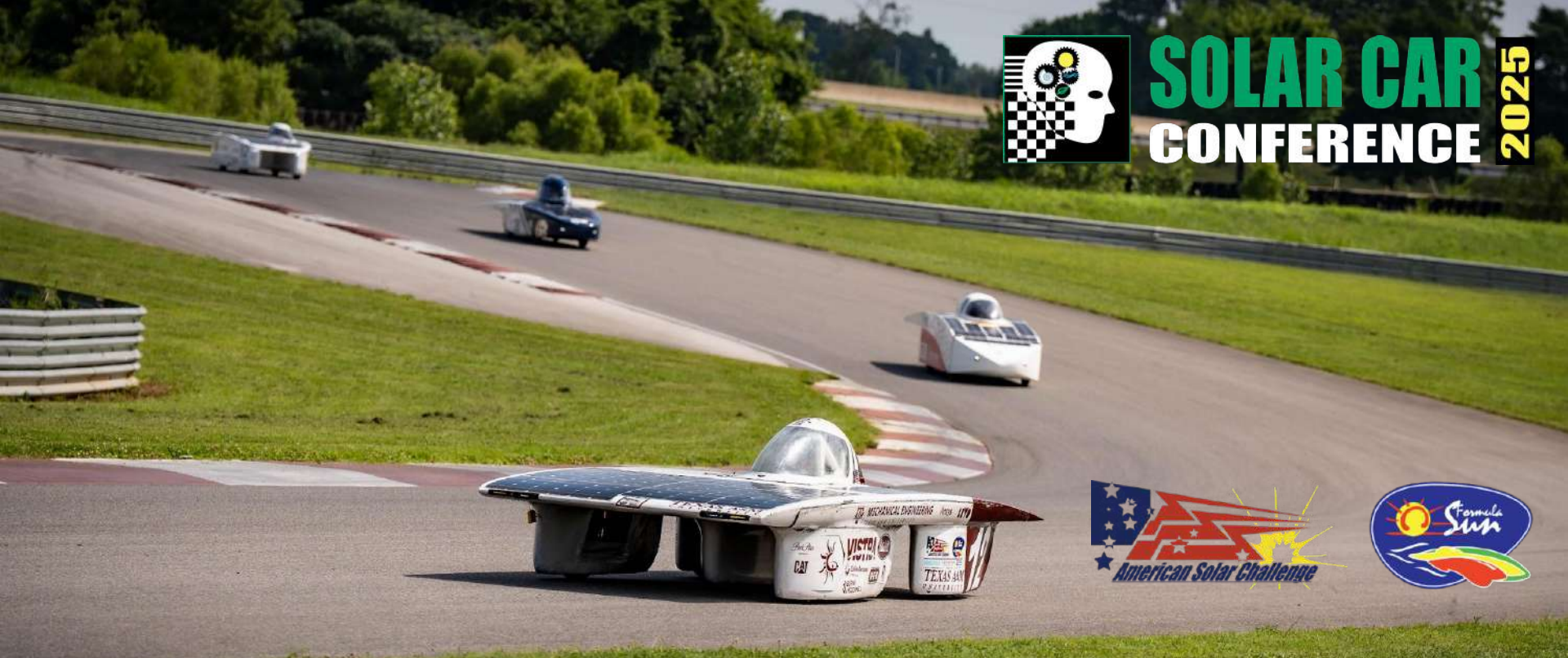




SOLAR CAR
CONFERENCE **2025**



Impound In Vehicle

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Impound In Vehicle - Topics

- Traditional Impound Overview
- Impound In Vehicle History
- Pros & Cons of Impound In Vehicle
- Certification Requirements
- Recommendations
- Case Studies
- Discussion & Q&A

Disclaimer

This presentation is intended to supplement the regulations, but does not supersede them.

When in doubt, ask Evan and I for help.

Traditional Impound Overview

- Purpose: ensures that no team can gain an unfair advantage by replacing battery modules or charging their battery pack while not under supervision from Officials or Observers.
- Must be impounded by 8:00 PM every race day, released at 7:00 AM the following morning.
- During FSGP, Officials monitor the charging area to ensure that teams' batteries are impounded on time.
 - ◆ The Officials provide a secure location at the track for impound boxes to be stored overnight. Outside of impound, solar cars (batteries) must be within view of a race Official (Garage/Cold Pit maintenance must be supervised)
- During ASC, Observers monitor impound & impound release, and record these times in their logs.
 - ◆ Typically teams must provide a secure location to store the impound box overnight, unless Officials designate a location.
- Teams should recognize the need for auxiliary power sources for troubleshooting vehicle systems during impound hours
- 2 mile penalty for every minute that a team fails to impound their batteries. Failing to impound during FSGP forfeits all official laps completed up to that point.

External Impound Box

- Battery enclosure(s) must be designed to be removed from the vehicle and placed in a sealed impound box during impound hours each day
- The impound box must be sealed to Official satisfaction using at most 2 seals
- The impound box must not have external hardware that can be removed to gain access to the inside of the box without breaking seal(s)
- Best Practices
 - ◆ Should support the mass of the battery and provide sufficient protection (water resistant?)
 - ◆ Enough clearance to fit the battery enclosure without pinching fingers
 - ◆ (Lockable) caster wheels for moving it around
 - ◆ Test fit your battery enclosure(s) before coming to Scrutineering

Impound Box Recommendations

Do



Include casters



Use internally mounted lockable hasp latch



Use internally mounted concealed hinges



Use cabinet corner protectors to protect the outside of the box from damage



Use internally mounted corner braces in addition to wood glue to secure sides to the bottom of the box



Install heavy duty handles to safely carry the box

Don't



Use any externally mounted hinges, latches, etc



Don't use external fasteners as the sole means of securing the box panels together

Impound In Vehicle History

- ASC introduced the MOV class for FSGP 2019, in alignment with the WSC cruiser class, battery weight for these vehicles is unlimited
- Large batteries made it impractical or impossible to remove them from the vehicle for impound
 - ◆ Entire vehicle could be impounded in trailer, which was undesirable due to teams wanting to work on their vehicles at night
- Added Impound in Vehicle as an option for MOV's in 2021
- Added Impound in Vehicle as an option for SOV's at FSGP/ASC 2024

Pros & Cons of Impound In Vehicle

→ Pros

- ◆ No need to construct and store an impound box
- ◆ Can more securely attach the battery box to the vehicle chassis
- ◆ By eliminating the need to remove the battery, it reduces the risk of handling damage and injury

→ Cons

- ◆ Battery Box construction is held to a much higher standard of inspection
- ◆ Increases Scrutineering inspection/certification time
- ◆ Requires training for Observers & Officials to ensure impound is performed properly.
- ◆ Usually requires more security seals than an impound box

Impound In Vehicle Requirements

- 8.10.B.1 - Teams must provide a robust solution that allows event organizers to lock/seal all high voltage battery power connectors/conductors
 - ◆ The solution must include sealing the battery box lid(s), air inlets/outlets, and high voltage power connections such as motor(s) and solar array
 - ◆ A general example is “Can a long screwdriver fit through a gap to reach a relay terminal?”
- 8.10.B.2 - Solution must require 4 or less seals to be used a day
 - ◆ More seals are allowed as long as they are “permanent”
- 8.10.B.3 - Battery box must not have external hardware that could be removed to gain access to the battery without breaking seals
- 8.10.C - Every security seal location must be labeled “Seal [#] of [total]”
- 5.2.C.1 - Method of securing the battery for impound must be in your Electrical System Technical Report

Impound In Vehicle Recommendations

- Ensure that external hardware is not the sole means of box construction
- Electrical connectors that mount to the inside of the battery box with internal hardware
 - ◆ Consider using (3d printed) covers or dummy plugs for connectors that can be secured in place with seals
- For ventilation, internally secured screen/mesh may be approved, as well as securely sealing manifolds to the battery box
- Consider minimizing the number of power connectors, and locate them close to each other so that a single cover can be used
- It is possible to create “caps” for bolts that could use a permanent seal to prevent access to the fastener
- Battery box lid should be fairly rigid, if it can be bent out of the way it may cause issues getting certified
- Don't completely rule out the possibility of an impound box if possible

Security Tag Seals

- Design your impound solution with these in mind
- Tags are serialized and logged for future reference
- Security seals are not structural
- These are a cost for the competition, please help minimize how many are required for your vehicle
 - ◆ Please don't need to break seals to replace Aux batteries in the middle of the day

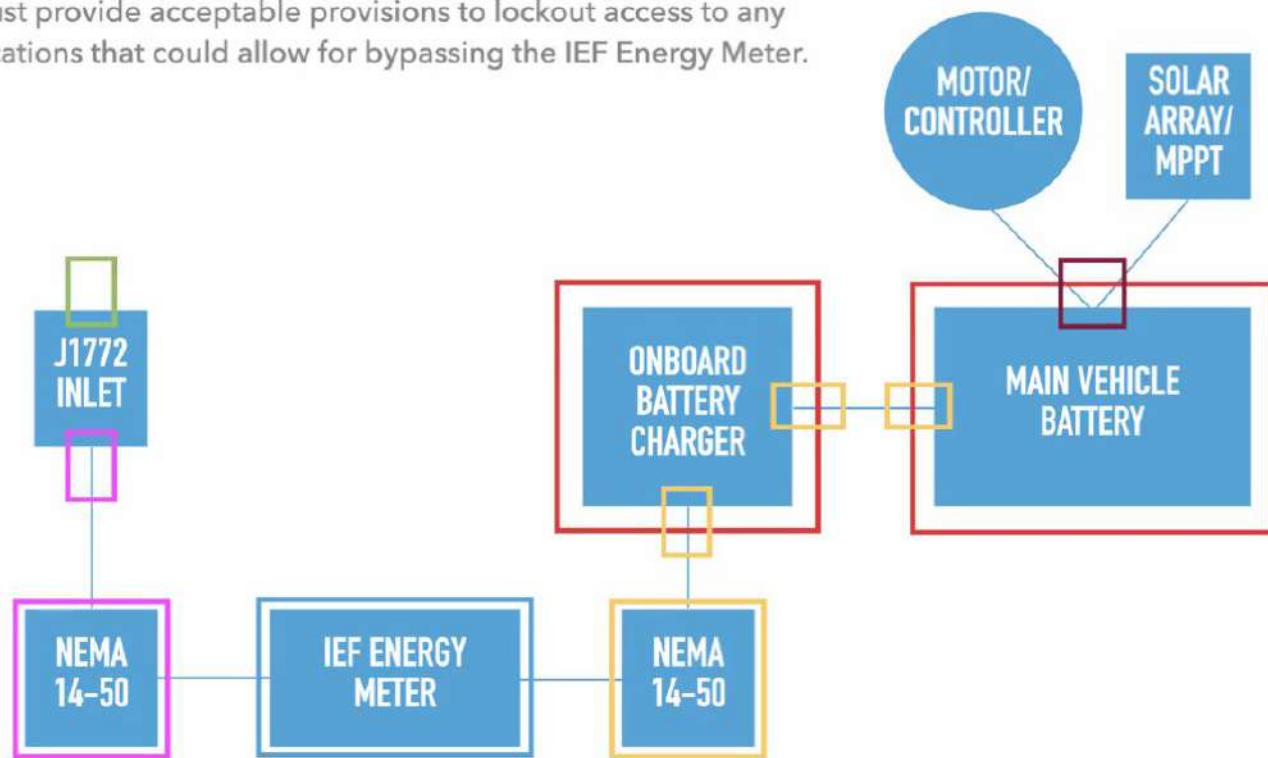


MOV Metered Charging Complications




- If your team wants to Meter Charge, we need to seal the charging system in place
 - ◆ Connections must be sealed so that they cannot be removed
 - ◆ Path between meter to battery must be sealed for the duration of the race

METERED CHARGING LOCKOUT LOCATIONS TO BE INSPECTED

In order to be certified for metered charging, MOV teams must provide acceptable provisions to lockout access to any locations that could allow for bypassing the IEF Energy Meter.



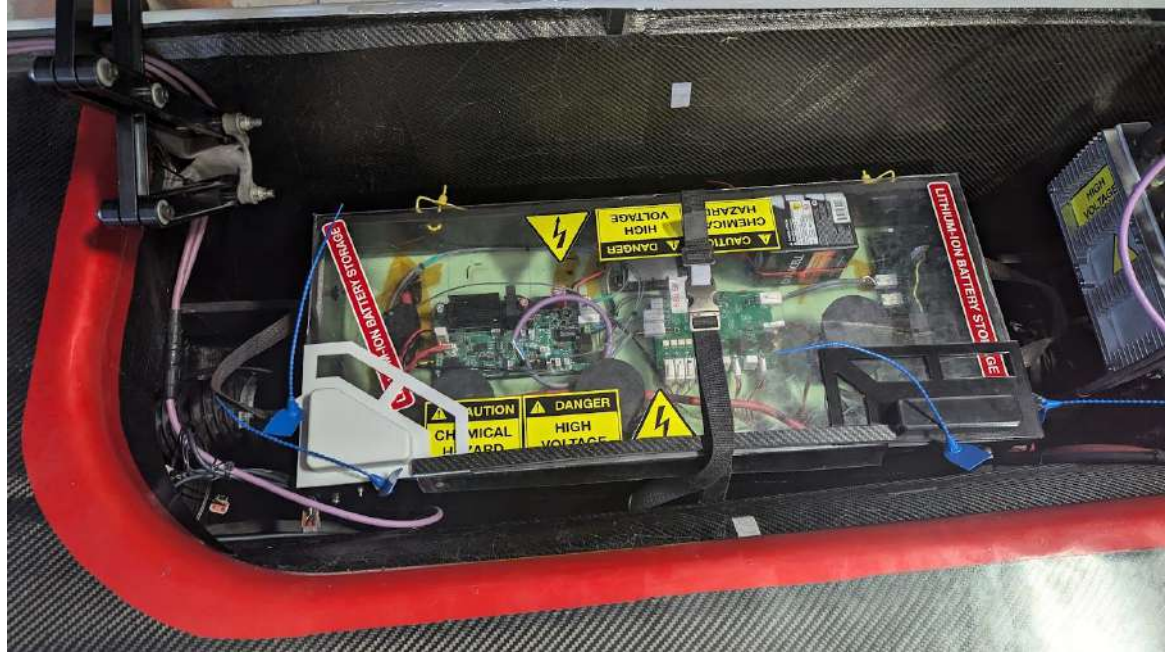
Color Key

-  Provision to lockout internal access
-  Provision to lockout connector access
-  Provision to disconnect and lockout access during impound
-  Meter enclosure is provided locked out
-  Exposed conductors not allowed and must prevent inadvertent disconnection but lockout not required
-  J1772 is always accessible to teams certified for metered charging

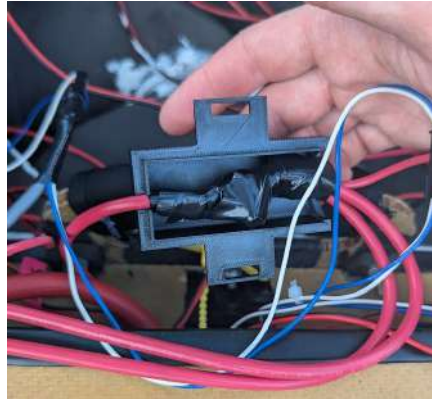
Examples!



Examples!

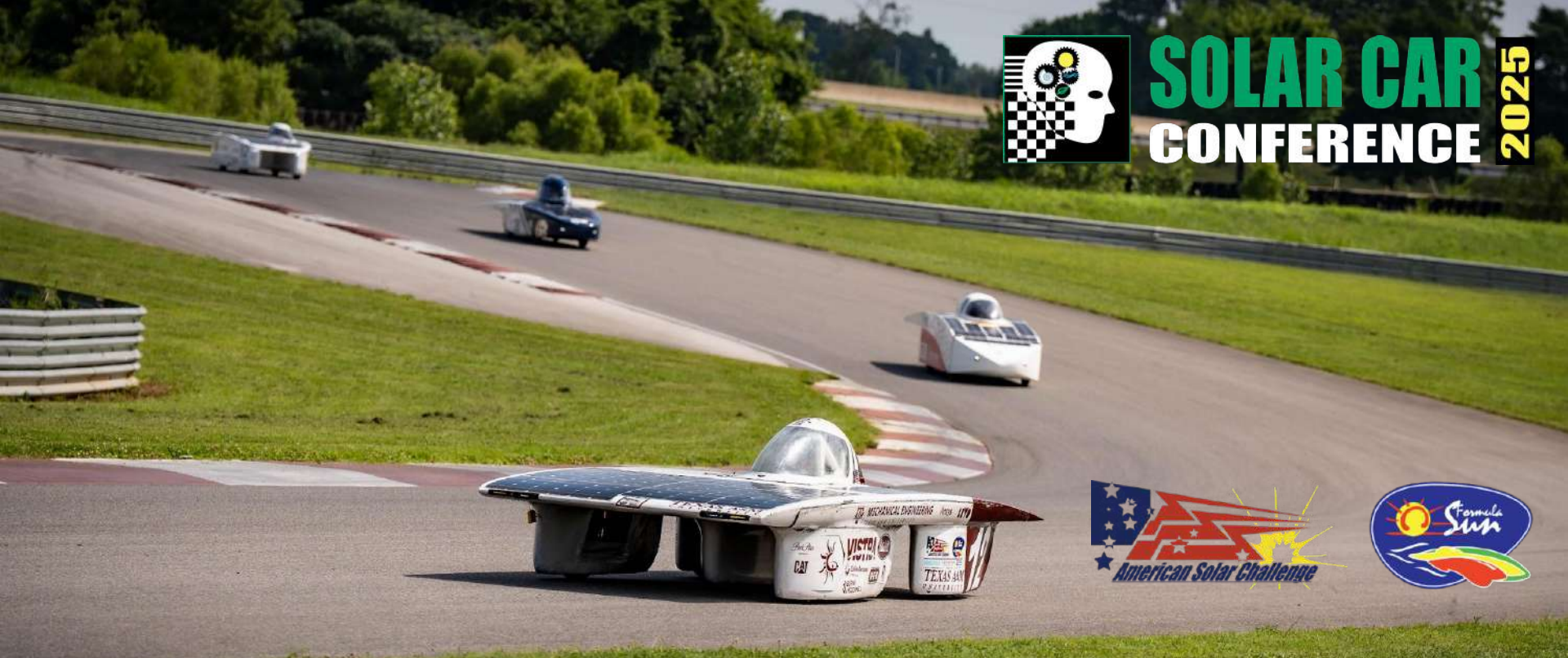


Examples!





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Open Discussion & Q&A