Welcome to Energy Incorporated. We are one of the largest energy providers in the nation and we are glad you’ve taken the challenge to help us maintain our energy infrastructure. As a consultant, you will get the opportunity to work with different sources of energy. From traditional fossil fuels to green alternatives (such as wind and hydroelectricity), you will have the opportunity to work with the equipment that help provide energy for our customers. The following projects are what we are currently working on:

- Oil drilling rigs that need to be relocated to a new drilling site. (*GEAR Challenge Lesson #3*)
- An underwater oil pipeline needs repair and needs a dry dock placed on the section that needs repair. (*GEAR Challenge Lesson #4*)
- On the trans-Alaska pipeline, workers are replacing a safety valve on the pipeline. The defective valve will be taken back to the maintenance shop for repairs. (*GEAR Challenge Lesson #5*)
- Construction of the new solar array is nearing completion in Sunvalley City and we need to prepare the last of the solar panels for shipping. (*GEAR Challenge Lesson #6*)
- Silt is building up near Boulder Dam and needs to be removed as soon as possible. (*GEAR Challenge Lesson #1*)
- Our bio diesel pilot program is in full swing and we need to pick up the oil containers from local restaurants and deliver them to the processing facility. (*GEAR Challenge Lesson #2*)
- A storm is brewing near the Windy Acres wind generator farm and we need to engage the safety stops on the windmill generators. (*GEAR Challenge Lesson #7*)

As you can see, our company is quite involved in many aspects of the energy field. With the current downturn in the nation’s economy it has become necessary to streamline our company resources. We are currently looking into employing robotic technology to handle some of the situations as mentioned above. However, we must remain mindful of meeting the energy needs and desires of today without compromising those of future generations. You have the opportunity to bring your expertise in the field of robotics to our board of directors. We would like for you to make a presentation for a proposal to incorporate robotics into our company.

By the end of the week, you will need to complete the following:

- Create a presentation using PowerPoint, Prezi, or other software of your choice detailing your proposal for consideration of our board of directors.
  - As a focus for your presentation, describe how implementing robotics in the energy field can solve the following dilemma: How do we meet our energy needs and desires today without compromising those of future generations?
- Design and build robotic devices using components of LEGO NXT kits for each of the projects listed above.
- Program and test robotic devices to successfully complete each project mission.
- Keep a design journal for each robot construction and program.
- Maintain a budget for each robotic challenge.

We look forward to working with you on this endeavor.

Sincerely,

Mr. Charles McBright, CEO
Teacher Notes:

Purpose: The project based learning (PBL) activity described above is intended to be the focus for a week long summer professional development. The PBL may then be incorporated into a robotics program or curriculum on each campus to either extend the current program or to serve as a basis for creating a robotics program. In the classroom setting, the above PBL would be a culminating project at the end of the year. Students will be able to participate in smaller GEAR design challenges that will follow the same format of the PBL but on a more specified topic.

Timeframe: For implementation in the classroom, teachers should refer to each GEAR challenge lesson. Timeframes are recommended on each individual lesson and may be tweaked depending on ages and experiences of students.

Procedures for conducting PBL in the classroom:

1. Students will be introduced to the overall GEAR competition challenge “Power Up” and provided an overview of the course/class.
2. Students will construct a variety of building designs using gears, sensors and other mechanical principles to create LEGO NXT robots. These robots will be used in mini design challenges not specific to the GEAR competition to demonstrate their knowledge and skills. The students will then be able to modify and redesign their robotic designs to best complete the GEAR “Power Up” challenges.
3. Students will learn how to manipulate the Mindstorm software in order to make their robotic designs move and function. Again, mini design lessons will be used throughout to assess knowledge and skills before students apply them to a GEAR challenge.
4. Students will be instructed in the use of an engineering design process and will be required to demonstrate the process through documentation in a design journal.
5. Students will be instructed in the use of keeping a budget for each design challenge. This is included to provide students a more real-life experience of being a part of an engineering field.
6. Students will be instructed in ethics involving engineering and robotics. They will be required to document and respond to ethical considerations for their robotic design in each GEAR “Power Up” challenge.
7. Students will be able to research the specific fields of energy that are introduced in each GEAR challenge. Hands on activities that provide more content knowledge are also included in each GEAR design challenge.
8. Students will create a presentation at the end of each unit or GEAR “Power Up” challenge. This presentation will allow students the opportunity to write and speak about what they have learned.

By completing a project based learning activity; your students will be introduced to 21st Century Skills such as:

- communication and presentation skills
- organization and time management skills
- research and inquiry skills
- self-assessment and reflection skills