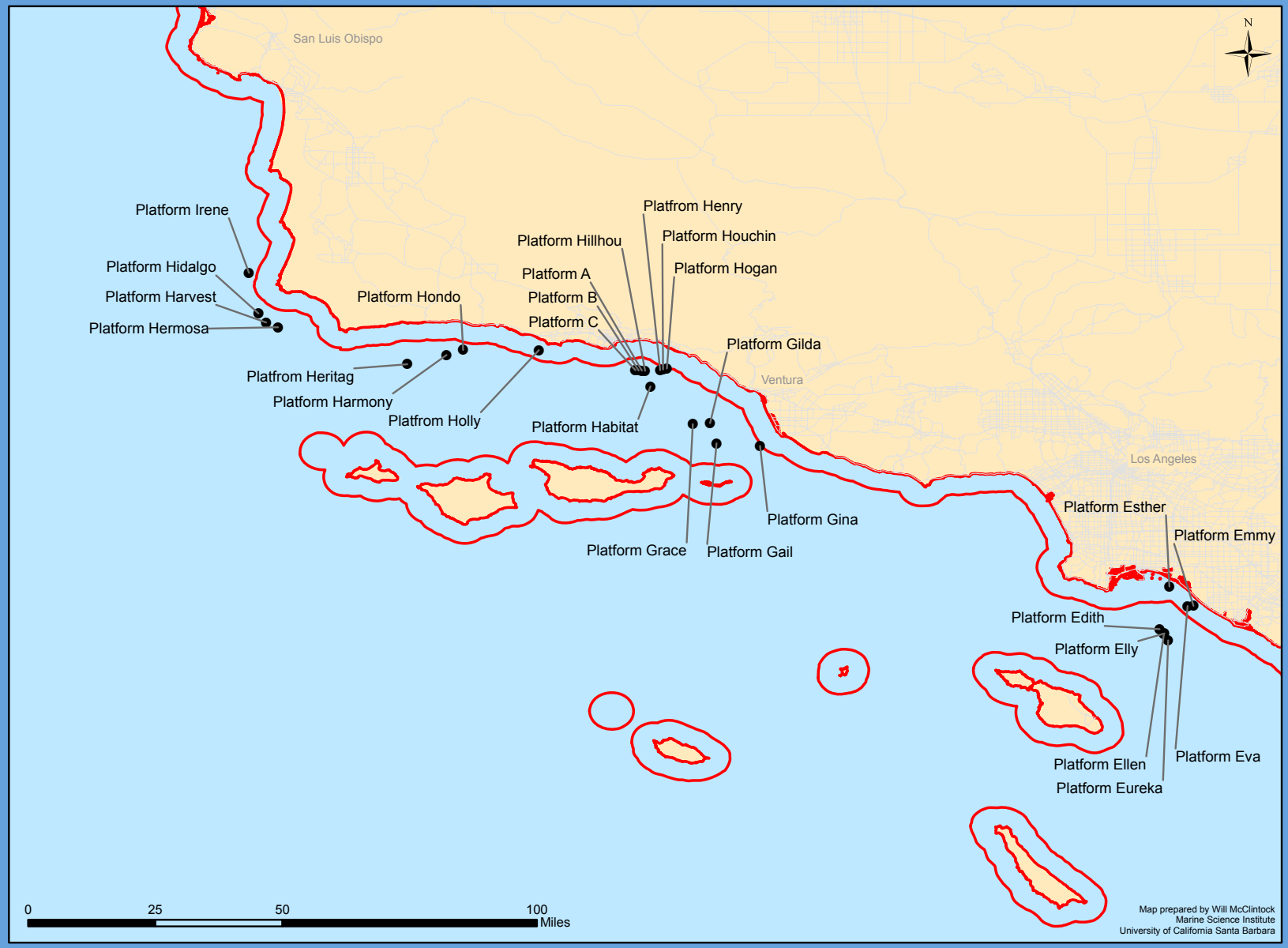
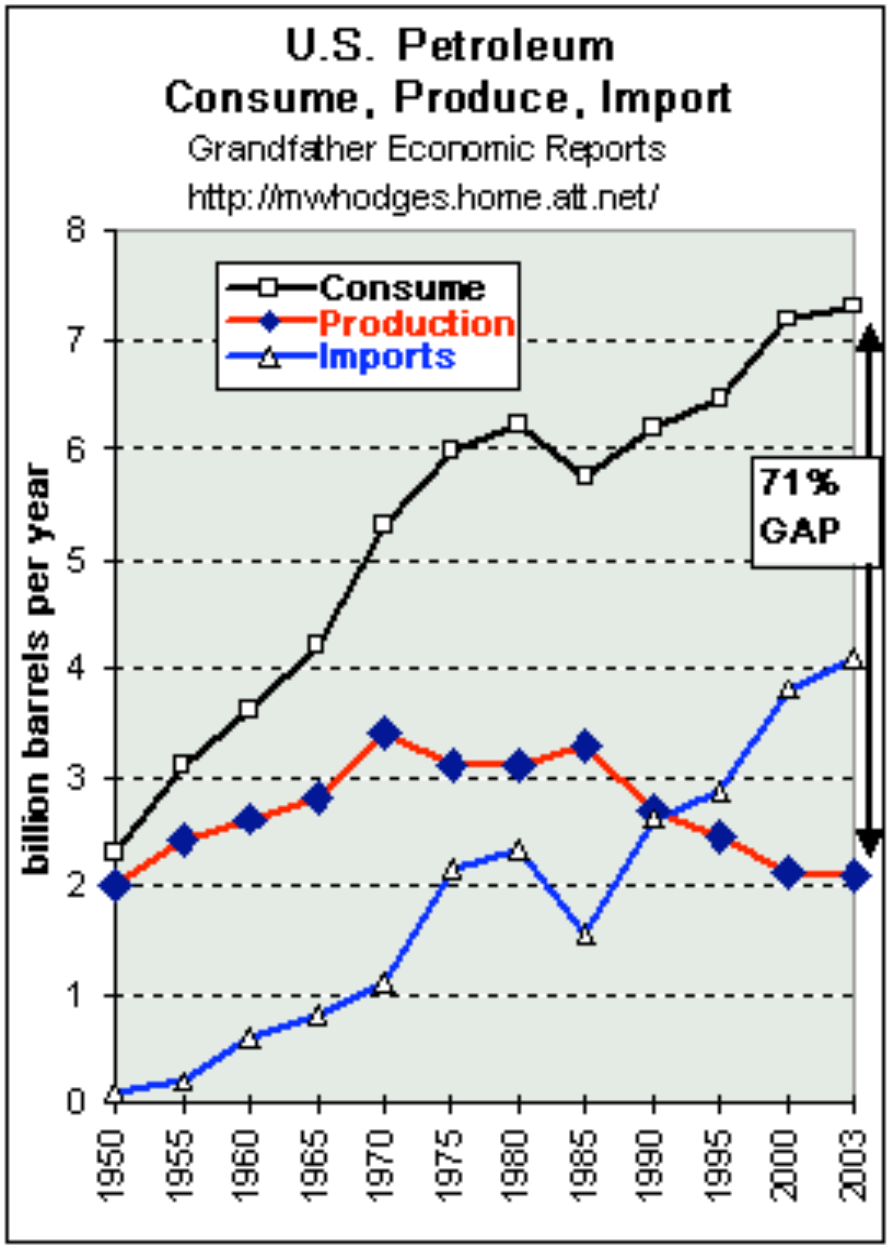
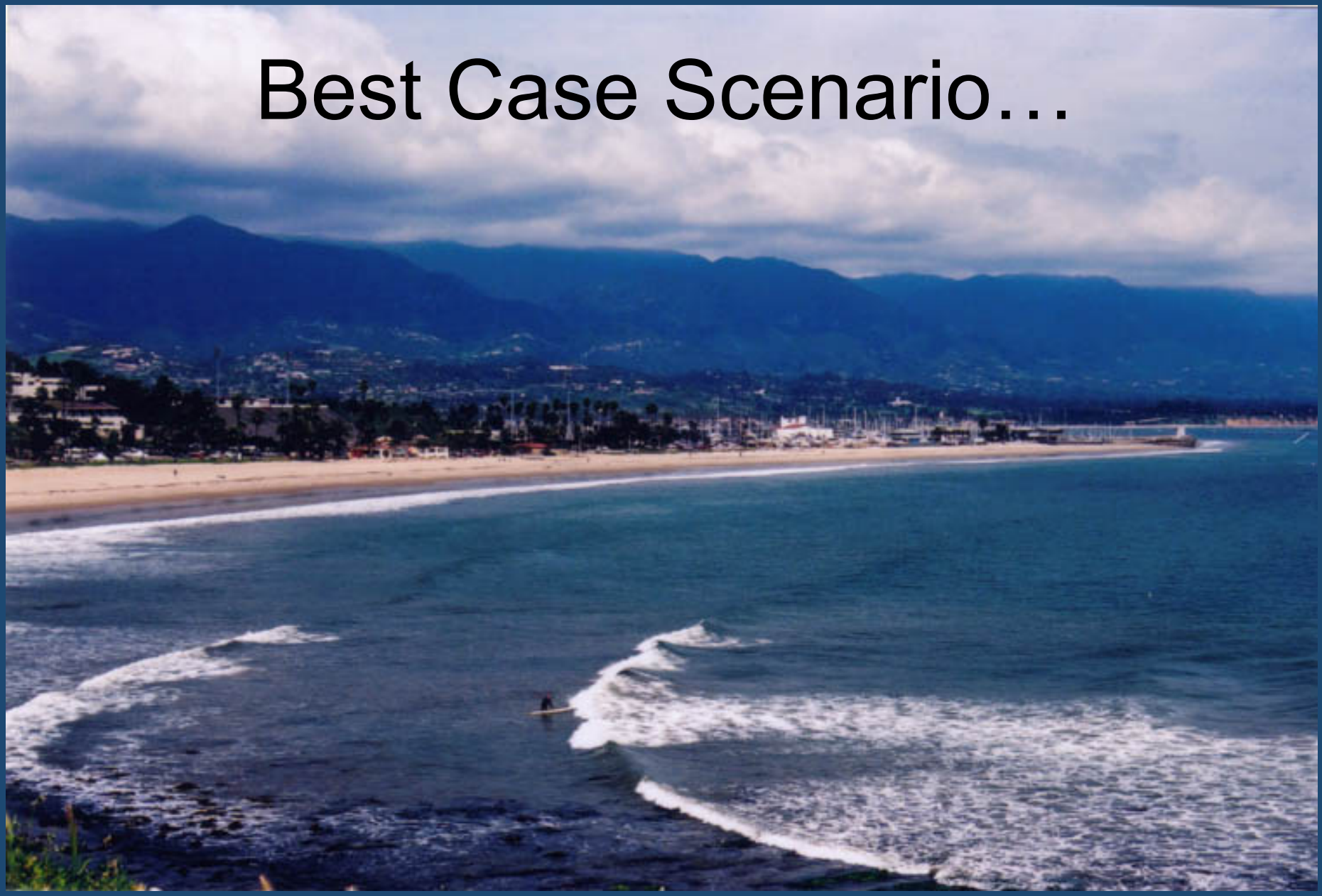
Offshore Hydrocarbons in California

Oil Platforms Off the California Coast




U.S. Petroleum
Consume, Produce, Import
Grandfather Economic Reports
http://mwhodges.home.att.net/
Consume
Production
Imports
71%
GAP
billion barrels per year
0
1
2
3
4
5
6
7
8
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2003

Best Case Scenario…

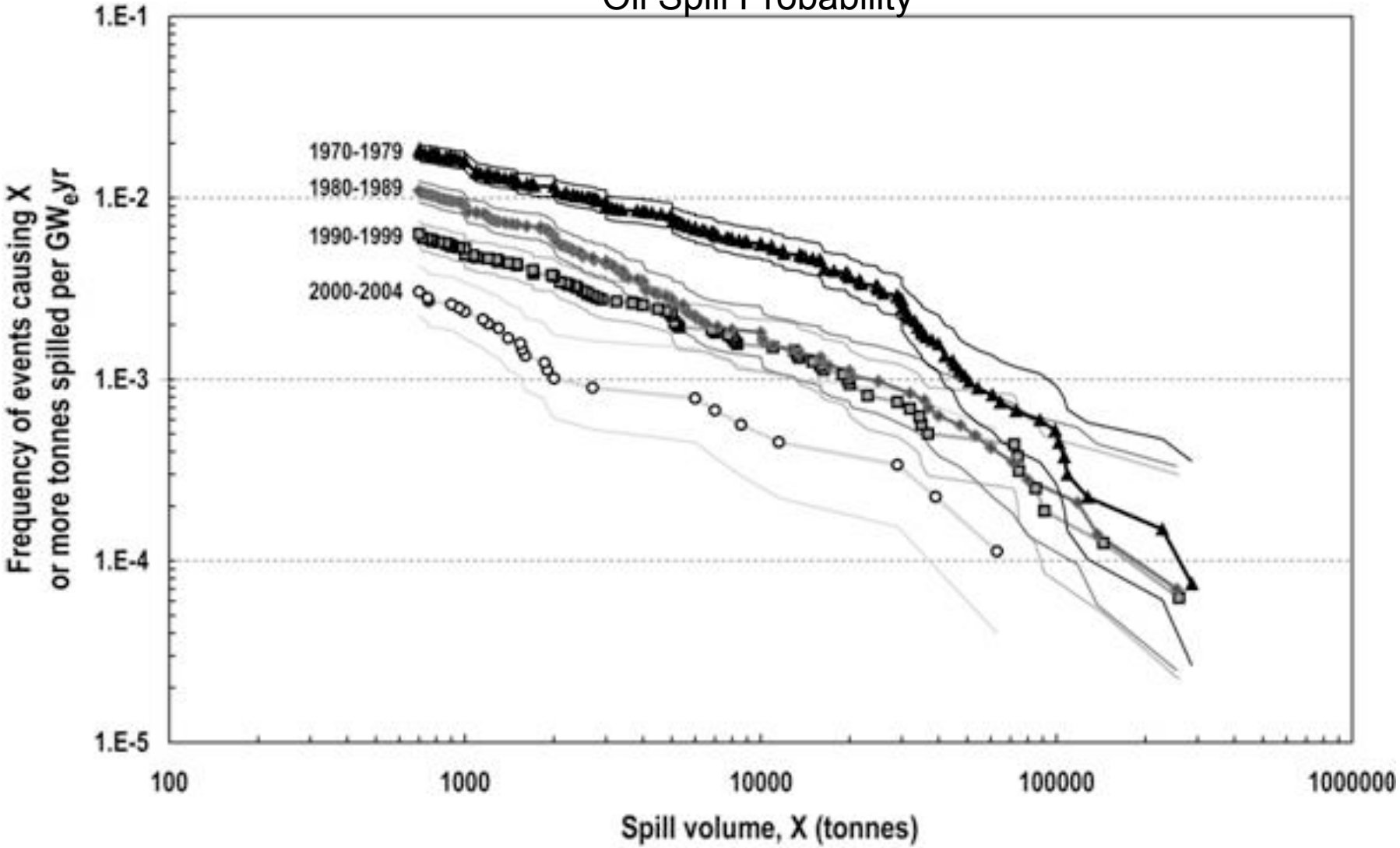



Effects of Rig Construction

Worst Case Scenario

Oil spill occurs during drilling or transport

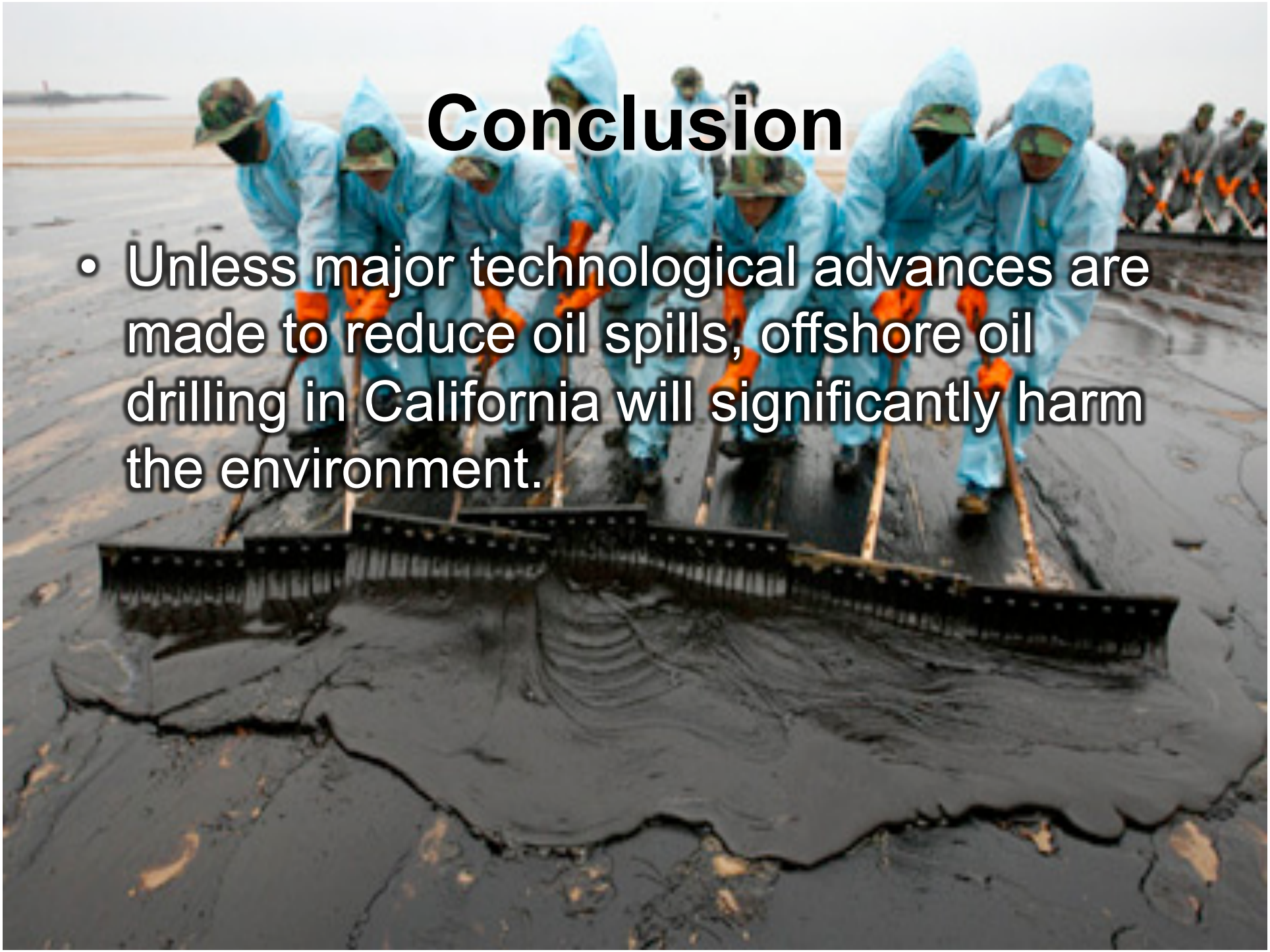
Oil Spill Probability




Harms Wildlife

Clean-up Costs

Transportation Impacts

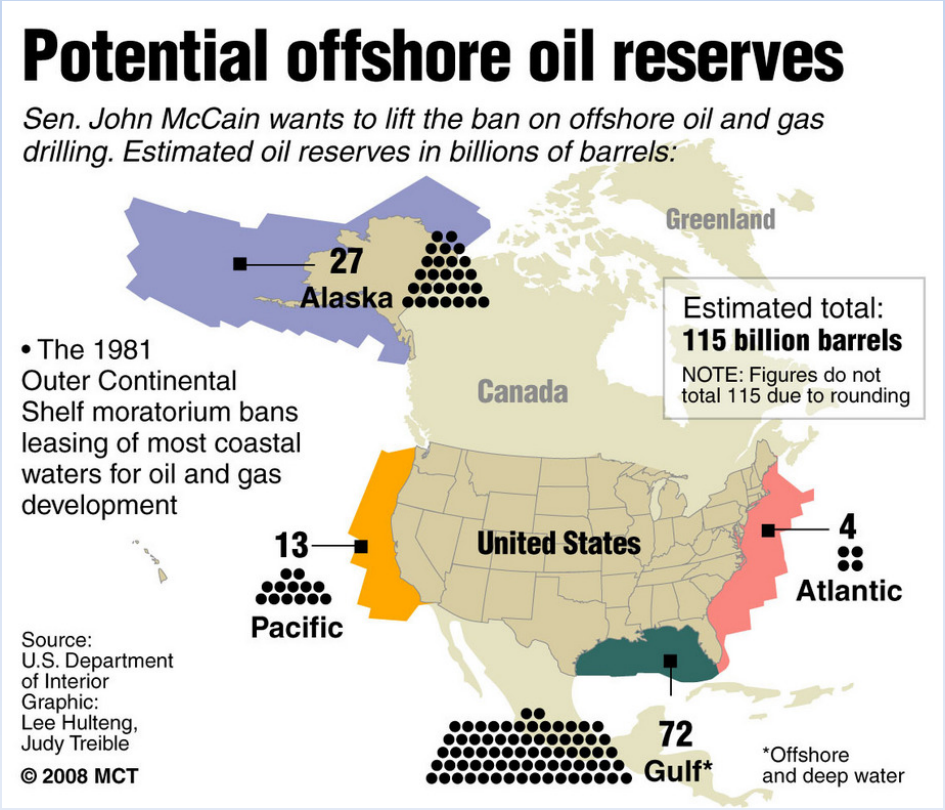


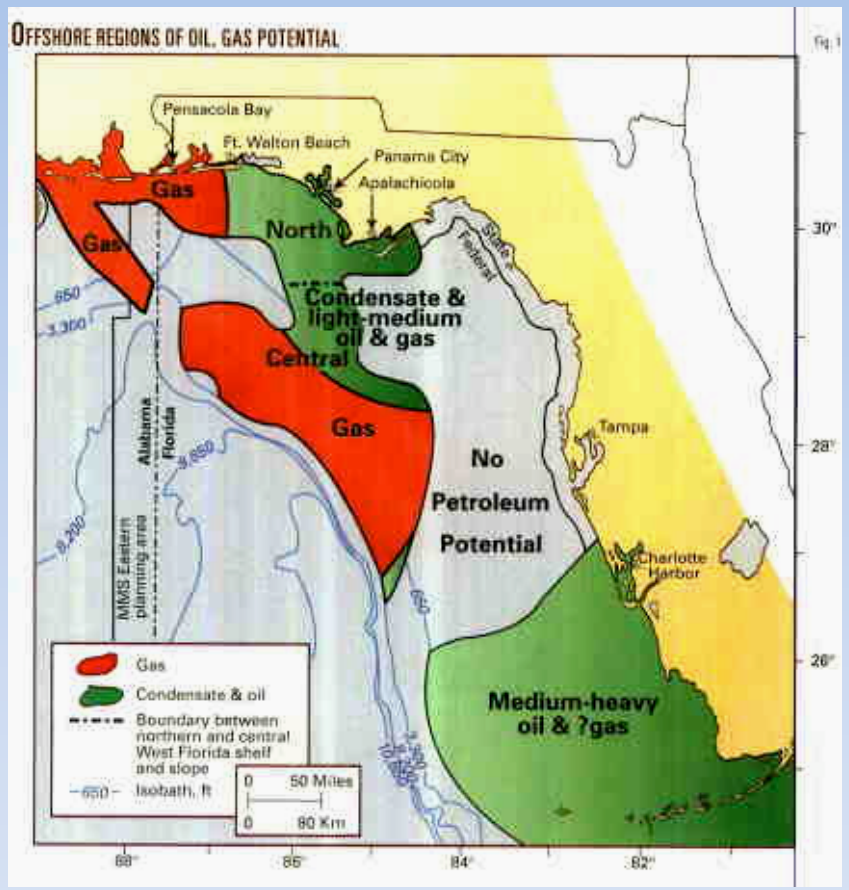
Conclusion

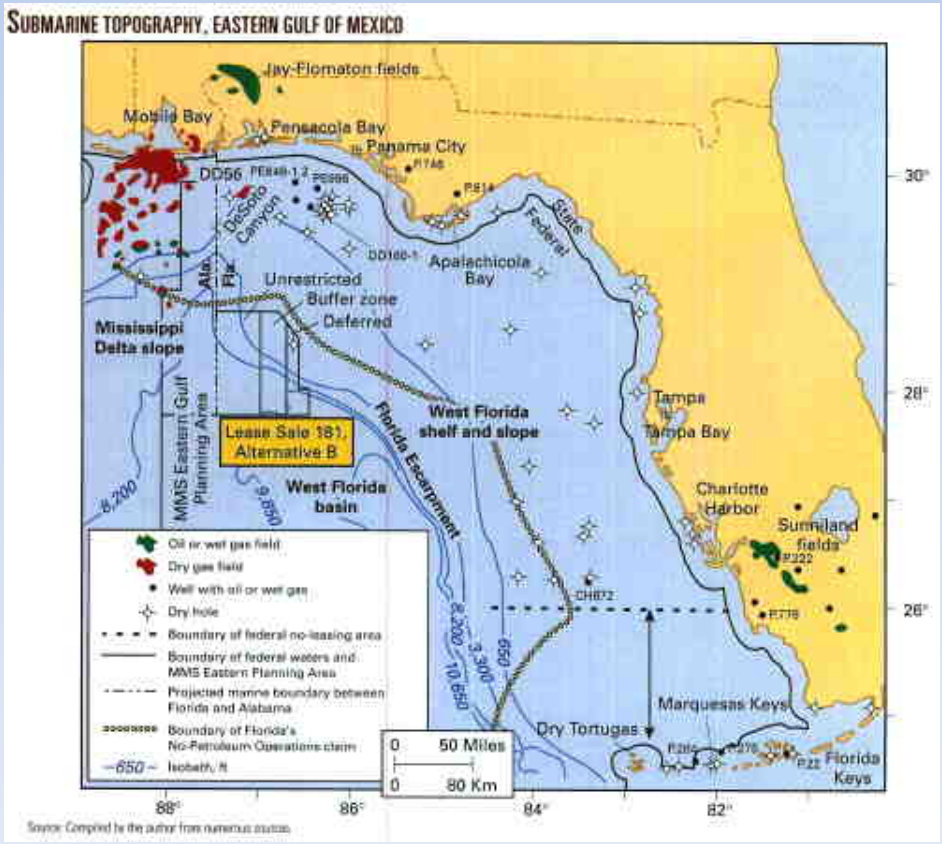
- Unless major technological advances are made to reduce oil spills, offshore oil drilling in California will significantly harm the environment.

West Florida Shelf Hydrocarbon Resources
&
Environmental Impacts of Drilling

Catherine Bryars, Michael Gary, Carmella Guiol,
Preston Puryear, Luke Zambetti







[1] Gohrbandt, Klaus H. "New assessment offered for W. Florida shelf, slope." 4 Feb. 2002. Exploration and Development.
[2] Gohrbandt, Klaus H. "West Florida shelf and slope; prime targets for gas, oil in eastern Gulf of Mexico." 11 June 2001. Exploration and Development.

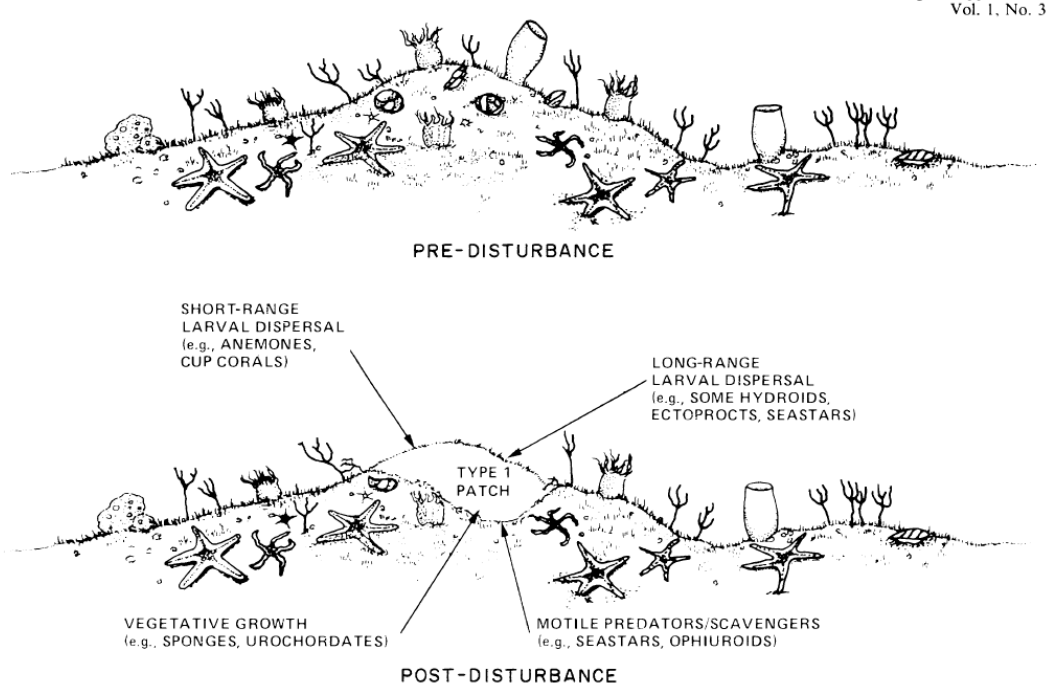
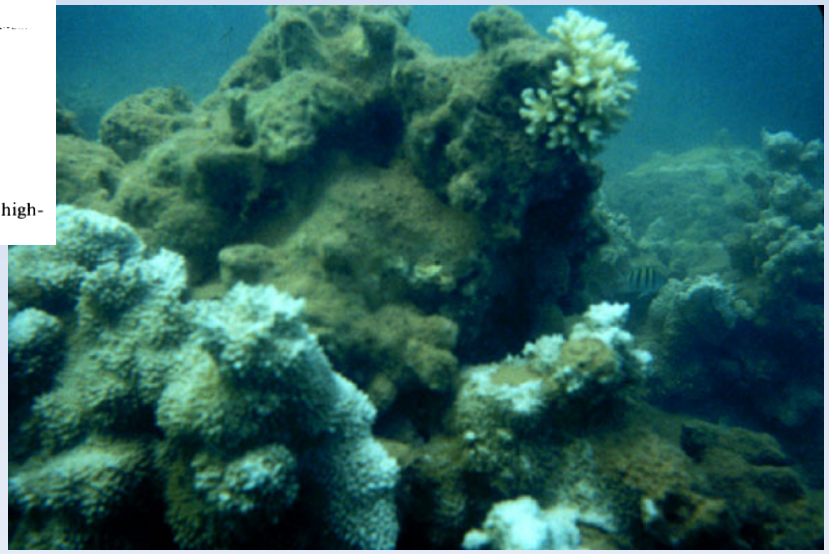
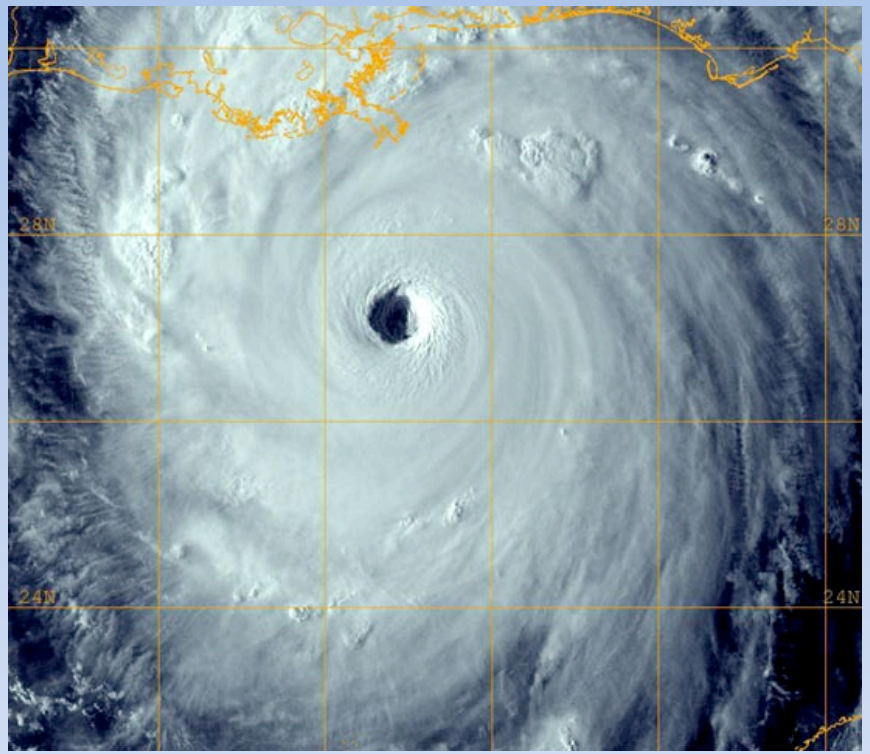
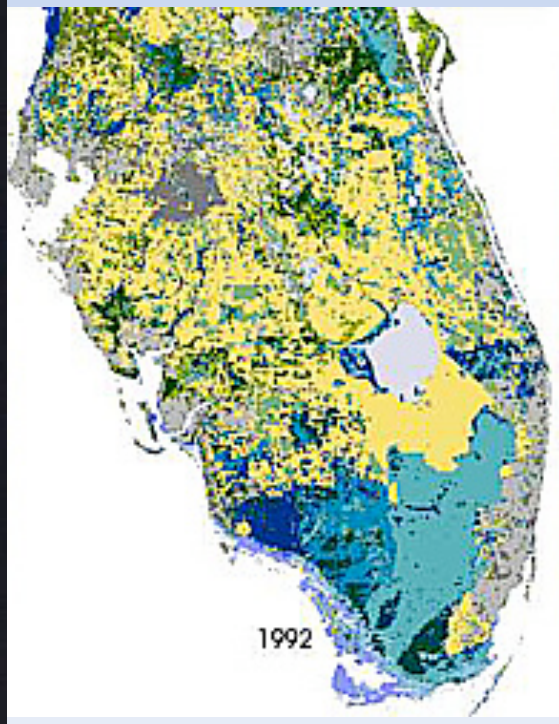


FIG. 2. Example of hypothetical recolonization and recovery of a Type 1 patch created by an anchor disturbance: high-relief hard-substrate community of the California outer continental shelf.

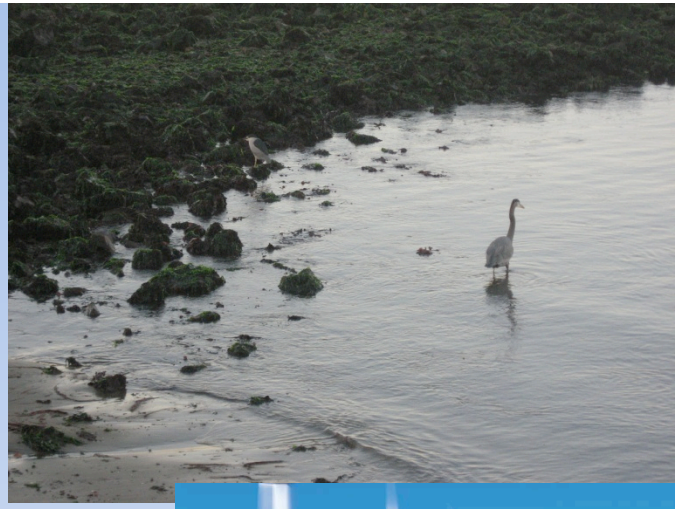



28N
28N
24N
24N


2005
Dennis
10 July
Katrina
Wilma



landcover types
- open water
- mangroves
- saltwater marsh
- woody wetlands
- deciduous needleleaf/swamp (cypress)
- evergreen shrub wetland
- saw grasses/other marshes
- slough, bog, or marsh
- wet prairie, marsh
- evergreen needleleaf trees
- deciduous broadleaf trees
- evergreen broadleaf trees
- mixed woodland
- shrubs
- grasses
- crops/mixed farming
- mixed residential
- urban/roads, rock, sand



VS.

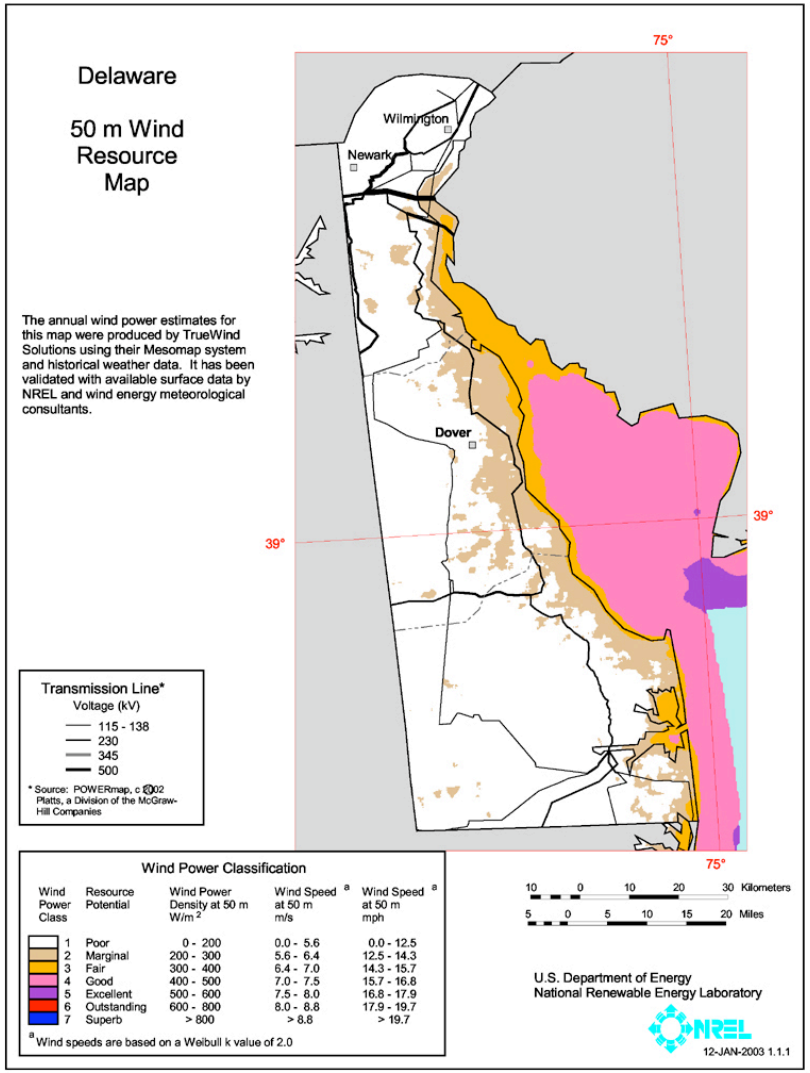
Hurricanes with centers within 10 miles of coast: 1851-2005

DELAWARE WIND POWER:

A VIABLE ENERGY SOURCE

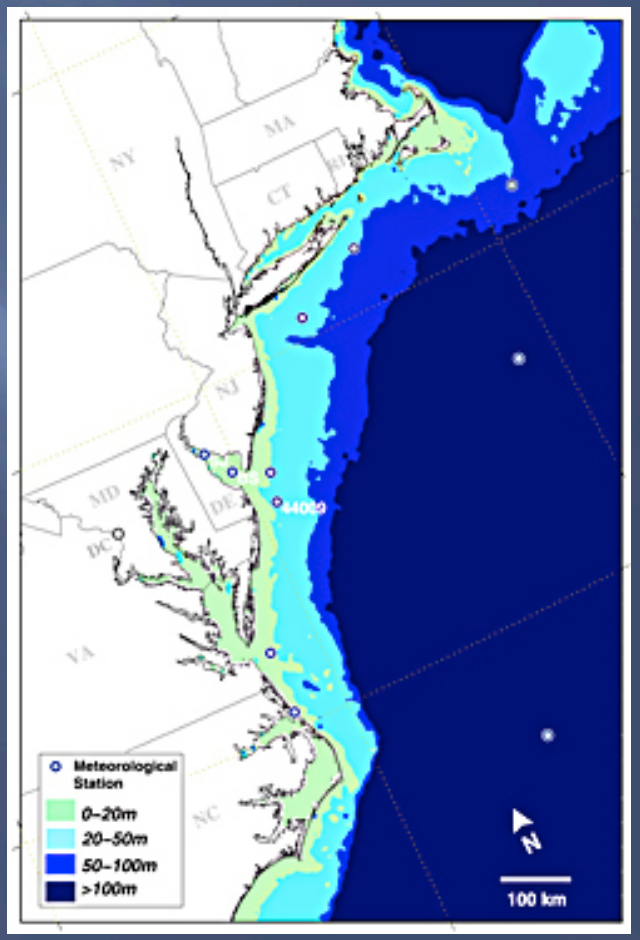
http://greenjersey.org/wp-content/uploads/2008/07/wind_nysted_000674.jpg

DELAWARE WIND RESOURCES



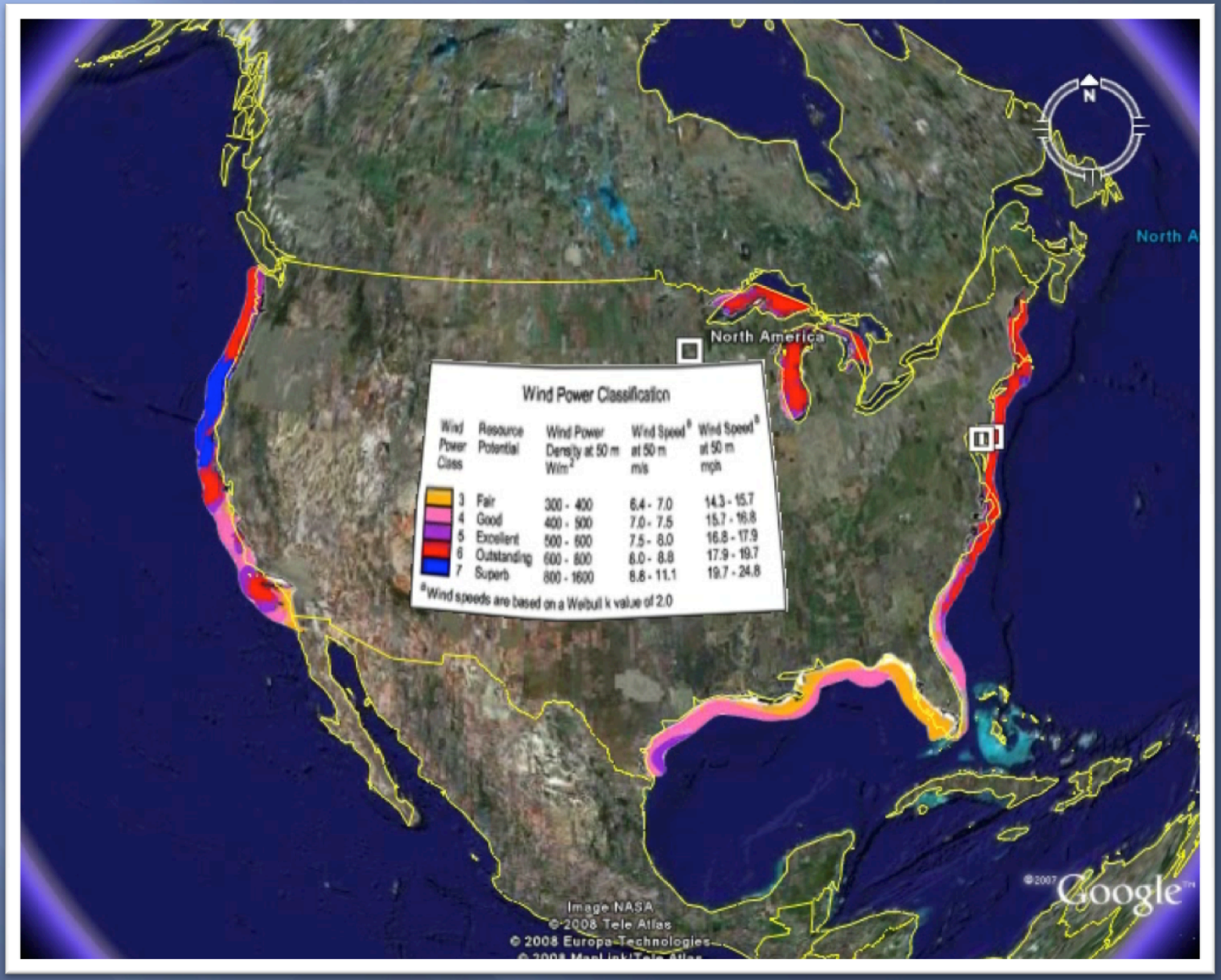
www.eere.energy.gov/.../windmaps/de_50m_800.jpg

- Most wind found off shore (8.6 m/s at 80m)
- Most wind found off the south east cost.

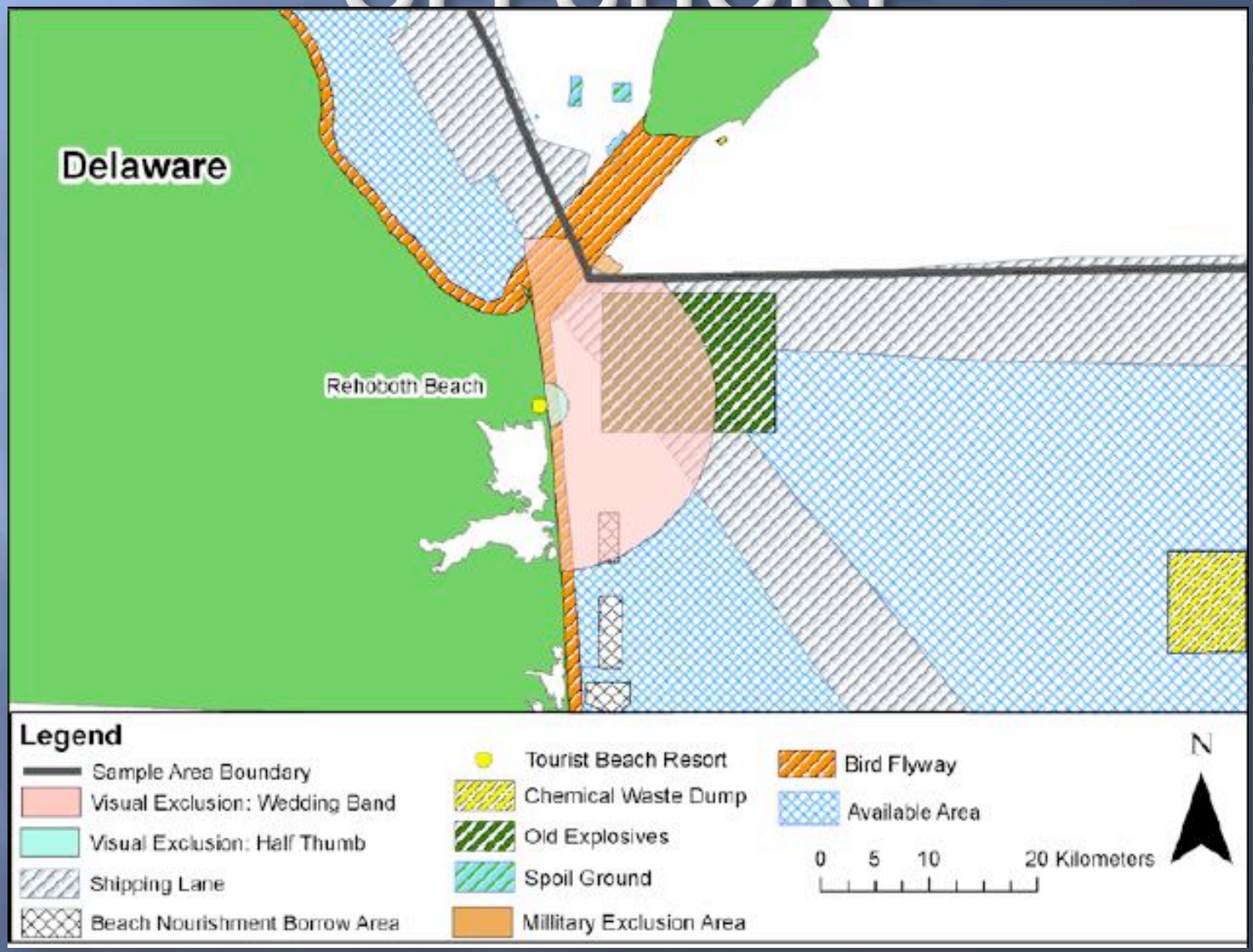


http://www.renewableenergyworld.com/assets/images/story/2007/2/7/1332_map_use.jpg

OFFSHORE DELAWARE



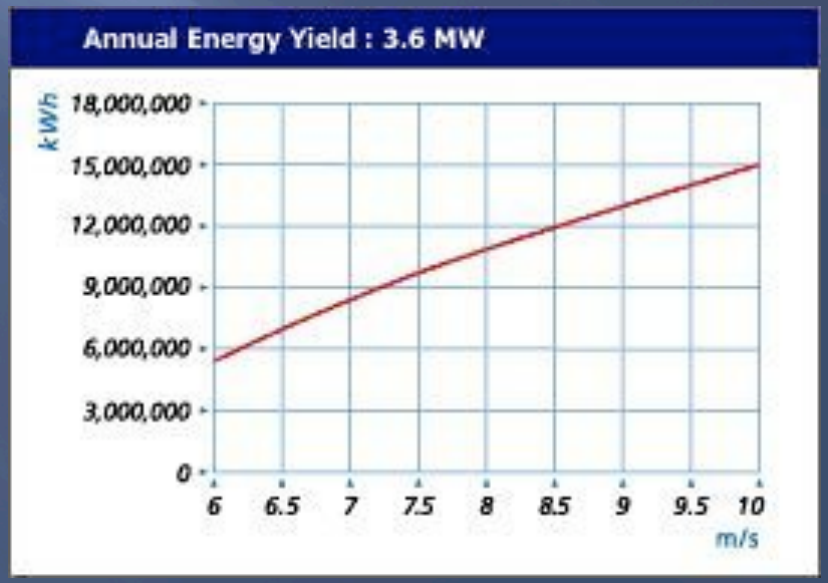
AVAILABLE AREA OFFSHORE



http://www.dnrec.delaware.gov/Admin/Documents/Kempton-EnvFootprintWorkgroup-July08.pdf

IMPLEMENTATION

The triple blade design and 104m rotor diameter make wind turbines like GE's 3.6MW model ideal for energy efficiency.



Images courtesy of GEPower.com

PRODUCTION POTENTIAL

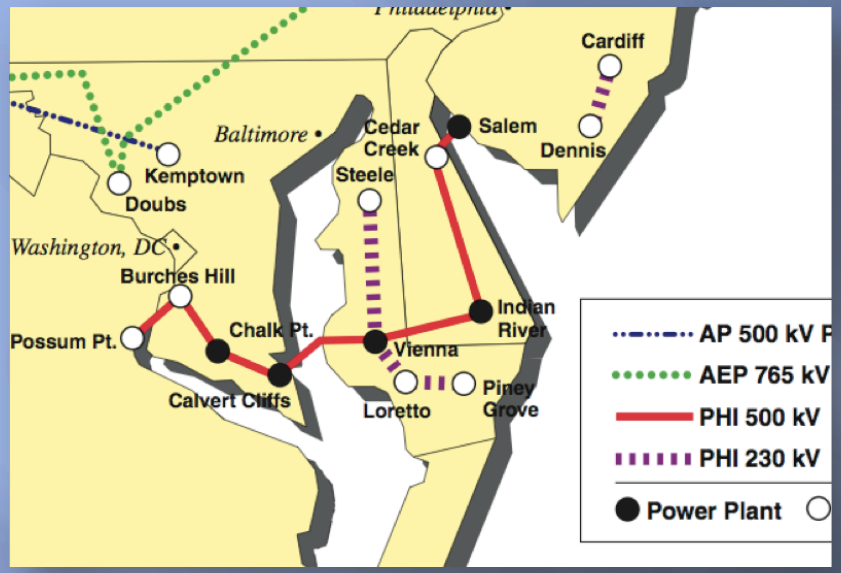
*limited to 30m of depth	Total Available Area (km^2)	Maximum number of turbines	Output (MW)	% of Net Summer Capacity (MW)
With 2 km visual exclusion zone	1,312	2,429	2906 *based on monthly averages at buoy 44009	86 %
With 15 km visual exclusion zone	1,178	2,181	2609 *based on monthly averages at buoy 44009	77 %

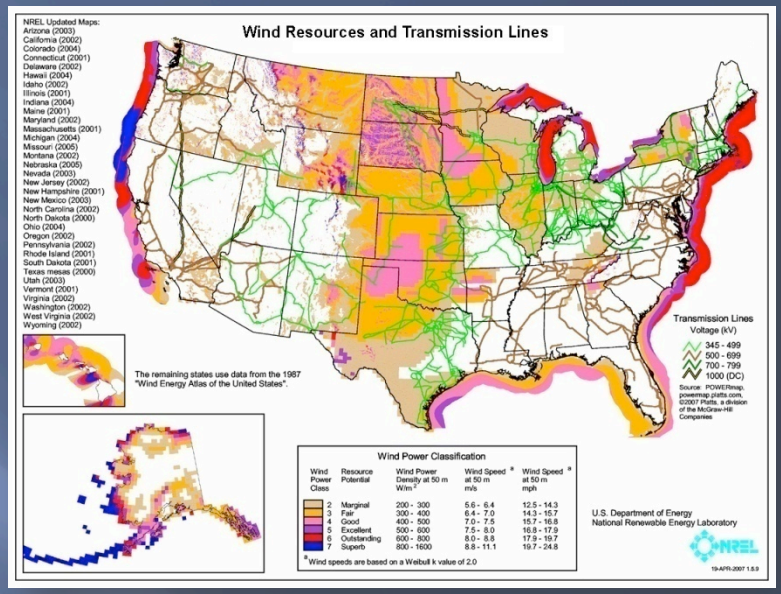
Current Delaware Net Summer Capacity = 3,374 MW

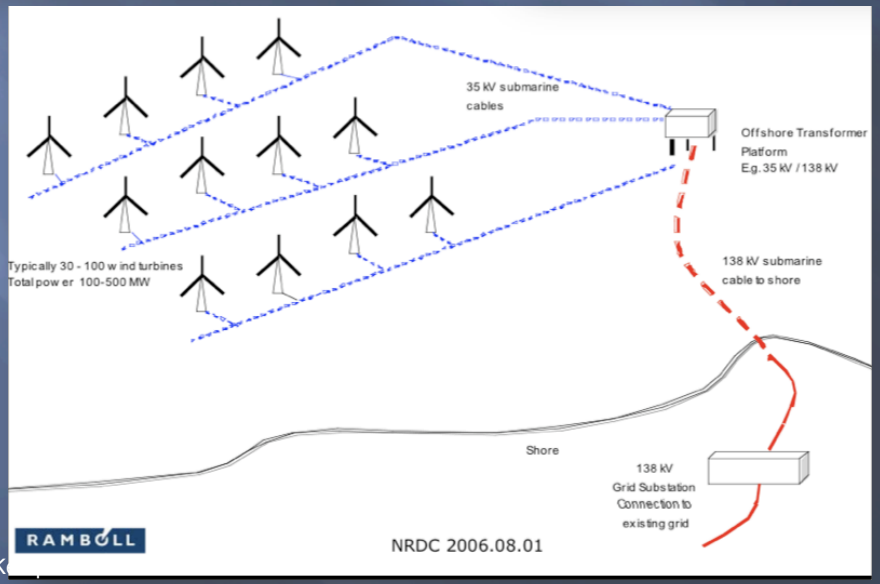
http://www.eia.doe.gov/cneaf/electricity/st_profiles/delaware.html
http://www.ocean.udel.edu/windpower/docs/DhanjuWhitKemp-proof-RE07.pdf

http://www.allamericanpatriots.com/48747015_wind-industry-asks-gov-granholm-sen-patterson-make

TRANSMISSION

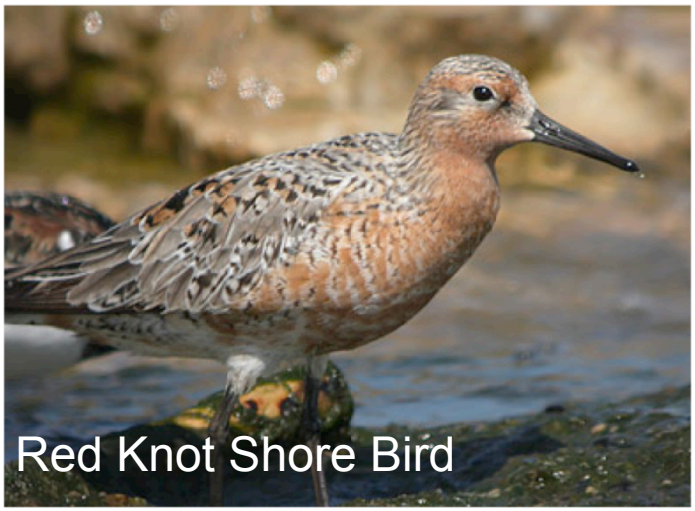






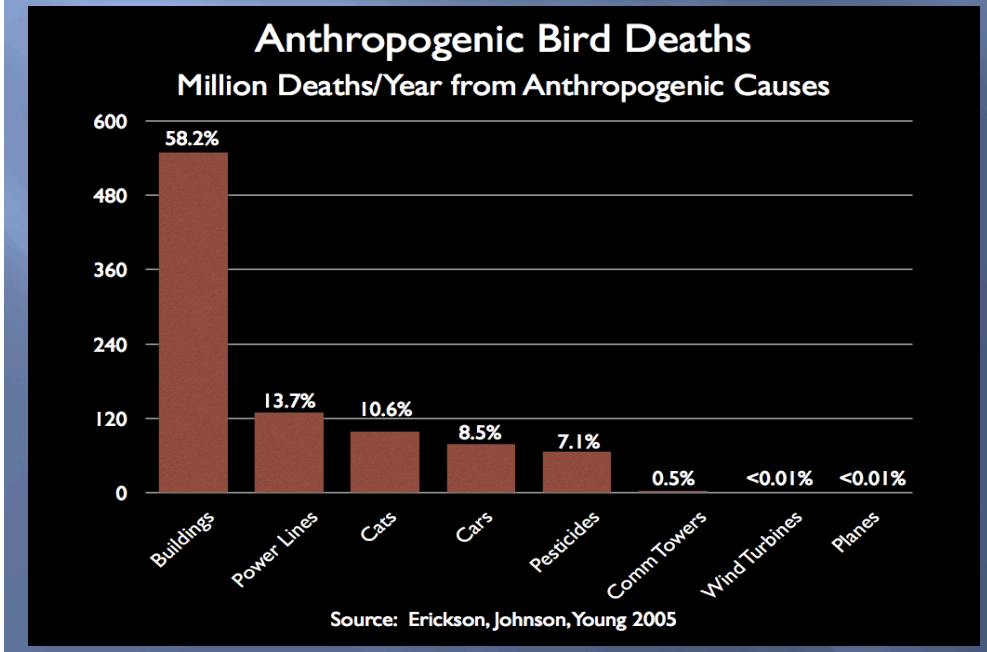
http://www.dnrec.delaware.gov/Admin/Documents/K
EnvFootprintWorkgroup-July08.pdf

ENVIRONMENTAL IMPACT


Red Knot Shore Bird


Kemp's Ridley Turtle


Right Whale

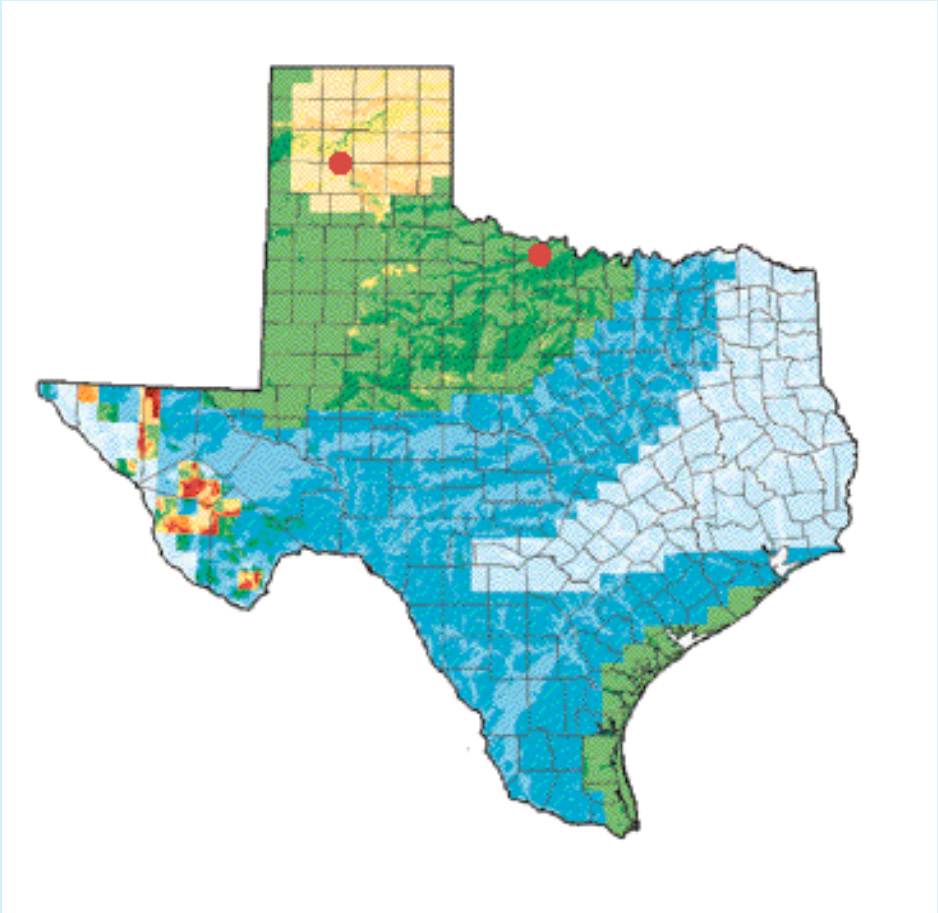


Main Issues:
- disruption of habitats
- noise
- electromagnetic fields
-altered ocean currents

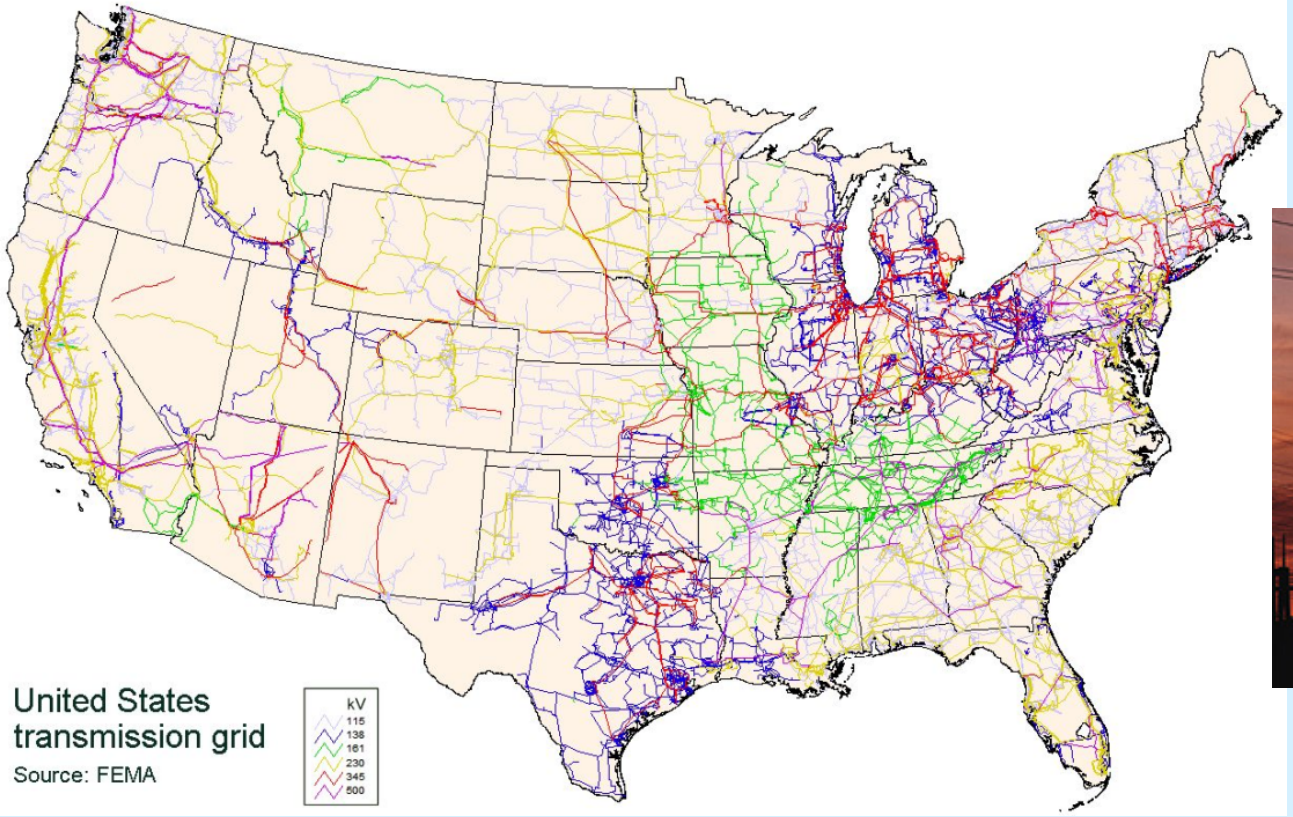
-Potential reduction of CO_2 emissions by 1.35 billion lbs.

http://www.nwrc.usgs.gov/world/images/turtle.jpg
http://www.birddigiscoping.com/blogtpredknot.jpg
http://www.noaanews.noaa.gov/stories2005/images/right-whale2.jpg
http://www.acsonline.org/factpack/images/RightWhaleRangeMap.jpg
http://www.lotuslive.org/energy/files/birddeaths.png


Christopher Callahan, Lisa Graichen, Rebecca Kelley, Caris Longoria, and Andrea Park
Wind Power, Y'all!



WIND POWER		
CLASS 1	CLASS 3	CLASS 5
CLASS 2	CLASS 4	CLASS 6


United States
transmission grid
Source: FEMA
kV
115
138
161
230
345
500

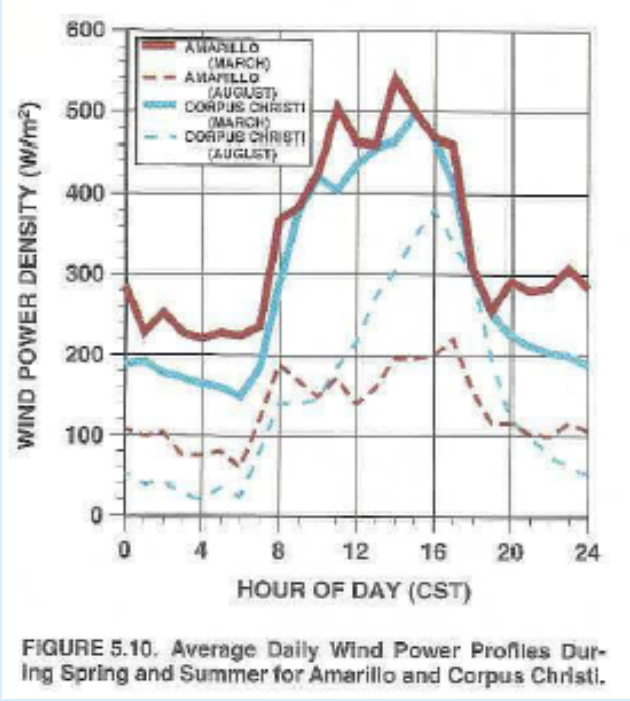
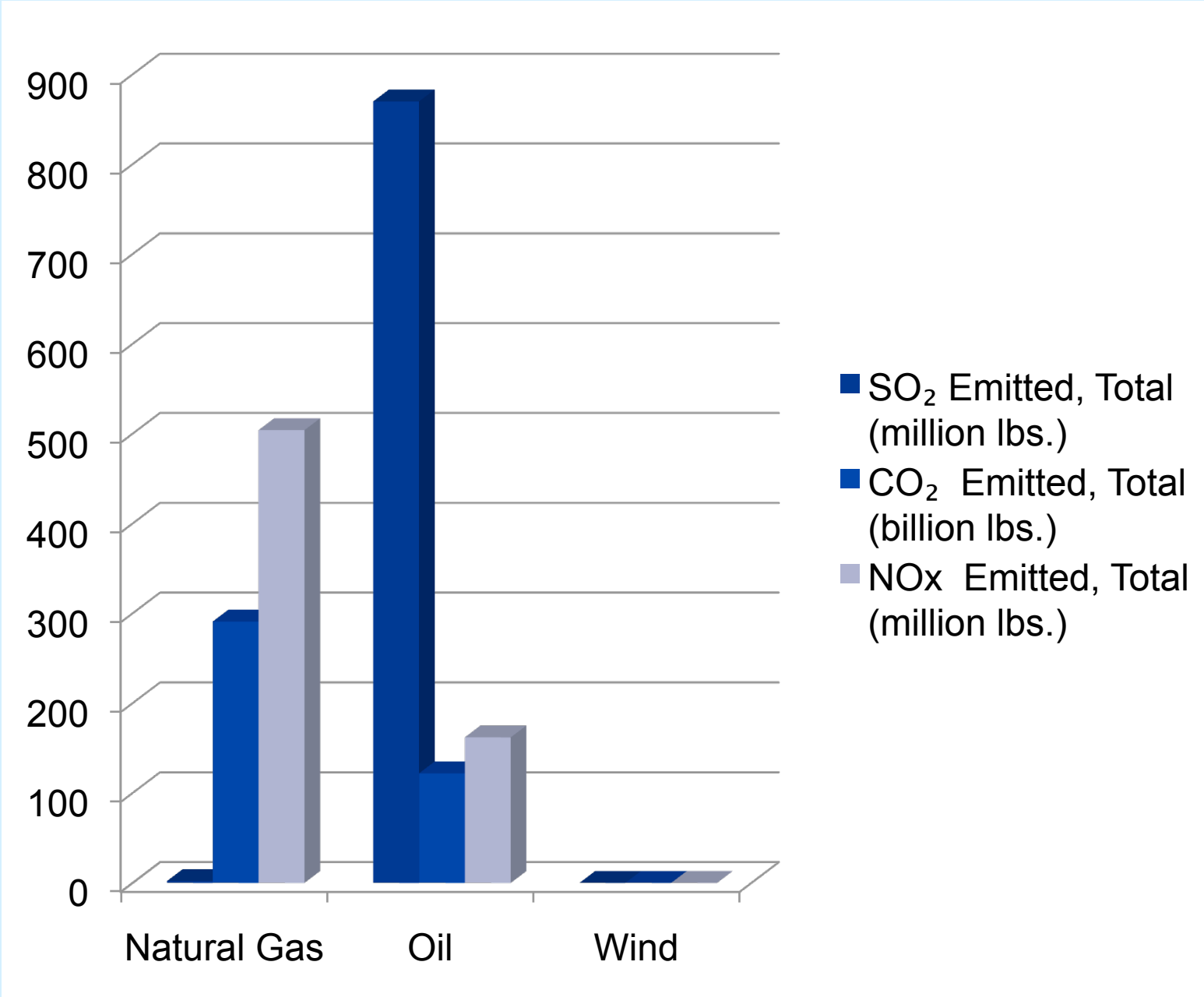


FIGURE 5.10. Average Daily Wind Power Profiles During Spring and Summer for Amarillo and Corpus Christi.


900
800
700
600
500
400
300
200
100
0
Natural Gas
Oil
Wind
SO2 Emitted, Total (million lbs.)
CO2 Emitted, Total (billion lbs.)
NOx Emitted, Total (million lbs.)


WICHITA CO. COURT HOUSE — AND JAIL.
C.A. SOUTHERS — BLOCK & OPERA HOUSE.
WILSON'S
TH. WILSONS GROCERY.
WICHITA ROLLER MILL
WICHITA ROLLER MILL — & MILL — & WAREHOUSE.
PUBLIC SCHOOL
Thanks!
Questions?
CRESCENT LAKE.
MICHIGAN AVE
EIGHTH ST.
SIXTH ST.
FIFTH ST.
FOURTH ST.
FORT WORTH & DENVER R.R.
PANHANDLE NAT'L BANK
WAGON & R.R. BRIDGES ACROSS THE WICHITA RIVER.
WICHITA FALLS.
TEXAS.
1890
HARDWARE.
KELLER & DURRETT, SADDLERY, BUGGIES & HARDWARE.

Photovoltaic Cells

- Under what scientific and environmental circumstances are photovoltaic arrays a viable energy generation strategy for commercial buildings?
- Maureen Yu, Anthony Bene, Alejandro Chaviano, Pir Granoff, Zachary Porges, and Susannah Rudel

Commercial Building Data

Single-Story Commercial Buildings in the US	**~2.879 million**
Mean Square Footage per Building	9,309 square feet
Mean Square Footage of Roof Space	~2.68 trillion square feet
Mean Square Footage of Roof Space viable for PV	~13.4 trillion square feet (481 sq miles)

Commercial Buildings and PV Cells

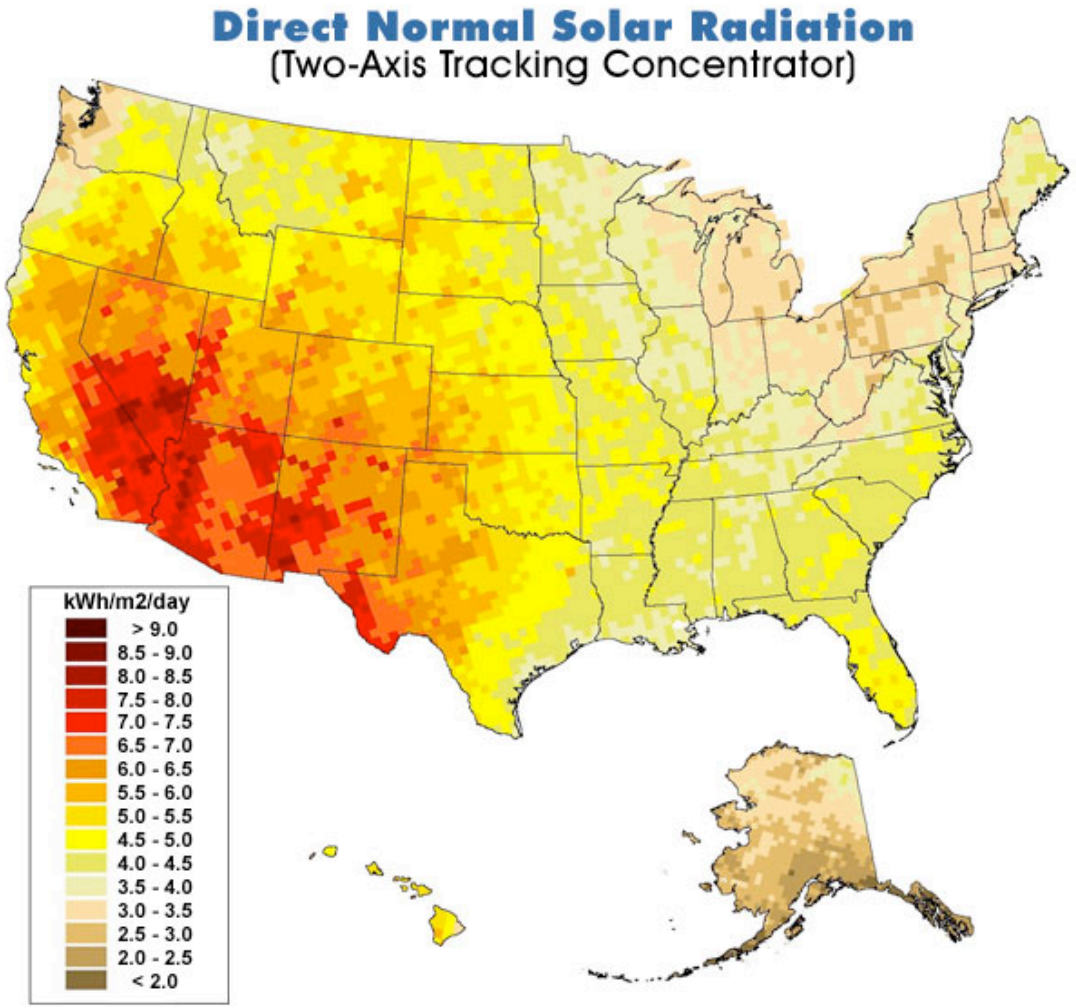
Flat-Plate PV Array

http://i.treehugger.com/images/2007/5/24/nrel-photovoltaic.jpg

Commercial Buildings with PV Arrays

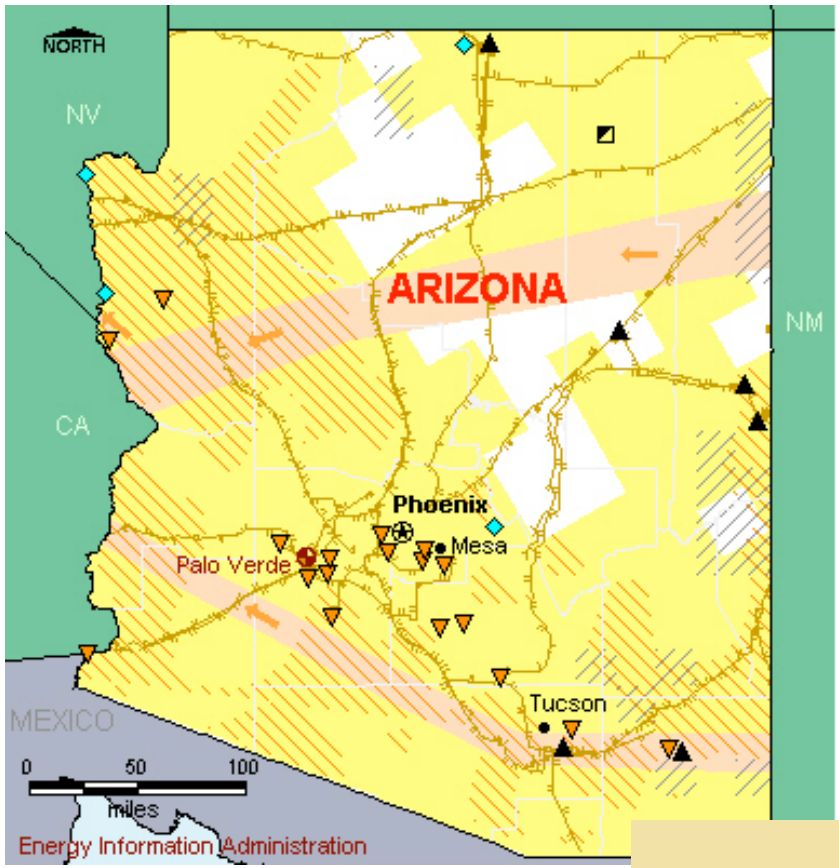
http://www.sunpowercorp.com/For-Businesses/Case-Studies/Retailers.aspx

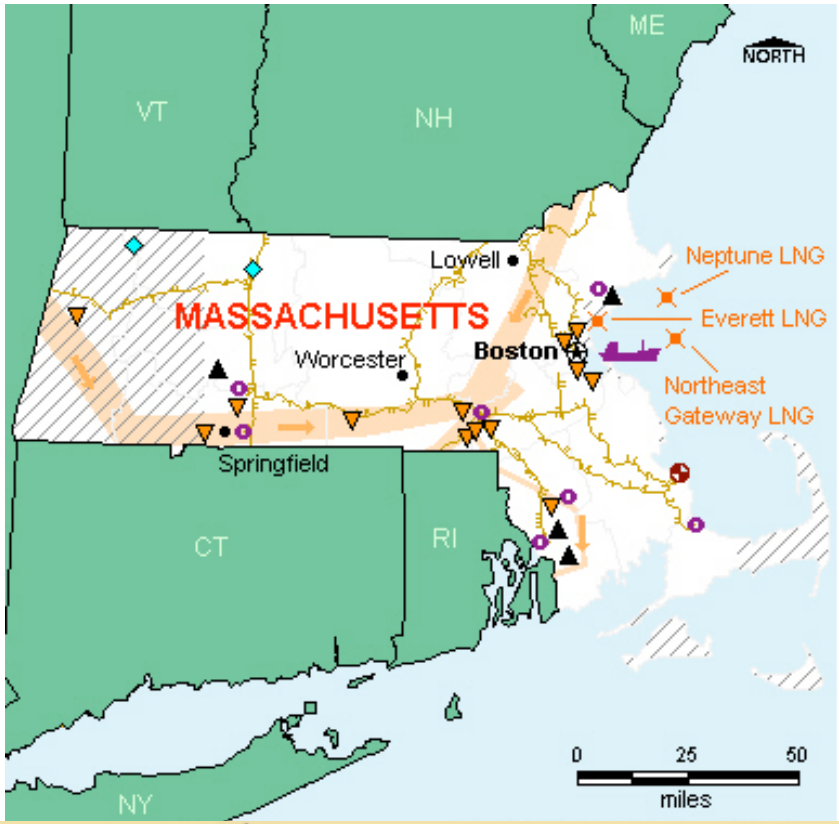
Solar Radiation Received By the US



- http://www.amonix.com/images/direct_solar_radiation.jpg

Solar Radiation In AZ and MA





Mouse over symbols for more details.

Electricity Transmission Line (>= 345 kV)
Oil Seaport
Oil Import Site
Petroleum Refinery
Coal Mine, Surface
Coal Mine, Underground
Natural Gas Flow
Hub
(1 mile band width = 100 million cubic feet/day)
Oil and Gas Active Leases

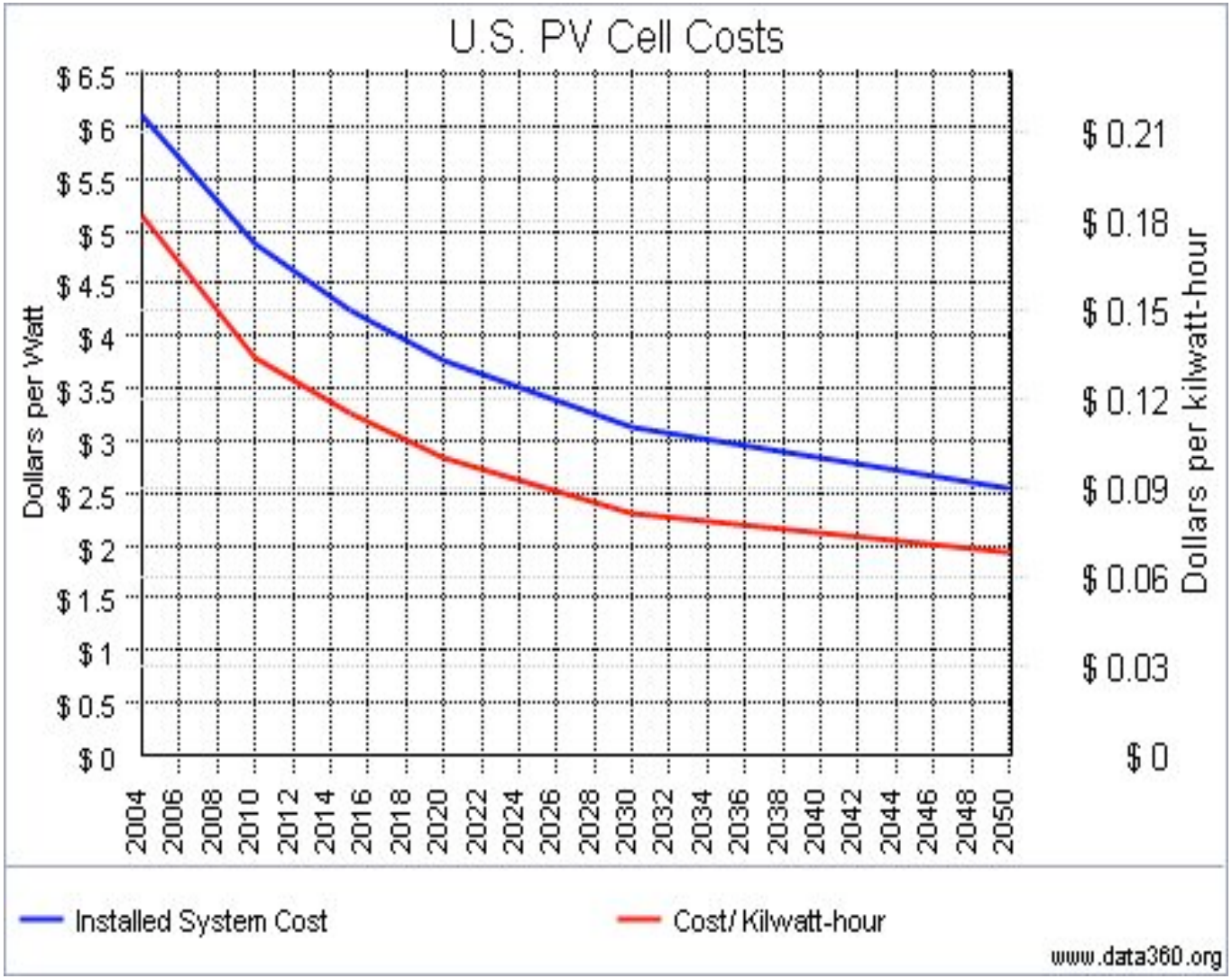
Major Electric Power Plants (>=100 MW)
Nuclear
Petroleum
Coal
Natural Gas
Geothermal
Solar
Hydroelectric
Wind
Wood

Renewable Energy Potential
Solar - (>= 6.0 kWh/m2/day)
Wind - (>= 4 Power Class)
Geo. - (>= 80 milliwatts/m2)

http://tonto.eia.doe.gov/state/index.cfm

The Cost of Energy

Avg Commercial (including industrial) cost of grid-supplied electricity in AZ	**8.41 cents/KWh**
Avg Commercial cost of grid-supplied electricity in MA	16.22 cents/KWh
Avg Commercial cost of grid-supplied electricity in US	9.41 cents/KWh
Avg cost of a photovoltaic system In the US (including installation)	~37 cents/KWh

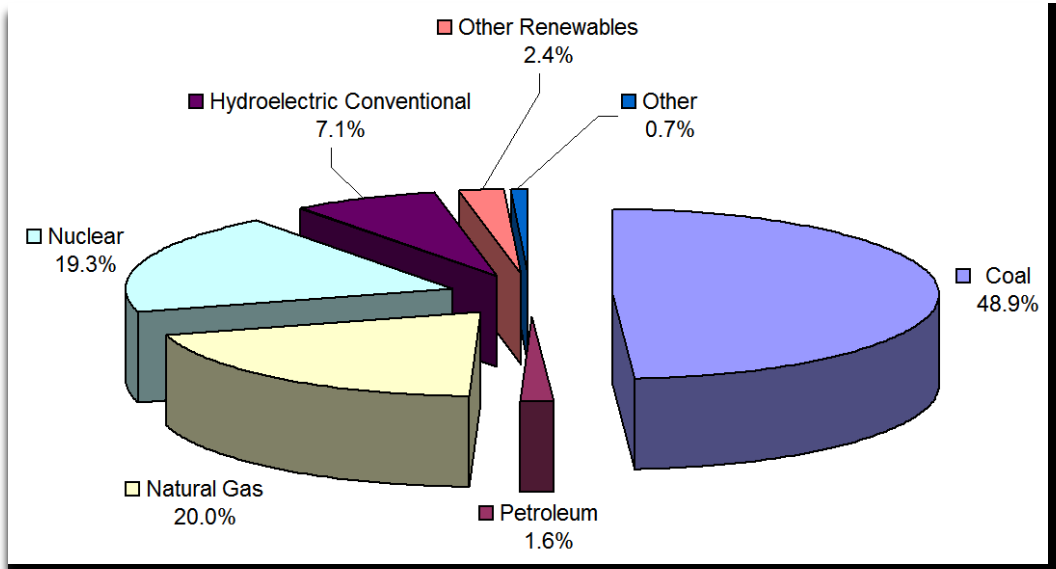


*cost is for the consumer

http://www.data360.org/dsg.aspx?Data_Set_Group_Id=605

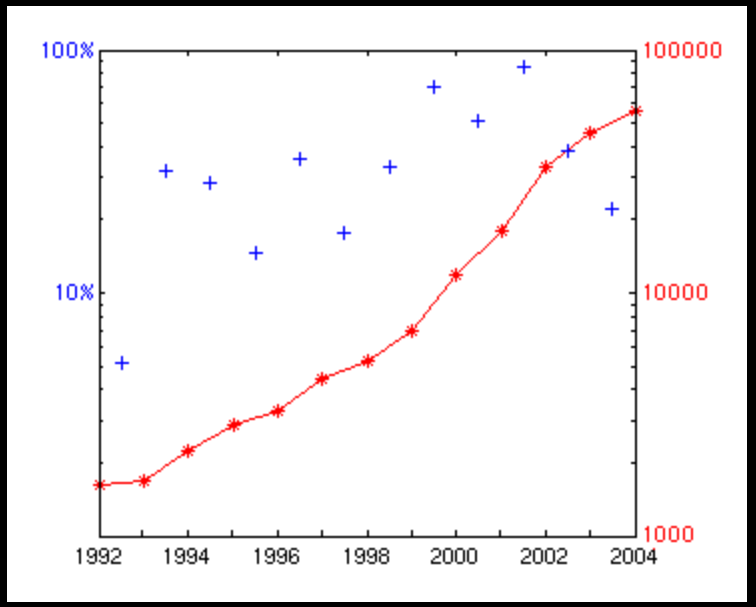
Sources

- http://www.nrel.gov/docs/legosti/fy98/24691.pdf (Photovoltaics and Commercial Buildings-A Natural Match)
- http://www.sciam.com/article.cfm?id=engineering-silicon-solar-cells&print=true (Scientific American)
- http://www.printed-electronics-reports.com/press/18.shtml ("When Will Organic Photovoltaics be Viable?")
- http://www.worldchanging.com/archives/001733.html ("Improvements in Organic Photovoltaics")
- http://www.amonix.com/images/direct_solar_radiation.jpg
- http://www.yuma-solar.com
- http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=AZ
- http://www.data360.org/dsg.aspx?Data_Set_Group_Id=605
- http://www.solarpowerrocks.com/massachusetts/
- http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=MA
- http://buildingsdatabook.eren.doe.gov/docs/xls_pdf/3.1.10.pdf
- http://www.nrel.gov/learning/re_photovoltaics.html
- http://www.findsolar.com/Widgets/CalculatorEmbed.aspx?t=pro&id=3893
- http://universe-review.ca/I07-12-Sun.jpg
- http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B73D8-4D4M8HD-16&_user=582442&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_version=1&_urlVersion=0&_userid=582442&md5=46812599668287c37505b345429348e7
- http://www.sunpowercorp.com/For-Businesses/Case-Studies/Retailers.aspx

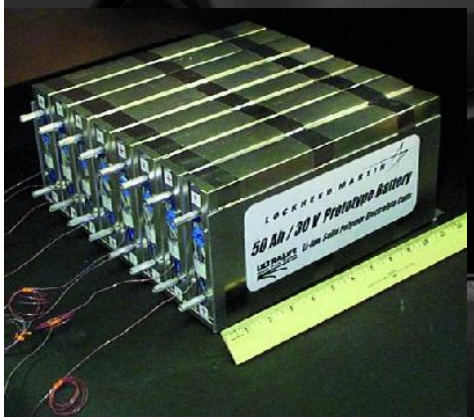


Source of electricity in the US in 2006

Number of Electric cars (red line) and percent increase (blue)

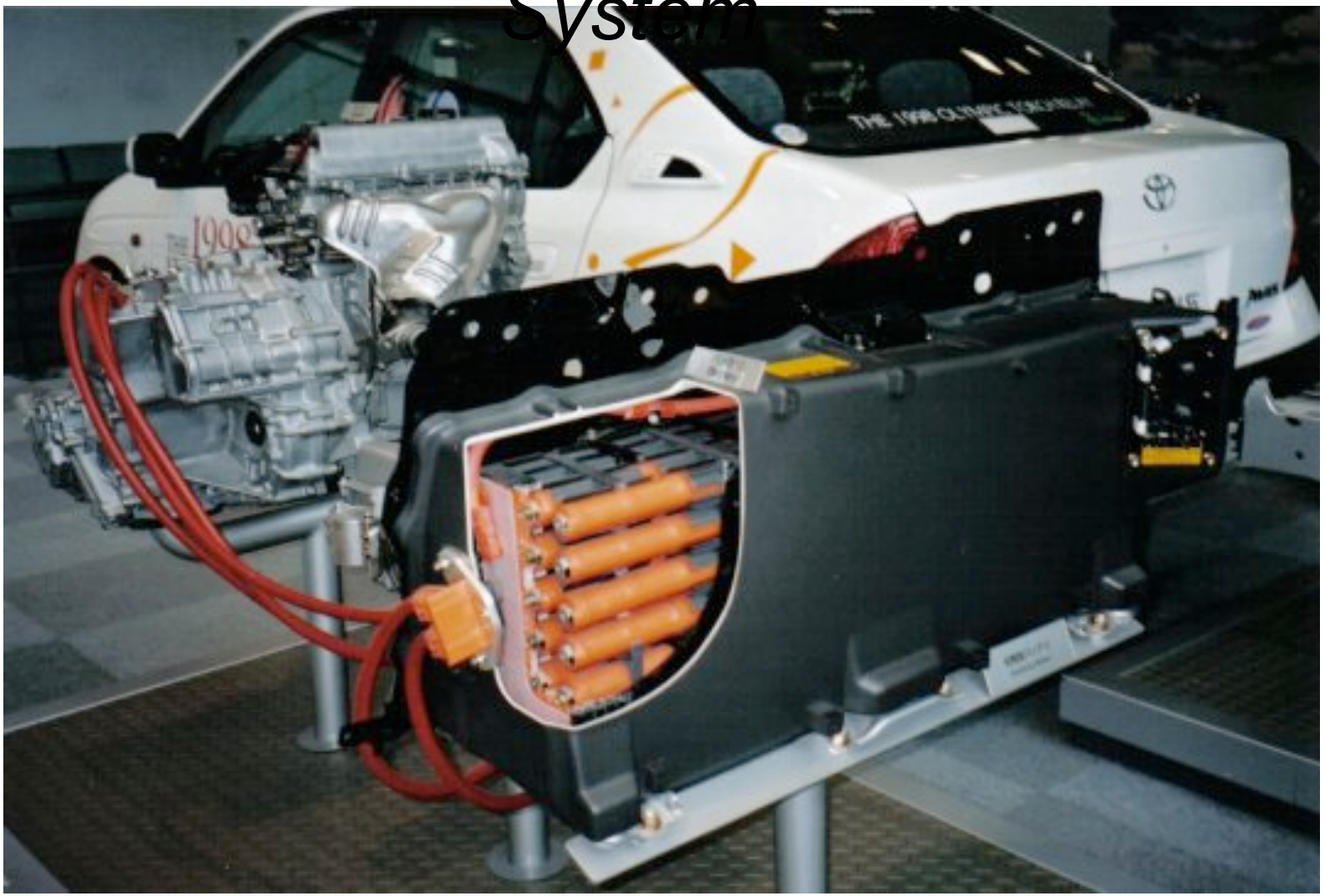


Electric Cars and their Viability

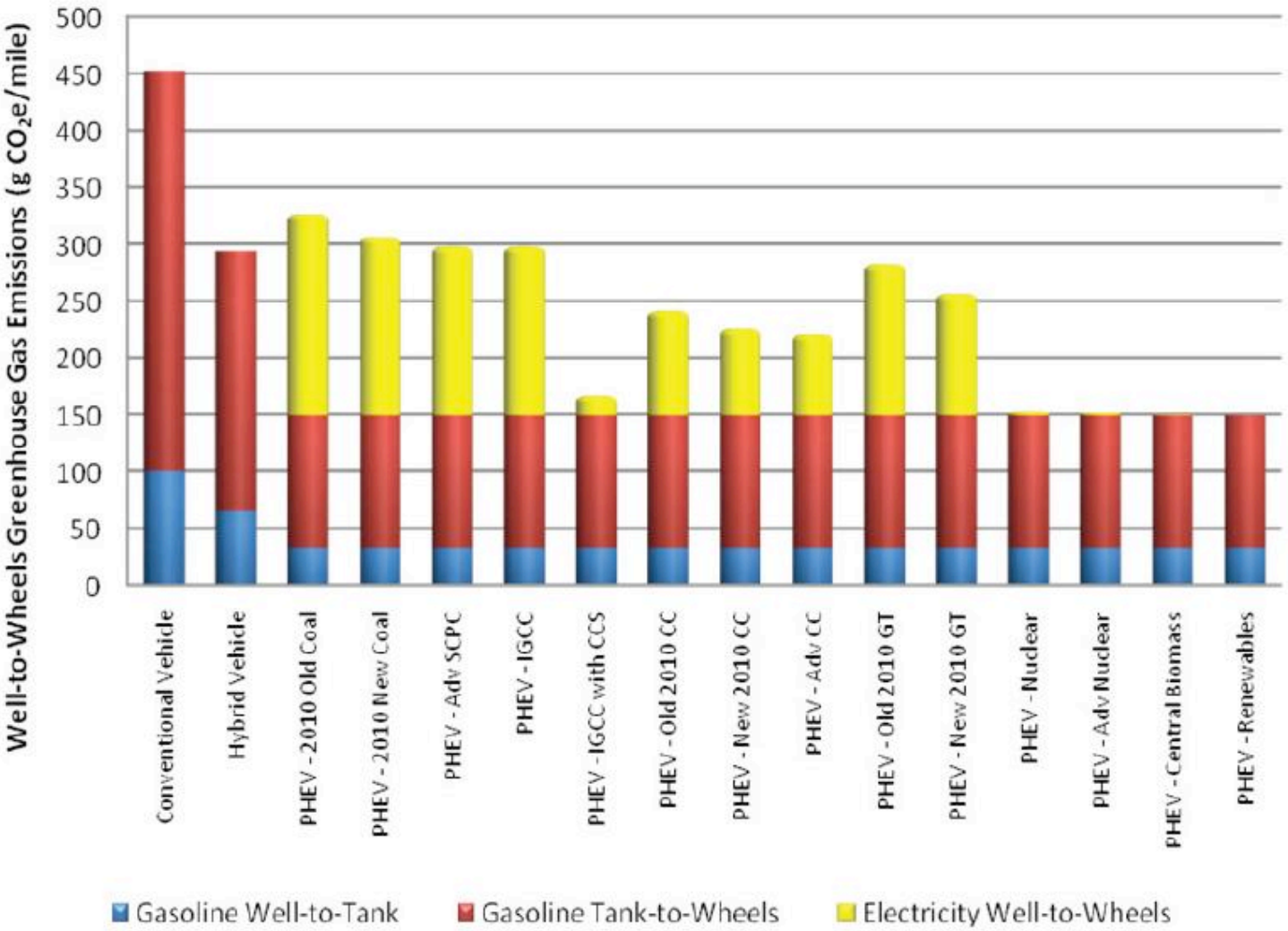


Prototypes of 75 watt-hour/kilogram lithium ion polymer battery.

Nickel-Metal Hybride System



Lithium-Ion Battery



Year 2010 comparison of PHEV 20 GHG emissions when charged entirely with electricity from specific power plant technologies (12,000 miles driven per year).

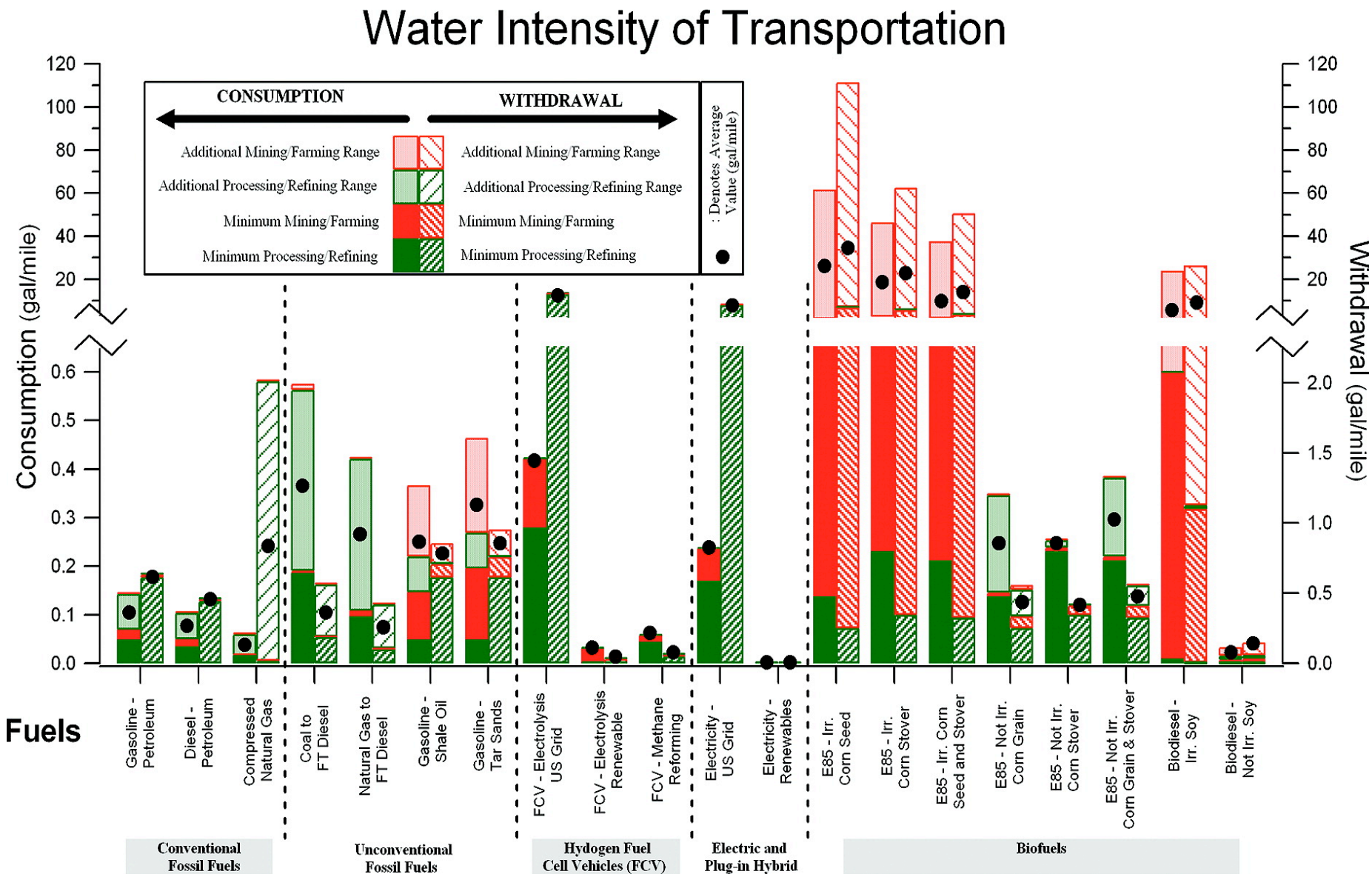
http://www.businessweek.com/investing/green_business/archives/PHEV%20ghg%20intensity.JPG

Environmental Impact Associated with Vehicle Production Stages

Type of car	Curb mass (kg)	GHG emissions (kg)	AP emissions (kg)	GHG emissions per 100 km of vehicle travel[a] (kg per 100 km)	AP emissions per 100 km of vehicle travel (kg per 100 km)
Conventional	1134	3595.8	8.74	1.490	0.00362
Hybrid	1311	4156.7	10.10	1.722	0.00419
Electric	1588	4758.3	15.09	1.972	0.00625
Fuel cell	1678	9832.4	42.86	4.074	0.0178

[a] During vehicle's life time (10 years), an average car drives 241,350 km

Image courtesy of: http://gizmodo.com/gadgets/gadgets/edrive-systems-testing-plug+in-prius-hybrid-165836.php



http://pubs.acs.org/appl/literatum/publisher/achs/journals/production/esthag/2008/esthag.2008.42.issue-21/es800367m/images/large/es-2008-00367m_0001.jpeg

Economic characteristics for four vehicle technologies

Type of car	Fuel	Price (thousands US$)	Fuel consumption (MJ per 100 km)	Fuel price (US$ per 100 km)	Driving range (km)
Conventional	Gasoline	15.3	236.8[c]	2.94	540
Hybrid	Gasoline	20.0	137.6	1.71	930
Electric	Electricity	42.0	67.2	0.901	164
Fuel	Hydrogen	100.0	129.5	1.69	355

a Fuel consumption based on 45% highway and 55% city driving.

b Life cycle of vehicle is taken as 10 years.

c Heat content of conventional gasoline is assumed to be its lower heating value (LHV), fixed at 32 MJ l−1.

http://www.carbodydesign.com/archive/2008/08/07-lotus-eigne/Lotus-Eigne-2-lg.jpg

http://www.sciencedirect.com/science?_ob=MImg&_imagekey=B6TH1-4J2M1S8-2-H&_cdi=5269&_user=582442&_orig=search&_coverDate=09%2F22%2F2006&_sk=998409997&view=c&wchp=dGLzVtz-zSkWz&_valck=1&md5=6a1bd21fb4b2ad6f084664224f8f130b&ie=/sdarticle.pdf

	Plug-in e-Hybrid	Regular e-Hybrid	Gasoline Powered Car
	Tesla Volt	Toyota Prius Touring	Nissan Maxima 3.5S
Initial Cost	30,000	24,270	30,160
Federal Rebates			
Initial Tax Rebate	-2,500	-3,150	0
Secondary Tax Rebate	-5,004	0	0
Fuel Costs	311	745	1,440
Total	22,807	21,865	31,600