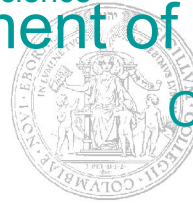


The Fu Foundation School of Engineering and Applied
Science

Department of Electrical Engineering



COLUMBIA UNIVERSITY

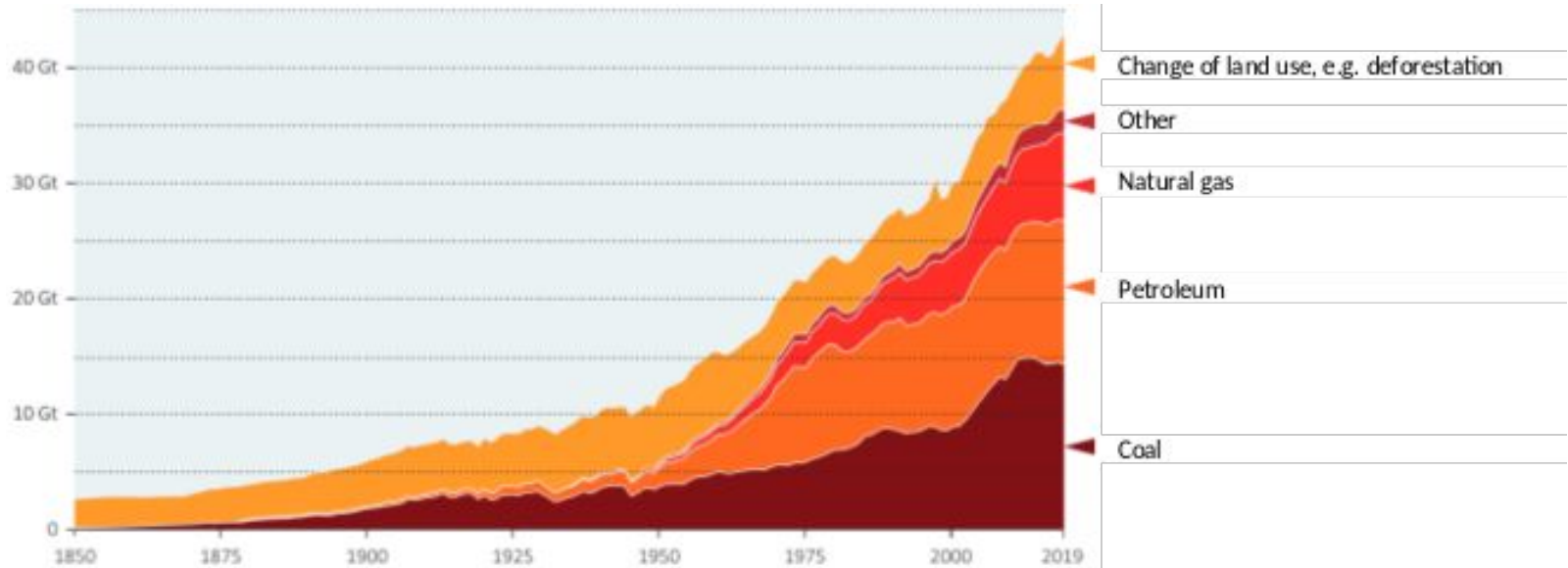
IN THE CITY OF NEW YORK

Smart Electric Energy

Prof. Matthias Preindl

Global Warming

Global CO2 Emissions

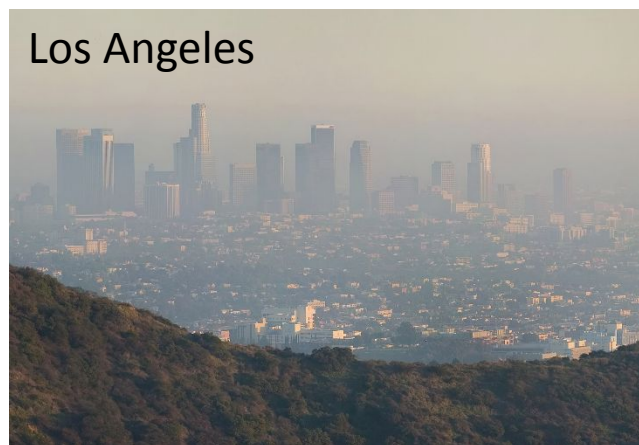


Yosemite National Park's Lyell Glacier



Potential effects: wild fires; droughts; extreme tropical storms

Atmospheric Pollution



Pollutants

Carbon Monoxide CO
Nitrogen Dioxide NO₂
Ozone O₃
Particles (<10 μm) PM₁₀
Particles (<2.5 μm) PM_{2.5}
Sulfur Dioxide SO₂

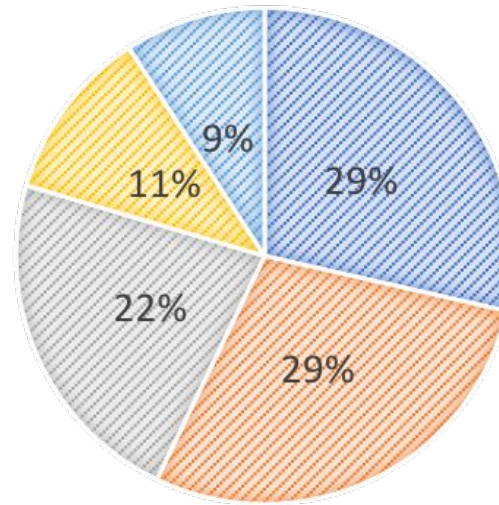
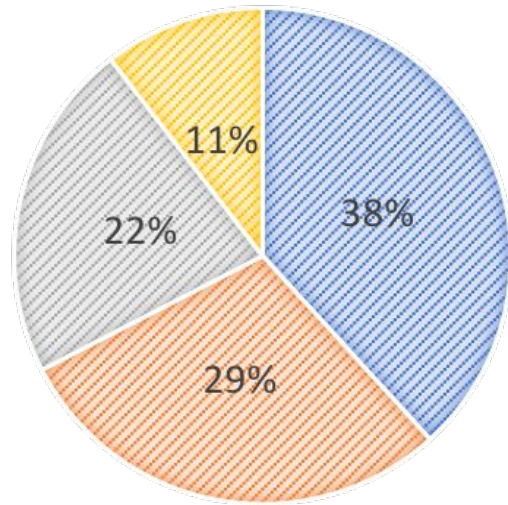
Main Sources

Vehicle emissions
UV light breakdown of vehicle exhaust
Vehicle emissions
Vehicle emissions
Coal-fired power stations

Graphic:
nytimes.com
theguardian.com
inhabitat.com
dailymail.co.uk
nyu.edu

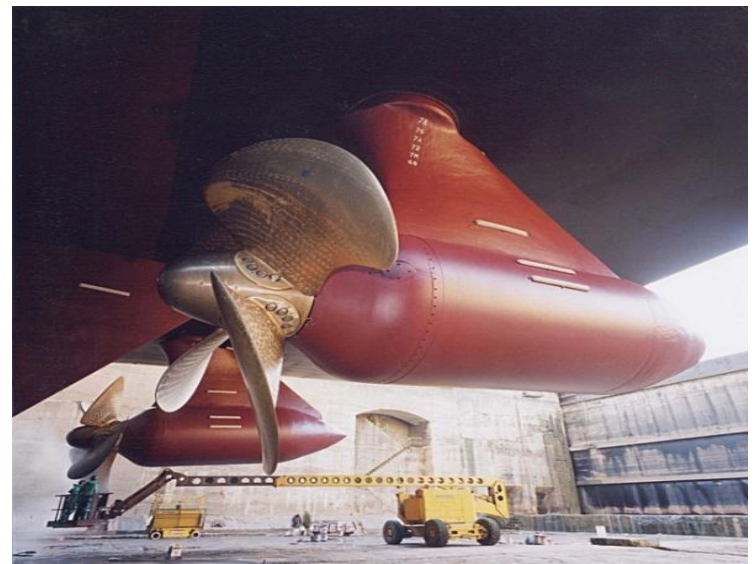
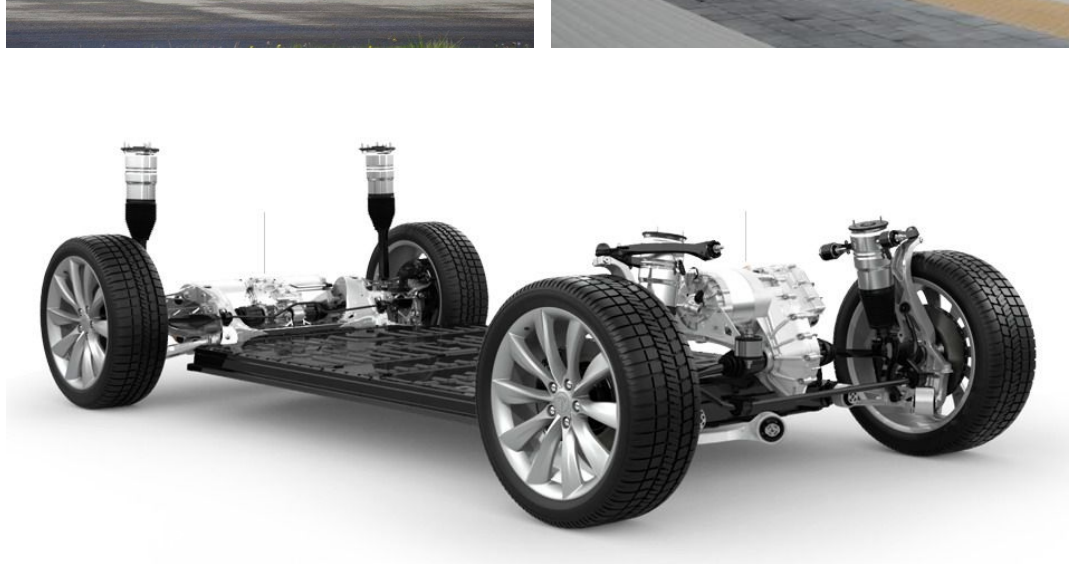
US Energy Consumption & Emissions

ENERGY CONSUMPTION GHG EMISSIONS



- Electric Power
- Transportation
- Industrial
- Residential/Commercial
- Agriculture

Transportation



Graphic: alstom.com, tesla.com, wikipedia

Power System

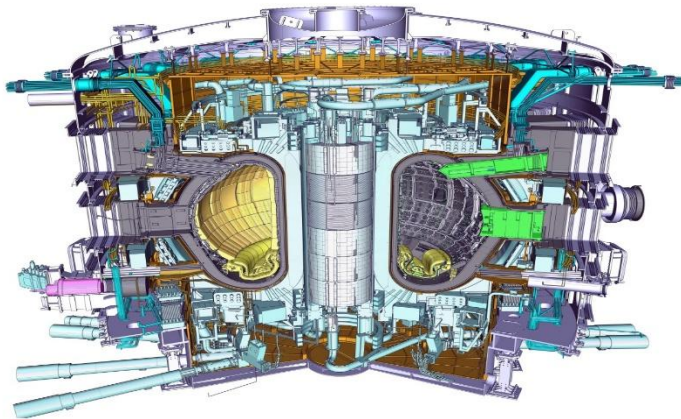
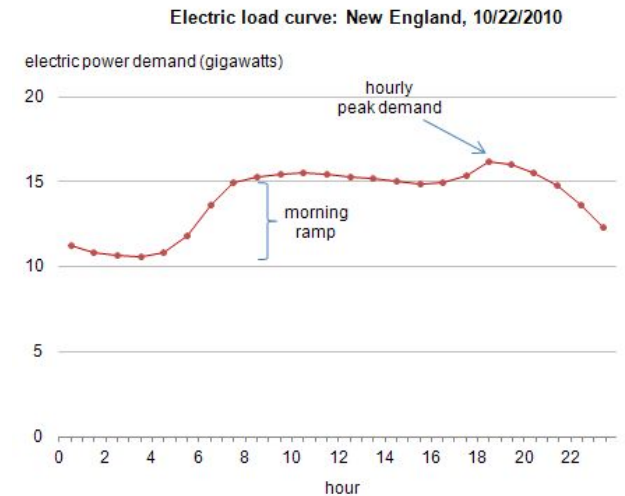
Generation



Transmission

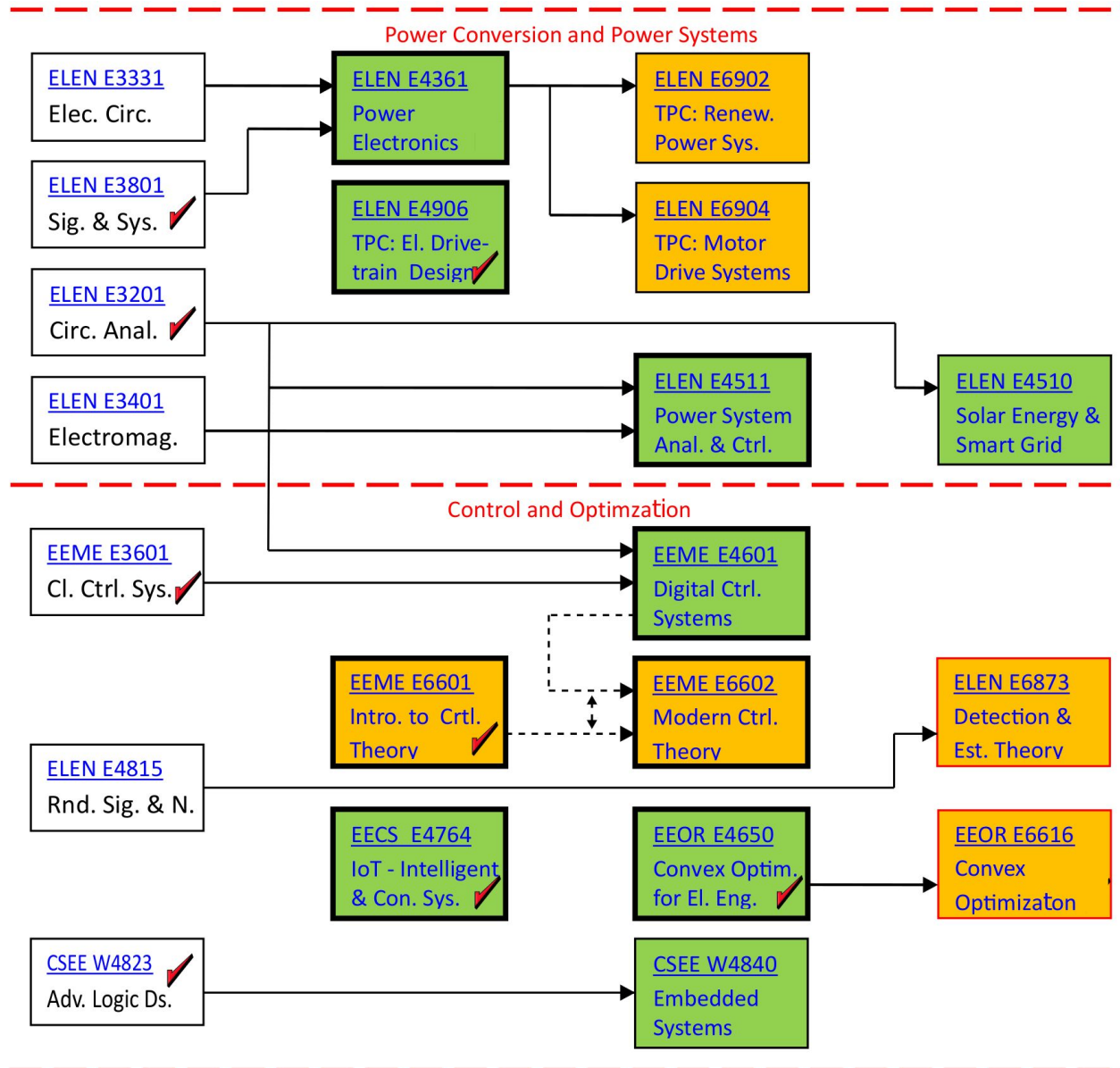


Loads



Graphic: leitwind.com, iter.org,
Wikipedia, eia.gov

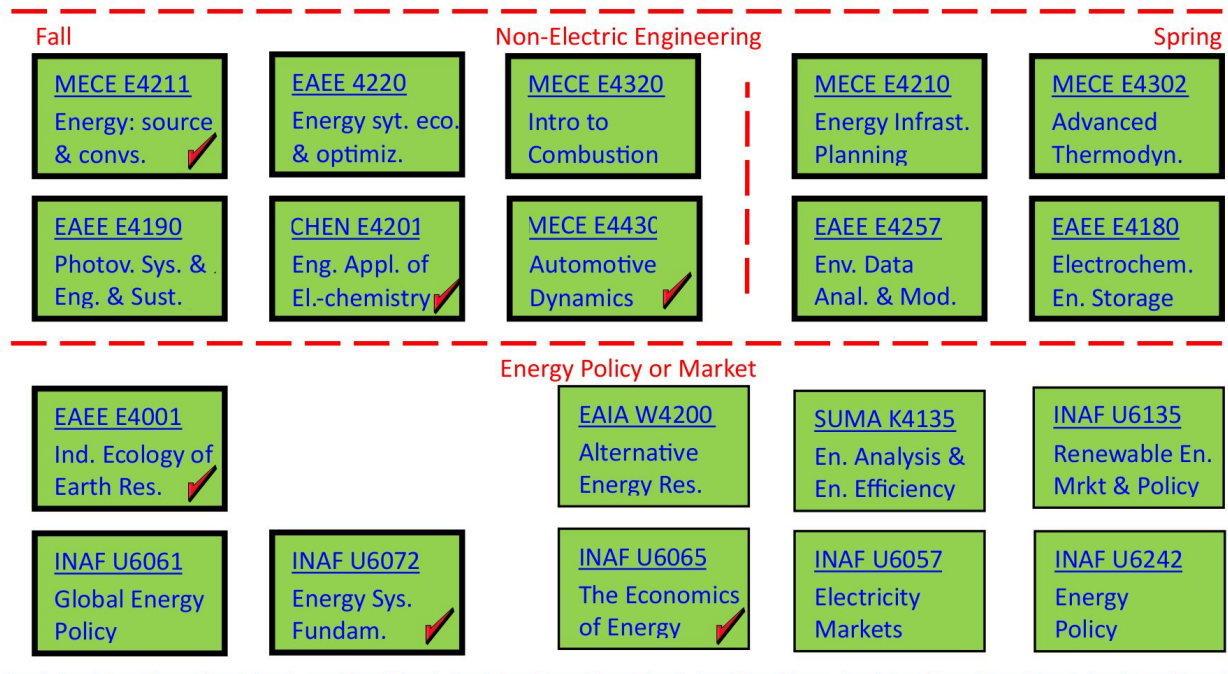
Flowcharts



Flowcharts

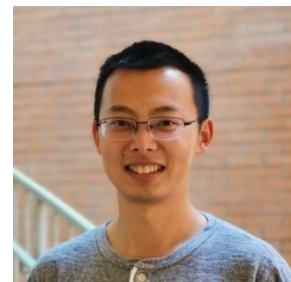
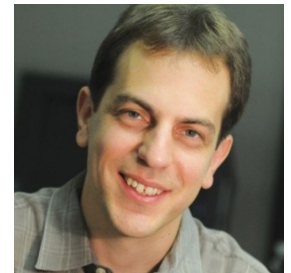
Green = Senior/grad; Orange = Adv. graduate;

Dots = EE related area; Bold border = offered regularly;



Faculty

- Matthias Preindl
- James Anderson
- Gil Zussman
- Xiaofan (Fred) Jiang
- Ken Shepard
- Xiaodong Wang
- Daniel Bienstock (IEOR)
- Vijay Modi (ME)
- Bolun Xu (EEE)



Electric Formula SAE

- Electric Formula SAE team
 - Joint Mechanical and Electrical Engineering Effort
 - Designs and implements an electric vehicle race car
 - 2 year cycle: design and first implementation (year 1); optimization and testing (year 2)
- Credits
 - Senior or class project
 - Research project (for credit)
- Career opportunities
 - Automotive companies (OEM) and suppliers
 - Race car teams



General Advice

- Short program: plan ahead
- Summer internship (plan in fall/winter)
- Participate in a research project/s (2nd and/or 3rd semester)
- Write a Master Thesis
 - Optional – not required for the MS program; students must find a thesis adviser
 - A high-quality MS thesis is an asset in job applications, especially in the energy and transportation sectors