

New Mexico Electric Car Challenge (NMECC) 2026 Teacher Guide



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1. Overview

The New Mexico Electric Car Challenge (NMECC) engages middle school students in applied STEM. Students design, build, and race a small electric car while demonstrating engineering thinking through Design and Research challenges.

2. Challenge Components

Race Challenge — Teams race an electric car over a 10-meter track in five qualifying runs; the fastest time counts. Top eight teams advance to head-to-head finals.

Design Challenge — A 10-minute, interview-style judging session. Students explain the car's design, demonstrate compliance, and respond to questions; prepared slide decks are not used for this challenge.

Research Challenge (optional) — Teams present a 5–7 minute research presentation of a topic Sandia provides.

3. Teams & Registration

- Teams consist of 2–6 students; up to three teams per school.
- Participation is limited to the first 50 registered teams.
- Coaches submit signed participant release forms for all students.
- Car kits are provided at the Teacher Workshop or shipped to coaches not in attendance.

4. Key Dates & Locations

Activity	Date	Time
Registration Deadline	September 25	
Teacher Workshop (CAMINO, Albuquerque, NM)	September 12	9:00 AM – 3:00 PM
Car Challenge Shakedown – Rules review/Car Specs	November 5	3:30 PM – 4:00 PM
Submit Research presentation & release forms	November 4	By 5:00 PM
Competition Day (Kennedy Middle School)	November 7	8:00 AM – 3:45 PM

5. Car Specifications & Safety

- Power: 3 AA alkaline batteries; the 3-battery holder and DC motor may not be modified.
- Each team receives parts for car construction (wheels, chassis, axles, gears); **motor and battery pack are mandatory**.
- Dimensions: Max 20 cm (W) × 40 cm (L) × 20 cm (H). Minimum recommended height: 1.5 in.
- Payload: Carry one full cylindrical salt container (height 13.5 cm, diameter 8.3 cm, mass 737 g ±1%). The container must be removable and unaltered; tape/adhesives may not secure it.
- Safety: Vehicles must be safe (no sharp edges or projectiles) and remain intact for the full competition.

6. Race Challenge Guidelines

- Five qualifying runs per team; fastest time used to seed finals.
- Top eight teams advance to timed head-to-head single-elimination finals.
- Track: Vinyl surface, 10 m lanes, 50 cm wide; guide wire ≤1.5 cm above surface.
- Start: Lift drive wheels, flip the switch, release cleanly, no pushing.
- Did Not Finish (DNF): Car leaves its lane or fails to finish within 30 seconds.
- Two team members must be present at each race; retrieve the car only after judges declare the race over.

Tip: Precise alignment on the provided guide wire matters, poor tracking wastes energy and hurts times.

7. Design Challenge Guidelines

- All teams participate; students are interviewed by judges (10 minutes).
- Teams demonstrate compliance with size and payload rules (use measuring tools and scale).
- Judges score chassis, body, creativity, motor/gear application, construction quality, overall design, and interview skills.

8. Research Challenge (Optional)

Research Question: How can electric cars and smart technologies like AI work together to use energy more efficiently and help protect the environment?

- Presentation: 5–7 minutes (live, in person). Visuals such as PowerPoint are welcome.
- Use multiple credible sources; focus on scientific understanding, engineering, evidence, and technology not policy advocacy.
- Submit electronic presentations by November 4, 5:00 PM; bring a backup copy on a drive. Prepared videos are not allowed.

9. Scoring Rubric & Awards

- Design Challenge: Judges evaluate seven categories (from Basic to Advanced performance).
- Research Challenge: Scored on informativeness, professionalism, organization, visual aids, and time/flow.

- Overall Winners: Points from all challenges (plus participation points for Research) determine overall awards; top placements recognized in each challenge and overall.

10. Event Day Logistics

- Students should meet school dress code standards.
- Food is allowed; each student and coach receives a lunch ticket.
- Store and maintain control of the car between challenges.
- An awards ceremony follows the completion of all challenges.

11. Best Practices for Teachers

- Plan–Build–Test cycles: Encourage rapid prototyping; log changes and observations after each run.
- Guide-wire alignment: Test without the wire first to ensure straight tracking; then tune the guide eyelet height (≈ 1 cm above the track).
- Weight & balance: Secure the salt container firmly without adhesives; use compartments, bands or ties; keep mass low and centered.
- Drivetrain tuning: Explore gear ratios for torque vs. speed; check friction at axles and wheel alignment.
- Battery management: Bring multiple fresh AA sets; reserve new sets for finals; avoid mixing old/new cells.
- Roles & communication: Assign clear build/test roles; practice the start and hand-off sequence; rehearse Design interview responses.
- Safety & integrity: Inspect for sharp edges; avoid launch pushes; follow lane rules to prevent DNF.
- Research coaching: Emphasize evidence, source quality, and clear visuals; define technical terms in student-friendly language; rehearse Q&A.

12. Contact Information

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Appendices

Appendix A

Design Challenge Rubric

Judges score each category as Basic (1), Intermediate (3), or Advanced (5). Categories and descriptors:

Category	Basic (1)	Intermediate (3)	Advanced (5)
Chassis	Incorporates basic design components of chassis, basic wheels, axles, axle guides	Incorporates moderate level of sophistication into chassis design	Incorporates high level of sophistication into chassis design, wheels, axles, axle guides
Body	Very limited body design and functionality	Incorporates moderate level of sophistication & functionality in body design & application	Incorporates high level of sophistication and functionality, aerodynamics into body design
Creativity / Aesthetics	Very little creativity (basic paint & attachments)	Some creativity used in the design (unique painting, more interesting than basic design)	Very creative design that also enhances the performance of the vehicle (great aesthetic value; attracts attention)
Motor & Gear Application	Basic motor mounting and no gear ratio experimentation	Moderate sophistication in motor mounting and some gear ratio experimentation	Enhanced modifications to motor mounting and gears to increase torque & speed
Construction Quality	Basic construction & materials used; little more than basic kit	Moderate attempt to improve overall construction quality with adherence to detail	Very high quality & detail in construction; well thought out & applied
Overall Design	Very little modification to basic kit; simple & effective overall design	More advanced design concept with some modifications; creative; good overall design	Extensive modifications demonstrating an understanding of engineering & physics in the design
Interview Skills	Missing some ideas of the project development & application; lacks eye contact; hesitating in response	Has the main idea and effective in sharing the concept; good eye contact; speaks clearly with confidence	Thorough in concept of the project & able to express it very well; good eye contact; speaks very confidently

Appendix B

Research Challenge Rubric

Score each criterion: 4 • Excellent, 3 • Strong, 2 • Developing, 1 • Beginning. Criteria and descriptors:

Criteria	4 • Excellent	3 • Strong	2 • Developing	1 • Beginning
Science & Technology Understanding	Accurately explains how electric cars use/store energy and how the selected smart technology works.	Mostly accurate explanation of both technologies; minor gaps.	Basic explanation; important gaps or a few inaccuracies.	Limited or unclear understanding; major inaccuracies.
Technology Connection & Energy Efficiency	Clearly explains, with a specific example, how the technologies work together to save energy.	Explains a logical connection and relevant example.	Connection is partly explained or example is general.	Connection is unclear, unsupported, or missing.
Evidence & Sources	Uses multiple credible sources; evidence directly supports claims and sources are identified.	Uses credible sources and relevant evidence for most claims.	Uses limited evidence or sources; some claims are unsupported.	Provides little reliable evidence or source information.
Environmental Reasoning & Conclusions	Evaluates benefits and limitations/tradeoffs; conclusion directly answers the question.	Explains benefits and gives a logical, supported conclusion.	Mentions benefits; analysis or conclusion is only partly supported.	Mostly reports facts; environmental reasoning or conclusion is unclear.
Presentation & Visual Communication	Clear, engaging, well organized; visuals/data strengthen understanding.	Clear and organized; visuals support the explanation.	Sometimes hard to follow or overly dependent on slides.	Difficult to follow; visuals add little or distract.
Team Understanding & Q&A	All members demonstrate ownership and answer questions using evidence.	Team demonstrates understanding and answers questions well.	Understanding or participation is uneven; answers need support.	Team has difficulty explaining or defending the work.