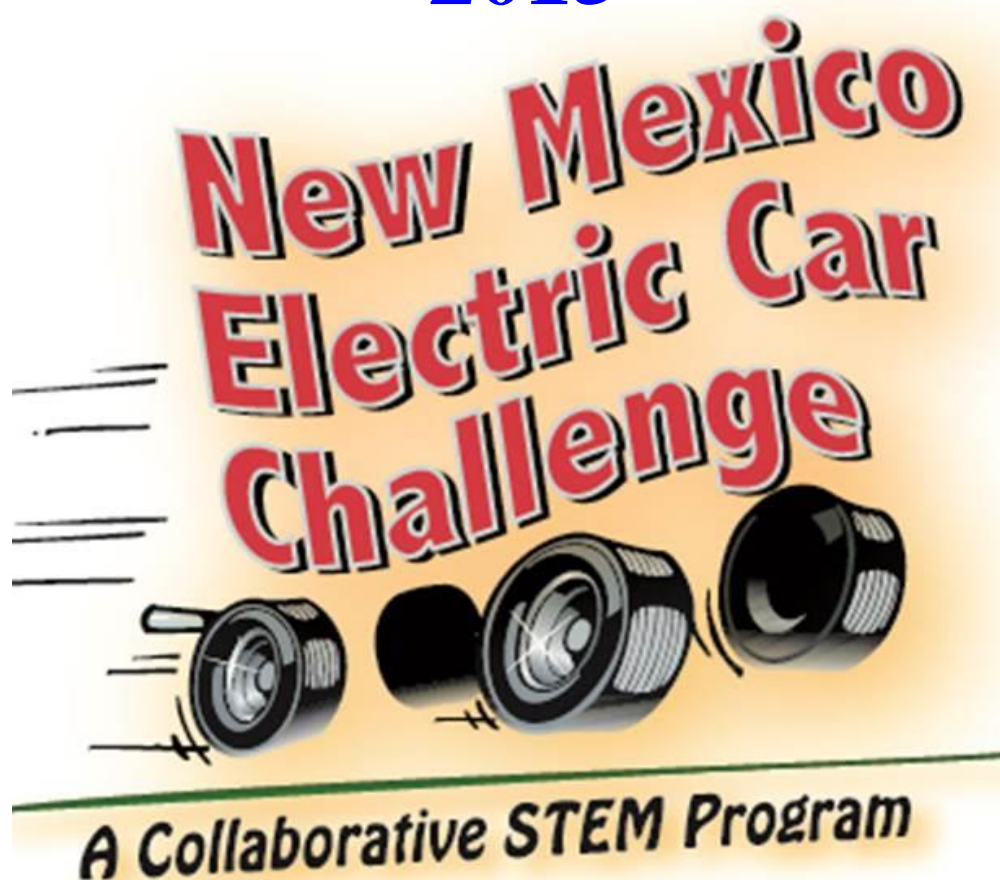


New Mexico Electric Car Challenge 2015



Guidelines

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CHANGES FOR 2015 ARE IN GREEN

Hands-on design and application has a different feel from textbook problem solving or even traditional science labs. There is no single correct answer, any number of solutions developed by students can work. Students are excited about generating ideas in a group and then applying, building and modifying projects. They can see for themselves how changes in their design / project reflects in performance. The role of the teachers / coaches is to nurture the spirit of excitement, joy of discovery and learning that awaits students in the quest of knowledge.

Goals of the program:

- Present science concepts in a fun and exciting way.
- Create and develop teamwork and team-building skills.
- Stimulate creative thinking through a hands-on design project.
- Challenge students in their writing capabilities.
- Help develop and enhance oral presentation skills.

2015 Guidelines

The New Mexico Electric Car Challenge provides an opportunity for 6th, 7th and 8th grade students to form a school team to develop and use applied science and engineering skills, and face technical challenges comparable to those that scientists and engineers face every day. The Challenge was developed to provide a hands-on opportunity for students to understand the need for renewable energy sources and explore the emerging technology of electric vehicles. In addition to understanding how things work, engineers and scientists must think creatively and be able to communicate their findings. New Mexico 6th, 7th and 8th grade students are invited to participate and meet the challenges of the three part competition.

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Team Guidelines:

1. Teams consist of 2-6 students from 6th, 7th and or 8th grade.
2. Students in grades 6th, 7th and 8th are eligible to participate.
3. Students may elect to work on different challenges (construction, design, and oral presentation) – all team members do not have to work on each challenge.
4. A teacher or coach from the participating school must attend the Electric Car Challenge with the student team(s) on November 21, 2015.
5. Each school may have a maximum of 2 teams – each team must have an adult coach.
6. A maximum of 50 teams will be allowed to participate.

The NM Electric Car Challenge is a three part challenge consisting of:

Car Design Challenge – challenge based on innovation (system design), technology (power-train/chassis), craftsmanship and appearance.

Car Race Challenge – challenge based on maximum of 5 qualifying runs over a 10-meter course.

Oral Presentation Challenge (optional) – challenge based on an oral presentation addressing

"Hybrid vehicles use a gasoline engine and electric motor to power the vehicle. What are the advantages and disadvantages of hybrid cars compared to electric cars?"

Each Challenge is scored individually and awards will be provided to the top three teams for each Challenge. In addition, scores for all Challenges will be totaled to determine the top three Overall winners. Participation in the optional challenge earns points towards the Overall winners.

Car Specifications/Construction:

1. Each team is responsible for designing and building a Li-ion battery powered model racecar.
2. All entered vehicles must be safe for contestants and spectators (e.g. no sharp edges, projectiles, etc.)
3. The dimensions of the car cannot exceed:
 - a. 20 cm in width (7.87 in.)
 - b. 40 cm in length (15.75 in.)
 - c. 20 cm in height (7.87 in.)
4. The DC motor and Li-ion battery provided must be used in the design – the battery and motor may **not** be modified in any way.
5. The team may use any wiring system they choose; however, there must be an on/off switch to start and stop the vehicle.

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6. The vehicle must be designed to carry a payload of 1 full cylindrical salt container: height: 13.5 cm, diameter of 8.3 cm and mass of 737g (+ or – 1%).
7. The salt container may not be part of the vehicle's structure and must be easily and rapidly removed or reinserted. The following materials are examples of items you can use to hold the salt container on the chassis: rubber bands, string, cable ties, structured compartment, etc.
8. Tape or any other adhesive cannot be used to secure the salt container.
9. The salt container will be supplied before the race and must remain unaltered. Salt containers will be reused for each race.
10. Each team will provide the additional parts needed for the construction of the car – wheels, car body/chasses, axles, ring connectors, gears.
11. All cars will be inspected by a race official prior to the race to ensure that they meet all vehicle specifications. Cars that meet these requirements will be given an inspection sticker that will be placed on the car.
12. Individual decals may be affixed, and the body may be decorated at the team's discretion, but a 3 cm. square space must be left free on each side for the official vehicle decal number and inspection sticker.
13. The car must remain intact (except for the salt container) for the entire competition – including Design. No body parts can be removed or altered between the Design and Race Challenges.

Steering: An eyelet must be attached to the bottom front of the car. An example of a possible design is illustrated. A guide wire, 1 cm. (+/- .05 cm) from the surface of the track, will go through the attached eyelets on the car, serving as the steering mechanism, and keeping the car in its lane. Attach the eyelet to the bottom of your car near the front (or use two eyelets--one near the front and one near the rear). The guide wire will pass through the eyelet to keep your car in its lane.



The vehicle must be easily removed from the guide wire, without disconnecting the guide wire. This is the only allowable method of steering the car. Lane changing or crossing during the race will result in Did Not Finish (DNF).

Tip: *Not tracking the wire is the biggest reason some cars do not win. Setting the car down straight isn't enough. Consider this carefully in your planning and design.*

Energy Source Specifications:

The only energy source permitted on the vehicle is the Li-ion battery. Failure to meet these expectations will result in disqualification.

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Race Challenge Guidelines:

Track Specifications:

Lane Length: 10 meters

Lane Width: 50 centimeters per lane

Track Surface:

Race surface will be on a rubber pad that is indoors. A guide wire will be located in the center of each lane of the track and will not be more than **1.5 cm** above the track surface.

Race Challenge Procedure:

The time trial phase is made up of all registered competing teams and teams will be assigned to a racing group at registration. The race event will use preliminary time trials before progressing to a single elimination tournament for the finals. Each team will have the opportunity of 5 time trials to achieve their fastest times. Any car that does not finish in 40 seconds will be considered a “Did Not Finish (DNF)” and count for 1 of the 5 qualifying runs. The fastest time in any of the 5 qualifying runs is used to determine the fastest teams. The 8 teams with the fastest times will progress to the single elimination tournament for final run off. In the event of ties, the next fastest time from one of the 5 qualifying runs will be used to qualify for the single elimination competition.

Repair/Charging Station:

Teams should bring a fully charged Li-ion battery to the competition. A battery-charging station will be available if necessary. The only energy source permitted on the vehicle is the Li-ion battery. Teams are responsible for bringing their own supplies for possible repairs or adjustments.

Qualifying and Race Procedure:

1. Teams must get their 5 qualifying runs in during the time set for the “Group” their team is in.
2. When a team is ready for a “Qualifying Run” they will report to a race official to at one of the race tracks.
3. Cars must race as presented/judged in the Design Phase of the competition, i.e. any additional modifications presented in Design Phase such as a “body” must be on during the races.
4. The team’s vehicle “run time” will be recorded and given to the “Race Table.” Any vehicle that does not cross the finish line within 40 seconds will be recorded as “Did Not Finish” (DNF), and count as 1 of the 5 runs.
5. If the salt container falls from the vehicle during the race, this will result in a Did Not Finish (DNF).
6. The eight teams with the fastest race times will be seeded into a single elimination bracket. The two teams eliminated in the semifinal round will race for third and fourth place points. (See Attachment C)

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7. In the event that both cars do not finish the race, the car that traveled the farthest will be declared the winner in the “single elimination” competition.
8. All decisions of the race officials are final. Officials have the option to inspect cars prior to the final heat or at any time during or after the heats are completed.

The Starting Line (all race phases):

1. It is the team’s responsibility to have their car charged and ready for their qualifying run times.
2. Judge will tell the starter to prepare for the start of the qualifying or race.
3. One team member (the starter) will be at the line with the car. The car will be placed behind the starting line with all wheels in contact with track.
4. Judge will tell the teams to start their car, teams will lift their drive wheels off the track and flip the switch / make the connection.

NOTE: *Best method is to hold with a single finger on each side just in front of rear wheels or just behind front wheels and pulling out quickly to the side at the “Go” command.*

5. Starter must remove their hands without any forward motion.
6. Team members may not push a vehicle to start it.
7. Team members may not accompany the vehicle in its lane during the race.
8. Team members may not touch the vehicle until the judge has declared the race over.

NOTE: *It’s recommended to practice this with your students – slight push from the student will result in the team forfeiting that run.*

During the Heat:

1. One team member may free the vehicle from the side or track imperfections should such problems occur. This freeing motion is a lateral movement only and may not include any forward movement or any modifications or adjustments to the vehicle.
2. Vehicles stalled on the track may be retrieved after the race is declared complete.
3. Team members may not push the vehicle or give any other physical assistance.
4. Team members may not change the vehicle's mechanical or electrical characteristics (e.g. shift a transmission) after the start of the heat.
5. Team members may not accompany or touch the vehicle while it is racing on the track.
6. Vehicles that change or cross lanes and interfere with the performance of their competitor will be disqualified (at the discretion of the race officials).
7. In the event neither car finishes their race in "Single Elimination" the vehicle that traveled the farthest on their track and in their lane will be declared the winner of that “Head to Head” race.

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The Finish Line:

1. One team member must be present at the finish line to stop the vehicle, preventing any damage to it.
2. The vehicle must remain in its lane at the finish line until the order of the race vehicles has been established.
3. Failure to meet these expectations will result in disqualification.

Race Dispute Procedure:

1. All disputes must be made to the Track Head Judge within one minute of the end of the challenged race.
2. All disputes must come from members of the team who actively raced during the race in question.
3. Non-racing team members, coaches, parents or anyone else may not object verbally or by signal.
4. All decisions made the Track Head Judge are final and may not be appealed.

Car Design Challenge:

All teams are required, to compete in the Car Design Challenge. Teams will be assigned to a group and will be presented to Design Judges. Judges will interview the students and inspect the cars. Scoring will be determined using the Car Design Rubric (Attachment A).

NOTE: *Innovation, technology and craftsmanship will all be considered.*

Oral Presentation Challenge:

Each team is encouraged, but not required, to compete in the Oral Presentation Challenge. The presentation topic is:

"Hybrid vehicles use a gasoline engine and electric motor to power the vehicle. What are the advantages and disadvantages of hybrid cars compared to electric cars?"

This is the chance for the teams to showcase their expertise, knowledge and talents beyond the design and performance of their car. The “live” team performance is to be 5 - 7 minutes in length and can be in any format that the team chooses. Scoring will be determined using the Oral Presentation Rubric (Attachment B). Examples below are not meant to be exclusive – students are encouraged to be creative. Examples might include a skit, poster board or trifold display, song. PowerPoint presentations and video clips may be used to enhance the presentation. ***All PowerPoint presentations/video clips must be emailed to Cheryl Garcia (cagarci@sandia.gov) by midnight, November 6, 2015.*** Upon receipt of the document, an email confirming receipt and completeness will be sent. The presentations will be loaded onto laptops prior to the morning of the event. File names must include the school and team number. This will ensure that files are operational and will avoid delays during the challenge. If the teams will not be using electric media, please bring your needed materials for the presentation.

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NOTE: *Prepared videos or movies are **NOT ALLOWED** to substitute for a live presentation – students must present “live” in front of the judges. As a precaution, each team should also bring a copy of their electronic presentation.*

Oral and Design Challenge placement process:

If the number of entries in these categories necessitates the use of multiple rooms for judging, the judges have the option of calling back their top candidates for a second round in front of the complete panel.

Overall Event Winners

Points will be awarded to the top four placements in all three categories of the Challenge. Participation points will also be awarded in the optional oral competition. The three overall winners will be determined by the points earned through the scoring rubric. (Attachment D)

Second Chance Race Challenge

The *Second Chance* race challenge is for those teams that did not qualify in the Design or Orals Challenge final or in the single elimination race competition. In this challenge, the eight fastest vehicles, meeting the above requirements, will compete in a single elimination competition taking place from 1:00 to 1:45 p.m.

Race Day Logistics:

1. Students **MUST** meet their school’s “Dress Code Standards”
2. Food can be brought to the competition. Each student and coach will receive a ticket for one lunch. Food will also be available for purchase.
3. An awards ceremony will follow the completion of all Challenges. All student participants will receive a personal medal for participation.
4. Awards will be given to 1st, 2nd and 3rd place teams in each Challenge and Overall.
5. Be prepared to store and maintain control of your model between challenges.
6. Invite parents and friends.

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Race Day Schedule

7:30 am - 8:30 am	Team Registration & Judge Training
8:30 am - 10:00 am	Rotation Group 1
10:00 am - 11:30 am	Rotation Group 2
11:30 am - 1:00 pm	Rotation Group 3
1:00 pm - 1:45 pm	Design Challenge & Oral Presentation Challenge Finals <i>Second Chance</i> 8 team, single elimination “Head to Head” race contest
1:45 pm - 2:45 pm	8 team, single elimination “Head to Head” Race Final Rounds
2:45 pm - 3:00 pm	Final calculations to determine Overall Winners in all categories
3:00 pm - 3:30 pm	Awards Ceremony

Contacts:

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Attachment A Design Challenge Scoring

	Basic 1	2	Intermediate 3	4	Advanced 5
Chassis	Incorporates basic design components of chassis		Incorporates moderate level of sophistication into chassis design		Incorporates high level of sophistication into chassis design and mounting of equipment
Body	Very little in body design and creativity		Incorporates moderate level of sophistication & functionality in body design & application; draws a second look		Incorporates high level of sophistication and functionality, aerodynamics into body design
Creativity/ Aesthetics	Very little in body creativity (basic paint & attachment)		Some creativity used in the design (unique painting, more interesting than basic design)		Very creative design that also enhance the performance of the vehicle (great aesthetic value; attracts attention)
Drive Train Transmission & Gear Application	Uses transmission & gears supplied in kit with basic wheels & tires		Uses kit transmission & gears with modifications; better wheels & tires		Enhanced modifications to transmission & gears to increase torque & speed; enhance wheels & tires
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
Response 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

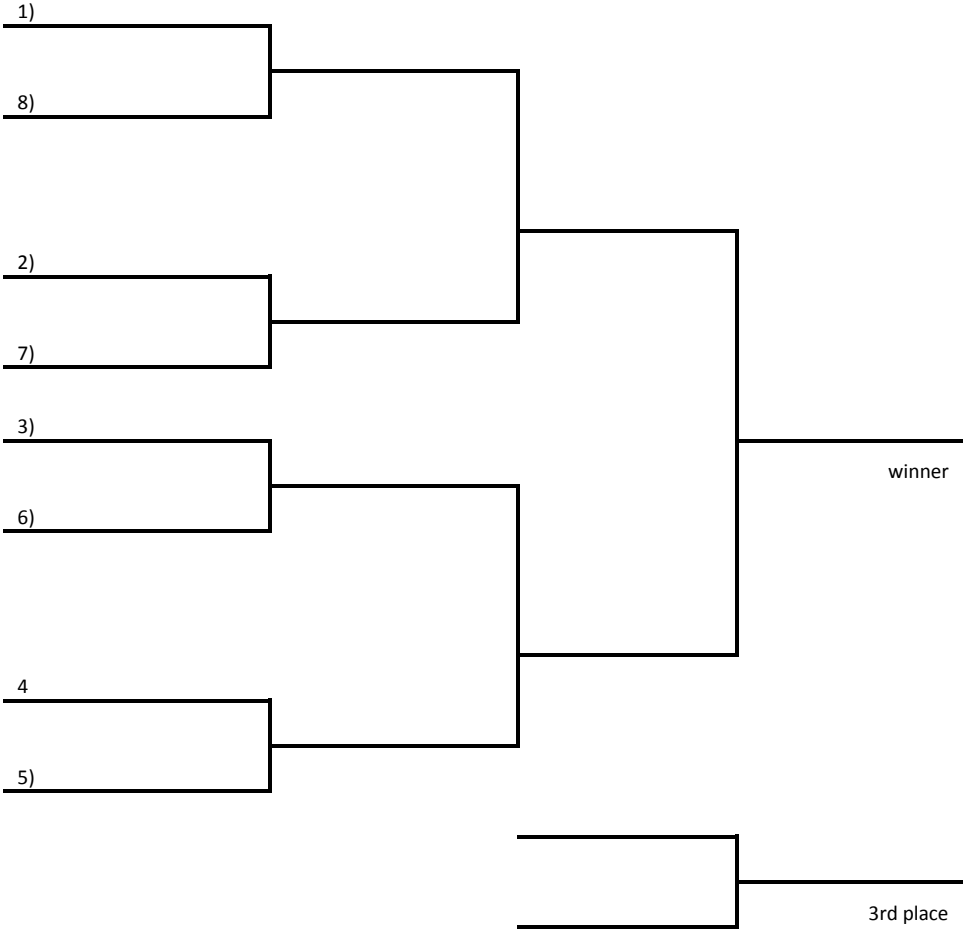
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Attachment B Oral Presentation Challenge Scoring

	Basic 1	2	Intermediate 3	4	Advanced 5
Informative	Missing some main ideas, inaccurate information		Captures main ideas, mostly accurate		Captures main ideas, thorough, accurate, provides good examples, and insightful
Professional Attitude	Often slouches, sways, turns back on audience frequently, fidgets frequently, hard to hear rare eye contact		Sometimes slouches, sways, sometimes turns back on audience, fidgets, volume too low at times, some eye contact		Stands straight, faces audience, words pronounced and heard clearly, good eye contact
Organization	Information not presented in a logical, interesting sequence; the audience could not follow		Information was interesting but not presented in a logical order; audience had difficulty following		Information presented in a logical, interesting sequence which the audience could follow
Visual Aides	Utilized less than two different types of media; information not relevant to outcome/content; messy; minimal artistic effort		Utilized two different types of media, information relevant to outcomes/content; messy; adequate artistic effort		Utilized more than two different types of media; information relevant to outcomes/content; very neat; excellent artistic effort
Time/Flow	Used significantly less or more than allotted time; time punctuated with many pauses and “bridges”		Used less or more than allotted time; time punctuated with some pauses and “bridges”		Used allotted time efficiently; utilized very few pauses and “bridging”
<p>Topic:</p> <p>"Hybrid vehicles use a gasoline engine and electric motor to power the vehicle. What are the advantages and disadvantages of hybrid cars compared to electric cars?"</p>					

Attachment C

8 Team Single Elimination Bracket



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Attachment D

Overall Scoring Rubric

	FIRST	SECOND	THIRD	FOURTH	PARTICIPATION
RACE	70	55	40	25	
DESIGN	50	40	30	20	
ORAL	40	30	20	10	5

2015 NM Electric Car Challenge

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