Carrier Decarbonization and Carbon Tech Summit

Dr. Vanessa Z. Chan, Office of Technology Transitions

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Three Lessons I've Learned

There are three broad lessons I have learned that I would like to use to frame my remarks today:

1. Engage and align the ecosystem…EARLY
2. Always start with deployment…and move backwards
3. If a technology isn't working…call it quits sooner rather than later

OTT's Mission

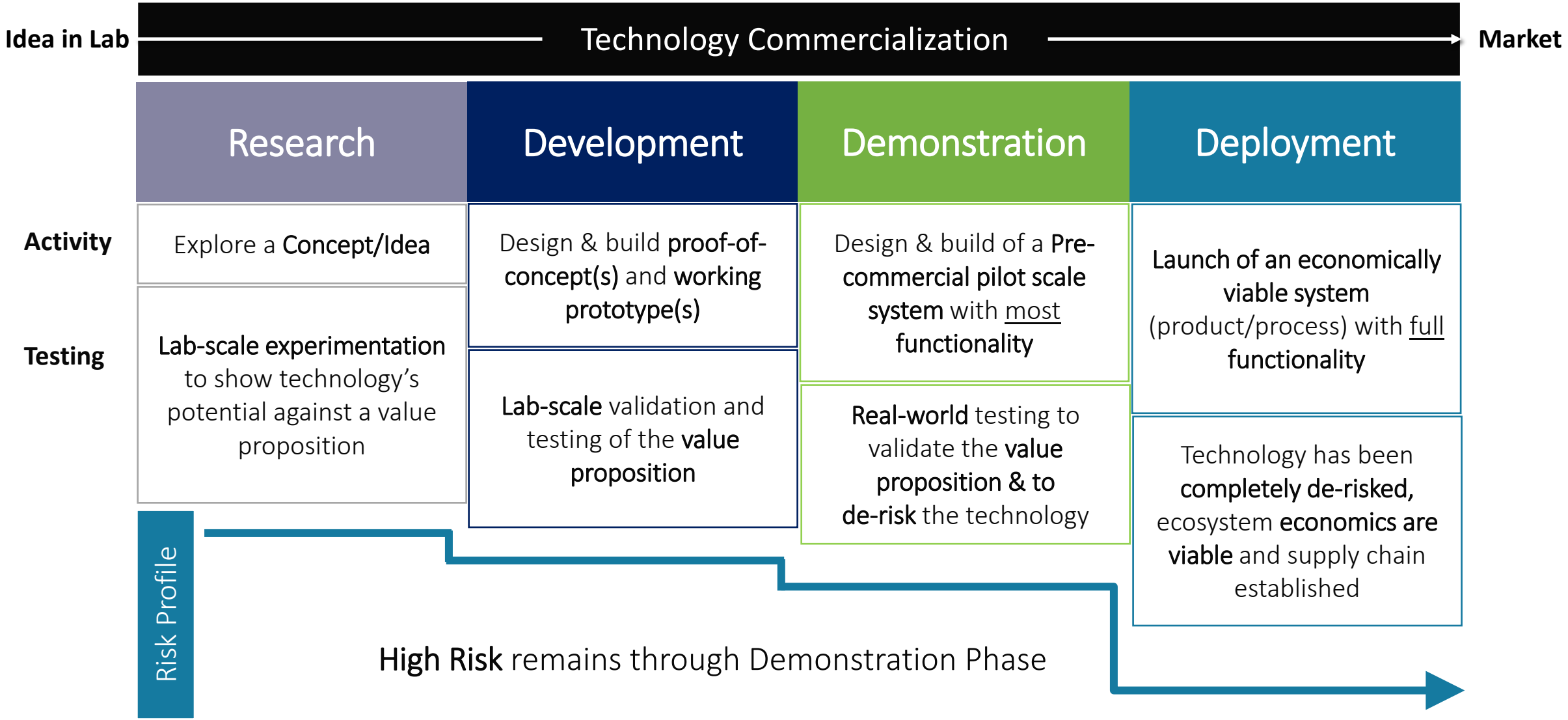
Our statutory (Energy Act 2020) mission is "to expand the commercial impact of the research investments of the Department."

We "oversee delivery of the DOE **strategic goals for technology commercialization** and streamlining access to DOE's national labs to **foster partnerships with the private sector** to **move solutions to market**."

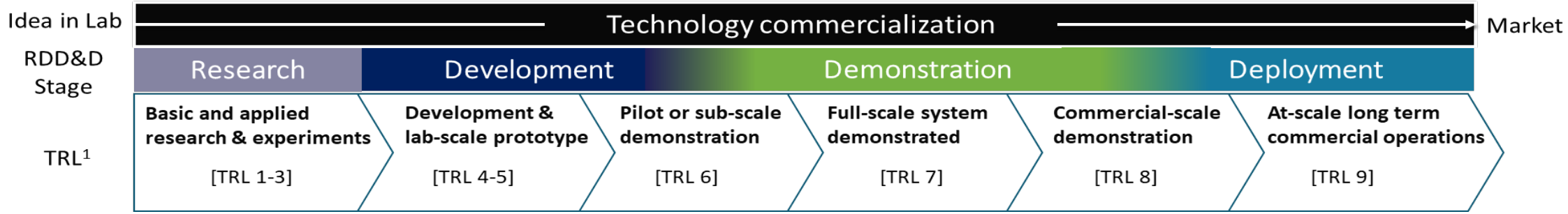
(We also have congressional mandate to report out on tech transfer activities across DOE.)

OTT stewards commercialization programs across the Department and labs.

In the DOE context, that means moving across the RDD&D continuum



Game-stopping barriers exist in DOE that must be overcome to drive commercial impact



1. Capabilities

- PhDs trained to be technology push – no formal training in "commercial impact"
- Market risk not consistently assessed/ managed to drive projects towards deployment

2. Capital

- Funding challenges across continuum
  - NLs - prototyping (especially when not aligned to applied program priorities)
  - Universally, for all stages of demonstration & first in kind deployment

3. Collaboration

- External entities tend to have more "one-off" contracts versus "strategic" partnerships with NLs
- No mandates or funding mechanisms to encourage researchers to engage with external community

4. Culture

- NLs emphasize papers vs commercialization outcomes: not driven primarily "deployable" R&D
- Cultural concerns that demonstrations are "risky"

5. Contracting

- Internal & external (private companies, other federal agencies), find it challenging to negotiate with DOE
- Contracting mechanisms are very cumbersome

Building Technologies Office

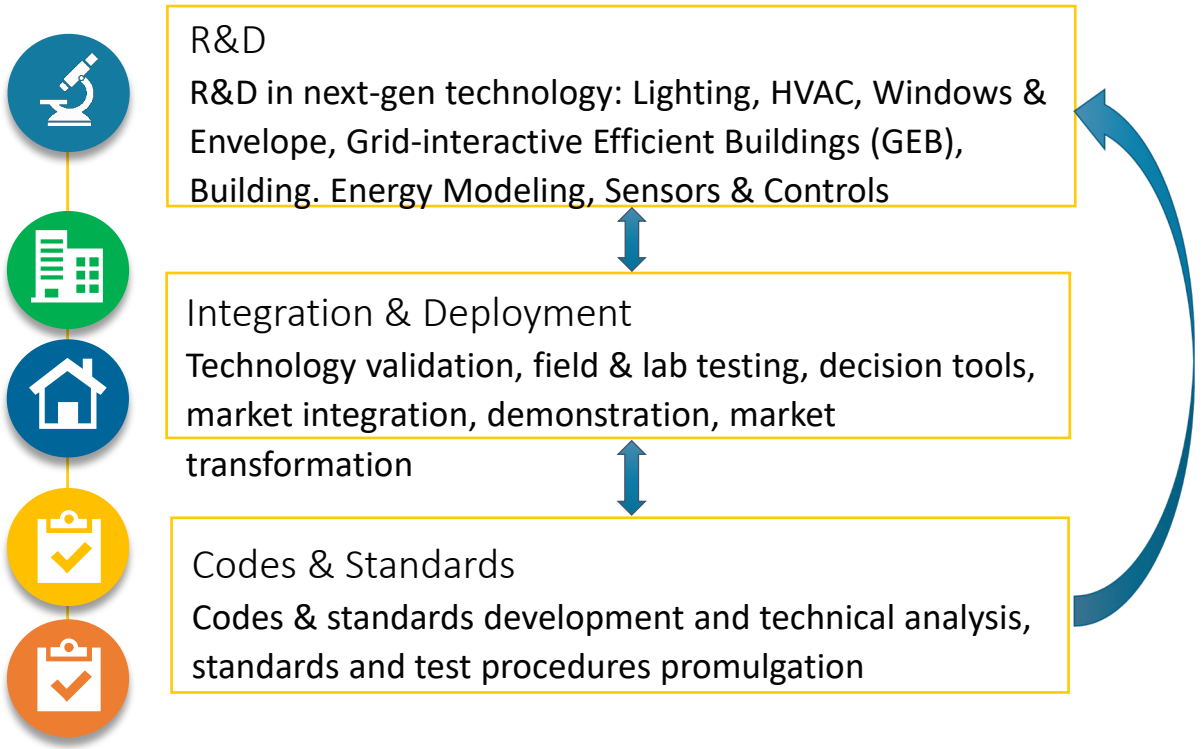
BTO Mission

Develop, demonstrate and accelerate the adoption of cost-effective technologies, techniques, tools and services that enable high-performing, energy-efficient and demand-flexible residential and commercial buildings in both the new & existing buildings markets in support of an **equitable** transition to a **decarbonized energy system by 2050**, starting with a decarbonized power sector by 2035.

(FY21 budget: $290M)

How They Do It

The Building Technologies Office conducts work in three key areas to continually develop innovative, cost-effective, energy-saving solutions: research and development (R&D), market stimulation, and building codes and equipment standards.



BTO Decarbonization Strategy

Opportunities & examples:	Energy Efficiency	Demand Flexibility	Beneficial Electrification	*Results*
RD&D	• Advanced Materials • Advanced Building Construction • Alternative Refrigerants • Non-Refrigerant Systems	• Advanced Controls • Thermal Energy Storage Materials • Communication Protocols	• High-Performance Cold-Climate Heat Pumps • Integrated Heat-Pump Water Heaters	Enabling Technology
Deployment	• Deep Energy Retrofits • Zero Energy (Ready) New Construction	• Integrated Controls & Interoperability • Envelope Upgrades	• Efficient Heat Pumps • Electric Cooking • Building Codes	Highlight the Ceiling
Cross-cutting	Codes & Standards, Utility Programs, Partnerships, Technology Campaigns, Consumer Awareness, Workforce, Lead by Example, Financing			**Raise the Floor**

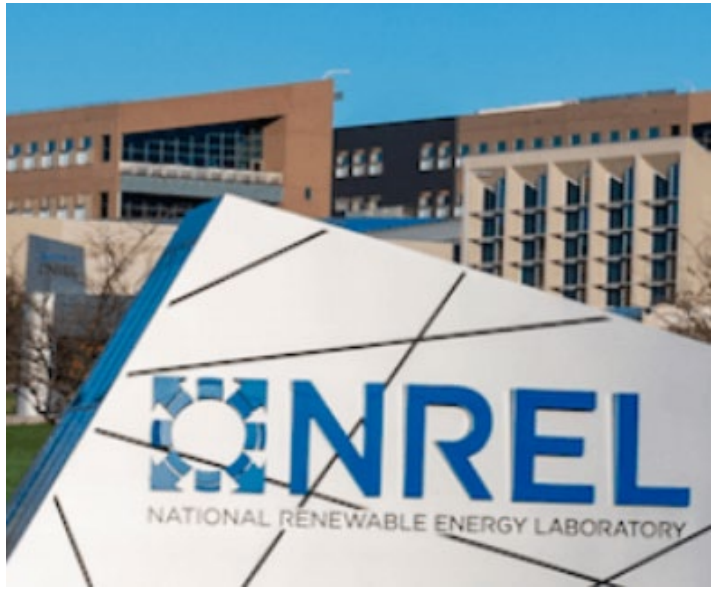
Potential

Decarbonization	3	2	3
Energy Savings	3	1	2
Consumer Savings	3	2	1
Renewables Integration	1	3	2
Employment	3	1	2

Success Stories: HVAC

HVAC Success Story: NETenergy executes exclusive license to commercialize thermal energy storage technology developed by the National Renewable Energy Laboratory

Project Partners: NETenergy



Innovation: Researchers at the U.S. Department of Energy's National Renewable Energy Laboratory (NREL) have developed a thermal energy storage (TES) technology using phase-change material for heating ventilation and air-conditioning (HVAC) applications. NREL has granted NETenergy an exclusive field limited license to develop and commercialize a hybrid HVAC-TES system that utilizes NREL's intellectual property. The hybrid HVAC-TES technology commercialization project is a close collaboration effort between NETenergy, NREL, and OEM partners as part of the second cohort of the Wells Fargo Innovation Incubator (IN2) and DOE's Technology Commercialization Fund.

Impact "Thermal energy storage will play a critical role in the ongoing global effort to reduce harmful emissions and accelerate the deployment of clean energy," said NETenergy CEO and founder Said Al-Hallaj. "It has been a great privilege to work with NREL and our OEM partners on this project and we look forward to continuing our collaboration to commercialize the hybrid HVAC-TES technology."

"Onsite thermal energy storage, such as the technology being developed with NETenergy modules, has great potential as an alternative to onsite electric batteries. Building owners are often charged high electrical prices for the use of their air conditioners. This technology can not only lower these costs, but also assist electric utilities to meet demands during hot summer days," said Eric Kozubal, senior researcher at NREL.

"NETenergy was part of the Wells Fargo Innovation Incubator's (IN2) second cohort of companies and has established a strong relationship with NREL," said Trish Cozart IN2 program manager. "This innovative HVAC technology is a shining example of the effectiveness of our tech incubation model, matching startup ideation and expertise with NREL research capability."

Full story can be found at https://www.labpartnering.org/stories/f3054a18-914f-4411-ac42-e8727d6d6749

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