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# Development of a Cloud-Based Tool for Predicting Thermal Battery Performance: TABS v6

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# TABS: The Thermally Activated Battery Simulator

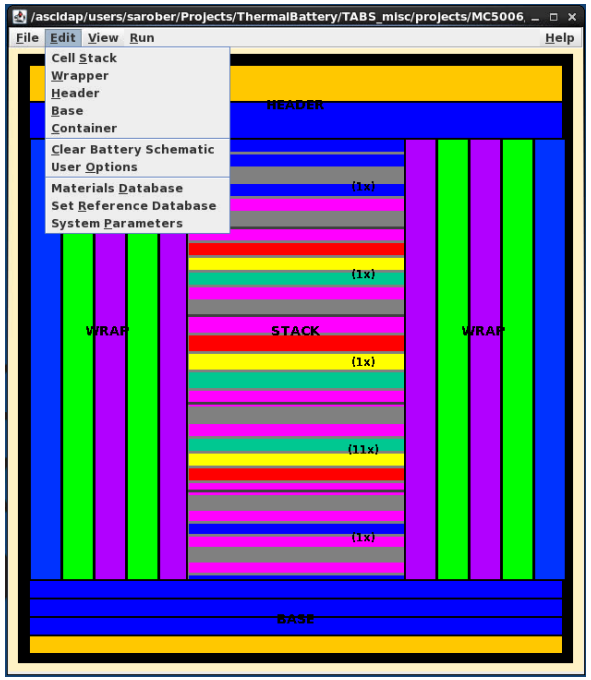
## TABS design principles

Create a user interface **intuitive to battery designers**, not just for computational scientists

Be **computationally efficient**, so many design iterations can be explored in a single work day

Present the user with the most **relevant quantities of interest**, yet enable them to explore more deeply

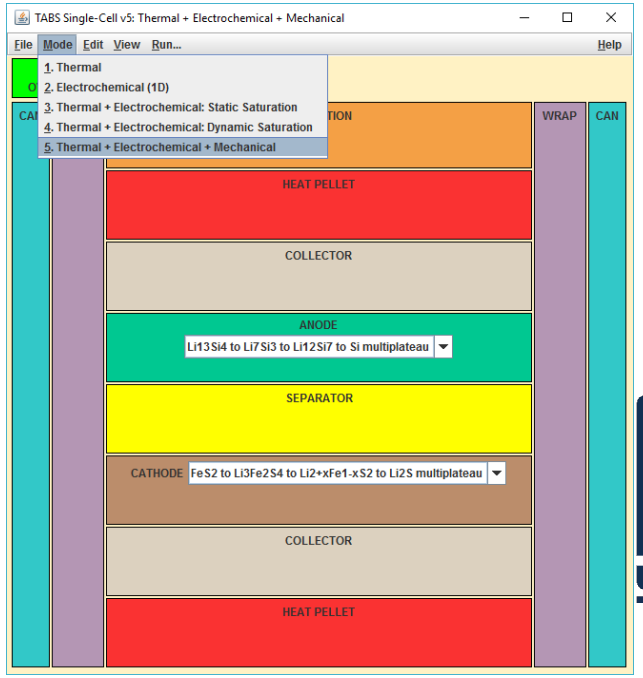
Have **demonstrated credibility**, such that the user knows when and how much to trust the solutions




TABS-FB: Full Battery

- Thermal

TABS FULL BATTERY



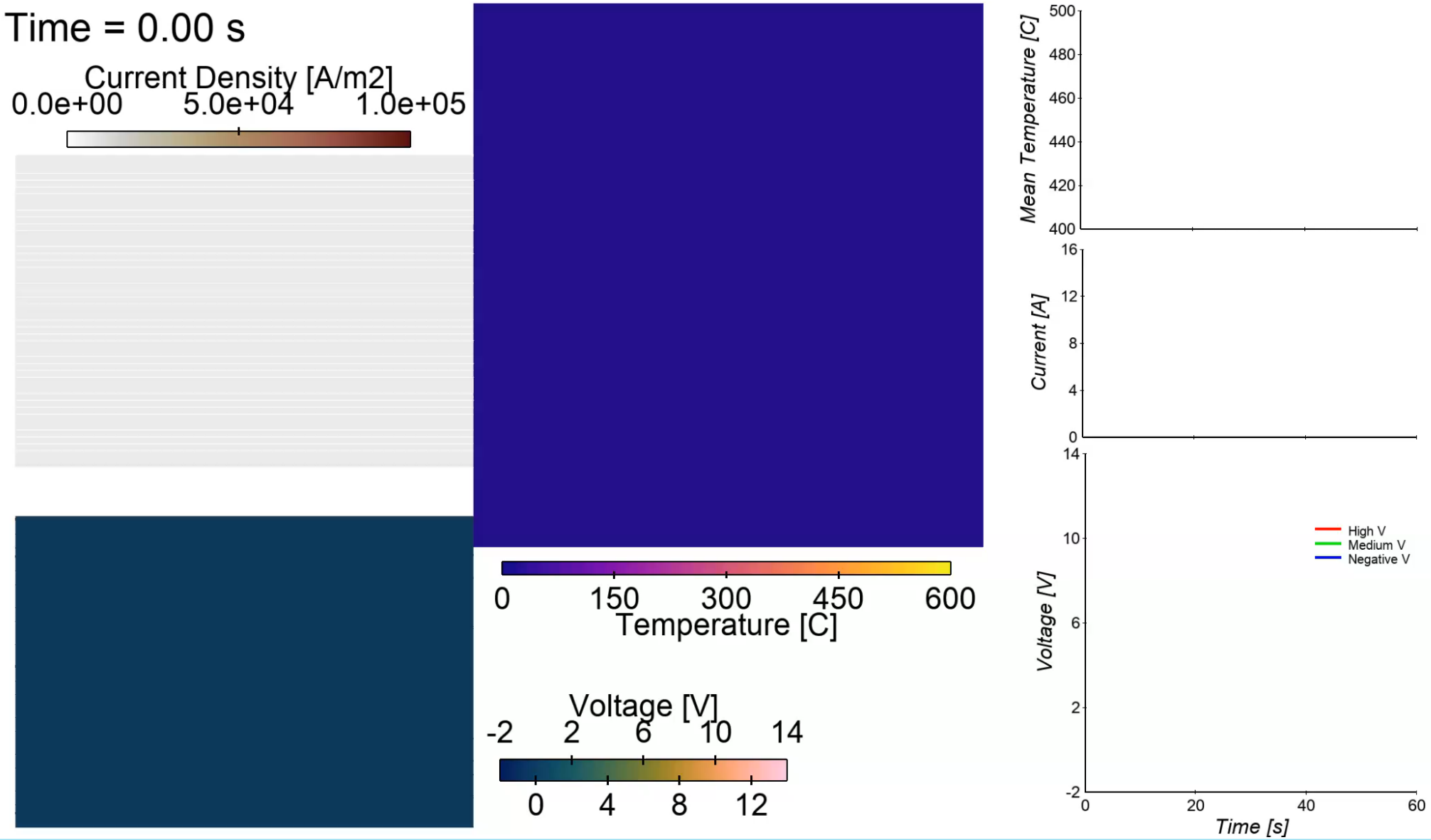

TABS-SC: Single Cell

- Thermal
- Mechanical
- Flow
- Electrochemical

TABS SINGLE CELL

Two powerful performance/design models with an easy-to-use interface

# Recent model development has focused coupled thermal-electrochemical response of full batteries



# So what's wrong with TABS?

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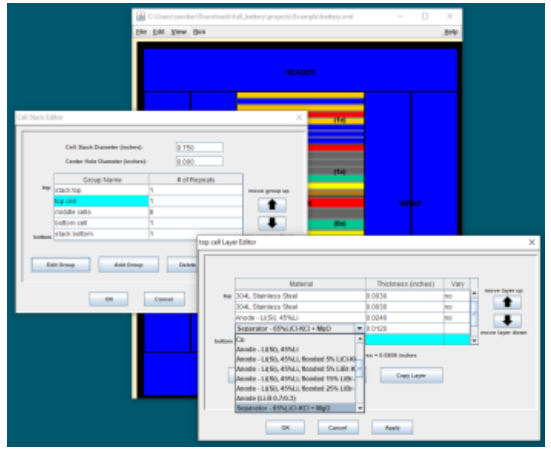
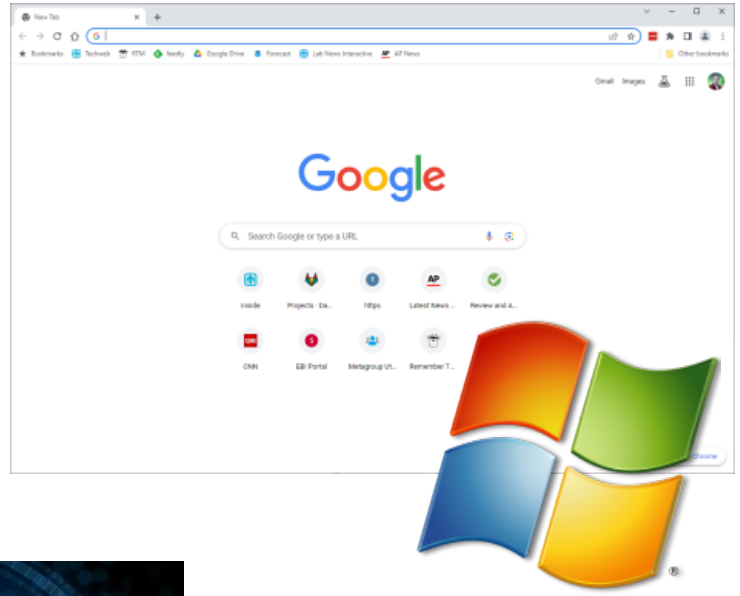
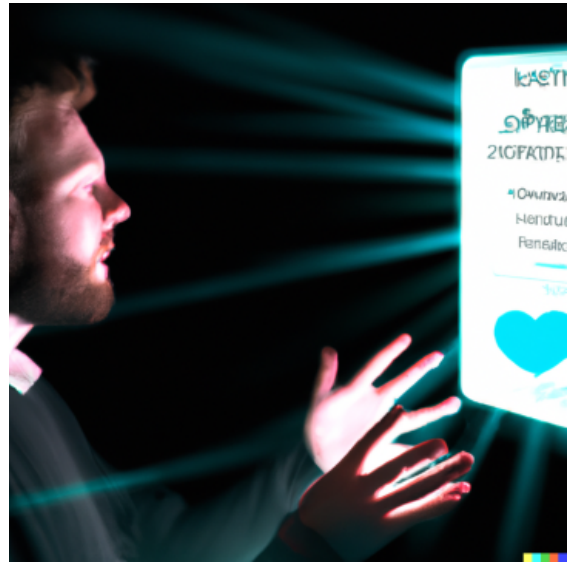


Legacy TABS is powerful and impactful, but not prepared to maximize potential

# TABS v6 designed from scratch to address prior deficiencies and provide an experience that delights our users



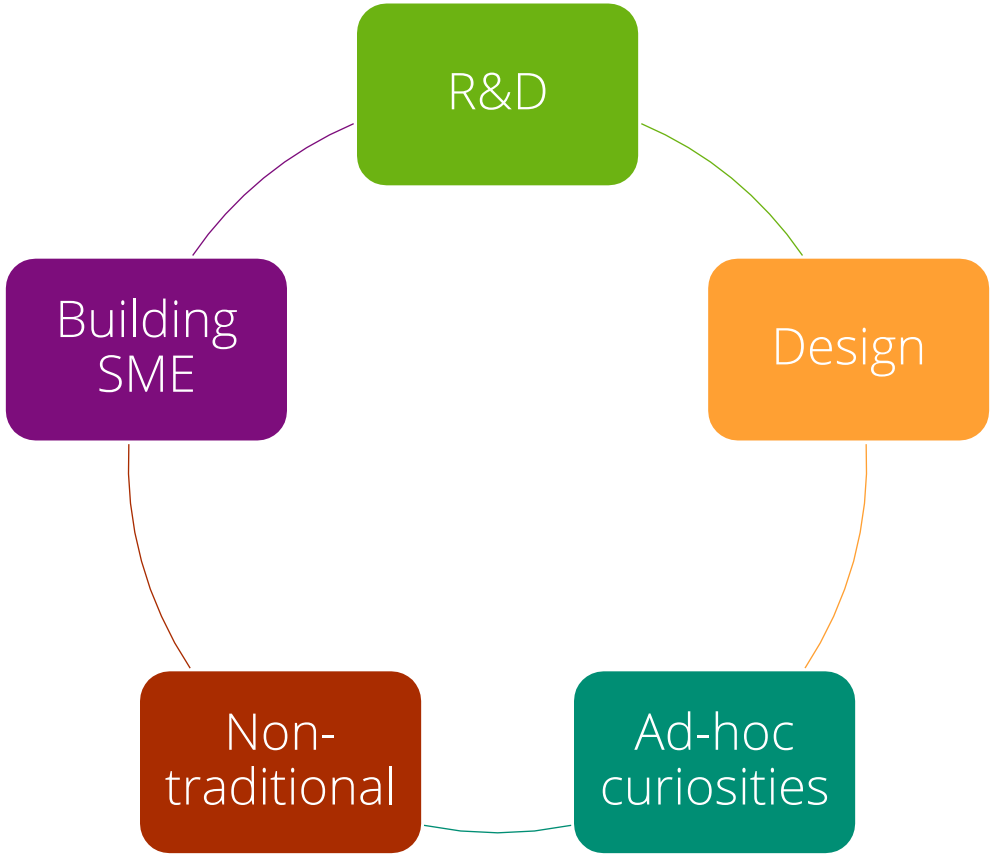



# Embarked in foundational user experience research to design a tool that exceeds user's needs and desires

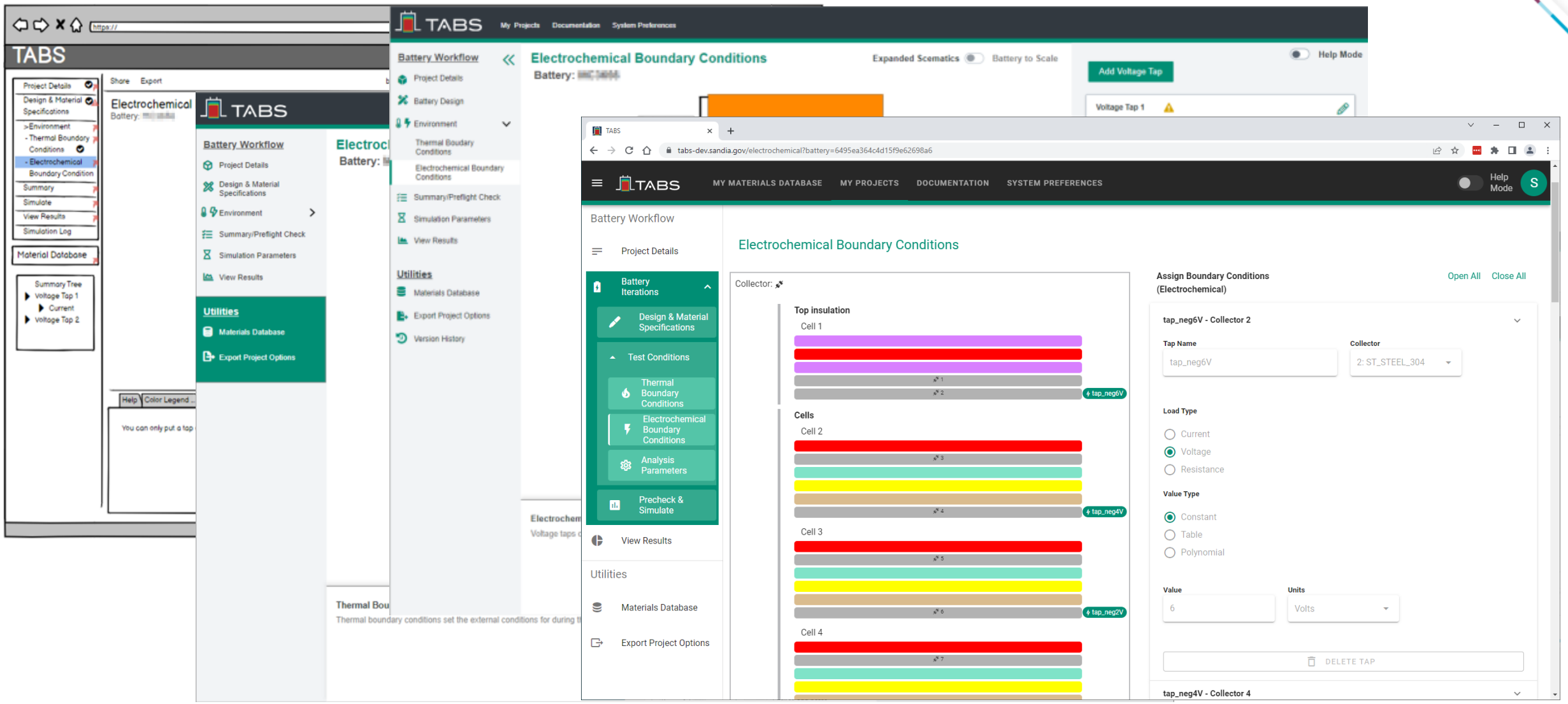
Interviewed current and prospective users (within Sandia, DOD, and AWE) to identify:

- What is working well
- Opportunities for improvement
- Barriers to adoption
- Gaps in user expectations of new tool

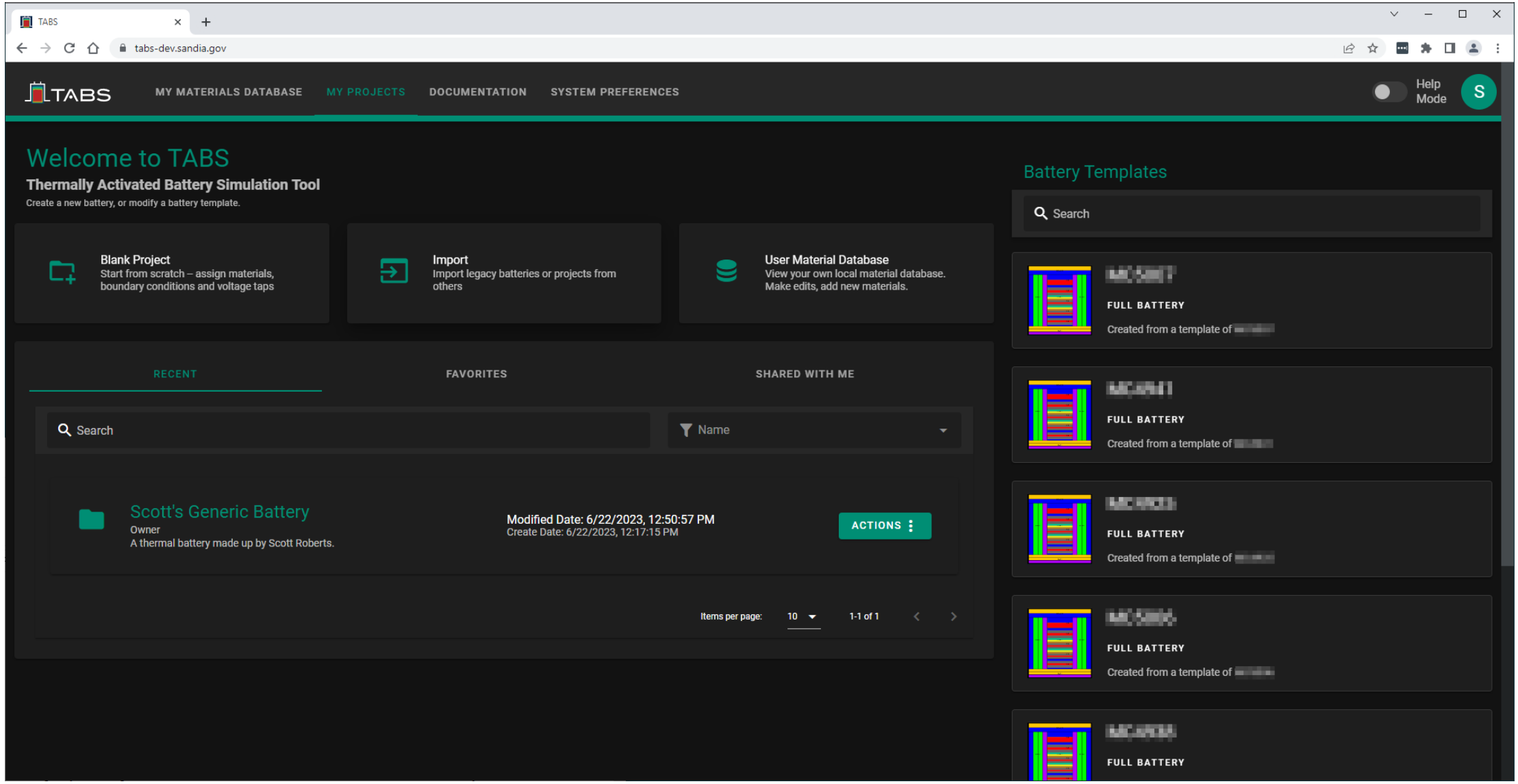
Identified 6 use cases:



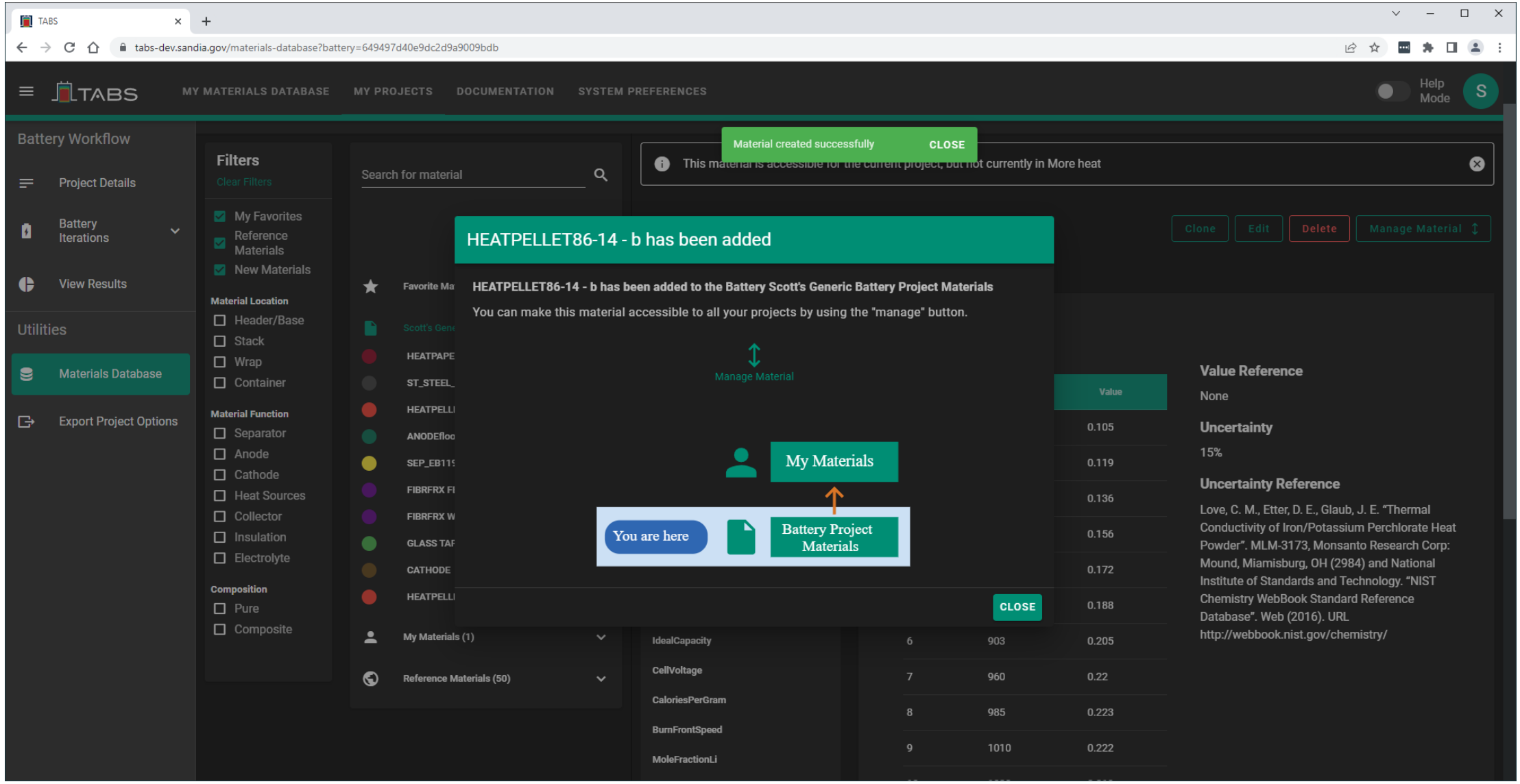
# User interface design evolves from low-fidelity mockups to implemented code, with user testing throughout development



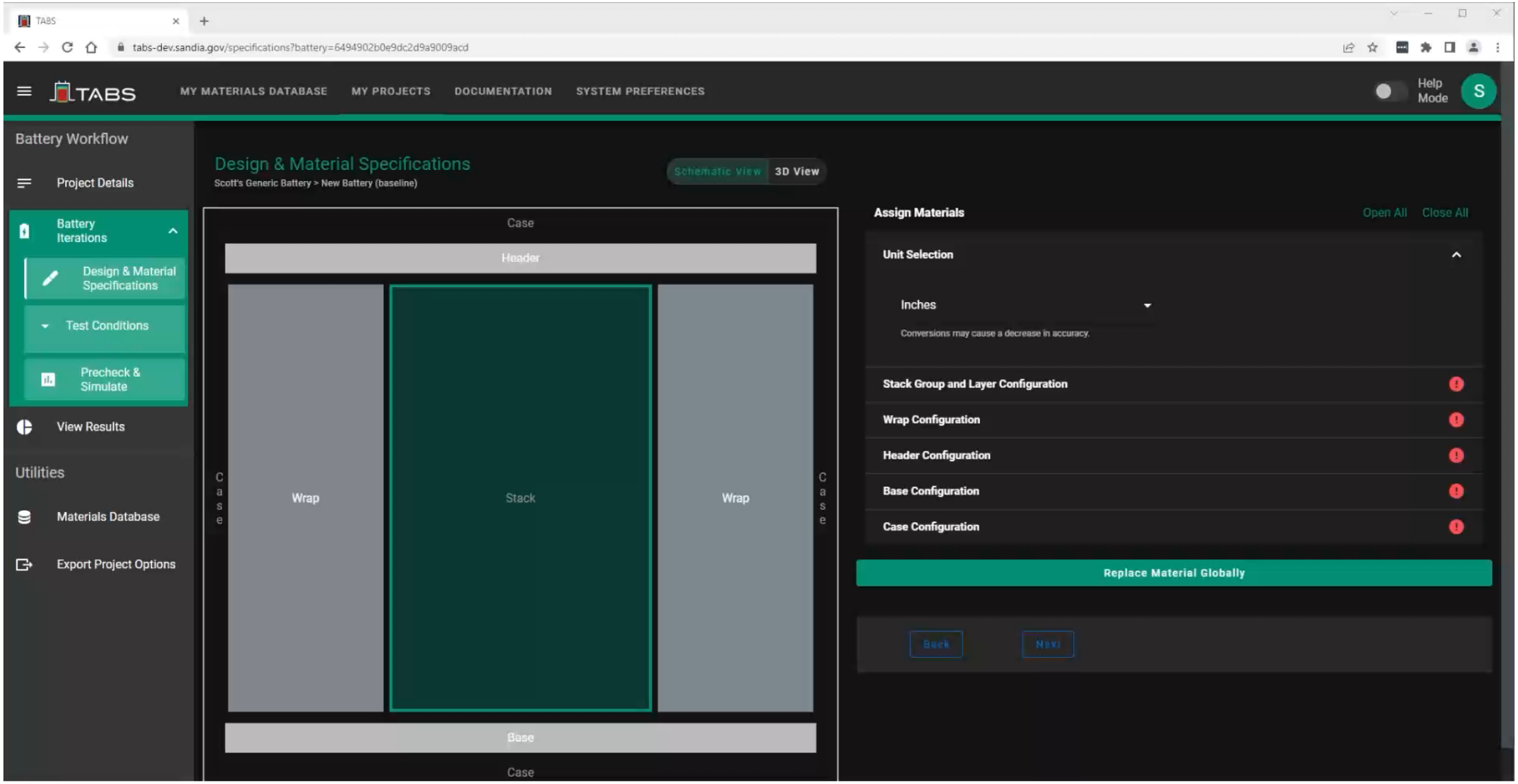
# TABS v6 highlights: Landing page with templates, recent projects



# TABS v6 highlights: Materials database hierarchy to maintain high-pedigree reference materials while exploring



# TABS v6 highlights: Building a battery from scratch in < 5 minutes



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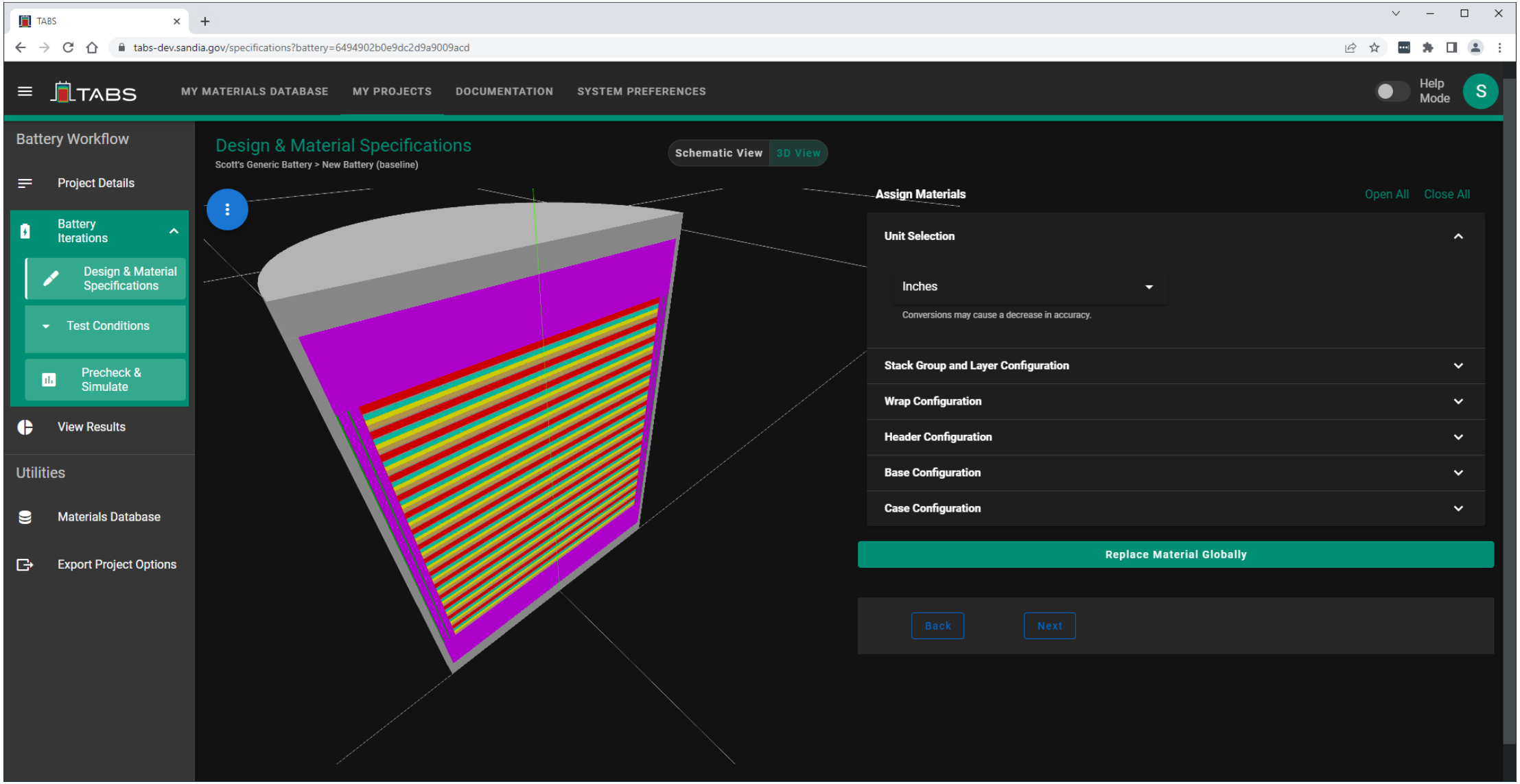
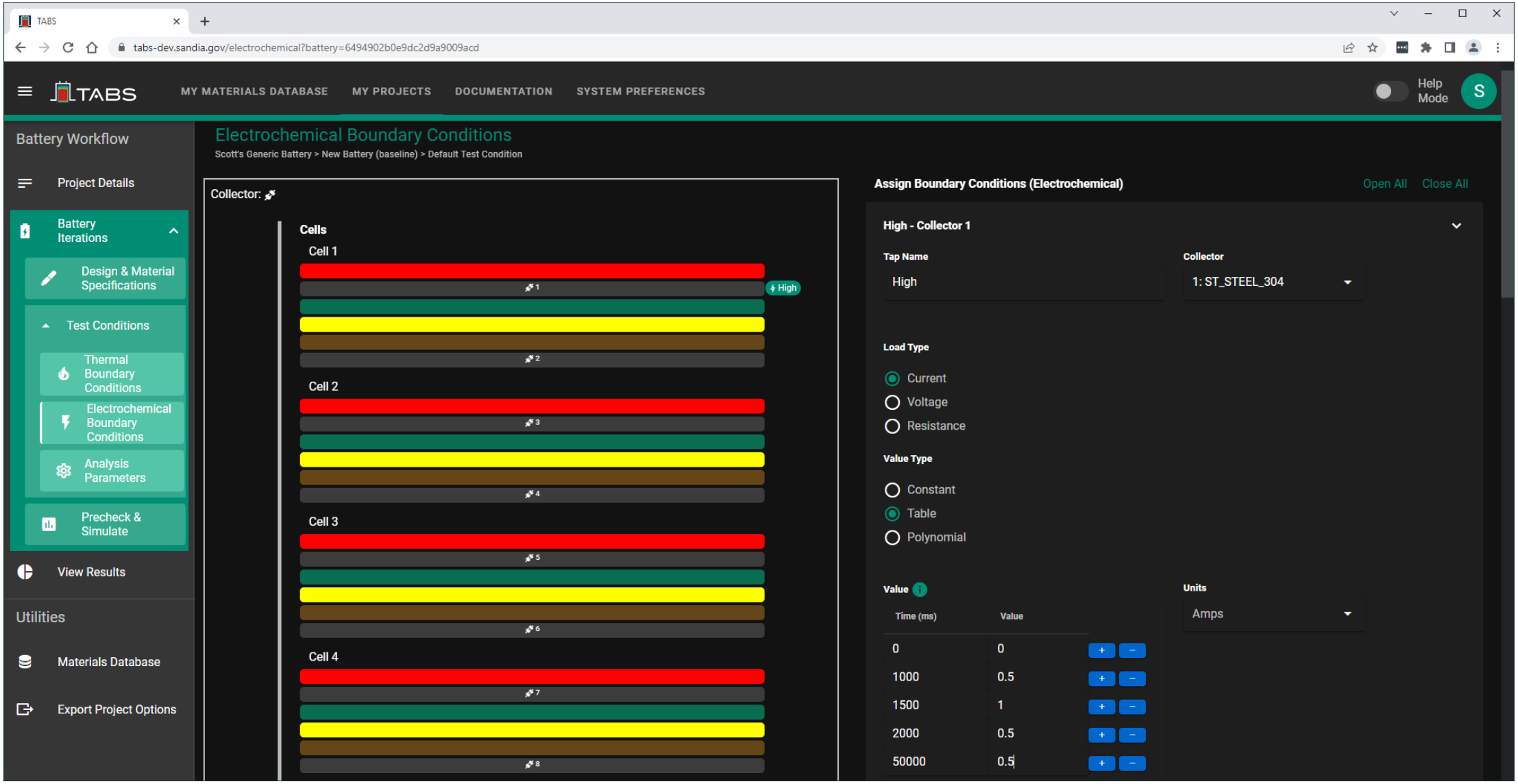
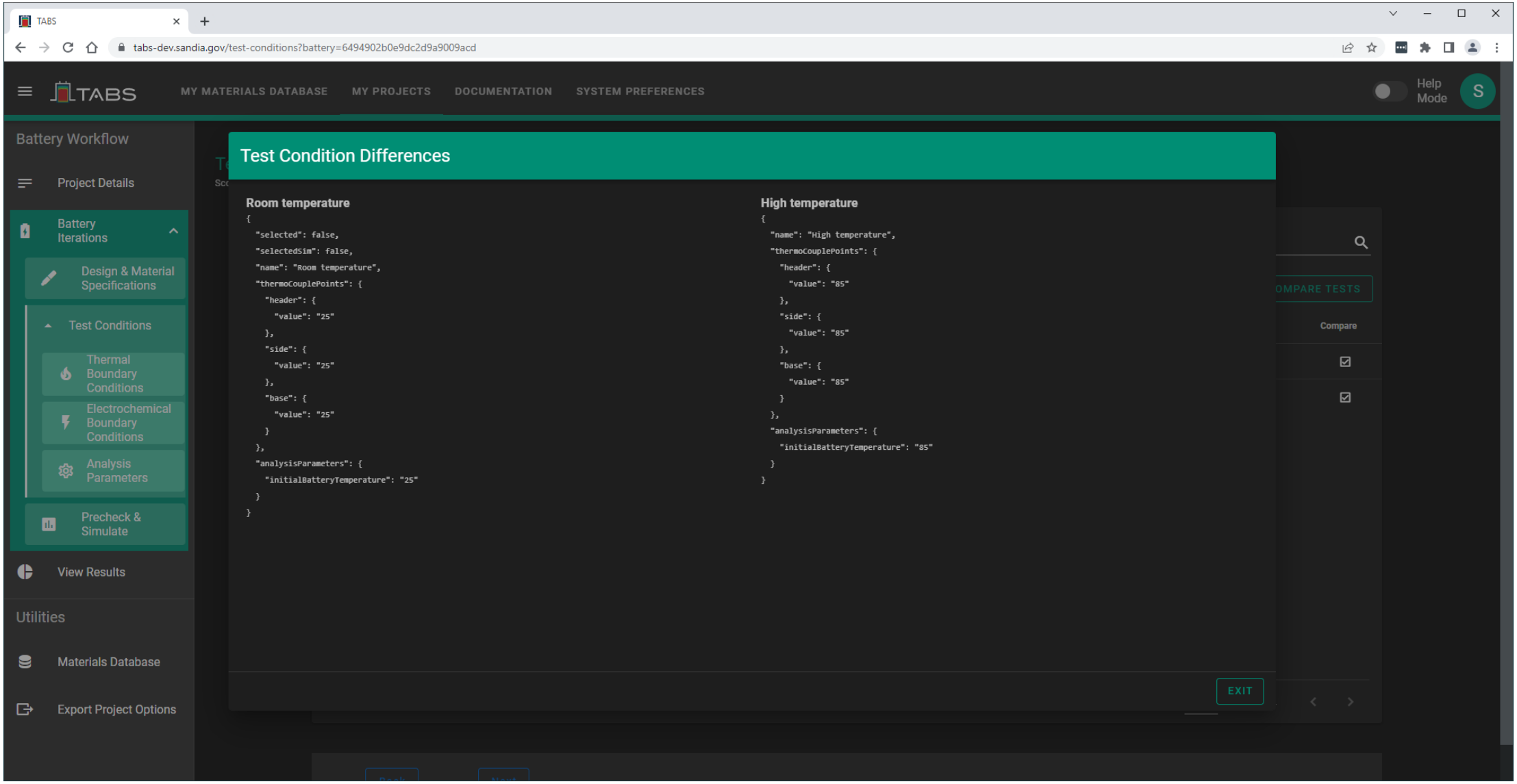


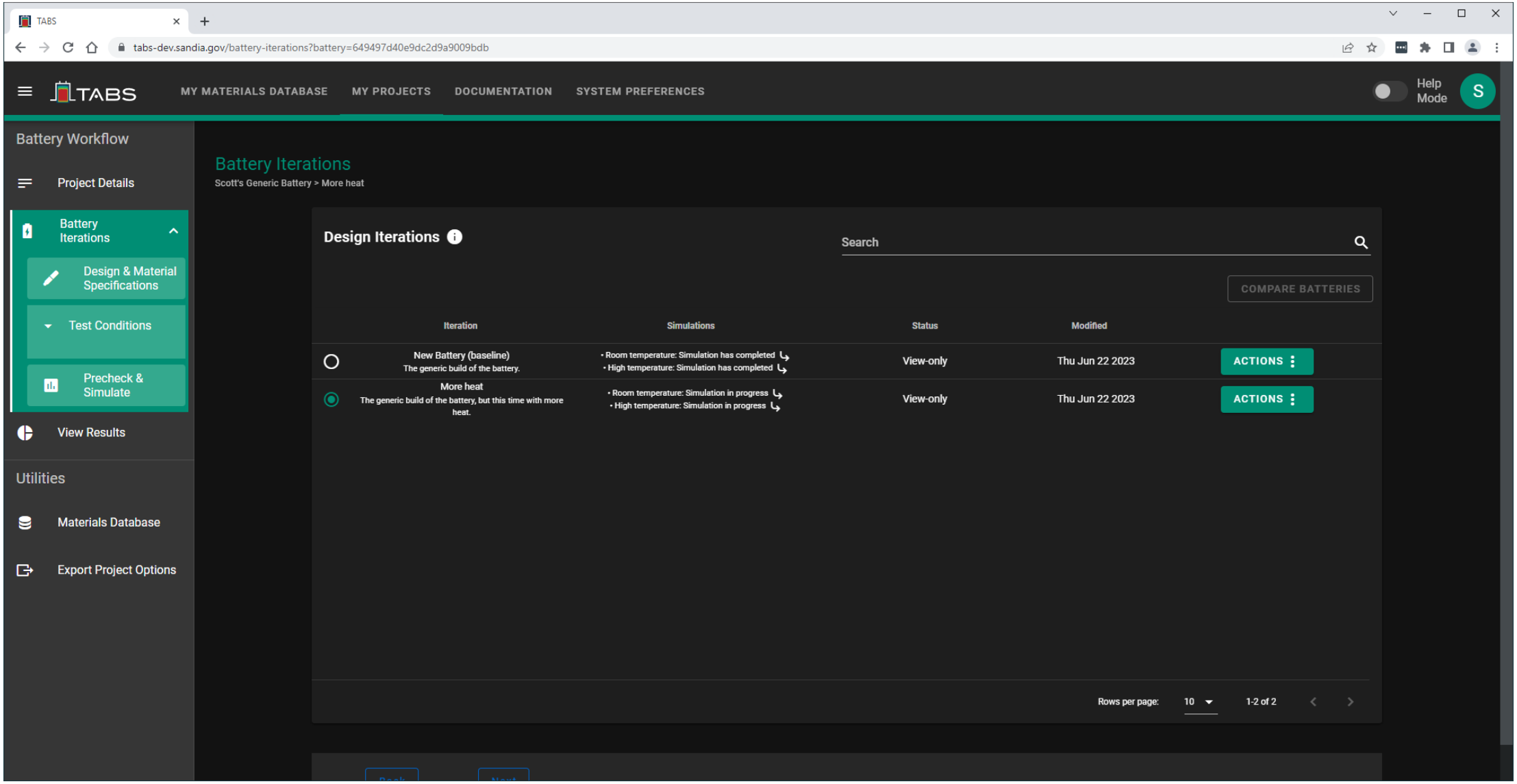
# TABS v6 highlights: Specifying boundary conditions and electrochemical loads in multiple formats



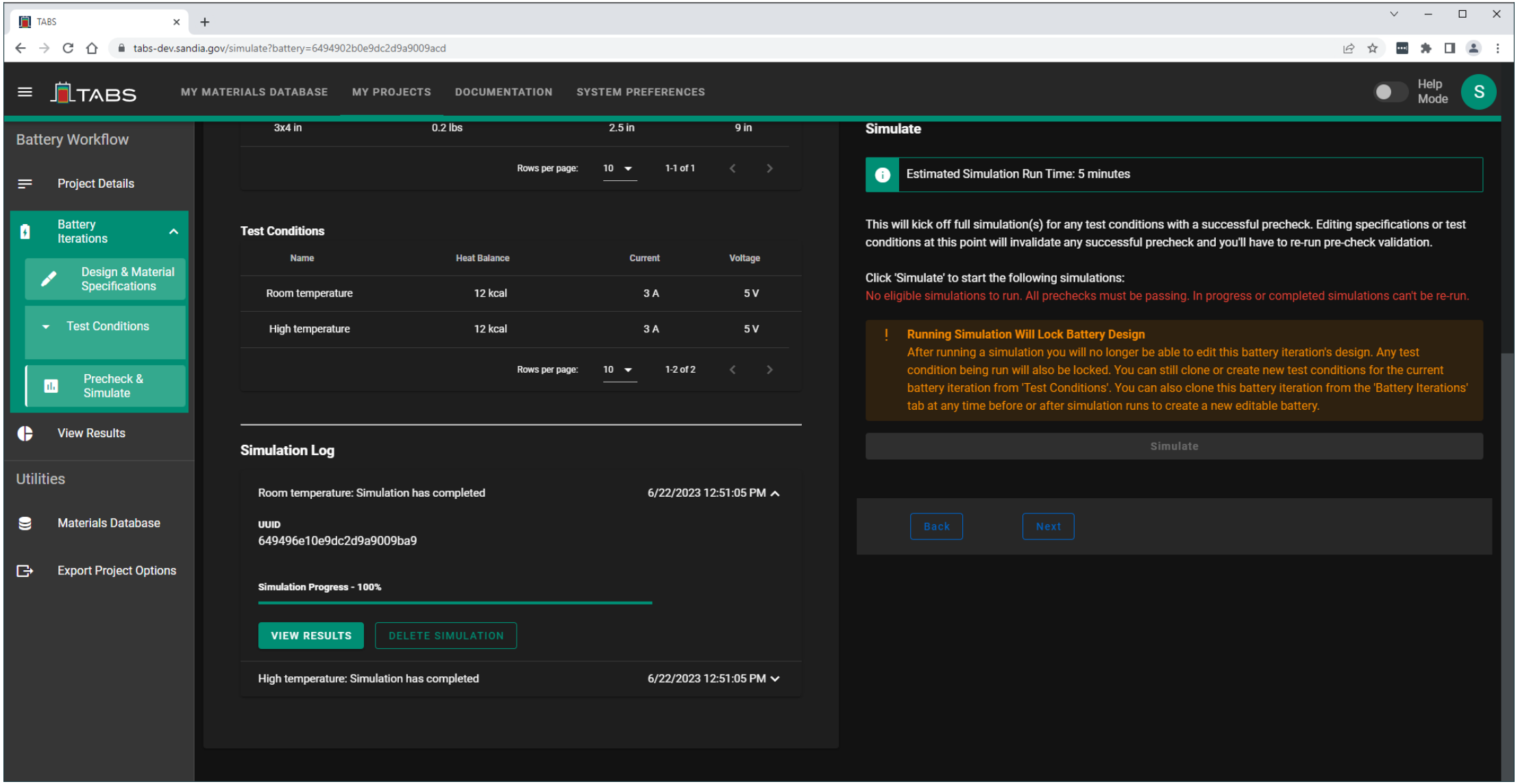
# TABS v6 highlights: Multiple test conditions can be simulated for a single consistent battery design



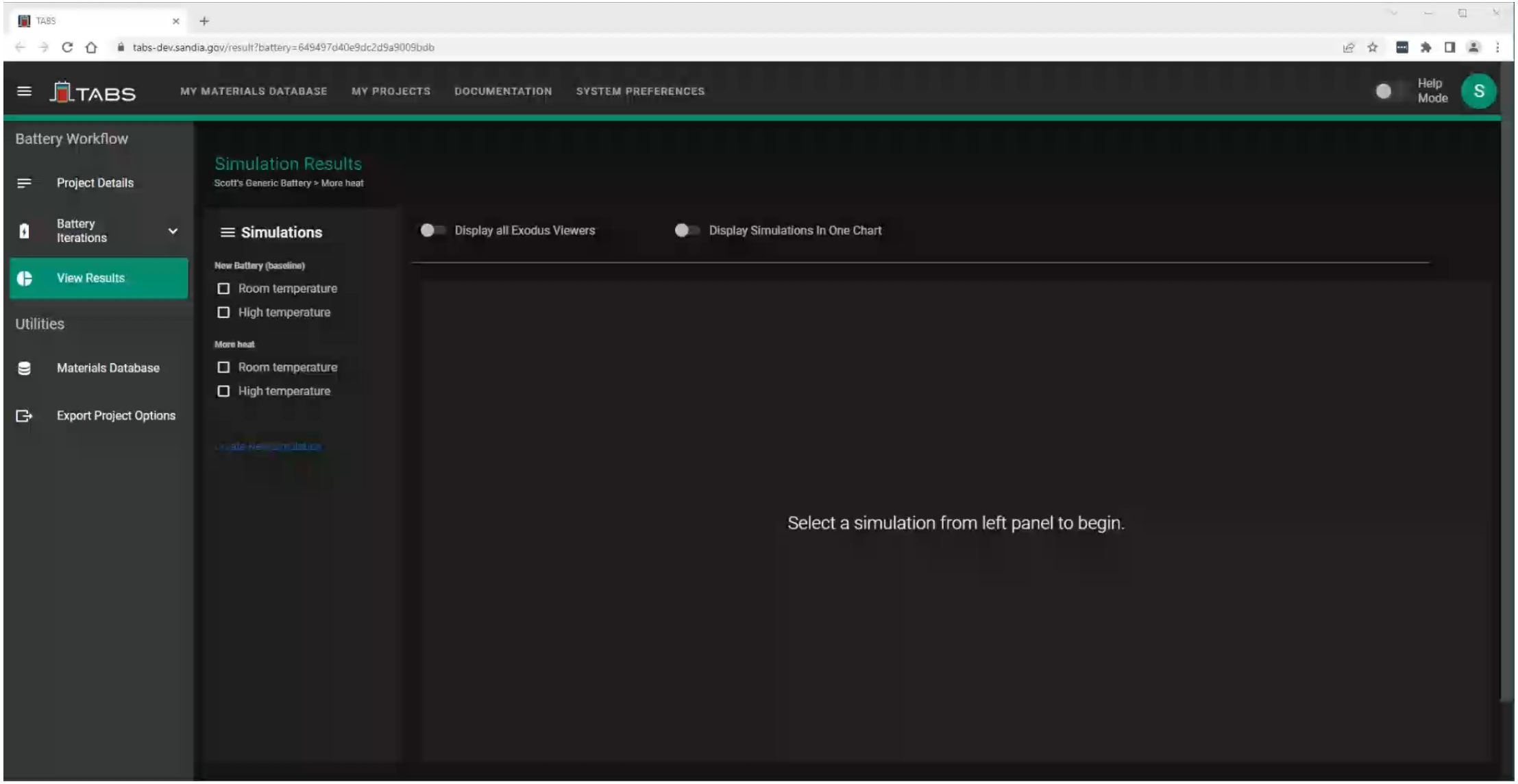
# TABS v6 highlights: Battery iterations allow testing tweaks to design, materials while keeping previous simulation pedigree



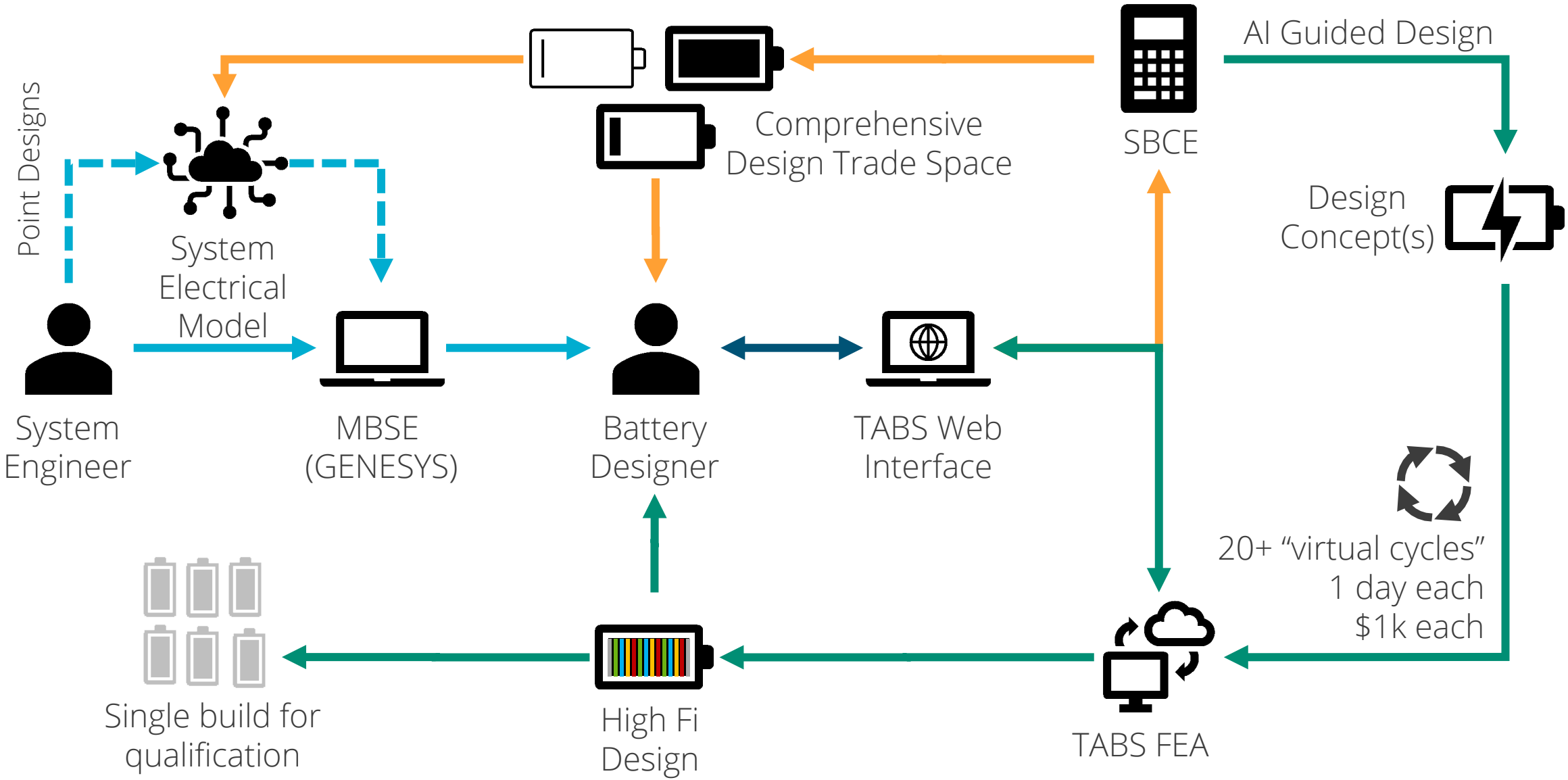
# TABS v6 highlights: Simulations run in cloud-computing resources, with multiple simultaneous simulations possible



# TABS v6 highlights: Results visualized in-browser, with comparison between battery iterations and test conditions



# Future State: Fully-Integrated Digital Workflow



# Wow!  How can I use TABS v6?


Initial TABS v6 capability development nearly complete

- Deployment at Sandia scheduled October 2023
- Deployment to external partners (DOD) scheduled early 2024
- Continual improvements through 2024 and beyond

TABS v6 will be available to U.S. government organizations and their contractors

- License requirements and costs depends on your organization and deployment details

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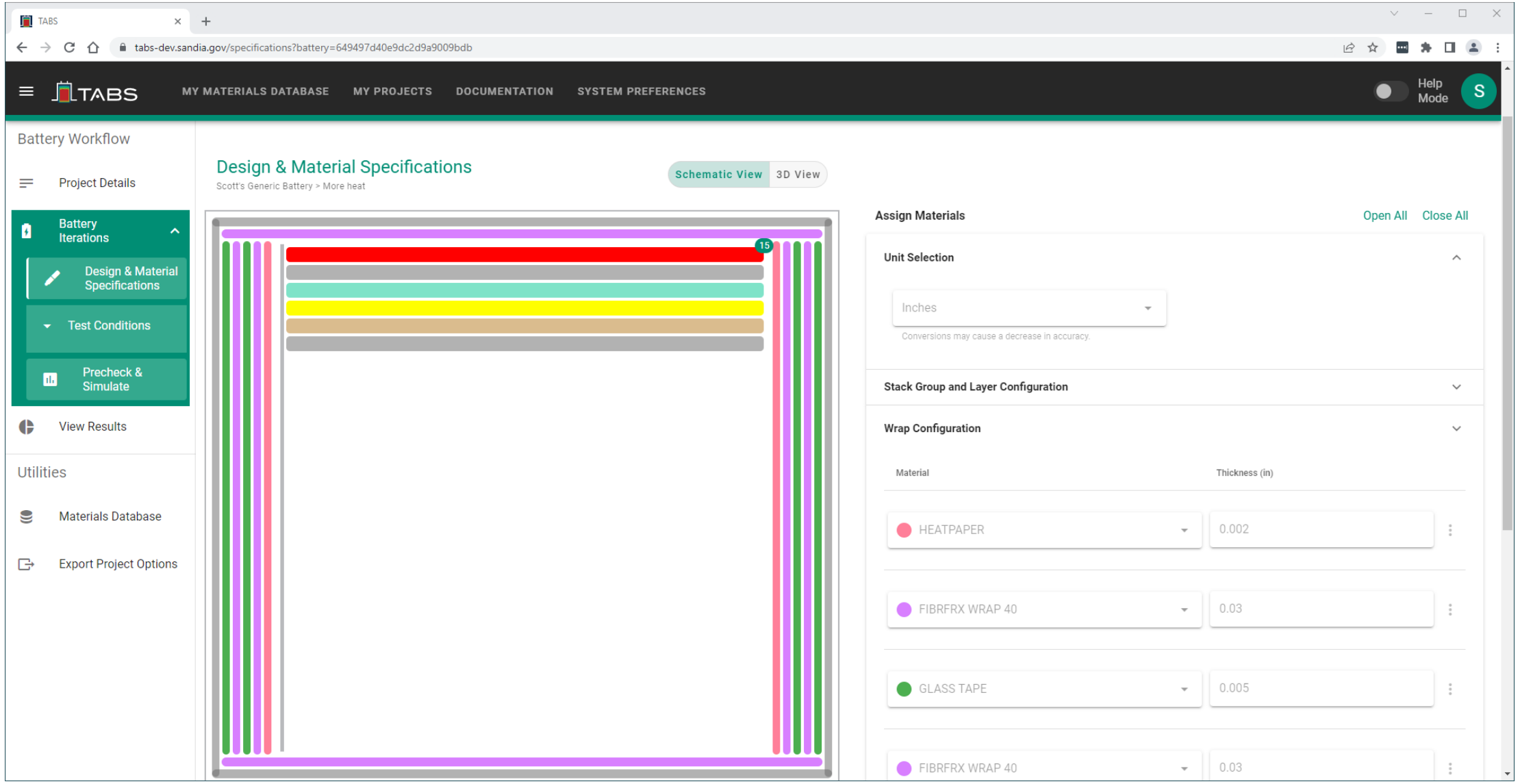
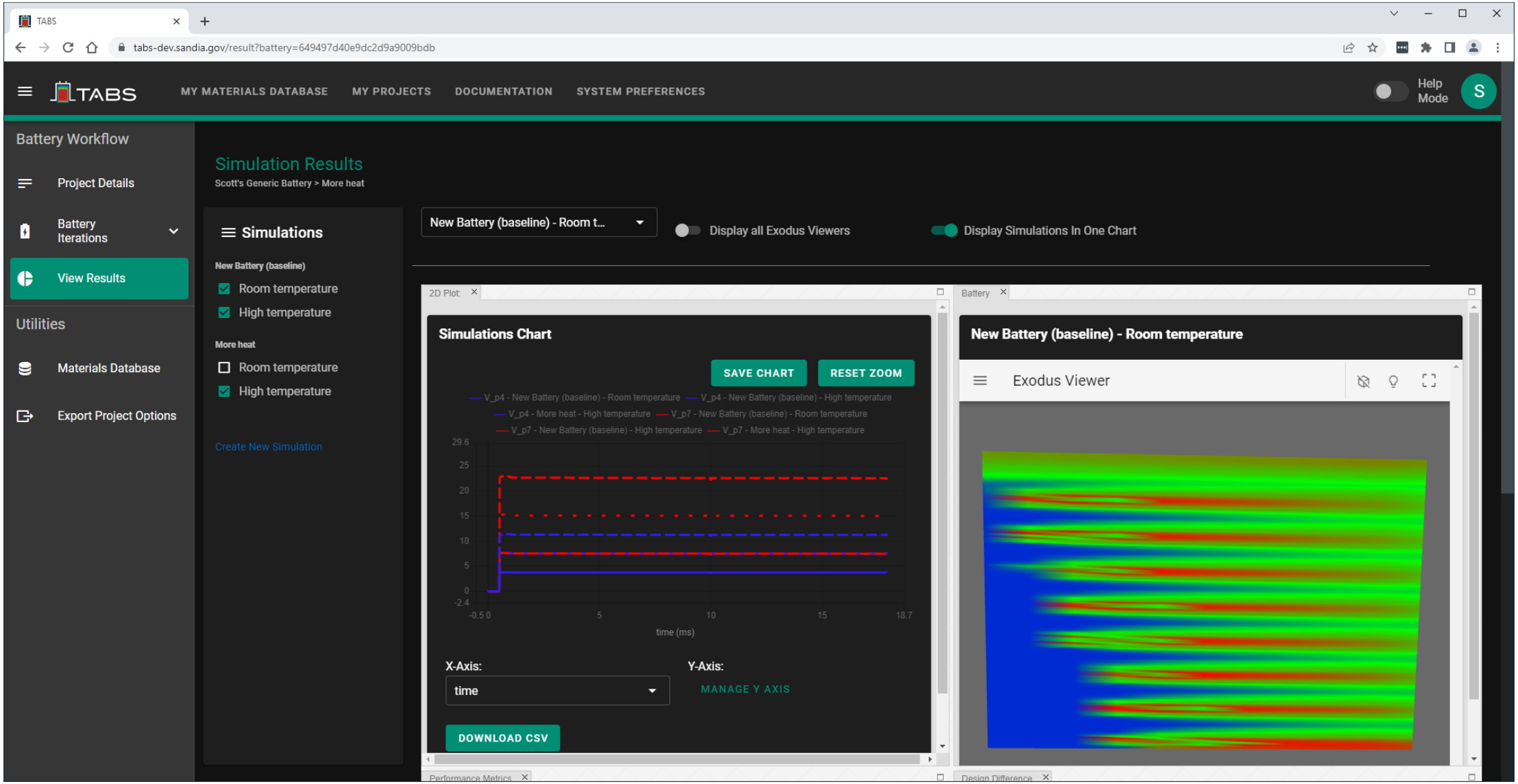
- Phone: (505) 844-7957

# Backup

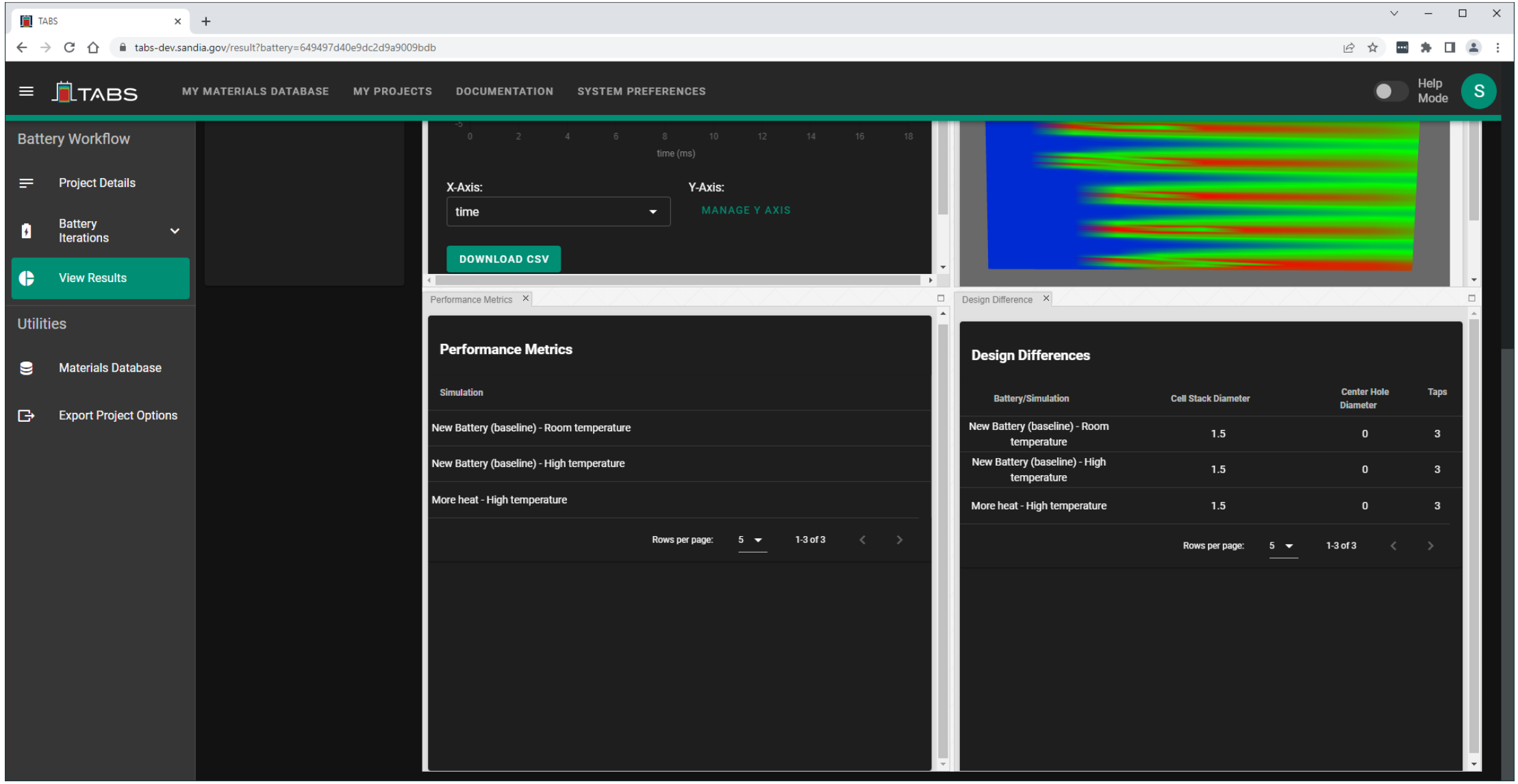
# Light mode


TABS
tabs-dev.sandia.gov/specifications?battery=649497d40e9dc2d9a9009bdb
TABS
MY MATERIALS DATABASE
MY PROJECTS
DOCUMENTATION
SYSTEM PREFERENCES
Help Mode
S
Battery Workflow
Project Details
Battery Iterations
Design & Material Specifications
Test Conditions
Precheck & Simulate
View Results
Utilities
Materials Database
Export Project Options
Design & Material Specifications
Scott's Generic Battery > More heat
Schematic View
3D View
15
Assign Materials
Open All
Close All
Unit Selection
Inches
Conversions may cause a decrease in accuracy.
Stack Group and Layer Configuration
Wrap Configuration
Material
Thickness (in)
HEATPAPER
0.002
FIBRFRX WRAP 40
0.03
GLASS TAPE
0.005
FIBRFRX WRAP 40
0.03

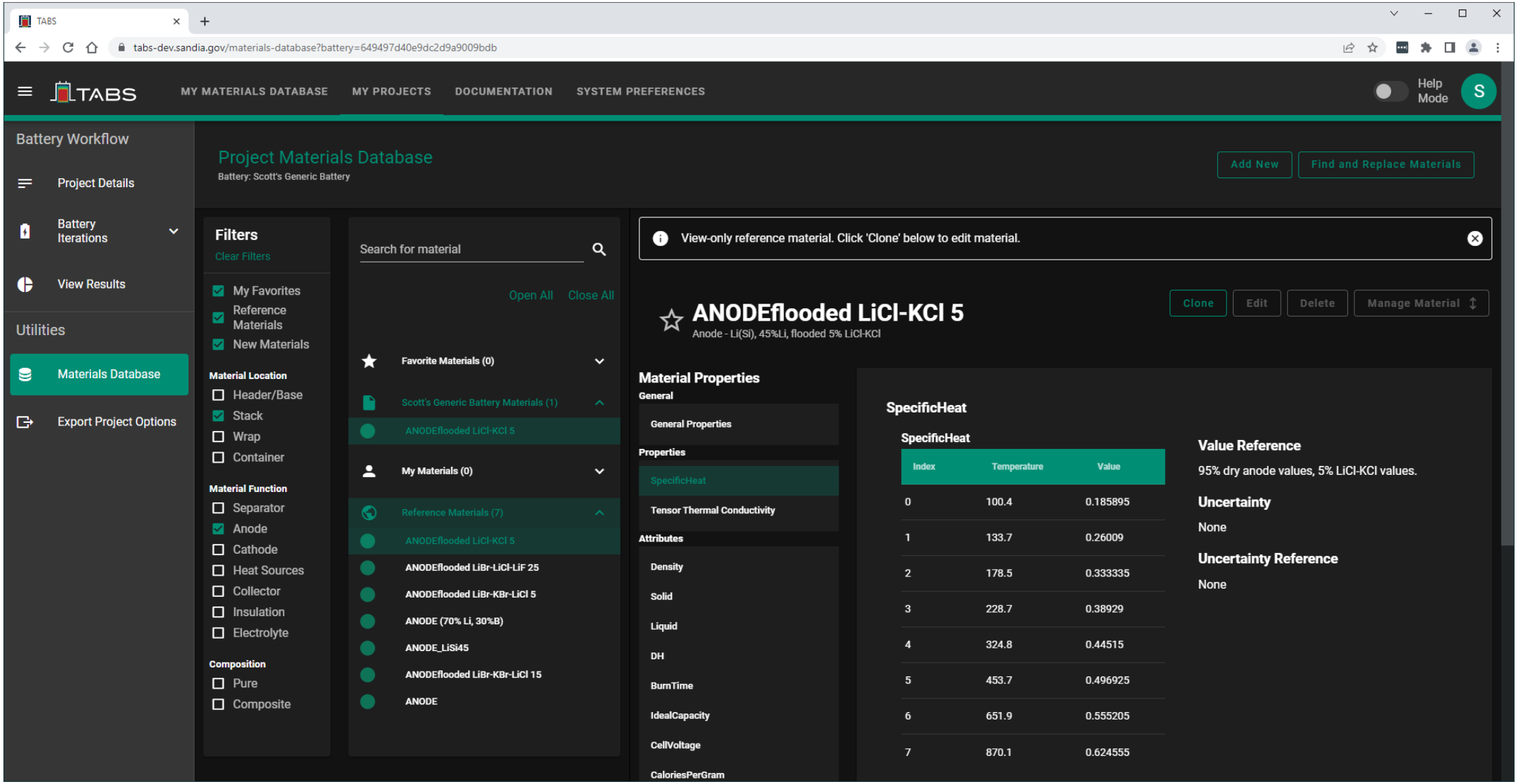
# Results - comparison



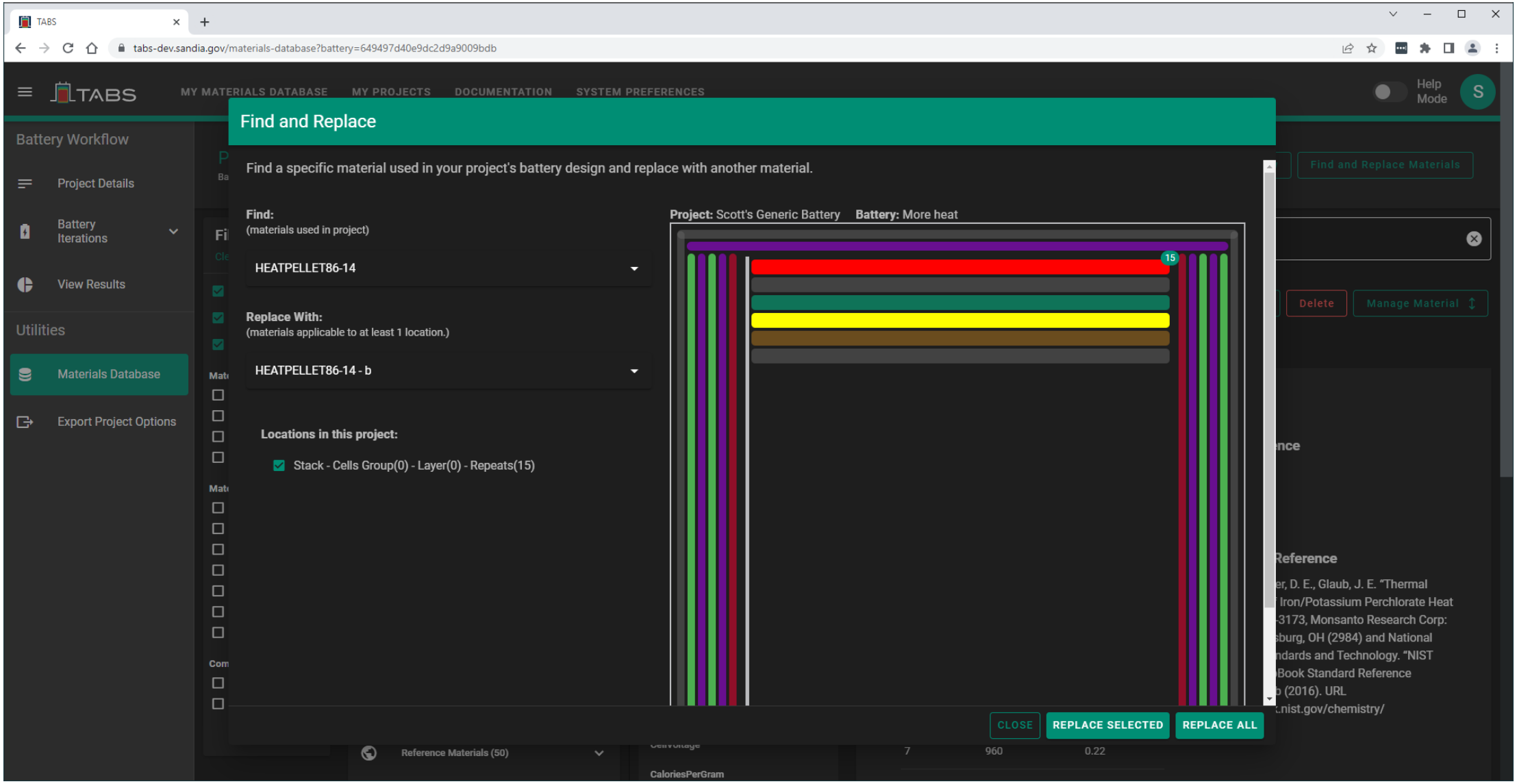
# Results - metrics



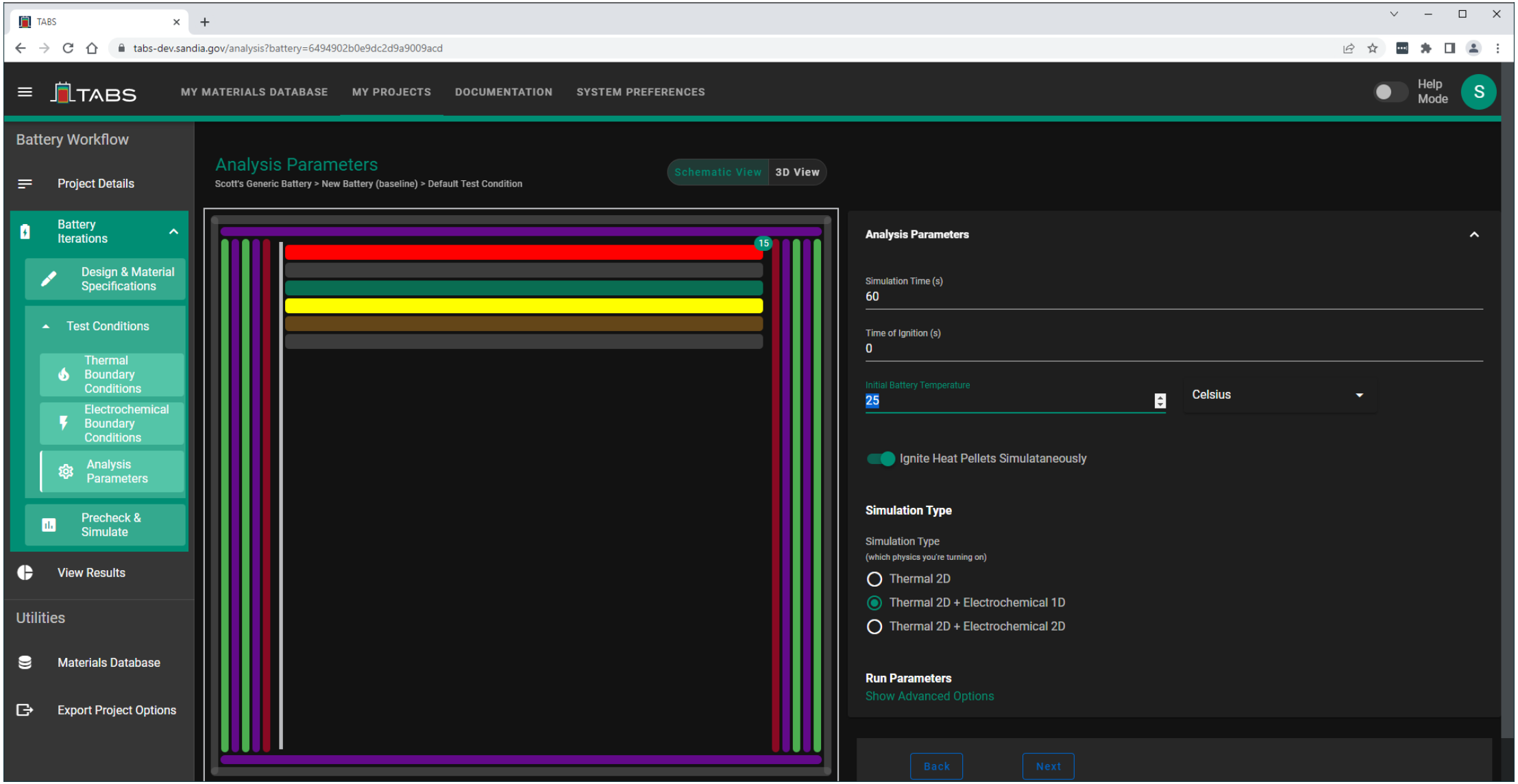
# Database - filter



# Database – find and replace



# Analysis parameters



# Project details