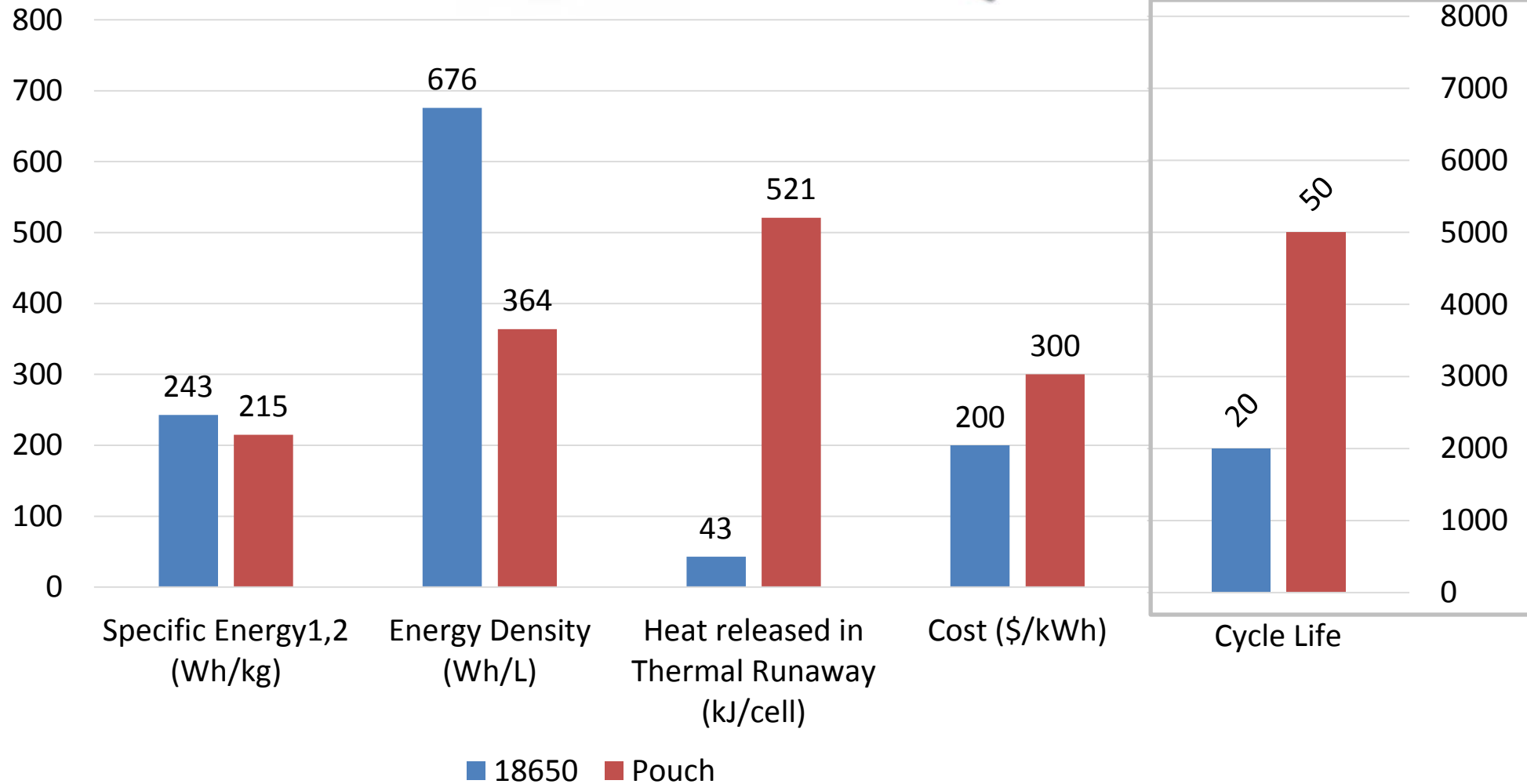

Cylindrical vs. Prismatic Cells: Life, Safety, Cost

Does Shape Matter?





VS.

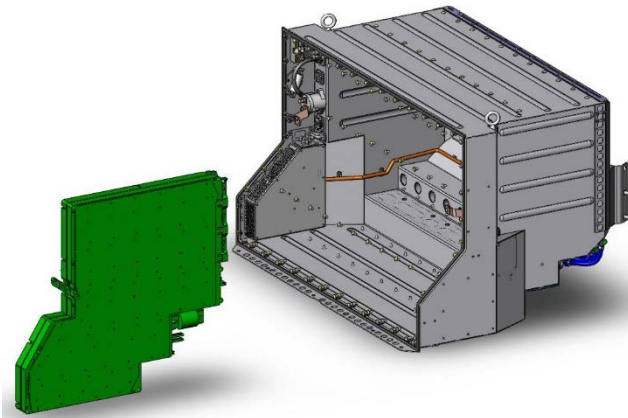


Practical Considerations

- Interchangeability – Samsung, Panasonic, LG, Sony, etc. offer virtually identical options

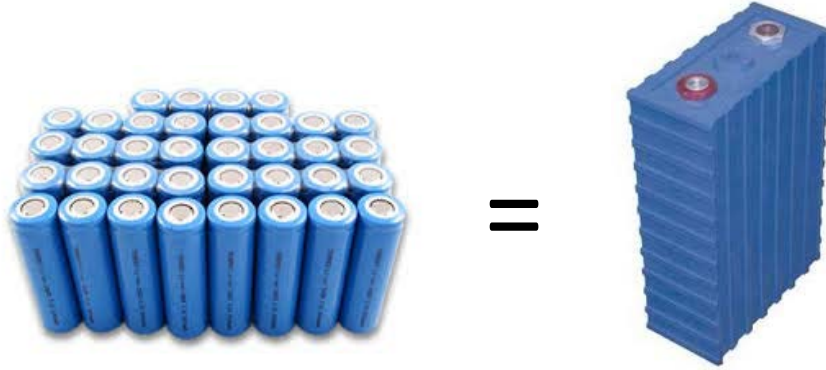


- Configurability – Could you do this with pouches?

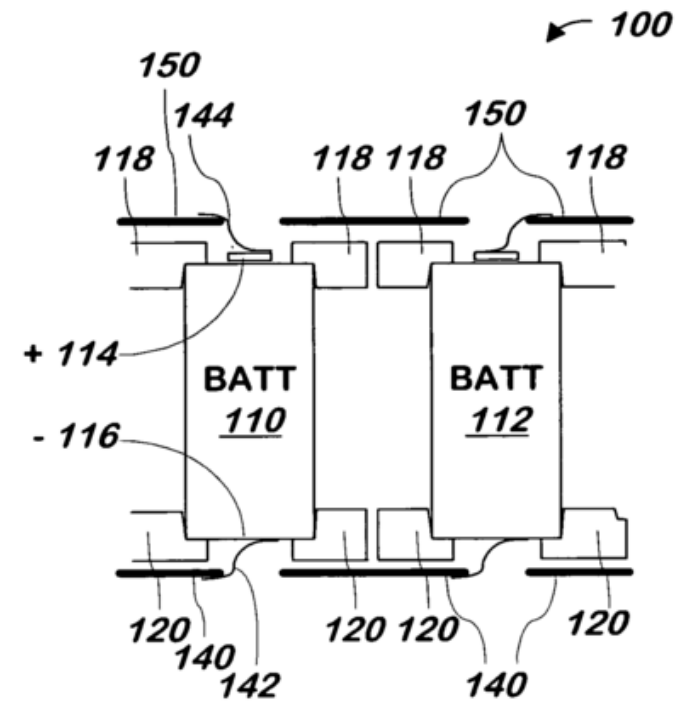


Only a Niche Product?

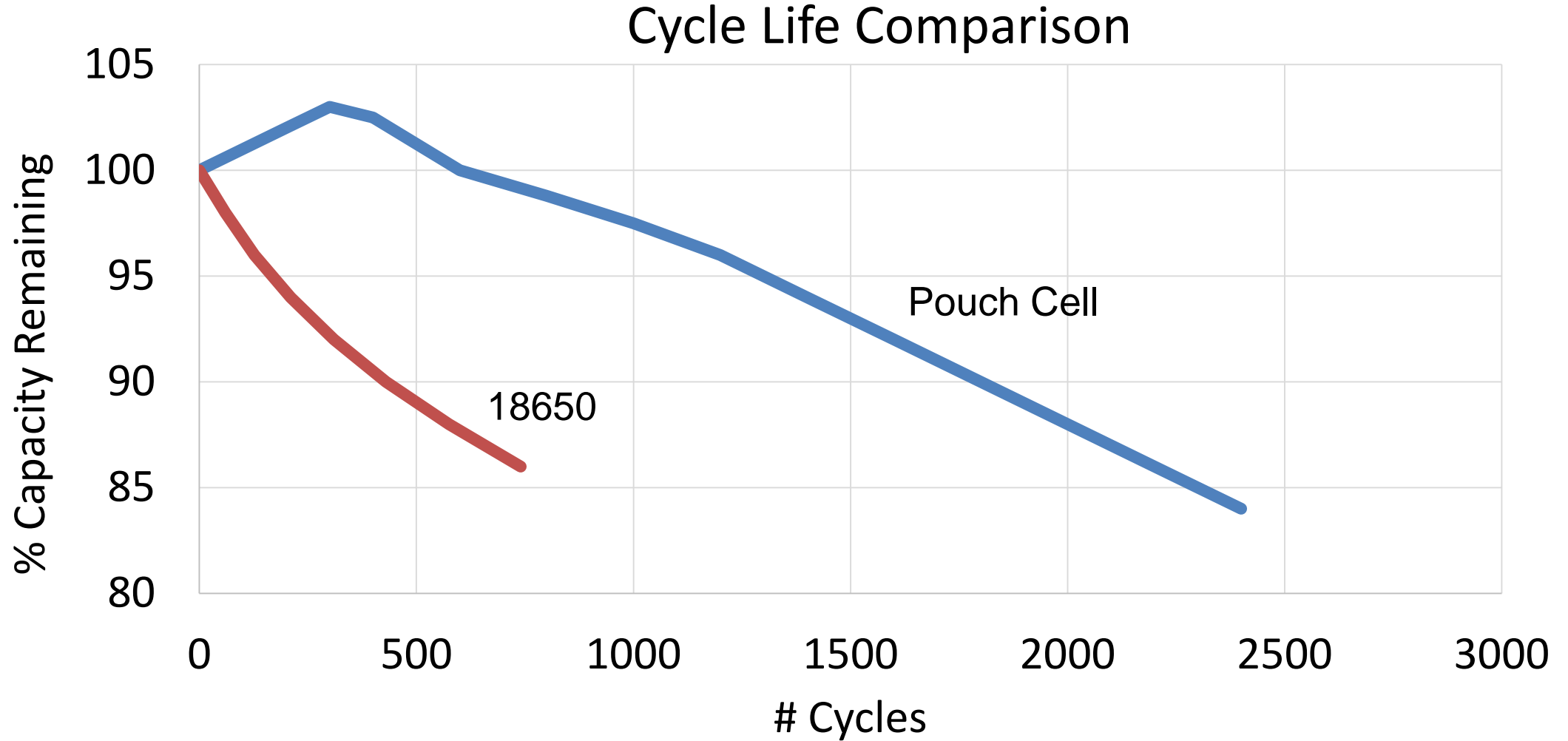
- More assembly time, labor, and material



- More complex pack electrical design



The Big Reason for Large Format



The Big Reason for Small Format

Single Cell failure
(large format)

Single Cell
failure
(small
format)

ALLCELL

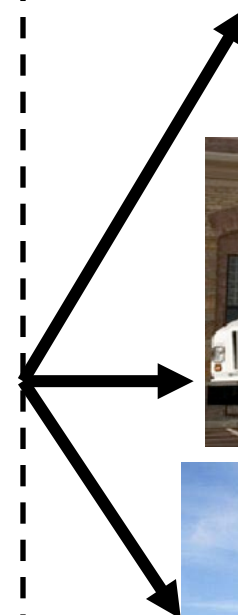
cool by design



+



=



PCC Material
(patented)

Hybrid and Electric Delivery Truck

- Customer makes hybrid and electric delivery trucks
- Battery systems are 60 and 120 kWh at 612V
- AllCell has brick configurable to 1s or 2s options

Advantages	Disadvantages
Configurability	Less cycle life
Lack of reliance on one supplier	Slower charge



All Terrain Vehicle

- All electric off-road 4WD rec-utility vehicle
- System is 100V, 100Ah with 450A discharge peak
- AllCell provides 45 cell brick in unique shape

Advantages	Disadvantages
Unique shape configurability	Less cycle life
Good power and energy to volume	High power+energy costs more



Material Handling

- Automated Material Handling Robots
- Systems 24 and 48V, 2-10 kWh
- AllCell has 70 cell brick configurable to 7.2V, 99Ah or 3.6V, 198Ah options

Advantages	Disadvantages
Can efficiently make small packs	Less cycle life
Custom shapes	Slower charge



Stationary: Frequency Regulation

- Frequency Regulation battery-inverter systems perform continuous shallow cycle operation at power up to 2C
- Battery systems are typically 500-1000V and 125kWh-1MWh
- AllCell has 105-348 Ah bricks

Advantages	Disadvantages
Comparable cycle life (theory)	Lower power
Safer	Higher cost (artificial?)

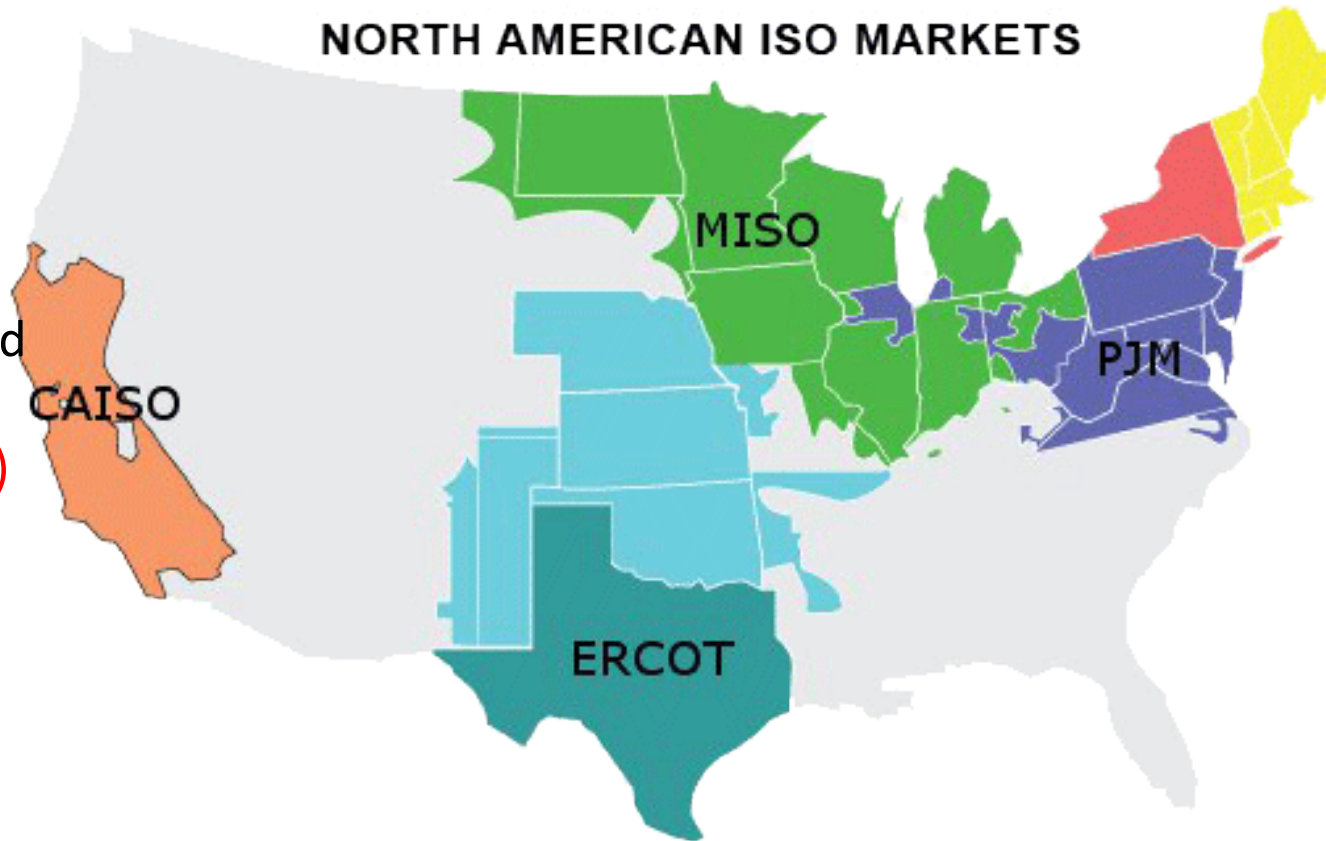


Is Frequency Regulation a Market Driver?

NORTH AMERICAN ISO MARKETS

CAISO

- 300 TWh/yr delivered
- 265 MW frequency regulation (*estimate*)



PJM

- 791 TWh/yr delivered
- 700 MW frequency regulation

AB2514 → 1.3 GW energy storage mandate

1.3 GW >> 265 MW

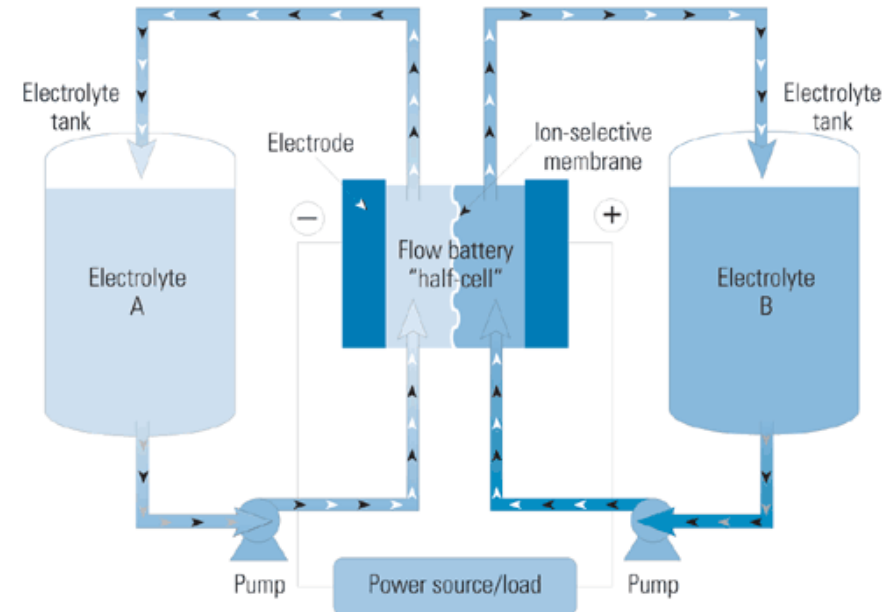
If low power is the future...



VS.



VS.



Conclusion

- In a truly non-committal statement: Cylindrical cells and large format cells each have distinct advantages and disadvantages
- Slightly more specifically: Large format cells seem to have more theoretical advantages, but:
 - Need to prove that costs will drop as volumes increase
 - Harder to contain thermal runaway
 - Sometimes real world issues will override advantages

Thank You!

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