation

Sources: (1) IDTechEx 2019 (2) MarketWatch 2017 (3) IDTechEx 2020 (4) IDTechEx 2018



Solid-state lithium batteries

Thin, solid-state lithium battery – Current State

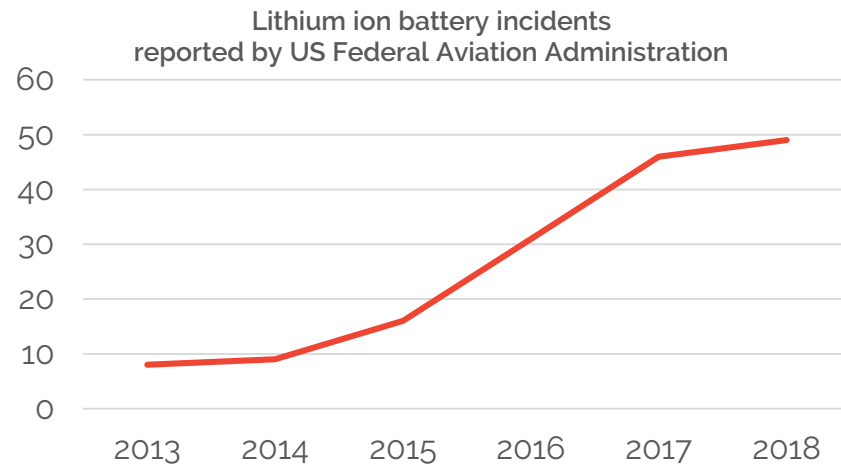
- Mature battery chemistry developed in 1990s
- Solves fundamental limitations of traditional lithium-based cells:
 - Safe: solid electrolyte → no fire/explosion risk
 - Ultra-thin (15-micron battery stack)
 - Extended life: 1000+ cycles
 - Improved sub-freezing performance
 - High peak current output
- Low manufacturing capacity and high costs limit wide availability
- Typically restricted to μAh energy storage as a result

SSLB solves li-ion fire safety concerns



What's Behind the Increase in Lithium-Ion Battery Fires on Planes?

The FAA reports that, on average, one of these fires occurs every 10 days. Here's what passengers need to know.



Source: US Federal Aviation Administration, 2019

The New York Times

Galaxy Note 7 Fires Caused by Battery and Design Flaws, Samsung Says

- Fundamental safety concerns restrict device innovation
- Wearable devices minimize distance between battery and body
- Millions of devices recalled due to lithium battery concerns

Solid electrolyte eliminates fire/explosion risk

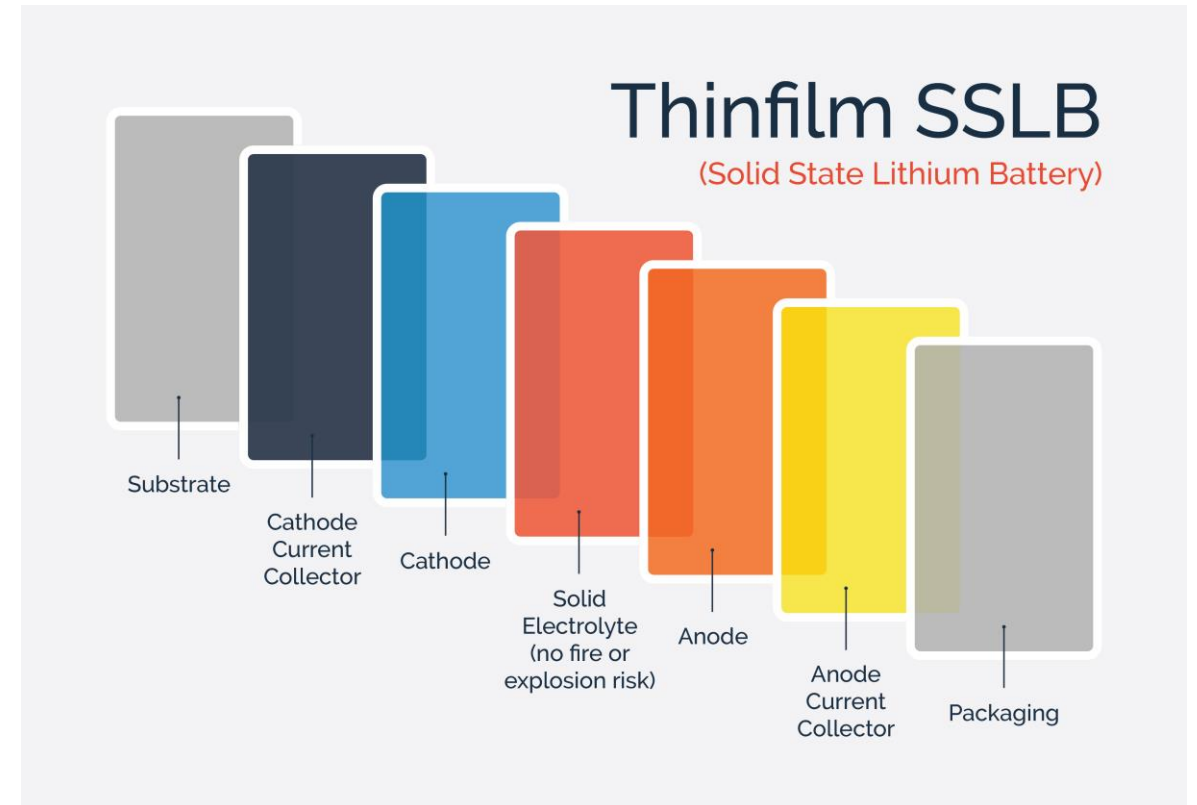


ThinFilm's unique solution

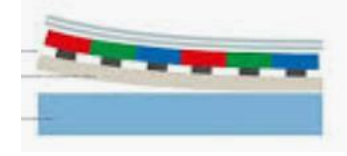
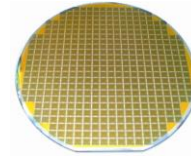
Thinfilm SSLB technology

Thinfilm core technical advantages:

- Stainless steel with proven metal diffusion barrier
- Scalable thickness to accommodate thin form factors
- Improved reliability through backside hermetic seal
- Flexible and durable substrate
- Solid electrolyte eliminates fire and explosion risk



Thinfilm R2R manufacturing advantage



Core Product Requirement	100mm R2R Thin Flexible ceramic	200mm silicon wafer	Flex polyimide on Gen 8 glass	320mm Thinfilm R2R steel
Energy density	High	High	Low	High
Durability @25um	Low (brittle)	Low (brittle)	High	High
Variable Cost	High	High	Medium	Low
Substrate area (m ²)	20	0.03	~3	64 m ²
Units per substrate (Based on 2 cm ² per mAh)	90,000	120	13,500	270,000
Backgrinding required	No	Yes	No	No

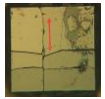
Steel: ideal substrate for SSLB production

Ultra-thin

5-20 μm thickness

Mechanically robust

Enables large-area batteries without cracking common in silicon wafers



Flexible

Allows roll-based scale-up

High-temperature

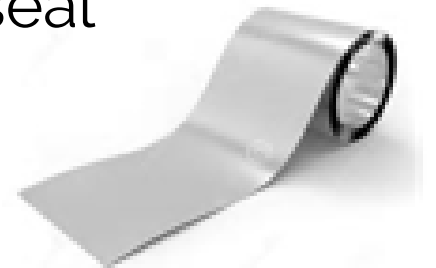
Compatible with high-temperature processes to increase energy density

Moisture resistant

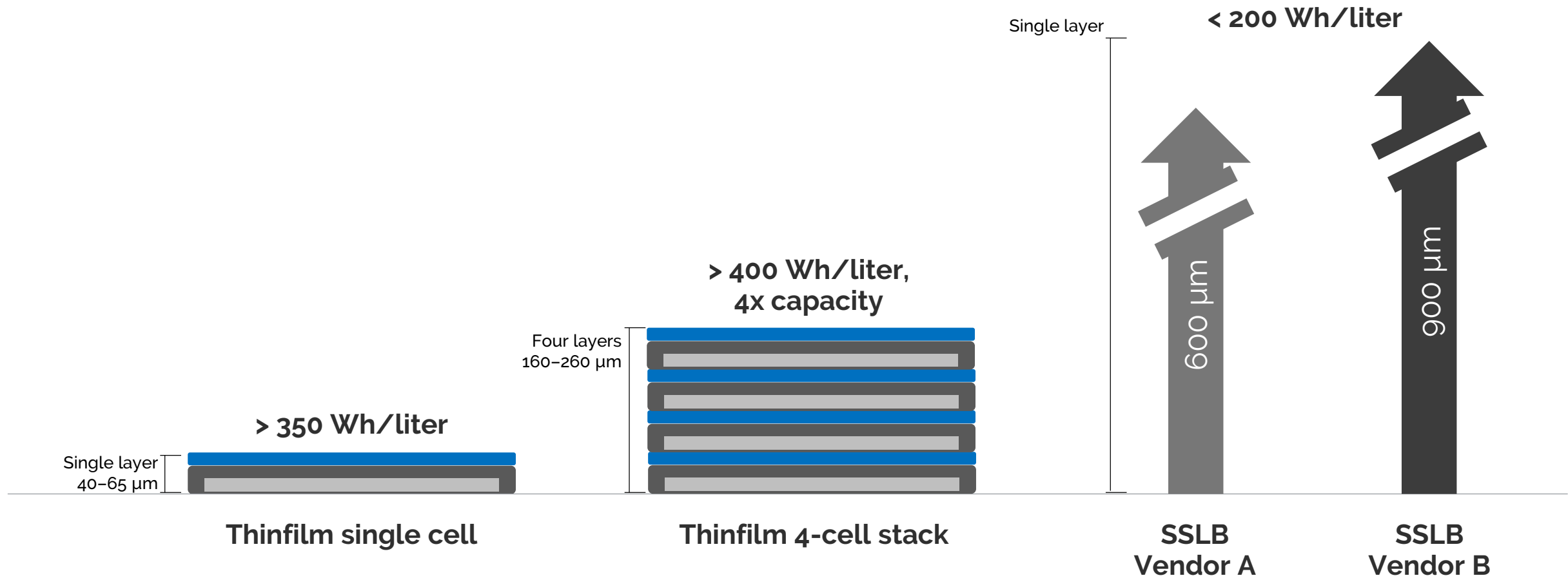
Acts as natural backside hermetic seal

Abundant

Commonly manufactured material

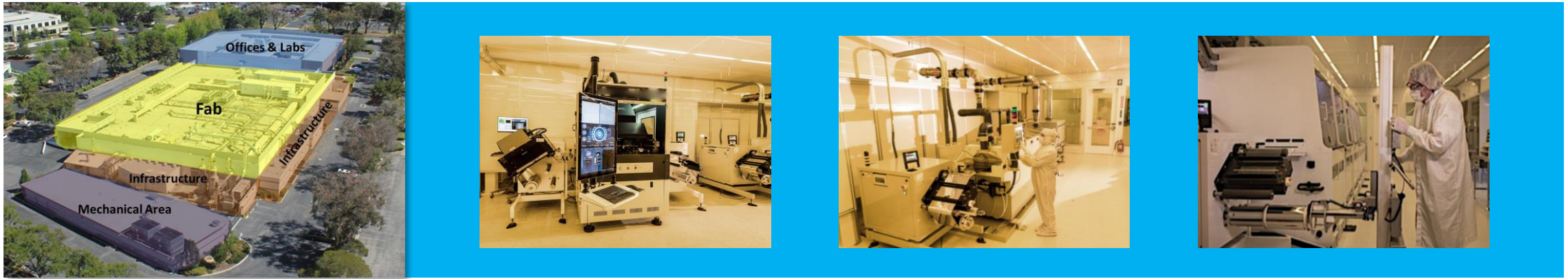


Steel and stacking: path to superior energy density



Stackable steel layers enable thin battery form factors with enhanced capacity & volumetric energy density

Scale: Thinfilm Silicon Valley facility



- Operational H-class clean room: 20,000 sq ft with expansion potential
- Installed capacity to manufacture 10s of millions of mAh-class cells
- Validated R2R manufacturing process

Catalyzing SSLB growth

Current SSLB limitations

Insufficient production capacity for mAh cells

Rigid, expensive substrates

Lack of design flexibility

Limited energy storage capacity (μ Ah)

Thinfilm solution

Production-scale facilities:
Tens of millions mAh capacity

Thin, durable, flexible,
high-temperature steel

Custom form factors

Higher volumetric energy density
in mAh-class cells

Competitive differentiation

Market priorities	Coin cell	Traditional Li-ion	Lithium manganese disposable	Available SSLB	 thinfilm SSLB
Safety	Fair	Poor	Fair	Excellent	Excellent
Thickness	Fair	Poor	Good	Fair	Excellent
Flexibility	Poor	Poor	Excellent	Poor	Excellent
Weight	Fair	Poor	Good	Excellent	Excellent
Cycle life	Fair	Good	None	Excellent	Excellent
Scale potential	Excellent	Excellent	Excellent	Fair	Excellent



Source: IDTechEx (baseline), Oct 2018; Thinfilm SSLB estimates



How Thinfilm is building a successful business

Leadership team



Kevin Barber
Chief Executive Officer



Mallorie Burak
Chief Financial Officer



Arvind Kamath
EVP Technology Development



Giampaolo Marino
EVP Product Solutions



Shannon Fogle
VP HR

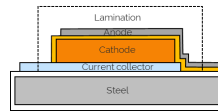
Development progress to date

- Engaged process development partner with demonstrated SSLB experience to accelerate timetable and reduce risk
- Established battery test and measurement capability
- Reconfiguring existing line to enable lithium-based manufacturing
 - Sheet line conversion nearly complete for initial volumes / samples
 - Roll-to-roll line conversion will follow to match growing demand

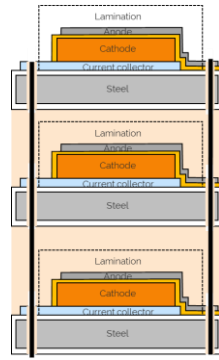
Process technology development approach

Sheet-to-sheet Development

Roll-to-roll Scale Up aligned to customer demand



Unit cell



Encapsulation & stacking

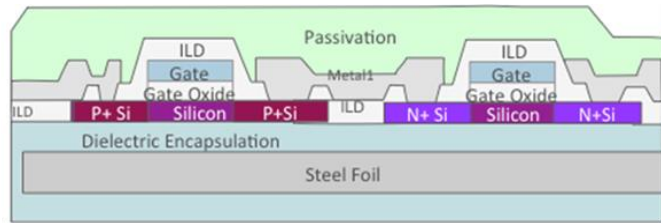


R2R process transfer

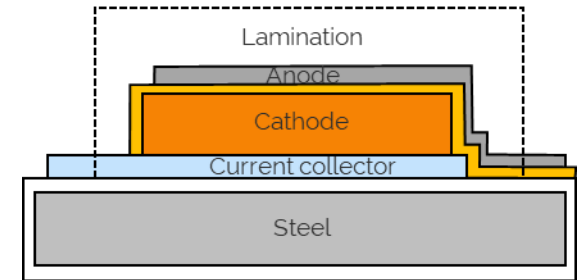


Cost reduction & performance improvement

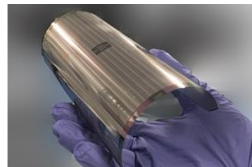
IP strategy to accelerate development



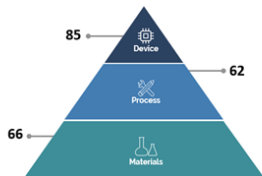
Hybrid CMOS TFT on steel



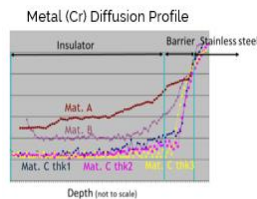
Flexible steel foil



Ultra-thin, durable products



>200 patents worldwide



Barrier technology

New SSLB IP development
product, packaging, process, manufacturing

Product & solution differentiation

Physical properties

- Custom form factors
- Thickness < 100µm
- Stackable configuration
- Zero swelling
- Wide operating temperatures

System

- BMS expertise at system and component levels
- Fast charge capability up to 2C

High energy density

- Highest SSLB volumetric energy density
- Capacity increase with stacking

Electrical properties

- Output voltage: 3.9V nominal
- Capacity: µAh - mAh
- High power density: peak current up to 10C

Legacy business update

NFC / CNECT® platform

- Thinfilm continues previously announced efforts to monetize NFC assets, including software platform, hardware, and IP
- Currently engaged with potential acquirers

EAS

- January 2020: shipped remaining finished goods, \$490k revenue to be recognized in Q1 2020

Continuing to evaluate additional opportunities for monetization



Summary

Changed focus to energy storage



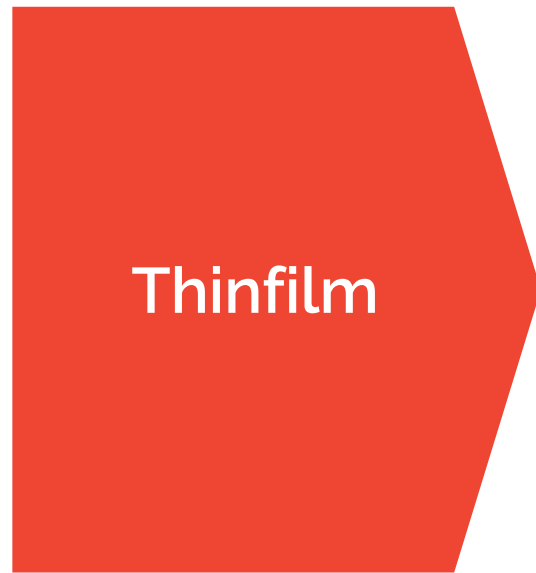
Market

NFC

- New market
- Consumer-brand engagement

SSLB

- Existing markets
- Wearables & connected sensors



Thinfilm

Developed NFC expertise

- Extensive industry deployments
- Hardware design
- Software development

Building solutions business

- Building on existing technology
- Deliver customized, thin, safe products
- High volume, low cost, leveraged manufacturing

Significant SSLB revenue potential

Revenue Pillars

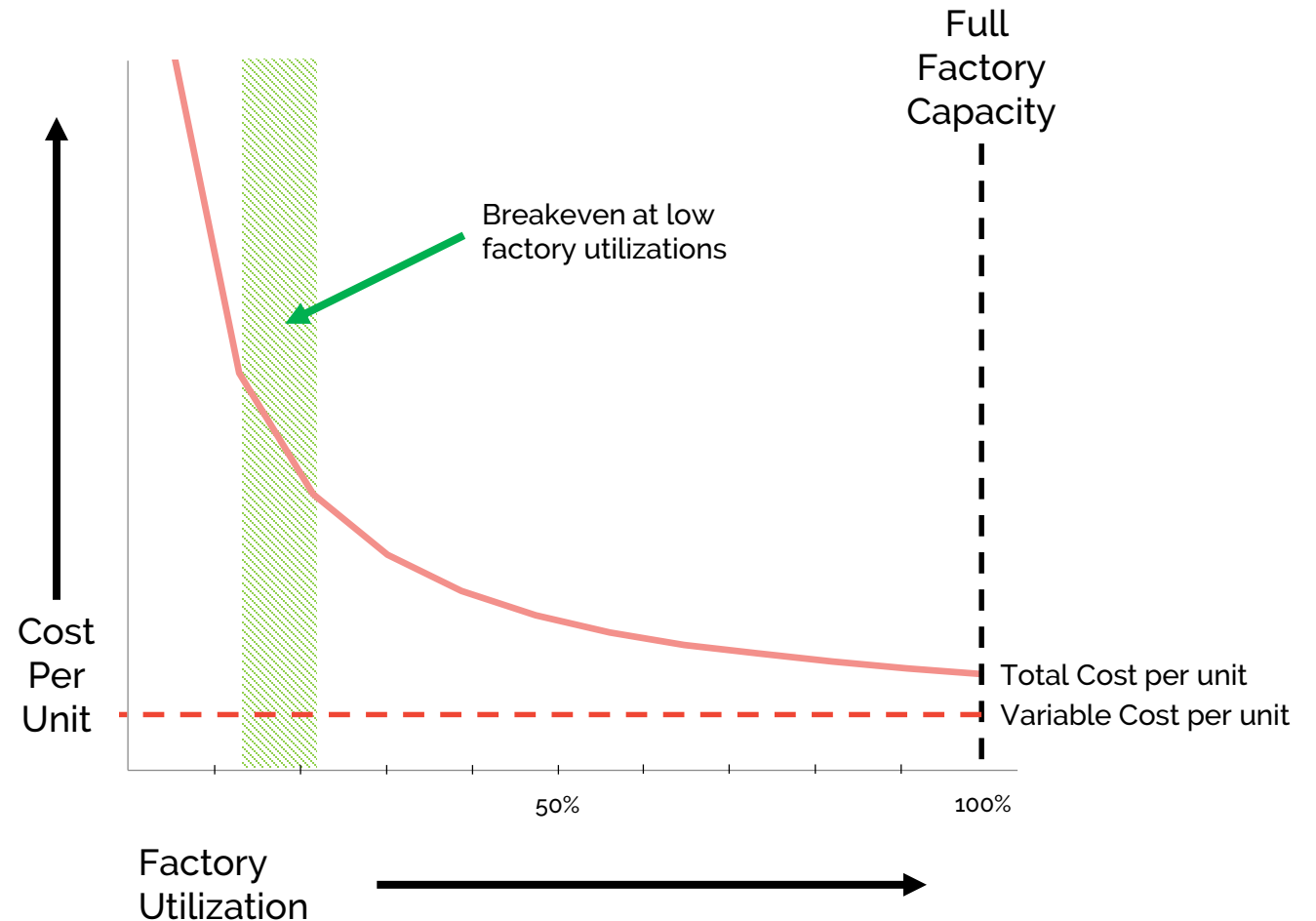
- Addressing existing markets
- Thin and safe battery solution
- Customization capabilities provide stickiness

Indicative 2022 Revenue Potential

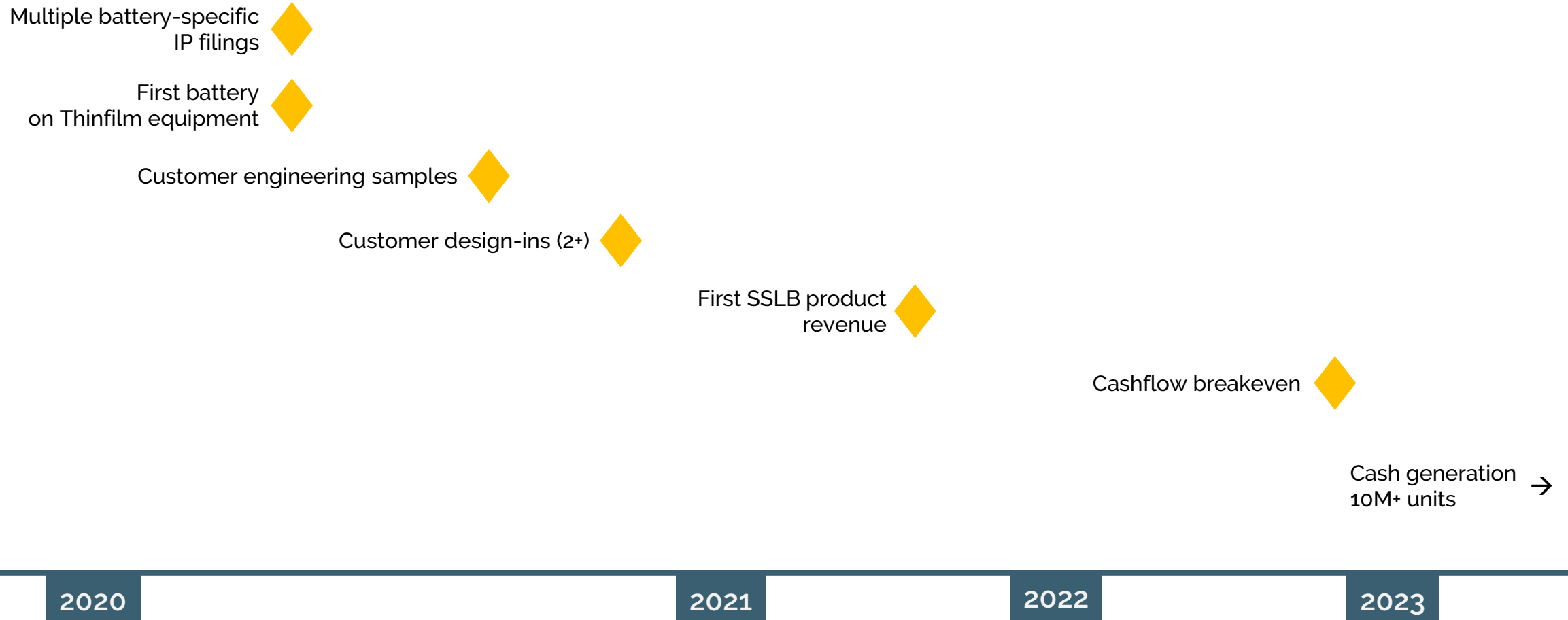
Thin battery SAM	3-4B USD
Premium pricing	1-4 USD
Factory potential	10s of millions / yr.

High gross margins – leveraging existing assets

- Premium pricing
- Contribution margin > 80%
- Cashflow breakeven at < 20% utilization



Key milestones



A new business model

Revenue		Gross margin	OpEx
Thin battery SAM	3-4B USD	High contribution margin > 80%	Annual OpEx run-rate < \$15M
Premium pricing	1-4 USD	Leveraging existing assets	Expected to remain stable
Factory potential	10s of Mu / yr.	<ul style="list-style-type: none">< 20% utilization required for cashflow breakevenMinimal CapEx needs	

Robust and sustained cash generation based on unique, defensible position and manufacturing leverage

Summary



Focus on wearables & connected sensors



Building on established SSLB technology



Enabling with steel, stacking, scale



Differentiating with thin, safe, customizable products



Delivering solid margins at modest utilization rates