



# Meridian Stories

## STEAM Challenge

### *Green Machine*

Designed for Middle and High School Students

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# Introduction

This Digital Story Telling Challenge will take two to four weeks to complete. This Challenge targets key 21<sup>st</sup> century skills – creativity, collaboration, critical thinking, digital literacy and presentational skills – in equal measure with the curricular content. Delivering on all those learning goals requires student immersion and time. The results, as based on our research, are a high level of student engagement, deep learning, and 100% teacher endorsement.

The following Challenge:

- Should be completed by collaborative teams of two to four students.
- Is aligned to Common Core Curricular Standards.
- Contains an Evaluation Rubric that allows the teacher to clearly score and appraise the students' work.
- Is designed to be integrated into the classroom in alignment with existing curricula.
- Can be assigned as an extra credit project to teams of students that you think would benefit from this kind of immersive, deep learning experience. Additionally, will work well in informal educational settings.
- Should follow the rules of Digital Citizenry in their proper usage and/or citation of images, music and text taken from other sources. See the Digital Rules area in the free Media Resources section of the Meridian Stories site for guidance.

The **Media Resources** section also contains many other **free support materials** from short videos featuring professionals in the field – Artists and Innovators– to short written documents that cover everything from storyboarding to creative brainstorming, interviewing techniques to game design.

While it is helpful to have a Technology Integrator involved, they are not usually necessary: the students already know how to produce the media. ***The teacher's primary function in these Challenges is to guide the students as they engage with the content. You don't need to know editing, sound design, shooting or storyboarding: you just need to know your content***

**area.**

At the end of the Challenge, it is often fun and useful to have a screening of all the media productions – they are never designed to run over 4 minutes each. Students can vote for their favorite videos that can then be screened in a larger assembly-like setting for the whole grade to see. Or this work can be presented as part of a student showcase for parents and friends. Presentational Skills is another 21<sup>st</sup> century skill that this project enables.

Our research indicates this to be a really useful exercise for two additional reasons:

1. Students actually learn from their peers' presentations – it is useful to hear a perspective that is not just the teacher's; and
2. The public setting – painful as it is for some students – provides them with an opportunity to 'own' their work and to be more accountable.

Finally, if you are interested to learn more about the community of schools who annually participate in the Meridian Stories Competitions – a community that is characterized by a friendly competitive spirit; feedback from Mentors on each submission; and the rewarding of digital badges in content, storytelling and digital literacy – please return to the Competitions section of the website or inquire at [info@meridianstories.com](mailto:info@meridianstories.com).

**Let's get started.**

## **The Challenge**

The Department of Energy is ...running out of energy! With their years of focus on non-renewable energy sources, such as coal and crude oil, they have backed themselves into a corner and are running out of options. They are hiring talent from all over the world to participate in the Department of Energy's showcase, 'The Future of Power – Renewable Energy', where the winning product design will receive enough funding to go to market. This is where you come in. You and your colleagues have already been exercising your knowledge of current renewable energy sources in your start up company "Green Machine". Your start up helps produce green energy solutions for

common, energy-dependent appliances, and this showcase is your ticket to getting your products in stores!

Green Machine got off to a rough start with your first idea: the renewable energy toaster oven. This version of a toaster oven was equipped with a pinwheel extension that was placed near the external exhaust fan of your home. The exhaust blew air onto the pinwheel, making it continuously rotate a full 360 degrees, harnessing the wind energy that made the toaster oven work. But people apparently complained about the food tasting like...exhaust.

However your co-worker recently showcased your company's sustainable version of a cell phone charger. This new charger has been adapted to contain a battery pack. During the day, the battery is worn on your wrist, like a watch. The more you move around, the more kinetic energy the battery is able to store! When you want to charge your phone, you simply put the battery back into the charger. The battery acts as a renewable energy source by completely cutting out the need for electricity in order to charge a cell phone. No more running around looking for wall outlets when you have the energy source on your wrist!

The Department of Energy can't get enough; they want you to produce more unique sources of green energy for a different appliance to pitch at the showcase.

This Challenge begins with you choosing the appliance you are going to make sustainable. Once you have decided on your appliance, you must create a three point video pitch that highlights:

- 1) A brief explanation of why it is important that the appliance you chose becomes more energy efficient - does it currently create pollutants? Does it need a lot of energy?
- 2) A detailed description of your green invention. Specifically, how does it make your appliance work? What type of materials will you need to build it?
- 3) A sales pitch! Why *will* people buy your product?! What makes your version of the appliance better than what is already out there?

In the approach detailed above, you don't have to actually *build* and test the invention. You just have to conceptualize and defend it. There is an alternative to this approach: build it, test it and tell us why it failed...and in your pitch, ask for money to make it work!

**Deliverables include:**

- Product Pitch Video
- Comprehensive Renewable Review (at teacher's discretion)
- Shooting Script (at teacher's discretion)

## **EVALUATION RUBRIC – *Green Machine***

<b>CONTENT COMMAND</b>			
<b>Criteria</b>	<b>1 – 3</b>	<b>4 – 7</b>	<b>8 – 10</b>
<b>Understanding of Energy Sources</b>	The understanding of renewable and non-renewable energy sources is absent or unclear	The understanding of renewable and non-renewable energy sources is clear	The understanding of renewable and non-renewable energy sources is clear and detailed
<b>Research</b>	The research to support your presentation is weak and ignores potential environmental and health risks	The research to support your presentation is adequate and considers environmental and health risks	The research to support your presentation is compelling, including its assessment of environmental and health risks
<b>Innovative &amp; Practical Application of Energy Knowledge</b>	The product's use of renewable energy is absent and/or impractical	The product incorporates renewable energy and demonstrates some practicality	The product incorporates renewable energy in an innovative and practical fashion

<b>STORYTELLING COMMAND</b>			
<b>Criteria</b>	<b>1 – 3</b>	<b>4 – 7</b>	<b>8 – 10</b>
<b>Scripting</b>	The script does not convey the content in a well organized or consistently engaging fashion	The script adequately conveys the content in an organized fashion	The script clearly conveys the content in a clearly organized and engaging narrative
<b>Persuasion</b>	The product pitch does not successfully persuade	The product pitch is inconsistently persuasive and engaging	The product pitch is consistently persuasive and engaging

<b>MEDIA COMMAND</b>			
<b>Criteria</b>	<b>1 – 3</b>	<b>4 – 7</b>	<b>8 – 10</b>
<b>Mixed Visual Media</b>	The use of new and existing video, stills, graphics and/or text is confusing and does not reinforce the pitch	The use of new and existing video, stills, graphics and/or text supports the pitch	The use of new and existing video, stills, graphics and/or text is engaging, visually interesting, and reinforces the pitch
<b>Sound and Music</b>	The selective use of sound effects and music detracts from the pitch's effectiveness	The selective use of sound effects and music supports the pitch's effectiveness	The selective use of sound effects and music enhances the pitch's effectiveness

<b>21<sup>ST</sup> CENTURY SKILLS COMMAND</b>			
<b>Criteria</b>	<b>1-3</b>	<b>4-7</b>	<b>8-10</b>
<b>Collaborative Thinking</b>	The group did not work together effectively and/or did not share the work equally	The group worked together effectively and had no major issues	The group demonstrated flexibility in making compromises and valued the contributions of each group member
<b>Creativity and Innovation</b>	The group did not make a solid effort to create anything new or innovative	The group was able to brainstorm new and inventive ideas, but was inconsistent in their evaluation and implementation of those ideas	The group brainstormed many inventive ideas and was able to evaluate, refine and implement them effectively
<b>Initiative and Self-Direction</b>	The group was unable to set attainable goals, work independently and manage their time effectively	The group required some additional help, but was able to complete the project on time with few problems	The group set attainable goals, worked independently and managed their time effectively, demonstrating a disciplined commitment to the project

# Process

Below is a suggested breakdown for the students' work

## During Phase I, student teams will:

- Individually or as a team, begin your investigation of the question: *what is renewable energy?*
  - What are the more common renewable energy sources available today? How does this type of energy impact the environment differently than other types of energy? Think about how you would explain the difference between renewable energy and nonrenewable energy to a friend. What are some of the facts they should know?
- Take turns discussing your responses, and take note of areas of agreement and disagreement. The purpose of this first round of team discussion is to get a sense of what knowledge you already have on renewable energy. This will help you decide where you and your team will want to further investigate specific renewable energy sources.
- As a group, choose (or your teacher chooses for you) a common household appliance that you will redesign to be fueled by green energy. In choosing your appliance, be sure to consider how much non-renewable energy that appliance generally consumes, as this will be a part of your argument.
- Research the current ways technology has been adapted to use renewable energy sources. Catalogue the most salient ideas from your team's research. Will solar power, wind power, geothermal or another renewable energy power source be the best fit?
  - **Teacher's Option: Comprehensive Renewable Review** - Teacher may require teams to present at least four plausible renewable energy solutions that can be adapted for their new appliance design.
- Now, mix the two: your expert knowledge on renewable energy resources and the researched ideas on how renewable energy can be engineered for everyday use. This can lead you to a clear engineering design: what renewable energy will you use and how will you adapt your appliance to use it? In short, design your solution.
- Correlative to this, make the decision: will your team be pitching the idea that you have come up with, or will you build a prototype and pitch what

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you have learned from the results of your tests...keeping in mind that the Department of Energy panel celebrates failure as an often important step to innovation.

**During Phase II, student teams will:**

- Complete any remaining design work on your product design.
- Investigate basic product pitch principles. A product pitch is like a one-sided sales pitch, where you want to convince your audience that making your appliance renewable energy efficient is the right choice; no, the best choice! A good place to start organizing your product pitch is by taking a look at the video pitches on crowd funding websites like Kickstarter, GoFundMe, and Razoo. What, in your view, makes a pitch successful or unsuccessful? Are there any ideas that you can adapt for your own product pitch video?
  - You may also want to watch some commercials on TV, for example the shopping channels that specialize in selling techniques. What works and what does not work?
- Brainstorm about the key ideas that will inform your video pitch. Here are some questions and ideas to consider:
  - What is the most persuasive and potent application that your team has agreed upon? Where, in this pitch, does that application go? At the beginning, or as a climactic ending?
  - What are the two or three chief ‘selling points’ for your Green Machine pitch? (e.g. the environmental impacts or the cost effectiveness)? These points could form the foundation of your investor pitch.
  - Who are the voices/characters that you want involved in this pitch? Sales people? Scientists? Possible end users? Will there be interviews?
  - Your intended audience is The Department of Energy. What do you think is most important to them? How can you target your pitch to meet their interests?
- Your team should now have a) the key content ideas that need to be communicated about renewable energy; b) a new energy design for an appliance of your choice; and c) a handful of creative ideas about how best to position your product. Now, outline your script.
  - Scripts should include a response to the questions a) *what renewable energy will your technology use?* b) *how will renewable energy be engineered to*



*charge the technology?* Additionally, the script should include a description of the major environmental benefits of this energy design, and a short demo or illustration of how the product will work.

- Draft the script.
- Discuss and map out the imagery needed to tell your story. Oftentimes a storyboard is the best process for this.

**During Phase III student teams will:**

- Pre-produce the pitch:
  - Scout locations for shooting (if this is being shot on location);
  - Contact the people that are a part of your narrative, including interviewees if interviews are a part of your final product;
  - Research, as necessary, the still images that you will integrate into your pitch;
  - Create costumes, props and other set pieces, as needed;
  - Prepare the logistics for the actual shooting of the pitch; and
  - Rehearse the scenes that will comprise the pitch.
- Finalize the script
  - ***Teacher’s Option: Shooting Script*** - Teachers may require that teams hand in their Shooting Script
- Shoot the pitch video
- Record the voice-over or narration, as necessary.
- Edit the video, adding stills and graphics as desired.
- Post-produce the video, adding music and sound effects as desired.

## Media Support Resources

***Meridian Stories*** provides two forms of support for the student teams.

1. Meridian Innovators and Artists – This is a series of three to four minute videos featuring artists and innovative professionals who offer important advice, specifically for Meridian Stories, in the areas of creativity and production.
2. Media Resource Collection – These are short documents that offer student teams key tips in the areas of creativity and production.

Recommended review, as a team, for this Challenge include:

**Meridian Innovators and Artists**

**Media Resource Collection**

<p><i><b>On Documentary Films</b></i> – Sarah Childress</p> <p><i><b>On Film Producing</b></i> – Tom Pierce</p> <p><i><b>On Non-fiction</b></i> – Margaret Heffernan</p> <p><i><b>On Editing</b></i> – Tom Pierce</p>	<p>“Creating a Commercial”</p> <p>“Video Editing Basics”</p> <p>“Creating Storyboards, Framing the Shot”</p> <p>“Three Free Rendering and Animation Programs: Scratch, Geogebra and Sketch Up”</p>
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## Essential Questions

1. What do we know or understand about renewable energy and how is it different from nonrenewable energy?
2. What renewable energy sources already exist and what are some of the innovative ways in which these resources are being used today?
3. In what ways do different energy sources directly and indirectly affect health? What are some health benefits of using one type of energy source over another?
4. What are some of the engineering and practical design challenges with the application of renewable energy sources to common house hold appliances?
5. How has incorporating scientific research into the production of a video that is intended to educate and persuade, changed your understanding of the science?
6. How has immersion in the creation of original content and the production of digital media – exercising one’s creativity, critical thinking and digital literacy skills - deepened the overall educational experience
7. How has working on a team – practicing one’s collaborative skills - changed the learning experience?

## Student Proficiencies

1. The student will have researched and understand the core differences between renewable and nonrenewable energy sources.
2. The student will have complemented the above exploration with select academic research about renewable energy as it relates to contemporary practices.
3. The student will gain a deeper understanding of renewable and non-renewable energy's environmental effects on individual and societal health.
4. The students will shift from student to engineer in their journey to redesign the energy use of a common appliance to utilize renewable resources.
5. The student will understand more about the scientific content and related societal context by approaching it through a media production designed to educate the audience.
  - a. The student will know the basic constructs of using video media in effectively communicate content, character, and story.]
6. The student will utilize key 21<sup>st</sup> century skills, with a focus on creativity, critical thinking and digital literacy, in their process of translating STEAM content into a new narrative format.
7. The student will have an increased awareness of the challenges and rewards of team collaboration. Collaboration – the ability to work with others - is considered one of the most important 21<sup>st</sup> century skills to develop in students as they prepare for life after secondary school.

## **Curricular Correlations: National Health Education Standards & Next Generation Science Standards (NGSS)**

The *Green Machine Challenge* addresses a range of curricular objectives that have been articulated by the National Health Education Standards and the NGSS.

Below please find the standards that are addressed, either wholly or in part.

### **National Health Education Standards**

- Students will comprehend concepts related to health promotion and disease prevention to enhance health.
- Students will demonstrate the ability to access valid information, products, and services to enhance health.
- Students will use interpersonal communication skills to enhance health and avoid or reduce health risks.
- Students will demonstrate the ability to advocate for personal, family, and community health.

## **Next Generation Science Standards (NGSS)**

### **High School – Engineering Design**

Students who demonstrate understanding can:

- Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios (HS-ESS3-2.)
- Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. (HS-ESS3-4)
- Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-LS2-7)

### **Middle School – Engineering Design**

Students who demonstrate understanding can:

- Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. (MS-ESS3-3)
- Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. (MS-PS1-6)
- Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles. (MS-PS2-3)
- Apply scientific ideas or principles to design an object, tool, process or system. (MS-PS2-1)

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- Science knowledge is based upon logical and conceptual connections between evidence and explanations (MS-PS3-4),(MS-PS3-5)
- Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings. (MS-PS4-3)