



High Resolution Ultrasound Battery Solutions

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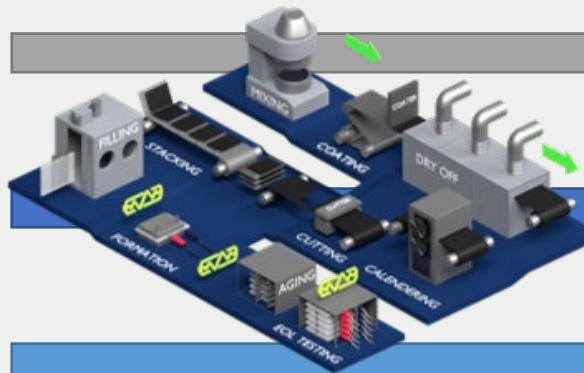


Full life-cycle transparency - optimization



IonView

Cell Inspection



Smart-Cell

In operation SoH, SoC and thermal runaway monitoring



Second Life

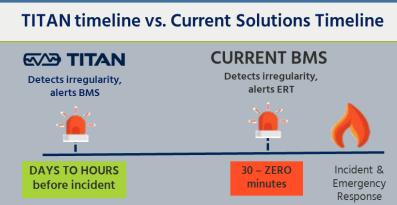
Fast SoH Determination



Traceability

Life-time operating transparency

Digital thread to instruct commercial decision-making



Titan's vision is gaining traction

\$1.45M DOE Prize for our thermal runaway detection system. Enables early detection of adverse changes that eliminates thermal runaway possibilities. This reduces the need for additional shielding and materials.



Process optimization feedback loop



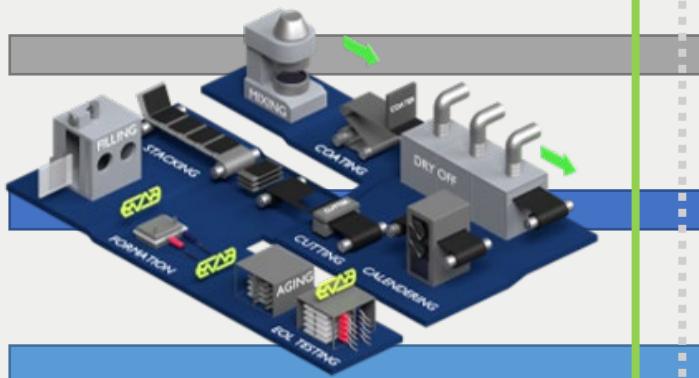
\$500,000 DOE Prize for our transformative battery diagnostics technology combined with Battago. The second-life EV battery marketplace will help drive recovery, repurpose, and recycle of used lithium-ion batteries.

Non-destructive inspection solutions



IonView

Cell Inspection



Smart-Cell

Intelligent

Resolution

Feb 2023

Q1 2024

Q1 2025

> 200 pixels per cm²

Speed

< 1,000 per day

10,000 per day

80,000 per day

In-line

At line



Anomalies detected

Li plating, tears, wetting, wrinkles, debris, residual gas

TITAN timeline vs. Current Solutions Timeline



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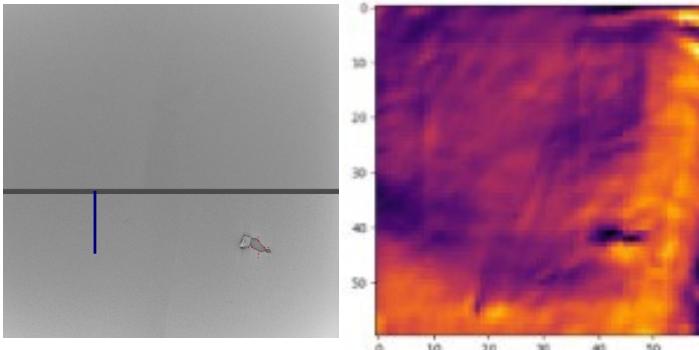
Process optimization feedback loop



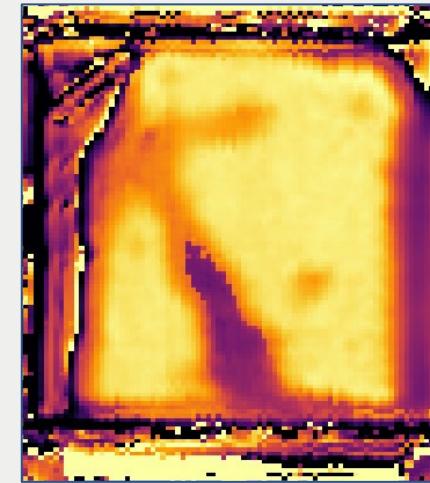
~\$1,000,000 DOE L-Ion Battery Recycling Competition Prizes for our transformative battery diagnostics technology combined with Battago. The second-life EV battery marketplace will help drive recovery, repurpose, and recycle of used lithium-ion batteries.

The advantage of Titan Ultrasound inspection is that it enables direct defect detection, spatially resolved & earlier in the process

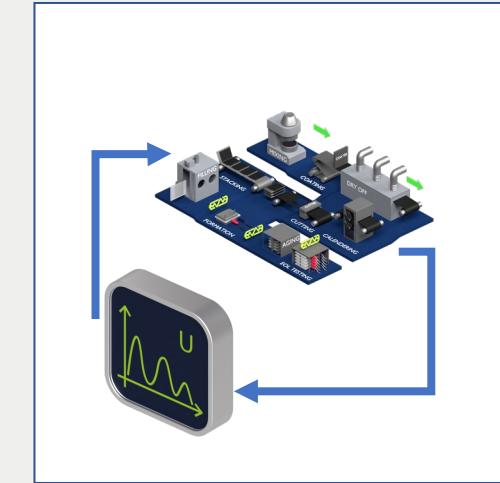
Direct defect detection



Spatially resolved



...early intervention



By analyzing cell morphology, Titan identifies anomalies that directly impact performance, like:

- Non-uniform electrode properties
- Insufficient electrolyte dispersion
- Tears, gas bubbles, Li plating and debris

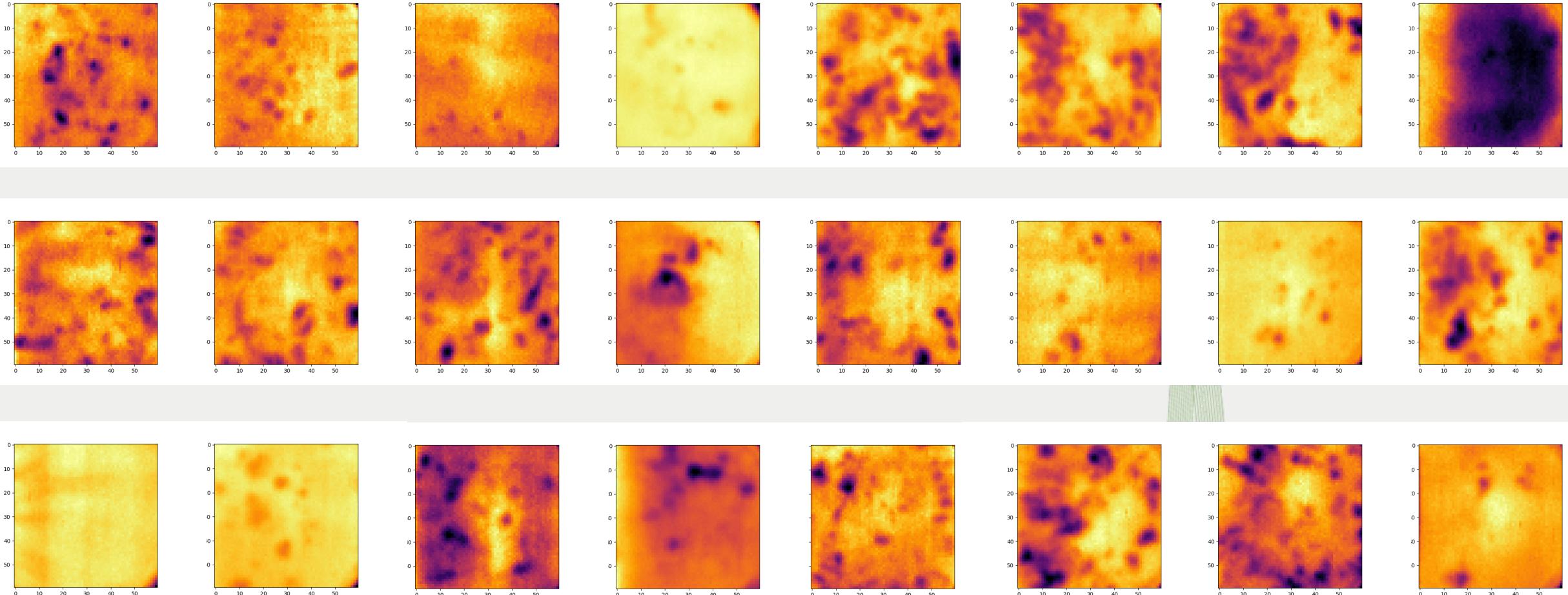
Titan identifies

- location of anomalies in 3D,
- capacity lost due to insufficient wetting
- debris or contaminants

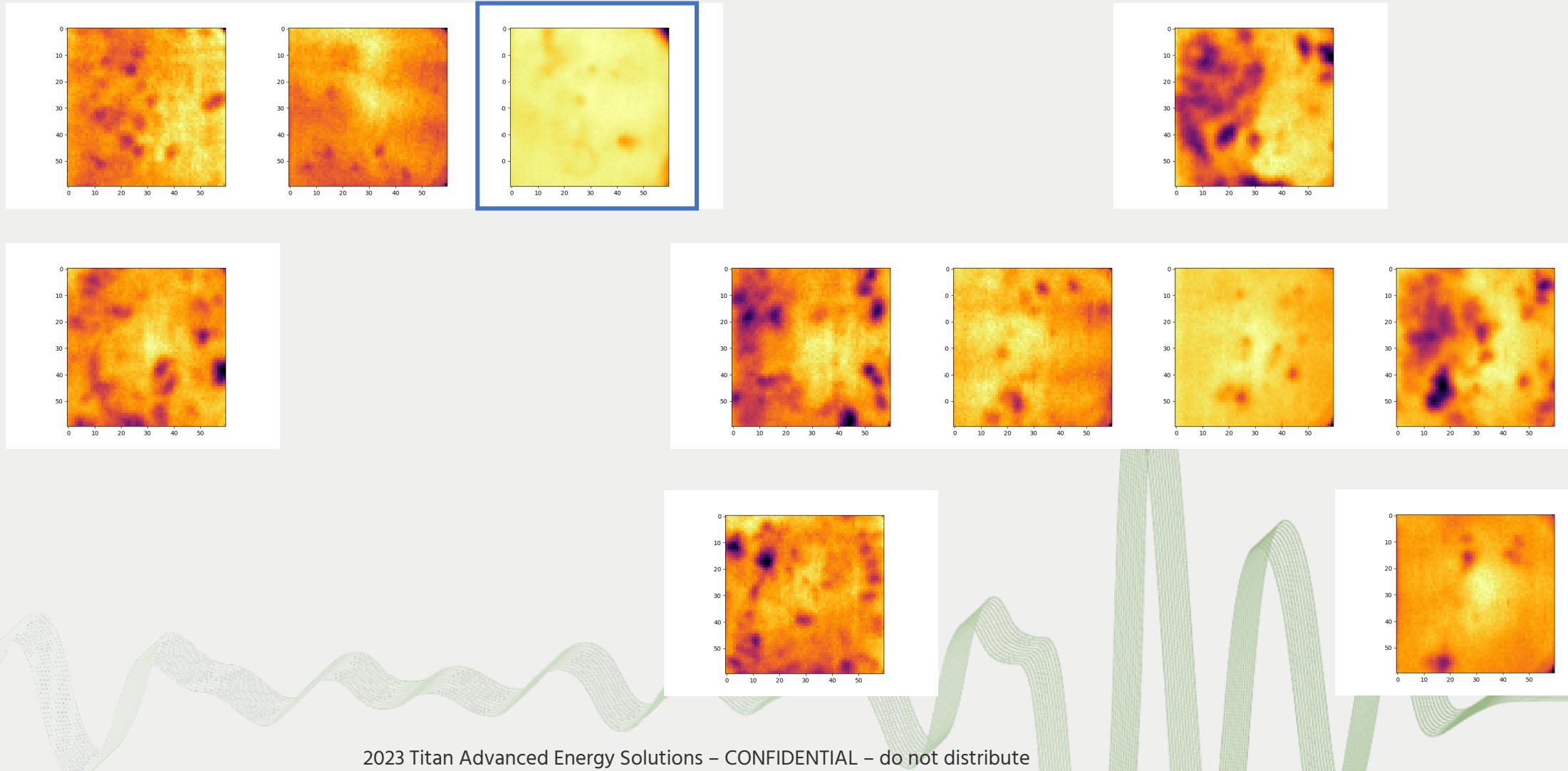
- Actionable insights enable rapid feedback loops
- Rework becomes possible, for instance with electrode wetting issues
- Shrinking the operational envelope

Inter-cell Variation

Significant variations between cells due to a range of manufacturing anomalies



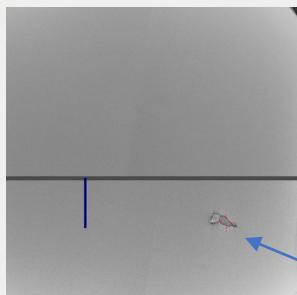
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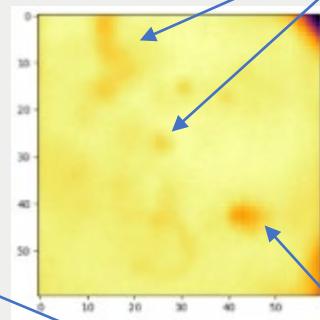
Manufacturing Anomaly Identification

Tear detected inside one of the layers and confirmed using CT scan

Detected multiple anomalies, which are mostly imperceivable with CT

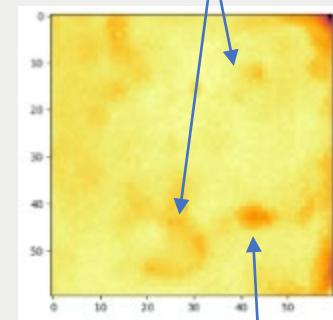


CT

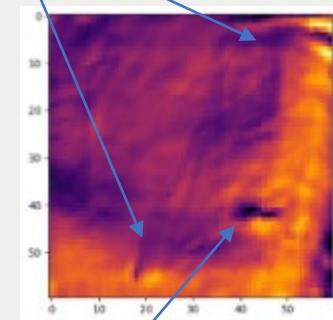


T_R

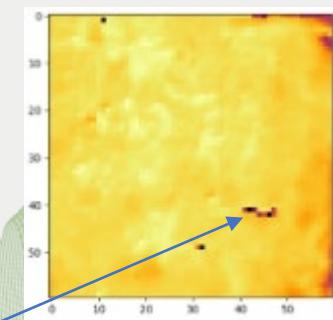
Anomaly Identification



T_F



R_R



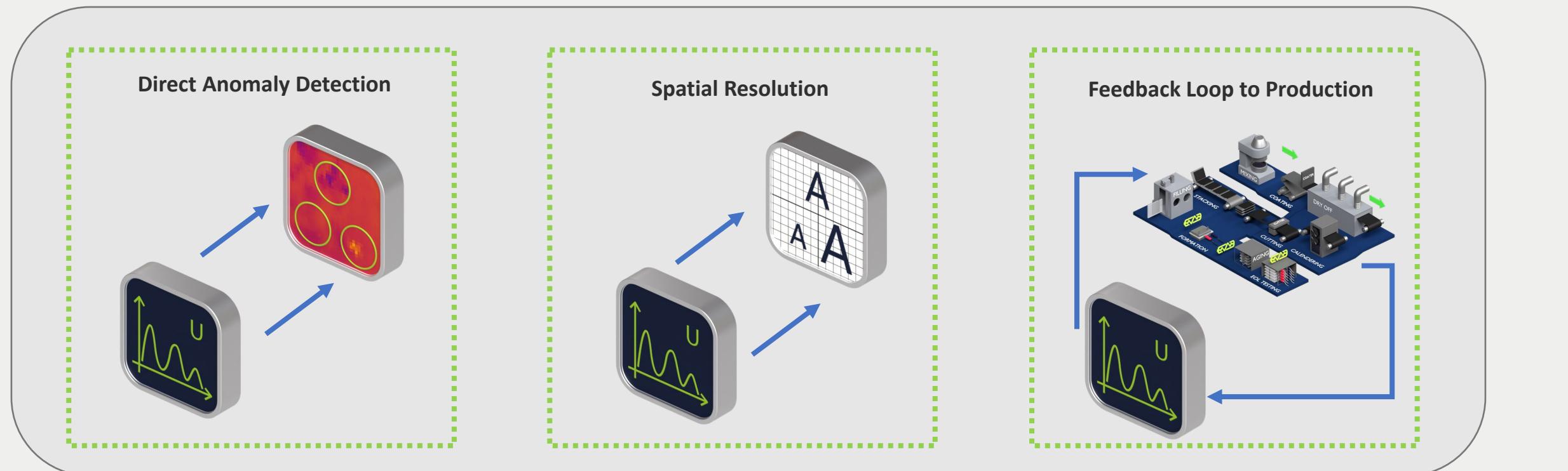
R_F

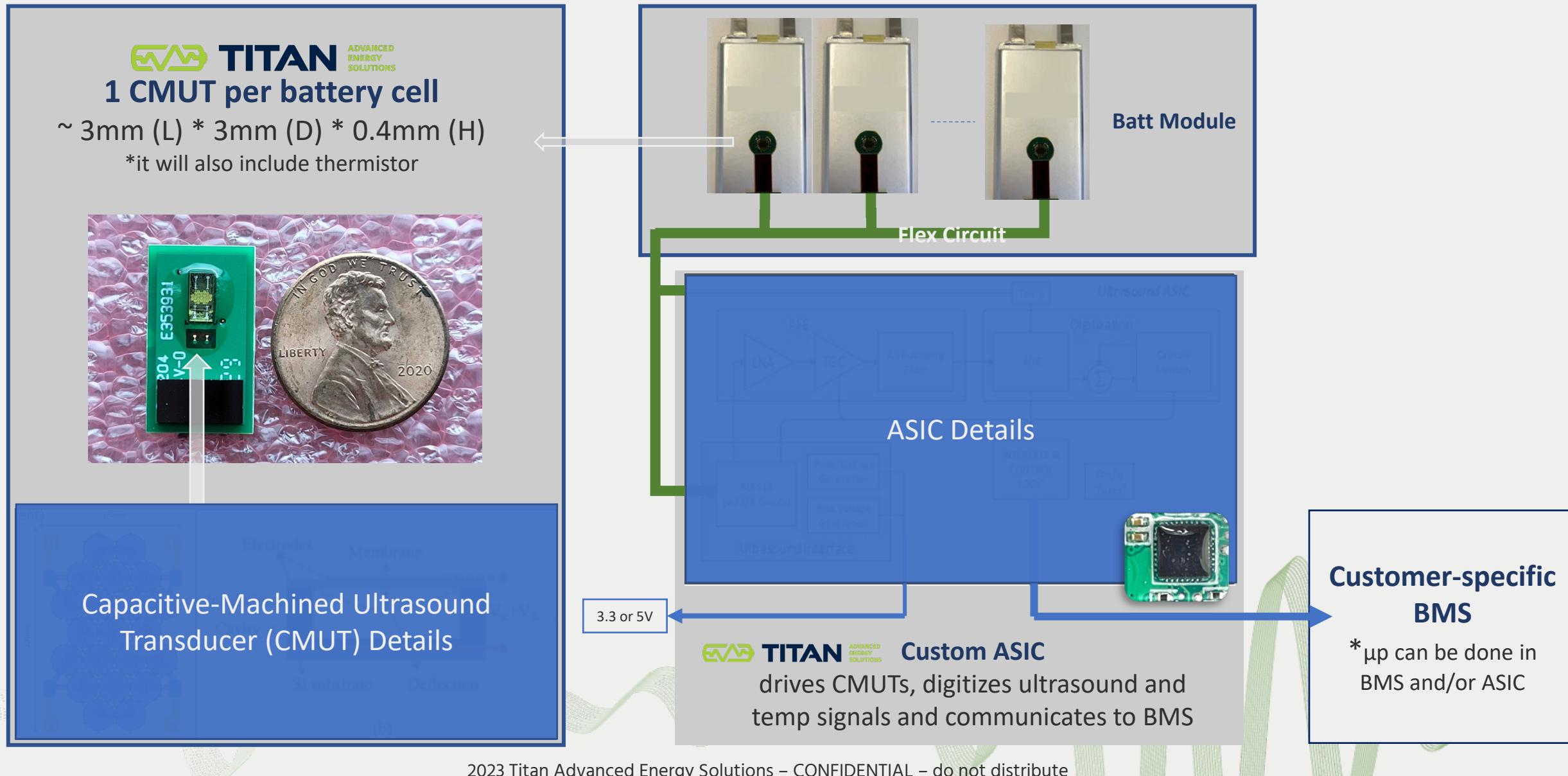
Separator tear



Titan's ultrasound technology helps deliver consistent, homogenous product faster

- Identifies anomalies directly, not through inference
- Spatially resolves the location and magnitude of the anomaly
- Early in the process to accelerate feedback loops
- Can reduce bottom line production costs up to \$4.00 - \$6.00 per KWh







Thank You!

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