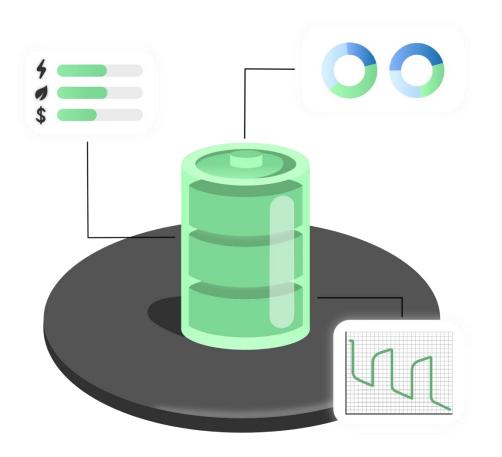
Battery Cell Selection Using About:Energy's Cell Database with TAITherm Webinar

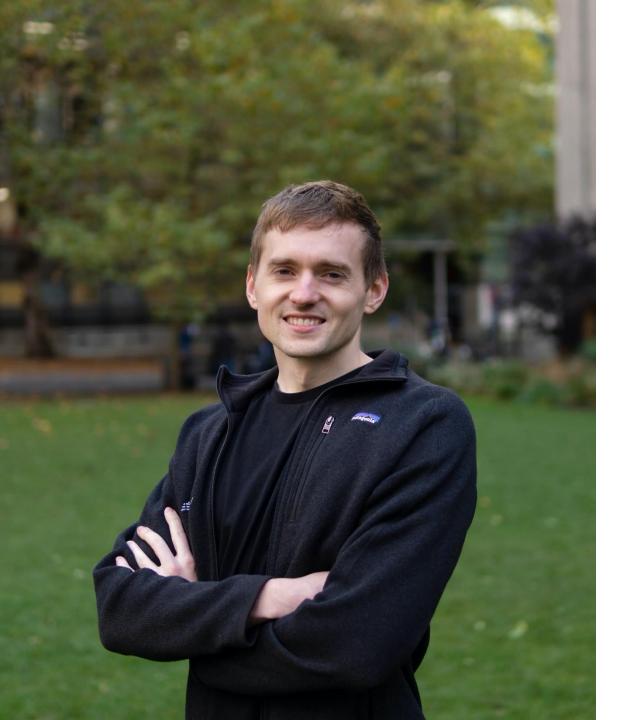
Gavin White, Ph.D. (About:Energy) Zachary Edel, Ph.D. (ThermoAnalytics)

ANALYTICS

Outline

- Introduction
- About:Energy's VOLTT database
- TAITherm thermal/electrical model
- Combined simulation results
- Conclusions





Gavin White

CEO / Co-founder



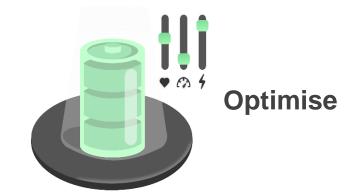
🖹 VOLTT	Cells							Q Se	arch
Dashboard	Show My C	Cells (Only)						Subs	cription ⊗ ∨ Columns 10 ∨
Cellector	Manufacturer	Model	Available data	Verified	Form factor	Capacity / Ah	Max continuous discharge / A	Price / \$	Positive electrode (Cathode)
00 Request	About:Energy	Genl Demo	î	v	Cylindrical 21700	5	7.5	5.00	NMC
	LG Chem	INR21700-M50	(7)	v	Cylindrical 21700	4.85	7.275	4.28	-
	Samsung	INR21700-40T	Ô	•	Cylindrical 21700	4	45	11.07	-
	LG Chem	INR21700-M50LT	1	I	Cylindrical 21700	4.9	14.4	7.99	-
	Murata	US21700VTC6A	Ô	v	Cylindrical 21700	4.1	40	8.07	-
	Samsung	INR18650-30Q	1	v	Cylindrical 18650	2.95	15	9.83	-
	Tesla	Tesla Model Y	1	•	Cylindrical 4680	23.7	50	-	-
	Panasonic	Tesla Model 3	1	•	Cylindrical 21700	4.8	21.6	-	-
	Lishen	LR2170SD	1	•	Cylindrical 21700	5	9.6	-	-
	Sony	US18650VTC6	1	v	Cylindrical 18650	3.12	30	-	-
	4								•
Bug Report	Showing 1-10 of 51	1 results							Previous
Settings									
ि Logout									

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ABOUT:ENERGY



Select





Benchmark





Your Virtual Lab





FACILITIES

Barriers to Battery Innovation

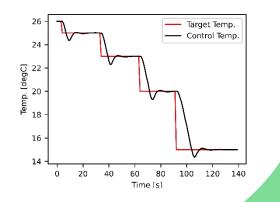




RESEARCH

EXPERTISE









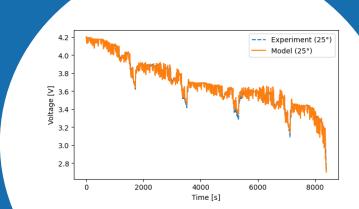


Thermal control

Teardown

Cell cycling protocols

Modelling





A look inside the Voltt

VOLTT	Cells					Q Search	
Dashboard	Show My Ce	ells (Only)				Subscription	Columns 7
Cells	Manufacturer	Model	Verified	Form factor	Capacity / Ah	Max continuous discharge / A	Price / \$
0 Request	About:Energy	Gen1 Demo	v	Cylindrical 21700	5	7.5	5.00
	LG Chem	INR21700-M50	I	Cylindrical 21700	4.85	7.275	4.28
	Samsung	INR21700-40T	I	Cylindrical 21700	4	45	11.07
	LG Chem	INR21700-M50LT	v	Cylindrical 21700	4.9	14.4	7.99
	Murata	US21700VTC6A	I	Cylindrical 21700	4.1	40	8.07
	Samsung	INR18650-30Q	I	Cylindrical 18650	2.95	15	9.83
	Tesla	Tesla Model Y	I	Cylindrical 4680	23.7	50	÷.
	Panasonic	Tesla Model 3	•	Cylindrical 21700	4.8	21.6	-
	Lishen	LR2170SD	v	Cylindrical 21700	5	9.6	-
Bug Report	Sony	US18650VTC6	•	Cylindrical 18650	3.12	30	
Settings	Showing 1-10 of 511	results		L3			Previous

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Going deeper: Advanced Datasheet

VOLTT	Cells					Q Search	
Dashboard	Show My Ce	ells (Only)				Subscription	Sv Columns 7
Cellector	Manufacturer	Model	Verified	Form factor	Capacity / Ah	Max continuous discharge / A	Price / \$
04 Request	About:Energy	Genl Demo	I	Cylindrical 21700	5	7.5	5.00
	LG Chem	INR21700-M50	I	Cylindrical 21700	4.85	7.275	4.28
	Samsung	INR21700-40T	I	Cylindrical 21700	4	45	11.07
	LG Chem	INR21700-M50LT	I	Cylindrical 21700	4.9	14.4	7.99
	Murata	US21700VTC6A	I	Cylindrical 21700	4.1	40	8.07
	Samsung	INR18650-30Q	I	Cylindrical 18650	2.95	15	9.83
	Tesla	Tesla Model Y	I	Cylindrical 4680	23.7	50	Ŧ
	Panasonic	Tesla Model 3	I	Cylindrical 21700	4.8	21.6	÷
	Lishen	LR2170SD	I	Cylindrical 21700	5	9.6	÷.
Bug Report	Sony	US18650VTC6	I	Cylindrical 18650	3.12	30	-
Settings	Showing 1-10 of 511	results	C ₂				Previous

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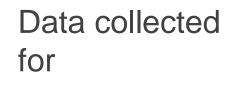
Want a battery model?

🖻 VOLTT	Cells					Q Search	
Dashboard	Show My (\searrow	Subscripti	on 📀 🗸 Columns 10 🗸
Cellector	Manufacturer	Model	Available data	Verified	Form factor	Capacity / Ah	Max continuous discharge / A
	About:Energy	Genl Demo	0	۷	Cylindrical 21700	5	7.5
	LG Chem	INR21700-M50	(7)	v	Cylindrical 21700	4.85	7.275
	Samsung	INR21700-40T	0	v	Cylindrical 21700	4	45
	LG Chem	INR21700-M50LT	0	•	Cylindrical 21700	4.9	14.4
	Murata	US21700VTC6A	0	v	Cylindrical 21700	4.1	40
	Samsung	INR18650-30Q	0	1	Cylindrical 18650	2.95	15
	Tesla	Tesla Model Y	0	•	Cylindrical 4680	23.7	50
器 Bug Report	Panasonic	Tesla Model 3	0	•	Cylindrical 21700	4.8	21.6
Settings	Lishen	LR2170SD	0	1	Cylindrical 21700	5	9.6
ြ Logout	Sony	115186501/TC6		•	Cylindrical 18650	כו ז	Z O

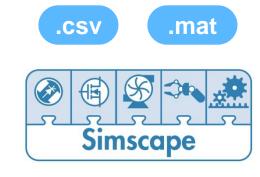
Want a battery model?

Dashboard	Genl Demo About:Energy 🕹 Li-ion 🔅 Cylindrical 21700 🥑 Ve	rified			← Back
Cells	Advanced Datasheet SModels 💼 Data				
Cellector	Advanced Parameters	b			
	Overview	+	Electrical	+	
	Economic	+	Degradation	+	
	Thermal	+	Chemistry	+	
	Geometry	+	Mechanical	+	
	- · ·				
器 Bug Report	Engineering Drawings Engineering Drawings and CT Scan Image				
(), Settings 단 Logout		0			

Equivalent Circuit Model







SIMULINK[®]

ICOMSOL



Model flavours ECM:Lumped ECM:3D ECM:Lumped:Network

ECM:3D:Network

User-Friendly

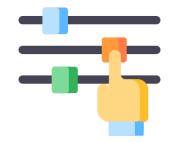


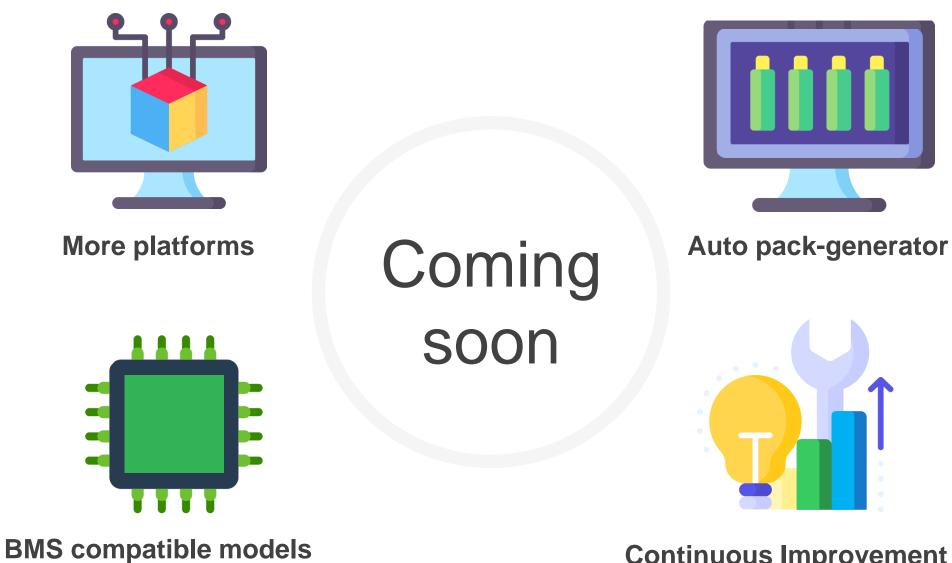
White-Box

Equivalent Circuit Model

Key features

In-house parameterisation





Continuous Improvement

More cells!



And even more cells!



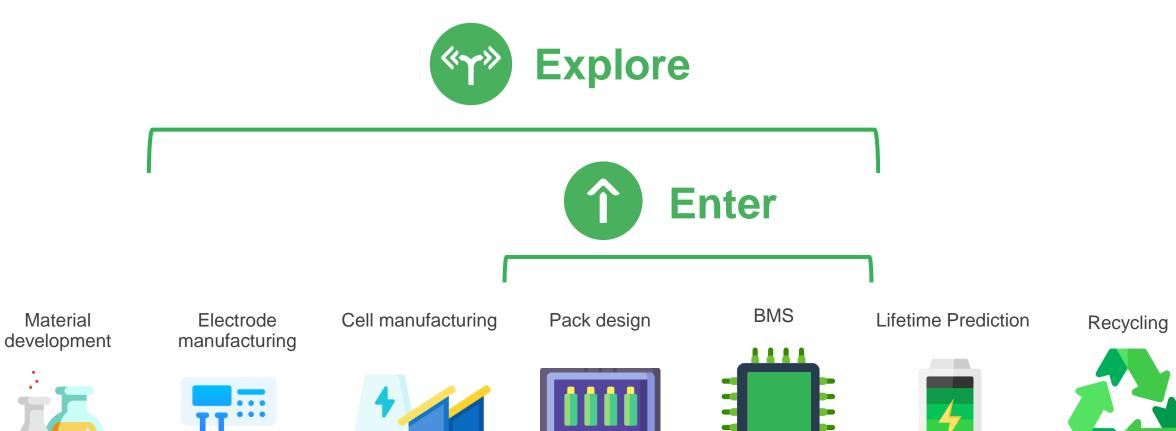


Enter

Explore

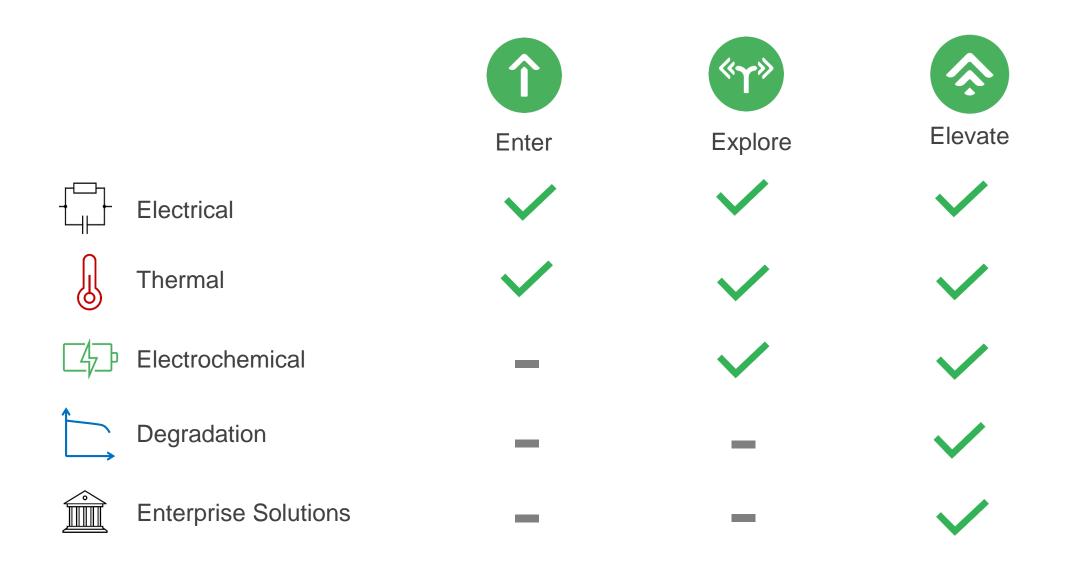


For those **beginning** their battery **development** process For those looking to leverage new technologies For those **positioning** themselves as industry **leaders**

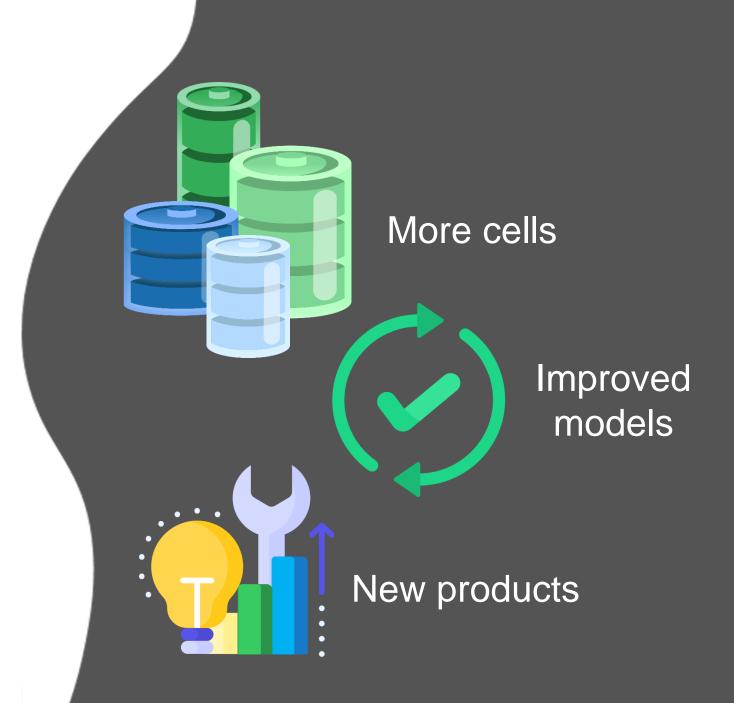


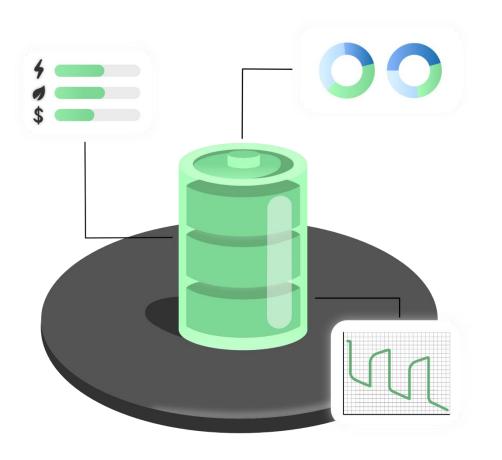


. . . .



Continuously improving





VOLT Unlocking the potential of battery technology

Objective

Given a five unique battery types from the $\frac{1}{2}$ VOLTT determine the difference in performance using simulation.

Battery Names

LG M50L

Samsung50S

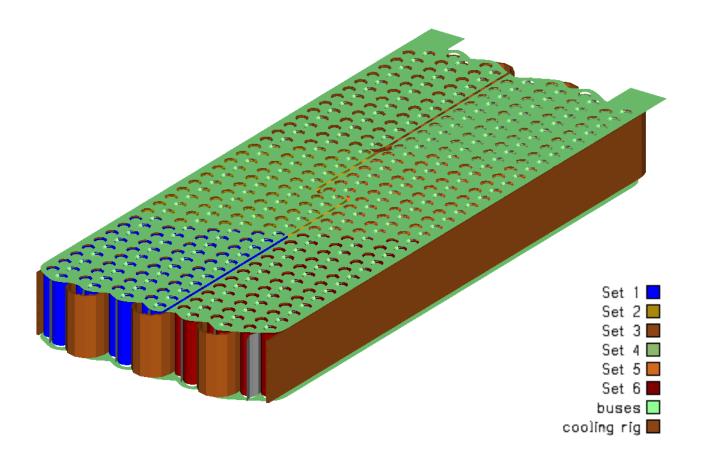
Samsung50E

Samsung48X

Lishen LR21700SF

- Operating scenarios
 - Constant current discharge (nominal 1C)
 - Drive cycle (IEEE EV Example)
- Heat sources
 - Battery cells
 - Bus bars
- Heat Exchanger
 - Input temperature taken from measurement (IEEE EV Example)

Thermal model setup



TAITherm model contains 444 cells split into 6 sets

Fluid streams are used to model cooling of the pack

Joule heating is applied to the bus geometry

Battery Setup in TAITherm

		– 🗆 ×	C CFEM MS0L battery.com/gtxt - Notepad
able Battery Modeling Extension			File Edit Format View Help ⊯ This is a 20 table representation of Vocv in cellTemp and DoD
ical Model	Electrical Source		(Vocv = cellTemp, DoD, {10, [0.00000, 0.04947, 0.09894, 0.14841, 0.19787, 0.24734, 0.29681, 0.34628, 0.39575, 0.44522, 0.49469, 0.54415, 0.59362, 0.64309, 0.69256, 0.74203, 0.79150, 0.84097, 0.89043, 0
ical model			+ [4.18455, 4.08257, 4.06613, 4.05708, 4.02281, 3.95959, 3.90965, 3.86997, 3.81432, 3.75184, 3.69526, 3.65028, 3.61603, 3.58453, 3.55074, 3.50995, 3.45573, 3.38550, 3.29221, 2
el Type: Equivalent Circuit	Source Type Current	~	 + (25, [0.00000, 0.04947, 0.09394, 0.14841, 0.19787, 0.24734, 0.29681, 0.34525, 0.39575, 0.44522, 0.49469, 0.54415, 0.59362, 0.6309, 0.69256, 0.74203, 0.79159, 0.84947, 0.89043, 0. + (4.18915, 4.09384, 0.40748, 4.64634, 4.02925, 3.95718, 3.91675, 3.36844, 3.82976, 3.7599, 3.15693, 3.65613, 3.51871, 3.46847, 3.40812, 3.34881, 3
ff Voltage (V) Value V 2.5	Imposed Current (A) Value V -370		+ [4,10315, 4,07305, 4,07470, 4,09430, 4,02450, 5,30710, 5,3170, 5,00044, 5,07570, 5,70539, 5,000530, 5,02514, 5,53470, 5,700530, 5,10173, 5,04071, 5,04073, 5,04150, 5,35415, 6,5356, 6,63250, 6,63260, 6,9256, 6,74203, 0,79150, 0,84097, 0,89043, 0
and a second sec	Signature of the Signature Sig		+ (1.872, 3.4.09964, 4.6.07972, 4.6.6804, 4.0.9084, 3.9.6935, 3.92100, 3.86434, 3.83800, 3.77157, 3.71383, 3.66533, 3.64389, 3.52355, 3.47564, 3.41022, 3.36399, 3
Buses			# This is a 2D table representation of Rs in cellTemp and DoD
0000			(Rs = cellTemp, DoD, {10, [0.00000, 0.04434, 0.08868, 0.13303, 0.17737, 0.22171, 0.26605, 0.31040, 0.35474, 0.39908, 0.44342, 0.48777, 0.53211, 0.57645, 0.62079, 0.66513, 0.70948, 0.75382, 0.79816, 0.8
		•	+ [0.025200, 0.026650, 0.022669, 0.022669, 0.02218, 0.02173, 0.02140, 0.02143, 0.02165, 0.02185, 0.02185, 0.02181, 0.02253, 0.02553, 0.02555, 0.0255
*			 + { (25) [0.000000, 0.04434, 0.08856, 0.13303, 0.17737, 0.21217, 0.20655, 0.31040, 0.35474, 0.39088, 0.41342, 0.48777, 0.53211, 0.57645, 0.62079, 0.66513, 0.70948, 0.79151, 0.2176, 0.1708, 0.01208, 0.01215, 0.01708, 0.01212, 0.01745, 0.01759, 0.01272, 0.01745, 0.01759, 0.01274, 0.01754, 0.01759, 0.01274, 0.0175
	tial Depth Capacity Resistance Electrode Area Heating	Current-Limiting Current-	+ [0.01900, 0.02010, 0.0110, 0.01011, 0.0170, 0.0172, 0.0172, 0.0172, 0.0100, 0.01000, 0.01090, 0.0173, 0.0170, 0.0172, 0.0172, 0.0172, 0.0174, 0.0174, 0.0174, 0.0175, 0.0155, 0.0155, 0.0155, 0.0175, 0.0175, 0.0175, 0.0175
in the Associated Geometry Cathode bus Anode bus of	Discharge (A-hr) Scale Factor (mm ²) Distribution	Resistance Enabled Resistar	+ (0.01621, 0.01590, 0.01561, 0.01551, 0.01551, 0.01488, 0.01479, 0.01481, 0.01476, 0.01484, 0.01514, 0.01486, 0.01516, 0.01516, 0.01532, 0.01533, 0.01572, 0.01484, 0.01484, 0.01484, 0.01514, 0.01484, 0.01516, 0.01516, 0.01512, 0.01532, 0.01553, 0.01572, 0.01484, 0.01484, 0.01484, 0.01484, 0.01484, 0.01514, 0.01484, 0.01516, 0.01516, 0.01512, 0.01532, 0.01553, 0.01572, 0.01484, 0.01484, 0.01484, 0.01484, 0.01484, 0.01514, 0.01484, 0.01516, 0.01516, 0.01512, 0.01532, 0.01553, 0.01572, 0.01484, 0.01484, 0.01484, 0.01514, 0.01484, 0.01516, 0.01516, 0.01512, 0.01553, 0.01572, 0.01484, 0.01484, 0.01484, 0.01514, 0.01516, 0.01516, 0.01512, 0.01553, 0.01572, 0.01484, 0.01484, 0.01484, 0.01484, 0.01484, 0.01484, 0.01484, 0.01484, 0.01484, 0.01516, 0.01516, 0.01532, 0.01553, 0.01572, 0.01553, 0.01572, 0.01553, 0.01553, 0.01553, 0.01553, 0.01553, 0.01572, 0.01484, 0.01484, 0.01484, 0.01484, 0.01484, 0.01484, 0.01516, 0.01516, 0.01532, 0.01553, 0.01572, 0.01484, 0.01484, 0.01484, 0.01484, 0.01484, 0.01484, 0.01484, 0.01484, 0.01484, 0.01484, 0.01484, 0.01484, 0.01484, 0.01484, 0.01516, 0.01516, 0.01532, 0.01553, 0.01572, 0.01553, 0.01572, 0.01553, 0.01572, 0.01553, 0.01572, 0.01553, 0.01572, 0.01553, 0.01553, 0.01553, 0.01553, 0.01553, 0.01552, 0.01553, 0
1 Cell_1 283: cell_ir_1 Pack Positive Te Connector_1	0 4.5 1 Value: 3634 All Layers Fi	False	# This is a repeated 2D table representation of the Ris
2 Cell_2 286: cell_jr_2 Pack Positive Te Connector_1	0 4.5 1 Value: 3634 All Layers Fi	False	(Ri = cellTemp, DoD, <{10, [0.00000, 0.04434, 0.08868, 0.13303, 0.17737, 0.22171, 0.26605, 0.31040, 0.35474, 0.39908, 0.44342, 0.48777, 0.53211, 0.57645, 0.62079, 0.66513, 0.70948, 0.75382, 0.79816, 0.
			+ [0.00437, 0.00254, 0.003254, 0.00332, 0.00468, 0.00551, 0.00568, 0.00513, 0.00355, 0.002244, 0.00274, 0.00332, 0.00334, 0.00438, 0.00513, 0.00638, 0.0
3 Cell_3 289: cell_jr_3 Pack Positive Te Connector_1	0 4.5 1 Value: 3634 All Layers Fi	False	+ {25, [0.00000], 0.0434, 0.08856, 0.1330, 0.1777, 0.21217, 0.2065, 0.31040, 0.35474, 0.39968, 0.44342, 0.48777, 0.53211, 0.57645, 0.62073, 0.66513, 0.70948, 0.73828, 0.79516, 0.8 + (0.0027), 0.00271, 0.00251, 0.00251, 0.00154, 0.00452, 0.00452, 0.00452, 0.00253, 0.00274, 0.00288, 0.00314, 0.00214, 0.00216, 0.00255, 0.00255, 0.00255, 0.00255, 0.00255, 0.00255, 0.00256, 0.0025
4 Cell_4 292: cell_jr_4 Pack Positive Te Connector_1	0 4.5 1 Value: 3634 All Layers Fi	False	+ (5), (6), (6), (6), (6), (6), (6), (6), (7), (7), (7), (7), (7), (7), (7), (7
5 Cell 5 295: cell jr 5 Pack Positive Te Connector 1	0 4.5 1 Value: 3634 All Layers Fi	False	+ [0.00285, 0.00286, 0.00303, 0.00259, 0.00237, 0.00338, 0.00426, 0.00442, 0.00442, 0.00237, 0.00237, 0.00209, 0.00279, 0.00272, 0.00272, 0.00286, 0.00164, 0.00173, 0.0
		False	+ <{10, [0.00000, 0.04434, 0.08868, 0.13303, 0.17737, 0.22171, 0.26605, 0.31040, 0.35474, 0.39908, 0.44342, 0.48777, 0.53211, 0.57645, 0.62079, 0.66513, 0.70948, 0.75382, 0.79816, 0.
		raise	+ [0.00645, 0.00798, 0.01010, 0.01193, 0.01221, 0.01164, 0.01149, 0.01138, 0.01019, 0.00822, 0.00768, 0.00848, 0.00993, 0.01239, 0.01536, 0.01795, 0.01387, 0.01130, 0.01086, 0.0
7 Cell_7 301: cell_jr_7 Pack Positive Te Connector_1	0 4.5 1 Value: 3634 All Layers Fi	False	 + (25, [0.00000, 0.04434, 0.08856, 0.13303, 0.17737, 0.21217, 0.20655, 0.31040, 0.35474, 0.39086, 0.44342, 0.48777, 0.53211, 0.57645, 0.62079, 0.06513, 0.07045, 0.02795, 0.00276, 0.01075, 0.00276, 0.01075, 0.00276, 0.01075, 0.00276, 0.01075, 0.00276, 0.01075, 0.00276, 0.01075, 0.01226, 0.010030, 0.00220, 0.000796, 0.01075, 0.01076, 0.01075, 0.01226, 0.010030, 0.00020, 0.00796, 0.01075, 0.01076, 0.01075, 0.01266, 0.010030, 0.00027, 0.00756, 0.01075, 0.01076, 0.01075, 0.01276, 0.01076, 0.01075, 0.01260, 0.00037, 0.01075, 0.00076, 0.01075, 0.00076, 0.01075, 0.01076, 0.01075, 0.01076, 0.01075, 0.01076, 0.01075, 0.00076, 0.01075, 0.01075, 0.01076, 0.01075, 0.01075, 0.01076, 0.01075, 0.01076, 0.01075, 0.01075, 0.01075, 0.01075, 0.01075, 0.01075, 0.01075, 0.01075, 0.01075, 0.01075, 0.01075, 0.01075, 0.01075, 0.01075, 0.01075, 0.01075, 0.01075, 0.01056, 0.01075, 0.010
8 Cell_8 304: cell_ir_8 Pack Positive Te Connector_1	0 4.5 1 Value: 3634 All Layers Fi	False	+ [0.00000, 0.00039, 0.00039, 0.00039, 0.00073, 0.00079, 0.00129, 0.000729, 0.00729, 0.00729, 0.00079, 0.00070, 0.00000, 0.0000, 0.0000, 0.0000, 0.0000, 0.00070, 0.00070, 0.00070, 0.0
9 Cell_9 376: cell_jr_9 Pack Positive Te Connector_1	0 4.5 1 Value: 3634 All Lavers Fi	False	+ [0.00094, 0.00152, 0.00192, 0.00347, 0.00501, 0.00580, 0.00697, 0.00815, 0.00820, 0.00639, 0.00382, 0.00562, 0.006561, 0.00777, 0.00838, 0.00592, 0.00592, 0.0
			# This is a 1D repeated table for the time constants (values in seconds)
10 Cell_10 379: cell_jr_10 Pack Positive Te Connector_1		False	(TC = cellTemp, <[[18.0, 25.0, 45.0], [4.4581398, 4.1013721, 4.3580139]}, + [10.0, 25.0, 45.0], [65.1684573, 52.9584573, 24.9582723]})
11 Cell_11 382: cell_jr_11 Pack Positive Te Connector_1	0 4.5 1 Value: 3634 All Layers Fi	False	+ <{[1,10:0, 23:0, 43:0],[03:10024/3, 32:3904322, 40:302/323]}>) #
12 Cell 12 385: cell jr 12 Pack Positive Te Connector 1	0 4.5 1 Value: 3634 All Layers Fi	False V	(dudT=DoD,{[0.00,0.05,0.10,0.15,0.20,0.25,0.30,0.35,0.40,0.45,0.50,0.55,0.60,0.65,0.70,0.75,0.80,0.85,0.90,0.98,1.00],
		>	+ [0.00,0.00,0.00,0.00,0.00,0.00,0.00,0.0

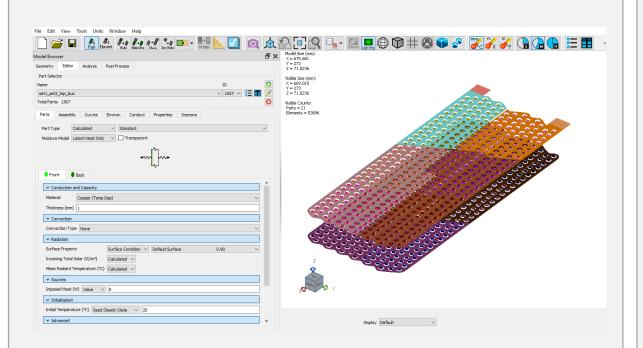
Inputs are defined in the **Battery Setup** in TAITherm and in a **battery.config.txt** file that is stored in the same directory as the TDF file.

There two inputs define the electrical set-up and cell specifics of a particular battery.

Joule Heating Setup

Thermal Model

- Continuous geometry
- Thermal boundary conditions
- Initial conditions
- Some electrical parameters, such as curves



Electrical Setup File

- Definition of electrical parts
- Electrical boundary conditions
- Electrical attributes
- Contact heating attributes

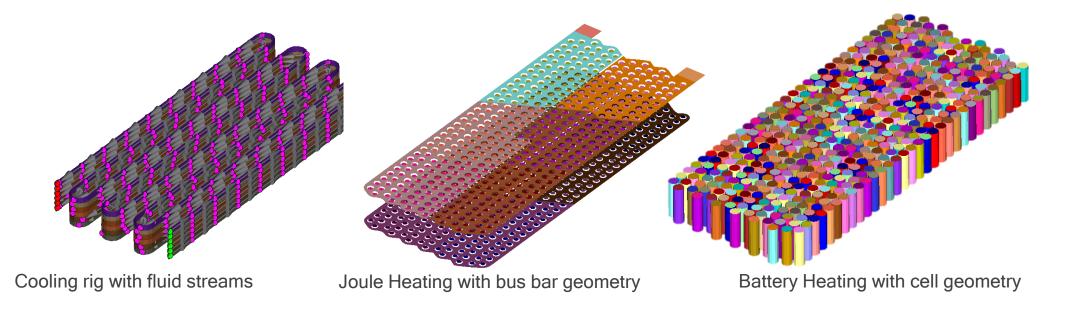
Section Start: Glo	bal Parameters							
Default Contact	Re 1.00E-06							
Section Start: Te	rminal Parameters							
Set Number	Component Type	Associate	Thermal Conductivity	Electrical	Electrical	Solver Vo	Number of	Insulation Laye
	1 Positive Terminal	1572	Curve: Copper, TempDep	Current	-370	0	0	
	1 Negative Terminal	1567	Curve: Copper, TempDep	Voltage	0	0	0	
	2 Positive Terminal	1577	Curve: Copper, TempDep	Current	-370	0	0	
	2 Negative Terminal	1570	Curve: Copper, TempDep	Voltage	0	0	0	
	3 Positive Terminal	1562	Curve: Copper, TempDep	Current	-370	0	0	
	3 Negative Terminal	1574	Curve: Copper, TempDep	Voltage	0	0	0	
	4 Positive Terminal	1575	Curve: Copper, TempDep	Current	-370	0	0	
	4 Negative Terminal	1568	Curve: Copper, TempDep	Voltage	0	0	0	
	5 Positive Terminal	1564	Curve: Copper, TempDep	Current	-370	0	0	
	5 Negative Terminal	1573	Curve: Copper, TempDep	Voltage	0	0	0	
	6 Positive Terminal	1576	Curve: Copper, TempDep	Current	-370	0	0	
	6 Negative Terminal	1569	Curve: Copper, TempDep	Voltage	0	0	0	
	7 Positive Terminal	1565	Curve: Copper, TempDep	Current	-370	0	0	
	7 Negative Terminal	1571	Curve: Copper, TempDep	Voltage	0	0	0	
Section Start: Le	ad Parameters							
Set Number	Component Type	Associate	Thermal Conductivity	Electrical	Max Temp	Number o	f Insulatior	1 Layers
	1 Lead	1566	Curve: Copper, TempDep	5.00E+07	1000	0		
	2 Lead	1561	Curve: Copper, TempDep	5.00E+07	1000	0		
	3 Lead	1563	Curve: Copper, TempDep	5.00E+07	1000	0		
	4 Lead	1560	Curve: Copper, TempDep	5.00E+07	1000	0		
	5 Lead	1557	Curve: Copper, TempDep	5.00E+07	1000	0		
	6 Lead	1558	Curve: Copper, TempDep	5.00E+07	1000	0		
	7 Lead	1559	Curve: Copper, TempDep	5.00E+07	1000	0		
Section Start: Co	ntact Parameters							
Set Number	Component Type	First Geor	Second Geometry ID	Contact R	esistance			

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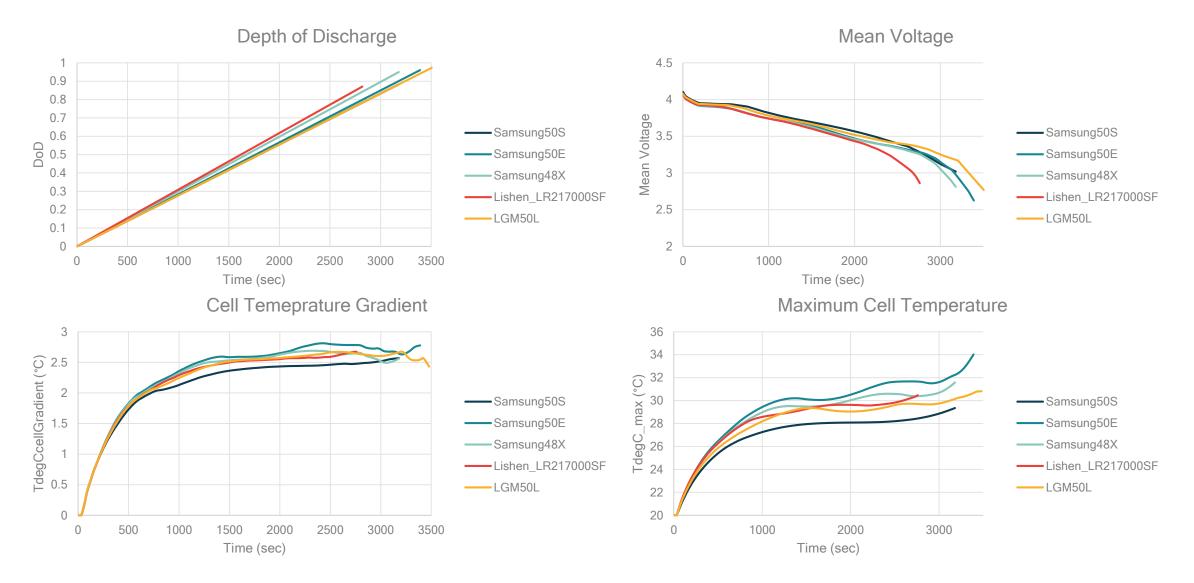
Constant current models

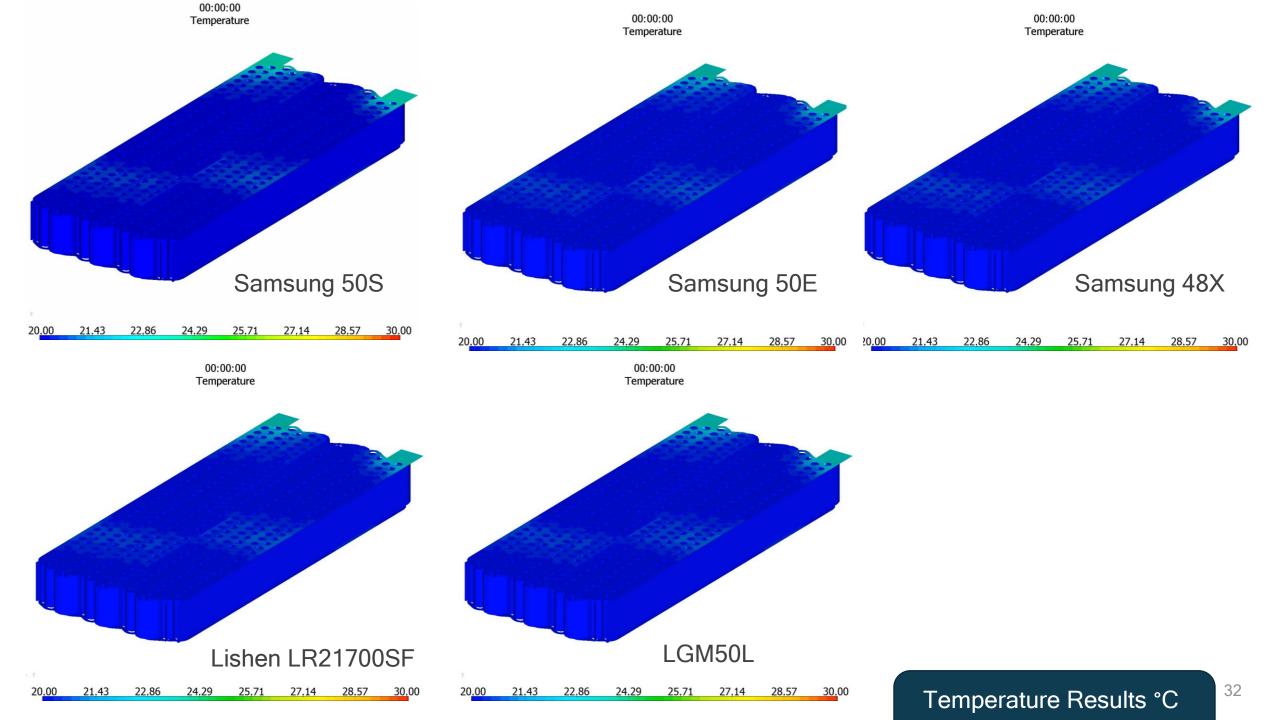
Imposed Current Pack	Initial Depth of Discharge	Cutoff Voltage
-370 A	0	2.5 V

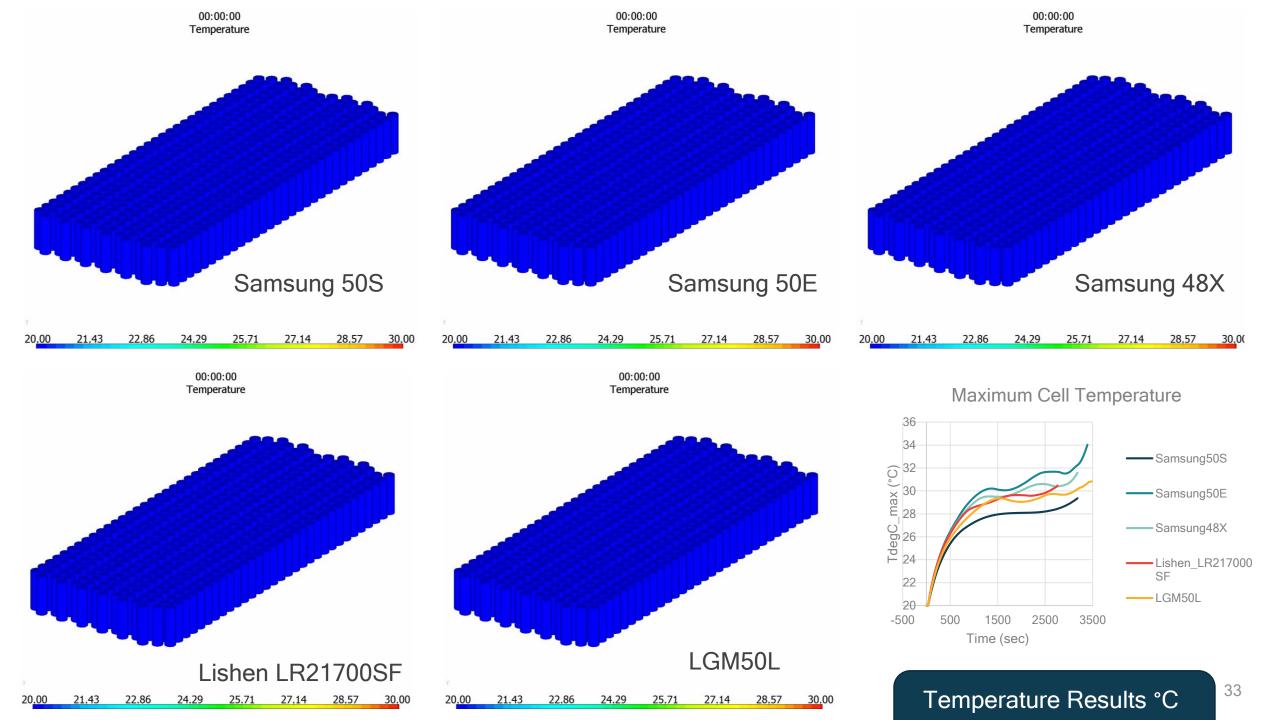
Models run until the cutoff voltage is reached.

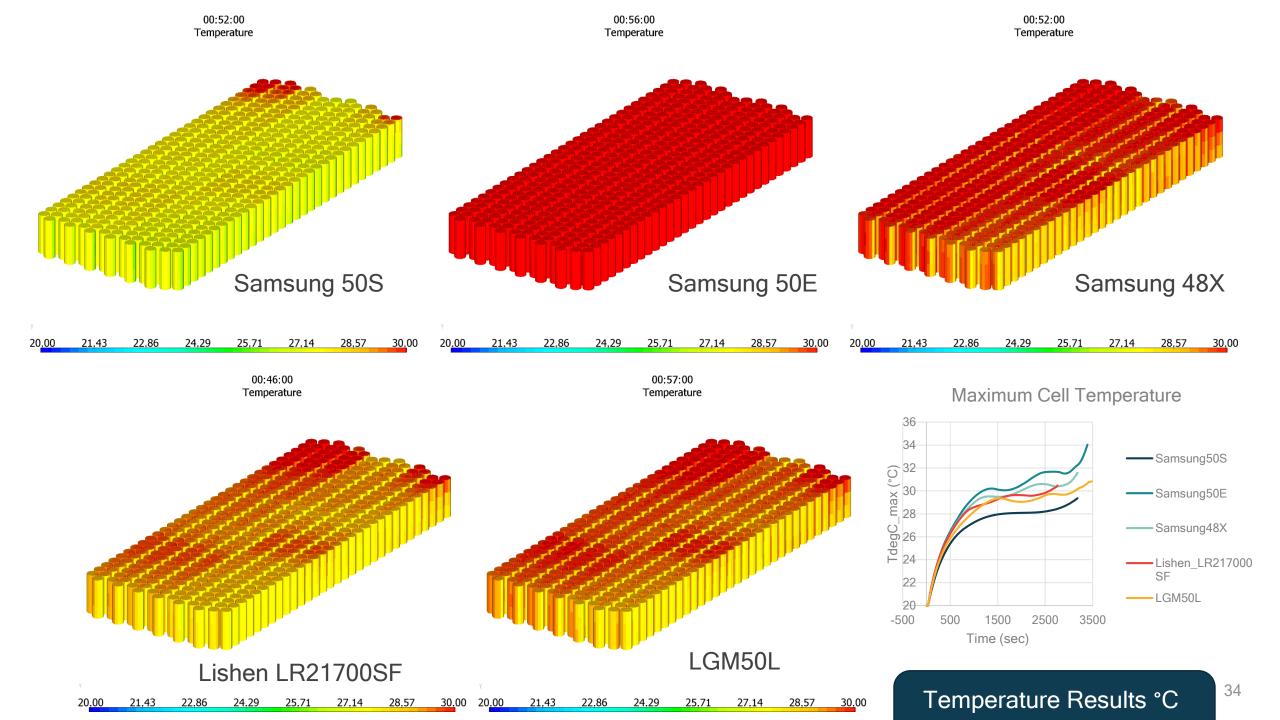


Constant Current Results

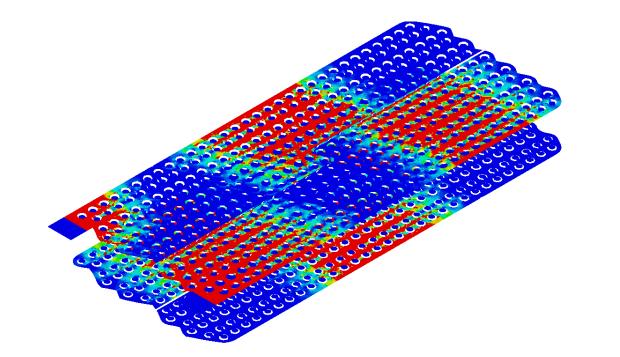








Joule Heating

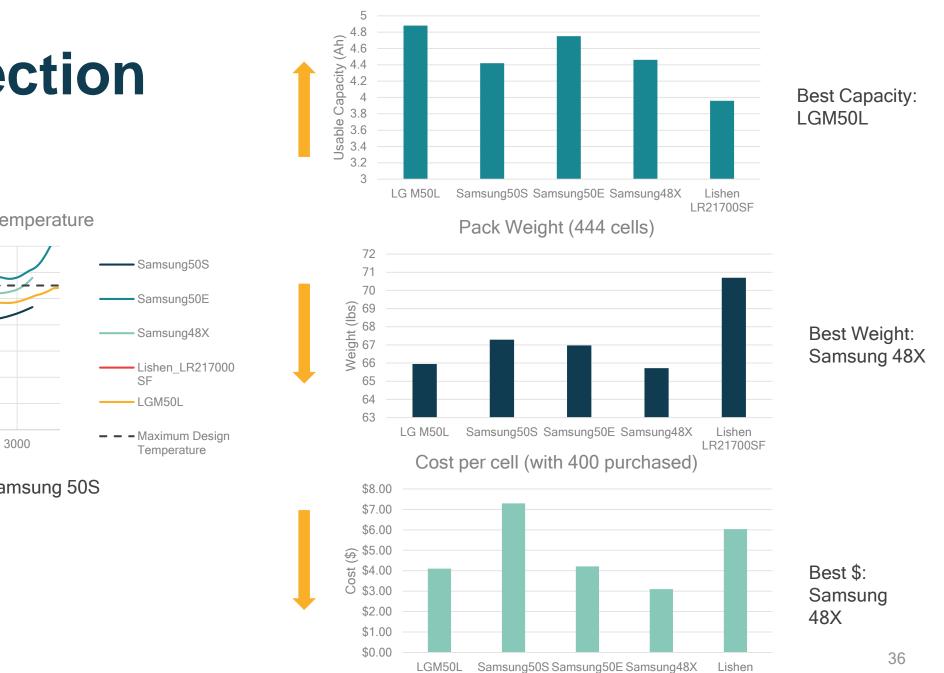


Imposed heat due to joule heating is mostly constant during the simulation. This is due to the constant imposed current in the model.

0.00 2.86e-05 5.71e-05 8.57e-05 1.14e-04 1.43e-04 1.71e-04 2.00e-04

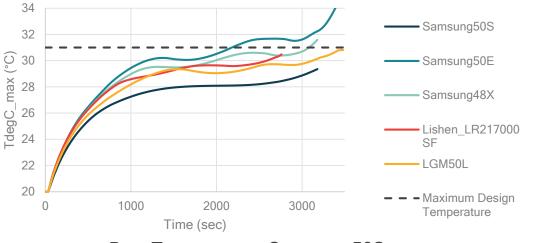
Cell Selection

Usable Capacity Comparison



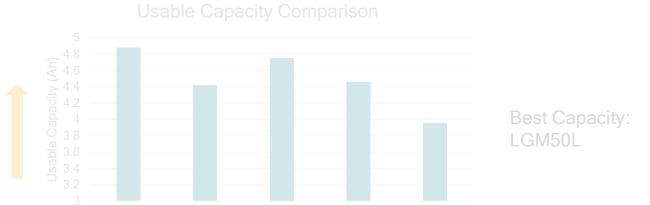
LR21700SF

Maximum Cell Temperature

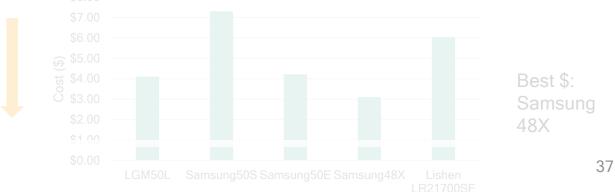


Best Temperature: Samsung 50S

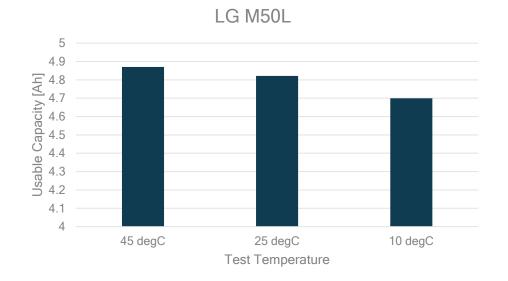
Cell Selection



		Weight		Samsung 50S	Samsung 50E	Samsung 48X	Lishen LR21700SF	
32 () 30	 Max cell temp	7	5	9	1	3	6	
	Usable Capacity	9	9	5	8	5	3	st Weight: msung 48X
22 -	Weight	4	8	5	6	9	1	
	Cost	4	7	2	7	9	3	
	Seat remperature. Oc	inisuna 505	176	136	131	138	85	

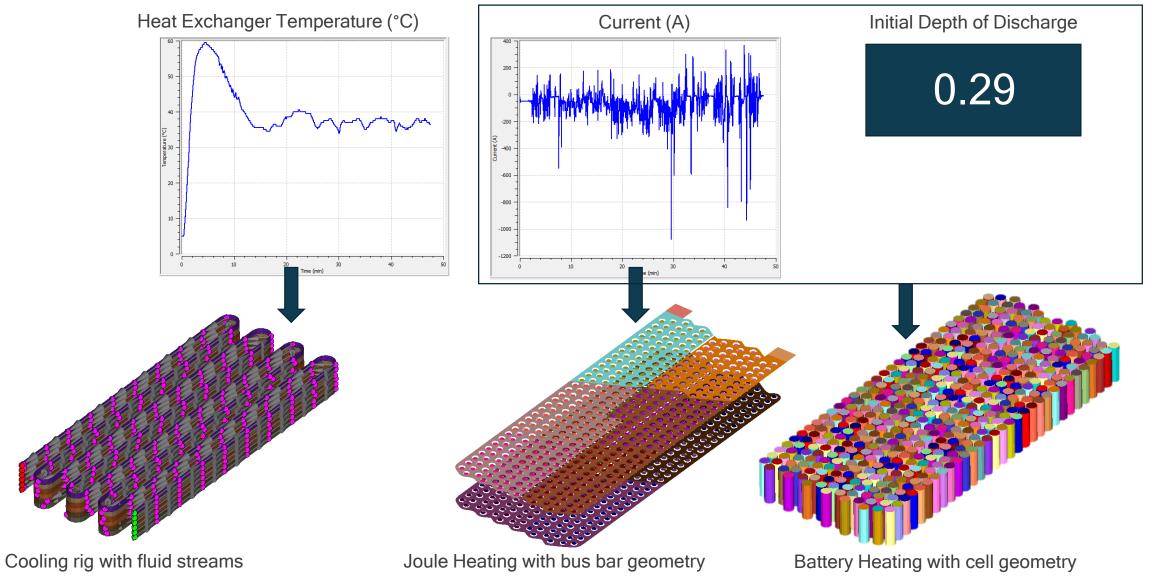


Battery Performance – Varying Temperature and Current

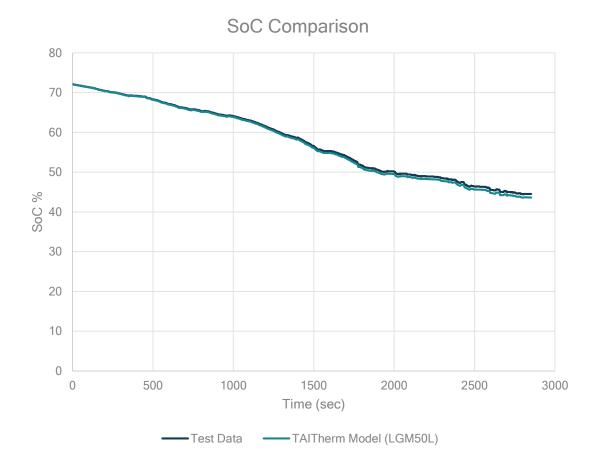




Model Drive Cycles

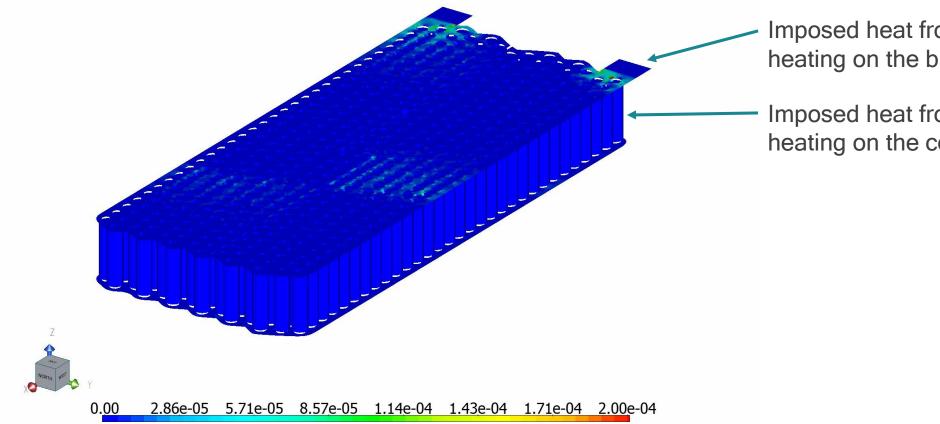


State of Charge Comparison



LGM50L Drive Cycle Results

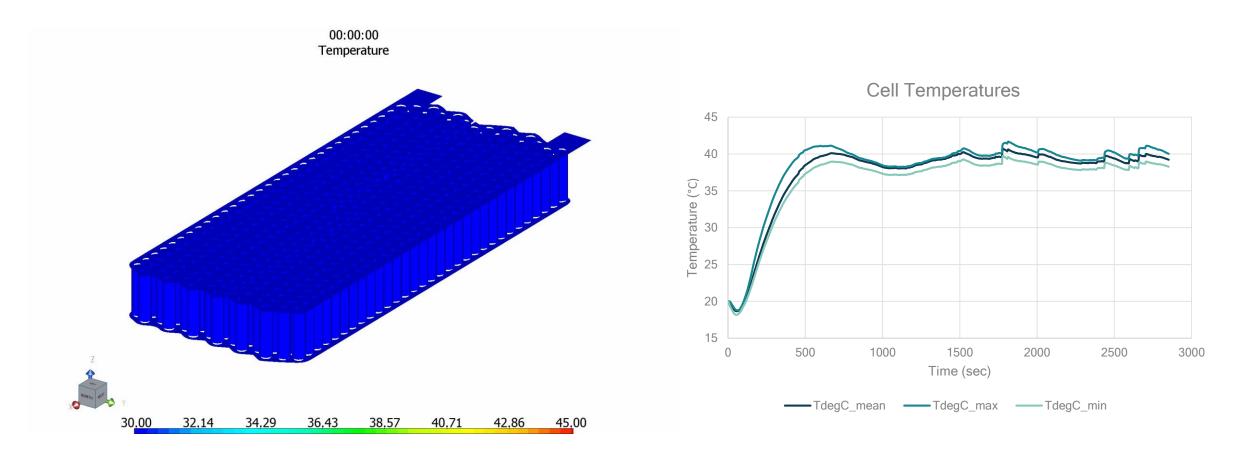
00:00:00 Net Imposed Heat



Imposed heat from joule heating on the bus geometry

Imposed heat from battery heating on the cell geometry

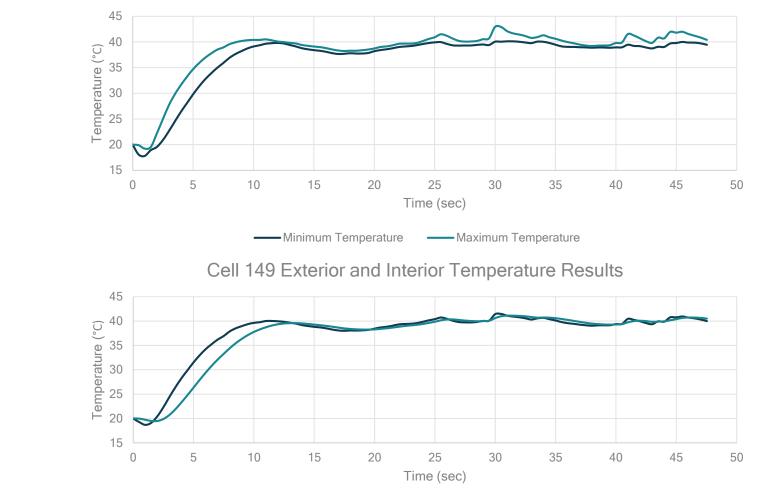
LGM50L Drive Cycle Results

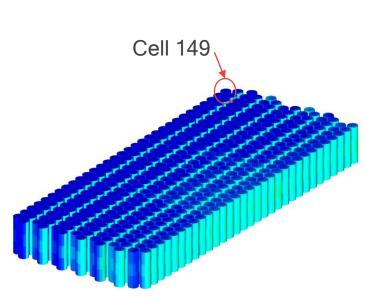


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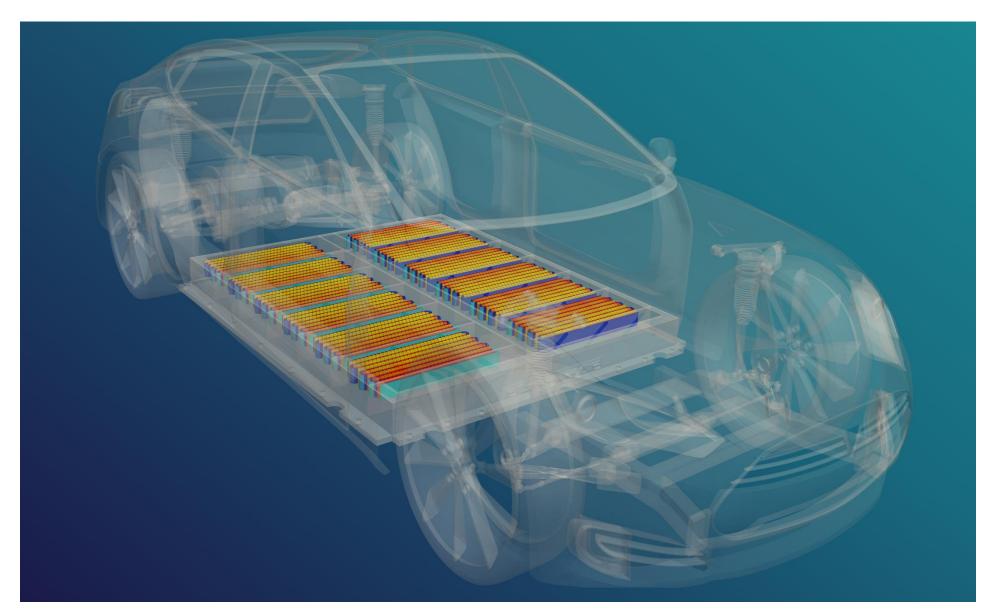
LGM50L Drive Cycle Results

Cell 149 Exterior Temperature Results





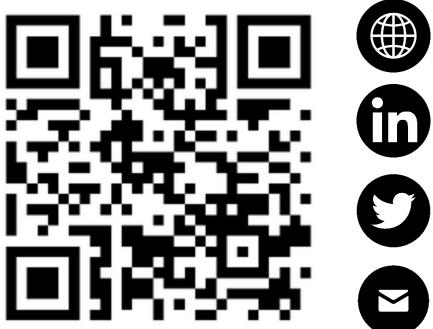
Next Steps



Conclusions

- About: Energy's 2/OLTT database can be used with TAITherm to aide in the selection of battery cells from over 400 commercially available alternatives
- Models include thermal properties and are available in ECM, split-ECM, SPM, and DFN format
- A 3D thermal/electric battery pack model aids in the selection of cells, and is improved by considering 1D fluid streams in ribbon coolers, Joule heating in bus bars, and cell balancing in the electrical equations
- The LG M50L was chosen as the cell of choice for this application, due to the highest usable capacity, moderate weight, and reasonable price
- Come to our booth at upcoming conferences, such as SAE TMSS 2023, where we will be presenting this work in more detail!

Get in touch





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