Mystery of the Sea: A Study of the Fair Conditions For U.S. Offshore Wind Farm Development

Ph.D. Dissertation Research
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Presentation Outline

- My background related to research topic
- Background on offshore wind energy generation
- The emergence of the “social gap” as a problem
- Current explanations and solutions for the “social gap” — what’s missing?
- Research plans for exploring other explanations for the “social gap” through offshore wind
  - Why offshore wind?
  - Research Design & Methods

Life Flowchart

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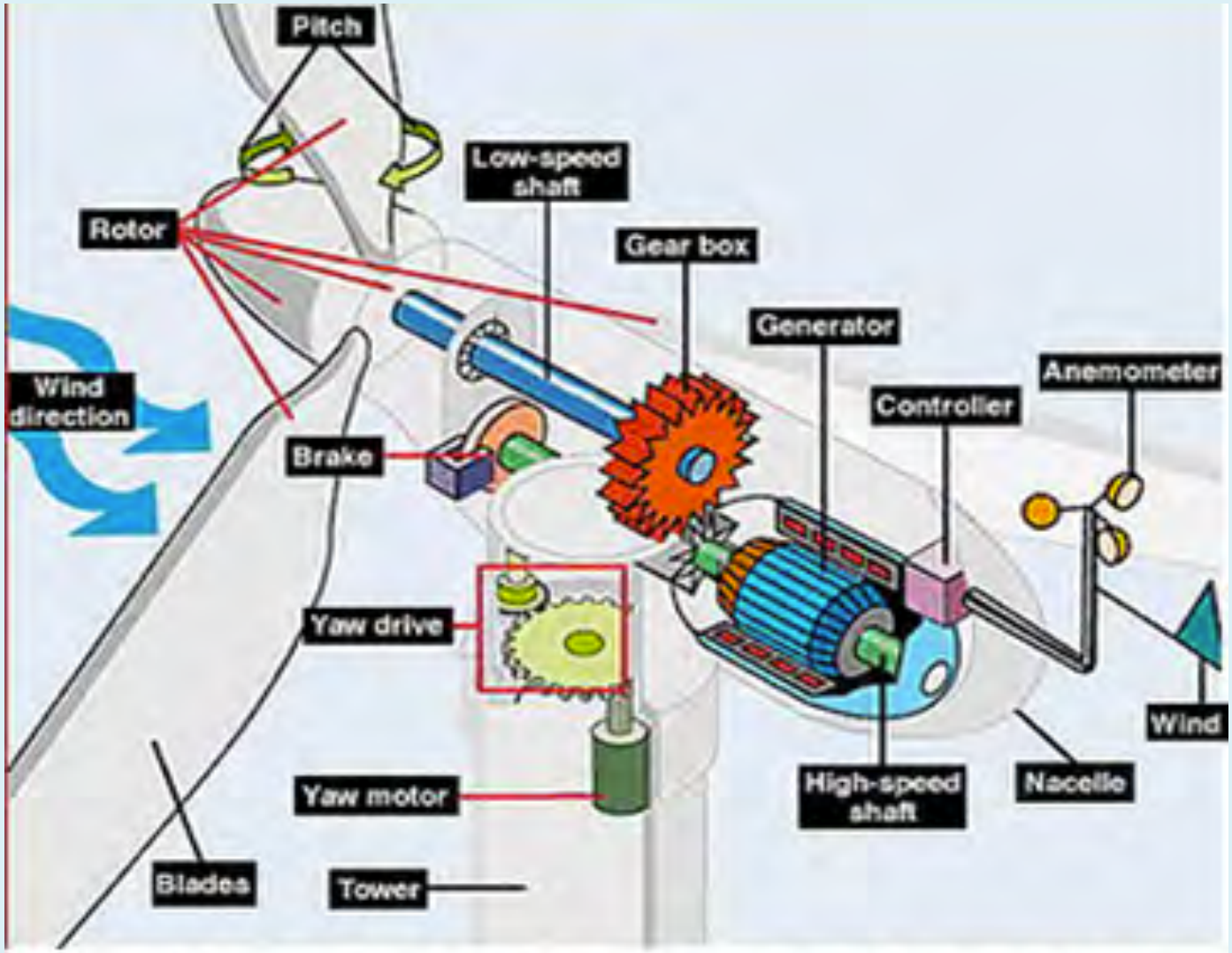
What is offshore wind?

- Wind farms built at sea, to generate electricity from wind
- The winds at sea are stronger and more uniform than wind on land.
- Increases in wind speeds of by just a few miles per hour can greatly increase energy output.

Source - Bureau of Ocean Energy Management: Offshore Wind Energy

Offshore wind: technology



Wind Turbine Nacelle Schematic (Credit: NREL)

Offshore wind: technology

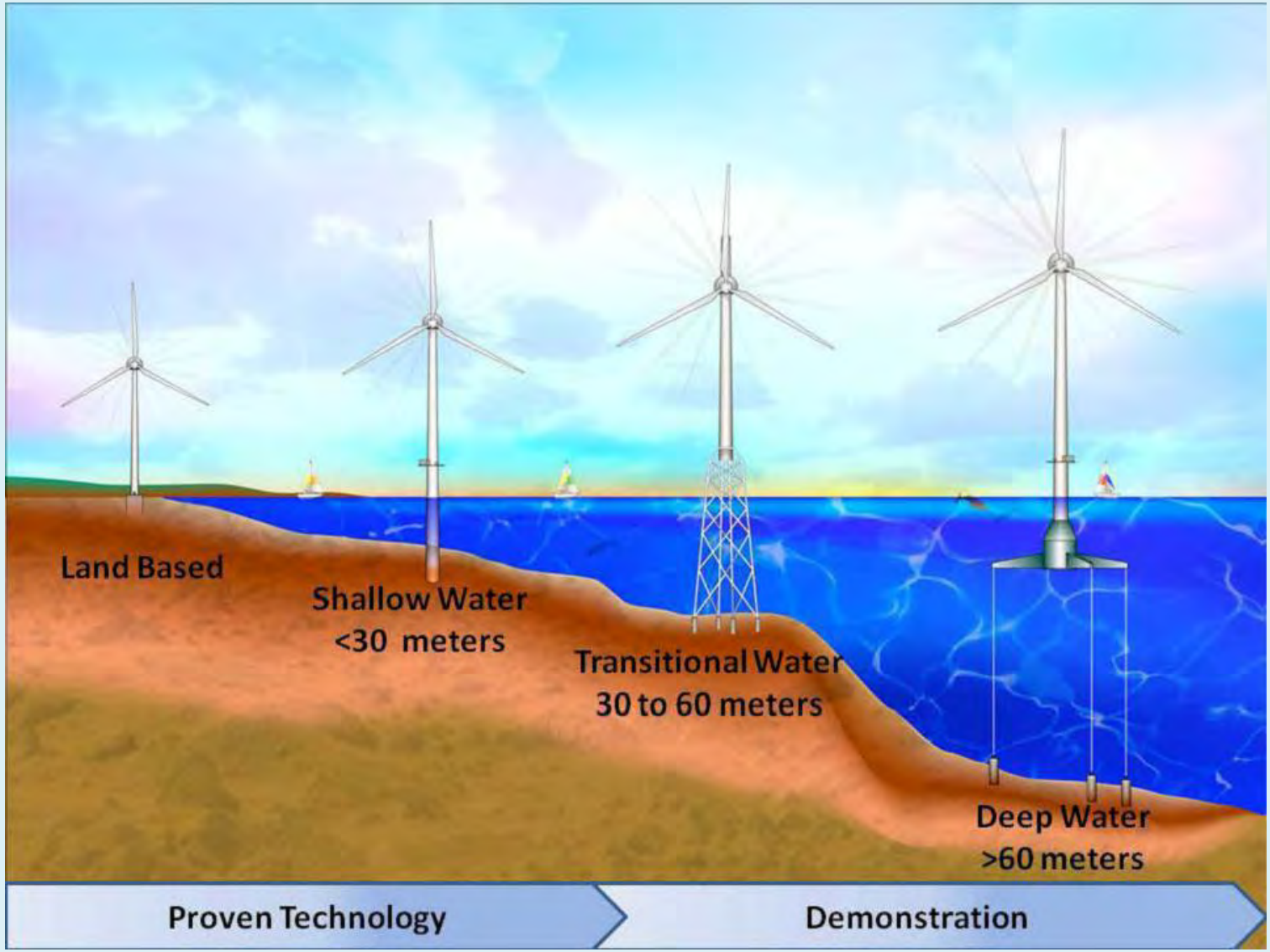
Onshore Wind

- Typically range from about 2 – 3 megawatts per turbine
- Rotor diameter = about 233 - 360 feet
- Height = ranges from about 200 – 300 feet

Offshore wind

- Typically range from 2 – 5 megawatts per turbine (average = 3.6)
- Rotor diameter = 250 – 430 feet
- Height = ranges from about 300 - 500 feet

Offshore wind: technology



Source - Bureau of Ocean Energy Management: Offshore Wind Energy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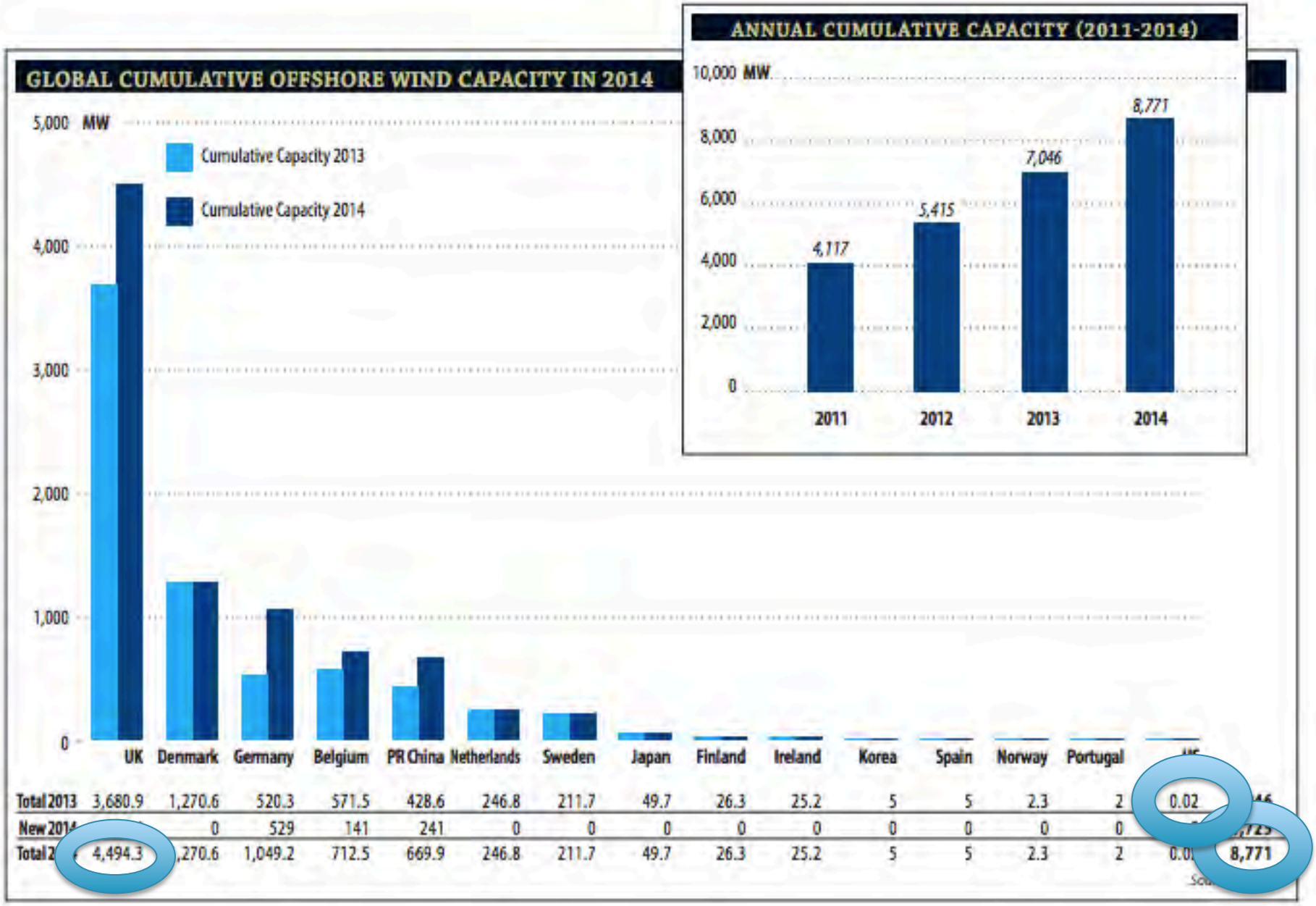


Source: Global Wind Energy Council

Current state of U.S. offshore wind energy

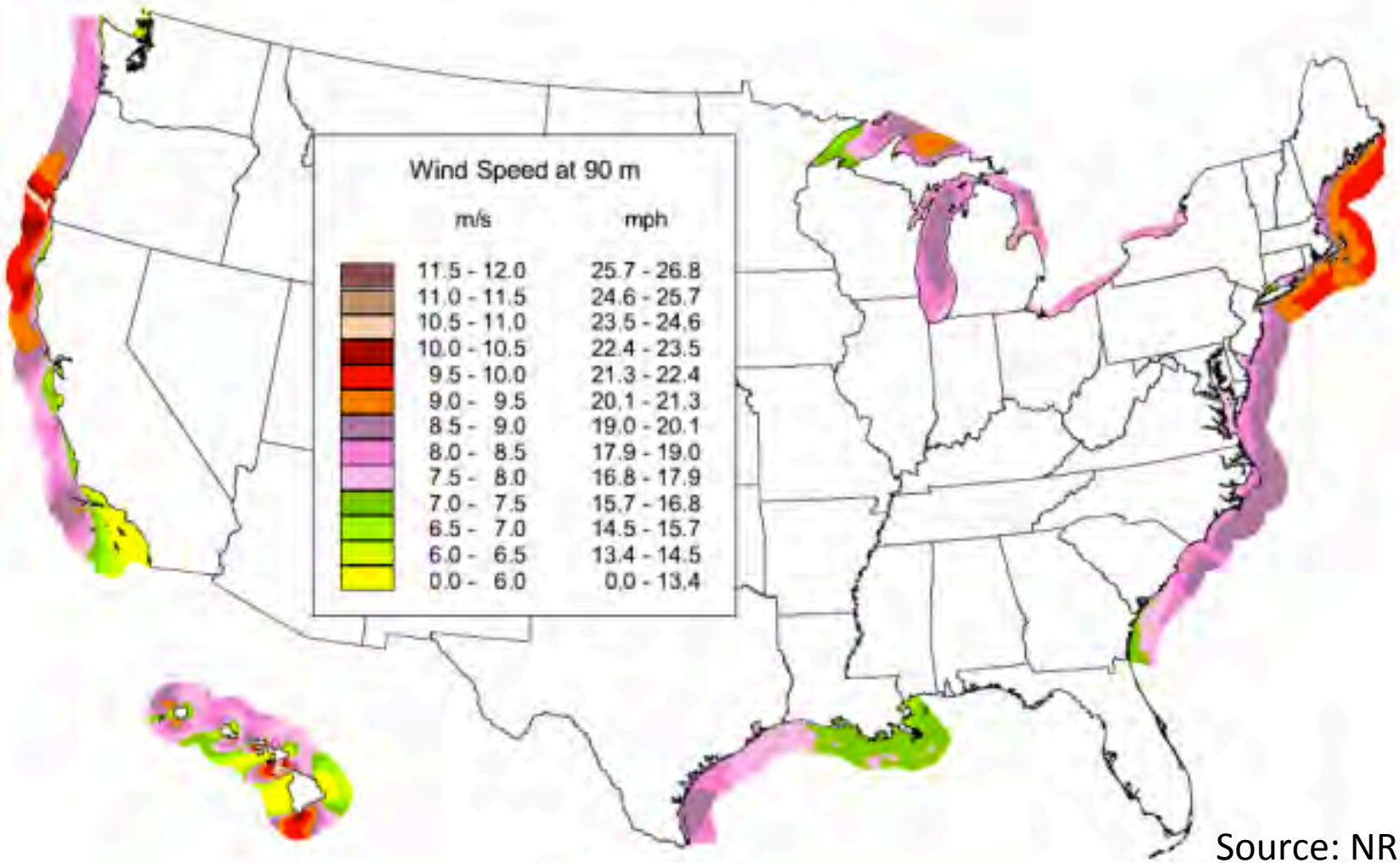
- Offshore =

1 floating offshore wind turbine prototype

- Dubbed “VolturnUS”

- Implemented by the University of Maine

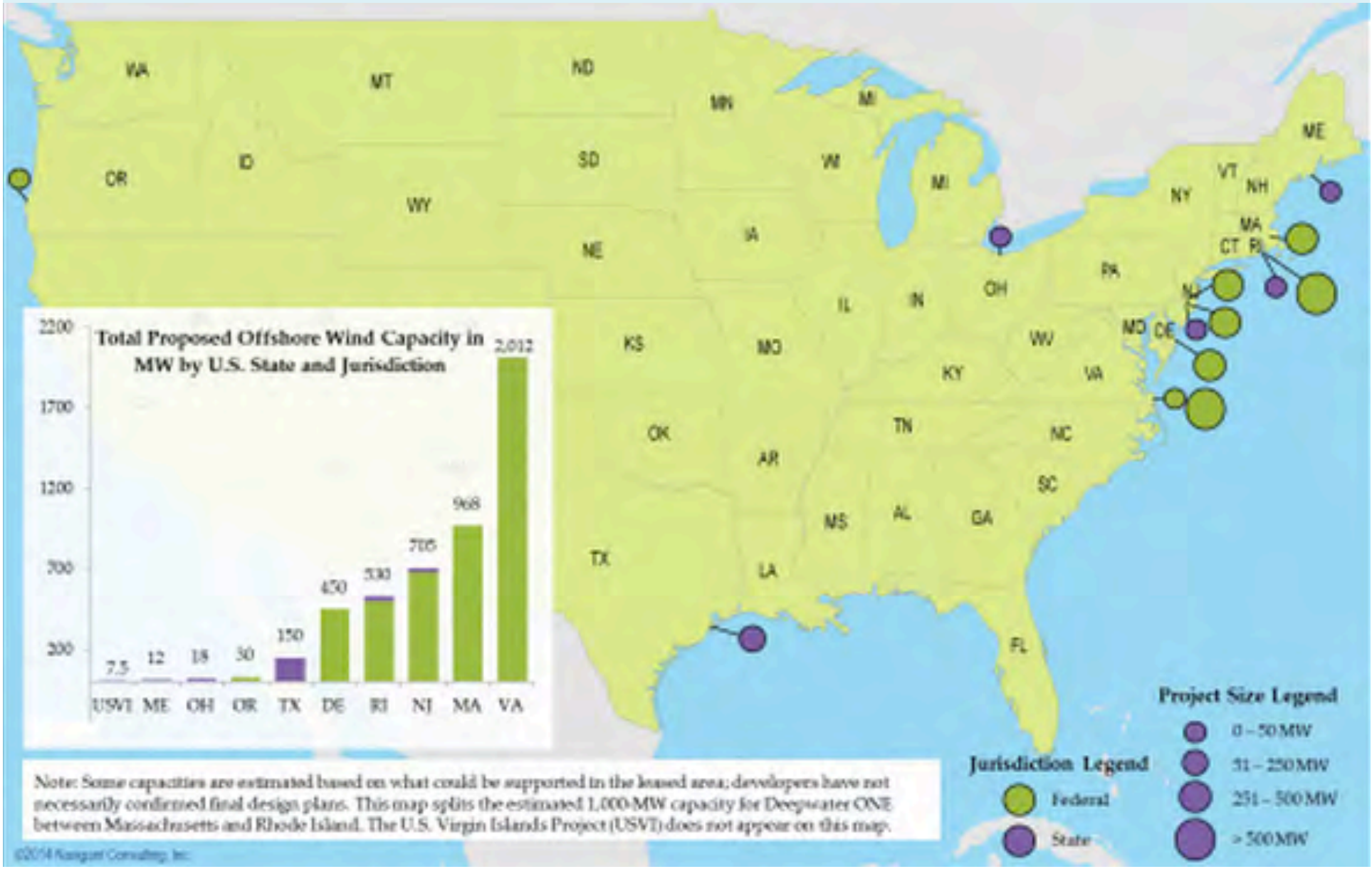
There are 2,400 gigawatts (GW) of wind resource potential in country's coastal waters, after taking competing uses and environmental considerations into account.



Source: NREL

Areas with 7.0 m/s average wind speeds are economically feasible for development.

Proposed offshore wind energy projects in the U.S.



U.S. Department of Energy wind energy goals

U.S. electricity portfolio =
20% wind energy by 2030

- 300 gigawatts of installed capacity
- 50 of the 300 gigawatts sourced offshore

Source: U.S. Department of Energy, *20% Wind Energy by 2013*

Americans Support Renewables

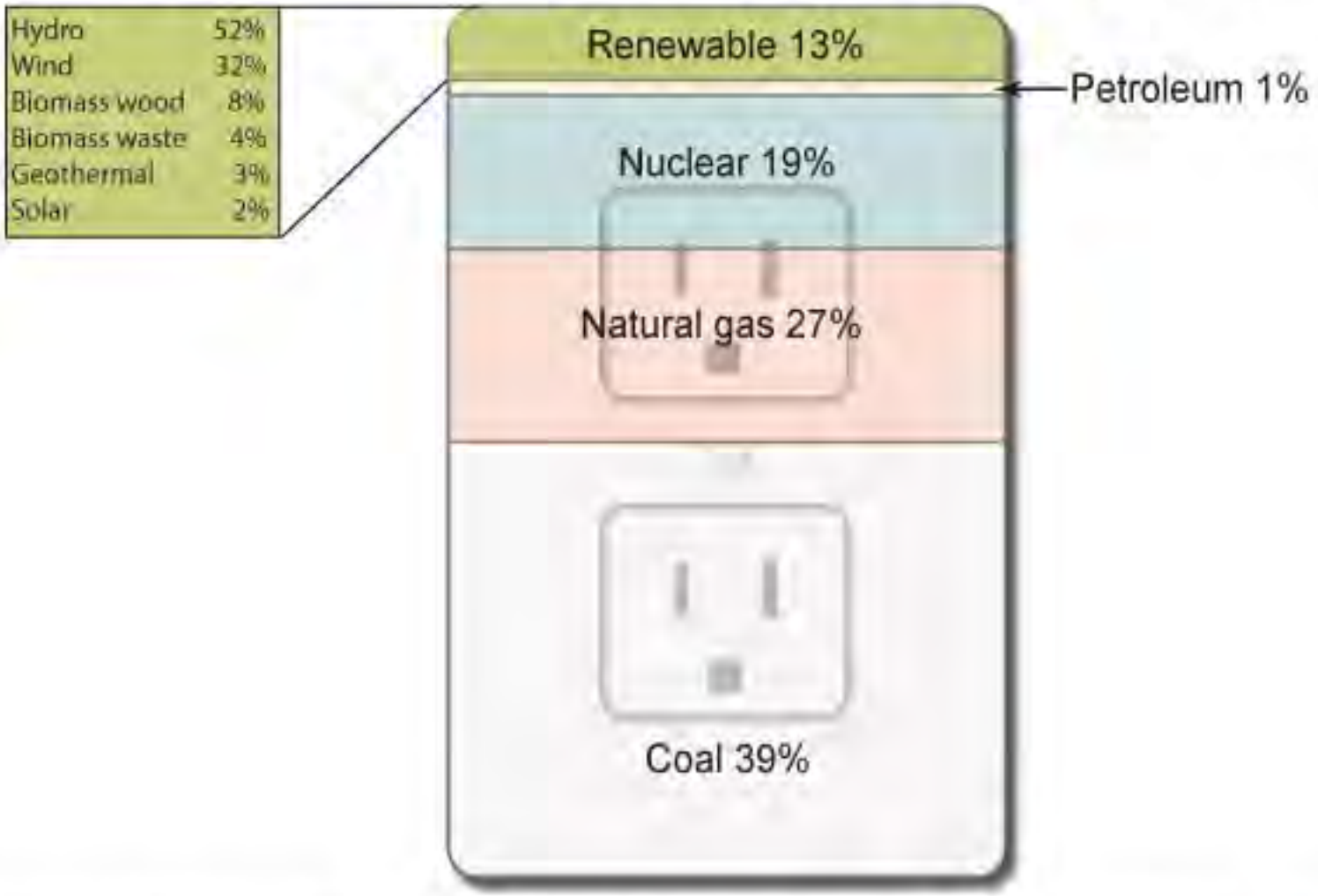
Jan. 2015: 80% favor giving tax breaks to produce more electricity from wind, water, and solar power

(Stanford University, *The New York Times,* Resources for the Future)

Dec. 2013: 91% believe generating electricity from sunlight is a "good thing," and 84% said the same for wind.

(Stanford University, *USA Today,* Resources for the Future)

Sources of U.S. electricity generation, 2013



Source: U.S. Energy Information Administration, *Electricity Power Monthly* (February 2014). Percentages based on Table 1.1 and 1.1a; preliminary data for 2013.

Note: Sum of components may not equal 100% due to independent rounding.

eia

Why offshore wind?

- Why should this research care why the U.S. has implemented only a small amount of offshore wind energy?

Climate change mitigation

- 20% wind energy = saving the U.S. electricity sector 825 million tons of CO_2 – almost one-tenth of the expected annual emissions for 2030.

Climate change adaptation

- Resiliency can be enhanced by:

  - More information about anticipated climate impacts and trends

  - Deliberate applications of risk-management techniques, such as energy infrastructure choices

    - Energy infrastructure tends to be long-lived

Anticipated climate impacts & risk management

Climate Impact

- In the Southeastern United States, it's expected that there will be "Decreased water availability, exacerbated by population growth and land-use change, causing increased competition for water."

Risk Management

- Offshore wind is not water intensive, as compared to conventional energy sources

Anticipated climate impacts & risk management

Climate Impact

- "Coastal lifelines, such as water supply and energy infrastructure … are increasingly vulnerable to higher sea levels and storm surge"

Risk Management

- Sited offshore, offshore wind is less subject to "large reductions in power plant output resulting from climate changes"

28 of the 48 contiguous states have coastal boundaries use 78% of the nation's electricity

Only six have of those 28 states have sufficient land-based resources to meet 20% of their electricity requirement though onshore wind power.

Diagram: 2014 NCA report

Economics & offshore wind

Globally

- The global offshore wind investment is expected to grow nine-fold between 2011 and 2025, increasing from $6 to $52 billion

Nationally

- Constructing 54 GW of offshore wind would provide more than 43,000 permanent jobs and about "$200 billion in new economic activity"

(IHS: Emerging Energy Research & NREL)

Health, the environment, & offshore wind

" … there are no possible catastrophic risks for offshore wind that cause human deaths or property damage over $1 million."

(Ram, 2011, p. 253)

Health, the environment, & offshore wind

Catastrophic risks & conventional energy sources

- Ruptured coal ash ponds
- Mercury contamination from coal plant emissions
- Worker deaths from mining uranium and coal
- Nuclear waste impacts
- Chemical contamination from natural gas fracking

(Ram, 2011, p. 253)

Tradeoffs & offshore wind

"In the case of offshore renewable energy development, policy makers must avoid creating new impacts in the rush to solve primary concerns such as climate change and energy independence." (Portman, 2008)

The "complex nature of interactions … does not lend itself to simple solutions." (Melillo et al., 2014)

Environmental impacts & offshore wind

Human impacts & offshore wind

Perceptions of the sea & offshore wind

To some, the sea is viewed as “a last refuge.”

“Offshore wind farming would mean a loss of everything that is important to me.”

Applied research goals

- Recommend policies for offshore wind development
- Keep tradeoffs in mind
- Ultimate goal is to advance human wellbeing and environmental sustainability
- However, provided the benefits of offshore wind energy generation, it's important to understand the development barriers

The "Social Gap"

- The "social gap:" high levels of public support for wind power in general and the low success rate for planning applications

(Agterbosch, Meerten, and Vermeulen, 2007)

- Research proposal: the term "social gap" can refer to widespread support for renewable energy projects in general, and the low success rate of renewable project implementation.

Offshore wind exemplifies social gap

- Developers have proposed more than 70 offshore wind projects since the early 2000s
- Received more than $300 million from the U.S. DOE
- Surveys and public opinion polls show high levels of support for offshore wind energy

How to bridge the “social gap”?

Often viewed as a primary challenge:

People support renewables, but not when the renewables are proposed for a nearby location

Why opposition to renewables nearby?

- First proposed offshore wind farm in the U.S.
- Extremely controversial, with groups forming both for and against Cape Wind
- The developers have faced considerable regulatory hurdles and private litigation

Jason Jones Reports on Cape Wind for *The Daily Show*

Why is there a lack of local acceptance?

- Academic literature does not focus on the Not-In-My-Backyard (NIMBY) syndrome

- The literature has found other, more well-supported explanations

Nuanced explanations for the lack of local acceptance

- Qualified Support: some narrowly defined criteria must be met
- Distributive Justice: equitable distribution of outcomes
- Procedural Justice: local involvement in the decision-making process
- Democratic Deficit: a small minority that opposes renewable energy projects is able to obstruct the majority of projects

Agterbosch et al., 2007

- It's critical to have these nuanced explanations

- If you're trying to address the lack of offshore wind development, you would want to know exactly why it is that locals oppose a project.

- My research argues: to reach a better understanding of why there's a social gap, even more information is needed
    - What other factors are impacting the lack of development?

Problems with other recommendations for addressing the social gap

- Recommendation: "Streamline the regulatory and permitting process for offshore"

Problem with recommendation: Timely, requires understanding what it would take to change numerous state and federal public policies

- Recommendation: Make offshore wind more economically attractive through policy

Problem with recommendation: Requires an understanding of what it takes to change policy

Research for bridging the social gap

- Principle of contextuality:

(1) All things are interconnected.

(2) The meaning of anything depends on its context.

Clark, 2002

Research for bridging the social gap

- Accounting for contextuality to understand the social gap:

- How do international and national conditions and actors affect local development?
- Who are the actors at the local level with political power?
- How to local biophysical, socioeconomic, and cultural conditions affect development?
- Are the policies the primary barrier, or actors in positions of power?

Recent research: Beginning to explore power, interdependencies, & scale

- Dawley and Mackinnon (2015): while attention to local conditions is important to path creation, "multi-actor and multi-scalar settings and power relations" also enable or inhibit path creation for offshore wind.

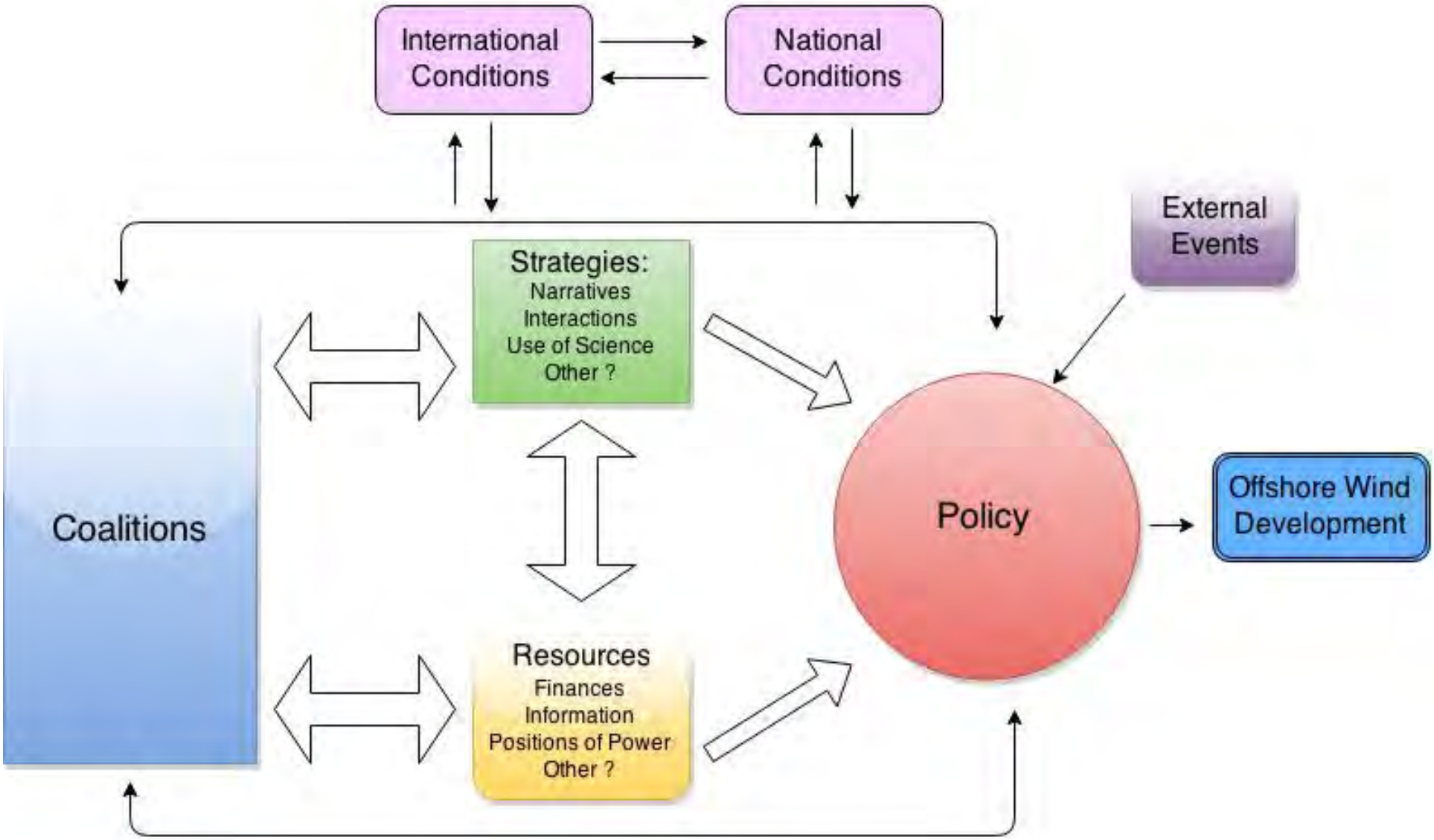
- Agterbosch et al. (2007): conducted multi-case study research in Sweden and found that positive social acceptance on the local level can compensate for poor public policy in terms of progress for onshore wind power development.

Research conceptualization

- "A kind of combination" of Dawley and Mackinnon's research (2015), and Agterbosch et al.'s (2007) research on onshore wind

- Additionally, this research will look at other critical contextual factors

Mapping various factors, at various levels that are affecting offshore wind farm development



Multi-case study research

- Block Island offshore wind farm: proposed for the coast of Rhode Island
- Fishermen's Energy offshore wind farm: proposed for the coast of New Jersey.

Cross-case comparison

Similarities

- Proposed in 2008
- 5 turbine projects
- Expected to generate about the same amount of energy
- In-view offshore wind farms, proposed for about 3 miles off of their respective states' coasts

Differences

- Block Island has all of the necessary "leases & permits" and is expected for construction in summer 2015
- Fishermen's Energy has experienced numerous setbacks in recent years

Block Island offshore wind farm

The Block Island offshore wind story

- January 2006, Rhode Island's then-Gov. Donald Carcieri announced a plan to supply 15 percent of the state's electricity demand from wind energy.
- In 2008, Rhode Island solicited proposals from developers for an offshore wind farm

The Block Island offshore wind story

- Offshore wind developer, Deepwater Wind, secured a power purchase agreement (PPA) with National Grid, an electricity distributor

- The Rhode Island Public Utilities Commission (PUC) declared the PPA as “not commercially reasonable in accordance with applicable legislation”

The Block Island offshore wind story

- Gov. Carcieri called the PUC decision "'extraordinarily shortsighted and narrow-minded,'" and promised to get the wind farm "back on track."

- The Rhode Island General Assembly passed new legislation that redefines the term "commercially reasonable"

  - The PUC now must consider local economic and environmental benefits.

The Block Island offshore wind story

- Following the new legislation, among the three Commissioners for the PUC, a majority ruled in favor of the PPA
- The PUC's decision has been challenged by a Rhode Island citizen and various groups
- The Rhode Island Supreme Court has struck down these challenges

The Block Island offshore wind story

- Block Island wind farm has all of the "leases and permits" needed.
- Leases were reviewed by more than 20 local, state, and federal government agencies.
- "Financing going smoothly"
- Construction expected by this summer 2015

Fishermen's Energy offshore wind story

Fishermen's Energy offshore wind story

- In August 2010, Gov. Chris Christie signed the Offshore Wind Economic Development Act (OWEDA)
- Directed the NJ Board of Public Utilities to develop an offshore wind energy renewable certificate program (OREC)
- Gov. Christie stated that he will make New Jersey a "national leader in the wind power movement"

Fishermen's Energy offshore wind story

- 2005, leaders of the NJ fishing industry reviewed of their previous opposition to offshore wind power.
- Wanting to be "agents of change," rather than victims, the fishermen founded "Fishermen's Energy" in 2007

Fishermen's Energy offshore wind story

- The New Jersey BPU has twice rejected the Fishermen Energy's applications to join the state's OREC program on the grounds that it inflicts high costs and risks on New Jersey ratepayers.

- Media speculations that Gov. Christie has stalled efforts to grow the offshore wind industry due to future political ambitions

- According to Fishermen's Energy, the BPU staff recommendation to deny approval of the Atlantic City wind farm has no legal basis and is inconsistent with OWEDA.

Fishermen's Energy offshore wind story

- Fishermen's Energy is challenging the BPU's recent decision
- To qualify for federal funds, Fishermen's Energy "broke ground in Atlantic City"
- Commissioned a European renewable energy consulting firm to "review the capital and operational expenditures" for the project

Variables of Interest

(1) Coalitions (beliefs, resources, strategies)

- interest groups, citizens, elected officials, judicial actors, experts

(2) Context

- socioeconomic, biophysical, cultural

(3) Offshore wind public policy

- statutes, laws, regulations, executive decisions, gov. programs

Variables of Interest

(4) The narratives coalitions tell to gain power and affect policy

- Narratives are how humans process info., communicate, & reason

(5) How coalitions use science and expert information to affect policy

- How is science and expert information integrated & deflected from belief systems?

(6) If, when, and why coalitions are willing to change beliefs and strategies

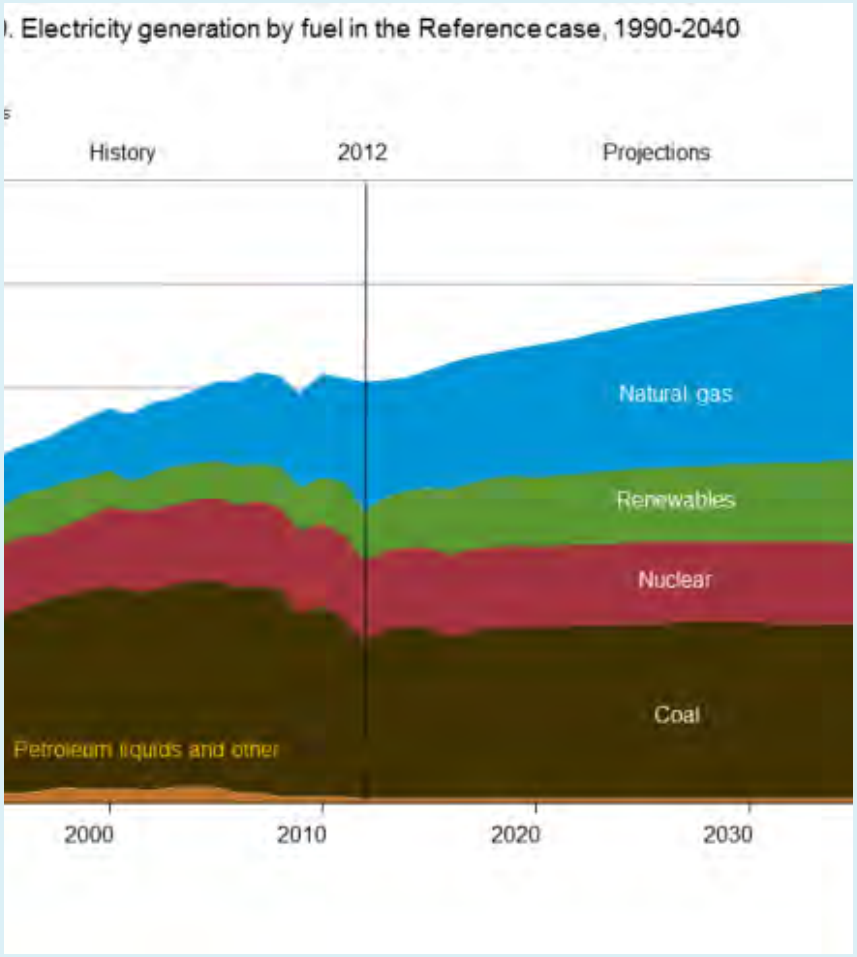
- Does science, expert info., local knowledge, & interactions between coalitions actually affect what coalitions believe?

Summary of research methods

- Refine questions & hypotheses for variables
- Gather data on hypotheses & rival hypotheses
  - Documents (agendas, legislative doc., open letters)
  - Archival Records (U.S. Census, service records)
  - Interviews (semi-structured, focus groups)
  - Direct Observation (meetings, immediate environment)
- Cross-case analysis
- Policy recommendations

Growing U.S. electricity demand

- In the U.S., electricity demand is expected to grow by 39% from 2005 to 2030
- To meet this growing electricity demand, offshore wind has significant potential



Source: U.S. EIA

Summary

- In consideration of the benefits of offshore wind, it's critical to understand why the U.S. has only one offshore wind prototype installed
- Through studying offshore wind and focusing on multiple variables of interest, this research can not only help to address the social gap for offshore wind, but lessons could potentially be applied to all renewable energy projects

Thank You!

Questions?