The sun provides an enormous amount of power to Earth. Naturally, the ability to harness the huge quantities of energy that it provides is a goal for the scientific community, so bigger and better solar panels are being developed every day. The robot created by Xavier Robotics would be capable of providing an efficient power source to the grid. The design utilizes a rotation arm and a tilting panel to create a dual axis tracking system, increasing the power output of the solar panel by 33% compared to a static panel. This gain is equivalent to 60 watts for a square meter panel. The tracker uses 3 watts making the increase 57 watts. This makes the solar tracker very efficient, because it creates its own energy and extra to power the grid. With land becoming the greatest commodity, being able to generate more energy in the same area is cost effective.

Programming is an important part of the solar tracker. Using incredibly complex algorithms created by NOAA and translated by our robotics club, the exact location of the sun can be found at any time, any place, and with any weather. The programming makes the solar tracker environmentally friendly because sensors do not have to be created and powered. This goes above and beyond green materials selection, because using no sensors is even better than using energy efficient sensors. The solar tracker can be used to track other objects with just a change of programming making it able to perform many other tasks such as star or moon tracking.

The rotation arm can be folded up to make shipping of the solar tracker easier. This lightweighting means that less air would be shipped in the box and allow other good to be transported at the same time saving fuel.

The solar tracker can be easily repaired if a part breaks because the tracker uses standard parts from the Vex Robotics Kit. The tracker can be easily serviced with 2 different sized allen wrenches, and a wrench. The broken part can be replaced, so only the bad part goes to waste, not the entire solar tracker. When the solar tracker reaches the end of its life, it can be broken down into its basic Vex pieces and used for other energy saving projects. Two half broken solar trackers could also be combined to form one working unit while the other parts were recycled. These concepts extend the product lifetime, and provide a use for the product’s basic pieces at the end of its life.

The use of Autodesk Inventor, Inventor Studio and Autodesk 3DS Max helped greatly in the design of our solar tracker. We attained our parts library from the Autodesk Vex Portal, and the Vex CAD Wiki. The process of creating the solar tracker began by creating sub assemblies. These assemblies included the wheel that spins the arm, the base, and a single elevation motor. The elevation motor was combined with itself in a second level assembly to form the elevation bracket. These sub assemblies were combined along with other parts to form the full assembly. To minimize the render time, nuts and bolts were not added. The assembly was imported into the Inventor Studio and the the rotation and elevation angle constraints were animated. A custom light was created and animated to orbit at the same speed the tracker spun to show the sun aiming at the face of the tracker. This animation was rendered into a series of 900 pictures that were compiled into a video. After the animation was rendered, the nuts and bolts were added to the assembly to make it as realistic as possible. The assembly was imported into Autodesk 3DS Max and still images were rendered in 4K resolution.

The features that were most helpful in the creation of the CAD solar tracker were the ability to create sub assemblies which could be placed in larger assemblies. The many types of constraints allowed the tracker to be assembled quickly. Making some parts invisible allowed hidden parts to be constrained. Inverter studio allowed animations and pictures to be created while 3DS Max was used for better quality images.

We also built and tested the solar tracker for real as a challenge from a potential sponsor. The requirements were that it had to be within 5 degrees of the sun 95% of the time during a 2 hour test. The tracker performed almost perfectly being within 5 degrees of the sun 99% of the time.