Catalysing an Industry: a historical analysis of the emerging US offshore wind industry

NORTH WIND

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In collaboration with FME NorthWind

Agenda

- Brief overview of the broader context and theoretical perspectives
- U.S. energy landscape and clean-tech innovation
- Research Questions
- Design
- Results
- Implications and future directions

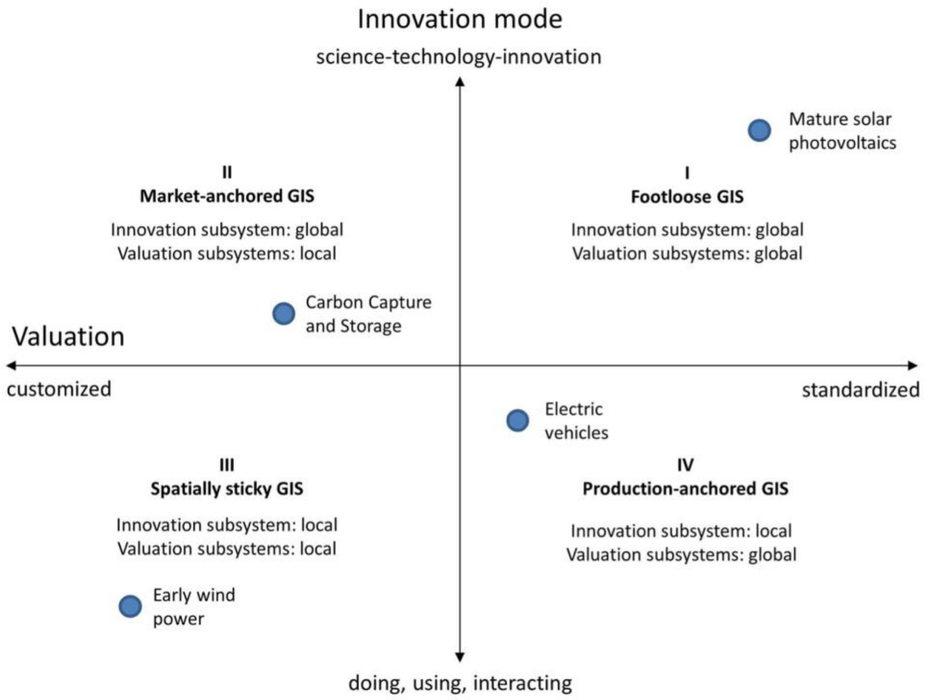
Broader Context and The Utility of a Spatial Perspective

- Offshore wind technology is beginning to rapidly diffuse to new territories
- Need to better understand how regions couple to the broader global innovation system
- How regions embed new technological paths within their region and a closer inspection of the institutional dynamics that facilitate or hinder this process
- Legitimacy/legitimation

Innovation-valuation framework

- Regional context particularly important for spatially sticky technologies with customized valuation.

- This brings legitimation processes to the fore as these technologies have to be aligned with the regional institutional environment



Source: C. Binz et al. 2017

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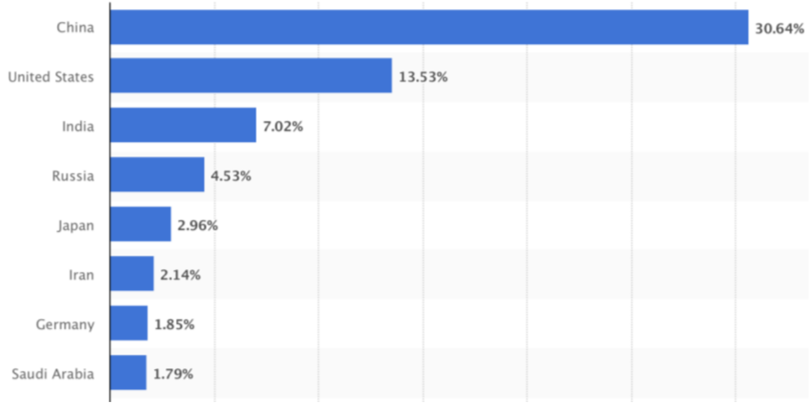
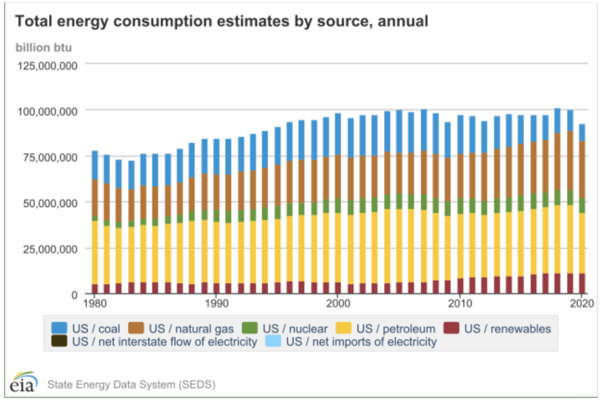
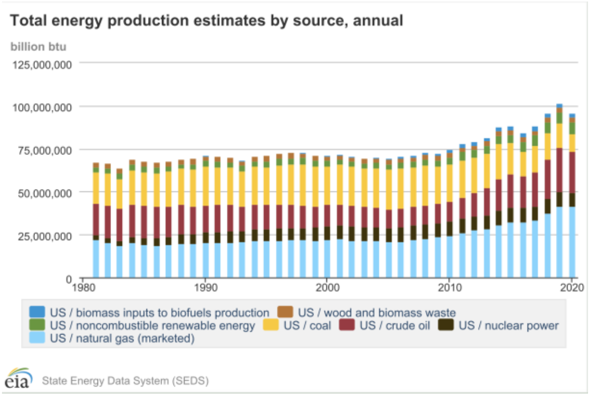
Why is the US important?

Distribution of fossil fuel CO2 emissions worldwide in 2020



Source EIA.gov





Significant opportunity for Norway to draw on existing knowledge capabilities, particularly for floating technology.

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Heterogenous Energy Landscape

Total Energy Production and consumption by state 2020 (tbtu)

Source: EIA.gov

Energy Policy

- In the absence of federal regulations, the US energy transition has been largely led by state agencies
- Riddled with competing interests and regulatory challenges.
- U.S. ocean policy is managed by 24 agencies, applying approximately 147 separate laws, many of which have been amended over time (D. Fluharty 2012).

Clean-tech in the US

Clean energy investment			Installed wind			Installed solar		
Country (rank)	Total bn $USD in 2013	% G-20 share	Country (rank)	Total MW As of 2014	% Global share	Country (rank)	Total MW as of 2014	% Global share
CHN	54.2	29	CHN	114,609	30.7	DEU	38,200	21.2
USA	36.7	19.4	USA	66,146	17.7	CHN	28,199	15.6
JPN	28.6	15.2	DEU	40,500	10.9	JPN	23,300	12.9
GBR	12.4	6.6	ESP	22,987	6.2	ITA	18,460	10.2
DEU	10.1	5.4	IND	22,465	6.0	USA	18,280	10.1
CAN	6.5	3.4	GBR	12,809	3.4	FRA	5660	3.1
IND	6.0	3.2	CAN	9684	2.6	ESP	5358	3.0
ZAF	4.9	2.6	FRA	9143	2.5	GBR	5228	2.9
AUS	4.4	2.3	ITA	8556	2.3	AUS	4136	2.3
ITA	3.6	1.9	DNK	4778	1.3	IND	3062	1.7

Source: Pew (2014) and BP (2015).

Clean energy investment		Installed wind		Installed solar	
Country	Bn $USD per 1000 capita	Country	KW per 1000 capita	Country	KW per 1000 capita
DEU	389.96	DNK	841.89	DEU	443.96
JPN	225.55	ESP	492.68	ITA	289.53
GBR	193.45	SWE	461.42	BEL	265.60
AUS	190.48	PRT	438.13	GRC	237.27
CAN	184.66	DEU	423.81	CZE	205.22
USA	116.10	CAN	219.81	AUS	138.69
ZAF	92.11	USA	193.90	JPN	107.31
ITA	59.80	GBR	170.01	DNK	106.94
FRA	44.01	AUS	148.66	ESP	103.88
CHN	39.93	ITA	138.97	FRA	69.95

Source: Data in this table were generated using base data from Pew (2014), BP (2015) and World Bank (2015).

Clean-tech innovation in US

Source: Cleantech Group and WWF 2017

The bricolage vs. breakthrough narrative

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From zero to 30 GW in 10 years? Not exactly…

- Expected to reach 25 – 30 GW by 2035

- Began in 2001 yet today capacity stands at a mere 42 MW (seven turbines)

Research Questions

- How have path development mechanisms and system building activities evolved over time and space in the US?

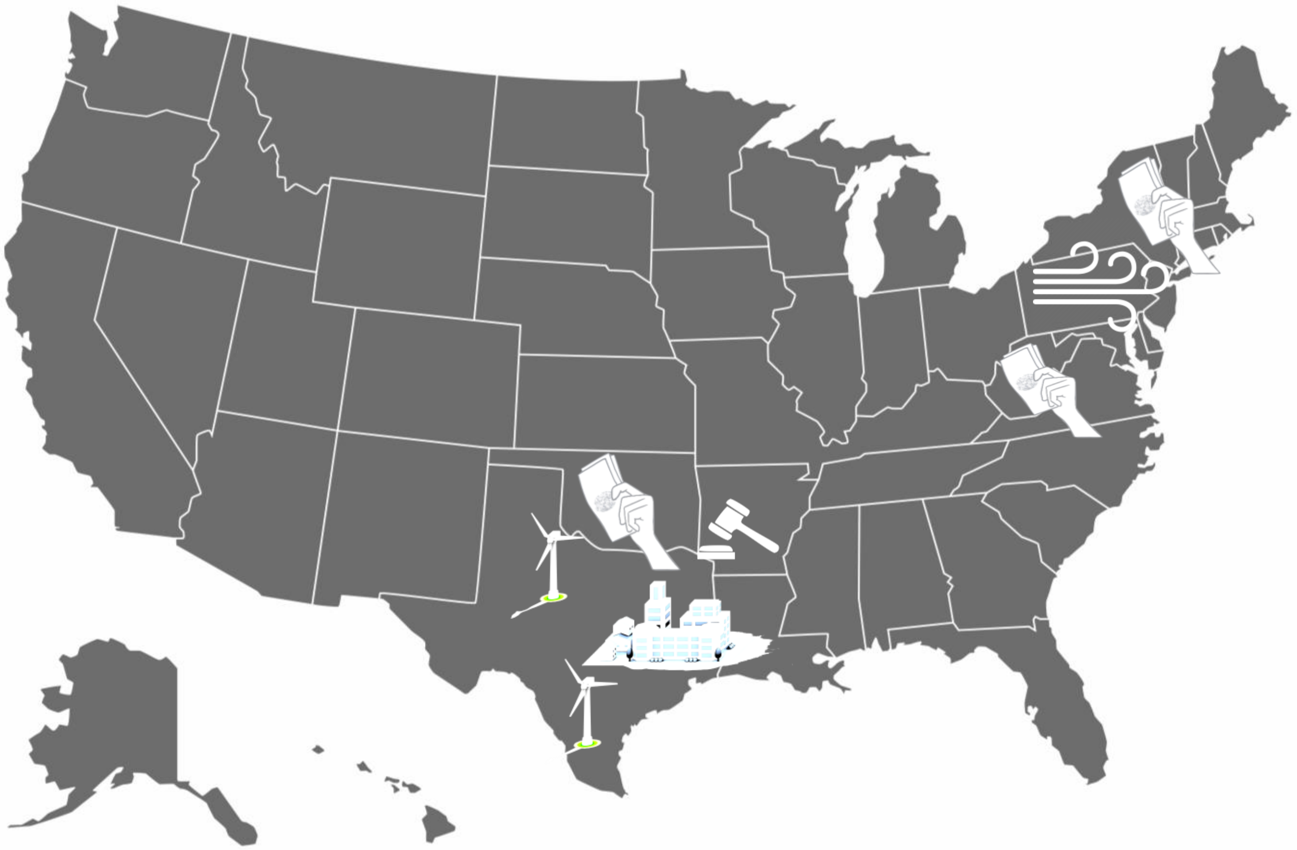
- How do these processes relate to the broader evolution of offshore wind innovation system?

- How has the legitimacy of OW technology changed over time in the US market?

Regional preconditions

Legend

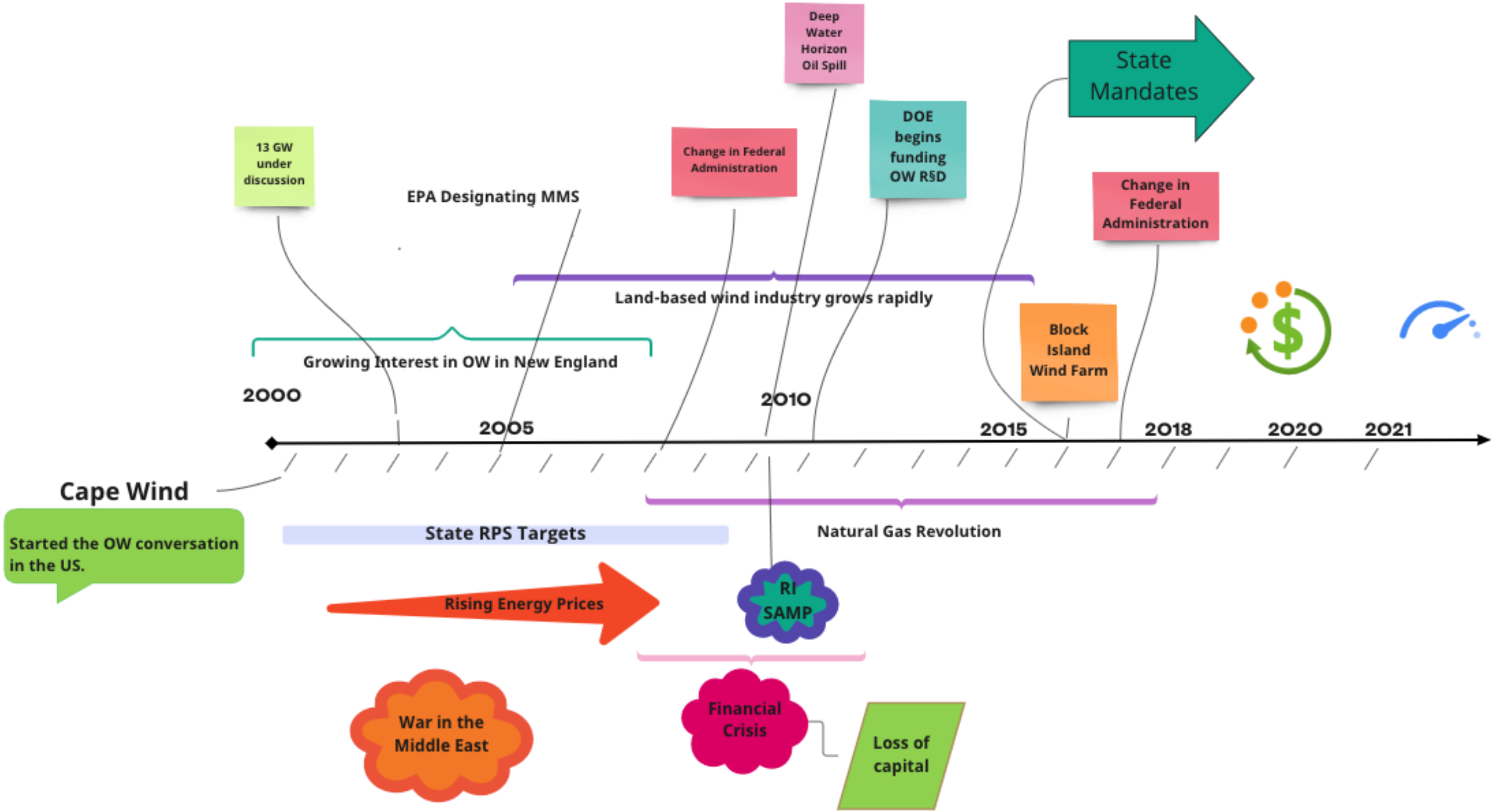
- **Demand**
- **State Control**
- **Port/Oil and gas Synergy**
- **Land-based wind**
- **Weather**



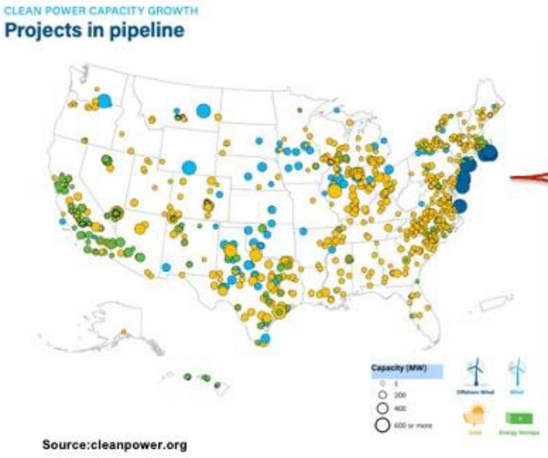
Proposed OSW projects as of 2008

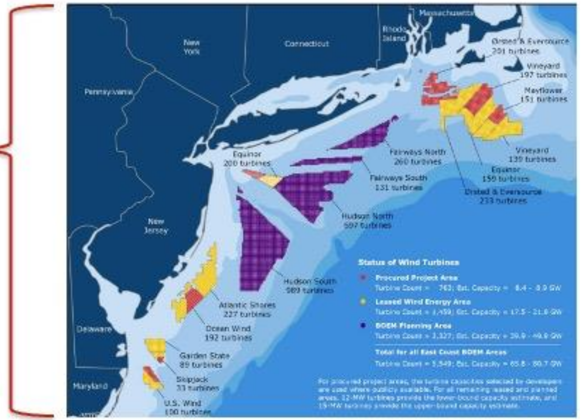
Developer	Wind Park	Location	Number of turbines	Project size	Depth (m)	Distance to shore (km)
EMI	Cape Wind	Massachusetts	130	450	15-18	10.5
West	Galveston Offshore Wind	Texas	50-60	150	16	11
Winergy (Deepwater)		New York	2-3	10	4-11	.5
FPL	Long Island Park	New York	40	150	15-20	5.8
SRE/Babcock § Brown	Padre Island	Texas	100 or more	500		
Patriot Renewables	South Coast Wind	Massachusetts	90 - 120	300	Less than 20	2
Blue Water Wind		Delaware		450		19
Southern Company		Georgia	3-5	10		
Hull Municipal	Hull Offshore Wind	Massachusetts	4	12-20	7-14	2
Deepwater Wind		Rhode Island	100	385		30
Deepwater Wind		New Jersey	96	350		

Offshore Wind Timeline in the US

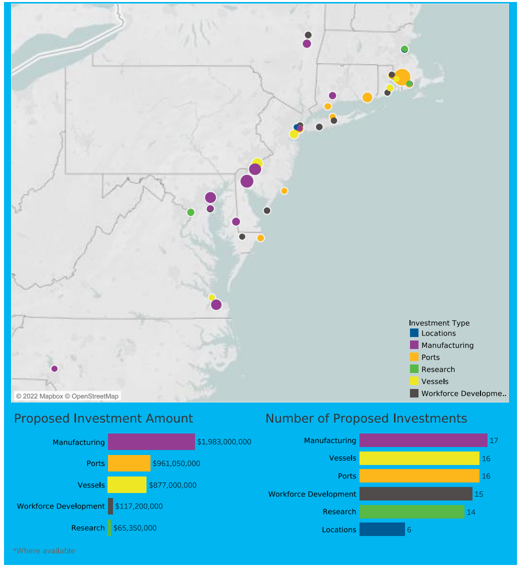


The Future of offshore wind in the US





Source: *Tufts University School of Engineering image*



Cleanpower.org (2022)

Conclusions

Multi-scalar legitimation and the power of expectations

- The spatial characteristics of OW technology means institutional coordination is key
- Block Island legitimized industry on regional and international level, leading to wave of states in the northeastern region to codify OW targets, attracting foreign direct investment
- The legitimacy of the industry is now heavily tied to job creation and value capture, yet the region lacks skills and industrial capbilities.

Salient Themes § Future Direction

- Regional dynamics and multi-scalar interdependencies are critical for understanding how new green path formations occur, particularly in the US federalist system
- Project developers must tailor approaches to particular contexts, which can vary depending on state and region
- Power relationship between lead firms and state stakeholders
- State cooperation vs. collaboration
- The benefits and challenges of being a late-comer in energy transitions

Thank you!

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