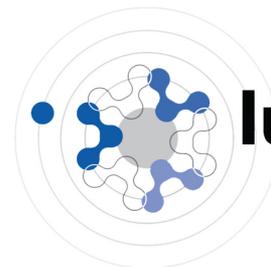




# Disrupting the Power Industry: Why Our Future Energy Infrastructure May Have Wheels and a Brain

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Evolving Energy Infrastructure Track  
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# Agenda

- › How do you disrupt the power industry?
- › Envisioning a new type of energy asset
- › How to think about the future of power

# Applying Uber-like thinking to electricity



- **Exploits underutilized capacity** to achieve lower costs
- **Skirts around existing infrastructure & regulators** to operate in parallel with the incumbent system rather than within it

*Who's doing this in electricity?*

# Applying Uber-like thinking to electricity



Exploits underutilized capacity to achieve lower costs



Skirts around existing infrastructure & regulators to operate in parallel with the incumbent system rather than within it



i.e., slow, incremental changes at the will of incumbents & regulators

# Applying Uber-like thinking to electricity

 Construction **DIVE**

## HI developer breaks off-grid housing

inhabitat

New Tesla battery could take your home off  
grid



Exploits underutilized capacity to achieve lower costs



i.e., \$\$\$\$



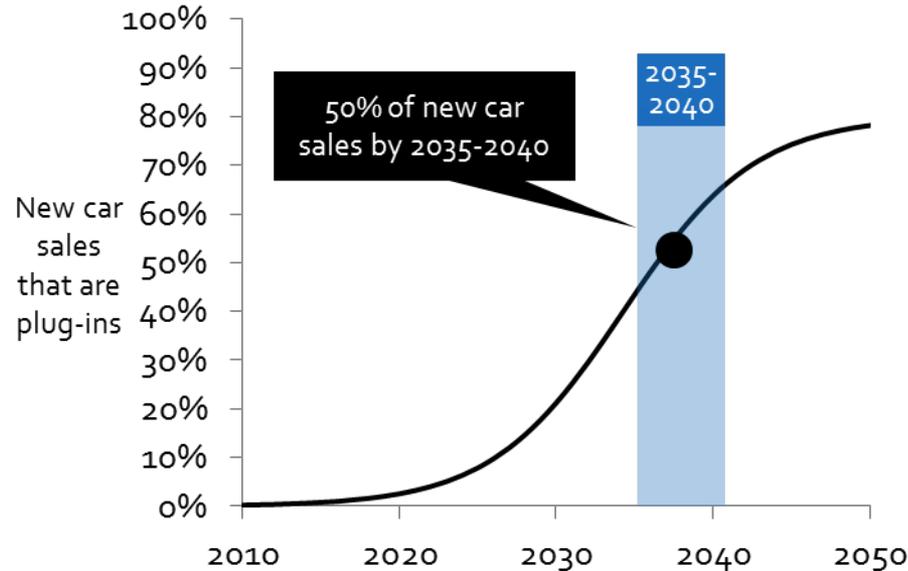
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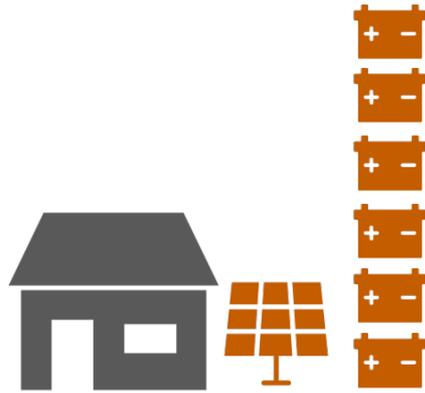


- Vehicles sit idle 96% of the time or more
- Battery packs are oversized; customers aim for worst-case rather than average daily travel



- **Exploits underutilized capacity** to achieve lower costs
- **Skirts around existing infrastructure & regulators** to operate in parallel with the incumbent system rather than within it

# Applying Uber-like thinking to electricity



8 year payback by 2040



3 year payback by 2040



**Exploits underutilized capacity** to achieve lower costs

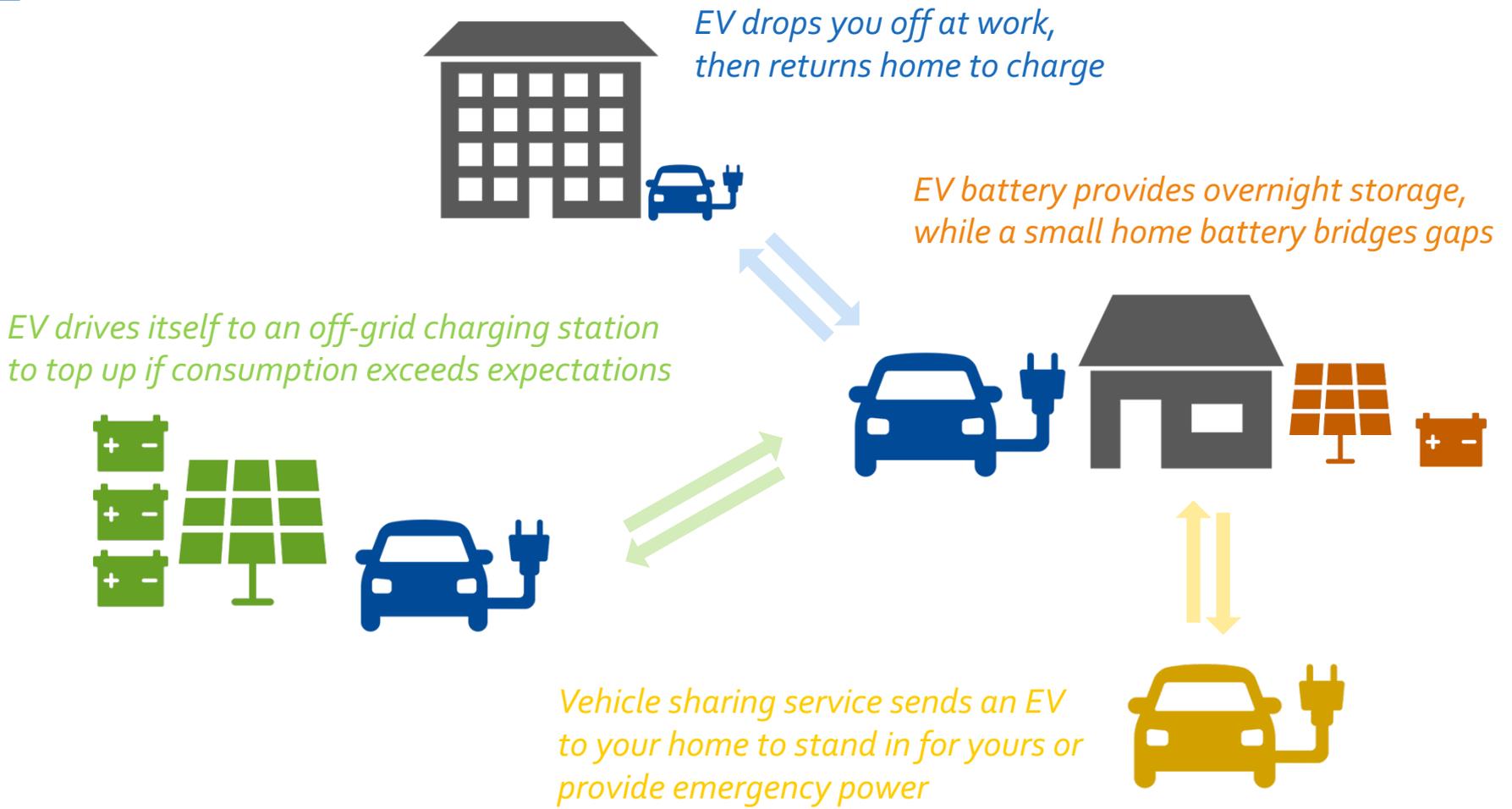
**Skirts around existing infrastructure & regulators** to operate in parallel with the incumbent system rather than within it

*There will be a massive, untapped, off-grid resource in the idle batteries of electric vehicles.*

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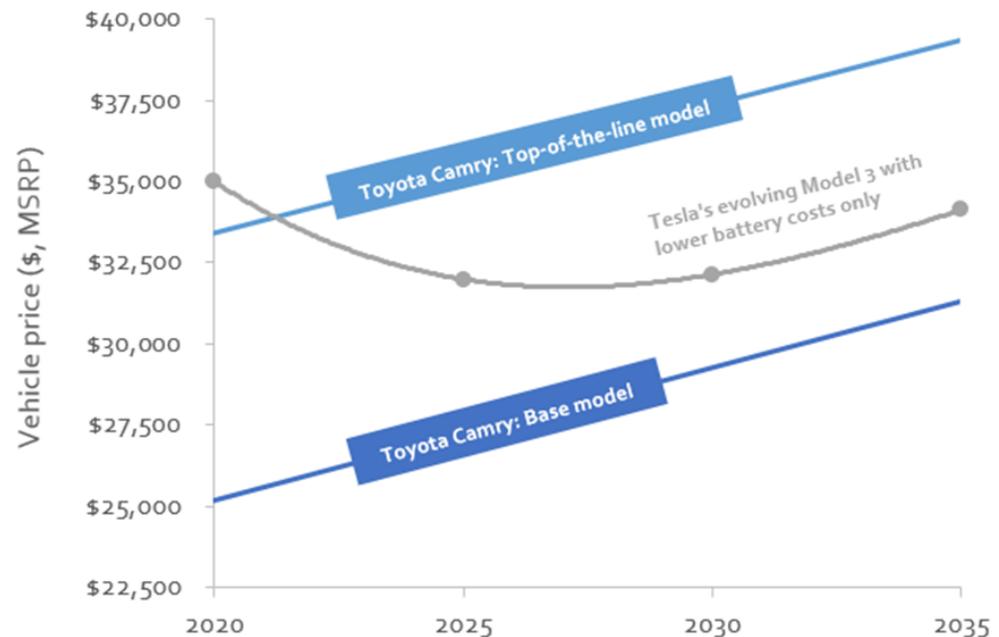
# What would EVs as an energy asset look like?



# There's a big gap between that picture and where we are today



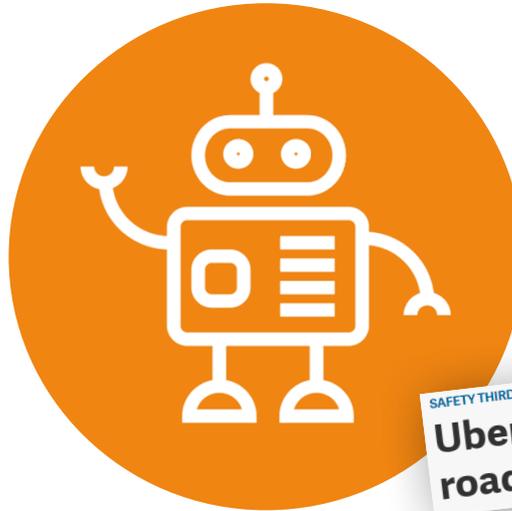
- Battery costs sufficient to make electric vehicles as affordable as ICE vehicles



# There's a big gap between that picture and where we are today



- Battery costs sufficient to make electric vehicles as affordable as ICE vehicles



- Safe, proven vehicle autonomy in a variety of situations and driving conditions

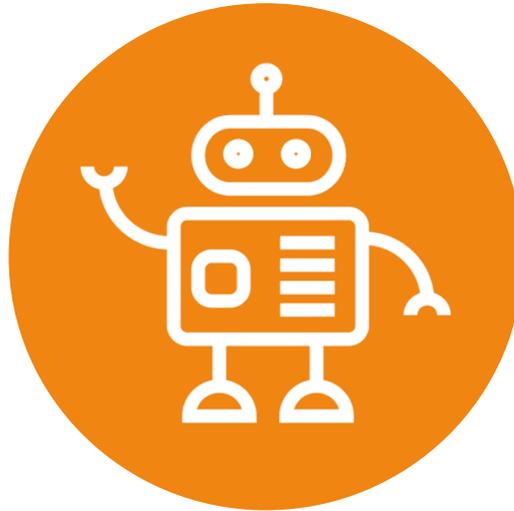
SAFETY THIRD  
**Uber has taken its self-driving cars off the road after one flipped over in Arizona**



# There's a big gap between that picture and where we are today



- Battery costs sufficient to make electric vehicles as affordable as ICE vehicles



- Safe, proven vehicle autonomy in a variety of situations and driving conditions



- Wireless charging and discharging with minimal losses

# An unexpected player could be the force that makes this a reality



- › If the car isn't stuck in the garage as an energy asset, it can be **out on the road as a shared vehicle**

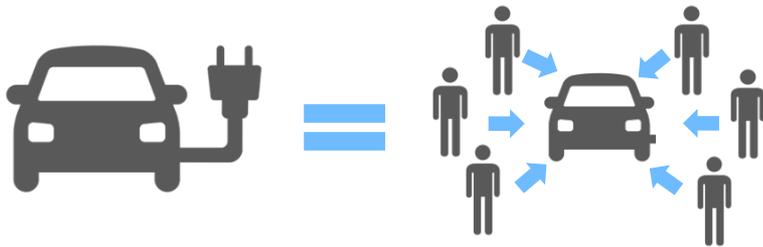
From *The Atlantic*  
**CITYLAB**

## Here's How Many Cars This Car-Sharing Service Killed

According to a new study, every car2go vehicle removes as many as 11 personal cars from city streets.

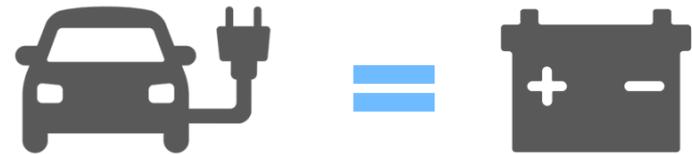
# Two competing views for the autonomous electric vehicle in its spare time

## Shared Vehicle



- > **Threatens automakers** by providing an alternative to vehicle ownership
- > **Avoids harm to utilities** by keeping customers on grid

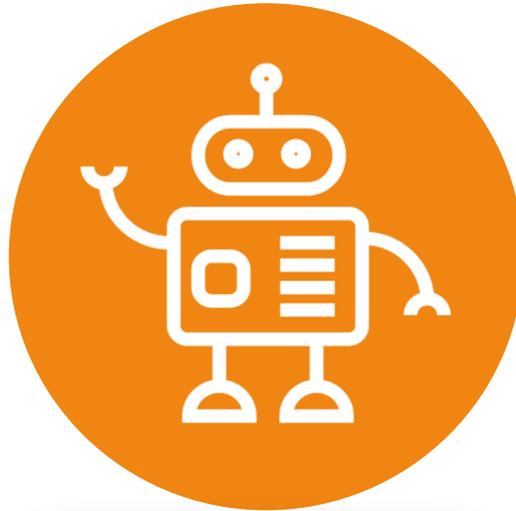
## Energy Storage Device



- > **Threatens utilities** by taking customers off grid
- > **Avoids harm to automakers** by encouraging everyone to buy a vehicle

*Could we be on the cusp of a battle between auto OEMs and electric utilities?*

# Auto OEMs are gearing up to fill the gaps

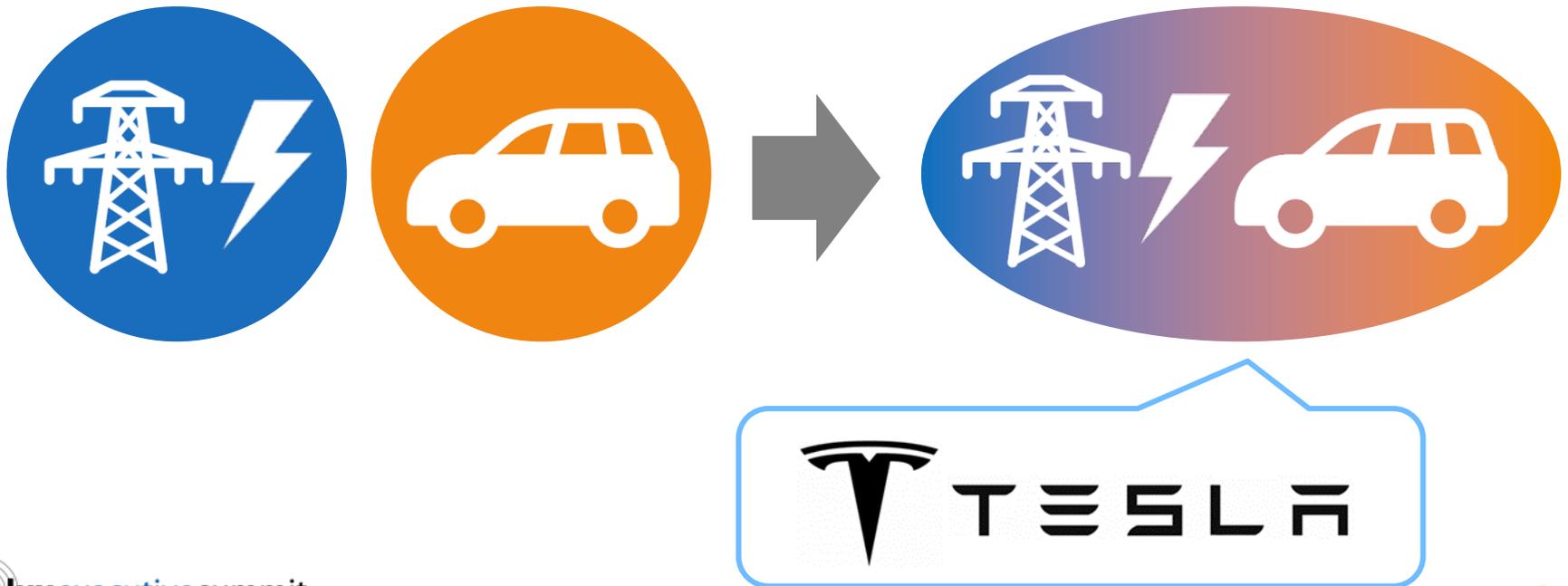


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# What this means:

- **This *does not* mean that the grid is going away.**
  - Even in the most optimistic case, there will still be a large number of customers (e.g. city dwellers, C&I) for whom going off-grid doesn't make sense.
- But this does mean that **the power industry isn't just about power anymore.**



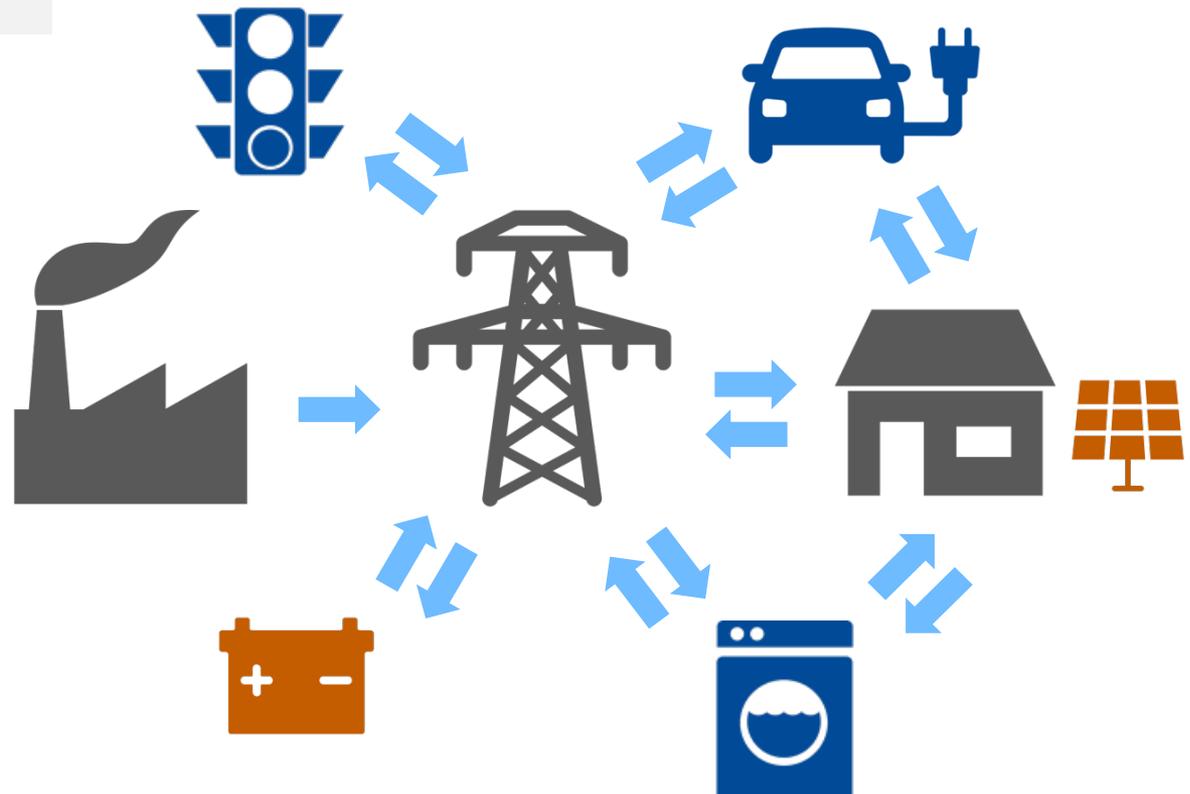
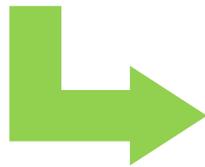
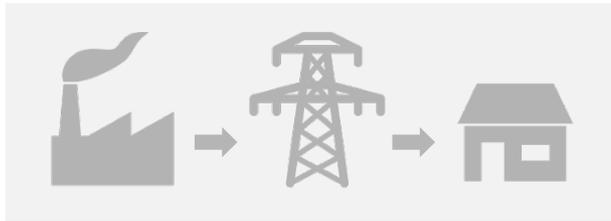
# These changes are already well underway, and they don't stop at transportation

- › Vehicles as energy infrastructure
- › Traffic lights as energy infrastructure
- › Your washing machine as energy infrastructure



*In the future, every device that uses power is a useful piece of power infrastructure.*

# The power industry isn't just about power anymore



Thank you



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