



# SUPER-CONDUCTORS

→ Superconductors transform the way we transmit and distribute electricity - with applications from high-speed trains to electricity transmission and storage.



## ECONOMIC

Uniting separate energy markets with interconnection capacity increases overall efficiency of the grid, which reduces electricity prices for consumers.



## SOCIAL

Increased interconnection capacity reduces the risk of blackouts.



## ENVIRONMENTAL

Low or zero transmission losses makes possible large-scale renewable energy projects further away from demand centers.

## THE SOLUTION

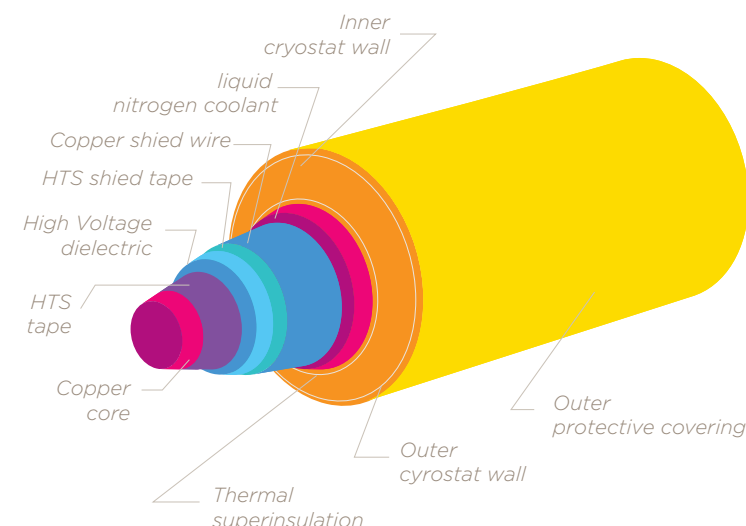
! The challenge of increasing electricity demand, an aging electricity infrastructure, and denser urban environments calls for a transformation of the grid. Complementary to smart grid solutions, superconductors can transform the way we transmit and distribute electricity.

A water pipe is a useful metaphor for understanding how our electricity grid works. The size of the pipe determines how much water can flow through it, and, if the pipe leaks, water is lost in transmission. In much the same way, the electricity grid has physical limits on the amount of current that can travel through it, and resistance causes electricity to be lost in transmission. Superconductivity is the ability of certain materials to exhibit zero (in theory) or very low (in practice) resistance.<sup>1</sup>

The Tres Amigas project intends to unite the United States' electricity grid using superconductor technology in order to realize the potential for renewable energy production.

## WHY A SUSTAINIA100 SOLUTION?

? As prices for superconductors continue to fall, the idea of connecting large-scale offshore wind farms or solar plants in the world's deserts with faraway urban consumption centers becomes viable. As such, superconductors can enable large-scale integration of renewable electricity in our energy system.



Source: Waterloo Global Science Initiative (2012): "Equinox Blueprint: Energy 2030"



# GEO THERMAL POWER



## ECONOMIC

Worldwide geothermal electricity generating capacity has doubled over the past 10 years.<sup>1</sup>



## ENVIRONMENTAL

The life-cycle greenhouse gas emissions of geothermal energy are 17 times lower than for coal.<sup>2</sup>

→ Imagine the energy potential of the sweltering cauldron that is the inner Earth. Today, geothermal energy is one of the main sources of the power coming out of the sockets in Kenya.

## THE SOLUTION

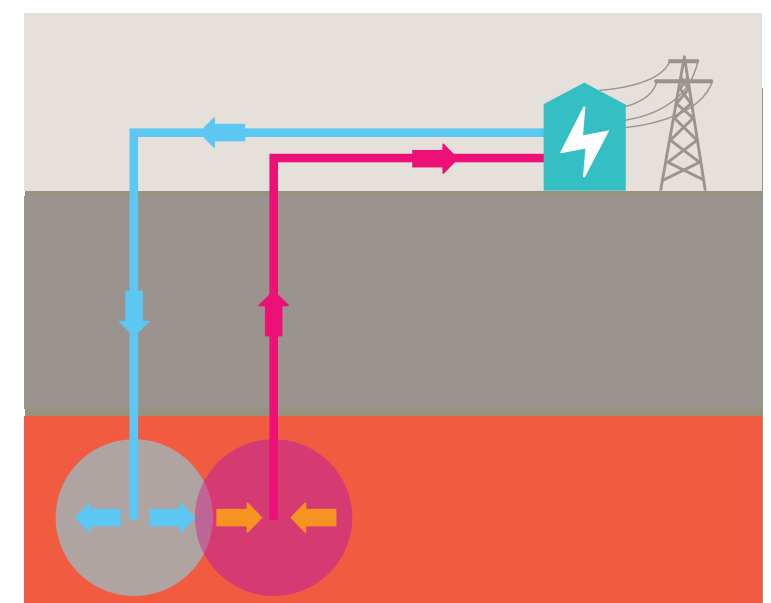
! Expansion plans for Kenya's KenGen Olkaria geothermal plants, owned and operated by Kenya Electricity Generating Company, will make them one of the primary electricity providers in Kenya, and earn them a place among the global leaders of geothermal electricity production, with a combined capacity of 740 MW according to the company - roughly equivalent to a third of the capacity required to supply Rio de Janeiro with electricity.

Geothermal power plants work by extracting energy from the core of the earth. Water is injected into a well and extracted via another. At surface level, the resulting steam is used to produce electricity. The result: environmentally friendly generation of renewable electricity.

## WHY A SUSTAINIA100 SOLUTION?

? Having existed for more than 100 years, the technology is ready and available. The theoretical potential of geothermal energy is large enough to cover all of humanity's energy needs. The challenge lies in mapping the geological heat potential in unexploited areas, determining if these areas have economically recoverable heat potential, and weighing production costs against competing energy technologies.

1. [www.geothermal-energy.org/](http://www.geothermal-energy.org/)
2. Based on Life cycle assessment reviews conducted by the U.S. National Renewable Energy Laboratory, <http://www.nrel.gov>.



1. Waterloo Global Science Initiative (2012): "Equinox Blueprint: Energy 2030."

