Technology policy lies at the core of the climate change challenge. Even with a cutback in wasteful energy spending, our current technologies cannot support both a decline in carbon dioxide emissions and an expanding global economy. If we try to restrain emissions without a fundamentally new set of technologies, we will end up stifling economic growth, including the development prospects for billions of people.

Economists often talk as though putting a price on carbon emissions—through tradable permits or a carbon tax—will be enough to deliver the needed reductions in those emissions. This is not true. Europe’s carbon-trading system has not shown much capacity to generate large-scale research nor to develop, demonstrate and deploy breakthrough technologies. A trading system might marginally influence the choices between coal and gas plants or provoke a bit more adoption of solar and wind power, but it will not lead to the necessary fundamental overhaul of energy systems.

For that, we will need much more than a price on carbon. Consider three potentially transformative low-emissions technologies: carbon capture and sequestration (CCS), plug-in hybrid automobiles and concentrated solar-thermal electricity generation. Each will require a combination of factors to succeed: more applied scientific research, important regulatory changes, appropriate infrastructure, public acceptance and early high-cost investments. A failure on one or more of these points could kill the technologies.

CCS, for example, depends on the ability to capture carbon dioxide at the power plant at low cost, transport it by pipeline over significant distances, and sequester it underground safely, reliably and durably. All these components are close to deployment, but each faces major challenges. Carbon capture is most promising for new types of coal-fired plants whose cost and reliability are yet to be proved. A vast new network of carbon dioxide pipelines would require major regulatory and policy support, with environmental and property-rights hurdles. The geologic sequestration of carbon dioxide at large scales must also be proved, carefully monitored and environmentally regulated. Early demonstration projects are likely to be many times more costly than later ones. Broad public acceptance and support will be crucial for the technology. Yet to date, the U.S. government has failed to get even one demonstration CCS power plant off the ground, and various private initiatives are currently strand-