Deepwater Offshore Wind in Maine: *the Plan, the Timeline*

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Outline

1. Why *Deepwater* Wind in the US?
2. Why *Deepwater* Wind in Maine?
3. How will Maine Use its Wind Resource?
4. Europe
5. Maine *Deepwater* R&D Plan

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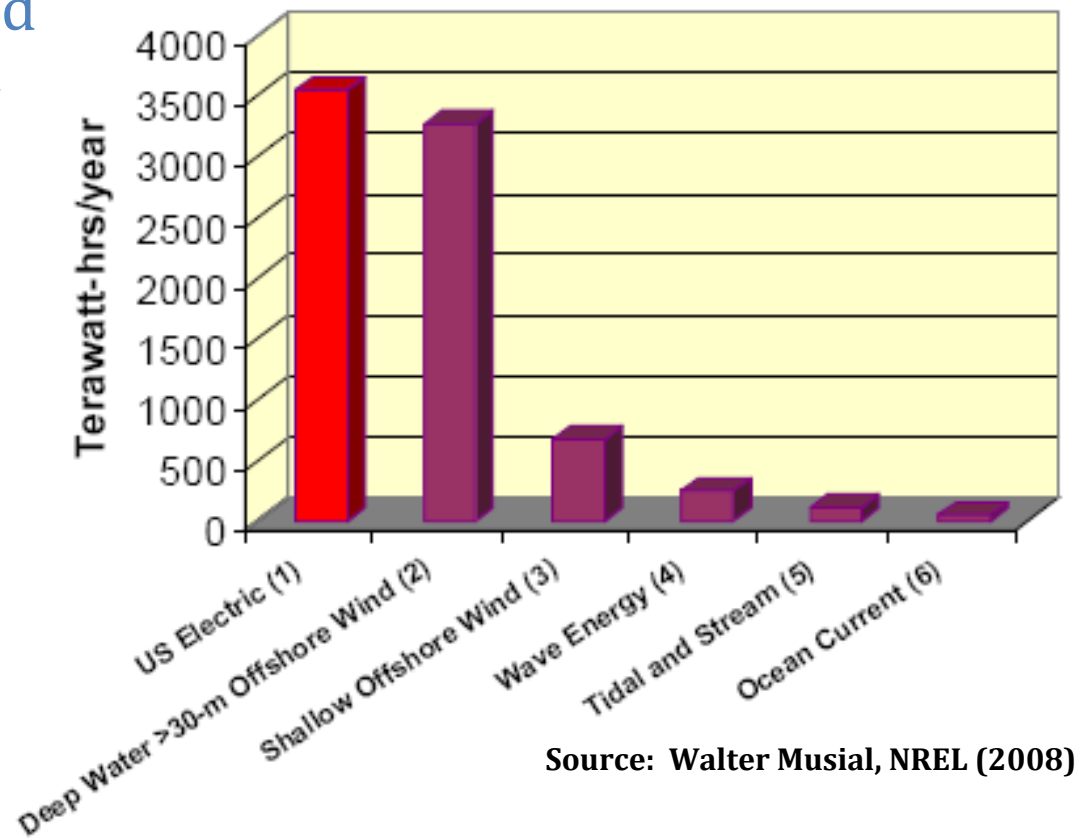
Deepwater Wind: Dominant US Ocean Energy Resource

1. 61% of US offshore wind resource in ***deepwater.***
2. US deepwater wind ~ 1,533 GW.
3. Total US electrical generation capacity ~ 1,100 GW.



Source: Walter Musial, NREL (2008)

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Why Pay Attention to Maine's *Deepwater* Wind?

1. **8.3% of US *Deepwater* Wind Resource is off Maine.**
2. **R&D Capacity:**
   - **UM Advanced Structures and Composites Center**
   - **UM GIS Offshore Wind Database** (25 faculty x 50 years)
3. **Governor Established *Deepwater offshore Wind Testbed***
4. **Unique Ocean Industry Assets:**
   (a) **Boatbuilding** industry (BIW)
   (b) ***Deepwater* floating exploration rigs** (Cianbro)

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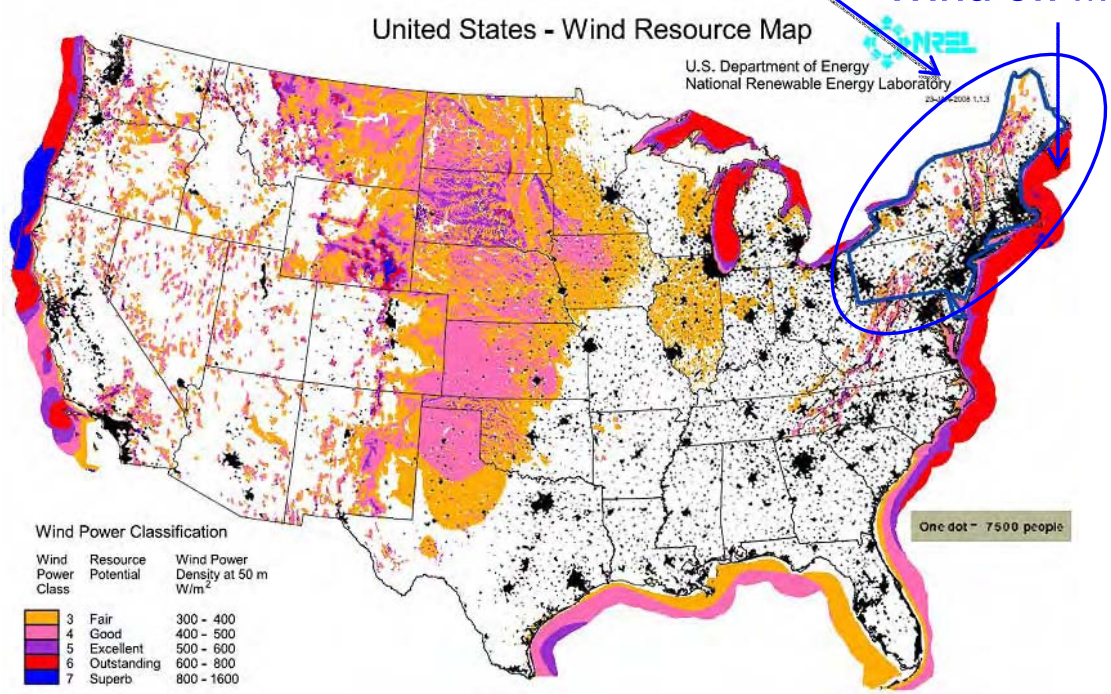
Maine: A Source of Green Energy for the Northeast U.S.

- Maine is larger than all other New England states
- 18% of US population in Northeast

55 million people

40 Nuclear Power Plants of Wind off Maine



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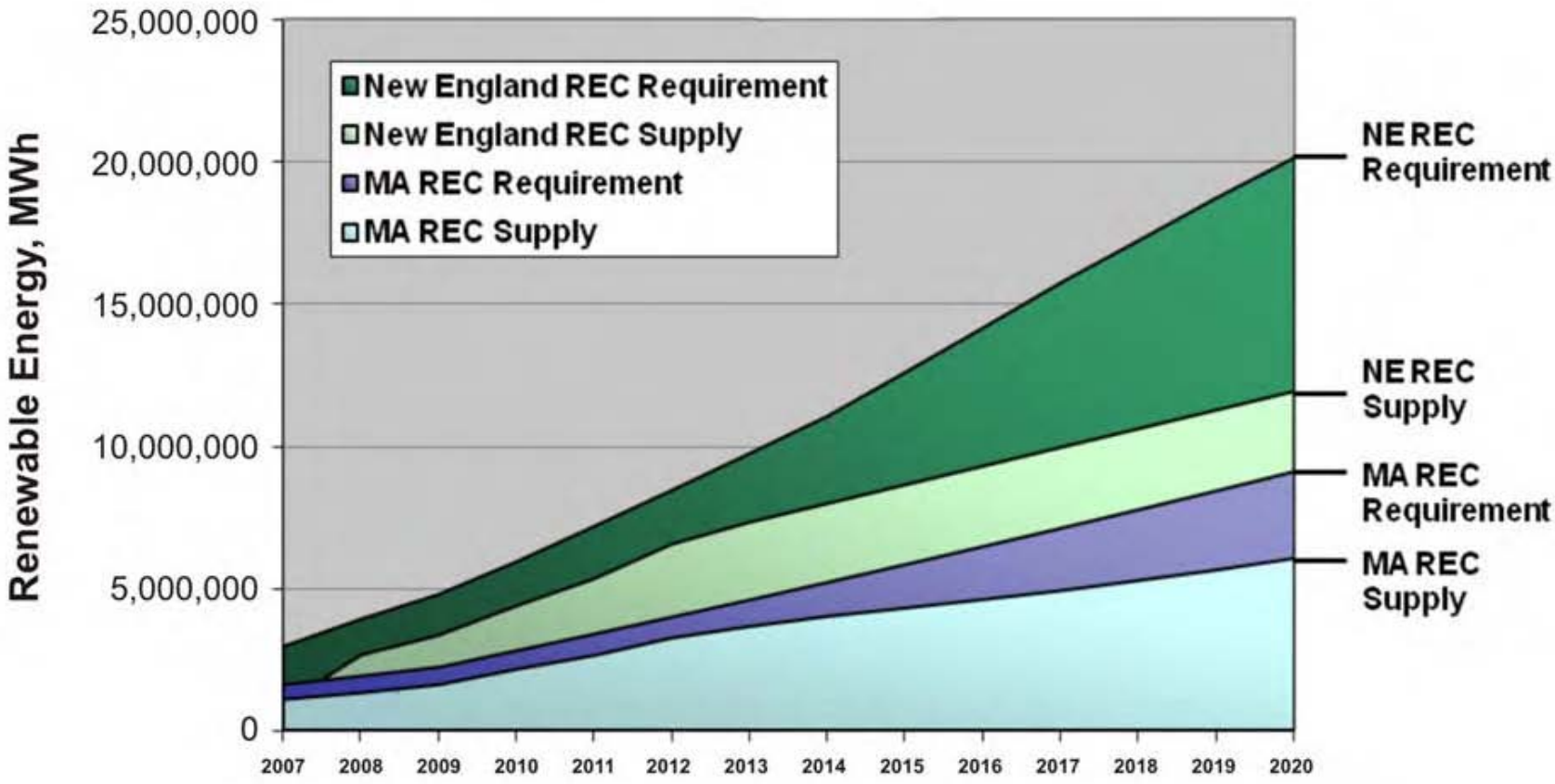
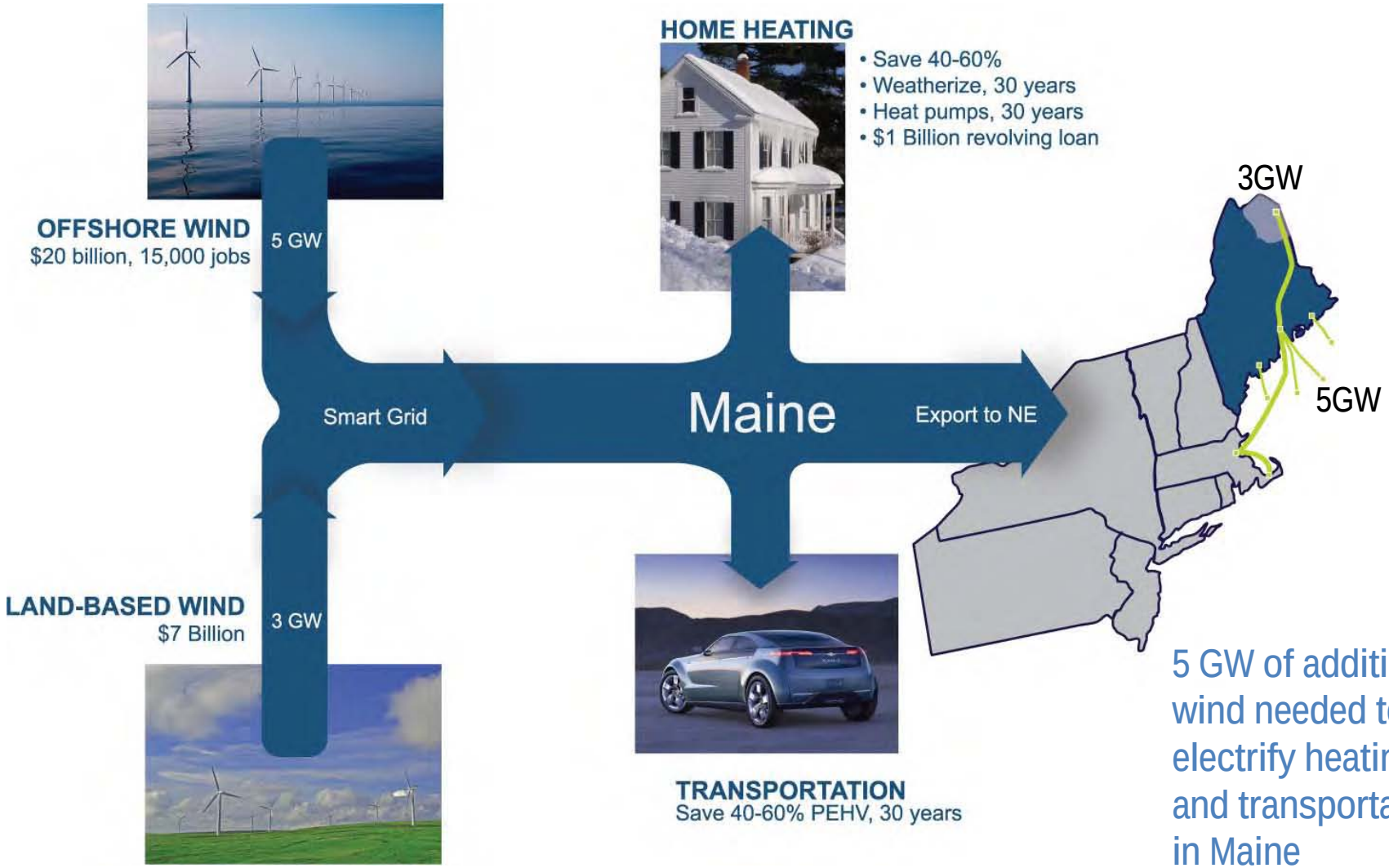
Maine *Deepwater* Wind: Part of the Regional RPS Solution



The Maine Plan:
More than Turning the Lights on!



5 GW of additional wind needed to electrify heating and transportation in Maine

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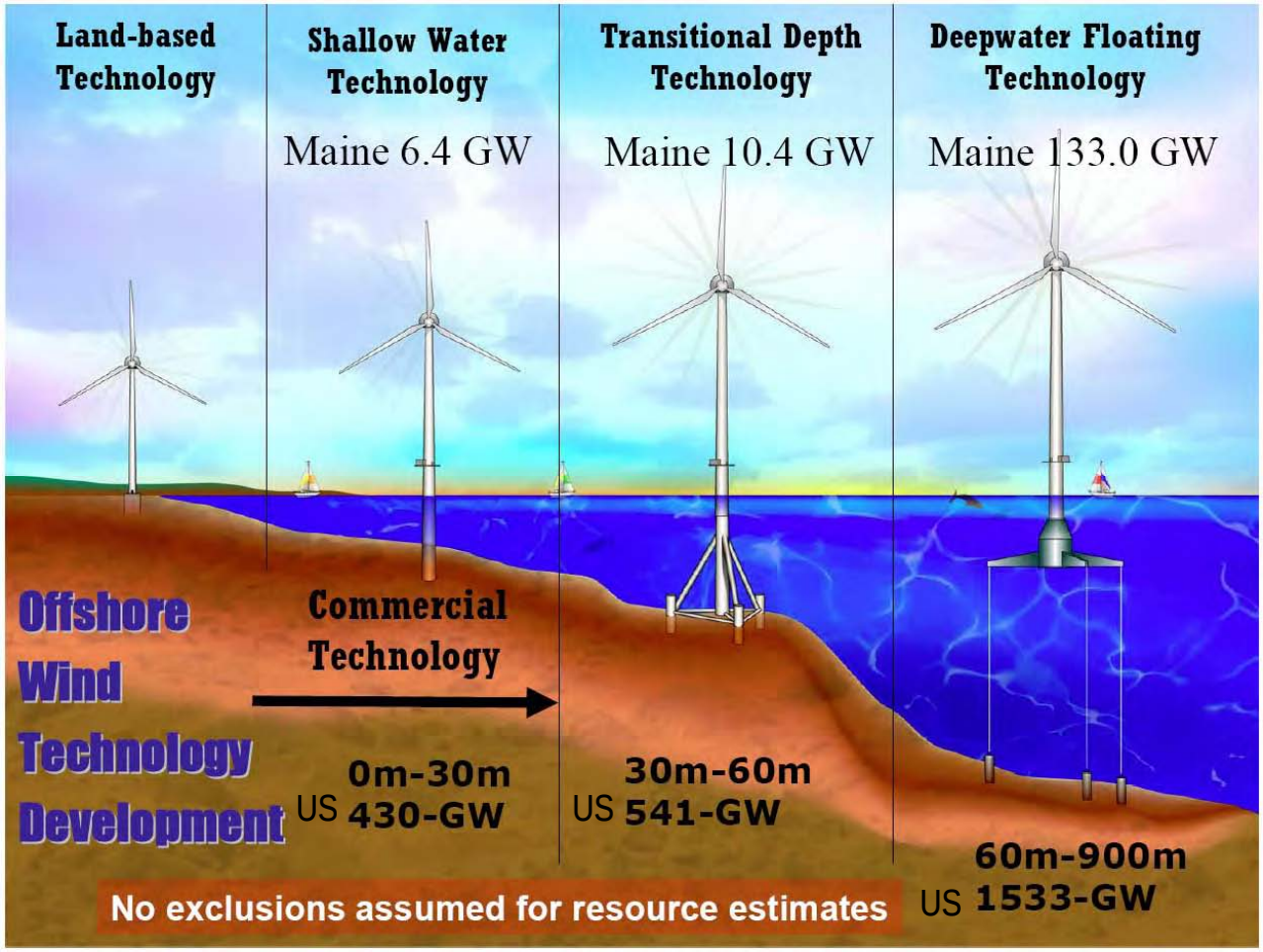
89% of Maine's Offshore Wind is in *Deepwater; Class 6 & 7 Winds*



Source: Walter Musial (NREL, 2008)

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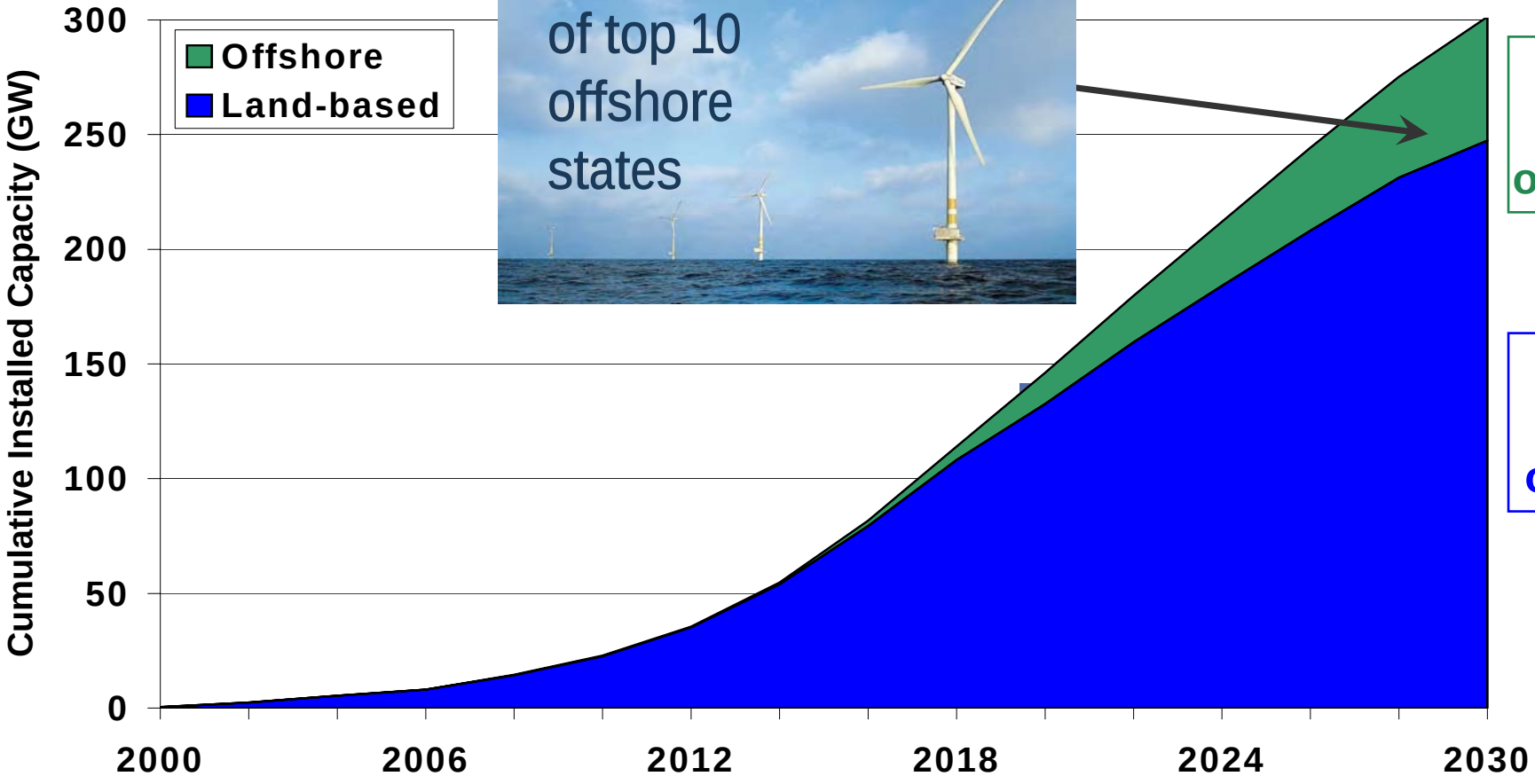
Maine's Role in Meeting U.S. DOE's Plan: "20% Wind Energy by 2030"



53.9 GW offshore

293.4 GW on land

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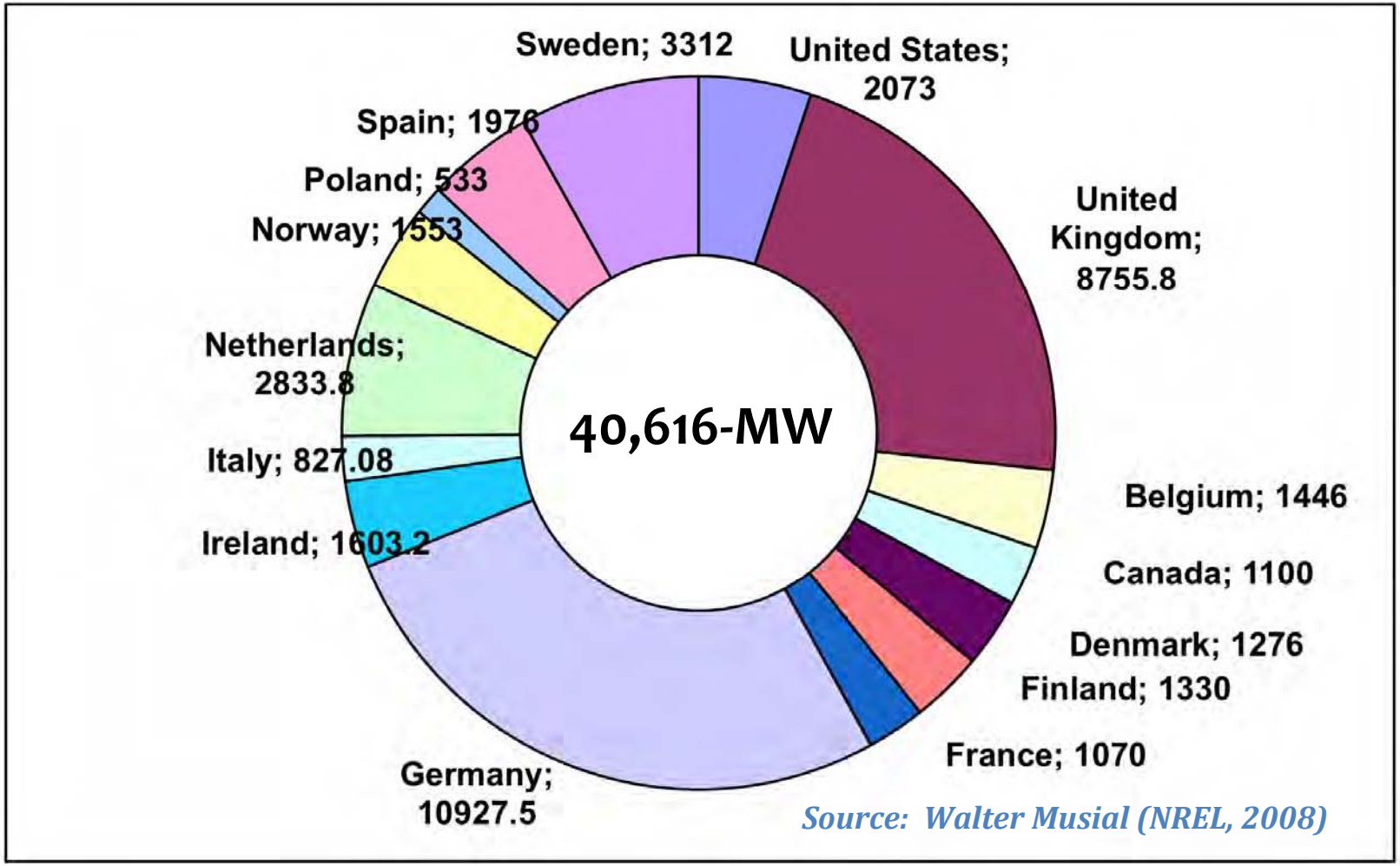
US is Behind:
Offshore Wind Projects Planned by 2015
Europe and North America



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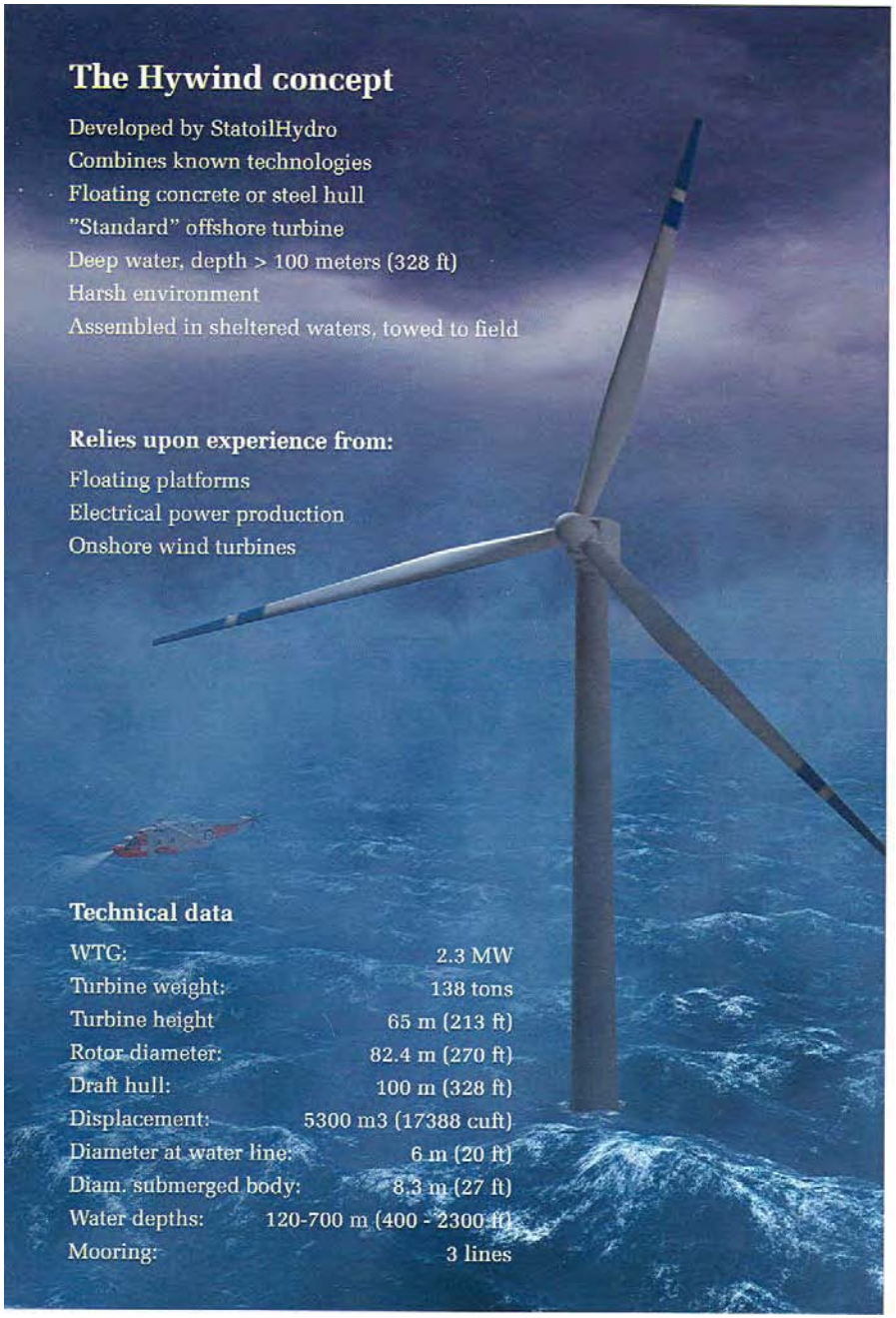
Floating Wind Turbine Testing Ongoing in Norway



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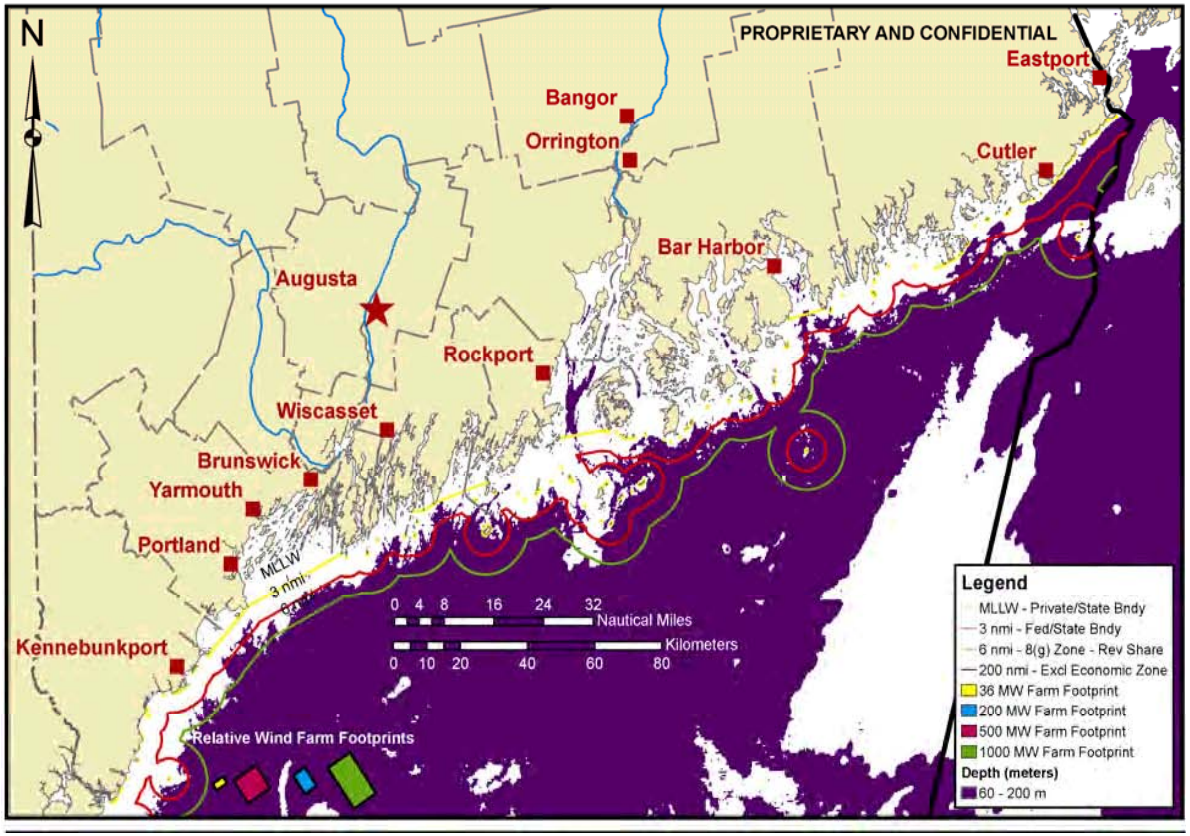
Maine R&D Goal 1(2009-2010): Establish *Deepwater Wind Testbed*

Objectives:

- Evaluate deepwater platform designs in-situ, both scale models and full-size.
- Verify models necessary for design.

Partners:

Testbed open to federal, academic and industrial partners.



Approach: Establish heavily instrumented, highly characterized ocean environment, >60m

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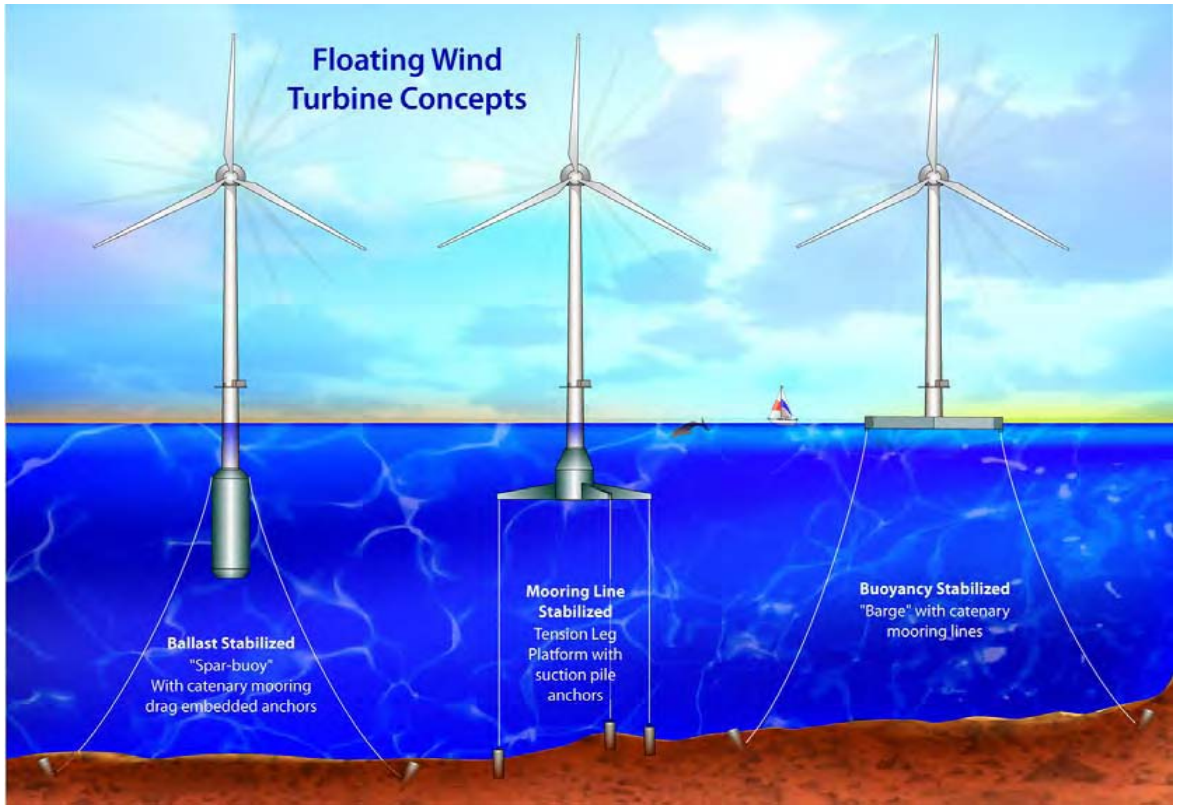
Maine R&D Goal 2 (2010-2014): Test *Deepwater* Wind Turbines

Technical Challenges:

- Predictive models.
- Cost Target ($3.5/W).
- Manufacturability.
- Deployment.
- Durability: corrosion/fatigue.
- Survivability (extreme local events).
- Foundations.
- Optimization for Class 6 and 7 winds.



Approach:

- Start with scale model(s), Laboratory → Testbed
- Use macrocomposites (conventional+advanced materials).

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Maine R&D Goal 3 (2014-2018): First Floating Offshore Wind Farm

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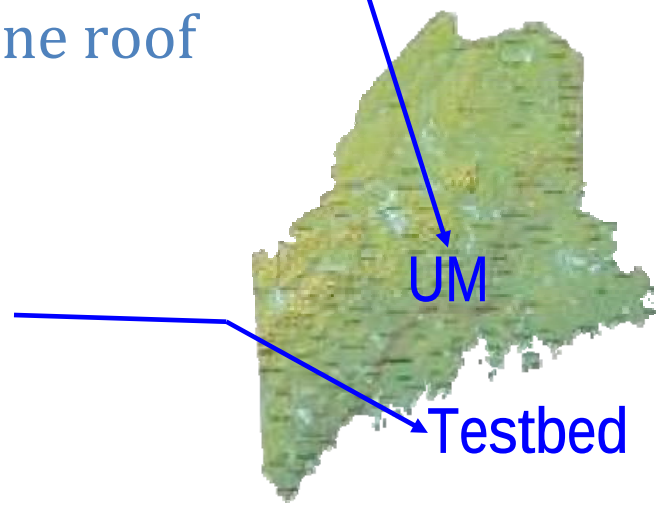
Maine to Invest in *Deepwater* Offshore Wind Research

1. ***Advanced Deepwater Wind Prototyping Center***:
   - Expands UM Advanced Structure and Composites lab to 70,000 ft^2
   - Design, prototype and test under one roof
   - Robotics composites prototyping
   - Nanocomposites
2. ***Deepwater Wind Testbed***



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Economic Opportunities for Maine
5GW = 250 MW/Year over 20 Years

Based on Vestas V90-3MW turbine

- **$1 billion per year over 20 years**
- **Local fab and install (30%) = $300M/year**
- **Local offshore service (2.5% of CI) = $500M/year <u>after</u> built**
- **With 25-year life, project re-powering sustains regional jobs**

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