Receive Update on Battery Electric Multiple Unit (BEMU) Project

Community Advisory Committee
September 16, 2026
Agenda Item 9

Caltrain

Battery-Electric Multiple Unit (BEMU)

- First US Major Passenger Rail BEMU Deployment
- Achieving Zero Emission, Decarbonization Policy
- Extend Electric Service beyond Wired Territory using on-board Battery
- First of Kind Bi-level Battery KISS in the World
- It is a National Demonstration Project

BEMU Overview Continued

- BEMU Pilot Project is for one, four-car trainset
- Project use case: Service from San Jose to Gilroy
- Demonstration use case: San Jose to Salinas
- Initial Maximum Authorized Speed (MAS) will be 79 mph
- Designed/tested for up to 110 mph

Location

- Tamien to Gilroy (off wire): 28 miles
- San Jose to Salinas: 68 miles

BEMU: Trainset

Battery
BB-car

C-car

D-car

A-car

Power Car

Restroom Car

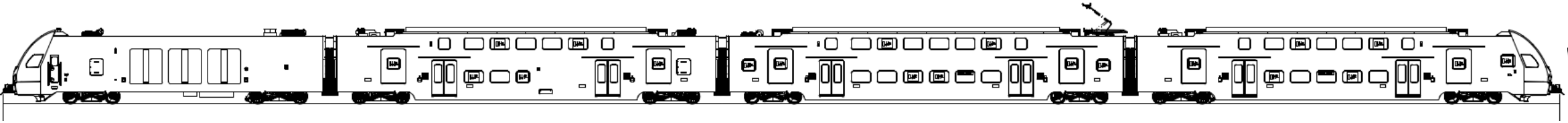
Bike Car

Cab Car

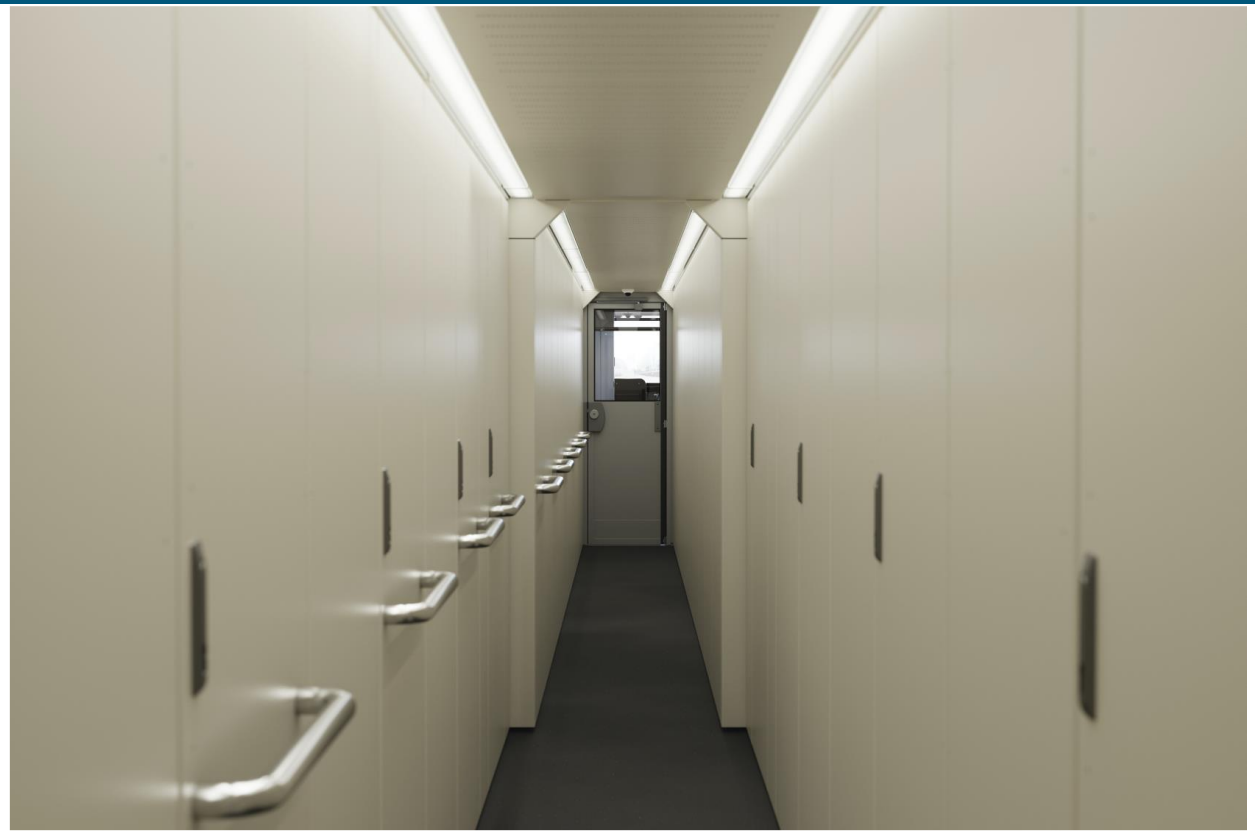
- BEMU Cars A, C, and D identical to EMU cars

BEMU: BB-Car Cab

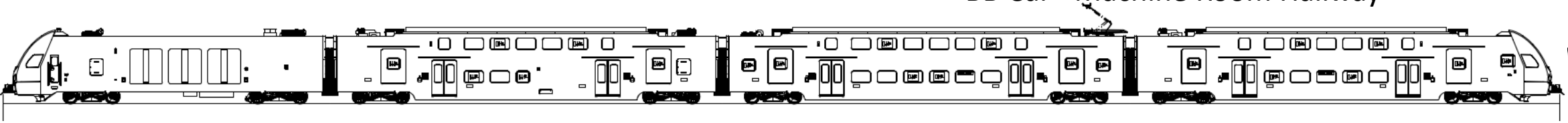
- Cab will be the same as EMU cab, except for:
  - Side doors for cab access
  - Console additions:
    1. Power source selector switch
    2. Battery cutoff pushbutton



BEMU: BB-Car Cab



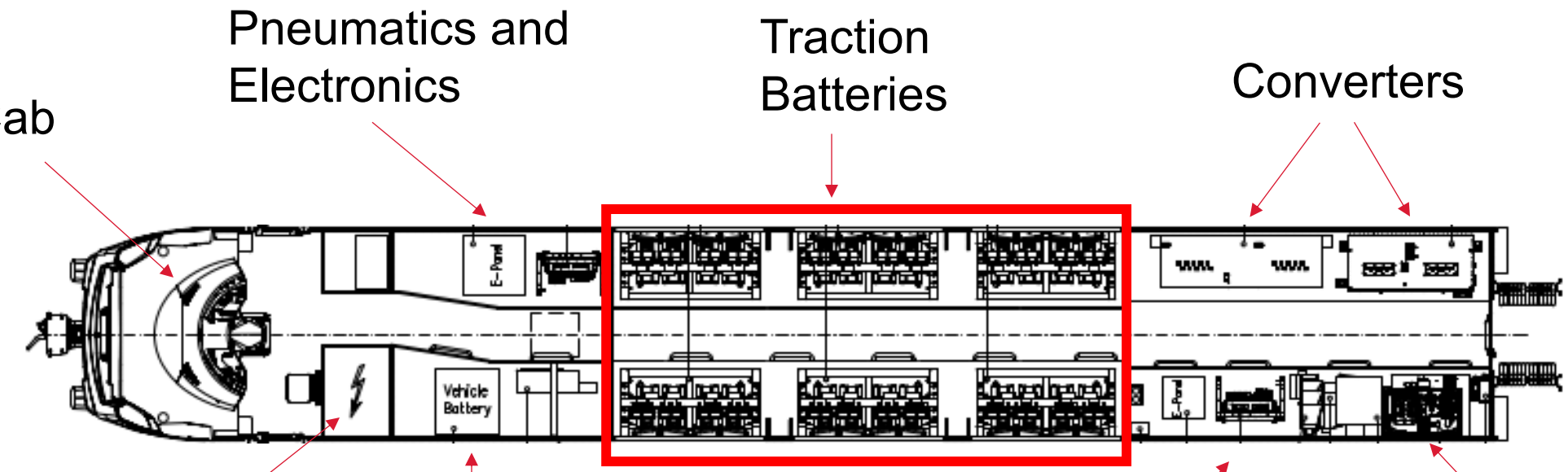
BB Car –Machine Room Hallway



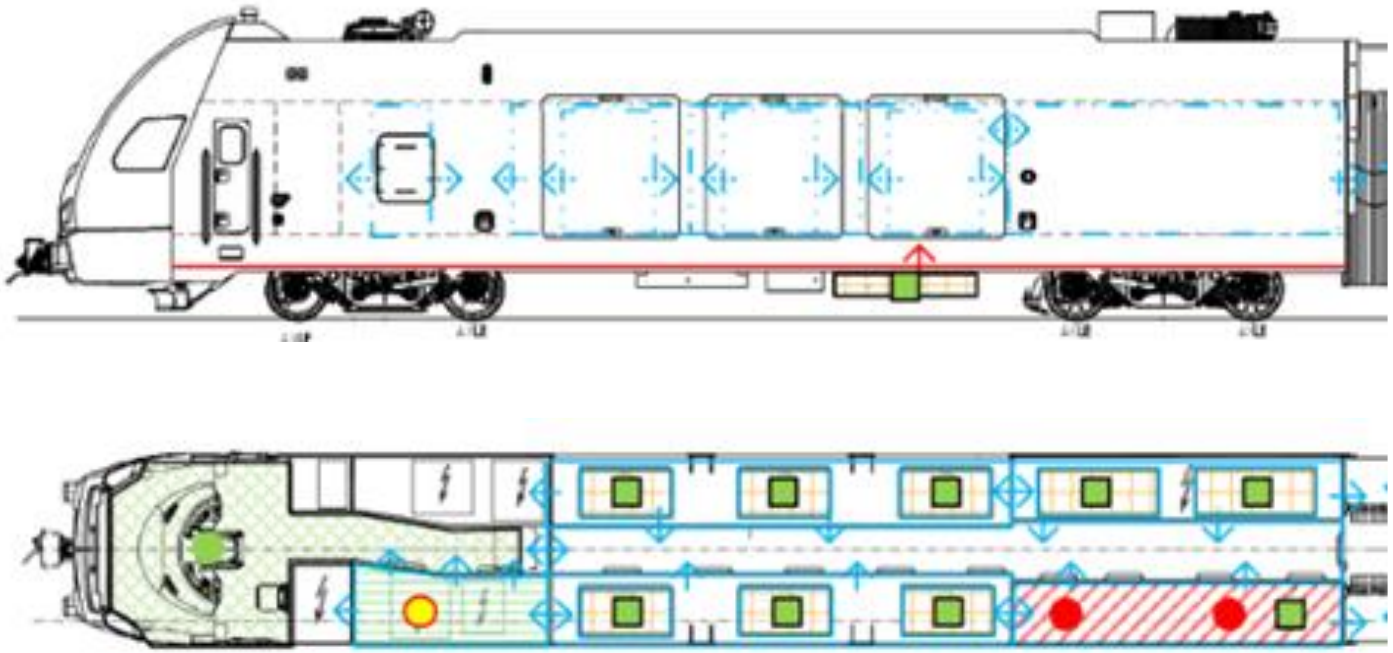
BEMU – Design

- Total seats = 280
- Bike capacity = 36
- Can run on overhead power (25kV) or battery power
- Traction Batteries:
  - A type of lithium ion battery with NMC (nickel manganese cobalt) cathodes
  - High energy density
  - Total battery weight = 42,000 pounds

BEMU – Design (BB-car plan view)



BEMU – Design (BB-car Fire Protection)

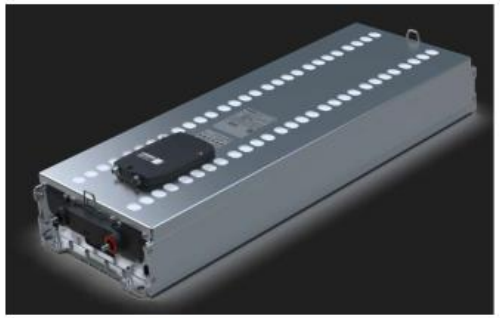
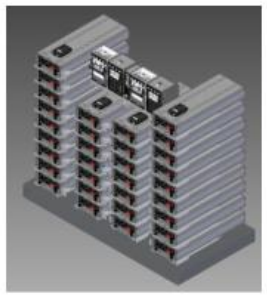
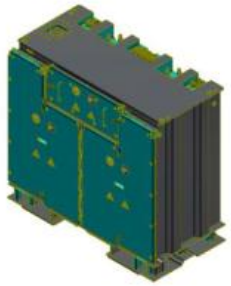
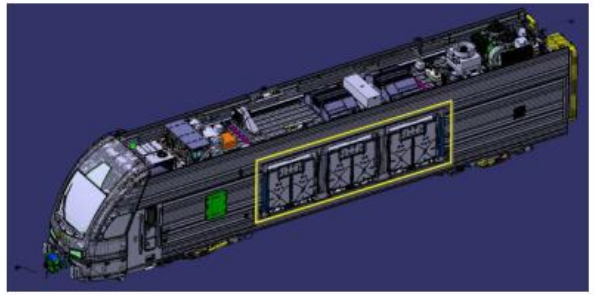


- Fire detection area - ESS
- Fire detection area - driver's cab
- Fire detection area - equipment cabinet
- Fire detection area - machine room
- Fire detection area - Restroom

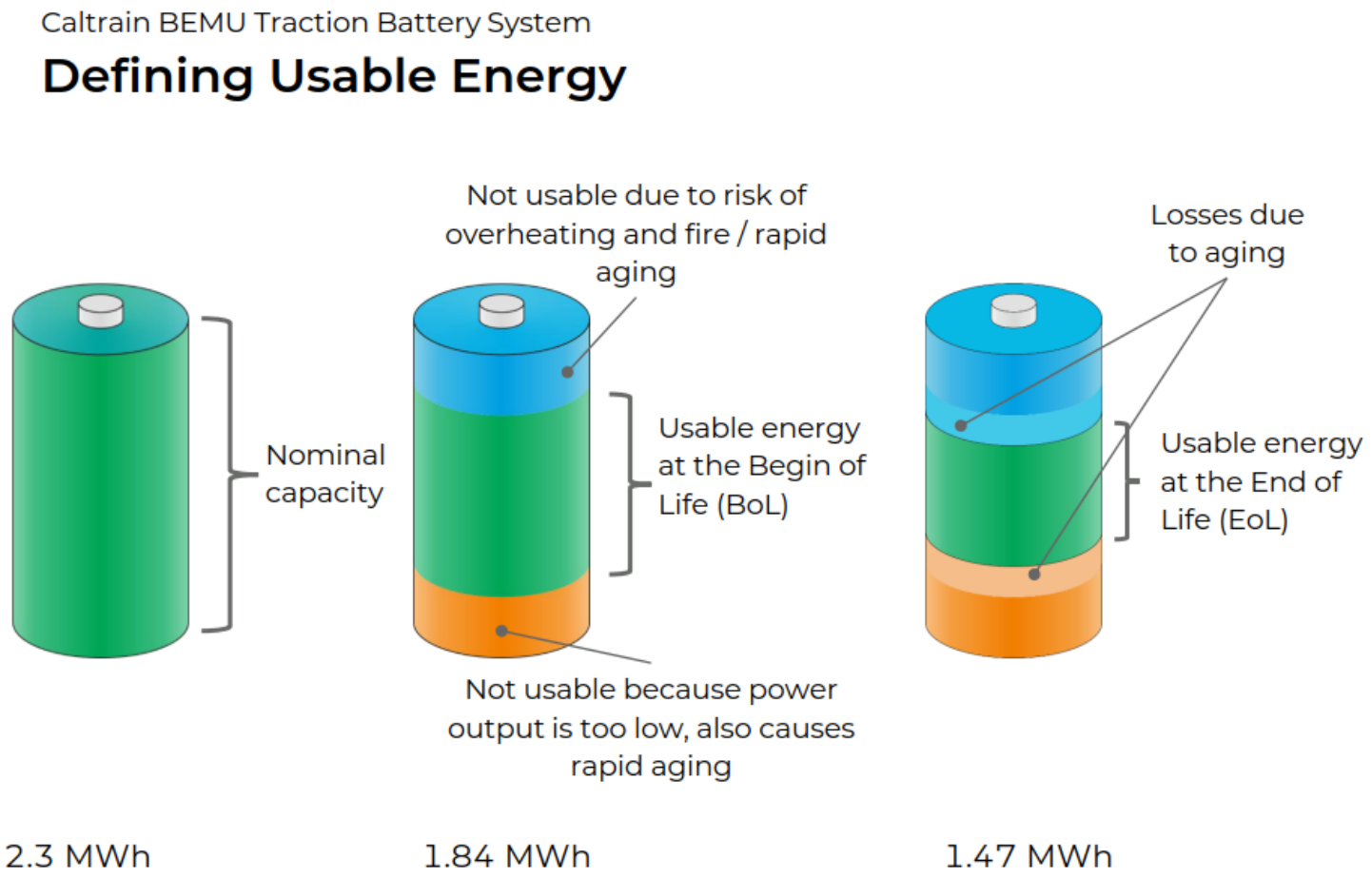
- Linear Heat Detector
- Smoke detector - machine room
- Smoke detector - driver's cab
- Smoke detector – Equipment cabinet
- Combination detector - Restroom

- Fire barrier E15
- Fire barrier EW15
- Fire barrier EI15

BEMU – Battery Technology

	Cell	Module	Container	Car
NMC			 	
	Calb 58 Ah cell NMC	**Module 4p14s**	**String (16 serial modules, 2 per rack)**	**6 racks, 12 strings. Total energy: 2.3 MWh**
Nom. Cap	58 Ah	232 Ah	459 Ah	2,784 Ah
Voltage	2.75 – 4.35 V	52.2 V	835 V	835 V
Energy	214 Wh	12 kWh	383 kWh	2.3 MWh

BEMU – Battery Technology



A traction battery is no longer usable if the entire system can no longer meet the requirements (range, time, safety, comfort, etc.).

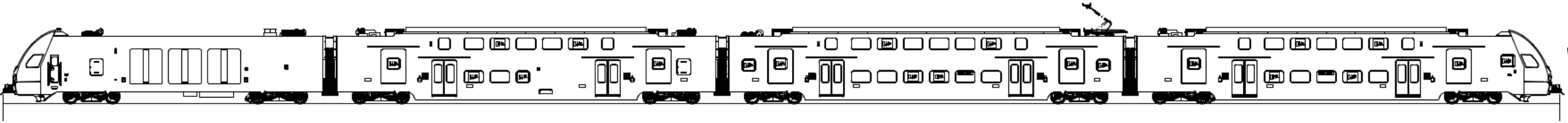
The following criteria are key when sizing battery capacity:

- the type of battery (chemistry)
- the expected service life (in cycles and years)
- the operating profile
- the environmental conditions

as well as the expertise of the system manufacturer in regulating the charging and discharging of the individual cells.

BEMU Charging

- Battery charging can be accomplished via:
  - OCS (~2 hours)
  - 480-volt wayside charging station (~5 hours)



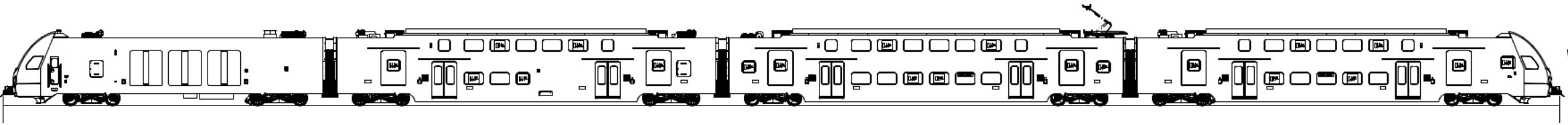
BEMU Project Current Schedule

Activity	Completion Date
Notice to Proceed	August 2025
Design (CDR/PDR/FDR)	September 2027
Production	July 2028
Qualification Testing (TTCI)	February 2029
Delivery (On Site)	March 2029
Qualification Testing (On Site)	June 2029
Training	July 2029
Certification and Acceptance	July 2029
Revenue In Service	August 2029

BEMU Project Budget and Funding

- $80 million TIRCP Fund was awarded in 2023
- Exercised EMU Contract Option with Stadler for one BEMU

	(a)	(b)	(c)	(d) = (b) + (c)
Cost Category	Project Current Budget	Cost to Date thru' 7/31/26	Estimate to Complete	Estimated at Completion (EAC)
Contractor - STADLER	$ 61,537,023	$ 26,172,305	$ 35,364,719	$ 61,537,023
Other Contracts	$ 1,064,706	$ 95,904	$ 5,211,110	$ 5,307,014
Program Mngt. & Admin Costs	$ 9,957,167	$ 1,087,817	$ 6,963,874	$ 8,051,691
Project Contingency	$ 6,842,800	$ -	$ 3,646,402	$ 3,646,402
ICAP	$ 598,304	$ 87,940	$ 1,369,930	$ 1,457,869
Total BEMU Project	$ 80,000,000	$ 27,443,964	$ 52,556,035	$ 80,000,000

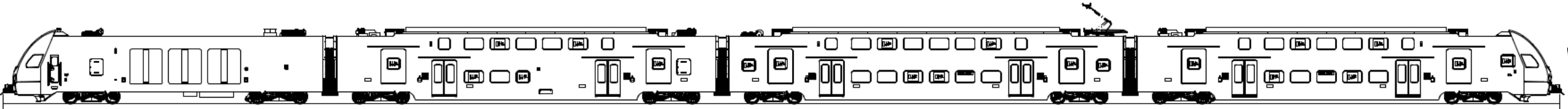


BEMU Project Key Risks

- Battery Technology - Propagation Test
- Supply Chain and Tariff Impact
- UPRR Corridor and TRA
- Infrastructure Scope
- EMU Storage Security Concern

What's Next

- Finalize Battery Option Path Forward
- Complete Final Design
- Battery Car Shell Production
- Finalize Wayside Charging Infrastructure Scope
- Finalize Concept of Operations
- Coordination with UPRR
- Continue FRA Compliance Review and Meetings



FOR MORE INFORMATION

WWW.CALTRAIN.COM