



U.S. DEPARTMENT OF  
**ENERGY**

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# **Advanced Scientific Computing Advisory Committee**

**August 14, 2012**

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Director, Office of Science  
US Department of Energy**

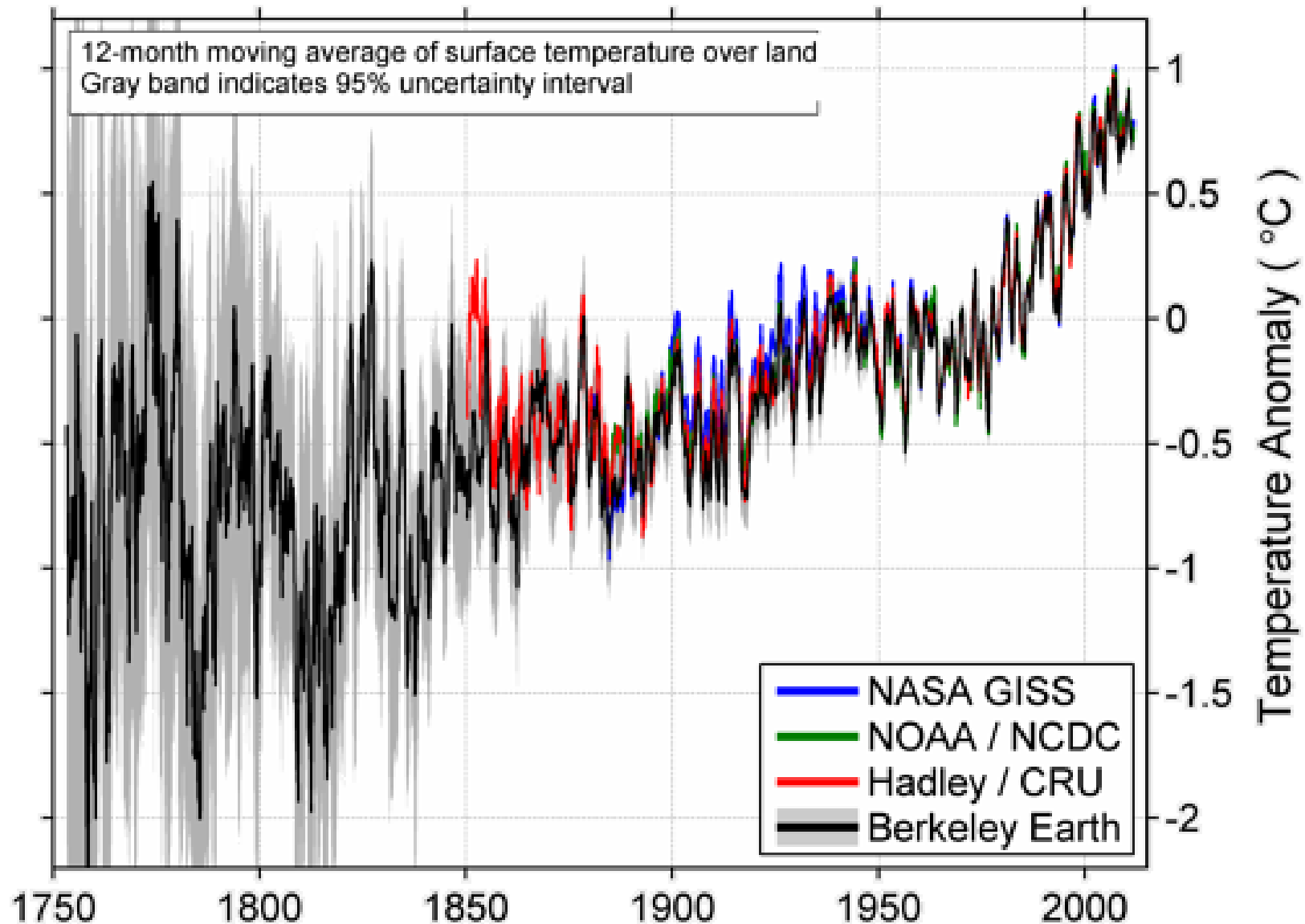


# FY 2012 Budget and FY 2013 Marks

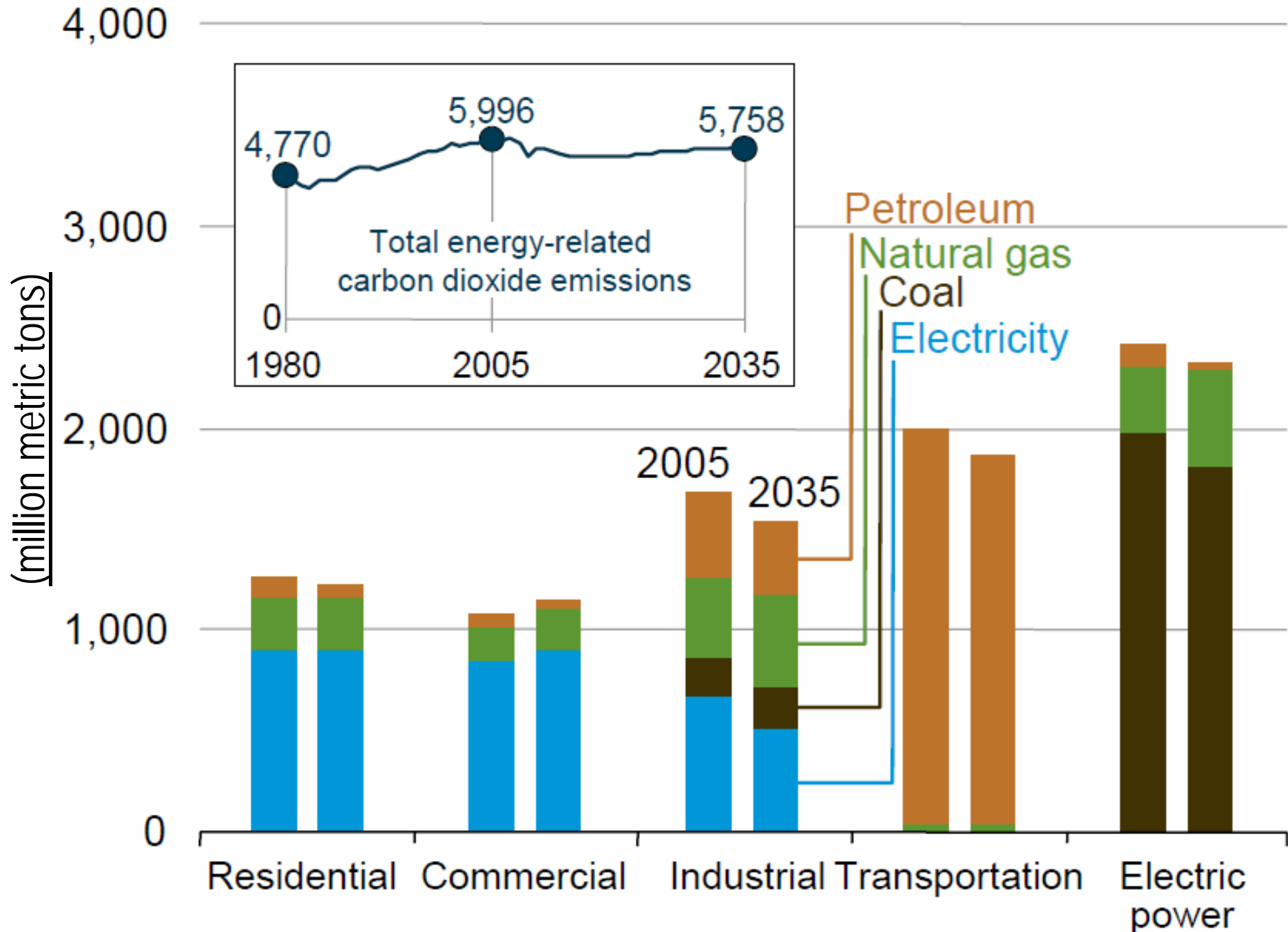
Office of Science												
FY 2013 House and Senate Mark												
(B/A in thousands)												
	FY 2012	FY 2013										
	Current Approp.	President's Request	House Mark	House Mark vs. FY12 Approp.	House Mark vs. President's Request	Senate Mark	Senate Mark vs. FY12 Approp.	Senate Mark vs. President's Request				
ASCR.....	440,868	455,593	442,000	+1,132	+0.3%	-13,593	-3.0%	455,593	+14,725	+3.3%	—	—
BES.....	1,688,093	1,799,592	1,657,146	-30,947	-1.8%	-142,446	-7.9%	1,712,091	+23,998	+1.4%	-87,501	-4.9%
BER.....	609,557	625,347	542,000	-67,557	-11.1%	-83,347	-13.3%	625,347	+15,790	+2.6%	—	—
FES.....	400,996	398,324	474,617	+73,621	+18.4%	+76,293	+19.2%	398,324	-2,672	-0.7%	—	—
HEP.....	790,860	776,521	776,521	-14,339	-1.8%	—	—	781,521	-9,339	-1.2%	+5,000	+0.6%
NP.....	547,387	526,938	547,938	+551	+0.1%	+21,000	+4.0%	539,938	-7,449	-1.4%	+13,000	+2.5%
WDTS.....	18,500	14,500	14,500	-4,000	-21.6%	—	—	14,500	-4,000	-21.6%	—	—
SLI.....	111,800	117,790	112,313	+513	+0.5%	-5,477	-4.6%	117,790	+5,990	+5.4%	—	—
S&S.....	80,573	84,000	82,000	+1,427	+1.8%	-2,000	-2.4%	83,000	+2,427	+3.0%	-1,000	-1.2%
PD.....	185,000	202,551	185,000	—	—	-17,551	-8.7%	190,000	+5,000	+2.7%	-12,551	-6.2%
SBIR/STTR (SC).....	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal, Science.....	4,873,634	5,001,156	4,834,035	-39,599	-0.8%	-167,121	-3.3%	4,918,104	+44,470	+0.9%	-83,052	-1.7%
SBIR/STTR (DOE).....	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal, Science.....	4,873,634	5,001,156	4,834,035	-39,599	-0.8%	-167,121	-3.3%	4,918,104	+44,470	+0.9%	-83,052	-1.7%
Rescission.....	—	—	-23,500	-23,500	—	-23,500	—	—	—	—	—	—
Use of PY Bal.....	—	-9,104	-9,104	-9,104	—	—	—	-9,104	-9,104	—	—	—
Total, Science Approp...	4,873,634	4,992,052	4,801,431	-72,203	-1.5%	-190,621	-3.8%	4,909,000	+35,366	+0.7%	-83,052	-1.7%

# Global Average Temperature Increases with CO<sub>2</sub>

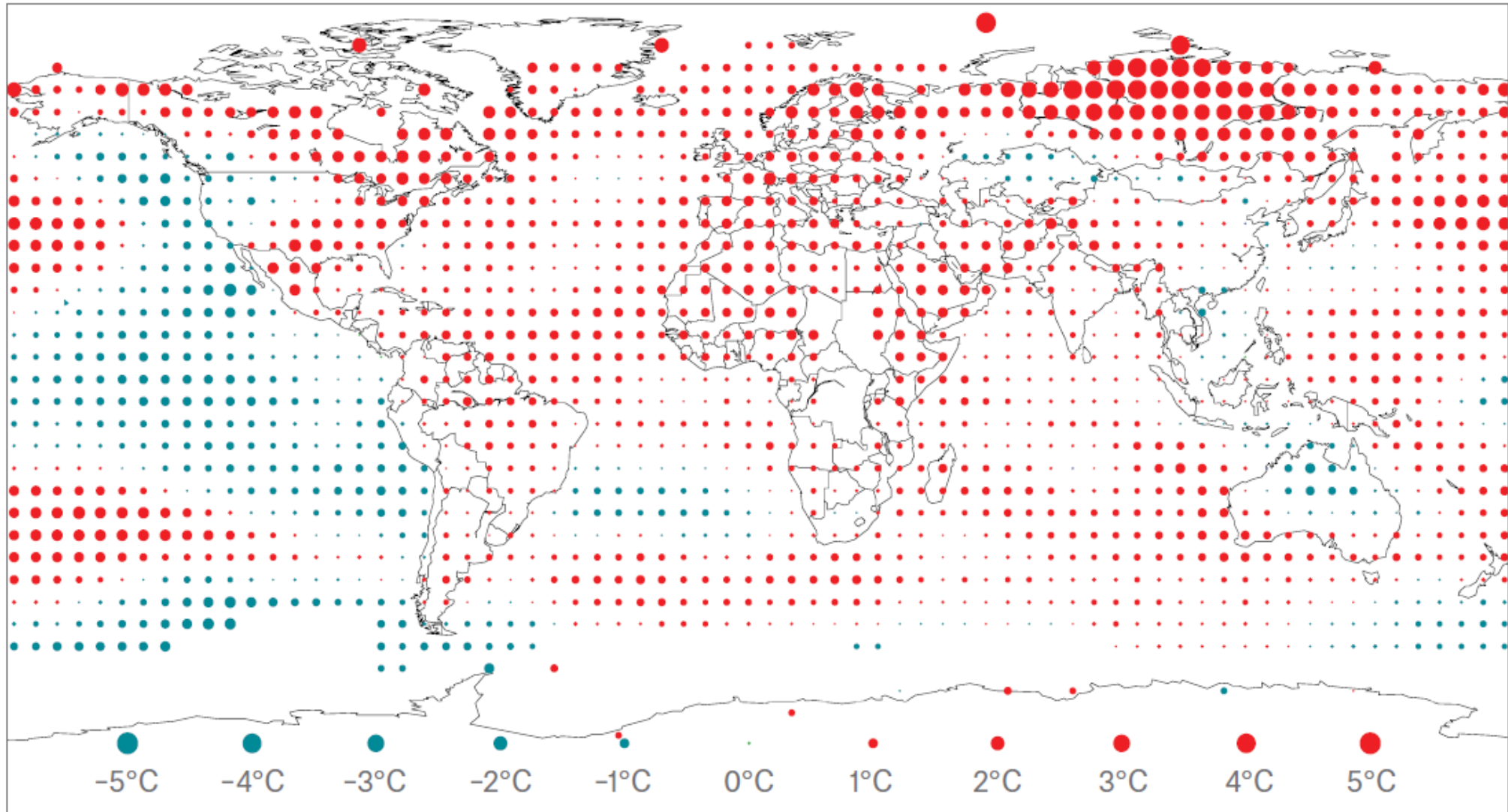
## Annual Land-Surface Average Temperature



# US energy-related CO2 emissions by sector and fuel, 2005 and 2035

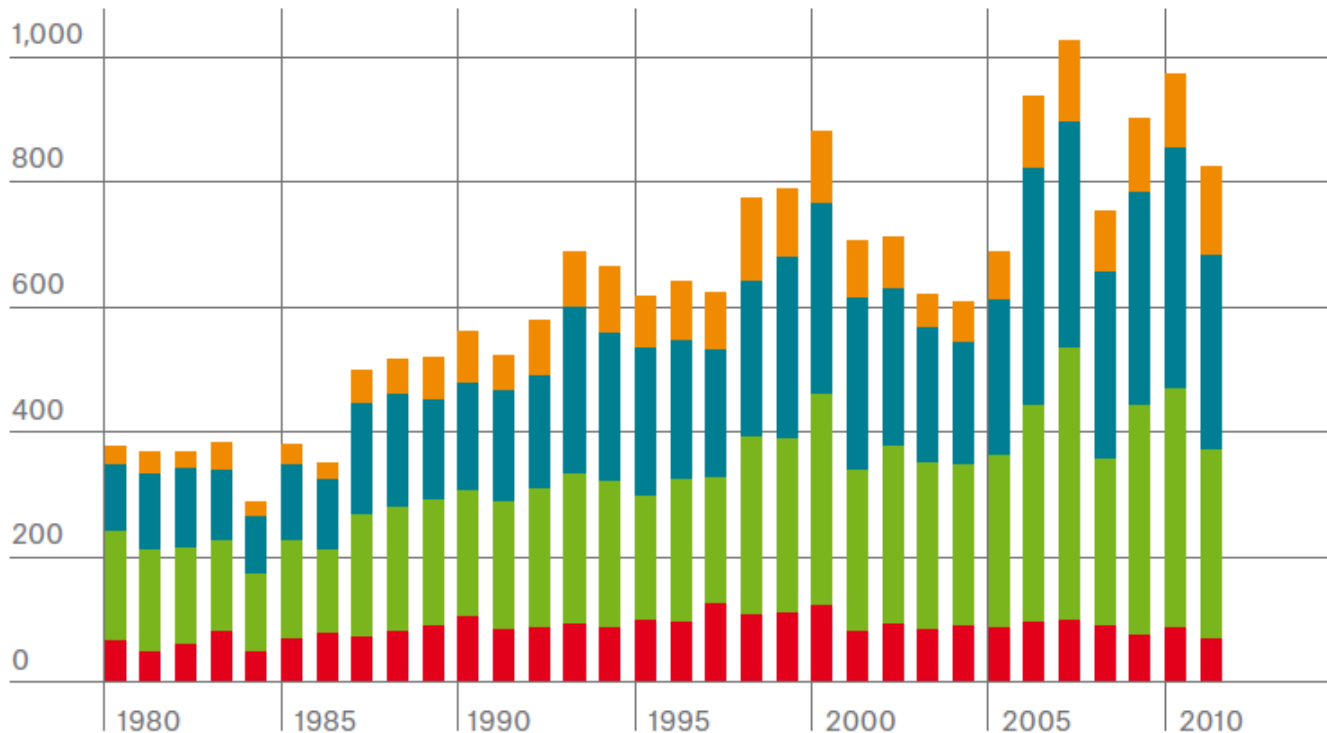


## Regional mean annual temperature anomalies for 2011 with respect to a 1971-2000 base period



# Number of Natural Catastrophes 1980-2011

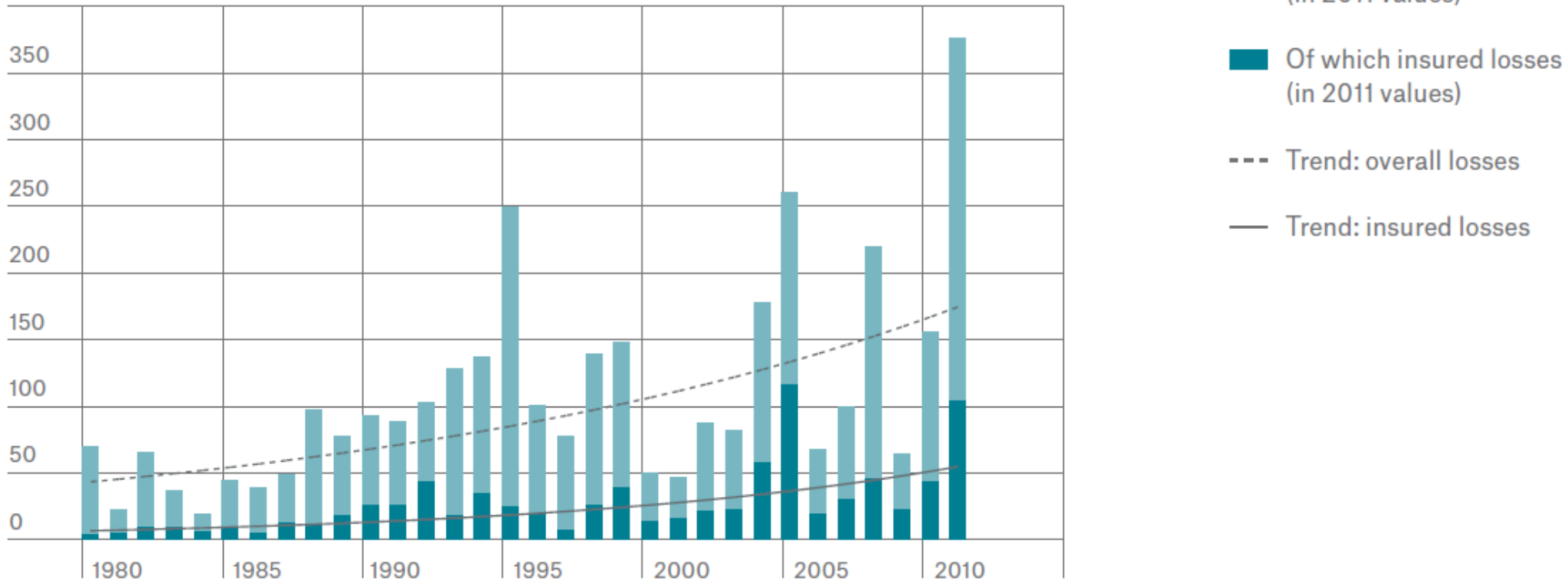
Number of natural catastrophes 1980-2011



- Geophysical events: Earthquake, volcanic eruption
- Meteorological events: Tropical storm, winter storm, severe weather, hail, tornado, local storm
- Hydrological events: Storm surge, river flood, flash flood, mass movement (landslide)
- Climatological events: Heat-wave, cold wave, wildfire, drought

# Overall Losses and Insured Losses 1980-2011 (\$ billion)

Overall losses and insured losses 1980-2011 (US\$ bn)



# Tesla – 300 miles per charge car





# The Tesla Is One Hot Car

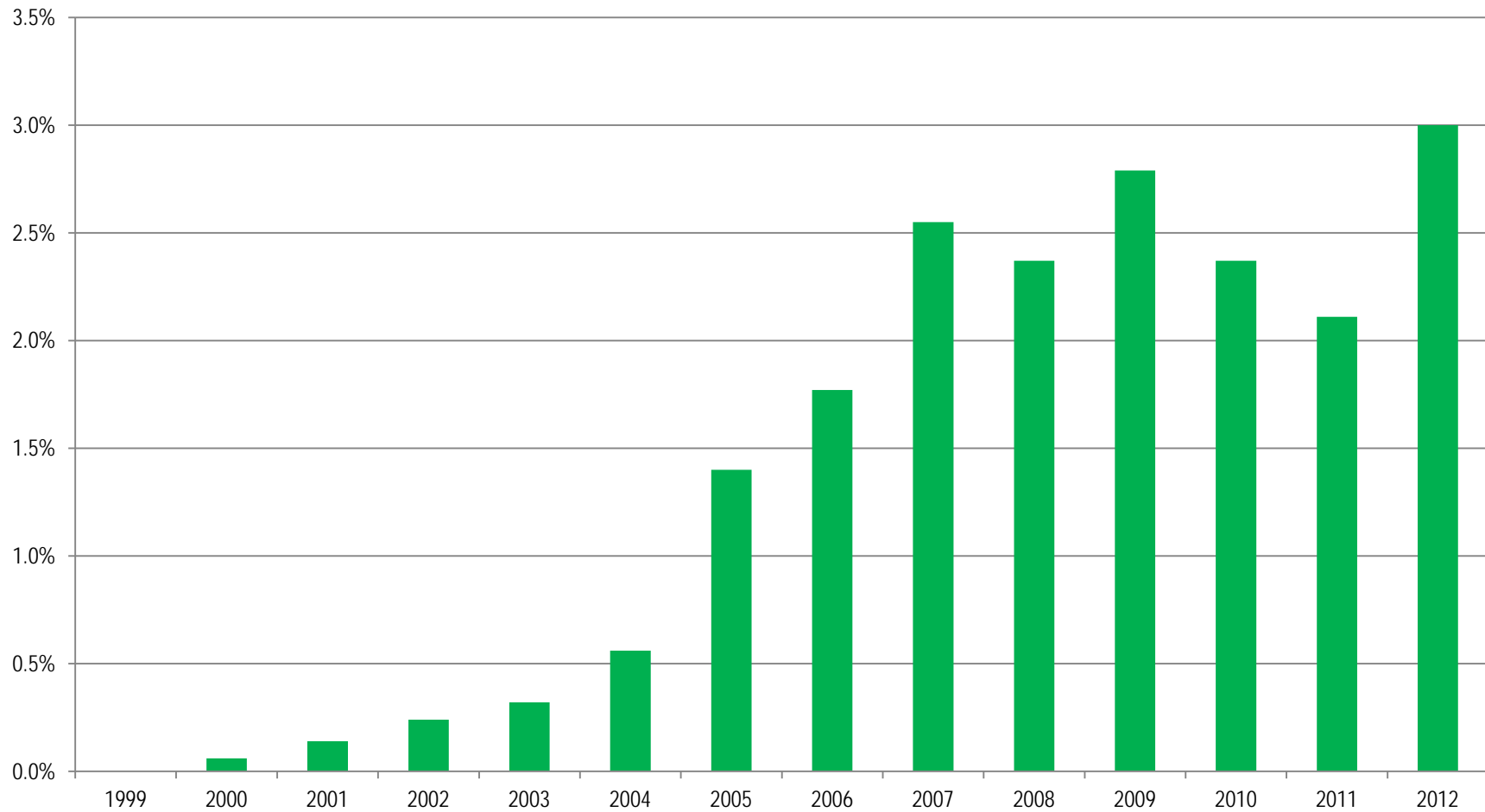
Four models

40 kWh	60 kWh	85kWh	85 kWh	
			performance	
160mi	230 mi	300 mi	300 mi	
6.5 sec	5.9 sec	5.6 sec	4.4sec	zero to sixty
110 mph	120mph	125mph	130mph	

Recharges at 62 miles per hour-has a supercharger

# Hybrid Sales 1999-2012 (per cent)

Per Cent of All Vehicles



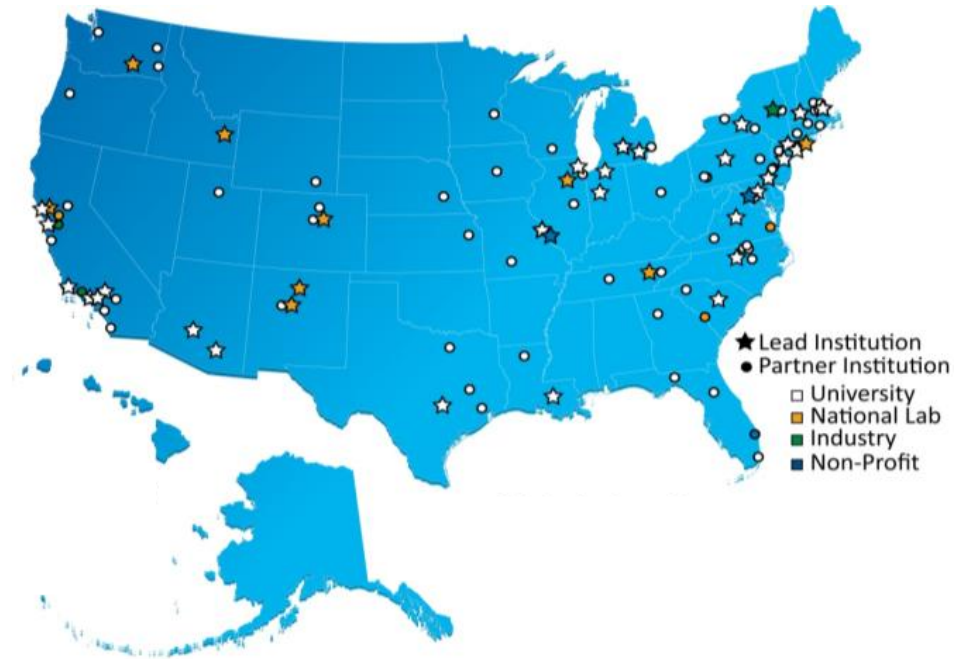
# Energy Frontier Research Centers Grand Challenge and Use-Inspired Research

## 46 EFRCs in 35 states were launched in Fall 2009

- Science crosscuts energy-use-inspired and grand challenge research
- ~850 senior investigators and ~2,000 students, postdoctoral fellows, and technical staff at ~115 institutions
- >250 scientific advisory board members from 13 countries and >40 companies

## Impact to date (~2.5 years):

- >2,400 peer-reviewed papers including more than 60 publications in *Science* and *Nature*.
- > 125 patents applications, nearly 55 additional patent/invention disclosures, and 22 licenses
- >30 companies have benefitted from EFRC research results



▪ Solar Energy

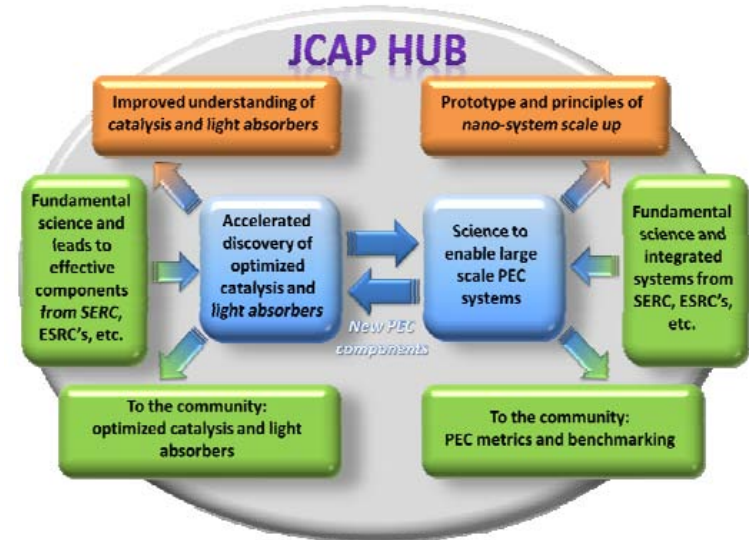
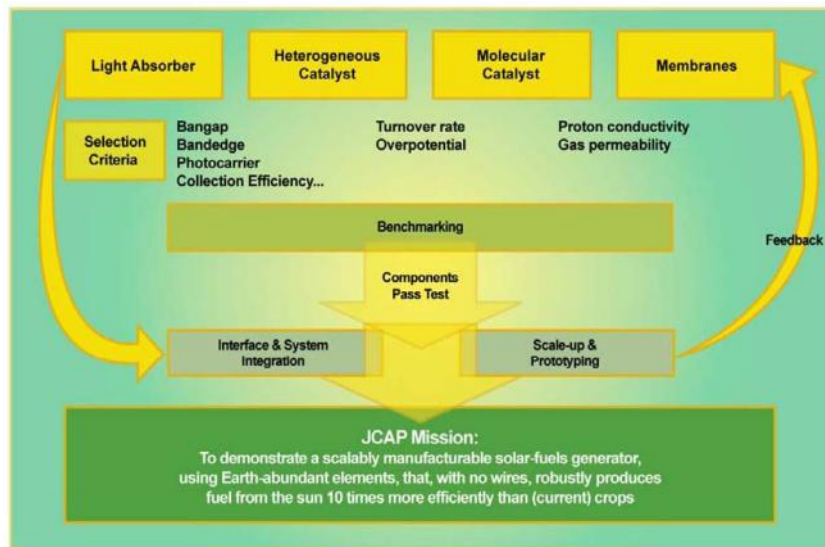
▪ Combustion  
▪ Bio-Fuels

▪ Catalysis

▪ Energy Storage  
▪ Solid State Lighting

▪ Geosciences for Energy Applications  
▪ Superconductivity  
▪ Advanced Nuclear Energy Systems  
▪ Materials Under Extreme Environment  
▪ Hydrogen

# Fuels from Sunlight Hub: Joint Center for Artificial Photosynthesis (JCAP)



**JCAP Mission:** To demonstrate a scalable, manufacturable solar-fuels generator using Earth-abundant elements, that, with no wires, robustly produces fuel from the sun ten times more efficiently than (current) crops.

JCAP R&D will focus on:

- Robustness of components
- Accelerating the rate of catalyst discovery for solar fuel reactions
- Discovering earth-abundant, robust, inorganic light absorbers with optimal band gap
- System integration, benchmarking, and scale-up

JCAP's role as a solar fuels Hub:

- Incorporating the latest discoveries from the community (EFRCs, single-PI or small-group research)
- Providing metrics and benchmarking to the community

# Other hubs or hub like structures

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## *Existing:*

- **Biofuel Centers – (Science)**
  - Joint BioEnergy Institute
  - BioEnergy Science Center
  - Great Lakes Bioenergy Research Center
- **Energy Efficient Buildings Hub (EERE)**
- **Consortium for Advanced Simulation of Light Water Reactors (Nuclear Energy)**

## *Coming soon:*

- **Battery Hub (Science, EERE and ARPA-E)**
  - **Critical Materials Hub (EERE, Science ARPA-E)**
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