Energy Challenge

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Energy Challenge: A Summary

- World consumes 17 TW of power on average at present.
- Large increases in energy use is expected (50% increase by 2030, 400% increase by the end of the century)
- International Energy Agency (IEA) World Energy Outlook reports that this will require increased use of fossil fuels.
  - Air pollution & Climate Change
  - Will run out sooner or later
- Limiting CO$_2$ to 550ppm by 2050 is an ambitious goal.
  - USDOE: “The technology to generate this amount of emission-free power does not exist.”
  - IEA: “Achieving a truly sustainable energy system will call for radical breakthroughs that alter how we produce and use energy.”
- Public funding of energy research is down 50% since 1980 (in real term). World energy R&D expenditure is 0.25% of energy market.
UCSD scientists perform leading edge research in new energy technologies

Some Examples:

- Bio-fuels from non-food-stock crops.
- Building a pilot scale plant for alcohol fuels from cellulosic feedstocks.
- High-efficiency Photovoltaic through novel material and design.
- Advanced solar concentrator using dichoric mirrors, space-efficient beam path and molded lenslet bars.
The Ultimate Power Play
Fusion Research at UCSD

**PISCES**: What is the effect of plasma on reactor walls?

Edge Plasma & Plasma-Wall Interactions in NSTX & DIII-D Tokamaks

Inertial Confinement Fusion Science and Technology

**ARIES**: What a fusion power plant looks like (UCSD leads the National ARIES Team).