**Climate Change – Powers**

**Fall 2017**

**PART 1 – US Law & Policy: The Clean Air Act**

1. **Overview of the Clean Air Act**
2. Background – US Climate Policy 1970s-2012

* 1970s: US was a global leader in establishing energy efficiency targets and promoting renewable power development in the 70s
  + Energy Policy & Conservation Act (1975) – established CAFE standards
* 1980s: “Reagan Revolution” – public push for decrease in government regulation, plummeting oil prices, & resurgences of coal-fired PP and natural gas development
  + By the end of the 80s, coal, natural gas, and oil had resumed their dominant positions in the power and transportation sectors
* 1990s: birth period for climate change awareness in the US, but Republicans took Congress making progress difficult
* 2000-2008: Bush repudiates KP, renounced mandatory emissions reductions
  + *Mass v EPA* (2007): EPA had both regulatory authority and the obligation to decide whether GHG emissions from motor vehicles cause or contribute to the endangerment of the public welfare
  + Ps tried to bring GHG suits under nuisance claims – were repeatedly denied on standing, PQ, & preemption
  + State & local efforts emerged with their own strategies to mitigate CC
* 2009-2012: CAA became primary federal law used to address GHGs
  + Vehicle Emissions Standards increased
  + Renewable energy development expanded (tax credits, federal grants)
  + Congress played a negligible role throughout Obama’s first term

1. CAA Generally

* Regulates “air pollutants” from stationary and mobile sources
* **“Air pollutants”** defined broadly: “any air pollution agent or combination of such agents, including any physical, chemical, biological, radioactive…substance or matter which is emitted into or otherwise enters the atmosphere.”
* Each CAA program requires further EPA action before it can be regulated
  + Some require an endangerment finding (NAAQS, NSPS, etc.)
  + Some only apply to “major” sources (PSD, NSR, etc.)
* Thus, a substance’s classification as an “air pollutant” is only a preliminary step to facing actual CAA regulation
* Common Mechanisms:
  + NAAQS
  + Emissions limitations (stationary and mobile)
  + Programs tailored to specific problems (ozone, acid rain)

1. National Ambient Air Quality Standards (NAAQS)

* EPA must list pollutants as “criteria pollutants” if they “may cause or contribute to an endangerment to public health or welfare
  + Welfare read to include the environment & therefore climate as wel
* NAAQS must be established for each criteria pollutant
  + Primary NAAQS: protect the public health with an adequate margin of safety
  + Secondary NAAQS: protect the public welfare
  + Criteria Pollutants:
    - Sulfur dioxide (SO2)
    - Particulate matter (PM)
    - Nitrogen oxide (NOx)
    - Carbon monoxide (CO)
    - Ozone
    - Lead (Pb)
  + Note: EPA creates these listings as opposed to NESHAPS where Congress listed the 188 pollutants regulated under that program
  + Currently CO2 (petition to add) and CH4 (huge contributors) aren’t listen under either
    - Issue with regulation
    - Obama-era protections: Clean Power Plan & vehicle emissions standards tried to address this issue
* Once EPA sets NAAQS, all regions of the country must meet them
  + Separated into “air sheds,” typically by political boundaries
  + Air sheds classified as being “in attainment” or “nonattainment” on a pollutant-by-pollutant basis
  + “Maintenance” – interim after being in non-attainment; monitor closely for 20 years (2 successive 10-year plans) to show attainment was not an anomaly
  + If classified as “non-attainment”:
    - Stringent permit requirements
    - Limits on new development
    - Possible fines & sanctions

1. State Implementation Plans (SIPs)

* Cooperative federalism (need EPA approval to have the force of law) approach to the implementation of the CAA
* Primary purpose: to ensure compliance with primary and secondary NAAQS
* Developed to include the broader authority to regulate sources and pollutants for which no NAAQS exist
* Once EPA approves, state becomes primary implementer of the CAA
  + Must show through attainment demonstration that the regulations will actually bring air shed into attainment
* Note: EPA sets the standards that states must meet, but states can always go beyond the “federal floor”

1. Stationary Source Emissions Standards or Limitations
2. New Source Performance Standards (NSPS)

* Applies to new or modified “stationary sources” which include “any source of any pollutant except those emissions resulting directly from an internal combustion engine for transportation purposes or from a non-road engine or non-road vehicle.” (i.e. factories, power plants, & other immovable facilities)
  + Rarely applies to existing sources (CPP), but may become more prevalent in the climate change context
* EPA develops standards on national level after endangerment finding – NSPS applies after this standard has been set
* Standards based on **best** system of emissions reductions that has been **adequately demonstrated** (BADT)
  + Separated into “categories and classes”– once a catgory is listed, EPA has 1 year to promulgate standards
  + Different technology standards for different industries
* Applies to any pollutant EPA makes endangerment finding on – broader than NAAQS

1. New Source Review (NSR)

* NSR refers collectively to PSD & NNSR (non-attainment NSR)
* Prevention of Significant Deterioration (PSD)
  + Program for attainment areas – keep clean, clean
  + Applies only to “major sources” (100 tpy for 28 categories/250 tpy for others)
  + Requirements:
    - Pre-construction permit
    - Compliance with emissions limitations = best available control technology (BACT) – set case-by-case
  + Applies only to new or modified sources
    - Existing facilities “grandfathered in” – do not have to comply with NSR unless they make a modification triggering PSD

1. National Emissions Standards for Hazardous Air Pollutants (NESHAPs)

* 188 HAPs listed by Congress, but EPA can add or remove based on adverse effects to human health or the environment
* Maximum Achievable Control Technology (MACT)
  + Maximum degree of emissions reductions the Administrator determines is achievable for new or existing sources in the category or subcategory to which such emissions apply
  + Administrator must “take into consideration” cost of achieving such reductions and any non-air quality health and environmental impacts and energy requirements
  + EPA sets emissions limits (on a national basis) that are “no higher than the average emission standards achieved by the best performing 12% of sources in each category specified.

1. Title IV Acid Rain Program

* Not technology-based; cap-and-trade program to limit and then lower the total amount of SO2 emissions from power plants
* SO2 = major contributor to acid rain deposition
* Became template for many other emissions trading programs

1. Title V Permits

* Attempts to consolidate all other stationary source requirements into a single permitting scheme
* Incorporates substantive requirements of all above and ensures that facilities adhere to various monitoring and reporting requirements
* Administered by states, subject to EPA oversight

1. Mobile Source Emissions Standards

* Standards that apply to pollutants that “cause or contribute” to an endangerment of public health or welfare
* Technology-based controls – standards reflect “the greatest degree of emission reduction technologically and economically achievable.”
* EPA has primary, preemptive authority to establish vehicle emissions standards – states cannot develop more stringent standards (competition, loss of business, commerce clause shit)
  + CA exempt from this – may develop its own if it gets waiver
    - EPA must determine CA standards are at least as protective as the federal standards and
    - Standards fulfill “compelling and extraordinary” conditions
  + Other states can choose between federal standards and CA standards

1. **Regulation of GHGs Under the CAA – *Mass v. EPA***
2. Where/how to Regulate under CAA

* Vehicles
  + Federal standards – endangerment finding prerequisite
  + State standards – CA waiver
  + Integration with CAFE standards
* Stationary Sources
  + NSPS – EPA standards apply on categorical basis – endangerment finding prerequisite
  + PSD – case-by-case requirements apply to each facility
* NAAQS

1. *Massachusetts v. EPA*

* Landmark decision on EPAs ability to regulate GHGs under the CAA
* Background: 19 environmental organizations petitioned EPA to regulate GHGs from new motor vehicles pursuant to §202 of the CAA, which provides “[t]he Administrator shall by regulation prescribe … standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare.”
  + EPA denied the petition, arguing that the Act “does not authorize EPA to issue mandatory regulations to address global climate change and that even if the agency has the authority to set GHG emission standard, it would be unwise to do so.”
  + EPA essentially argued that:
    - GHGs were not “air pollutants” covered under statute
      * Local v. Global issue
      * Not added to 1990 amendments
      * Covered under other laws
      * Superfluous with fuel economy standard
      * Overall: climate change was so important that Congress would have addressed it explicitly if it intended for the CAA to cover the issue
    - In the alternative, even if they are covered by statute, not a good idea to regulate
      * Causal link unclear
      * Piecemeal
      * Use as bargaining chip in international regime
* Majority: “any” within definition of “air pollutant”
  + *Chevron* step 1 argument – any means any
  + Embraces all airborne compounds of whatever stripe
  + Responses to EPA arguments:
    - Covered under other laws: overlapping obligations do not negate CAA regulations
    - Not included explicitly: broad language shows statute’s intent to adapt
    - “Unwise to do so”: not founded in statutory text – only “judgement” allowed is making the endangerment finding – this “‘judgement’ is not a roving license to ignore the statutory text” – reason for action or inaction must conform to the statutory text – essentially, once the endangerment finding is made, EPA must regulate it
  + **Overall:** “EPA has offered no reasoned explanation for its refusal to decide whether GHGs cause or contribute to climate change.”
* Dissent: Scalia take the other side of this argument
  + Says there’s ambiguity in “any” and “air pollution agent” and should therefore be left to *Chevron* deference
  + Not “polluting” the “air”by dictionary definition
    - GHGs are not like other pollutants the CAA has to date regulated – “air” refers to ground level concerns but CAA does regulate ODSs, which go higher/mix more than GHGs?
  + “Judgement” does give EPA discretion to make judgement
  + Majority does not explain why EPA’s exercise of discretion is “so unreasonable,” let alone so unreasonable as to not receive *Chevron* deference
* On remand: EPA must make endangerment finding, or can avoid taking further action only if
  + No endangerment is found (Unlikely) – really two findings: endangerment & cause or contribute
  + Provide some reasonable explanation as to why it will not exercise discretion
    - Not reasonable: domestic policy/voluntary action; international bargaining chip; concerns about piecemeal regulation
    - If scientific uncertainty is so profound that EPA cannot make reasoned judgement, EPA must say so

1. **Regulation of Vehicle Emissions**
2. The Endangerment Finding & the Tailpipe Rule

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| **Federal Standards (§ 202)** | **CA Standards (§§ 209 & 177)** |
| Endangerment finding:   1. Cause or contribute finding: “cause, or contribute to, air pollution … 2. …which may be reasonably anticipated to endanger public health or welfare | Protectiveness Finding: Waiver if “State determines that the State standards will be, in the aggregate, at least as protective of public health and welfare as the applicable federal standards”  - States preempted, unless CA waiver |

* Post-Mass v. EPA: EPA finalized endangerment finding
  + Endangerment:
    1. Public health = impacts on human health from contamination
    2. Public welfare = broader = climate, environment, etc.
  + Cause & Contribute: largest GHG emissions come from China, US. Russia, **US transportation**, Japan, Brazil, Germany, everyone else

1. Tailpipe Rule: emissions standards for future model years
   * Limit emissions (measured in grams/mi)
   * Linked to fuel economy standards (mpg)
2. *Coalition for Responsible Regulation v. EPA* (DC Cir, 2012)
   * Basis of lawsuit:
     1. Climate Gate and the legitimacy of climate science
     2. Fear of regulation of stationary sources
        + Once vehicle emissions in place, EPA regulations said GHGs are “regulated” and thus subject to PSD
        + If emissions from vehicles cause/contribute to endangerment, why don’t coal-fired power plant emissions and other industrial source emissions?
   * Challenges to the endangerment finding:
     1. EPA should have waited or considered policy
     2. Science is too uncertain/record inadequate
     3. Well-mixed GHGs too broad
     4. ClimateGate
   * Court’s response:
     1. Policy is not an issue – statute calls specifically for a scientific judgement based on endangerment & cause or contribute findings – Mass v. EPA already established this
     2. Science is adequate and scientific determinations are given a great deal of deference – do not need to be absolutely certain or quantify the threshold
     3. 2/6 in the mix aren’t even emitted by these companies = no injury = no standing for this issue
     4. 10 petitions for reconsideration were filed asking EPA to reevaluate finding cased on releases of hacked emails – EPA issues a 360-page response (acknowledged it), this is good enough
   * Tailpipe Rule Challenge:
     1. EPA should have delayed tailpipe standards
     2. EPA must demonstrate that standards will effectively mitigate the endangerment
     3. EPA failed to account for full costs beyond car industry
   * Court’s response:
     1. No – once endangerment finding is made, EPA must make standards in response
     2. They did, they concluded vehicle emissions are a significant contributor and thus reduced emissions will effectively reduce GHG emissions
     3. No – focus on car industry is adequate because that’s what the regulations are affecting
3. State Standards

* §209(a): No state or any political subdivision thereof shall adopt or attempt to enforce any standard relating to the control of emissions from new motor vehicles or new motor vehicle engines subject to this part.
  + Made to protect automobile companies from a “hodgepodge” of different state regulations, thus ensuring they could create uniform automobiles for a national market
* §209(b) provides for CA waiver (“any state” that had its own standards before March 30, 1966 – CA was the only one)
  + No such waiver shall be granted if:
    - The determination of the State is arbitrary and capricious
    - Such State does not need such State standards to meet “compelling and extraordinary conditions,” or
    - Such State standards are not consistent with the federal vehicle emissions standards
* If CA is approved, other states can choose to follow CA or federal
* Historically, CA is given strong deference and the burden of proof is on the opponent to show that CA has not met the §209(b) requirements – intentionally structured to limit EPA’s ability to deny a waiver
* Issues with the “protectiveness” standard
  + Is California’s protectiveness determination arbitrary and capricious?
    - Both criteria and GHG emissions would be lower than the federal standard to make this finding
    - CA does not need to show protectiveness on pollutant-by-pollutant basis – standards in the aggregate must be at least as protective
  + How to compare with nonexistent federal standards?
    - Easy: anything is better than nothing
    - At time of waiver, no federal standards = waiver granted
  + Delayed Scrappage?
    - Scrapping: turning in old car for parts – consumer makes this decision based on trade-off between existing value in working condition and scrappage value
    - Concept: people will drive older cars longer because newer ones will cost more – may make standards effectively less protective
    - EPA didn’t think this would occur or be significant if it did – defer to agency here
  + Rebound effect?
    - Supply-and-Demand Concept: more conservation = more gas available = cheaper prices = more driving (“Jevons Paradox”)
    - EPA findings estimates ~4% rebound effect in 2020 – would not offset the benefits of CA standards
* Does CA need its standards to meet “compelling and extraordinary” conditions?
  + EPA looks at whether CA needs its own program overall, not whether it needs a specific standard
  + Entire basis of allowing the waiver is the exceptionally poor air quality conditions in CA and need dramatic emissions reductions
  + Should not be limited to standards designed to address only local or regional air pollution problems (based on geography, wind patterns, vehicle population)
  + March 2008 Denial: based on EPA saying the traditional approach (determined by looking at whether CA needed its own program overall) didn’t apply because GHGs are a global problem
    - Said CA would need a specific standard based on geography, wind, vehicles to have compelling and extraordinary conditions
    - Reconsidered in 2009 – went back to traditional approach – CA has same geography & climatic conditions, but more vehicle use and some of the worst air quality in the nation
* Are the State standards consistent with §7521(a) (§202(a))?
  + Focus on technological feasibility, costs, adequate time to implement
  + EPA said it was consistent

1. **Regulation of GHGs from Stationary Sources**
   1. Prevention of Significant Deterioration (PSD)
      * “No major emitting facility may be constructed in any area to which this part applies unless… [various requirements]
        + Key Terms:
          - Major
          - Construction (new or modification)
      * Applies in areas either in attainment or unclassifiable under NAAQS
      * “Major” emitting facilities:
        + Within specified list of 28 categories – emit or have the potential to emit 100 tpy+ of any “regulated air pollutant” or
        + Other source type that emits or has the potential to emit 250 tpy+ of any “regulated air pollutant”
        + What is a “regulated air pollutant”?
          - “Any pollutant that is otherwise subject to regulation under the CAA”
          - Environmental groups: means subject to any regulation (including reporting and monitoring)
          - EPA: means subject to controls or limitations (vehicle emissions standards = include GHGs)
          - Industry: does not include GHGs
      * “Major” modifications:
        + Physical change in, or change in method of, operation
        + Said change results in “significant” emissions increase of a pollutant subject to regulation
          - “Significant” = equal or above the significance level EPA has set for a given pollutant (significant emissions rate = SER)
          - If EPA has not set a significance level, it is assumed to be 0 and therefore any increase triggers PSD
        + Significant net emissions increase of a pollutant
        + **NOTE**: MAJOR FOR ONE = MAJOR FOR ALL
          - A source must only emit “major” amounts of one pollutant to be considered a “major” source
          - Once this is established, any other pollutants emitted in “significant” amounts depending on their own SER (even if below threshold) are subject to regulation/BACT
      * If source is a major emitting facility, then it must get a permit. To get a permit, it must:
        + Treat according to BACT
          - Emissions limitation based on the maximum degree of reduction, taking into account energy, environment, economics
          - Set on a case-by-case basis (applies to “each pollutant subject to regulation under this chapter”)
          - Top-down approach: identify all possible control technologies, eliminate infeasible options, rank remaining options by control & cost-effectiveness, & then select BACT
        + Asses alternatives to the project
        + Meet air quality requirements (analyze effect on ambient air quality)
      * Permitting agency must provide notice of its preliminary decision on permit application and provide opportunity for comment – issue final determination after considering and responding to comments
      * Two-step analysis:
        + Is it “major?” (100/250 thresholds)
        + If yes, are other pollutant emissions “significant?”
      * Sham permit rule: can’t separate out modifications into baby steps to avoid reaching SER and thereby avoid PSD
      * Statutory triggers
        + New source: 100/250 threshold for at least 1 + SER for others
        + Existing source: 100/250 threshold + change + SER
        + Can have a change that bumps the source into “major” world, but if that change itself does not break the SER, doesn’t trigger regulations
   2. The Tailoring Rule
      * EPA attempt to regulate GHGs under PSD
      * Reasoning: to regulate GHGs by 100/250 thresholds would be absurd; “plain language” does not apply if it will produce absurd results and administrative impossibilities – then look the congressional intent

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|  | Statutory/Regulatory Triggers | Tailoring Rule |
| New Sources | Emissions thresholds  - 100/250 tpy for at least 1  - + SER for others | - 100/250 tpy “mass-based” limits -OR- 100,000 tpy CO2e  - “anyway” sources: “major” for non-GHG and emissions will =>0 tpy “mass-based” + 75,000 tpy CO2e |
| Existing Sources | Emissions thresholds  - 100/250 tpy for at least 1  - Physical change/ change in method  - + SER | - major emitting facility  - physical change/change in method  - >0 tpy “mass-based” + 75,000 tpy CO2e |

* Note: 0 tpy “mass-based” = any increase breaks the threshold \***do not forget to lay down this step even though it’s obvious**\*
* *UARG v. EPA*
  + Issue #1: Is EPA required to regulate GHG emissions under PSD?
    - Majority: No – “any air pollutant” does not literally mean any air pollutant – EPA has limited this term in the past in accordance with the program at issue – simply not true that GHG regulation is compelled
  + Issue #2: Was EPA’s choice of regulation (i.e. its efforts to tailor?) reasonable?
    - Majority: No – ignores the plain numbers set out in the statute – instead of figuring out how it could have regulated, EPA should have concluded no regulation was possible
    - Dissent: EPA had the choice of how to deal with a statute that will be absurd as literally applied; It can either address the absurdity by dealing with the pollutant or the facility – EPA chose to deal with the facility, deserves deference
  + Issue #3: What about the “anyway sources” – will BACT apply to GHGs?
    - Majority: Yes, this is fine, as long as emissions levels are not *de minimis*
    - Takeaway: GHGs cannot be the trigger for PSD, but once PSD is triggered otherwise, they can be regulated from that facility

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|  | New Rules Post-UARG |
| New Sources | Major for a non-GHG:  - 100/250 tpy for at least 1 non-GHG  - + SER for others  **if yes to major…**  - 0 mass-based + 75000 CO2e |
| Existing Sources | Major for a non-GHG  - 100/250 tpy for at least 1 non-GHG  - Physical change/ change in method  - + SER for non-GHG or 0 mass-based + 75000 CO2e |

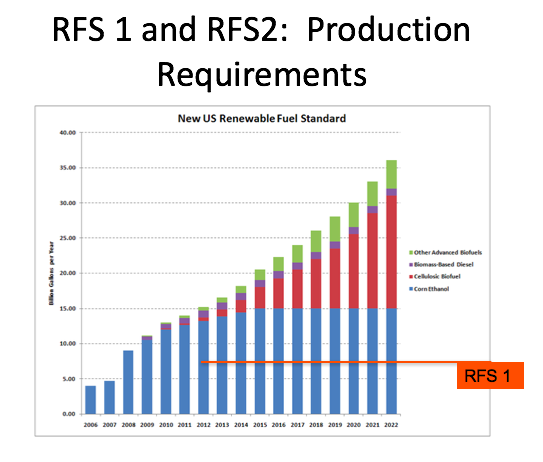
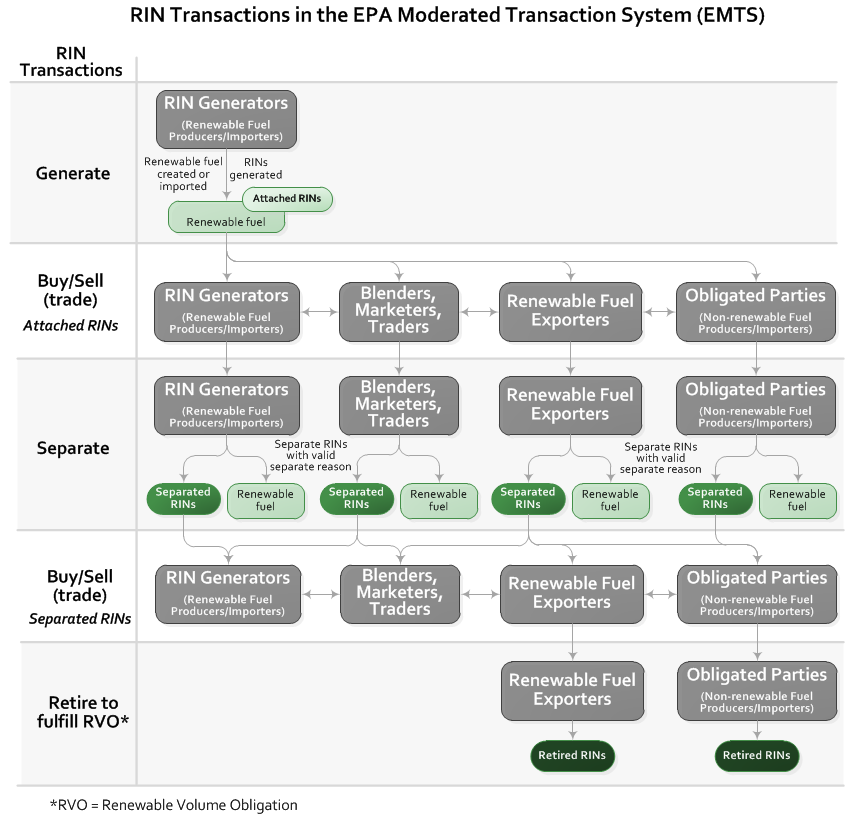
**PART 2 – Energy and Transportation Emissions**

**The Transportation Sector**

1. Initial CAFE Standards
   * Background:
     + 1975 – Congress passed the Energy Policy and Conservation Act
     + EPCA established Corporate Average Fuel Economy (CAFE) Standards
     + CAFE Standards = fleet-wide average fuel economy standards (in mpg)
     + Based on “maximum feasible average fuel economy level” achievable in each model year. Factors in:
       - Technological feasibility
       - Economic practicability
       - Effect of other federal standards on fuel economy
       - Need of nation to conserve energy
     + Initial Standards
       - Passenger vehicles (18.5 mpg minimum for MY 1978; 27.5 mpg presumptive minimum by MY 1985) – can go lower or higher than the presumptive minimum (“max feasible average”)
   * What is a “fleet”?
     + Passenger vehicles – designed primarily for transport
       - Do not include off-road vehicles that the Secretary decides:
         * Has another feature (other than 4wd) designed for off-highway transport; and
         * Is 4wd or more than 6,000 pounds
       - Implications: The “SUV Loophole”
         * Cars designed for off-road use due to additional features, and are either 4wd or heavier than 6000 pounds are “non-passenger”
         * NHTSA has discretion regarding whether to set standards and at what level
         * Non-passenger standards not affected by passenger vehicle fleet and not subject to same minimum
     + Non-passenger vehicle
       - Not passenger
       - Not work truck
     + Work trucks
       - Not designed for transport
       - Between 8,500-10,000
   * Fleet-wide Standards – How do they work within fleets?
     + Need to average at the standard
     + Example: Ford produces 3 models (small, medium, sport)
       - Produce equal number of each @ 27 mpg
       - Produce equal number of each @ different mpg (35, 28, 18)
       - Produce different number of each car @ different mpg
       - ALL OK as long as they average to 27 mpg total
   * Decline of CAFE Standards – beginning of the ‘80s
     + SUV Loophole
       - Allowed larger vehicles to benefit from lower standards
       - Definition of “passenger vehicle” (see above) allowed many SUV and other “off-road” capable vehicle to be exempt
       - Created “light truck” category (6000-8500 pounds) and exempted 8500< entirely
       - “Light truck” category was given lighter standards
     + Consumer Choice
       - Safety concerns of smaller vehicles (marketing)
       - *Competitive Enterprise Institute v NHTSA* – high standards = more small & less big vehicles = price people out of purchasing big vehicles
         * Nothing in the record showed or denied that the higher standards would “kill people”
         * NHTSA should add this possibility into their analysis
     + Congress Moratorium
       - Studies about safety, rebound effect, etc. combined with NHTSA effort to increase standards 🡪 moratorium and NAS study = no money to revise standards
       - NAS proposal after study:
         * Change cost/benefits to consider long-term benefits
         * Consider reformed (attribute) approach – specific standard based on “footprint” (discussed below)
         * Don’t worry too much about rebound effect
       - Study now seen as over-conservative – technology advanced much faster than NAS had predicted
     + Average fuel economy shifted from 26.2 mpg (1987) to 23.8 (1999)
   * *Center for Auto Safety v. NHTSA* (DC Cir, 1986)
     + NHTSA set lower standards for 1985/86 MY for light trucks
       - Initial standards were set in 1980 when gas prices were high & it was more likely for consumers to buy fuel-efficient vehicles
       - Lower gas prices 🡪 increased interest in bigger cars
     + Challenged by non-profit consumer organizations that work to promote energy conservation
       - Reliance on consumer demand is inappropriate
       - Setting standard based on Ford’s capacity is inappropriate
     + Rule: consumer demand falls in technological feasibility/economic practicability – can’t force manufacturers to produce cars they’re not going to sell, this is counterproductive
       - NHTSA cannot rely on consumer demand too much – can’t ignore goal of fuel conservation, but
       - Also, cannot impose harsh economic consequences on the auto industry
       - Here, it was only relied on a fair amount
   * The CAFE Penalty
     + EPCA established $5.00 penalty per vehicle for each 0.1 mpg by which a manufacturer’s fleet falls below the applicable CAFE standard
     + Example: standard=26.5, 3.5 million vehicles produced with an average of 27.5, 3.5 million x 10 x $5 = $175 million
     + For years, many European manufacturers opted to just pay wile US and Japan followed standards – does this give NHTSA incentive to lower standards to protect US manufacturers?
   * The Gas Guzzler Tax
     + Imposes tax on each automobile that fails to meet specified fuel economy requirements – exempts “non-passenger” vehicles and cars with fuel economy of at least 22.5
     + Highly ineffective because of all the exemptions
   * Summary of Initial Standards
     + “Feet-wide approach” = average standard for all cars in a category
       - Passenger/Non-passenger cars = 2 separate categories, not averaged together
       - Within each category, may produce cars that do not meet the standard, so long as you produce cars that do better than required, too
     + Consumer demand can be calculated in as long as it is not weighed so heavily as to ignore the goal of fuel efficiency entirely
     + No presumptive minimum standard for non-passenger cars
       - People wanted bigger SUVs – especially from US producers
       - Fleet average continued to decline
     + Some cars can avoid “standards” altogether
     + Penalties & Gas Guzzler tax ineffective
2. Reformed CAFE
   * Moratorium lifted after report in 2001- changes developed:
     + “Reformed CAFE” – revised approach to setting standards
     + Energy Independence and Security Act – established a minimum standard of 35 mpg by 2020 for passenger & non-passenger combined
     + NHTSA + EPA promulgated joint regulations combining CAFE with vehicle emissions standards under the CAA
   * Set standards based on attributes – car weight, size, load-carrying, etc.
     + Issues with fleet-wide standards: SUV loophole & nothing stopping manufacturers from producing extremely inefficient vehicles
     + Initially, set standards based on size (wheelbase x average track width)
     + No fleet-wide average
     + Essentially, manufacturers determined their own average by the type/size of vehicles they chose to produce
     + As footprint increases, fuel economy standard goes down
     + Avoid giving the option to have extremely inefficient vehicles
     + No **“backstop”** to prohibit manufacturers from only producing large vehicles and thus having low overall fuel economy
   * *CBD v. NHTSA* (9th Cir. 2007)
     + Several states and conservation groups challenged Reformed CAFE – also challenged SUV loophole and NHSTA’s refusal to consider the economic benefits of carbon dioxide reductions
     + NHTSA Proposal:
       - No average standard – change based on number of large footprint vehicles produced
       - No “backstop”
       - Cost-effective approach – did not include assessment of the value of GHG emissions reductions
       - Declines to change definitions to close SUV loophole or to regulate vehicles between 8.500 and 10,000 pounds
     + Issue #1: Did not include $ assessment of GHG emissions reductions
       - C-B analysis done to figure our maximum feasible standards
       - Sets standards at point that marginal (incremental) cost of improving fuel economy = benefits from doing so
       - Court says yes, even if value is hard to place, it is not 0
       - Lots of uncertain benefits are monetized
       - Safety argument no longer accepted
       - Practical implications:
         * Technology allows for higher standards
         * But economic overlay says standards set at point where marginal costs = marginal benefits
     + Issue #2: Backstop for reformed CAFE?
       - Backstop would prevent car companies from effectively determining their own fleet-wide standards based on theur own production levels
       - Without backstop, company could produce 100% of its vehicles with 15 mpg, because fleet-wide average = production choice
       - CBD argues: mandated “max” and “min” language in statute
         * “Maximum” feasible average fuel economy level
         * Average fuel economy standard = performance standard “specifying a minimum level” of average fuel economy applicable to a manufacturer in a MY
       - NHTSA argues: will unduly limit consumer choice and perpetuate problems with unreformed CAFE
       - Court: statute does not mandate backstop, but it is arbitrary & capricious not to have one – agency relied too heavily on consumer choice to the exclusion of fuel conservation
     + Issue #3: SUV Loophole
       - Passenger automobile definition excludes “off-road” vehicles (off-road feature + 4wd or 6000+ pounds)
       - Decision not to define these trucks as passenger automobiles is arbitrary & capricious – designed for passenger use
   * EISA: 35 mpg by 2020
     + Fuel Economy Standards
       - “at least 35” = hard minimum
       - Total fleet = passenger and non-passenger
       - After 2021 – “max feasible average” – can they go below 35?
     + Codification of Reformed CAFE
       - Standards set on vehicle attributes for passenger & non-passenger vehicles
       - Paragraph (b)(4): 27.5 mpg or 92% of fleet-wide average of all manufacturers
   * Actual Standards

|  |  |  |  |
| --- | --- | --- | --- |
| **Fleet** | **2012** | **2014** | **2016** |
| Passenger | 33.8 mpg | 36 mpg | 39.5 mpg |
| Light trucks | 25.7 mpg | 27.3 mpg | 29.8 mpg |
| Combined | 30.1 mpg | 32.3 mpg | 35.5 mpg |

* + Ongoing Concerns
    - Economic incentives for trucks – higher fuel economy requirements for cars = more technology ($$) = trucks may appear cheaper
    - Fuel economy standards may be based on outdated tests regarding driving practices
    - Electric vehicles improving and becoming more cost-effective, but do we have adequate systems in place to design infrastructure to serve them?

1. Alternative Fuels & the Renewable Fuels Standard
   * Overview
     + Biofuels
       - Corn Ethanol: makes up 95% oh all biofuels produced in the US
       - Biodiesel = dominant in Europe
     + “Advanced” biofuels: at least 50% reduction in lifetime emissions compared to GHGs
     + Established/emerging “second generation” or “advanced” biofuels:
       - Sugarcane ethanol (very established/ “advanced”)
       - Waste vegetable oil
       - Cellulosic (questionable how much this will be able to scale up)
       - Algae (ability to stay liquid at carrying temperatures is a plus)
     + Compressed natural gas
       - Used in many areas
       - Unclear future because of reliance on natural gas
     + Hydrogen fuel cells
       - Energy-intensive to produce, but if inputs are renewables, may be climate friendly
       - Issues with cost
       - Plus: creates emissions-free energy
   * Ethanol: “clear colorless liquid that can be produced from any biological feedstocks that contain appreciable amounts of sugar”
     + Corn serves as the primary feedstock for ethanol production in the US
     + Agricultural subsidies, tax incentives, and ethanol subsidies promote its use & domestic production
     + Fuel blending requirements – put additives (ethanol) into fuel lowers ozone depleting emissions
     + 2005 Energy Policy Act: First Federal **Renewable Fuel Standard (RFS1)** – set absolute requirements for renewable fuel blending (**volumetric standards**)
       - 2006: 4 billion gallons
       - 2012: 7.5 billion gallons
       - Prediction of cellulosic biofuels to make up the majority of “advanced” biofuels
     + **RFS2**: After 2016, all new fuel must come from “advanced” biofuel increased the overall blending requirements for all biofuels, created separate mandates for the production of advanced biofuels and established greenhouse gas emission thresholds that certain renewable fuels must achieve.
       - GHG Reduction Requirements:
         * 20% reduction – new renewable fuels (including corn ethanol) – produced in facilities for which construction commenced after December 31, 2009 (any facilities older than this a grandfathered in)
         * 50% reduction – advanced biofuels (not corn ethanol)
         * 60% reduction – cellulosic biofuels
       - RFS1 & RFS2: Production Requirements
     + EPA Role in RFS
       - Determine extent to which the statutory volumes can be met for different fuel types each year
       - Allocates each year’s total volume among the obligated parties.
       - Establishes equivalence values for specific categories, or “pathways” of biofuels, and thus determines whether they will have greater value for an obligated party
       - Decides whether economic or environmental circumstances justify waiving the RFS in whole or in part.
       - Each year, the EPA must determine whether the statutory mandates of the RFS can be satisfied based on the actual production and development levels of advanced biofuels.
       - If not, the EPA may waive or modify the statutory requirements.
         * If the EPA determines that the statutory mandates exceed actual production capacity of cellulosic biofuel, the EPA must adjust the required amount of cellulosic biofuel to the “projected volume available during that calendar year”
         * If the EPA reduces the applicable volume of cellulosic biofuel, it may – but is not required to – also reduce the required amounts of advanced biofuel and total renewable fuel “by the same or a lesser volume”
     + RFS Implementation
       - Fixed volumetric requirements set my statute
       - EPA then calculates annually estimated gasoline consumption by **“obligated parties” (oil blenders, refiners, & importers)**
       - Based on this calculation, EPA sets % mandate for the industry
       - EPA then applies the % mandate to individual obligated parties = “renewable volumetric obligation (“RVO”)
       - Biofuel producers: Pathways
         * Determine whether biofuels meet production and GHG emissions requirements
         * Establish energy content of the fuel – once certified, biofuel producers must continue to comply with the pathways
     + Two mitigation measures:
2. Equivalence values and Trading – Compliance through **RINs** 
   * + - “Renewable Identification Numbers”: facility ID – type of fuel (pathways) – date of production – number of units (gallons) produced that day
       - Obligated parties must obtain RINs within each category (ethanol, advanced, etc.) to comply with RVOs
       - Obtain certificate showing fuel produces – paper trail helps with enforcement; certificates can be bought/sold/traded
       - Turn over correct number of RINs to agency to confirm compliance
       - Essentially the equivalence of a compliance credit; RINs have different values based on energy intensity (i.e. corn ethanol = 1, cellulosic biofuel = 2.5, everything else is in between)
       - Parties can meet RFS requirements by trading credits representing renewable fuel production
       - Theoretically, should incentivize the production of high equivalence value sources, but in reality, cheap corn ethanol-RINs mean that equivalence values do not incentivize
3. Waiver
   * + - General waiver: EPA may waive the RFS mandate for any year if EPA determines that the RFS will severely harm the environment or economy of any state, region or the US
       - EPA has construed this general waiver to require anyone seeking the waiver to demonstrate that the RFS program, in isolation, is causing extreme damage to a state’s entire economy or environmental well-being
       - Narrow interpretation has rendered the general waiver an impotent tool for those who object to the EPA’s implementation of the RFS
       - Texas tried to use the waiver to suspend the RFS in 2008 when data suggested the RFS was contributing to high animal feed prices (skyrocketing oil prices 🡪 high ethanol demand 🡪 high corn & feed prices 🡪 cattle industry damage)
         * Denied – RFS not the sole cause of corn ethanol demand
         * Damage to economy not “severe” ($50-90 million damages compared to TX’s $1 trillion state economy)
         * EPA’s interpretation of the waiver has seemingly cut off other parties’ efforts to invoke the general waiver; RFS will never be the “sole cause” of harm, severe harm seemingly very difficult to prove
     + Opposition to RFS
       - Opponents: environmental and food advocacy organizations, food producers, fossil fuel interests, retail gasoline operators, fuel users, and even some biofuel producers
       - RFS1: concern about promoting ethanol production leading to increases in GHG emissions & interference with food supplies
       - RFS2: economic impacts of volumetric mandates
       - Key design flaws:
         * Requires affirmative action from EPA each year = waste agency resources, invites litigation, leads to uncertainty
         * Exempts existing corn ethanol (more GHG intensive biofuel) = undermines goal of the whole thing – benefited from subsidies before & from grandfathering now – difficult for new market entrants to compete
         * Not designed to promote the development of technologically innovative advanced biofuels – many advanced biofuels have not reached commercial production yet
         * Over-incentivizes the production of undesirable biofuels – crowd out political appetite for advanced fuels
   * Biodiesel: derived from vegetable oil or animal fats that can be converted into fuel – relatively simple process
   * Issues with biofuels (ethanol & biodiesel):
     + **Blendwall:** because volumetric, not %, standards are set, potentially could be way over or way under the 10% safe value for ethanol percentage depending on supply-and-demand determination of how much petroleum is needed
       - Ethanol has the potential to corrode engine parts – can blend it into gas up to a certain point, but over that threshold it will destroy vehicles (cars before 2001 can only handle 10%)
       - Different engines/better designs can handle more as technology improves, but not prevalent yet – EPA tried to raise the standard to 15% but gas stations said no
       - Infrastructure issues: how many pumps allocated to ethanol blends at different levels
       - Declining fuel consumption due to vehicle emissions standards, CAFE standards, reduced VMT (urban livability, younger Americans don’t love cars as much, public transportation)
     + Localized environmental problems: water, air, land
     + Food v. Fuel
       - Food supply reduction: local (animal feed) – grains usually cheap, but this is increasing the demand & therefore increasing prices – and global (US grain exports)
       - Heavily disputed issue
       - Challenged on economic hardship grounds, but lost because not “fairly traceable” (standing) – too many other factors
     + Direct Emissions v. Indirect Offsets
       - Emissions: soil tilling, fertilizers, manufacturing
       - Offsets: Plants take up CO2
     + Indirect land use
       - Food/fuel production in other countries
       - Deforestation for agricultural land use (emits C02, N2O, CH4)
     + This is where cellulosic biofuels are seemingly better – if produced using wood waste and agricultural residue, they presumably would not be replacing food crops – issue here becomes the energy-intensive extraction (much more difficult than ethanol)
       - Algae also has these benefits + the ability to remain liquid at freezing temperatures – understudied area currently
   * Future issues:
     + Inadequate incentives: For any biofuels program to succeed, consumers must purchase vehicles capable of using biofuels and then purchase the actual biofuels themselves. Encouraging customers to make such investments requires substantial public outreach and, probably, subsidization.
     + Market uncertainty – many alternative fuels need a distinct market – no “one size fits all”
     + Political issues
4. Electric Vehicles & Reducing Vehicle Miles Travelled

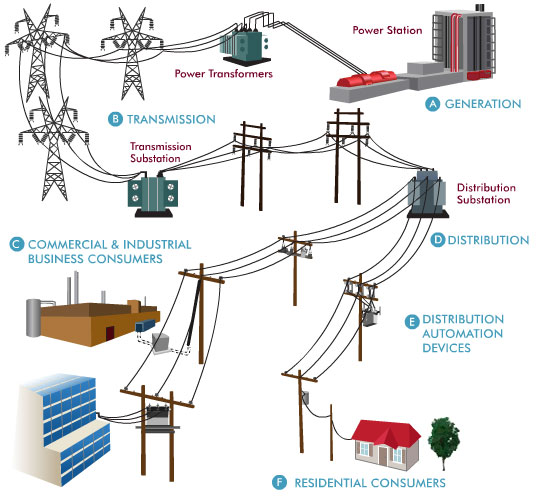
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| **Vehicle Travel Reduction Strategies** | | | |
| **Concept** | **Policy** | **Positives** | **Negatives** |
| Travel Pricing Mechanisms | Road Pricing  - use of fees to increase the cost of driving in certain areas  or times of day | - revenue | - public pushback  - some people don’t have a choice/poor |
| VMT Fees  - annual or semi-annual charge based on VMT per year | - revenue | - political feasibility  - equity |
| Fuel Pricing  - fuel taxes currently make up 30-40% of fuel prices  - increased fuel prices to incentivize less VMT | - incentivize purchase of more efficient vehicles | - dependent on consumer responses = market uncertainty |
| Provisions for Alternative Modes of Transportation | Transit Investment  - put more money into public transportation systems | - make public transport more efficient/viable | - limited to urban areas  - inconsistent with need for flexibility |
| Bicycle Support Facilities  - more support for bicycle use | - less cars on the road | - limited to short trips |
| HOV Lanes  - carpool lanes to avoid congestion | - reduce peak period travel time | - limited to more urban/developed areas |
| Parking Management | Parking Pricing  - charges for parking  - increase employee parking rates to market value | - trip-by-trip basis encourages people to limit even just a small amount | - unavoidable for many – need the flexibility of having car at all times |
| Mandatory Parking Cash-Out  - offer cash in lieu of free parking; make this mandatory | - employees may take the money instead |  |
| Land-Use Planning  - shape development patterns to encourage less VMT; increase dense, mixed-use transit-oriented development | | - decrease travel distances | - denser areas = lower travel speeds  - zoning |
| Other Measures | Telecommuting  - work from home via computer/phone | - less congestion during peak hours | - not feasible for all jobs  - commuting is only ~25% VMT |
| Compressed Work Hours  - work more hours per day fewer days per week | - less vehicles on the road on a given day during peak hours | - not feasible for all jobs  - incentivizing private employers |

* Fuel Economy Focused Standards:
  + Traffic Flow Improvements
    - Low traveling speeds, idling, etc. = increased fuel consumption
    - Signalization Improvements: reduce intersection delay on arterials and other routes in urbanized areas
    - Incident management & advanced traffic sensing technology = faster response time to remove breakdowns and accidents
    - Intelligent Transportation Systems (ITS): range of technological developments for vehicles and infrastructure
  + Limit freeway speeds to 55 mph

**The Energy Sector**

1. Traditional Utility Regulation

* Background
  + Overarching goal: to provide cheap, abundant, reliable energy throughout the country
  + “Dominant model”: mixes regulation with market-based approaches – aimed at promoting production and use over energy efficiency and conversation (Joseph Tomain)
    - Favors energy production by large-scale, capital-intensive, centralized facilities
    - Favors traditional fossil-fueled electricity sources, particularly natural gas and coal
    - Aims to provide energy at reasonable prices established by state (or occasionally federal) regulators
  + Wasted energy accounts for a large amount of energy “use” – more than the amount actually consumed
  + Overall, US electricity sector is highly inefficient and fossil-fuel intensive
* Recent Changes
  + Natural gas production – fracking technologies have made natural gas more abundant
    - Natural gas prices reached unprecedented lows in 2012
    - Rise of natural gas resulted in lower GHG emissions
  + Renewables: Wind & Solar
    - Production growth, but cost concerns
    - Future absent continued regulatory intervention is uncertain
  + Nuclear – was coming back, but issues with safety concerns
  + Efficiency and conservation have become increasingly important issues (social and political pressure)
* History of Electric Utilities
  + Direct current (DC): electrons flow in one direction – less power, shorter distances – originally used, then…
  + Alternating current (AC): electrons flow in both directions – more power, farther distances
* Traditional Electricity System

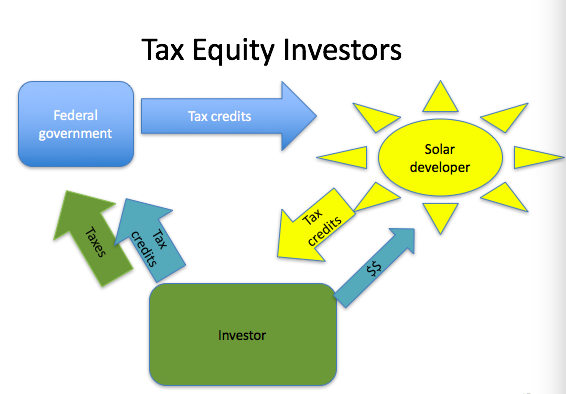
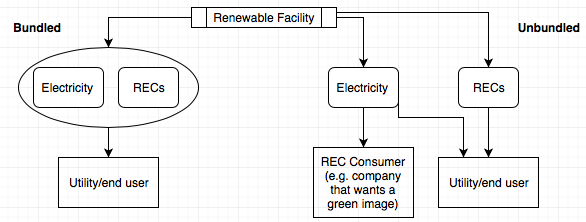


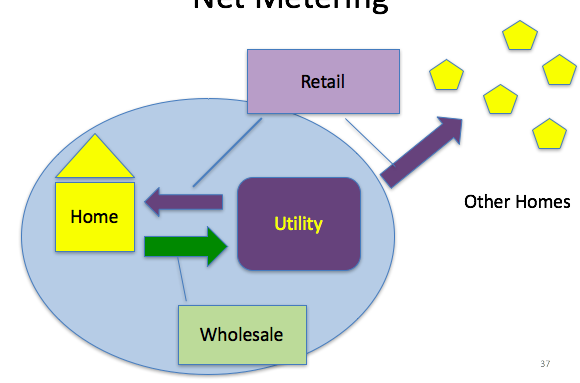
* + Features of the traditional system:
    - Large power plants with long-distance transmission lines
    - Investor-owned Utilities **(IOUs)**: private companies approved by government to provide electricity
      * Vertically integrated monopolies that earn a “rate of return” for their investors
      * “Natural monopoly” – when a system is in place, it would not be cost-effective to have anyone compete
      * Instead, regulate the monopoly
    - Public Utility Commissions **(PUCs)**: regulate IOUs – Key Elements of monopoly regulation:
      * Fixed territories (geographical limitations): limit competition within boundaries
      * Procurement: direct utilities to procure specified amounts and types of power
      * Service: require utilities to provide adequate service – reliable & localized renewable energy (allow them access to the grid)
      * Ratemaking: (discussed further below) – most active area of regulation – unchecked monopolies will increase prices & limit services. To limit these behaviors, regulators:
        + Rewards for desirable investments
        + Compensation for providing necessary service
        + Price cap on rates for consumers
* The Electricity System has three main components:
  1. Generation
  + “Generation” refers to the actual production of electricity
  + Generation Plants
    - Baseload plants: operate continuously to meet consumer demand
      * High capital costs, low operating costs
      * Typically, nuclear & coal-fired – hydro & natural gas sometimes, depending on location and season
      * Issue with natural gas: volatile prices, need consistency here
    - Peak-load plants: operate during “peak” times
      * i.e. morning, dinner time, etc.
      * Low capital costs, high operating costs (turning on and off is fuel intensive)
    - Intermediate plants: somewhere in between – serve when needs are higher, but not quite at “peak” level
  + Producers
    - About ¾ of all utility electricity generation comes from IOUs
    - Independent Power Producers **(IPPs)**: non-utility generators that own power plants and sell “wholesale” electricity to others
  1. Transmission
     + “Transmission” refers to the high-voltage, long-distance delivery of electricity over power lines
       - Storage is difficult
       - Need real-time balance between supply and demand
     + Connected power lines = “the grid”
       - Came together haphazardly
       - Management can be poor
       - Congestion is a problem
     + US: three main grids (“interconnections”): east, west, and Texas (purposefully independent to avoid federal regulation)
  2. Distribution
     + “Distribution” refers to the delivery of electricity to end-users, including industries, commercial buildings, residences, and other consumers of electricity
* Electricity Sales/Regulation
* Wholesale sales: sales of electricity to entity other than the end user
* Retail sales: sales to end user
* Traditional Regulation:
  + Utility gets right to maintain its monopoly
  + PUC (mainly) regulates types of plants utilities will build, rates utilities can charge customers, rates utilities’ investors will earn from the ratemaking process
  + Ratemaking = maintaining fair, reasonable rates
* Rate Regulation: R = O + Br
  + R = revenue requirement – the amount the utility needs to recover from its customers
  + O = operating expenses – variable expenses, including fuel costs, labor costs, etc.
  + B = rate base – capital investment in plant and other assets
  + r = rate of return on investment
* Utilities: how they make money
  + Once PUC sets R, it translates it into a price per kwh
  + Example: R = $10 million; unit cost = $.10 kwh
    - If utility sells 100 million kwh, will earn R
    - If utility sells 150 million kwh, will earn extra 5 million
  + Issue: incentivizes promotion of consumption
* Federal regulation
  + Federal Power Act (**FPA**): gives the Federal Energy Regulatory Commission (**FERC**) power over wholesale electricity rates (interstate commerce and interstate transmission) – SCOTUS has made clear that this power is exclusive
    - Exception to this exclusivity: Public Utility Regulatory Policies Act (**PURPA**) – allows states to set wholesale rates for purchases of energy from “qualifying facilities”
    - States technically engaged in rate-setting process, but must follow federal (FERC) guidelines in doing so
    - Effects of PURPA discussed further below in “Reforming” section
  + Note: FPA gives FERC jurisdiction over “public utilities” defined to include individuals and corporations, but not government entities.
    - Government sales of electricity are therefore not regulated by FERC
    - Federal legislation creating the agencies that run the plants establish requirements regarding rates
    - State or municipal utilities regulated by states or allow them to set their own wholesale rates
  + FERC has wide authority because of the broad definition of “interstate commerce” and the “elusive nature of electrons” – basically, if you’re hooked up to the grid, you’re engaged in interstate commerce
* State regulation
  + State PUCs – retail sales, transmission, distribution
  + Procurement Power: general approaches:
    - “Hands-off” approach: allow them to use whatever power they want, but must obtain authorization prior to investing in new capital facilities (PP, transmission lines, etc.) – receive “Certificate of Convenience and Necessity (CCN)” to prove “prudent”
    - Some states require utilities to invest in “least cost” resources & long-term planning
    - Some states direct utilities to purchase or build certain types of power or power plants (Renewable Portfolio Standards)
    - Most states use a combination of the three approaches
  + FERC’s control over wholesale rates does not impede on state’s traditional regulatory power of procurement. But, once state authorize utility to purchase some power at wholesale, its job is done – the rates the utility will actually pay are set by FERC
* Transmission Regulation: Open Access
  + General rule: Utilities/transmission providers must provide non-discriminatory open access to their transmission lines if
    - In “interstate commerce” (connected to interstate grid, so essentially everyone but TX)
    - Participate in the wholesale market
    - FERC otherwise tells them to
  + Jurisdiction over transmission
    - Under FPA’s definition, FERC has jurisdiction over all transmission outside of Hawaii, Alaska, and Texas
    - FERC has only asserted authority over transmission of wholesale electricity and “unbundled retail” transmission –necessary to allow non-utility energy producers to get access to the grid, but not transmission in states where vertically integrated utilities continue to operate as monopolies in supplying retail power
* Utilities incentives and limitations
* Utilities earn a profit on their rate base, the bigger the rate base, the bigger the profit – incentive to build big, expensive facilities
* Limitations: used and useful prudent investment
  + Prudent: what was known and knowable at time of construction and through each stage of construction?
  + How does that play out with climate change?
  + Good in theory, but not always enforced – states don’t want utilities to eat big money even if they screw up
  + Integrated resource planning: advanced planning identifying power resources for the future – alternative to “used and useful” Take into account:
    - Population growth/housing stock
    - Business expansion
    - Increased regulation on GHGs
    - Pricing mechanisms
    - EV/other tech requiring increased energy demand
  + Often overestimated to make Br higher aka get more profit
* Implications of the ratemaking formula
  + Flipside of the incentives for utilities to build = cost of future CO2 regulation?
  + Since utilities can pass cost of CO2 regulation onto their customers, PUCs have responsibility to scrutinize proposals with future carbon costs in mind
  + *Florida Power & Light*
    - Proposal for 2 ultra-supercritical pulverized coal plants
    - Factors the PUC considers:
      * Electric system reliability & integrity
      * Adequate electricity at a reasonable cost
      * Fuel diversity and supply reliability
      * Cost-effective alternatives
      * Conservation measures to mitigate need
    - Held: too expensive and risky; based on uncertainty of fuel prices, capital costs, & market/regulatory factors
    - Procurement case: PUC must make determination – mainly based on cost-effectiveness (only reason CO2 and CC taken into account was because of cost)

1. Fossil Fuels

* Dominance of Fossil Fuels
  + Endowment Effect: when something is engrained in society, it is difficult to get rid of for political, social, and economic reasons
    - Past/present/future investors
    - Links with infrastructure
  + Highly effective
    - Abundant, reliable, potent, cheap
    - Easily deployable and scalable
    - Human nature = bad behavioral economist – apply immediate price signals to long term purchases
  + Subsidies
    - Focus of energy sector has always been supplying more at lower prices
    - Renewables receiving some recently, but FF have always received more & have a head start
    - FF subsidies are notoriously difficult to quantify and track, while renewable subsidies are easier to target and critique
    - “Hidden” subsidies by externalizing environmental and public health costs
* Natural Gas / The Natural Gas Bridge
  + Possibly/likely to lead to more natural gas
  + Just because the power plant itself is cleaner does not necessarily mean emissions will go down – look at lifetime emissions
    - Release of heavy metal during on-site drilling/welling
    - Leaking of CH4 (85 gwp)
  + Other externalities – earthquakes from fracking
  + Production level: starts out high upon initial release and then begins to die off (18-36 months) – pay off capital expenses by drilling another one hoping it will peak higher … “natural gas treadmill”
  + Positive: most price competitive with coal – issue for solar and wind
  + Prices historically volatile – been consistently low lately
* Nuclear Power
  + Benefits: no GHG emissions from electricity plants; small amount of uranium = lots of power; centralized power source; technology already in place
  + Negatives: uranium mining; heat as a pollutant = concern in areas with cold-water species; expensive; waste storage
* Carbon Capture & Sequestration (CCS)
  + Capture CO2 from power plants 🡪 Pressurize to liquid form
  + Inject into underground storage areas
    - Natural gas underground reservoirs and oil deposits
    - Long-term storage in depleted areas unclear
    - Underground aquifers? Pressure and water keep CO2 in liquid form?
  + Benefits: option to burn coal in a cleaner way; technological opportunities, especially with China’s growth & increased coal use; retains baseload source of electricity; favored by some utilities as more manageable way to meet obligations (abundance, reliability)
  + Concerns/limitations: cost, energy (increase ~25% at each plant), capacity for storage sites, risks of release (groundwater, air)

1. Reforming the Energy Sector

* Major Sources: wind, solar, hydro, biomass, geothermal
  + Drop in coal mainly attributed to natural gas
  + Hydro & nuclear remain relatively constant
  + Solar increasing; becoming cheaper, marketing & installing, China importing lots of panels
  + Supply: “capacity” in optimal conditions; what is the maximum amount of power we can create
  + Generation: actual amount produced from specific sources
* Tax Credits
  + **Investment Tax Credits (ITC):** based on cost of renewable energy projects (credit based on amount invested in renewables)
    - Credit for various type of projects (10% for geothermal, up to 30% for solar/small wind (100kw<) and converted PTC)
    - Dominant subsidy for large solar thermal plants & other large solar energy facilities – Congress excluded solar from PTC in 05
    - Greater certainty for developers of large power facilities with high upfront capital costs and uncertain production forecasts
    - “Tax Extenders”: value of ITC drops in 2019 and becomes 10% for everything in 2030 (phase-out\_
  + **Production Tax Credit (PTC):** tax credit based on amount of renewable energy produced (credit based on actual production and delivery of renewable energy to the power grid)
    - Main program for wind energy, also covers biomass, geothermal, small irrigation, landfill, some hydropower, and hydrokinetic – infrastructure was already in place during energy boom – issue was not whether they could create it, but whether they could compete with FF costs
    - Give inflation-adjusted amount of tax credit for each kwh given to the grid (1.5 cents/kwh for wind, geothermal, and closed-loop biomass (2.3 inflation-adjusted)’ .75 cents/kwh for others)
      * Lifespan of credit = 10 years after initially “placed into service”
      * “Placed into service” = signed K and invested 5% of total cost – changed in 2013 to when project “begins construction
    - “Tax Extenders”: PTC value will drop 20% per year starting Dec 2015 and become 0 starting Jan 1,2017
    - Market may affect the value of the credits, but production levels do not
  + Politics of Tax Credits
    - Overt/transparent – easy to see who’s getting credits and where they’re coming from – people like this
    - Oil/gas has received far higher subsidies over time – does this qualify continuing subsidies for renewables, or do we let them grow on their own?
    - Solar receives the majority, then wind, then large gap between wind and others
  + Equity Investors
    - Need tax liability to take advantage of credit
      * Need to be profitable to have tax liability
      * Necessary because many renewable energy developers don’t have tax liability at the outset
    - Equity investors = funders; become “owners” of the facilities for life credit
    - Allows companies who are not yet profitable to enter tax equity relationships
    - Trade tax credits to investors for investment money
      * Will pay back and give credits
      * Investors can then use credits to pay government taxes
  + Issues with Tax Credits:
    - Most investors were big banks; financial crisis 🡪 banks stop investing 🡪 no one is profitable 🡪 no one is tax equitable 🡪 no one needs credits (volatile market)
    - Treasury grants: direct subsidies to RE owners
    - Political power: banks have more power in Congress
    - Biggest concern with tax credits is their temporary nature
      * Concept of the phase-out for PTC: wind energy should be able to exist without subsides
      * Credit system has been overly successful
      * Argue that “tax extenders”/ “on-again off-again” nature disrupts growth and puts it at a disadvantage to FF – “boom-bust” cycle
* Renewable Portfolio Standards
  + Mandate for utilities to obtain certain percentage from renewable sources (example: HI = 100% by 2045, OR = 50% by 2040)
    - Note: % standard as compared to mass standard for biofuels
    - More effective in volatile markets
  + State law defines “renewables”
    - Wind, solar, biomass usually included
    - Others vary, example: PA includes waste coal
    - States also have varying targets and deadlines
    - Certain states include “carve-outs” – specify certain amounts of renewable power must come from particular resources
      * Creates diverse portfolio of resources
      * Build-up local resource consumption
  + Renewable Energy Credits **(RECs)**
    - Represent the “greenness” of the electricity resource; show that 1 kwh of electricity is a qualifying type of RE
    - REC ID Example: 003-001-121010-105; translated: facility ID-type of power (001 = solar)-date of generation-unit ID number
    - Multipliers: different values for different resources (e.g. each kwh of solar = 3 RECs; wind = 2 RECs; biomass =1)
      * Benefit: make renewables profitable faster
      * Downside: only need to produce ½ etc. of the actual energy to comply with mandates
    - State law determines if RECs are to be bundled or unbundled
    - Bundled: REC accompanies the electricity itself
      * Accounting and tracking tool
      * Means an entity cannot transfer the REC without also delivering electricity – requires utilities to either produce or procure renewable energy that actually reaches instate customers
      * REC ID stays with the resource through all the trades
      * Helps ensure facilities aren’t making up RECs or double counting
      * Incentivizes production closer to consumers – likely to convey the benefits of renewable power to utilities’ own customers
      * Reduce flexibility – may force utilities to buy power from facilities in close proximity to the state; may mean less availability 🡪 higher prices
    - Unbundled: electricity & credit sold separately
      * Tracking applies to the RECs
      * Electricity is sold as a separate commodity, and generally it doesn’t matter what happens to the actual electricity
      * Tradable instrument
      * Emphasize cost control and flexibility over efficiency and localized benefits
  + RECs and Ratemaking
    - RECs have complicated the regulatory landscape for PUCs regarding ratemaking
    - Do not earn rate of return on O; fuel costs, including costs of wholesale electricity, are considered operating costs; so, when utility buys from RE producer to comply with RPS, utility can pass cost of electricity on to ratepayers, but cannot put the cost of mandatory purchase into the rate base
  + Issue: how to treat tradeable RECs
    - Utility purchases more power than it needs to comply, may be able to resell surplus RECs at a profit
    - E.g.: Utility A purchases 100k RECs but only needs 80k; sells 20k to Utility B earning profit – presumably already calculated original cost in O, should they be allowed to keep the profit?
  + Energy system for renewables based mainly on RPS & the sale of tax credits & RECs
  + National RPS?
    - Arguments for: harmonize markets between states; potential faster rate of development
    - Arguments against: state sovereignty; wealth transfer from states with relatively few RE resources to those with significant wind and solar resources; redundant or conflict with state goals; stifle own states industry; political cost (FF industries own Congress); federal preemption of more aggressive state policies (e.g. CA)
* Public Utility Regulatory Policies Act **(PURPA)**
  + First significant US policy designed to promote renewable energy production; promulgated in response to more independent power producers coming online
* PURPA promotes power reduction from **“qualifying facilities”** (small, less than 80 mw) RE facilities & combined heat & power (CHP) plants)
* Utilities must:
  + Purchase power from QFs
  + Connect QFs to the grid and sell them power if they need it
  + Pay QFs “avoided cost” rates for the power
    - “Avoided cost” = amount utilities would pay to produce or purchase the power themselves
    - When demand is high and supply is low, AC will be high
    - When fuel cost is high, AC is high
    - Cause renewable sources to chase markets – where QFs AC are the highest (CA, NY)
* Ensures contract with utility = easier to get loan to build
* Can have tax credits under PURPA
* Purpose was to promote more sustainable power, but unintentionally spurred deregulation efforts
  + Showed electricity generation was no longer uncompetitive
  + Urged states to restructure their electricity sectors to make generation competitive – states either order utilities to sell off their PP or to create legally separate entities to own & manage generation separately from transmission and distribution
* 14 states restructured (utilities buy most or all of their energy on a competitive market); CA restructuring imploded 2000-2001 = others put their restructuring on hold
* Legal Implications of Restructuring:
  + When a state restructures, generation that used to be retail becomes wholesale – a utility that used to produce its own power for its retail customers must now buy its power at wholesale and resell it
  + States give FERC regulatory control over transmission access and rates; basically, one consequence of allowing competition is a loss of state power of rates and transmission
* Distributed Renewable Generation
  + Distributed Generation: power generation at or near the site of consumption aka local power
  + Supported to expand renewable development in urban areas
  + Two main policies to incentivize: net metering & feed-in tariffs
* Net Metering
  + Dominant tool to promote DG thus far
  + Utilities buy their customers’ power
  + Offset the customers’ retail rates (up to point that customers’ production = consumption’ possible that utilities must also buy excess at wholesale or avoided cost rates, but rare)
  + Without net metering, consumer would pay for electricity at retail rates and sell at wholesale rates; net metering allows homeowner to earn full retail rates
  + Example: home uses 150 kwh & produces 100
    - 150-100 = 50 kwh NET RETAIL
    - Homeowner pays for 50 kwh & gets 100 for free
  + Opposite: home uses 100 & produces 150 = 50 NET WHOLESALE (some states allow the homeowner to actually profit, others don’t)

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* + Benefits:
    - Legal certainty: FERC has authorized use despite utilities’ argument that it unfairly forces them to pay retail rates for wholesale sales; FERC has exclusive authority to regulate wholesale rates (except where states implementing PURPA = state authority to set wholesale rates for QFs)
  + Limits:
    - Serves a limited group of producers; limited eligibility in limited areas
    - Does not always guarantee easy access to the grid
    - Does not cover up front costs of investment – property owners must make initial investment
    - State limitations: low fixed cap, size of facilities, etc.
* Feed-in Tariffs (RITs)
  + Concept: provide a guaranteed rate of return on the investment in renewable energy technology and insure interconnection to the grid
  + Popular in Europe – essentially European PURPA, but issue with third requirement of “avoided costs” being slight different and therefore not conforming to US federal law
  + Utilities must:
    - Buy power from facilities (same as PURPA)
    - Connect them to the grid (same as PURPA)
    - Pay the “incentive rates” for the power (issue with PURPA)
  + Advantages: guarantee full recovery of the investment in the capital project + specific rate of return on that investment within a specified period of time
    - Rate of return often set high enough to make investment attractive to a wide array of investors – this is where the issue with US federal law comes in
    - Certainty regarding amount investors will earn over a certain period of years
    - Streamlines access to grid
  + Issues: federal preemption – under FPA, max rate = wholesale rate = avoided cost rate
    - Main difference between PURPA and FIT are the prices the utilities must pay
    - Under PURPA: AC establish presumptive rates for QFs; if AC low due to high production 🡪 low wholesale rates, QFs may not receive as much revenue
    - FIT: avoid this risk by guaranteeing fixed price for power or at least certainty that they will regain their investment + profit on RE facilities
  + Overall Implications:
    - Federal law constrains state authority to set rates for wholesale power – tied into market prices
    - States can mandate that utilities purchase or build certain types of power, but have limited authority (PURPA) to control market rates

**High-GWP Gases: The Montreal Protocol & US Implementation**

1. Science of Ozone Depletion
   * + - Ozone creation
         * O typically exists as O2
         * UV rays breaks up O2
         * Single O reacts with O2 = O3 = ozone
         * This process keeps too much sunlight/UV from reaching Earth’s surface – O3 essentially blocks UV

* Ozone Depletion
  + CFCs = C-Fl-Cl; human made compounds emitted into the air known as “ozone depleting substances” **(ODSs)**
    - * + Cl interacts with O3 & breaks it into O2 & O-ClHas cause major thinning of the ozone layer (O3 abundance), allowing more UV to reach Earth’s surface
      * Picture of ozone hole 🡪 freak out 🡪 Montreal
    1. Montreal Protocol on ODSs
       - Regulates production and consumption of ODSs
       - Widely regarded as the most successful environmental treaty
       - Basic framework is a phase-out process
         * Timeframes for reductions set based on availability of alternatives; initial schedules from high-potency to low-potency
         * Developing countries given longer phase-out times
       - Trading restrictions prevent leakage/violations
    2. Montreal Protocol Relationship to Climate Change
       - CFCs 🡪 HCFCs (ODS replacement)
         * Huge benefit because CFCs are more potent GHGs
         * Issue: production of HCFCs = lingering GHG emissions = problem
       - HCFCs 🡪 HFCs (ODS to non-ODS)
         * Pretty big loophole under CDM; companies began to increase production of HCFCs to create HFCs as a byproduct
         * HFCs then destroyed to earn CERs
       - Responses to Problems
         * Accelerated phase-out of HCFCs (emissions & byproduct emissions)

CFCs = high ODP & high GWP

HCFCs = neutral ODP & high GWP

HFCs = no ODP & neutral to high GWP

Goal: next step should be no ODP & neutral to low GWP

* + - * + New rules under CDM regarding HCFCs/HFCs
        + HFC controls (Kigali agreement – phase out HFC production & consumption; adopted in 2016 & seen as major improvement)

Issue: can we regulate GHGs (HFCs) under MP phase-out? AKA will Kigali be ratified, especially in the US?

Most agree it is possible – “controlled substance” as defined in Art I of NP does not = ODP, but rather a substance listed in the Annexes of the Protocol; just add GHGs to Annexes?

* + 1. CAA Implementation of the Montreal Protocol
       - Title VI
         * Requires phase-out of class I and class II substances, which are defined as ODSs
         * Also requires EPA to identify alternatives to class I and class II substances and list them as “acceptable” or “unacceptable”
         * Parties may not replace class I and class II substances with “unacceptable” alternatives
       - *NRDC v. EPA*: Does EPA have to follow MP decisions?
         * Court: NO – not binding
       - *Mexichem Fluor, Inc. v. EPA* (DC Cir, 2017)
         * Issue: Can EPA use the CAA to accelerate phase-out of HFCs? If EPA has listed HFC as an unacceptable alternative, can it require existing manufacturers, retailers, etc. to replace HFCs in processes?
         * Majority: Once ODS is replaced with a non-ODS, EPA cannot order replacement of non-ODS
         * Dissent: EPA may order replacement because:

“Replace” is not a one-time event

Alternatives process would have a major loophole

ODSs still in use/consumed

* + - * + Any other options? – EPA could potentially retroactively reconsider listing HFCs as an acceptable substitute
        + Takeaway: The CAA crafted a very narrow reading of M

**Article II Standing and the Role of Courts; Atmospheric Trust Litigation**

1. Standing Overview
   * Standing creates jurisdiction hurdles for CC plaintiffs:
     + Art III
     + Political Question doctrine (circuit split in regard to CC)
     + Statutory commands (citizen suits? States allowed to regulate CC?)
     + Prudential Standing (pass Art III but Court doesn’t want it anyway)
       - P not in “zone of interest”
       - P must assert own legal rights
       - Can courts address CC injuries? – Courts should not adjudicate “abstract questions of wide public significance”

* *Lujan v. Defenders of Wildlife* (SCOTUS, 1992): established irreducible constitutional minimum for standing
  + Injury-in-fact
    - Concrete and particularized
    - Actual or imminent
    - Note: *Laidlaw* established that the relevant inquiry is injury is to the *plaintiff,* not the environment
    - Issues: “concrete and particularized” – is CC not a “general grievance”? & “imminent” – CC often predicts severity of future effects
  + Causation
    - “Fairly traceable” standard
    - Issue: Elusive nature of emissions – can’t trace specific emissions to specific effects
  + Redressability
    - “Likely, not speculative” that favorable decision will redress the injury at least in part
    - Issue: widespread causes – is court or Congress a better venue for redressing these issues?
* *Mass v. EPA* (SCOTUS, 2007)
  + State overcame Article III standing hurdle
    - Majority: State gets “special solicitude”; widely shared injury does not lessen MA interest
    - Dissent: “Special solicitude” for the state does not replace Art II requirements – meant to be an “irreducible minimum”; also rely on “landowner” status for injury, not state status
  + “Injury to all is injury to none” theory – can’t argue generalized grievances before the court – but how do these problems get fixed then? Do we have time to wait for Congress to act?
  + “Probalistic Harm” theory: Ps must submit detailed scientific record to demonstrate likelihood of future injury, and Ds often submit their own record to refute these claims – standing inquiry turns into “battle of the experts”
  + Issues post-*Mass v. EPA*:
    - How does *parens patriae* standing differ from Art II standing?
      * *Parens patriae:* quasi-sovereign interests v. proprietary interests
      * States can sue in 3 capacities in federal court:
        + Proprietary suits: acting as private party with direct injury
        + Sovereign suits: boundaries, water rights
        + Health/well-being/safety/etc. of inhabitants
      * *Mass v. EPA* sort of blurred these first two
    - Does this mean private parties have no chance at standing?
    - Does standing depend on procedural or substantive rights?
    - Will standing depend on the law/statute at issue?
    - Will prudential standing limitations apply to CC?

1. Recent Case Law
   * + - *WEC v. Bellon* (9th circuit): WEC brought action pursuant to CAA to compel agencies to regulare GHG emissions from WA state’s 5 oil refineries (RACT)
         * Court ruled no standing because causation/redressability
         * Chain of causality was too attenuated – beyond the scope of science to link specific emissions to the injuries
         * Can’t rely on *Mass v. EPA* because Ps are not a state
         * Court also argued issue in *Mass* was different because procedural – but got that wrong, this is procedural too
       - *Juliana v. US*
         * Claims: Youth plaintiffs assert that US action/inaction in developing FF resources and infrastructure violates fundamental constitutional rights and US trust obligations
         * Motion to dismiss denied: not yet in evidentiary phase, Ps haven’t gotten a chance to prove their point
         * Distinguished from *Bellon* – emissions at issue here are way bigger
         * Injury: property damage/storm flood issues = individualized & actual
         * Redressability: asking government for an action plan – this is a big ask