



# Project Financing Considerations for LDES

California Energy Commission Long  
Duration Energy Storage Systems Workshop

Michael Fisher, PhD  
Director, Valuation Services  
Ascend Analytics

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# Ascend Analytics Supports \$Billions in Project Financing Annually

- Independent valuations for the developer-side and finance-side of stand-alone and renewable-paired storage projects
- Live bidding of storage projects in wholesale energy markets

## Facts-at-a-Glance 2019-Present

**~45**  
GW  
Merchant finance supported

**~46**  
\$Bn  
Value of current independent economic assessments

**~26**  
Operating Sites in four ISOs with more coming online in 2025

## Seller-side References

 BayWa re.

 edf  
renewables

 Clearway

CapitalDynamics 

RECURRENT  
ENERGY

Algonquin

 AREVON

 TERRA-GEN

 AVANTUS

GLIDEPATH

ABLE GRID

esVOLT

STRATA  
SOLAR  
DEVELOPMENT

## Finance-side References

 UBS

Goldman  
Sachs

Morgan  
Stanley

CIT  
Bank

WELLS  
FARGO

 citi

KeyBank 

 Partners Group  
REALIZING POTENTIAL IN PRIVATE MARKETS

Deutsche Bank 

 Hana Financial

CORDELIO  
POWER

GUGGENHEIM

# Agenda

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- What is project finance?
- Where does project finance sit within the project development lifecycle?
- What are the motivations of each of the key players?
- How is risk analysis handled within project finance?



Financiers are very focused on avoiding projects hiding sticks of dynamite

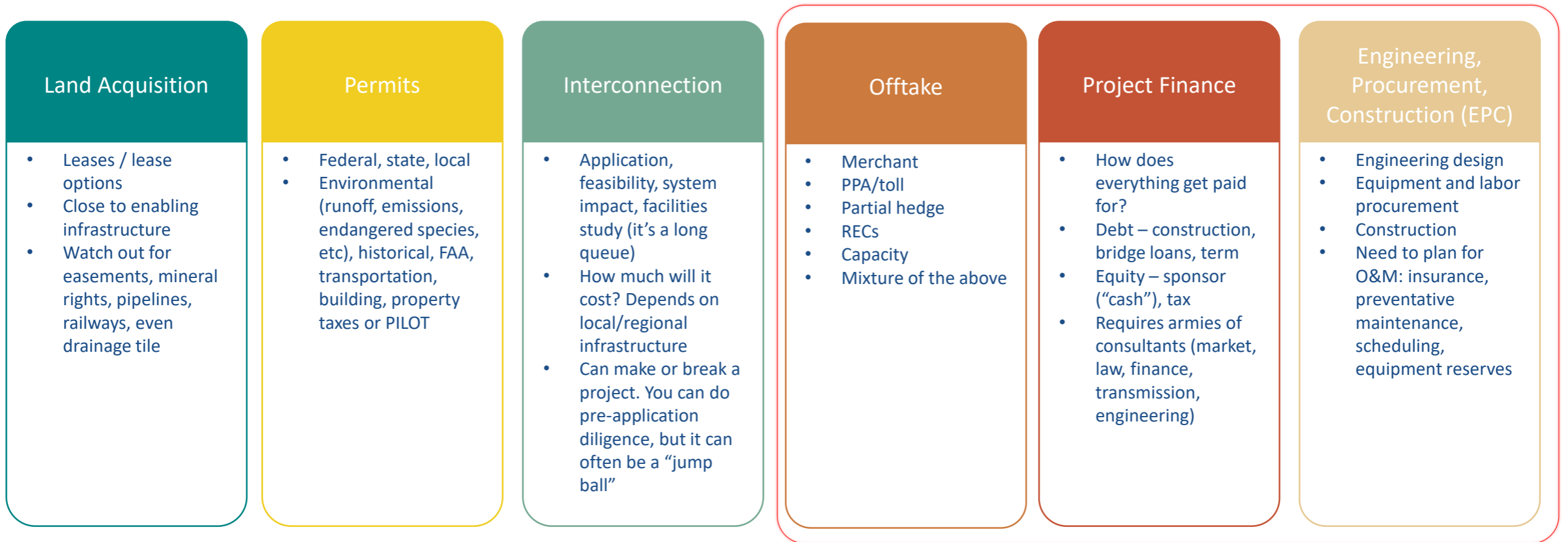
# What is Project Finance?

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- It is employed when independent power producers want to reduce the cost of private capital required to fund a project.
- Project financing is generally **non-recourse**: it is tied to the cash flows and assets of that project only. Aggrieved parties cannot go after the assets of affiliated or parent entities.
- Without the support of more credit-worthy entities to provide a backstop for project cash flows, equity and debt holders must be keenly aware of the particular **RISKS** of a given project so they can understand their likelihood of getting paid back.
  - Construction – is the project going to be built well and function correctly?
  - Technology – is the chosen technology going to perform to expectations in the long-run?
  - Market – how exposed are the project cash flows to uncertain market forces (e.g., fuel costs, energy and capacity prices)?
  - Regulatory – are there regulatory movements that could change how the project operates or shift the competitive landscape?
  - Financing – how will interest rates evolve?
- Financing entities will typically form investment committees for senior decision makers to make yes/no/contingent decisions.

Financiers are focused on return vs risk.

# Project Development – Where Does Project Finance Fit In?

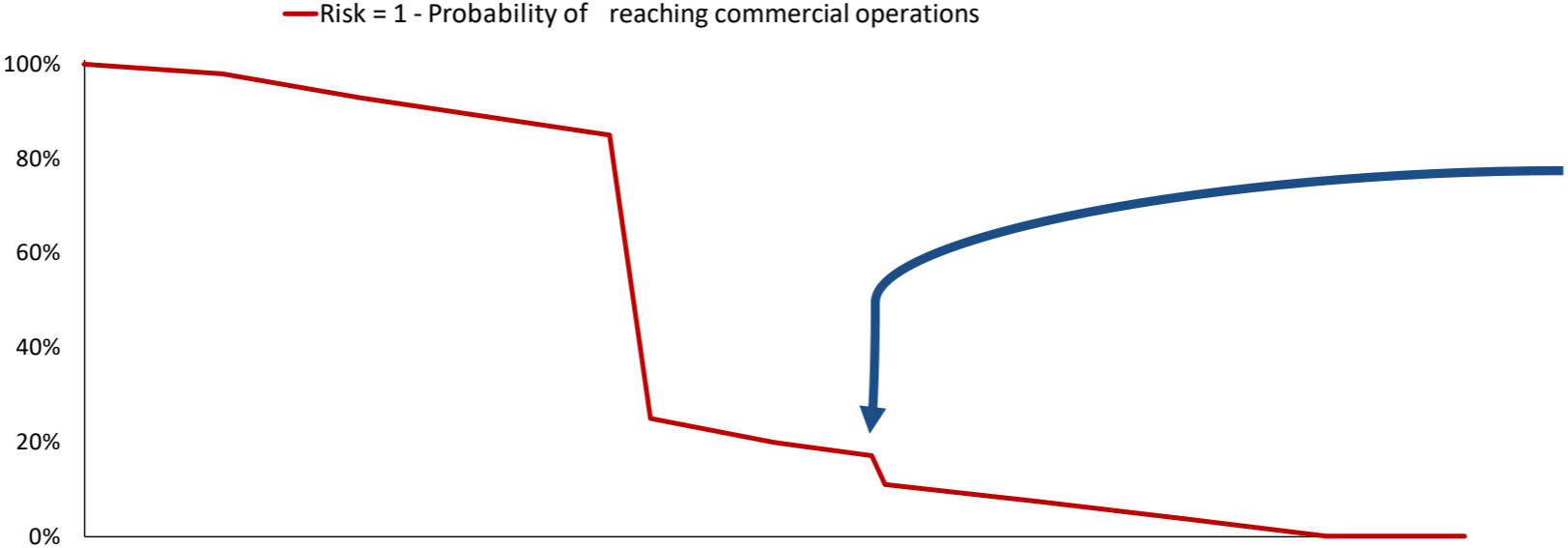


Note: Stages are roughly in order, but there is a fair degree of overlap between stages of development. E.g, Offtake might be negotiated before all permitting/interconnection is completed; some engineering work is required before permits and interconnection.

Once you get here

Your remaining **RISK** is mostly here

# Project Development Risk Evolution

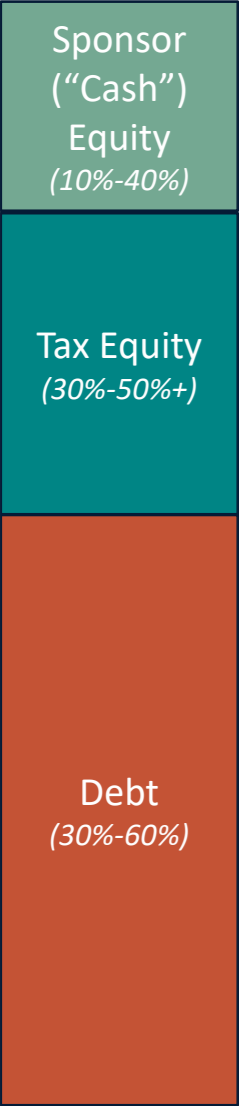


**Financial Closing happens roughly here, after you've eliminated early development risk.**



# Different Sources of Capital Serve Different Roles

## “Average” Project Capital Stack



**Tax Equity**  
*8-10% return*

**What is it?**

- Entity owns right to tax benefits of a project (depreciation + credits)

**How does it work?**

- Tax equity partnership diverts tax benefits to one entity, and cash flow to another. Often tax equity is at the top of the income waterfall

**Why is it useful?**

- Allows entities with little tax liability (developers) to monetize tax credits by offloading those benefits in return for a capital injection

**What is their primary concern**

- The **risk** of recapture, which can happen under certain conditions like project bankruptcy

**Sponsor (“Cash”) Equity**  
*10-20% return req.*

**What is it?**

- Ownership interest in a project. Like the equity in a house that has a mortgage.

**How does it work?**

- Equity gets paid last, but excess returns flow to equity

**Why is it useful?**

- Allows control of a project (within limits)
- Most of project risk, and therefore project returns fall to the equity holder.

**What is their primary concern**

- Minimizing equity check size by maximizing cheaper sources of capital (debt + tax equity).
- Maintaining upside on returns

Debt can be “backlevered” – it is not debt to the project, but to the sponsor equity returns.

**Debt**  
*6-8% return*

**What is it?**

- A loan provided by a financial entity at fixed or indexed interest rate

**How does it work?**

- Debt typically gets paid back before equity (but not always tax equity)

**Why is it useful?**

- Debt has a lower required rate of return than equity, so mixing in some proportion of debt lowers the overall cost to finance a project.

**What is their primary concern**

- The **risk** of not getting paid

# A Revolution in Tax Equity: Transferability

- Traditional tax equity was only for the top tier of energy projects
  - Limited supply: traditionally supplied by a few large banks that had the sophistication and tax liability to deal with a complex legal framework
  - Complication: high burden of diligence and structuring. Expense to go through with tax equity meant that only the biggest deals would go this route.
- IRA introduces “transferability” provision. Greatly reduces complexity burden by allowing a project owner to sell the credits.
  - Pool of tax capital has expanded to corporations and syndicates that are looking to make safe investments at premium returns. Market has roughly doubled from \$20B to \$40B and climbing.
  - Transaction cost and complexity has been reduced without the need for complicated tax equity partnerships.

## Illustrative Transferability Transaction

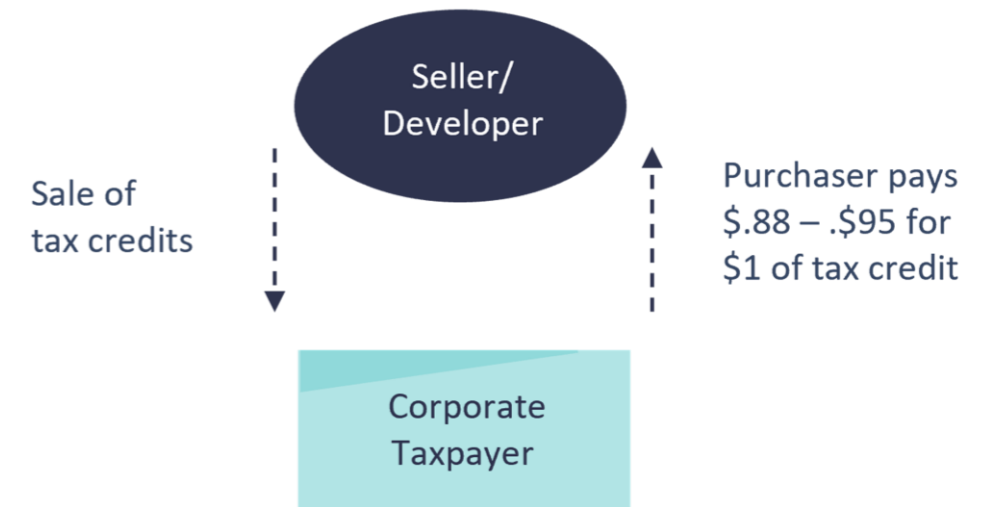


Image credit: CLAconnect.com

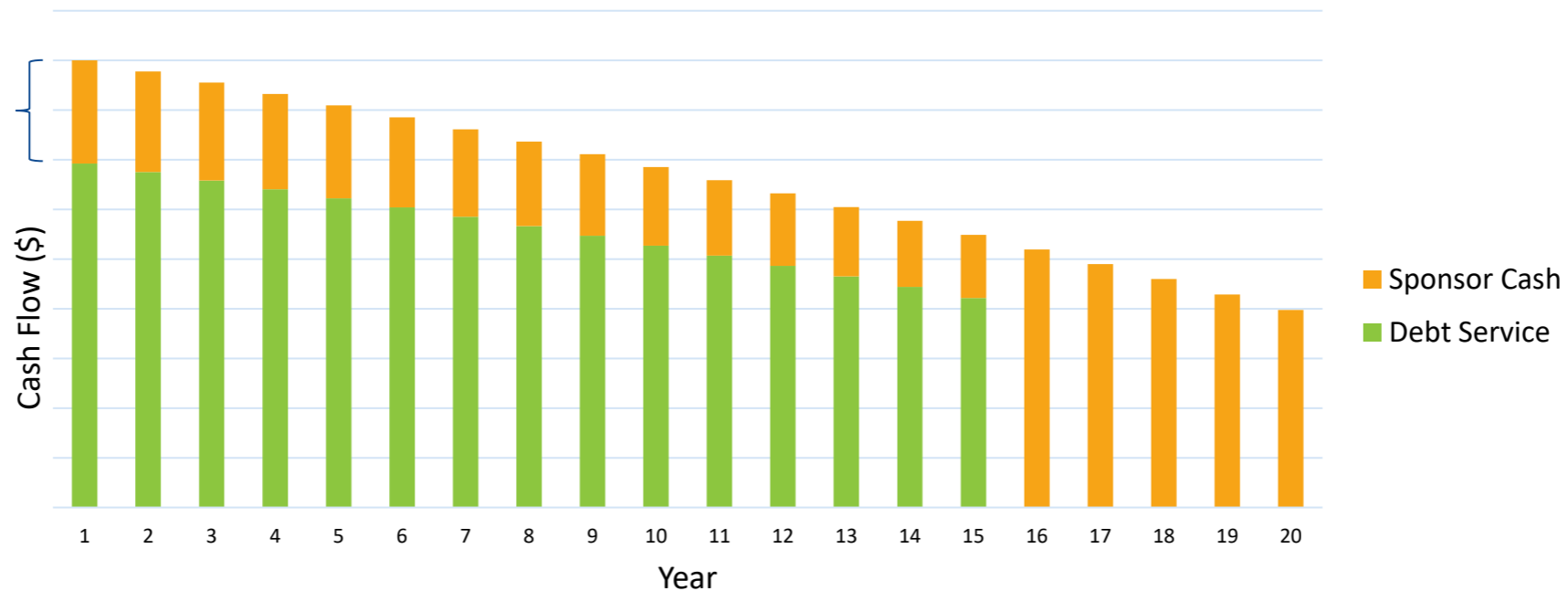
*The IRA has expanded the amount of tax equity in the market by ~2x (and counting). Big and small deals can now access this market. Price differences still remain across technologies, credit types, deal size, tax years, and developer quality.*



# How Debt Deals With Risk

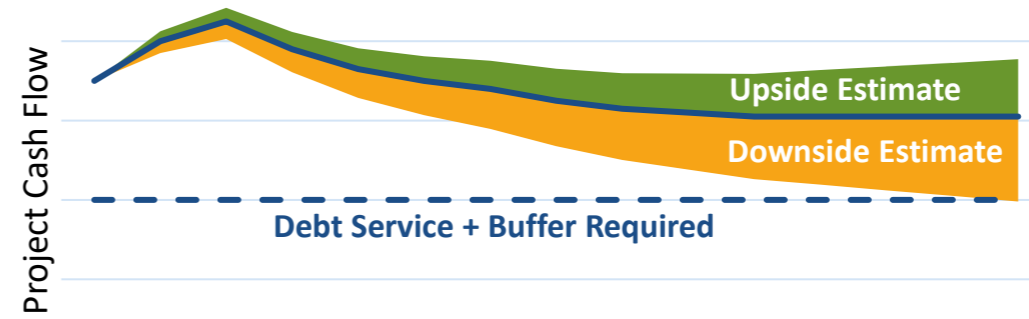
- Debt holders want to be highly confident they'll be paid back → what are the risks underneath the cash flows during the term of the loan?
- Debt Service Coverage Ratio (DSCR): as a lender, how big of a **buffer** will I demand between expected cash flows and debt service to be comfortable that the project will be able to pay?
- Size of DSCR depends on risk: Contracted cash flows will require a smaller buffer because they are more certain, but even they are not taken at face value (there is always some risk)
- A bigger buffer means that the project can take out less debt and will suffer from a higher cost of capital

Example: Project debt is sized such that expected cash flow is 1.3x (DSCR) the required debt service. Excess, if it materializes, will flow to sponsor equity.



# Risk Characterization in Project Finance

- Some risks can be mitigated
  - Weather/disasters: insurance
  - Equipment failure: warranties; redundant equipment
  - Project cash flows: contracted offtake
- Some risks cannot (at least not fully)
  - Fuel/technology: solar production
  - Force majeure (“Acts of god”)
  - Market: basis/congestion 15 years from now
  - Regulatory: what the Texas legislature is going to do to protect gas generation at the expense of other forms of generation
- So how do investment committees seek to quantify risk/return for risks that cannot be fully mitigated? Sensitivity analysis...
  - **Rerun the financial model with different assumptions (e.g., P90 solar production, lower gas prices) to see what happens to returns**
    - Debt holders want to know that debt service can still be met
    - Tax equity wants to make sure the project doesn’t go bankrupt and force tax credit recapture
    - Equity holders want to see how low returns could get



✓  
Debt service  
below downside  
estimate



Debt service  
violated by  
downside

# Risk Register for LDES

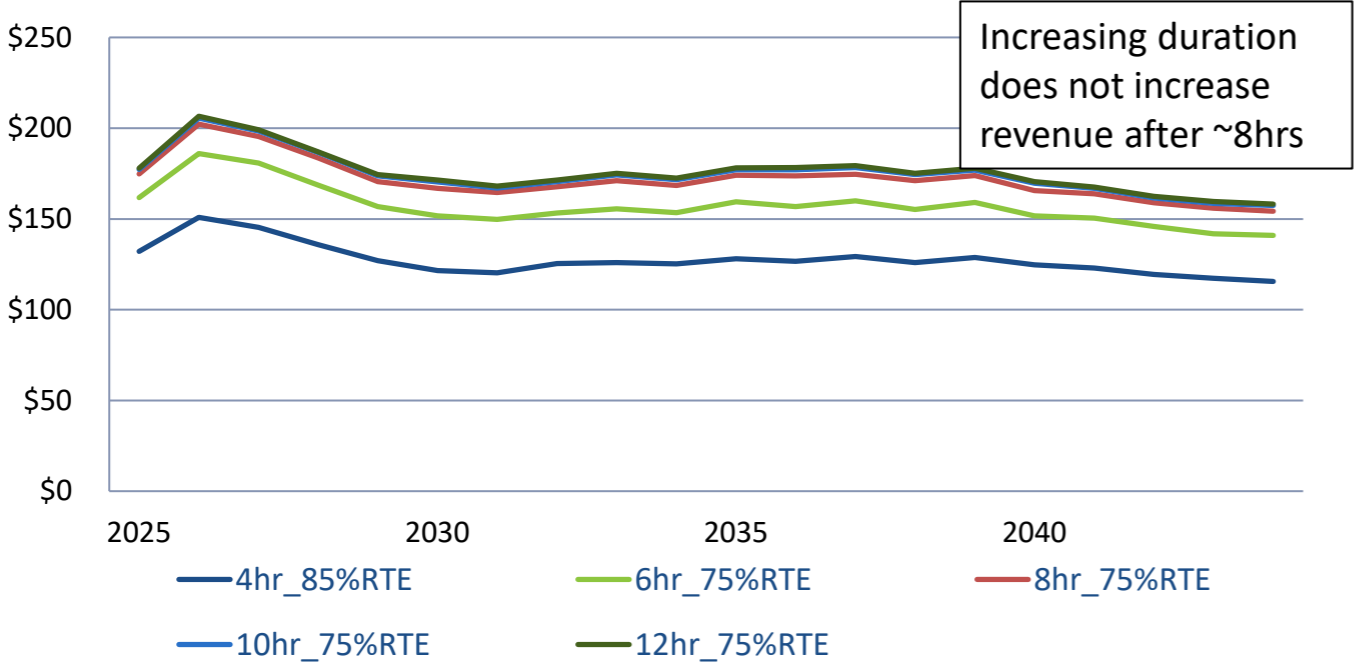
- The Rapid Integration and Commercialization Unit (RICU) at Marine Corps Air Station Miramar has developed a great risk accounting checklist (“register”) to guide developers
- Part of a larger effort to explore LDES integration into microgrids

Risk Value	Risk Consequences	Risk Probability
5	Very Significant	Highly Likely
4	Significant	Likely
3	Moderate	Probable
2	Low	Unlikely
1	Minimal	Highly Unlikely

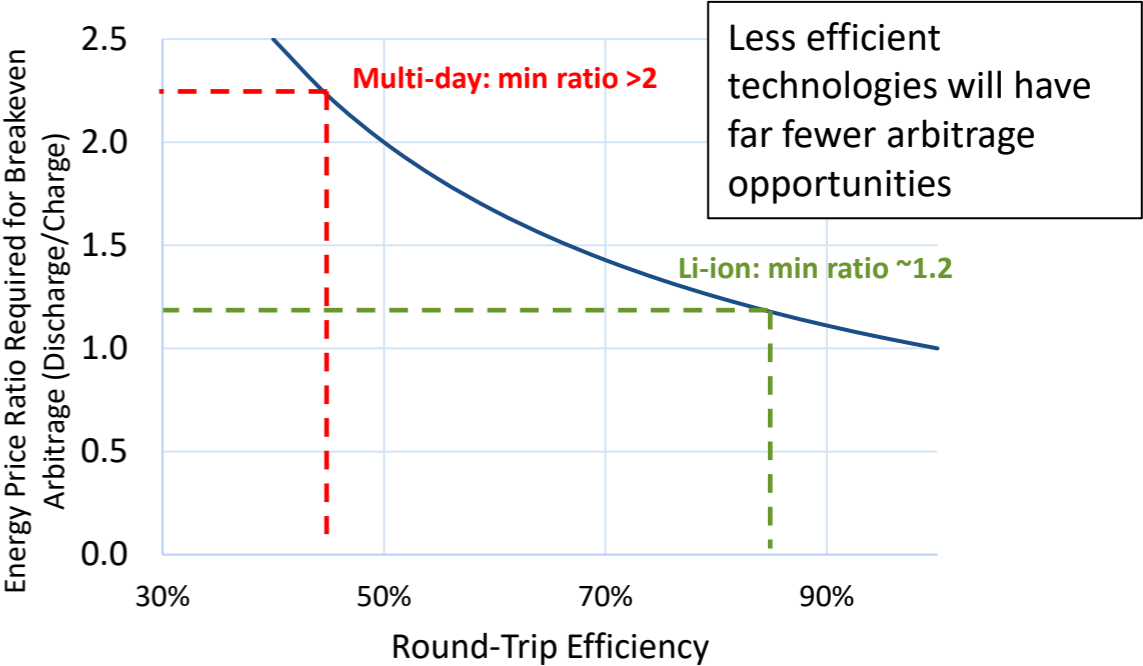
Risk Name	Category	Description	Probability (1-5)	Consequence (1-5)	Pre-Mitigation (1-25)	Post-Mitigation (1-25)	Mitigation Strategy	Mitigation Status	Coverage	Risk Owner	Next Action / Status	Team Action	Cost Impact
Labor Compliance	Compliance	Labor regulations & compliance	2	4	8	4							
Tariffs	Cost	Risk of Tariffs / escalation throughout project life	2	3	6	4							
Financial Security	Financing	Loan Guarantee does not come through.	3	5	15	10							
Warranties	Insurance	Technology warranties	1	3	3	3							
Network Upgrades	Interconnection	The interconnection study may identify the need for downstream transmission upgrades to allow additional capacity within the transmission system.	1	5	5	10							
Bad acts	Legal	Bad acts	1	4	4	4							
Regulatory	Regulatory	Uncertainty exists in CA as to the direction of the policies and regulations that will emerge to support the distributed grid, or microgrid, future.	2	3	6	4							
Wildfire	Safety	Potential for wildfire damage	3	4	12	6							
Schedule	Schedule	A delay in financing, or continued inclement weather, could negatively impact COD and result in liquidated damages for failure to meet certain Guaranteed Project Milestones under the terms of the PPA.	4	5	20	6							
Tech	Technology	Technology or technology vendor has technical or corporate challenges.	3	4	12	10							

# Market Risk Assessment: Energy Arbitrage

Forecasted Energy Arbitrage Revenue at SP15  
\$/kW-yr



Minimum Price Ratio Required for Energy Arbitrage

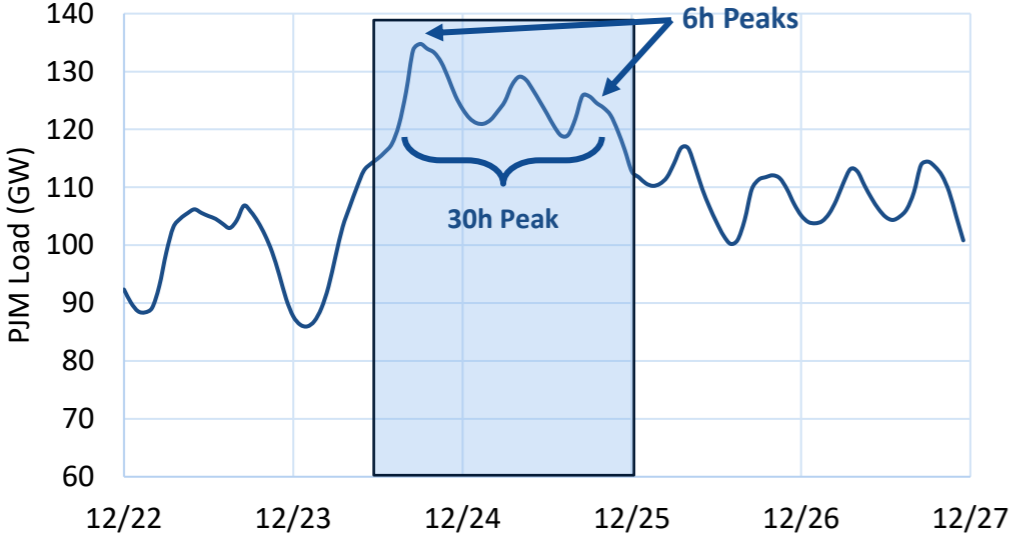


*LDSEs cannot rely on energy arbitrage as a significant component of the revenue stack for financing purposes. Value must be created elsewhere...*

# Market Risk Assessment for LDES: Capacity

- LDES are primarily needed for capacity value (infrequent but potentially long-lived scarcity events)
  - Some jurisdictions will provide long-term contracted offtake for capacity value -> great for financing
  - Others have annual auctions -> more market risk
  - Ancillary services are shallow, short-term capacity-like markets that will be saturated with short-duration resources -> difficult to rely on for financing
- Transmission and distribution deferral applications may come with contracted/regulated returns

**PJM Load During Winter Storm Elliot**



Market Region	Capacity Procurement Structure
WECC, SPP, Southeast	Bilateral contracts or build-transfer
MISO	Mostly bilateral / build-transfer, voluntary auction
PJM, NYISO, ISO-NE	Periodic auctions
ERCOT	No true capacity market

*Surety of capacity value will be key to financing LDES in wholesale markets. Policy mechanisms will be necessary to help LDES compete (e.g., ELCC accreditation, procurement mandates).*

# Technology Risk Assessment for LDES

- Many LDES technologies don't have the proven track record of Li-ion.
  - How can I trust that the technology will still work at expected performance 10-20 years from now?
  - Do I believe the LDES manufacturers will be around to honor warranties or O&M contracts?
- How to achieve scale and improve learning rates? Deploy, deploy, deploy...
  - Pilot projects can help demonstrate commercial viability, but "bankability" requires repeat deployments at volume so financiers can get comfortable with risks.
  - It's hard to find someone that wants to be first to procure an unproven technology. California's recent procurement order may help LDES along the road to bankability.
- "Shortcut" to bankability through another mature industry? Has your technology already been proven in another application?
- Loan guarantees: guarantees from some other credit-worthy entity (e.g., federal government) may obviate most risk assessments in the short-term, but in the long-term the technology will need to stand on its own.

California AB 1373 "Long Lead Time" Resource	Maximum Quantity	Online By
LDES: 12+ hour	1 GW	2031-2037
LDES: Multi-day	1 GW	2031-2037

*Li-ion stationary storage has benefited from piggy-backing on consumer electronics and transport electrification to de-risk the technology, scale manufacturing, and build supply chains. LDES technologies that can also piggy-back on other mature industries may have a competitive advantage in technology risk assessments.*

# Project Finance in a Nutshell

- Project finance is a process by which developers can access cheaper forms of capital (tax equity and debt) to lower the overall cost to build a project.
- Capital providers want to ensure they get paid back -> careful assessment of all risks that might affect cash flows
  - Are the returns that the project provides worth the risk (compared to other investments I can make with my money)?
- Market and technology/performance risk are two of the biggest questions that financiers will ask developers of LDES
  - Does the project rely on an uncertain market value of energy or capacity?
  - How sure can I be that the technology will work as expected over the period that I'm lending you money?





Michael Fisher, PhD

[mfisher@ascendanalytics.com](mailto:mfisher@ascendanalytics.com)

1877 Broadway Street | Suite 706 | Boulder, CO 80302 | (303) 415 1400