



Demonstration projects unlocking Commercialization

Clean Fuels and Products Shot™ Summit

Session 4: Technology Scaling and Demonstration

April 9, 2024

Olivia Corriere

Portfolio Risk Management

Office of Clean Energy Demonstrations (“OCED”)

U.S. Department of Energy

Commercialization

Progression of a technology from an idea in a lab to full-scale adoption in the market

AGENDA

- Office of Clean Energy Demonstrations (“OCED”) background
- Commercial demonstration projects
- Important factors for private sector investment and uptake + *Adoption Readiness Level* framework
- Role of catalytic capital

OFFICE OF CLEAN ENERGY DEMONSTRATIONS MISSION

Deliver clean energy technology **demonstration projects at scale** in partnership with the **private sector to accelerate deployment, market adoption**, and the **equitable transition** to a decarbonized energy system.”



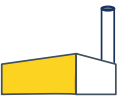
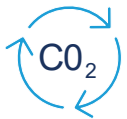
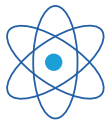
\$90B+

→ **\$25B+**

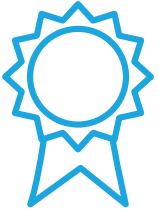
→ **50%**

EARLY INVESTMENTS WILL CATALYZE A COMMERCIAL WAVE

Focused on triggering a wave of private sector financing for commercial deployment of emerging clean energy technologies before the end of the decade.



OCED MANDATE



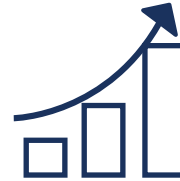
CENTER OF EXCELLENCE

Serve as primary DOE office to deliver full scale clean energy demonstration projects and project management oversight excellence



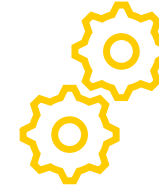
CLEAN ENERGY & EQUITABLE

Help enable 100% clean electricity by 2035 and net zero emissions by 2050 through an equitable energy transition



FOLLOW ON INVESTMENT

Unlock and scale trillion-dollar clean energy follow on investment from the private sector and other sources of capital



DE-RISK TECHNOLOGY

Maintain risk-based, balanced, and defensible portfolio of investments



ENGAGEMENT & OUTREACH

Leverage private sector and broader energy ecosystem to inform OCED and DOE technology commercialization efforts

PRIORITIZING COMMUNITY BENEFITS IN OCED PROJECTS

OCED **requires** applicants to include a Community Benefits Plan to help ensure broadly shared prosperity in the clean energy transition.

By **prioritizing community benefits**, we can ensure the next chapter in America's energy story is marked by greater justice, equity, security, and resilience.

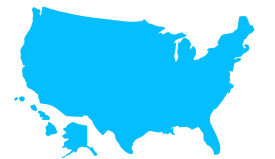
Community & Labor Engagement



Diversity, Equity, Inclusion, & Accessibility



Investing in the American Workforce



Justice40 Initiative



WHAT ARE COMMERCIAL DEMONSTRATIONS?

- One of the first few examples of a new technology being introduced onto a given market **at the size of a full-scale commercial unit**
- Involves far **more time, cost and risk than a prototype**, and **significantly reduces investor risk** for subsequent installations
- Combination of capital requirement and risk places them in the “valley of death”, **a stage when technologies can fail to progress commercially even if they have high market potential**
- There are three main purposes of demonstration projects:

**Prove Technology
is Effective at
Scale**

**Reduce Perceived
Risk for Investors**

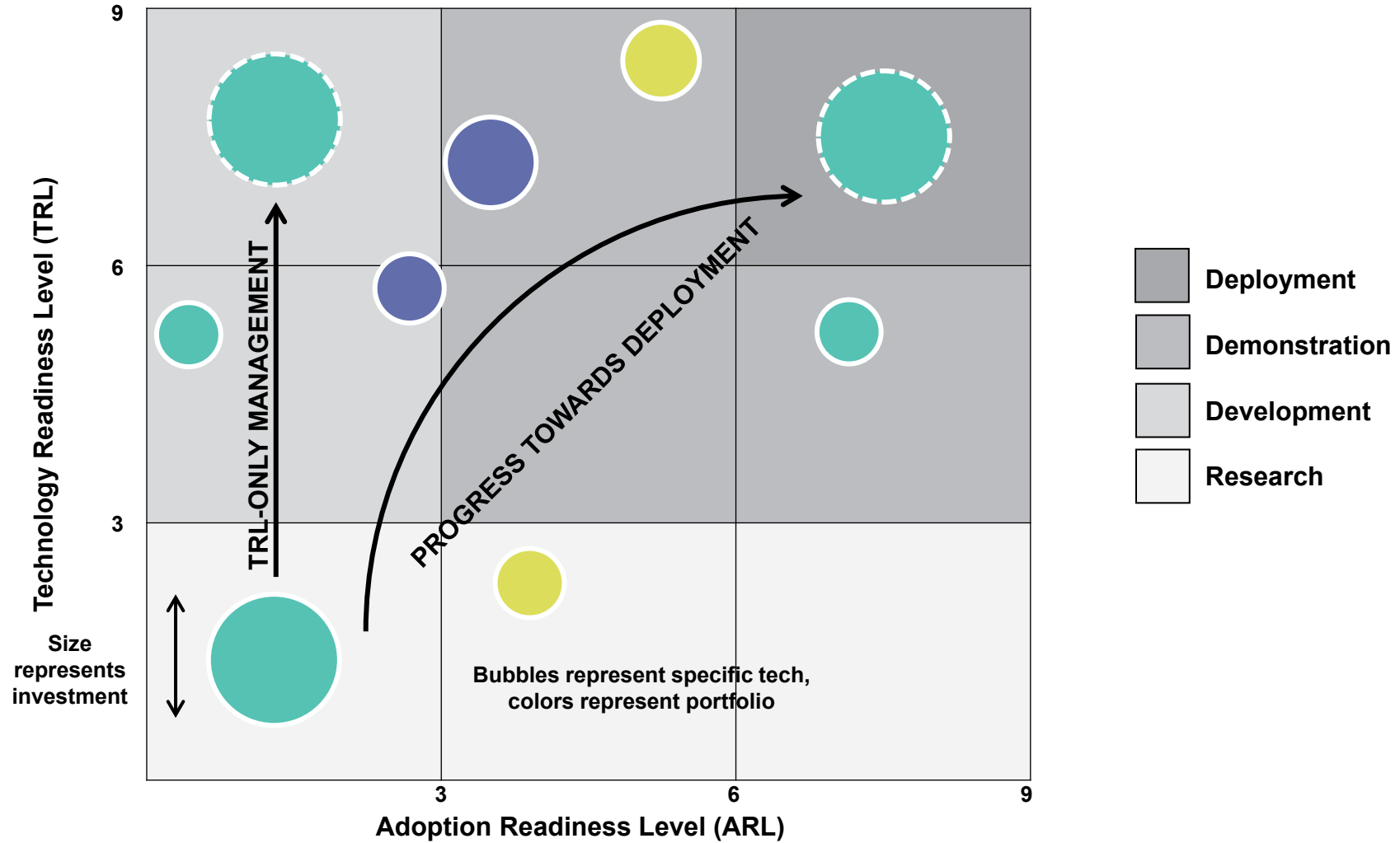
**Inform Market
Actors on Costs
& Deployment
Needs**

ADOPTION READINESS LEVEL – RISK DIMENSIONS¹

<p>Value Proposition</p>	<p>Delivered Cost Cost competitiveness when produced at full-scale (incl. amortization of development and capex, and switching costs)</p>		<p>Functional Performance Performance compared to incumbent solutions or ability to create new end-use materials</p>		<p>Ease of Use / Complexity Operational switching costs, ability of new user to adopt and operationalize the technology with limited training, requirements or special resources</p>	
<p>Market Acceptance</p>	<p>Demand Maturity/ Market Openness Demand certainty and access to sales & contracting and natural / structural barriers to entry (network effects, first-mover advantages, existing monopolies)</p>		<p>Market Size Overall size and certainty of market that can be served by the technology</p>		<p>Downstream Value Chain Projected path to get product from producer to customer along the value chain</p>	
<p>Resource Maturity</p>	<p>Capital Flow Availability of capital needed to get to production at scale (\$ # investors, insurance, speed)</p>	<p>Project Development Processes and capabilities to successfully and repeatedly execute projects</p>	<p>Infrastructure Large-scale systems needed to facilitate deployment at scale (pipelines, transmission lines, roads)</p>	<p>Manufacturing & Supply Chain Entities or processes to get to end product (integrators, component manufacturers)</p>	<p>Materials Sourcing Availability of critical materials required (rare earth minerals)</p>	<p>Workforce Human capital and capabilities required to design, produce, install, maintain, and operate at scale</p>
<p>License to Operate</p>	<p>Regulatory Regulations, requirements/ standards that must be met to deploy at scale</p>	<p>Policy Environment Policy actions that can support or hinder adoption at scale</p>	<p>Permitting & Siting Process to secure approvals to site and build equipment/ infrastructure</p>	<p>Environmental & Safety Hazardous side effects or adverse events caused by the solution</p>	<p>Community Perception Perception by communities of the solution and its risks / impact</p>	

¹ Version as of March 2023. Now available at: <https://energy.gov/technologytransitions/ar>

TRLS + ARLS CAN BE USED TO TRACK PROGRESS AGAINST RDD&D



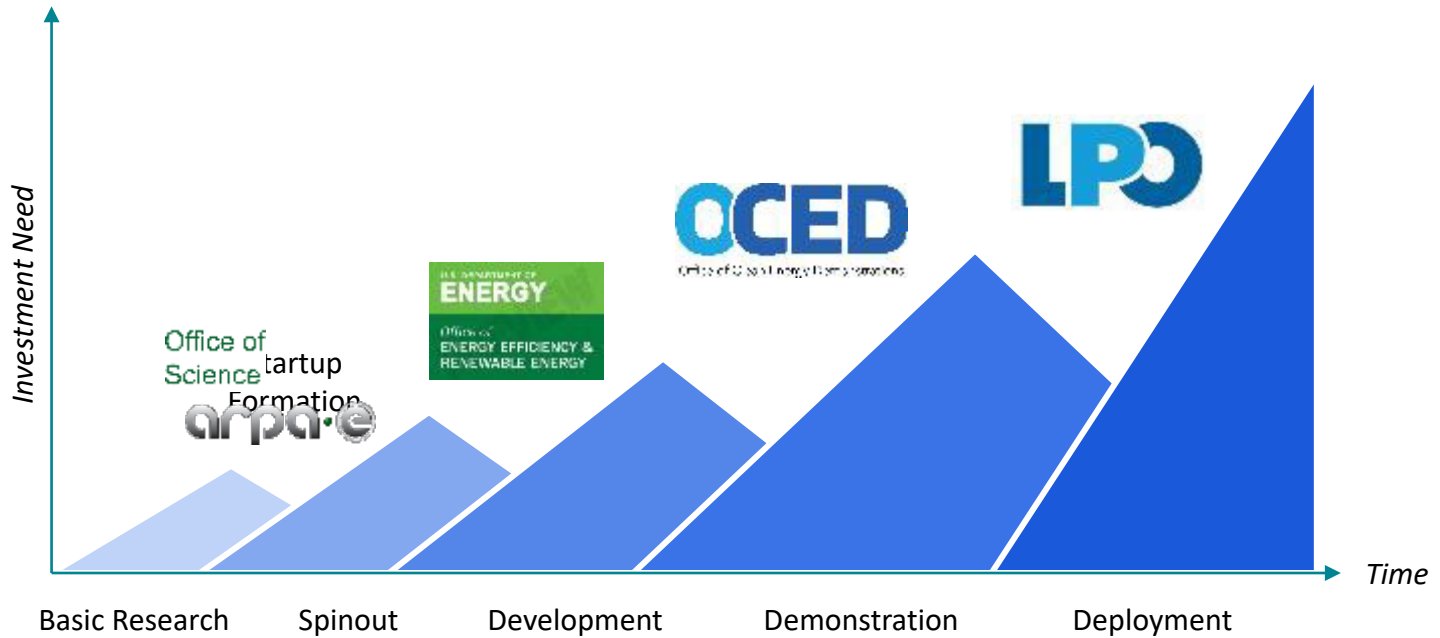
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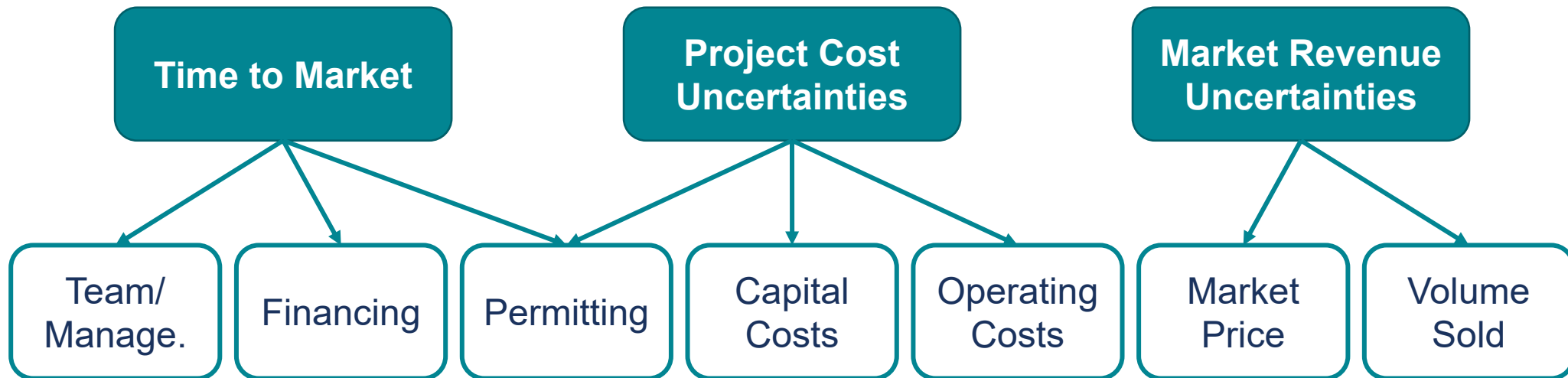
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COMMERCIALIZATION IN ENERGY IS REALLY HARD

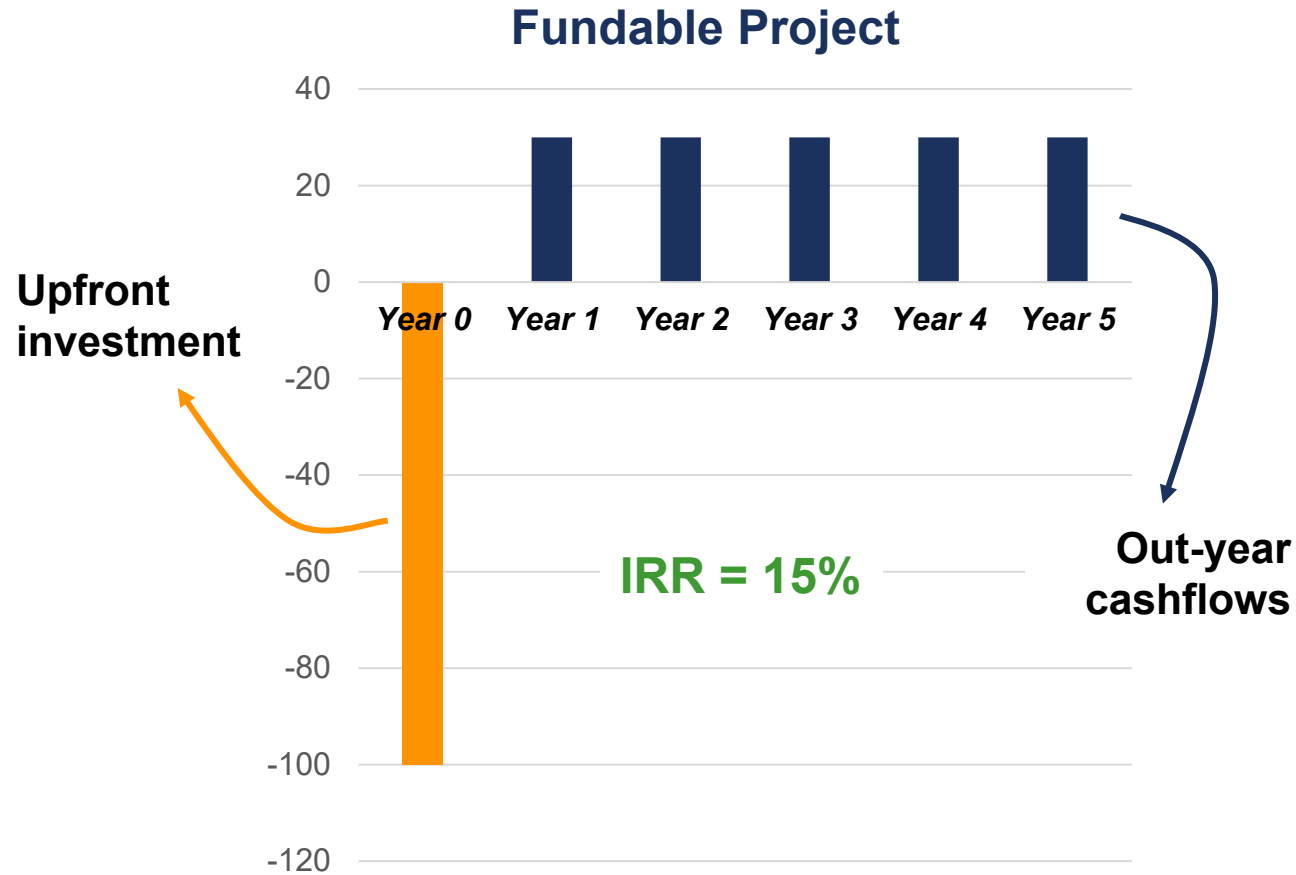
~~DOE Office generally has programs in place to address these capital inequities to overcome the private capital~~



WHAT IS SO TRICKY ABOUT THESE PROJECT INVESTMENTS?



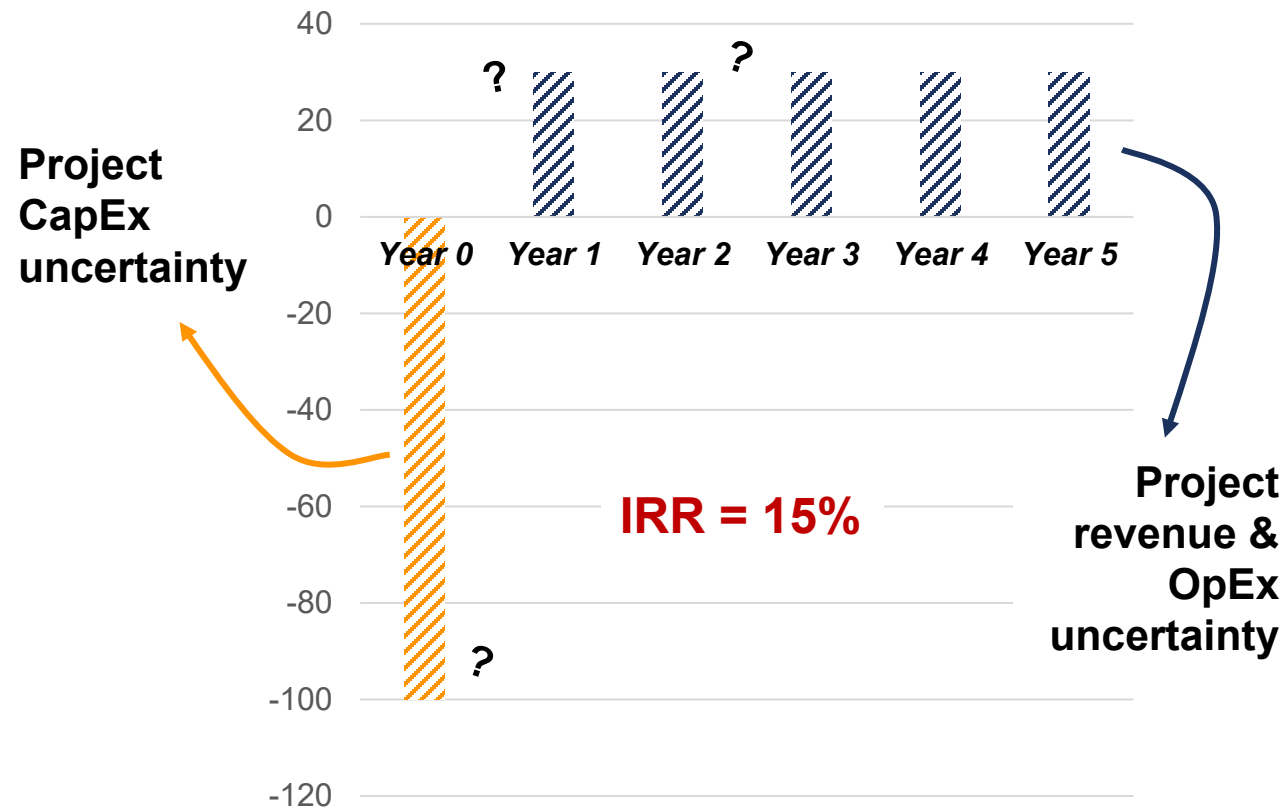
A TYPICAL PROJECT IN A KNOWN SECTOR WILL PENCIL



- ✓ **Costs are well characterized:**
dozens or hundreds of installations worth of data
- ✓ **Performance is well characterized:**
years of operating data from previous installations
- ✓ **Revenues are well characterized:**
known market with contracted offtake or active hedging instruments

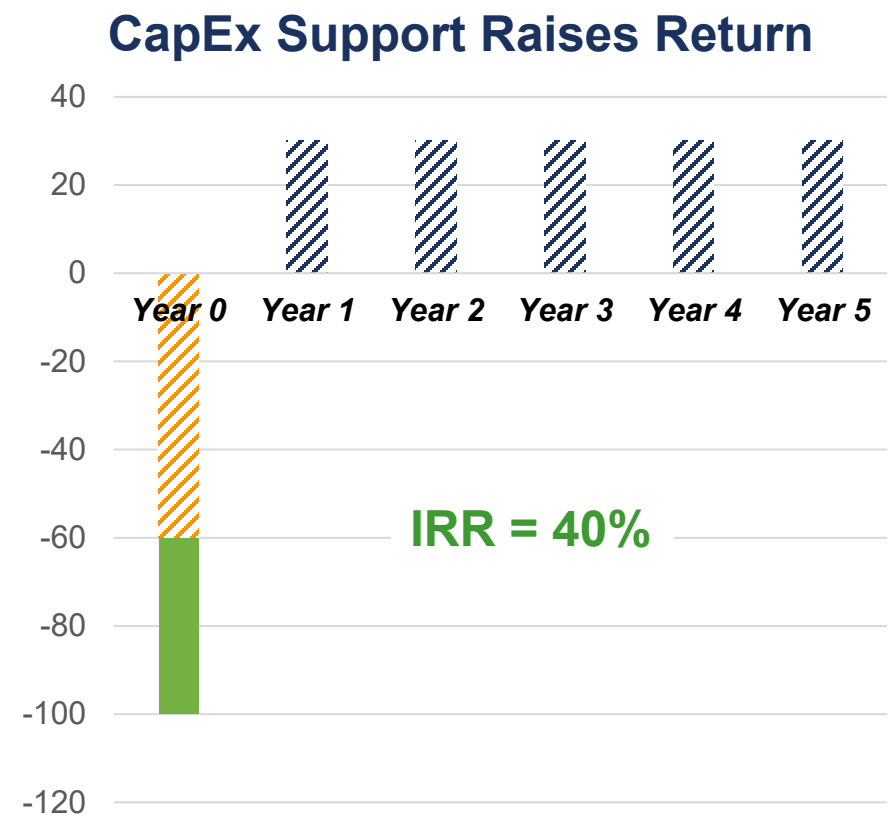
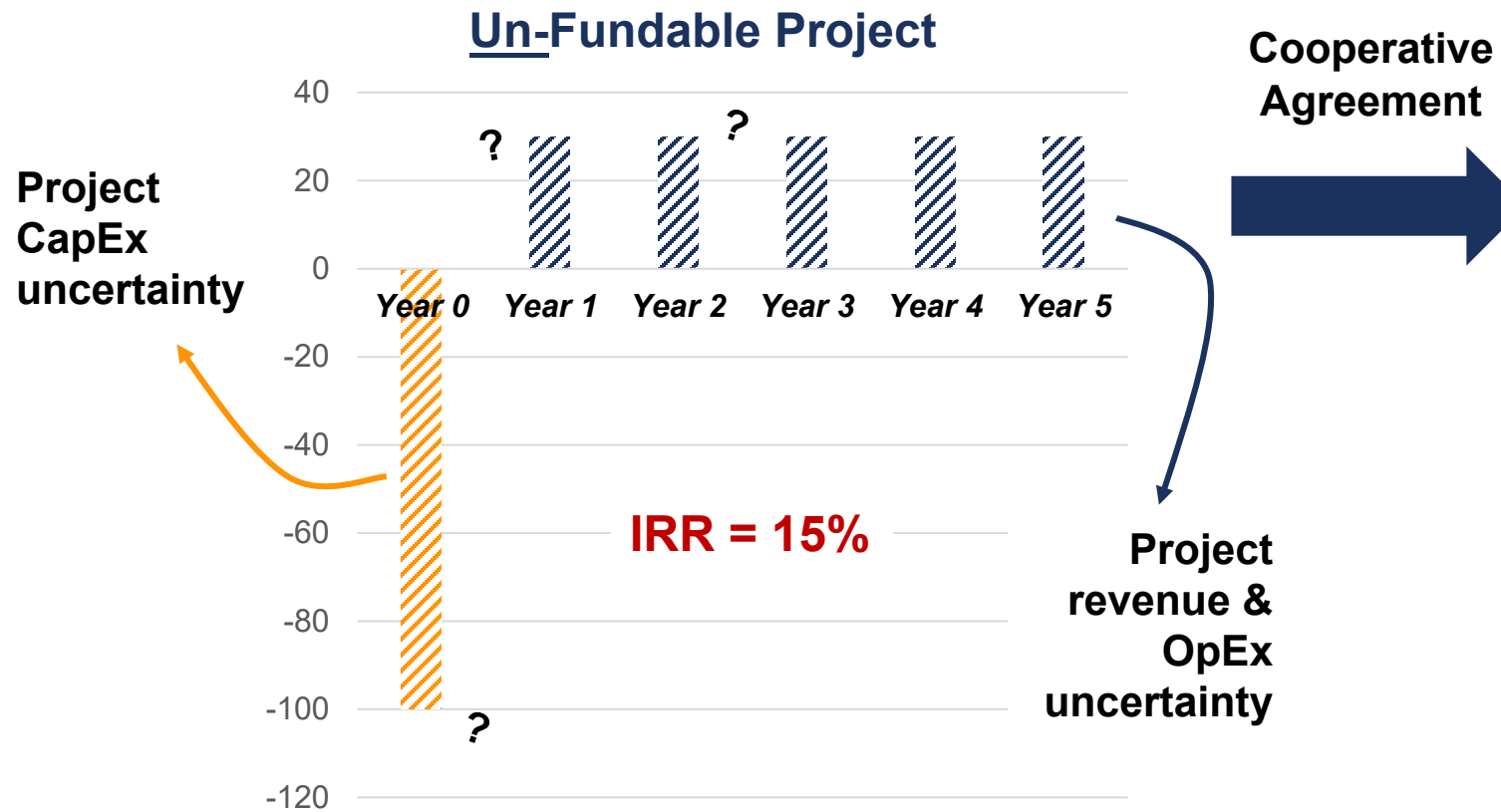
A TYPICAL PROJECT IN AN OCED SECTOR MIGHT NOT

Un-Fundable Project



- ? Capital costs are uncertain
- ? Tech performance is uncertain
- ? Revenues are uncertain

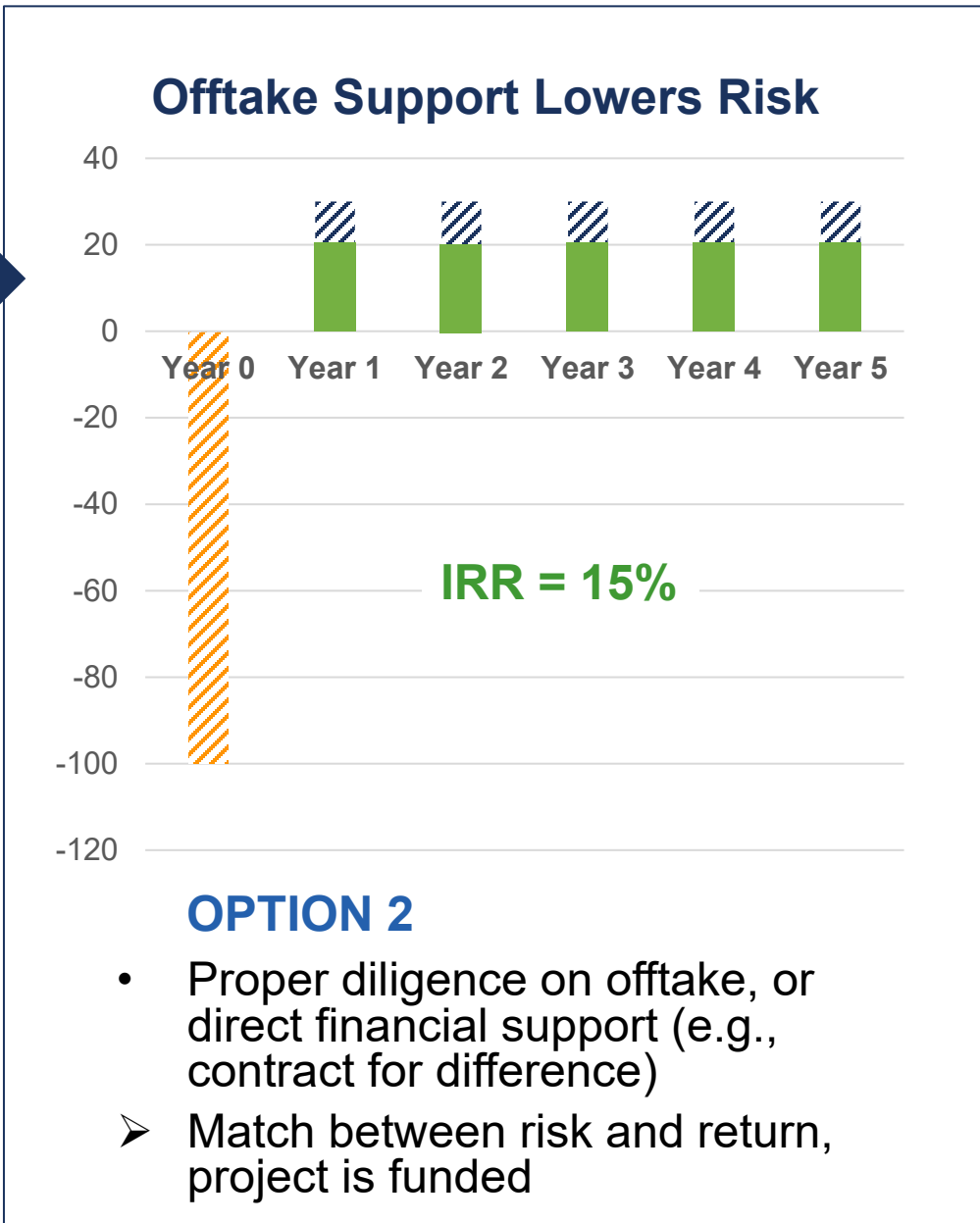
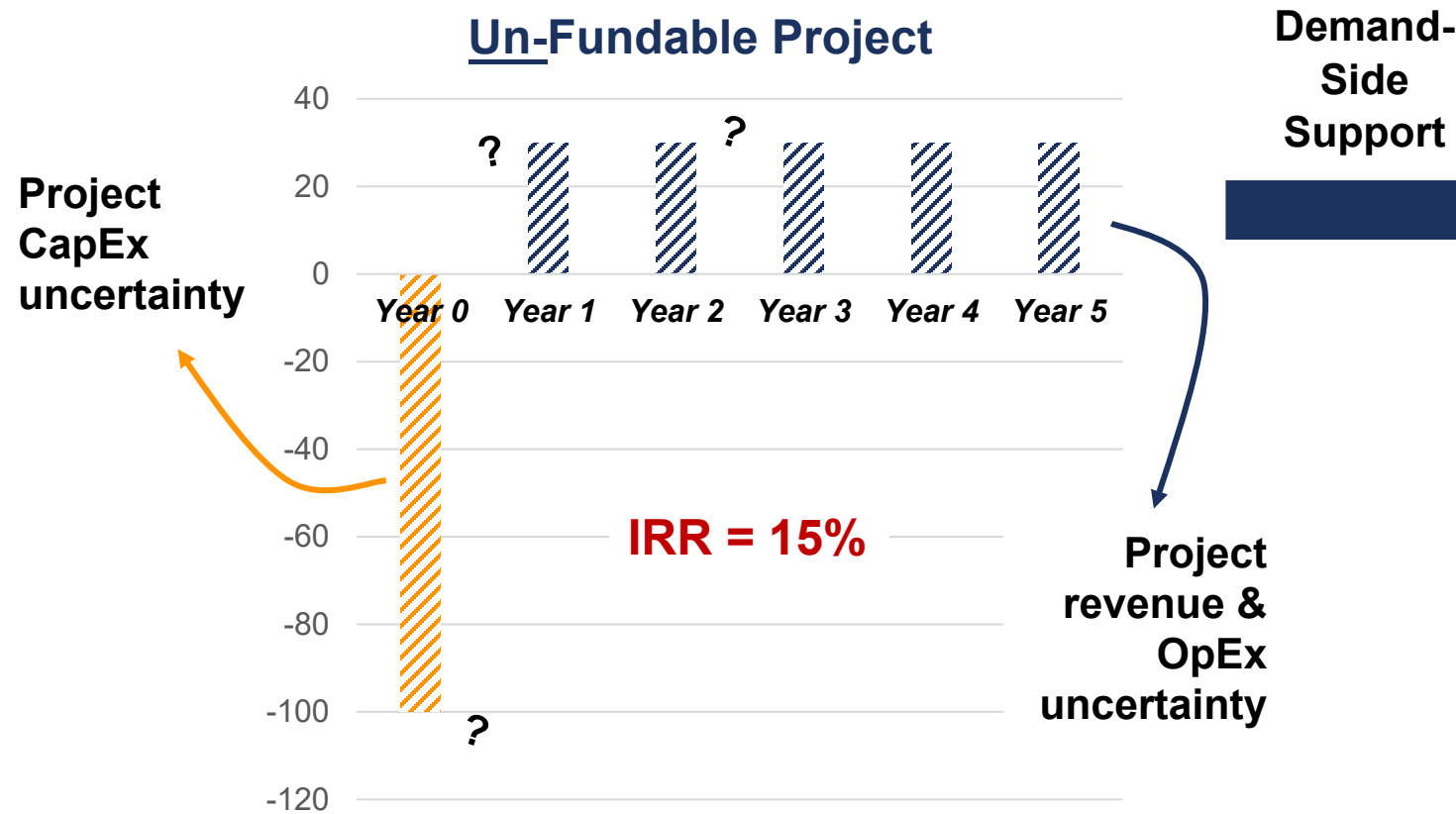
CATALYTIC CAPITAL CAN TAKE MANY FORMS



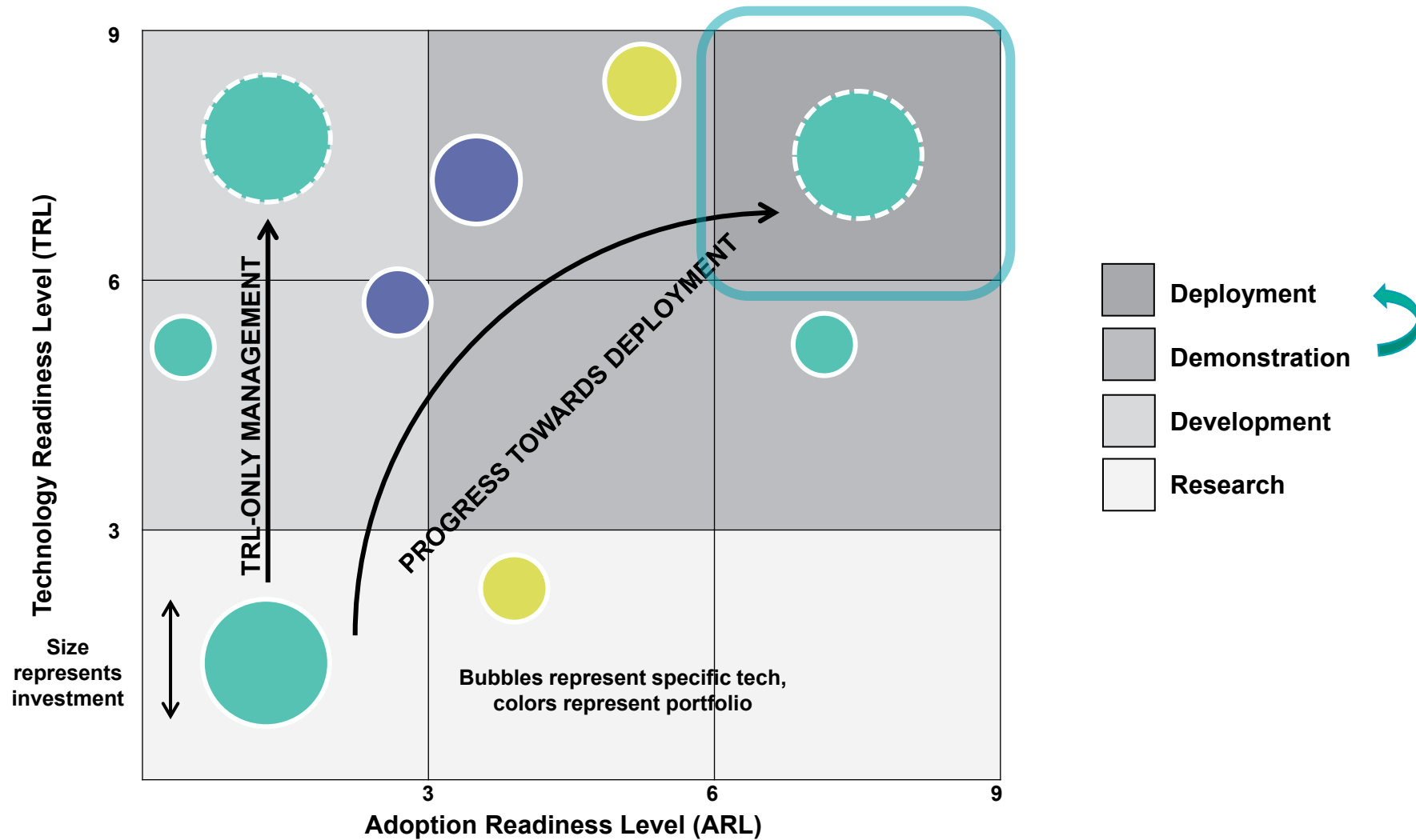
OPTION 1

- Providing up to 50% of the capital costs increases the calculated return
- Match between risk and return, project is funded

CATALYTIC CAPITAL CAN TAKE MANY FORMS



TRLS + ARLS CAN BE USED TO TRACK PROGRESS AGAINST RDD&D





Clean Fuels
& Products™

Thank you!

OCED Credo

T **Transparency**

Ensure fairness, clarity, and candor throughout the lifecycle of the demonstration projects

R **Replicability**

Enable private sector replicability, feasibility, and deployment through technical, financial, commercial, and human capital

U **Urgency**

Accelerate timeline to unleash private sector clean energy investment to meet U.S. net-zero goals

S **Shared Success**

Ensure OCED and its private sector partners are fully aligned to achieve win-win equitable outcome

T **Timeliness**

Commit to crisp decision-making to severely limit project delays

