Power 2π is a mobile bicycle generator which directly employs Faraday’s Law in order to power a safety light. Strong neodymium magnets on each wheel spoke pass by an iron-core solenoid, generating electromotive force (EMF) and inducing current. The resulting power is then rectified, regulated and stored before being fed into an LED bicycle light.

Rectify:
A full bridge rectifier converts the generator’s AC input to a positive DC signal, effectively adding the positive and negative components.

Light:
A white Schwinn, 4LED safety headlight serves as a load, and makes the rider’s presence known to nearby vehicles and pedestrians.

Stabilize:
Two 18mF capacitors in parallel average out the rectifier’s output to provide the regulator with a stable input.

Regulate:
A SWADJ3 step-down adjustable switching regulator sets its output to a constant voltage. A 2.8V output can be chosen for a slightly faster charge time or a slower rider. A 3.0V output can be chosen for a brighter light and a more advanced rider.

Store:
Three 1.5F supercapacitors in parallel are used to store power not dissipated by the bicycle light. During longer bike rides, this stored energy can be used to sustain the light when the bike is temporarily slowed or stopped, such as at intersections.

The permeability of iron is approximately 6000 times that of air, greatly increasing the inductance of the solenoid.