

APPLICATION COVER PAGE

Project Name: "Engineering the Future of Power and Energy"
Amount Requested: \$268,045

Project Director: HD Weddel, Principal Bend High School		
District, School or ESD: Bend High School (Bend-La Pine School District)		
Address: 230 NE 6 th Street		
City: Bend	State: OR	Zip: 97701
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Grant Fiscal Agent Contact: Zhai Logan, Director Fiscal Services		
District, Charter School or ESD: Bend-La Pine School District		
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Superintendent: Ron Wilkinson		
District or ESD: Bend-La Pine School District		
Address: 520 NW Wall Street		
City: Bend	State: OR	Zip: 97701
Phone: (541) 355-1000	Email: ron.wilkinson@bend.k12.or.us	

	Participating High School, Middle School or ESD Name	Lead Contact Name	Grade Levels	Student Enrollment
1.	Bend High School	HD Weddel, Principal	9-12	1,658
2.	Summit High School	Alice Dewittie, Principal	9-12	1,448
3.	Mountain View High School	Katie Legace, Principal	9-12	1,328
4.	Marshall High School	Julie Linhares, Principal	9-12	163
5.	La Pine High School	Matt Montgomery, Principal	9-12	456
6.	Sisters High School	Joe Hosang, Principal	9-12	502
7.	High Desert Middle School	Gary DeFrang, Principal	6-8	778
8.	Pilot Butte Middle School	Michael Hecker, Principal	6-8	667
9.	High Desert ESD	John Rexford, Superintendent	MA	NA

Please check all that apply

This project directly involved Career and Technical Organizations Pages 8, 9, 12, 30, 32
Please note page of proposal that describes this relationship

This project has a clear connection to STEM No single page as
Please note page of proposal that describes this relationship STEM is referenced throughout the entire proposal

PURPOSE AND SCOPE OF THE PROJECT

“Engineering the Future of Power and Energy” (EFPE) is a dynamic, new, forward-looking CTE Program of Study (POS) designed to introduce and provide skills to 300+ high school students in “high wage, high skill, high demand” occupations. Courses will be taught at the Bend High School Center of Technology and Design (“Technology Center”), introducing students to the fundamentals of electricity and power, engineering design, turbines, solar, wind, hydro, geothermal, biomass, biodiesel, automotive, energy efficiency, safety, and the business aspects of energy production.

EFPE Partners include many local businesses and 3 higher education institutions: Central Oregon Community College, Columbia Gorge Community College and OSU-Cascades. This proposed POS will cost **\$268,045** to launch and will develop a “pipeline” that is tied to a certificate or a degree in an area related to engineering and/or energy. The District and Partners are providing **\$64,000** of funds, in-kind labor and equipment.

The POS will be comprised of 5 semester long courses including a field rotation and independent study offering. Courses will include a wide range of instructional techniques from lecture and presentation to engaging field trips, real-world job shadow opportunities and exciting hands-on projects (e.g. installing an array of solar panels and an electric charging station, building an electric car, conducting an energy audit, etc.)

EFPE Partners represent a diverse mix of business and higher education that are excited to bring their expertise, resources and connections to this initiative. If approved, an Instructor will be hired (part-time) in Spring 2014 for planning/equipment acquisition and then start teaching EFPE (full-time) in the Fall 2014, phased in with 2 courses in the Fall semester and all 5 in the Spring, with a goal of becoming a state-approved POS by July 2015.

SUPPORTING THE OVERALL REVITALIZATION EFFORT

Innovation - *True educational innovations are those products, processes, strategies and approaches that improve significantly upon the status quo and reach scale. How does this project demonstrate innovation in the delivery of CTE? (10 points)*

Engineering the Future of Power and Energy (EFPE) is a highly innovative POS that moves beyond the traditional auto shop to examine the potential future of transportation; it moves beyond the study of a single form of energy to a comprehensive look at a wide variety of energy sources (including conservation) that are happening right here in Central Oregon and poised to grow rapidly in the coming years.

EFPE will include a number of traditional power and energy topics like fluid power (e.g. hydraulics, pneumatics), electricity and electronics, combustion engines (e.g. piston, rotary, turbine), but will also add alternative sources of power and the various systems to distribute it (e.g. photovoltaic, wind, hydro, biomass, geothermal, etc.)

Two other innovative features of Engineering the Future of Power and Energy include:

- Engaging hands-on projects – every year, EFPE students will physically build electric cars, install an electric charging station, install solar panels, and learn to use a variety of tools to create basic fabrication projects. These projects will provide students with valuable hands-on skills as well as give them a tangible result.
- Use of distance learning technology (recorded or live streaming) – in a cost-effective effort to share information with other students (and staff) in the region, we are going to work with the Visual Arts/Videography Program at Bend HS to record and edit select EFPE lectures and demonstrations of hands-on projects that will be stored on YouTube EDU. These new offerings will be made available to educational Partners to augment their own classes and instruction.

Integration - *How does this project demonstrate the integration of the required and bonus elements of the proposal into a coherent project including the integration of core academic content and community resources? (10 points)*

HD Weddel, Principal of Bend High School, was honored in 2010 as the CTE Administrator of the Year. Speaking passionately about this interdisciplinary approach, he states, “CTE is one of the most relevant course options we offer at Bend High. It provides hands-on experience and builds critical thinking skills which are important for both higher education and the work force. The CTE programs tie directly into our core classes of science, math and english and we have outstanding teachers who work collaboratively to help students transition between these classes. Test scores of Bend HS CTE students are high (consistently exceeding state targets) because all Bend HS CTE instructors have been trained in CTE in Literacy and/or CTE in Math.”

Engineering the Future of Power and Energy continues that integration of core academic content and takes full advantage of significant community resources (see Partnerships section and letters of commitment). There is a strong commitment to the integration of math and science woven throughout the engineering design projects of EFPE. In addition, when Bend HS committed to Project Lead the Way – Engineering, this set in motion a comprehensive STEM curriculum that engages students and prepares them to be innovative and productive leaders of science and engineering.

Through the well-established “Engineering Rotation” (see more details in the Bonus section and Appendix), students learn first-hand from local practitioners in the engineering field what knowledge and skills are necessary to be successful.

Expansion and Growth – *How does the project support the expansion and growth of CTE in your district, region and/or state? (10 points)*

The Bend-La Pine School District (“District”) has long been a strong supporter of CTE programs. During a time of budget cutting across the state, many school districts have seen both offerings and student enrollment in CTE programs decline. In stark contrast, the District has made a conscious decision to keep our CTE programs intact, recognizing the inherent value and importance of these types of courses that help students become college and career ready.

The District sought to increase overall CTE offerings by building a \$5 mill Center of Technology and Design at Bend High School (part of a bond measure that was passed by voters in 2006 and completed in 2010). The building features a cutting-edge environment for modern career and technical skills classes with a sound studio, woods manufacturing and computer labs for “Visual Design” and “Communication Arts.” The Technology Center was created with the vision of many programs working together so students could move from one project to another with cross-curriculum instruction. The layout of the Technology Center allows courses to seamlessly blend traditional classroom lectures side-by-side with hands-on projects as well as co-teaching efforts. Three quarters of the building is now occupied, but it has an entire section on the 1st Floor that is still vacant waiting for the final piece to be found/developed. “Engineering the Future of Power and Energy” is that piece!

Because it’s an exciting, new POS that will generate significant attention and community awareness, Engineering the Future of Power and Energy helps to build and accelerate the pipeline from middle school through high school and on to higher education. To make it sustainable, Bend High School will pick up the cost of the instructor in future years.

Experiential Learning - *Providing students with authentic workplace experiences are a cornerstone of CTE programs. This authentic learning can take many forms from applied learning activities to full apprenticeship programs. How does this project ensure students are provided with experiential learning opportunities? (10 points)*

Engineering the Future of Power and Energy (EFPE) has been designed to maximize authentic learning opportunities through engaging field trips, hands-on projects and internships that include the following:

- Installing a 5 kW solar array – students will assist Sunlight Solar in installing (and dismantling) solar panels on the roof of the Technology Center as well as building support brackets and other necessary equipment. This activity is sustainable as the same solar array can be used in future classes.
- Building an electric car – students will take the knowledge they have learned about automotive principles and build a ¾ scale electric car.
- Installing an electrical charging station – students will assist Sunlight Solar to install an electrical charging station at the Technology Center. They will then work with other organizations to build additional electrical charging stations out in the community in future years.
- Going on an energy audit – students will assist GreensaversUSA with an actual energy audit of a nearby residential or commercial property.

In addition, Cascade Truck and Auto Repair is prepared to offer an internship for one or more students to work at their facility which is located just out the back door of the Technology Center. Students will have the opportunity to work on a variety of vehicles as well as learn about customer sales and service.

A. Project Outcomes and Progress Markers (15 Points)

The proposed new CTE Program of Study “Engineering the Future of Power and Energy” (EFPE) has been specially designed to address increased student engagement and performance, enhanced instructor knowledge and practice, alignment with diploma/certificate requirements and improved partnerships with business, industry and higher education partners. Through a dynamic curriculum which includes course lectures, outside speakers, hands-on fabrication, field trips, special projects, leadership development and CTE-related competitions, EFPE will put students on a trajectory for success in both higher education and the workforce. As proposed, EFPE will achieve the following outcomes:

1) Increase enrollment of students in CTE Programs of Study at Bend High

School from ~1,500 courses to over 1,800 courses per year as a result of adding this new POS by July 2015.

Bend High School currently operates 7 CTE Programs of Study: 1) Graphic Arts, 2) Business, 3) Visual Arts/Videography, 4) Family and Consumer Science, 5) Project Lead the Way – Engineering, 6) Construction Technology, and 7) Culinary. Bend HS students currently take a total of approximately 1,500 CTE courses each year (with some students taking more than one CTE course). We believe Engineering the Future of Power and Energy will be very popular with students since it provides both information and real-world applications on topics that they see on the news and hear all around them every day. Coupled with engaging marketing efforts at feeder middle schools, EFPE will attract a broad range of students from those who want to work right out of high school as well as those who want to pursue a certificate or a degree in a particular field.

2) At least 50% of EFPE Program Completers (State target TBD) will meet technical skills attainment as determined by the E-sess measurement tool by June 2015.

An EFPE Program Completer is defined as a student who has completed “Principles of Power and Energy” (the Intro course that provides a foundation for the other EFPE courses) and at least one other course in the POS.

3) At least 80% of EFPE Program Completers (State target TBD) will Meet or Exceed benchmark on Smarter-Balanced in Reading, Writing and Mathematics by June 2016 (Note: state guidelines on grade levels regarding who are allowed to take Smarter-Balanced may limit the number of participants in early years, but we would fully capture all POS participants by June 2017)

Given the phased approach to starting these new EFPE courses, we anticipate there will be considerably more Program Completers in Yrs 2 and beyond than in Yr 1. Our interim Goal is to have roughly 70% of 2014-15 Program Completers Meet or Exceed Benchmark on Smarter-Balanced in Reading, Writing and Mathematics by June 2015.

4) All EFPE Instructors will complete training through High Desert ESD in Math in CTE and Literacy in CTE by August 2015

This training will depend entirely upon the new instructor that is actually hired to teach the POS (as they may already meet one or both of these qualifications). If not, the training will be provided by High Desert ESD who is nationally certified to do this.

5) Engineering the Future of Power and Energy (EFPE) will be a state-approved CTE Program of Study by July 2015

EFPE is designed to prepare students for self-sufficiency and career success since it is targeted at high wage and high demand occupations in the energy and engineering

fields. Our application to become a state-approved POS will outline how the 5 EFPE courses provide continuums of critical knowledge and skills that have been identified by K-12, post-secondary and our workforce partners.

B. Career and Technical Education Program of Study Design (15 Points)

Inspired by the promise of 21st Century technology, the energy demands of a growing global economy, the burgeoning alternative energy industry in Central Oregon, and available space in the Bend High School Center of Technology and Design (“Technology Center”), “Engineering the Future of Power and Energy” (EFPE) has been designed to introduce and provide valuable skills to high school students in “high wage, high skill, high demand” occupations. EFPE will introduce students to the fundamentals of electricity and power including engineering design, turbines, automotive mechanics, energy efficiency, and the alternative energy sources of solar, wind, hydro, geothermal, biomass, and biodiesel. Also covered will be safety and many of the business aspects of energy production.

Key elements of “Engineering the Future of Power and Energy” (EFPE):

- The EFPE Program of Study will be comprised of 5 semester long courses:
 - #1 “Principles of Power and Energy”** - this is an introductory course that provides a foundation for all the other EFPE courses. It presents many critical concepts and topics to students in a broad brush “cruise” approach including fundamentals of electricity and power, turbines, engineering design, solar, wind, hydro, biomass, geothermal, bio-fuels, automotive, energy efficiency, safety, business aspects of energy production, etc. There will be a number of field trips and outside speakers coming in to talk about various energy sources (see separate letters of commitment).

This is the primary class where various out-of-class engineering options will be introduced to students (includes SkillsUSA and the Central Oregon Engineering Competition - see Bonus section for more details).

#2 “Automotive Concepts and the Electric Car” - provides an introductory look at the engine/motor and key principles around automotive transportation. Students learn about and become familiar with basic automotive tools and equipment, understand the science and design behind the electric motor, and undergo leadership training related to the construction of an electric car (e.g. project management, fundraising, marketing and ultimately community presentations). Course Projects include: 1) students design and build a ¾ scale electric car; 2) students install an electric charging station at the Technology Center; 3) students in future years will install an electric charging station in other community locations (TBD).

#3 “Solar Energy and Electricity” - provides a more detailed look at electricity and specifically how solar energy is converted, stored and utilized in a variety of settings (e.g. residential, commercial, industrial). Students learn about solar panels, how they are used and the equipment required to install and maintain them (including safety rules and regulations). Students also learn about the business aspects of solar including financing, tax credits, metering, etc. Course Projects include: 1) students assist with the installation of a 5 kW solar panel array on the roof of the Technology Center (and dismantle it so it can be reinstalled by future classes), and 2) students do basic machining and/or fabrication projects such as create panel brackets as part of the installation.

#4 “Principles of Design for Alternative Energy and Efficiency” - provides an

opportunity for students to learn some of the critical design questions and features of the latest energy technology (e.g. aerodynamics of a wind turbine blade, geothermal drilling techniques, passive solar design, etc.) Students also learn about the critical role of energy efficiency in the home and business, and get to observe testing procedures first-hand. This course features extensive cross-disciplinary work with adjacent Design, Engineering and Construction Technology classrooms in the Technology Center. Course Projects include: 1) students conduct an energy audit (with GreenSavers); 2) students build and place a small hydro turbine (with Central Oregon Irrigation District); and 3) students do basic machining/fabrication projects (i.e. design and build composite blades, construct fiberglass molding, devise and test electrical wiring systems, etc.)

#5 “Field Rotation in Energy Occupations” / Capstone Project - this course is primarily for independent study and provides an opportunity for more in-depth student-led field work and/or research. Many EFPE Partners would play an advisor role with the individual students (see list of Partners and roles in Required Documentation). This course would interface with the existing Bend HS School-to-Career Program/”Future Center” which helps organize and coordinate job shadow opportunities and work on summer internships.

- The EFPE POS will be taught by experienced and highly qualified instructors:

Gavin Meyers earned a degree in Landscape Architecture, then worked five years for a civil engineer before transitioning to teaching. He has an MA in CTE and six years of experience teaching in high school. He currently teaches PLTW-Intro to Engineering Design; Principles of Engineering; Civil Engineering Architecture; and

Drafting. He has been an active champion in promoting engineering in the District and spearheaded the Central Oregon Engineering Competition.

Don Carter has been a Technology Educator in the K-12 system for 21 years. He has a BS in Industrial Science Technology and a CTE2 license in Engineering Technology. Over the years, he has taught a wide array of courses including Manufacturing; Construction; Power and Energy; Automotive; Forestry; Computer Science; Graphic Arts; CAD/CAM; and Robotics.

The Engineering the Future of Power and Energy POS will be taught by three Bend HS instructors: Gavin Meyers, Don Carter and a third instructor to be hired in February/March 2014. The job description for this third instructor will be written to complement the skills and experience that Gavin and Don bring to this effort. The new instructor will work on a part-time contract for the Spring and Summer, meeting frequently with Gavin and Don, helping develop the POS curriculum, purchasing equipment and setting up the workshops and classroom. To make EFPE sustainable, Bend High School will pick up the cost of the third instructor in future years.

- EFPE courses will be taught at the Technology Center at Bend High School and open to students at the three other Bend high schools (Summit, Mountain View and Marshall):

In addition, students and teachers at all educational Partner institutions will be able to access select course offerings through an on-line system established at YouTube EDU. We estimate 230 students will take at least one EFPE course in Yr 1 and 300+ students in Yrs 2 and beyond. We estimate another 75 non-Bend HS students will access information/materials through this on-line system annually.

- EFPE courses will feature outside speakers from local industry and higher education

as well as cross-disciplinary instruction with other CTE programs at the Technology Center or Bend High School:

This cross-disciplinary work includes Project Lead the Way – Engineering, Visual Arts/Videography, Graphic Arts, Construction Technology, and Business.

- Courses will include a wide range of instructional techniques and methods:

EFPE will feature lectures and presentations, engaging field trips, exciting hands-on projects, real-world job shadow opportunities and independent study/capstone projects. Examples of various course projects include installing a 5 kW array of solar panels, installing an electric charging station on site, building an electric car, and conducting an energy audit, etc.

- A “pipeline” for students will be developed that is tied to a certificate or a degree:

In conjunction with many local businesses and higher education partners Central Oregon Community College (COCC), Columbia Gorge Community College (CGCC) and OSU-Cascades, EFPE will develop a “pipeline” for students that is ultimately tied to a certificate or a degree in a particular area (e.g. Oregon Green Technology certificate at COCC, Renewable Energy Technology AAS degree at CGCC or an Energy Systems Engineering degree at OSU-Cascades to name just a few).

- Student leadership and development opportunities will be an important part of EFPE:

The EFPE Instructor will talk about Oregon SkillsUSA with students in Yr 1 with the goal to send them to the Leadership Conference in Fall 2014 and the actual Competition in Spring 2015. In addition, the Central Oregon Engineering Competition will be heavily promoted in the classes (see Bonus section for more details).

- A CTE Advisory Committee will help provide guidance/oversight and assist with

program design and evaluation:

We have already identified half of the 8-10 business and education representatives so one of the tasks for the new EFPE Instructors will be to round out this body. The CTE Advisory Committee will hold meetings in August, September, and October 2014 and then quarterly after that.

- Student support/mentoring is provided:

Several EFPE partners have agreed to mentor students and/or serve in an advisory capacity for a “Capstone” independent study project (see letters of commitment).

- Evaluation and Assessment are ongoing:

E-sess assessments will be used for end-of-program assessment of technical skills attainment. The EFPE Instructors will work with the CTE Advisory Committee to select and/or modify the assessments as needed. The Bend-La Pine School District utilizes the Oregon Skill Sets and other national standards along with the Framework for 21st Century Learning to help integrate skills into the teaching of all core academic subjects. These frameworks describe the skills, knowledge and expertise students must master to succeed in work and life - a blend of content knowledge, specific skills, expertise and literacies. Within the context of core knowledge instruction, students must also learn the essential skills for success in today’s world - critical thinking, problem solving, communication and collaboration. Engineering the Future of Power and Energy builds on this foundation, combining the Framework with the necessary support systems - standards alignment, assessments, curriculum and instruction, professional development and collaborative learning environments.

EFPE partners have been selected because of their ability to help us align the EFPE

program with industry-recognized technical standards, academic standards and employability skills. Through EFPE, students will be more engaged in the learning process, take ownership of their future and be better prepared to thrive in today's global economy. Through EFPE courses, students will learn to think critically about the tradeoffs associated with different energy sources, learn problem solving and engineering design as they create basic machining and fabrication products, and learn teamwork as they collaborate to build an electric car and/or install various pieces of equipment.

Specifically, EFPE weaves 21st Century interdisciplinary themes into core subjects such as 1) global awareness, 2) STEM, 3) financial, economic, business and entrepreneurial literacy, and 4) environmental literacy. Students will be challenged and learn innovation skills that separate those who are prepared for today's increasingly complex life and work environments and those who are not. Since employability skills are critical to POS success, as the EFPE courses are developed, we will ensure that they align closely to nationally-recognized industrial standards such as the Common Career Technical Core.

Looking at job prospects, the EFPE POS covers a very diverse set of potential occupations for students to pursue. A small sample includes energy engineer, mechanical engineer, solar energy installation manager, wind turbine technician, fuel cell engineer, automotive technician, biomass and geothermal technicians and managers, etc. (see Appendix for more complete list of potential occupations that could begin with EFPE).

C. Underserved Students (10 points)

Many traditional CTE programs tend to be heavily weighted toward boys (in terms of

enrollment if not necessarily targeted recruitment efforts). Engineering the Future of Power and Energy (EFPE) has been designed to cast a very wide net in introducing students to potential occupations and careers, and we feel EFPE will be much more balanced in terms of gender participation. There are three reasons that we feel this way.

The first is that many of the EFPE courses deal with the environment which studies have shown has a very strong emotional connection for young girls. Secondly, some of the high profile special projects mentioned above (e.g. build an electric car) have proven in other locations to be a strong draw for girls because it is the right blend of hands-on work with cerebral design. We anticipate that the installation of the electric charging station and solar panels will have a similar appeal. The third reason is that several of our EFPE Partners are women and they will be able to be positive role models during class presentations and field trips. Examples include ML Vidas who runs her own architectural firm and Kendra Van Note who is the Community Outreach Coordinator for GreenSavers USA. Their role in the EFPE POS will be highlighted when we share the program with Bend HS counselors.

There are two other specific outreach efforts that should spur increased participation by underserved populations. The first (“No Boys Allowed”) is specifically for CTE and the second (Equal Opportunity Schools) is for more advanced courses in general.

The idea behind “No Boys Allowed” is to utilize a non-student contact day to set up and hold a planned event concurrently at the three traditional Bend high schools (Bend, Summit and Mountain View) which showcase the District’s various CTE programs and offerings. 8th grade girls that attend get to build projects, play games and participate in fun activities that highlight the many CTE options. Participants meet teachers, talk with

current CTE students and get to know other students with similar interests. By not inviting boys, the intent is to offer girls a safe place (with the support of their female peers) to explore some of the nontraditional options that high school has to offer. Girls need to know that CTE is fun, not just for boys, and can open an infinite number of doors for them in their lifetime. The event would be held in early February 2015 during an early release Wednesday afternoon so as to coincide with forecasting classes for the following year.

Finally, Bend High School has just started working closely with Equal Opportunity Schools (a national nonprofit organization) to identify potential students who are qualified for advanced courses, but are not enrolled in them. The goal is to identify, enroll and support these “missing students” in challenging college-preparatory courses by boosting their academic motivation and achievement, and their likelihood of going to and graduating from college. This work will obviously dovetail with the efforts to enroll more girls and low-income students in EFPE and other CTE courses.

D. Diploma Connections (10 Points)

In an ongoing effort by the state to increase academic rigor, members of the Class of 2012 were the first to be required to have 3 credits in CTE, Fine or Performing Arts or a 2nd language to earn a diploma. Adding Engineering the Future of Power and Energy (EFPE) as an additional CTE Program of Study gives students yet another option to meet that credit requirement. Through the EFPE curriculum and course requirements, students will have authentic, field-based career-related learning experiences as well as opportunities to demonstrate career-related learning standards, develop extended application of learning and identify personal academic and career interests as part of an Education Plan and Profile.

Regionally, the District does training for all our CTE Instructors in Math in CTE and Literacy in CTE. This is a national training program done through High Desert ESD which is certified as a trainer. In the CTE training, the CTE Instructor is paired with the academic content teacher to develop specific lessons that focus on the necessary academic skills. In Literacy, this is critical reading and writing; in Math, this is Algebra 1 level or above standards. Additionally, our District has made a substantial investment in STEM and STEM-related programming; Project Lead The Way – Engineering started at Bend HS (2010) and PLTW-Biomedical Science started at Summit HS (2011). The District is exploring Gateway to Technology and other possible routes to increase exposure to engineering at the middle school level.

We believe that this CTE training over the past 5 years has been a contributing factor to our increasing OAKS scores, especially given the fact that our CTE students score higher on OAKS than our general student population. EFPE will provide students an incredible opportunity to begin to personalize their studies in the dynamic fields of engineering, energy and/or the environment and to have those authentic field and mentoring experiences that will inform their Education Plan and Profile and be the basis of their extended application.

E. Sustainability and Communication (25 points)

Engineering the Future of Power and Energy is an ambitious new CTE POS that is able to take advantage of several unique circumstances to ensure long-term sustainability. It is a program that was literally envisioned more than 7 years ago when the Technology Center was first being designed so it has dedicated space with all the necessary electrical, gas and related hook-ups to install energy-intensive machinery and

equipment (e.g. welding stations have been partially installed). The workshop space is adjacent to a classroom for seamless transitions during courses and it is located in a facility which is designed to work collaboratively with other related CTE POS such as Engineering, Construction Technology, Graphic Arts, etc. (See 2-page overview of the Technology Center and the proposed EFPE space in the Appendix).

The largest ongoing expense of the EFPE POS is the new Instructor, and Bend High School is committed to picking up the cost of the additional teaching position after July 2015. Many of the other costs associated with EFPE implementation are one-time expenses (e.g. metal working equipment, fabrication tools, automotive tools, safety equipment, video equipment, displays, etc.). Professional development expenses can largely be picked up by Perkins funding in future years once EFPE is an established POS.

Items that will need to be replenished on an annual basis include funds for field trips and student leadership/competitions along with materials and supplies for some of the special projects (i.e. building electrical cars). Fortunately, these costs are not that substantial and will be covered by a combination of District funds, school funds, grants and sponsorships from EFPE Partners and the broader community.

We anticipate that Engineering the Future of Power and Energy will generate an extensive amount of interest from students and the broader community so we will be able to recruit new partners that have not even been identified. In addition, the District has a full-time grant writer and one of his tasks will be to identify and write grants for STEM-related activities as well as pursue other business-related grants and sponsorship opportunities.

Engineering the Future of Power and Energy proposes to use distance learning as a special tool to significantly expand the reach of the coursework. Students in the Videography/Visual Arts Program (located just upstairs from EFPE in the Technology Center) will be trained to video record select EFPE lectures and project work. These classes will then be edited and uploaded to YouTube EDU for easy access by students and teachers at other Central Oregon partner institutions. Since there is no reason why this information could not be more broadly accessed by anyone with an internet connection, we are happy to publicize this resource through various CTE networks and other channels.

There are not many Oregon locations that have the full range of renewable energy sources like Bend, but most do have at least one or two. Given that, we are happy to share our experience in launching EFPE and provide assistance with lesson plans, choice of equipment and developing special projects that would help another school replicate part or all of the EFPE Program of Study.

F. Activities and Timeline (10 Points)

Action/Activity and Rationale	Timeline
Hear from state about approval of the CTE grant	December 2013
Develop formal EFPE Instructor job description and post position	January 2014
Interview and hire EFPE Instructor (on part-time contract position until starting full-time in the Fall)	February-March
Hold planning meetings between the three EFPE Instructors to begin developing course outlines; making site visits and attending conferences as pertinent	March-June
Work with feeder middle schools and the District to determine how best to expand engineering offerings in earlier grades	March - June

Begin developing curriculum/standards for courses #1 and #2, conduct outreach to project Partners (business and higher education as needed)	May - August
Advertise first 2 EFPE courses to students before they leave for the summer – this is done by a phone call (auto-dial) to every student's home plus Art students will develop a DVD	May - June
Purchase or acquire EFPE equipment and supplies and set up workshops and classroom	June - August
Instructor starts training in Math in CTE and Literacy in CTE (5 days in summer and 5 days during school year for both subjects if schedule permits)	June - August
Develop CTE POS Advisory Committee and hold first meetings	August, September, October and then quarterly after that
Schedule course presentations and field trips for Fall	August – September
Begin teaching first 2 EFPE Fall courses and gather baseline data of students	September– October
Work with higher education partners on articulation and standards	ongoing
Begin recording and editing select EFPE courses, storing them for Partner use	ongoing
Talk to students about upcoming competitions: Oregon SkillsUSA (Leadership – Fall 2014, Competition – Spring 2015); Central Oregon Engineering Competition (Spring 2015)	September - October
Advertise all 5 EFPE Spring courses to students (using posters, banners, talking to counselors, etc.)	October– December
Develop curriculum for courses #3, #4 and #5	TBD - Fall Semester
Schedule course presentations and field trips for Spring	November 2014 – February 2015
Use E-sess to measure technical skills attainment	December
Begin teaching all 5 EFPE Spring courses and gather baseline data of students	January 2015
Hold “No Boys Allowed” conference for 8 th grade girls	Early February
Hold Central Oregon Engineering Competition	February - March
Advertise EFPE Fall courses to students (using posters, banners, talking to counselors, etc.)	February - March
Use E-sess to measure technical skills attainment	May - June

Instructor completes training in Math in CTE and Literacy in CTE (5 days in summer and 5 days during school year for both subjects)	June - July
Apply to become a state-approved CTE Program of Study	June 2015
Gather data including enrollment, technical skills attainment, Smarter balanced results and submit report to ODE	June-July
EFPE becomes a state –approved CTE Program of Study	July 2015

G. Evaluation (10 Points)

All five proposed POS Outcome Measures are able to be tracked with existing systems that have been established by the District or represent verifiable Yes/No outcomes.

- 1) *Increase enrollment of students in CTE Programs of Study at Bend High School from ~1,500 courses to over 1,800 courses per year as a result of adding this new POS by July 2015.***

Through class registration and attendance, we will be able to track student enrollment for each of the 5 proposed EFPE courses (and obviously for all CTE courses offered at Bend HS). Since the EFPE Instructors will need additional time to develop courses 3-5, only the first 2 courses will be offered in the Fall of 2014. This means that we will not be able to ascertain enrollment trends (representing student interest) on those courses until the following year (Fall 2015).

- 2) *At least 50% of EFPE Program Completers (State target TBD) will meet technical skills attainment as determined by the E-sess measurement tool by June 2015.***

An EFPE Program Completer is defined as a student who has completed “Principles of Power and Energy” and at least one other course in the POS. We will use on-line assessments through E-sess that meet national standards as well as locally designed common formative and summative assessments that will guide the EFPE Instructors on modifying teaching practices as needed. These assessments

will be conducted on-line and/or in class in the Fall 2014 and Spring 2015 to establish baseline data and then following program completion after that.

- 3) At least 80% of EFPE Program Completers (State target TBD) will Meet or Exceed benchmark on Smarter-Balanced in Reading, Writing and Mathematics by June 2016 (Note: state guidelines on grade levels regarding who are allowed to take Smarter-Balanced may limit the number of participants in early years, but we would fully capture all POS participants by June 2017)**

Utilizing the District's EduPoint (Synergy) system, we will be able to fully track student performance. This process will be headed by the District's Director of Assessment and Evaluation in conjunction with Bend HS officials (Principal and EFPE Instructors).

- 4) All EFPE Instructors will complete training through High Desert ESD in Math in CTE and Literacy in CTE by August 2015**

If the new EFPE Instructor who is hired is already trained in either Math in CTE or Literacy in CTE then this outcome will have been achieved at the beginning of the effort. If not, then the training will be completed through High Desert ESD during the ensuing 20 months (January 2014 – August 2015). This training will be identified as part of the new EFPE Instructor's workplan and will be reviewed on a regular basis by the CTE Advisory Committee to ensure compliance.

- 5) Engineering the Future of Power and Energy will be a state-approved CTE Program of Study by July 2015**

We will work closely with the Regional CTE Coordinator to submit an application at the end of the 2014-15 SY for EPE to become a state-approved CTE Program of

Study. The Regional CTE Coordinator will serve as a member of the new CTE Advisory Committee and will be able to provide any assistance and guidance necessary to help ensure that we have all program components covered prior to the application. The application itself will be written by the District's Grant writer in consultation with the EFPE Instructors and Regional CTE Coordinator.

In addition to the formal evaluation of the proposed Outcome Measures listed above, there are several other ways in which the value of EFPE will be determined, including:

- *Student interest/engagement survey* – in collaboration with the District's Director of Assessment and Evaluation, we will develop a formal student survey that will be administered to every student who signed up for an EFPE course. The survey will seek to understand motivation for taking a particular course (or courses), whether that interest was career-related and whether it has helped focus career aspirations. The survey will be administered at the end of each course by the respective teacher.
- *Business relevance review* – we will develop an ongoing process for gathering feedback from local business leaders to gauge response to the following question: "Are we going in the right direction and teaching the knowledge and skills their company needs?" This will be done through a combination of site visits, CTE Advisory Committee meetings, and a brief on-line survey. The process will be developed and administered by the CTE Advisory Committee and EFPE Partners once per year.

Partnerships (25 points)

As Engineering the Future of Power and Energy moved from a simple concept to a full program laid out on paper, it was exciting to see how many local partners jumped at

the chance of doing something this forward looking. EFPE Partners currently include:

K-12 and ESD	Higher Education	Business/Industry
Bend HS	Central Oregon Community College	Sunlight Solar
Summit HS	OSU-Cascades	Central OR Irrigation District
Mtn View HS	Columbia Gorge Community College	GreenSavers USA
Marshall HS		Energy Trust
La Pine HS		ML Vidas Architecture
Sisters HS		North Coast Electric Company
High Desert MS		Energyneering Solutions
Pilot Butte MS		Deschutes County (Knott Landfill)
High Desert ESD		Cascade Truck & Auto Repair

EFPE Partners were instrumental in helping us with the following:

- determining scope of the POS including key elements such as an emphasis on the basics of electricity, covering broad business principles, including a safety and regulations component, and special projects)
- helping develop lists of tools, equipment and safety supplies for the workshop and classroom
- helping develop lists of equipment and supplies for special projects
- hosting field trips (e.g. Sisters HS biomass plant, COID hydro power site, Davenport Geothermal Project at Newberry Crater, visit to a wind farm in Hood River, energy audit, etc.)

EFPE Partners also made significant donations of labor (Sunlight Solar) and equipment (North Coast Electric Company) as well a commitment to give presentations, lead field trips and work with students in a mentor, job shadow and intern capacity (Cascade Truck and Auto Repair).

Our higher education partners are also committed to help articulate curriculum, seek credit whenever possible, and make sure that all EFPE students know about post-secondary opportunities.

Central Oregon Community College degree programs that are applicable to EFPE courses include:

- ✓ Automotive Technology
- ✓ Business Administration
- ✓ Engineering
- ✓ Manufacturing Technology
- ✓ OR Green Technology

Columbia Gorge Community College degree programs that are applicable to EFPE courses include:

- ✓ Renewable Energy Technology

OSU-Cascades degree programs that are applicable to EPE courses include:

- ✓ Energy Systems Engineering
- ✓ Sustainability

EFPE Partners recognize that this is a very ambitious undertaking and will require their sustained support in future years. As mentioned previously, the District grantwriter will work with EFPE partners to pursue grants for STEM-related activities as well as other business-related grants and sponsorship opportunities.

A. Career and Technical Student Organizations (CTSOs) (7 Points)

CTSO's can provide students with exposure to all aspects of industry, enhancing technical and academic knowledge while at the same time developing strong leadership skills. Describe how CTSO's will be embedded in the overall CTE project proposed in this application. How will the CTSO impact the overall school environment? How will the CTSO be linked to partners in the community? Describe the recruitment process for members and how interest will be built before they start high school. How will this component be integrated into the project and support the goals of the CTE Revitalization Grant?

Under the direction of Gavin Meyers (one of the three proposed EFPE Instructors), Bend HS has been doing SkillsUSA competitions for several years. There is an active "Skills Club" that meets at school once a week, culminating in a Spring SkillsUSA Competition over in the valley. Bend HS Skills Club members have competed in the following categories in recent years: Novice CAD, Technical Drafting, Carpentry and Cabinet Making. This effort will continue and we see it expanding significantly with the addition of EFPE as there will be even more students introduced to engineering elements.

In addition to the Skills Club, Bend HS has started a formal "Engineering Club" that meets bi-weekly (also headed by Gavin Meyers). The highlight for this Club is an annual Engineering Competition where students work throughout the year on a specific "design challenge" that has been established by an industry-led PLTW Advisory Team (additional details of a recent competition are provided on page 32).

To date, the Engineering Competition has only had participants from Bend-La Pine and Gilchrist School District, but the hope/intention is to open it up to a tri-county competition (Deschutes, Crook and Klamath Counties).

B. Middle School Component (7 Points)

A well designed career and technical education program builds from one year to the next and starts early in the middle school years. This encourages students to persist in career and technical education as they advance through their school career. Describe the middle school component of your proposed project. How will this component be integrated into the project and support the goals of the CTE Revitalization Grant?

The District has been increasing its commitment to engineering/STEM for several years and this was highlighted by starting Project Lead The Way – Engineering at Bend HS in 2010 and Project Lead The Way – Biomedical Science at Summit HS in 2011. The District is currently in the process of exploring how best to bring engineering/STEM to middle school students and younger. Currently, there are two “feeder” middle schools that send graduates on to Bend HS: Pilot Butte MS and High Desert MS.

Pilot Butte MS is implementing an MYP Program (middle school counterpart to IB) which features many engineering elements (see Appendix). High Desert MS currently offers “TAG Tuesdays” where an outside tutor comes in and provides instruction and hands-on lessons in engineering design (see full program schedule in Appendix). The EFPE Instructors will reach out to the appropriate teachers at these two schools and come make a presentation in Fall 2014 to let students know about this new POS.

As part of this EFPE proposal, we are earmarking \$9,000 for planning and professional development at the middle school level to determine how best to increase and integrate engineering across the District. Because of our positive experience with PLTW – Engineering, we are seriously considering Gateway to Technology and have been in regular contact with OIT. This planning will occur during Spring 2014 so that training can occur over that summer or in the Fall.

C. Out of School Time Programming (7 Points)

Including students in career and technical education programs have the potential to bolster both technical and academic skills during these non-traditional learning times. Out of school time includes any time that schools are not in session – this may include summer, after school or weekends. Please describe the out of school time programming component of your proposed project. How will this component be integrated into the project and support the goals of the CTE Revitalization Grant?

There are two specific out of school programs that will augment the coursework of EFPE: 1) Engineering Rotation and 2) Central Oregon Engineering Competition.

Engineering Rotation - for the past nine years, the District's School-to-Career Program has run an "Engineering Rotation" which supplements Industrial and Engineering Systems CTE curriculum taught in traditional classroom settings with hands-on, relevant learning in the Bend area engineering community. Up to 56 students meet on Wednesday afternoon (District early release day) over a 12 week period to learn from local engineers either through labs at a host high school or at the firms themselves (see full schedule of the Engineering Rotation in Appendix).

Central Oregon Engineering Competition – this annual one-day event (now in its 3rd year) is offered to all District high schools plus Gilchrist every Spring. The formal "design challenge" is established by the industry-led PLTW Advisory Team which meets 2-3 times per year with the engineering instructors meeting about once per month. Students have a general sense of the challenge, but do not know in advance how they will be tested. For example, in 2013 the competition sought to assist the Bend Paddle Alliance which was working to develop a kayaking route through the removal and reconstruction of the Colorado Bridge Dam (over the Deschutes River). Students were given the challenge of "How do you change the current of the river to create an optimal surfing wave for kayaking?" They then had 30 minutes to devise/build a model to test various theories.

D. Focus on Regional, Statewide or System Changes (7 Points)

Proposed projects may take on a scope larger than a single school or district. Such projects can demonstrate scalability of an idea, solve problems that are common across all CTE programs, or develop a regional strategy that uses shared resources. Bonus points will be provided for proposals that offer to take the project to a larger audience. Describe how your project is eligible for bonus points under this section. What impact will your proposed project have on a region, the state or the entire CTE system?

We believe that Engineering the Future of Power and Energy (EFPE) has the potential to change what CTE looks like, to transform the image/perception, and to help shift some of the stereotypes around CTE that it is simply the current generation's vocational school. The sheer breadth of the EFPE topics and the ability for 300+ students annually to be exposed to energy (and engineering) will excite both young and old throughout the community. With the growing higher educational presence in Central Oregon (e.g. COCC doubled enrollment from 2008-2011 and OSU-Cascades is converting to a 4-year university) it will be valuable to have a robust pipeline to many certificates and degrees in the fields of engineering and energy.

Finally, EFPE is a great model of a school/District reaching out to local industry and securing their assistance to provide time and resources to create a pipeline for a future workforce. Many Oregon schools have at least a couple of nearby energy sources and we are happy to share our experience in launching EFPE and provide assistance with lesson plans, choice of equipment and developing any special projects that would help another school replicate part or all of the EFPE Program of Study.