



Digital  
Futures

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## Next-Gen Batteries Will Define Our Future

Renewable energy is finally becoming competitive, but utilities can't adjust the sun and wind to meet grid-scale demand.

New ways to store energy and move it to where it's needed will be key to unlocking a bright and sustainable future.



**\$480 million:** venture investments in battery R&D in first half of 2017



**8 minutes:** amount of time to charge Toyota's experimental solid state battery



**30,000:** number of homes to be powered by world's largest lithium-ion battery array



**200,000:** number of charges experimental gold nanowires can take without losing capacity

[Link to Sources](#)

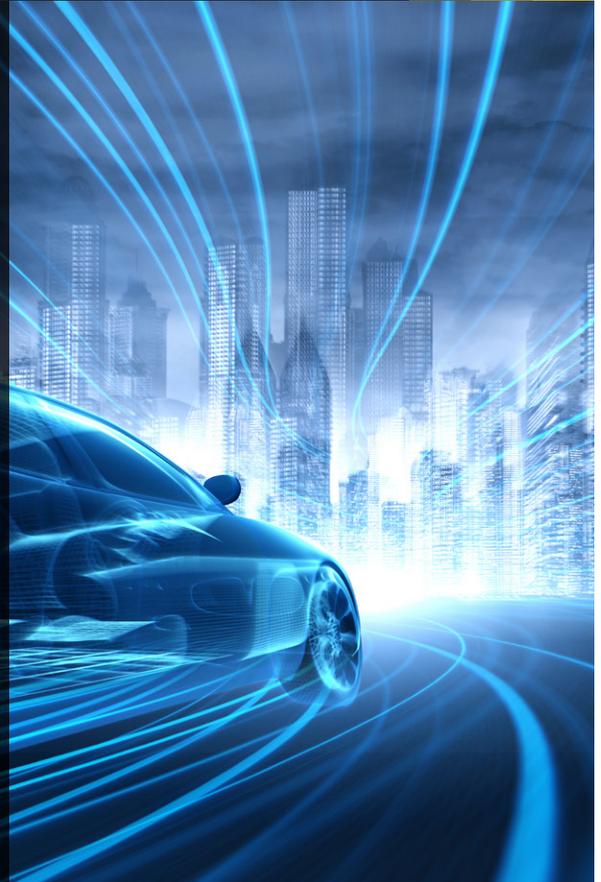
## New Approaches to Energy Storage

Standard rechargeable lithium-ion batteries are made with cobalt. They're small, light, and long-lasting, but they can't store power at grid scale.

## Watch for these emerging alternatives:

- **Graphene**, a one-atom-thick form of graphite, conducts energy faster and more efficiently than any other known material.
- **Sodium**, in a form similar to table salt, is cheap and plentiful.
- **Sulphur and oxygen**, combined with lithium, can each store two to three times more power than cobalt.
- **Solid state batteries** contain no liquid, so could function in extreme temperatures.

Also at early stages of development are batteries 3-D printed from copper foam, a wearable nanofilm that captures energy from body motion, a phone that charges itself using ambient sound, and even an electric "supercar" that stores energy in its carbon nanotube body panels.



## A World Built on Batteries

The energy storage revolution isn't merely about charging your phone faster or extending the range of your electric car. It's about enabling a society-wide transformation in which renewable energy can be generated sustainably, stored at scale, and distributed consistently and reliably at all hours, under all conditions.

The batteries we develop today will create jobs, support circular business models, reduce pollution, and make the power grid more resilient. That will accelerate the shift to a post-fossil fuel economy while making the transition less disruptive.

Scientists say we have just a few more years to mitigate manmade climate change before reaching the tipping point into an extremely unpleasant future. Tomorrow's energy storage may actually assure our future civilization.