

Driving renewable energy development through legislation

where we've been, where we are, and where we need to go

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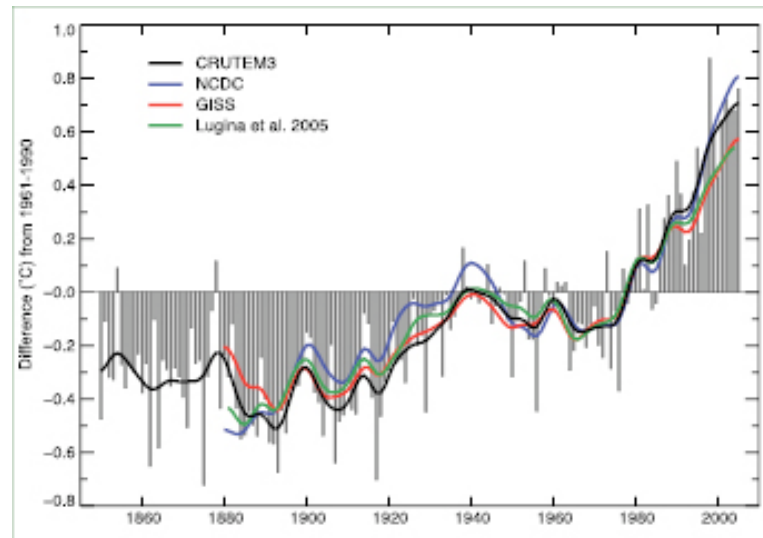
Photo: Middelgruden Wind Farm, Copenhagen Harbor, Denmark. Credit: Thomas Lee

Outline

- The need for clean energy legislation
- Policy tools used in legislation
- A recent history of Federal energy legislation
- Pending legislation
- Opportunities for investment and challenges to deployment
- Ways to participate in the legislative process

Three challenges: Climate, energy, and economy

- Climate change
 - Emissions of CO₂ and other greenhouse gases (GHGs) are causing global temperatures to rise
 - Risks to public health, economic growth, cultural preservation



Source: IPCC 4th Assessment Report, Working Group I

The challenge: Energy

- Energy sustainability
 - The world is running out of fossil energy
 - High crude oil prices (currently ~\$80/bbl)
 - More challenging fossil fuel sources coming into use
 - Tar sands, shale gas, mountaintop coal
- Energy independence
 - The United States imported 54% of its oil in 2009¹
 - Significant economic, diplomatic, and military resources are expended to secure oil supplies
 - China is also expending significant resources to secure oil to meet rising demand

¹EIA Energy Outlook 2010

The challenge: Economic growth

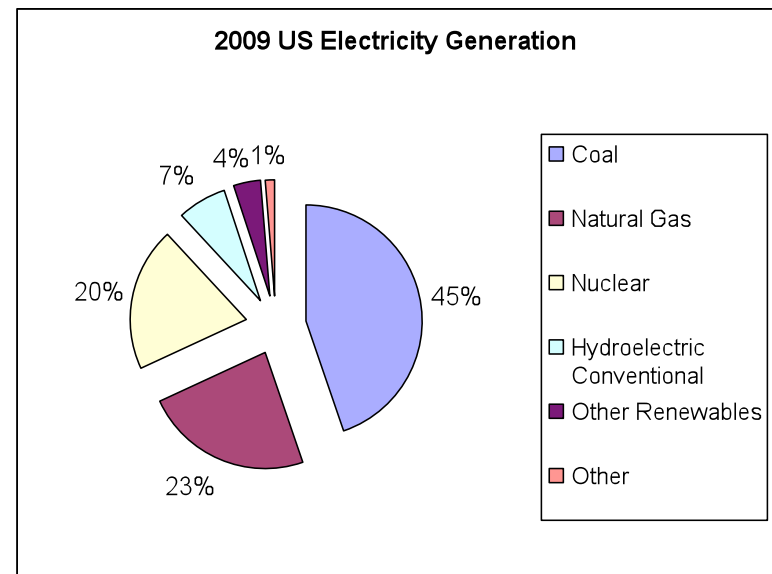
- Economic growth depends on energy
- Today, increased energy use requires increased GHG emissions, which cause climate change and threaten long-term economic growth
- Future growth depends on decoupling energy from GHGs
- There is a global race to develop and deploy low-carbon energy technology
 - The US is playing catch-up to Europe (particularly Germany and Denmark) and China

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RES: Creating demand for renewables

- Renewable electricity standard (RES)
 - Also known as a renewable portfolio standard (RPS)
 - A requirement that electric utilities produce a given fraction of their output from renewable sources
 - Utilities unable to meet the standard can purchase Renewable Energy Credits (RECs) from utilities exceeding the standard
 - Intended to spur investment in renewable energy
 - Some states, including WA, have state-level RES



Source: EIA Report No. DOE/EIA-0226 (2010/04)

RFS: Mandates for biofuels

- Renewable fuel standard (RFS)
 - Requires that a certain amount of renewable fuel be sold into commerce in a given year
 - Currently most renewable fuel is corn ethanol
 - US law puts obligation on refiners to blend renewable fuel into gasoline
 - Refiners unable to meet standard can purchase credits (Renewable Identification Number, or RIN credits) from those selling excess quantities
- Complication:
 - US law specifies an amount, rather than percentage
 - Does not adjust with fuel demand, causes technical (“blend wall”) and economic problems



An E85 (85% ethanol/15% gasoline) fuel pump

1Source: http://commons.wikimedia.org/wiki/File:E85_fuel_pump_7563_DCA_09_2009.jpg

May 12, 2010

Legislative Drivers for Renewable Energy

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LCFS: A technology-neutral approach

- Low carbon fuel standard (LCFS)
 - Mandates a reduction in overall lifecycle GHG emissions of transportation fuel
 - Reductions can be achieved in any manner
 - Blending biofuels
 - Reducing refinery or transport emissions
 - Electrification
 - Producers exceeding mandated reductions can sell credits to producers who fall short
- Complications
 - Monetizes small differences in lifecycle GHG emissions
 - Requires precise lifecycle calculation
- CA adopted an LCFS in 2009

Limiting GHGs with cap and trade

- Carbon cap and trade
 - Annual GHG emissions are capped at a predetermined level
 - GHG emitters required to purchase an allowance to emit a given amount of GHG. Those with unused allowances can sell to those needing more
 - European Union is using a carbon cap and trade system
 - Similar systems used successfully by the US in the 1990's for acid rain reduction, also used to manage fishing quotas
- Complications
 - Trading systems require strong oversight to prevent malfeasance
 - Cushioning cost impact of transition can undermine environmental benefits
 - Requires accurate monitoring and reporting systems
 - Requires accurate baseline in order to set cap properly

Carbon tax: A third rail

- Carbon tax
 - A fee placed on carbon emitters for each ton of CO₂ equivalent emitted
- Complications
 - There is no hard cap
 - Politically challenging
 - Responsible party: upstream or downstream?
 - Requires accurate measurement and reporting
 - Requires legislation to adjust (e.g. in response to a recessing or booming economy)

Financial tools enable development

- Tax credits
 - Production and investment credits
 - Can be transferred (i.e. sold to investors)
- Loans and loan guarantees
 - e.g. “Clean energy bank”; EPACT 2005 Title 17
 - Clean Renewable Energy Bonds (CREBS)
 - Provides financing to develop clean energy projects

If all else fails, regulate

- Regulate carbon dioxide as a hazardous pollutant
 - New large sources must undergo a review and permitting process under the Clean Air Act.
 - Emitters can be required to employ specific technologies to reduce GHGs
 - EPA authority confirmed by *Massachusetts v. EPA*

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First steps: EPACT 2005

- Energy Policy Act of 2005 (EPACT05)
 - Title 17: Loan guarantees for alternative energy projects
 - Renewable fuels standard (RFS): mandates the blending of biofuels (ethanol) with gasoline, 7.5 billion gal. by 2012
 - Requires electricity utilities to offer net metering
 - Tax breaks for energy efficiency, renewable energy production
 - Authorizes Clean Renewable Energy Bonds (CREBS) to finance government renewable energy projects
 - Title 5: Establishes an office for Tribal Energy at DOE; provides funding and technical assistance for tribal energy, addresses self-determination in energy development

Moving forward(?) EISA 2007

- Energy Independence and Security Act of 2007 (EISA07)
 - Increases RFS to 36 billion gal. by 2022
 - 21 billion gal. from non-corn starch sources, including 16 billion gal. of cellulosic biofuel
 - “Blend wall” problem; food vs. fuel debate
 - Expanded funding for energy research
 - Increased vehicle fuel economy standards
 - Loans for advanced automotive technologies
 - Block grants for energy efficiency
 - Efficiency standards for buildings, lighting products, Federal procurement
 - “Green jobs” training funds

A shot in the arm: 2009 Recovery Act

- \$69 billion for low-carbon energy and energy efficiency, including:
 - \$11 billion for smart grid
 - \$6 billion to guarantee \$60 billion in loans for renewable energy
 - \$2.3 billion for advanced batteries
 - **\$2.5 billion for DOE EERE**
 - **\$400 million for ARPA-E**
 - \$3.4 billion for carbon capture and sequestration
 - \$5 billion for weatherization
 - Extends production tax credit for 3 years
 - Provides for grants in lieu of tax credits to spur investment



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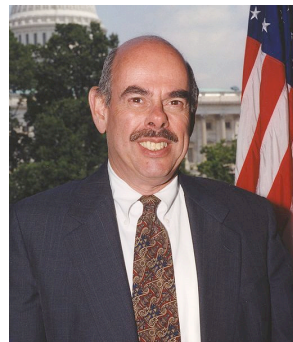
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Pending legislation: *The Senate* ~~Waiting for Godot~~

- House: HR 2454, The American Clean Energy and Security Act (ACES) aka “Waxman-Markey”
 - March 2009: discussion draft released, hearings begin
 - May 21, 2009: ordered reported favorably by the Energy and Commerce committee
 - June 26, 2009: passes the House, 219-212
- Senate
 - July 16, 2009: Senate Energy and Natural Resources committee reports S. 1462
 - September 30, 2009: Sens. Kerry and Boxer introduce S. 1733, hearings begin
 - November 5, 2009: Environment and Public Works Committee orders bill reported favorably. Republicans boycott markup and final vote.
 - November 2009: Sens. Kerry, Graham, and Lieberman begin discussions on a compromise
 - December 11, 2009: Sens. Cantwell and Collins introduce S. 2877 (CLEAR Act)
 - April 24, 2009: Sen. Graham withdraws from negotiations. Sens. Kerry and Lieberman postpone planned introduction
 - May 12, 2009?: Sens. Kerry and Lieberman release energy bill

ACES: Launching the low-carbon economy

- American Clean Energy and Security Act (HR 2454) (aka “Waxman-Markey”)
 - RES: 20% by 2020, combined with energy efficiency standard
 - Provision to facilitate transmission line siting in the Western Interconnect
 - Economy-wide carbon cap: GHG reductions of 17% by 2020, 80% by 2050 (relative to 2005)
 - Other provisions for research funding, clean energy financing, energy efficiency, climate change adaptation, carbon offsets, transition assistance



Rep. Waxman
(official photo)



Rep. Markey
(official photo)

Cap and trade: Easing into a cap

- Reductions in GHG emissions
 - 17% below 2005 levels by 2020
 - 42% below 2005 levels by 2030
 - 80% below 2005 levels by 2050
- Phase-in
 - Electric utilities, oil refiners and importers, fluorinated gases in 2012
 - Industrial sources in 2014
 - Natural gas distributors in 2016
- Transition
 - Allowances allocated to consumer protection, trade-sensitive heavy industry, research, others to mitigate cost impacts
 - Subject of intense negotiation!
- Offsets
 - Up to 2 billion tons of offsets may be used to meet cap
- **Renewable biomass and biofuel emissions exempt from cap**
 - **Definition of “renewable” biomass becomes extremely important**

RES: Definitions are key

- The aim is to encourage new investment, not rest on past achievements
- Need to balance renewables with other environmental needs
- Reflected in the definition of “renewable”
 - Solar, wind, marine and hydrokinetic (tidal, run-of-river)
 - Biomass
 - Tricky definition, need to balance incentives with ecological preservation
 - Hydro
 - Capacity added to dams built before 1988
 - No new hydro dams
 - Biogas, wastewater treatment gas
 - Qualified waste-to-energy
 - Only get credit for the biomass portion
 - Must comply with air quality regulations
- Excluded from baseline
 - Hydropower placed in service before 1988
 - New nuclear capacity
 - Fossil fuel plants employing carbon capture and sequestration



A solar thermal facility¹

¹Source: http://commons.wikimedia.org/wiki/File:PS10_solar_power_tower_2.jpg

Balancing two 'goods': the renewable biomass definition

- Biomass can reduce GHG emissions, but we don't want to chop down the forest to make electricity or fuel
- One of the most challenging negotiations
 - Mostly rooted in woody biomass
- Non-federal lands: concerns about converting forested lands into fuel farms
- Federal lands: balancing desire to incentivize healthy forest practice and reduce wildfire risk with concerns about returning to clear cutting
- Agriculture and forest products vs. environmental NGOs

Renewable biomass: After much gnashing of teeth...

- Compromise definition
- Non-federal lands, including tribal lands held in trust
 - Farm bill definition
 - Plant material, trees, feed grains, animal waste, mill residue, algae
- Federal lands
 - Products from recognized timber sales
 - Byproducts of preventive treatments
 - Invasive species
 - Not from
 - Wilderness or Roadless areas, National Monuments, National Landscape Conservation System, National Conservation Areas, Designated Primitive Areas, Wild and Scenic Rivers corridors
 - No old growth or late successional stands
 - Except “dead, severely damaged, or badly infested trees”
- All wood, pulp and paper mill byproducts

Kerry-Lieberman-Graham : Key differences

(As understood from press reports as of May 11)

- Allowance trading by regulated entities only
- Separation of transportation
 - Fuel allowances not traded, prices set by rolling average of traded market
- Price collar: \$12 floor, \$25 ceiling
 - Floor rises by inflation + 3%
 - Ceiling rises by inflation + 5%
- Includes Senate energy bill (S. 1462) (RES, efficiency standards, financing for renewables, electricity transmission, etc.)
- Expanded off-shore drilling
 - States allowing off-shore drilling get 37% of royalties
 - Adjacent states can veto drilling plans
- Expanded nuclear power

Others are not waiting for Congress

- EPA Clean Air Act regulation
 - EPA issued an “Endangerment Finding” in December 2009
 - Allows regulation of CO₂ as a pollutant
 - Large emitters will require review by EPA, may be required to install pollution control technologies
 - Costs of compliance will make renewables competitive
- President Obama’s Executive Order 13514
 - GHG reduction targets for Federal agencies
- State and regional initiatives
 - Washington I-937 (RES)
 - California AB32: Carbon cap, RES, Low Carbon Fuels Standard
 - NE Regional Greenhouse Gas Initiative (RGGI): Carbon cap
- Federal programs
 - Title 17 loan guarantees
 - Farm bill programs
 - ARRA funding
 - Research programs
 - ARPA-E, EERE

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Electricity may be easier

- Wind and solar
 - Best for open spaces with strong wind or ample sunshine
 - Technologies are mature or near maturity
 - Transmission of power to load centers is a challenge
- Biomass
 - Many existing coal plants can burn biomass with little or no modification
 - Cost of transporting material to plant can be prohibitive.
- Marine and hydrokinetic energy
 - Tidal energy, run-of-the river
 - Minimal disturbance to water allows other activities, e.g. fishing
 - Early technical maturity, uncertain ecological effects
- Geothermal? Carbon sequestration?
 - Depends on geology
 - Sequestration requires significant research



A marine hydrokinetic turbine¹

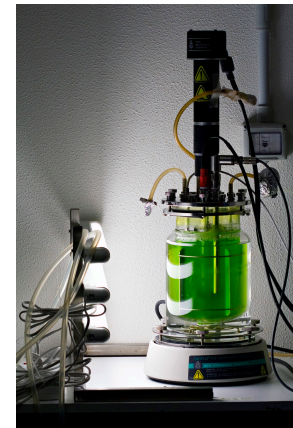
¹<http://www1.eere.energy.gov/windandhydro/hydrokinetic/information.aspx?id=d1d2f899-ac91-4cc0-9af0-312fef9caee7&type=tech>

Liquid fuels are promising, but will take longer

- Advanced biofuels
 - Non-food crops on marginal land or in crop rotations
 - Oilseeds: camelina, jatropha
 - Cellulosic: plant residues, corn stover, weeds
 - Algae
 - Grows in brackish water, sunshine and CO₂
 - Volume and cost challenges
 - Processing techniques still need work



*Camelina sativa*¹



Algae growing in a laboratory bioreactor²

¹ Source: http://commons.wikimedia.org/wiki/File:Camelina_sativa_eF.jpg

² Source: Umberto Salvagnin, http://commons.wikimedia.org/wiki/File:Green_algae_in_a_bioreactor.jpg

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Your input counts!

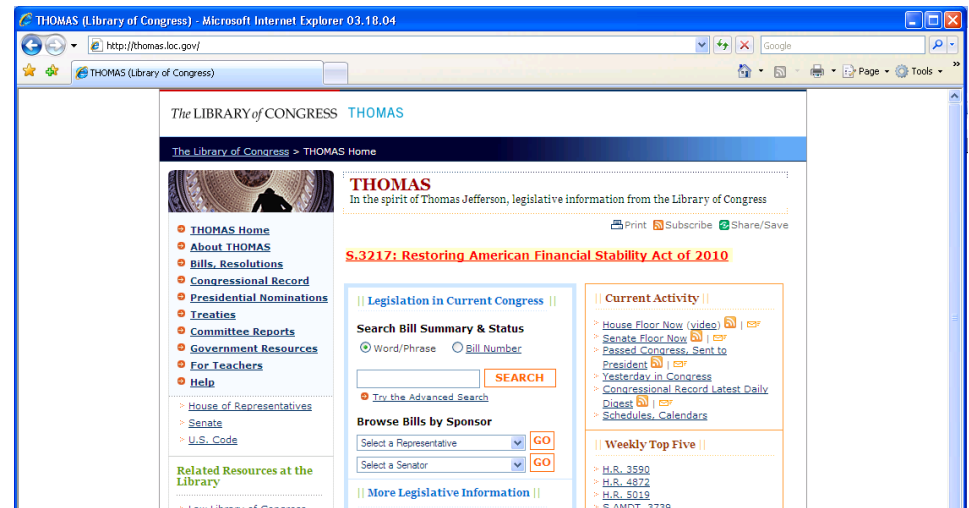
CONTACT

YOUR

SENATORS

Congress is closer than you think

- All bills are available online: <http://thomas.loc.gov>
- Committee websites have detailed information on bills
- Offices have web pages with email forms and phone numbers
 - Letters are read and logged, phone calls are logged
- All members have District/state offices – you don't need to go to DC
- Find your Representative or Senator on the House or Senate website
 - House: <http://www.house.gov>
 - Senate: <http://www.senate.gov>



You don't need to meet with the Member

- Staff are key
 - You will get a longer meeting with staff than with a Member
 - Staff generally have a deeper understanding of your issue
 - Staff are the people making recommendations to the Member
 - A meeting with staff can be arranged by email, on much shorter notice than a Member

Make yourself available

- Be a resource – fill the information vacuum
 - Reliable, objective information is hard to find
 - Anecdotes are very helpful
- Bring concrete proposals
 - An actionable item is more useful than an abstract discussion
 - Constituent ideas do end up in bills
- Learn the legislative process and understand the politics
 - Timing is key to maximizing your impact
 - Some members have more influence over certain issues than others
 - Seemingly unrelated politics can have a substantial effect

Experience it firsthand!

- AAAS Science and Technology Policy Fellowships
 - 1-year fellowships in Congressional offices or Federal agencies
 - Agency fellowships extendable to two years
 - Hands-on experience making real policy
 - Bring science into the vacuum
 - <http://fellowships.aaas.org>



Key takeaways

- New energy legislation can help drive clean energy investment
 - But opportunities exist even without it
- The adage about law and sausage is true
- YOU can make a difference by getting involved

THANK YOU!

Questions and Discussion