Massachusetts Grid Services & DER Compensation Study

Workshop 2

March 3, 2025

MASSACHUSETTS CLEAN ENERGY CENTER®

In Partnership With

Massachusetts Department of Energy Resources

Office of the Attorney General Commonwealth of Massachusetts

EVERSOURCE

Unitil

nationalgrid

RMI

Energy+Environmental Economics

Welcome and Check -In

- Please use the rename function to add your affiliation after your name – eg. "Brett Webster, RMI"

- Please put in the chat:
  - Your name, org, and a brief description of your interest in this work.

Disclaimer Prior to Recording

- This workshop will be recorded to ensure transparency in this process and provide participants or those unable to attend the opportunity to refer back to the workshop at a later date.
- This recording and the slides presented will be posted publicly on the MassCEC website at the link below.
  - https://www.masscec.com/grid-modernization-and-infrastructure-planning/grid-services-study
- If you are not comfortable being recorded, you may mute your video and microphones now.
  - Once the time dedicated to the primary content of this meeting has concluded, the recording will be ended.
- In order to facilitate free and open discussion during the workshop, it should be understood that statements made, positions taken, and information provided by the participants are part of an evolving and collaborative effort to encourage discussion and develop effective solutions to the challenges presented. As such, except as set forth below, these perspectives and materials should not be used by or against participants or presenters in any litigation, including administrative proceedings before federal, state, or local governmental authorities.
- This prohibition does not prevent any participant from using its own statements, positions, or information provided in any subsequent litigation, provided that such use contains no reference or indication that these materials were made and presented in the workshops.

Objectives for the Massachusetts Grid Services Study

1. Develop a methodology for calculating location-specific distribution grid services value that may be provided by flexible Distributed Energy Resources (DERs) in Massachusetts
2. Explore potential compensation frameworks specific to this grid services value – balancing policy objectives and avoiding overlap or double-counting with other available benefits/incentives
3. Recognize equity and environmental justice impacts in both valuation and compensation for grid services
4. Create a roadmap to guide both near and long-term development of grid services programs for DERs
5. *Provide ongoing opportunities to incorporate stakeholder input!*

Recap - Workshop 1 Objectives

- **Build foundational understanding and vision for grid services in MA**
- **Share the motivations, goals, and intended approach for establishing a compensation mechanism for the value that distributed energy resources (DERs) can provide to the distribution grid**
- **Align on the role of stakeholder engagement throughout the work**
- **Begin to solicit input and feedback from diverse groups on their priorities and concerns related to the work, and on the proposed approach and methods (with additional opportunities in future sessions)**

A recording of Workshop 1 and copy of the slides and primer can be found on the MassCEC website

Workshop 2 Objectives

What we’d like to share

- Intended approaches to valuing distribution grid services – distinct from benefits that are addressed via other existing frameworks in Massachusetts
- Introduce potential mechanisms for compensating grid services value

What we’re asking from you:

- Input from regarding the structure of compensation mechanisms
- Input on key considerations for implementation and reducing barriers to access from an equity standpoint

Agenda

12:00 - 12:20	1.	**Welcome and Introduction**
12:20 – 1:10	2.	**Proposed Distribution Grid Services Valuation**
	A.	**Deferral Valuation Methodology**
	B.	**Bridge-to-Wires Valuation**
	C.	**Environmental Justice Valuation**
		- - - - - Break (10 min) - - - - -
1:20 – 1:35	3.	**Types of Compensation Mechanisms and Roadmap**
1:35 – 2:30	4.	**Break-out Rooms**
2:30 – 2:45	5.	**Closing and next steps**

Workshop Participation Guidelines

- Please mute yourself when not speaking
- We suggest minimizing distractions by silencing or turning off cell phones during the workshop
- Please post questions in chat as we go along, or use the raise hand function for any questions during the Q&A breaks
- There will be brief pauses for Q+A after each section, with a dedicated half hour for questions and feedback near the end of today's workshop
- Please identify yourself when speaking or commenting in the chat, including the organization or community you represent if applicable

Workshop Resources and Communication

- **Future meeting announcements will be sent by email to the workshop mailing list**
  - If you are not on the list and would like to be added, please sign up here
- **Workshop session slides and recordings will be made available on the MassCEC website:**
  - https://www.masscec.com/grid-modernization-and-infrastructure-planning/grid-services-study
  - This site also contains general information about the study and a primer for this workshop series
- **Please share any questions or feedback after the meeting with:**
  - Grid@masscec.com
  - Andrew.Solfest@ethree.com
  - Bwebster@rmi.org

Introduction to Study and Refresh on Workshop 1

Energy+Environmental Economics

Collaborative Study Partners:

- **Study is led & funded by MassCEC's Net Zero Grid team**

- **MA state agencies:**
  - Department of Energy Resources (DOER)
  - Attorney General's Office (AGO), Office of the Ratepayer Advocate

- **Investor-owned MA electric distribution companies (EDCs):**
  - Eversource
  - Unitil
  - National Grid

- **Consultants:**
  - Rocky Mountain Institute (RMI)
  - Energy and Environmental Economics (E3)

Workshop Context – What are DERs?

Distributed energy resources (DERs) are technologies connected to the distribution grid which can generate electricity or reduce or shift grid loads.

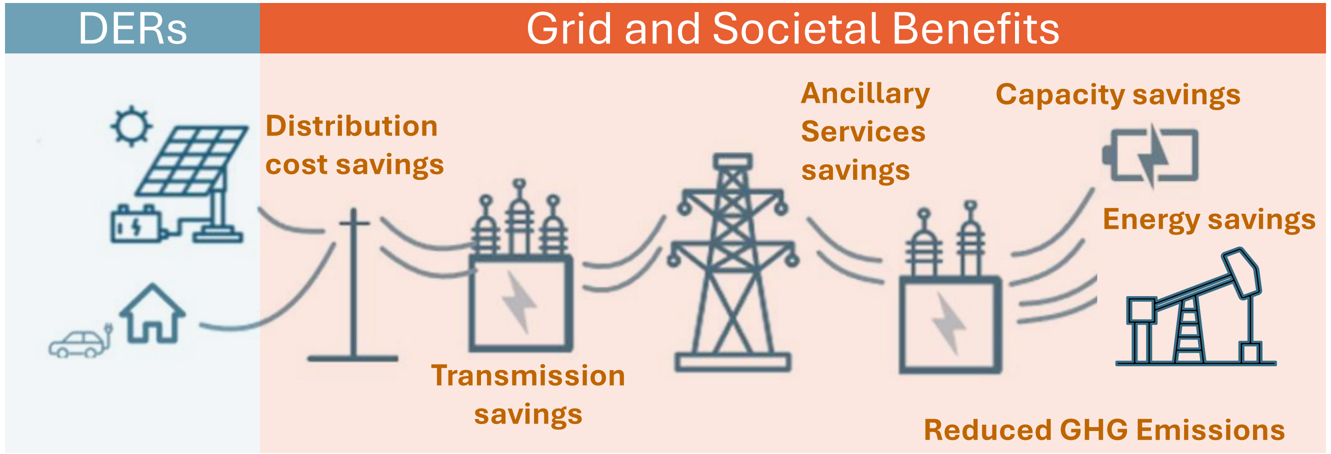
DERs include energy efficiency, demand response, distributed solar PV, distributed energy storage, and electrification loads such as from EV and heat pumps.

DERs can provide a range of services to the electric grid, including generating, storing, and modulating the use of electricity, among others. DER grid services can play a critical role in meeting local demand, easing localized constraints, and improving reliability.

DERs can perform a variety of valuable functions for the electric grid, referred to as grid services

- **DERs frequently benefit the grid by:**
  - Generating carbon-free electricity
  - Reducing customer electricity loads
  - Shifting customer loads to times when the grid is less constrained

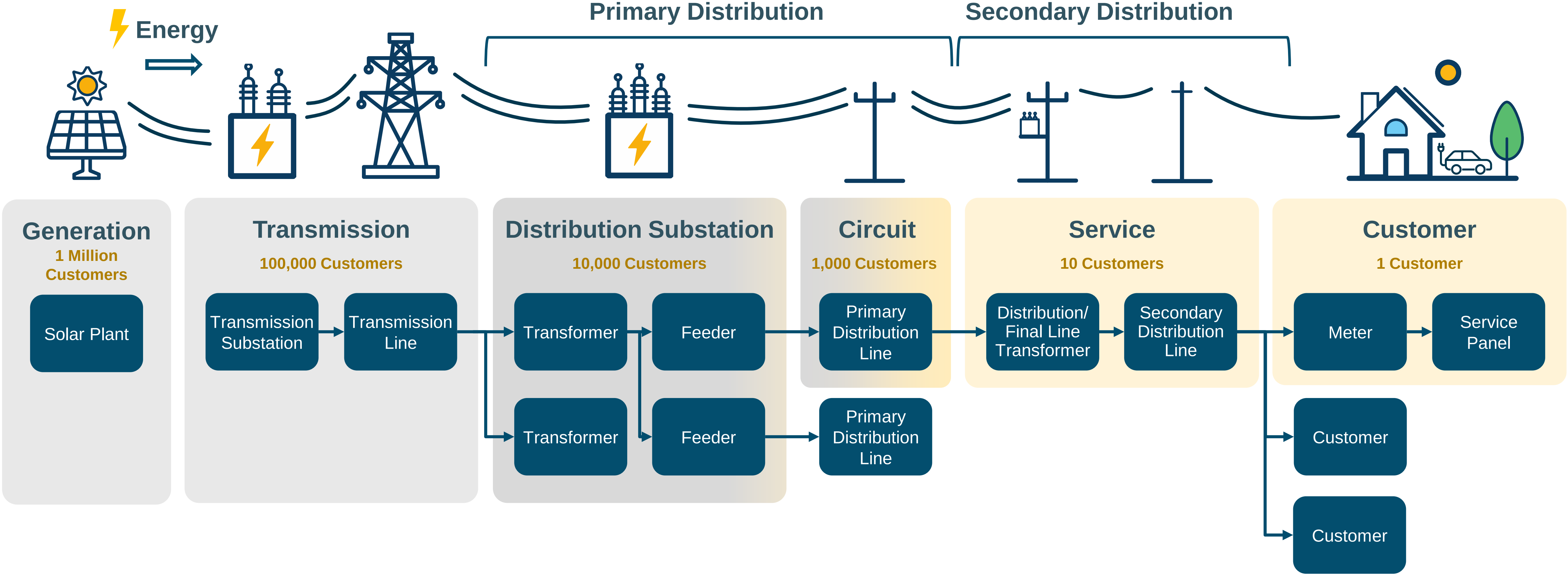
These benefits reduce costs for electric grid operators; resulting savings can be passed on to ratepayers



- **DERs can also provide societal benefits in the form of 'Non-Rate Impacts', such as reduced emissions of greenhouse gases or other pollutants harmful to human health**

This study focuses specifically on *distribution* grid services, with the goal of establishing a framework for valuing these services and laying out a roadmap for how we can capture and compensate those benefits

Distribution grid services address highly location-specific needs



Energy

Primary Distribution

Secondary Distribution

Generation
1 Million Customers

Solar Plant

Transmission
100,000 Customers

Transmission Substation → Transmission Line

Distribution Substation
10,000 Customers

Transformer → Feeder

Transformer → Feeder

Circuit
1,000 Customers

Primary Distribution Line

Primary Distribution Line

Service
10 Customers

Distribution/ Final Line Transformer → Secondary Distribution Line

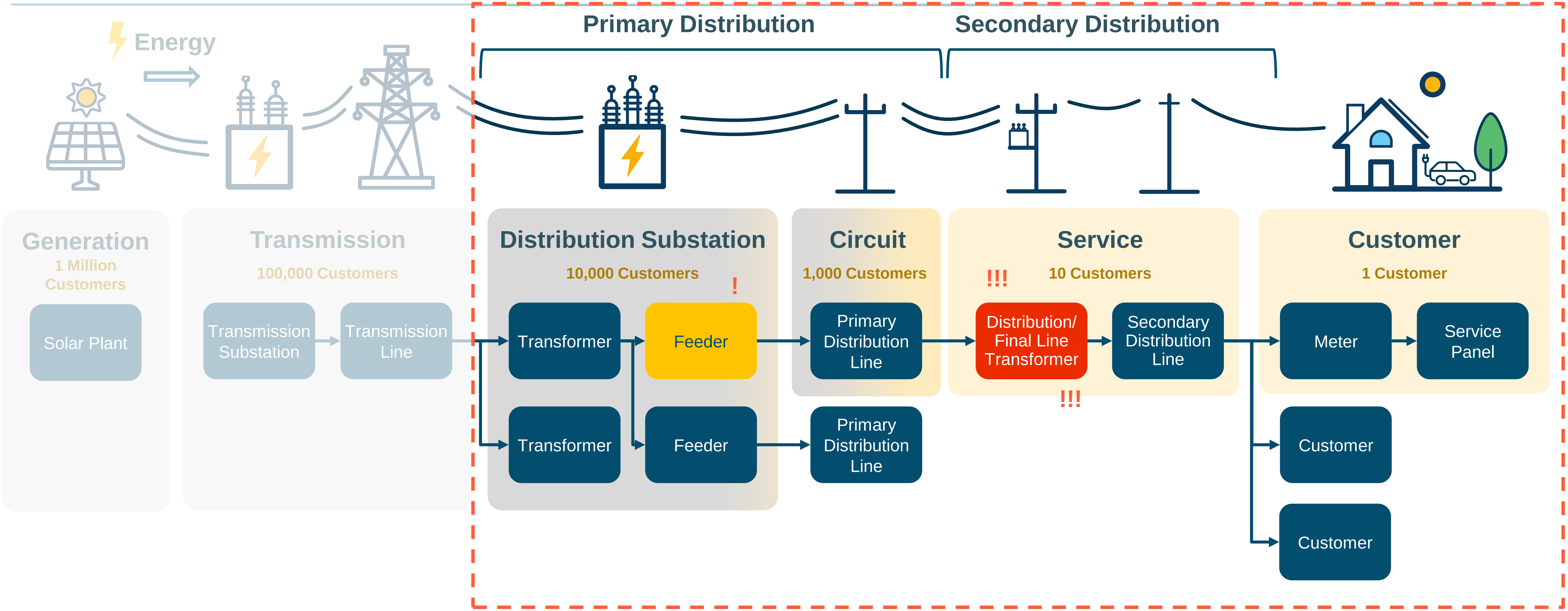
Customer
1 Customer

Meter → Service Panel

Customer

Customer

Distribution grid services address highly location-specific needs



Energy

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- Primary Distribution Line
- Primary Distribution Line

Service
!!!
10 Customers
- Distribution/ Final Line Transformer
!!!
- Secondary Distribution Line

Customer
1 Customer
- Meter
- Service Panel
- Customer
- Customer

Electric sector modernization requires innovative analysis and policy to keep pace with technology adoption

The electric grid is **evolving rapidly** – creating new challenges as well as new opportunities to solve them

Existing frameworks are best at recognizing **systemwide resource value**; they are less effective for local distribution networks

We need a new framework for understanding location-specific value: both to maximize and appropriately capture it

This framework must be:

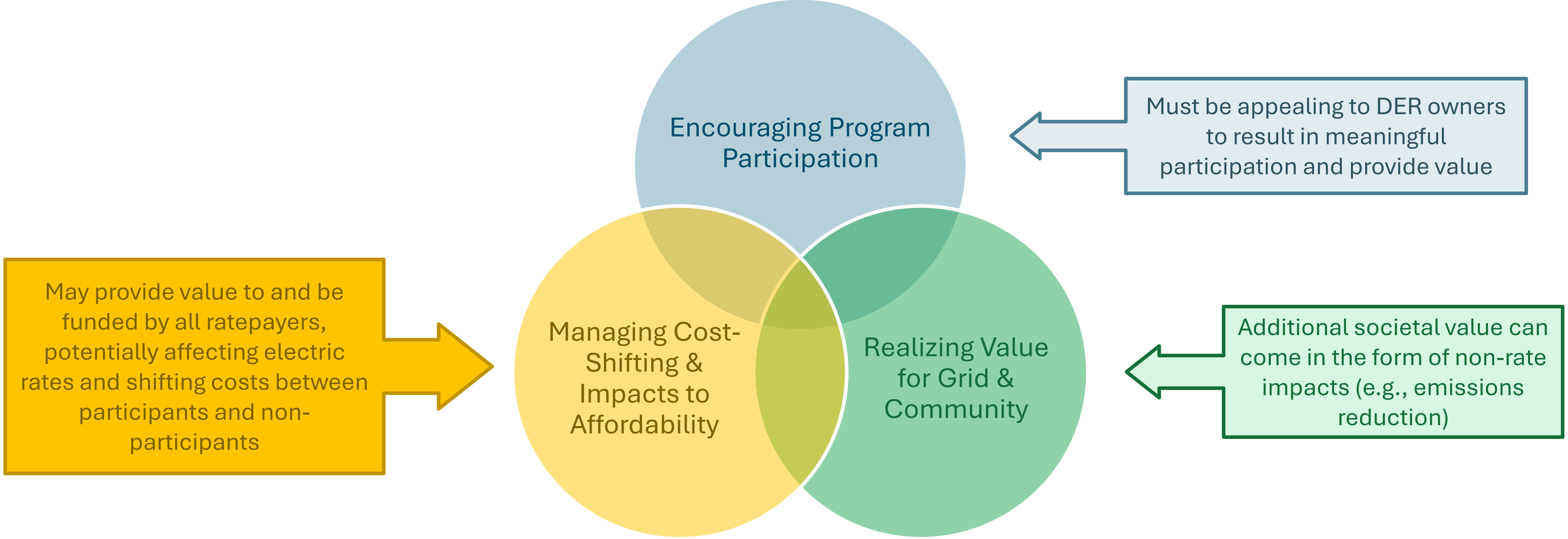
1. **Actionable** for the near-term
2. **Adaptable** as available data and technologies improve

Driving questions for this study

- **What are the benefits that DERs can provide to the distribution grid?**
- **How do we quantify the different types of benefits?**
  - How can we incorporate non-monetizable benefits?
- **What determines where on the grid these benefits where appear and what value they provide?**
  - How may these benefits impact Environmental Justice populations differently and specifically?
- **What is required for utilities to be able to realize these benefits?**
- **How should we go about compensating these benefits?**
  - What does a feasible near-term implementation plan look like to begin exploring this value?
  - How should the approach to valuation and compensation evolve over time?

Compensation design must balance competing policy goals and ultimately be actionable

Competing policy goals



Encouraging Program Participation

Managing Cost-Shifting & Impacts to Affordability

Realizing Value for Grid & Community

Must be appealing to DER owners to result in meaningful participation and provide value

May provide value to and be funded by all ratepayers, potentially affecting electric rates and shifting costs between participants and non-participants

Additional societal value can come in the form of non-rate impacts (e.g., emissions reduction)

Ideal compensation structures address all three key goals

All while remaining simple and transparent enough for participants to understand and for administrators to implement

Study work products

Valuation Framework

- Incorporate distribution grid services and non-rate impacts
- Must be applicable statewide and include consideration for EJ communities

Compensation Mechanism

- Compare candidate mechanisms
- Determine qualitative considerations of each mechanism

Near Term Implementation Plan

- Provide steps for engaging stakeholders and supporting EJ communities in implementation
- Identify potential barriers to implementation and recommend improvements

Long Term Implementation Plan

- Consider the future of the electric sector and impacts on compensation design
- Discuss milestones that can be used to determine when to re-evaluate the mechanism

Study work products

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Valuation of Distribution Grid Services

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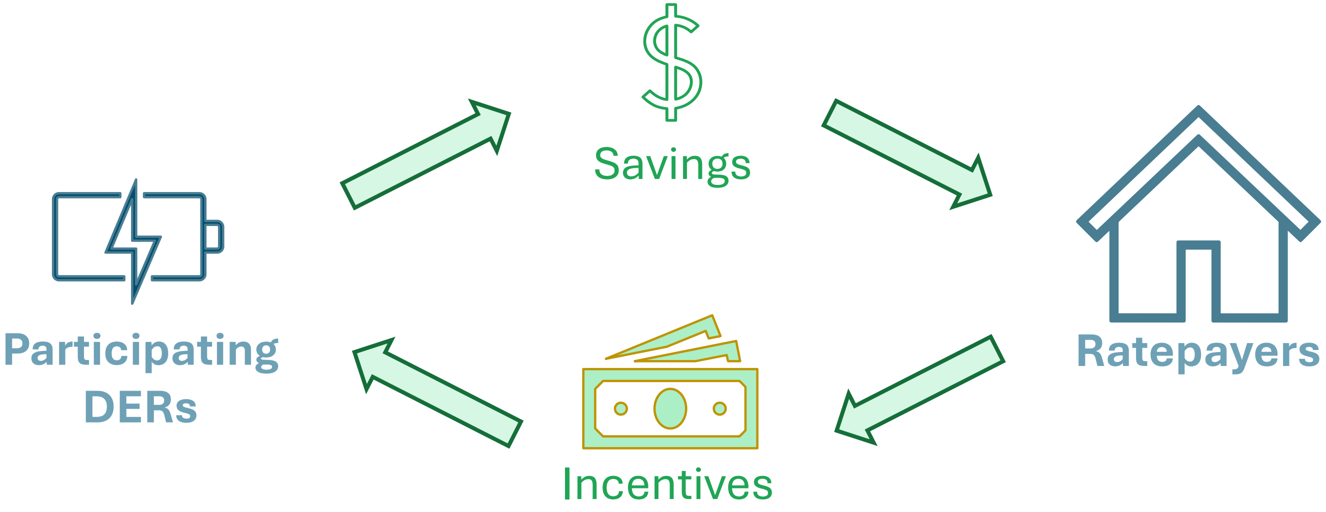
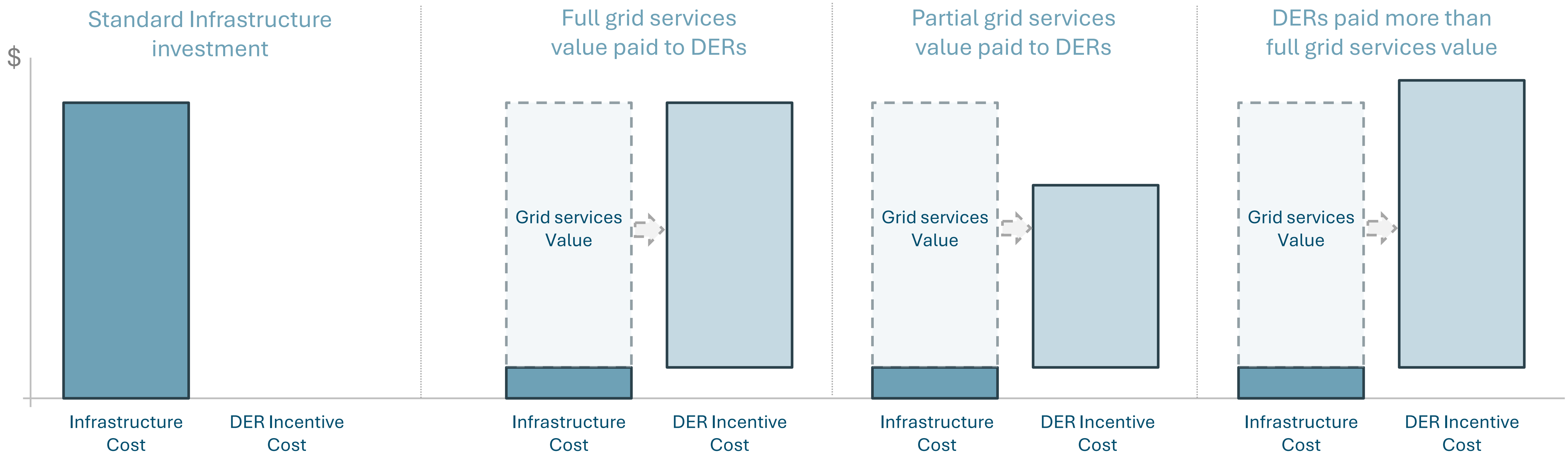
Valuation provides a North Star for compensation design



- **Ratepayers will benefit from grid services through reduced electric infrastructure costs and rates over time, and pay for these benefits through incentive payments**
- **Quantifying value provided by a resource can provide a guidepost for setting incentive payments**
- **While compensation does not need to equal the value provided, this should be a conscious decision**
  - Even when setting incentives to meet other policy goals, it's important to know the net cost to achieve those
- **This is particularly crucial for utilities, as excess costs for program incentives can increase the relatively high energy burdens already borne by low income or disadvantaged communities**

When compensation and value do not match, ratepayers may bear excess costs or program participation may be reduced



Full grid services value paid to DERs	Partial grid services value paid to DERs	DERs paid more than full grid services value
Promotes DER participation	Shares grid services value among DER owners and ratepayers	May be desirable for promoting market transformation or EJ goals (for targeted programs)
No impact to non-participants	May not maximize DER participation	Increases costs for non-participants

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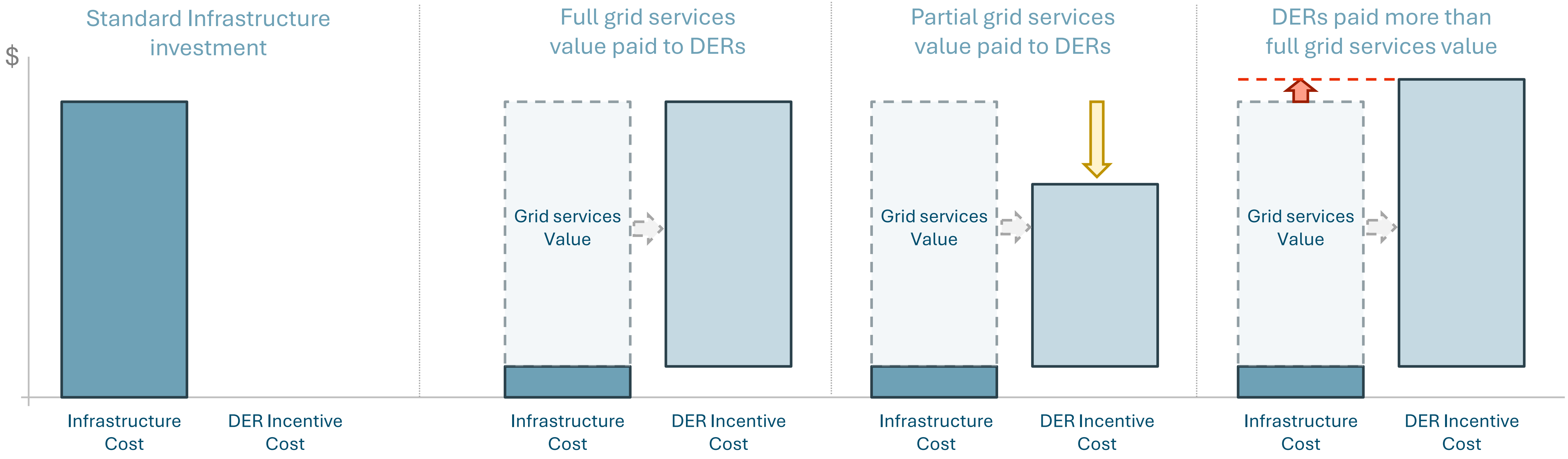

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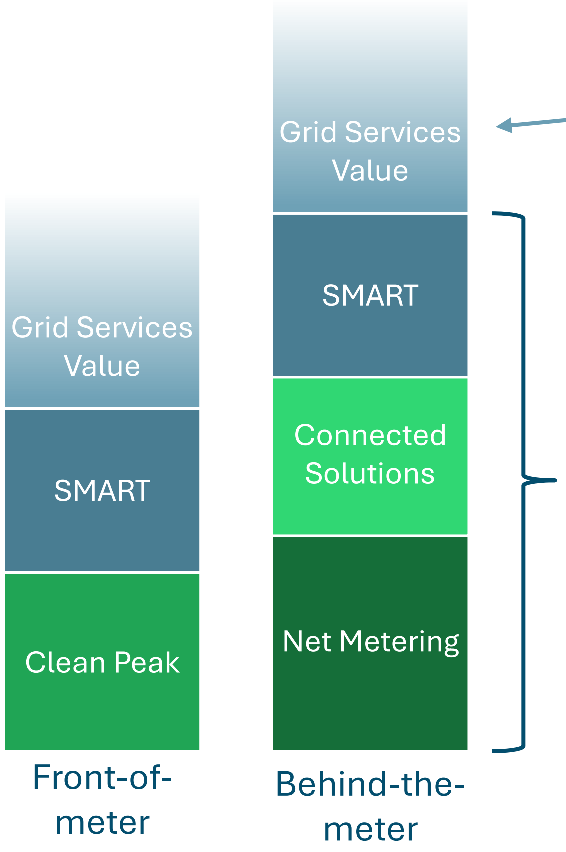
Isolating for distribution grid services value prevents double counting with other programs



Grid Services compensation is targeted to elicit and compensate location-specific and incremental distribution value

Existing programs compensate DERs for Energy, GHG, Generation and Transmission Capacity values, among others

Distribution grid services to consider

- **Deferral Value.**
  - Additional capacity can allow utilities to delay investments in traditional solutions, reducing costs for customers
  - Deferral also may provide an additional **Optionality** value, allowing planners to wait and see how system needs develop before committing to long-term investments
- **Bridge-to-Wires Value.**
  - Providing an alternate means of meeting immediate capacity needs while long-term infrastructure solutions are under construction
- **Environmental Justice and other Non-Rate Impacts.**
  - DERs may help to avoid costs experienced specifically by Environmental Justice populations which do not necessarily show up in utility rates
  - Quantification for these impacts may be tied to Deferral or Bridge-to-Wires scenarios for inclusion in the Grid Services compensation

Proposed Valuation Methodologies:

Deferral of Distribution Investments

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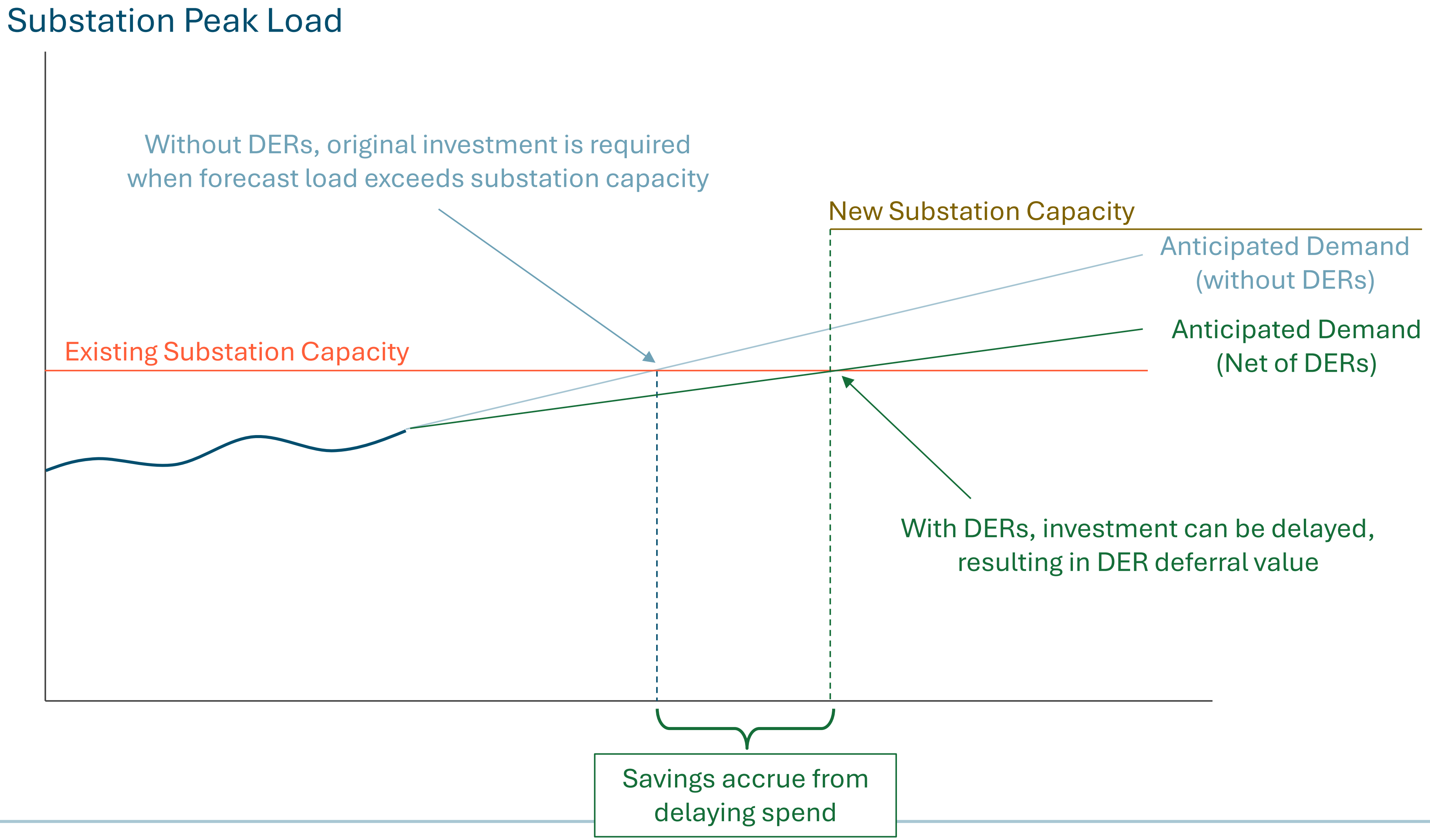
What is the value of delaying (or deferring) an investment to a later date?

- Money is worth more today than at a future time because of its earnings potential (e.g., reflected as interest, called the "time value" of money)
- Therefore, if a new grid investment, like a substation or line, can be delayed, money is saved
- Near-term capacity shortfalls limit the potential to defer investments
- However, where load growth is manageable, DERs can limit potential capacity shortfalls to enable investment deferral

Deferral Solution: DERs deployed to a location to delay a capacity upgrade investment

Deferral value reflects benefits of delaying investments related to the time value of money



Deferral Value is based on the discount value of the deferred investment

1. **Revenue requirements (RR) are calculated for the original investment starting in Year 0 and the deferred investment starting in Year X**

Revenue Requirement =

O&M Expenses
+
Taxes
+
Depreciation of Investment
+
Return on Investment (Rate of Return x Rate Base)

2. **Calculate Net Present Value (NPV) of original investment's RR**
3. **Calculate Net Present Value of deferred investment's RR**
4. **Deferral Value ($/kW) =**

(NPV of Original Investment RR ($)) – NPV or Deferred Investment RR ($)) / Capacity Need (kW)

Proposed Valuation Methodologies: Optionality Value

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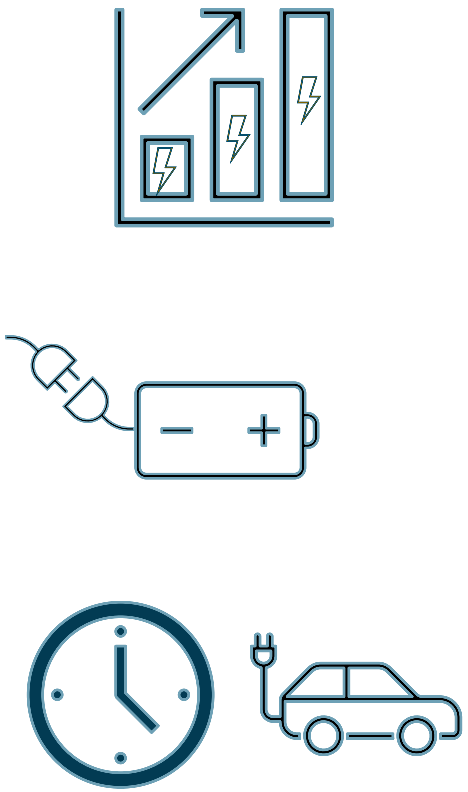
Delaying investments can provide additional Optionality value

+ Distribution planning cannot fully account for future variability including:

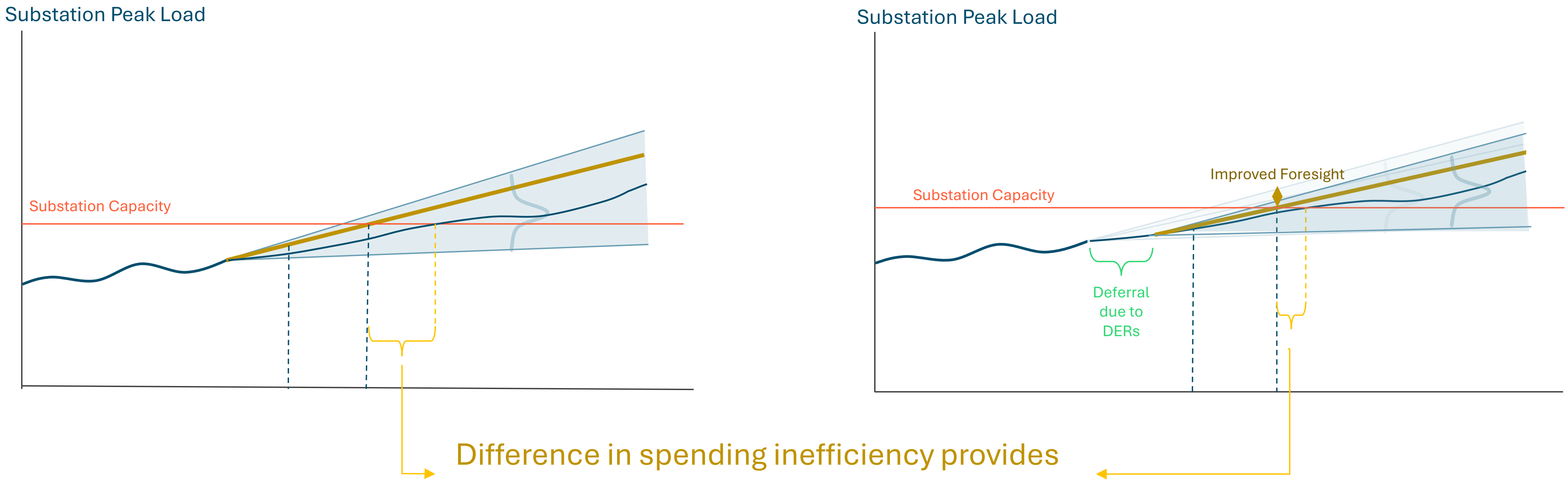
- Uncertain load growth
- Evolution of technological capabilities
- Changes in infrastructure costs
- Changes in policy and rate structures and customer response
  - i.e. Time-varying rates or demand charges

+ Delaying decision-making allows planners to gather more information and reassess conditions before making investments



Optionality Value: Benefit of reducing inefficiencies in spending due to improved foresight over time

Optionality benefit captures the value of decreased uncertainty in the forecast used to determine investment timing



Difference in spending inefficiency provides **optionality benefit** of DERs

To calculate optionality value, we can simulate outcomes across many different probabilistic future scenarios and determine the probability-weighted overspend due to imperfect foresight

Proposed Valuation Methodologies:

Bridge-to-Wires Benefits

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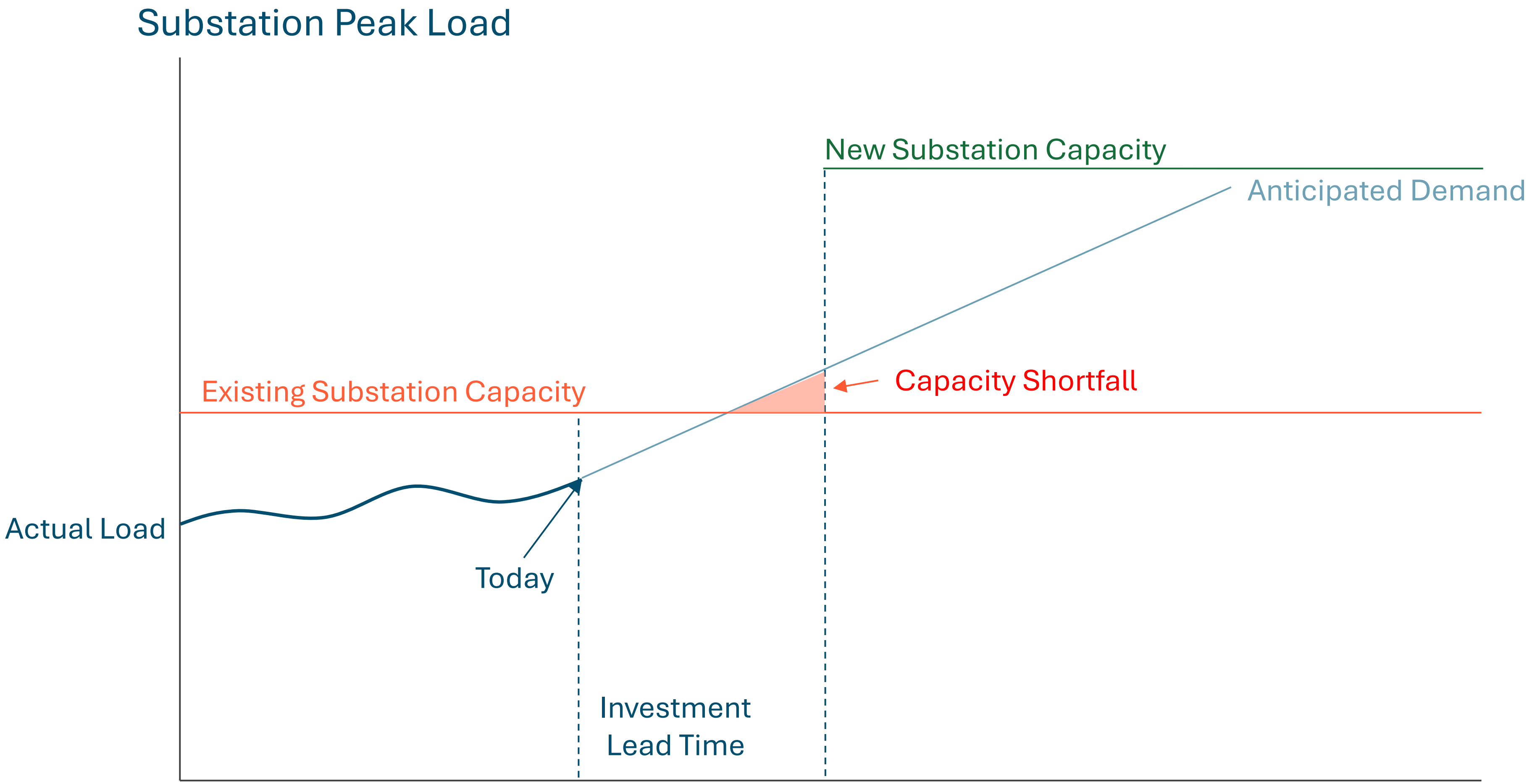
What if you identify a distribution grid need and can't address it quickly enough?

- Some capacity projects have a long lead time and construction cannot be completed before there is a capacity shortfall
- To fill the capacity shortfall, EDCs must deploy interim solutions or face operational risks

Bridge-to-Wires Solution: DERs deployed to a location with an imminent capacity constraint to mitigate risk where a traditional solution cannot be quickly deployed and alternate interim solutions may be sub-optimal

DERs may be able to bridge the gap until the infrastructure solution is complete



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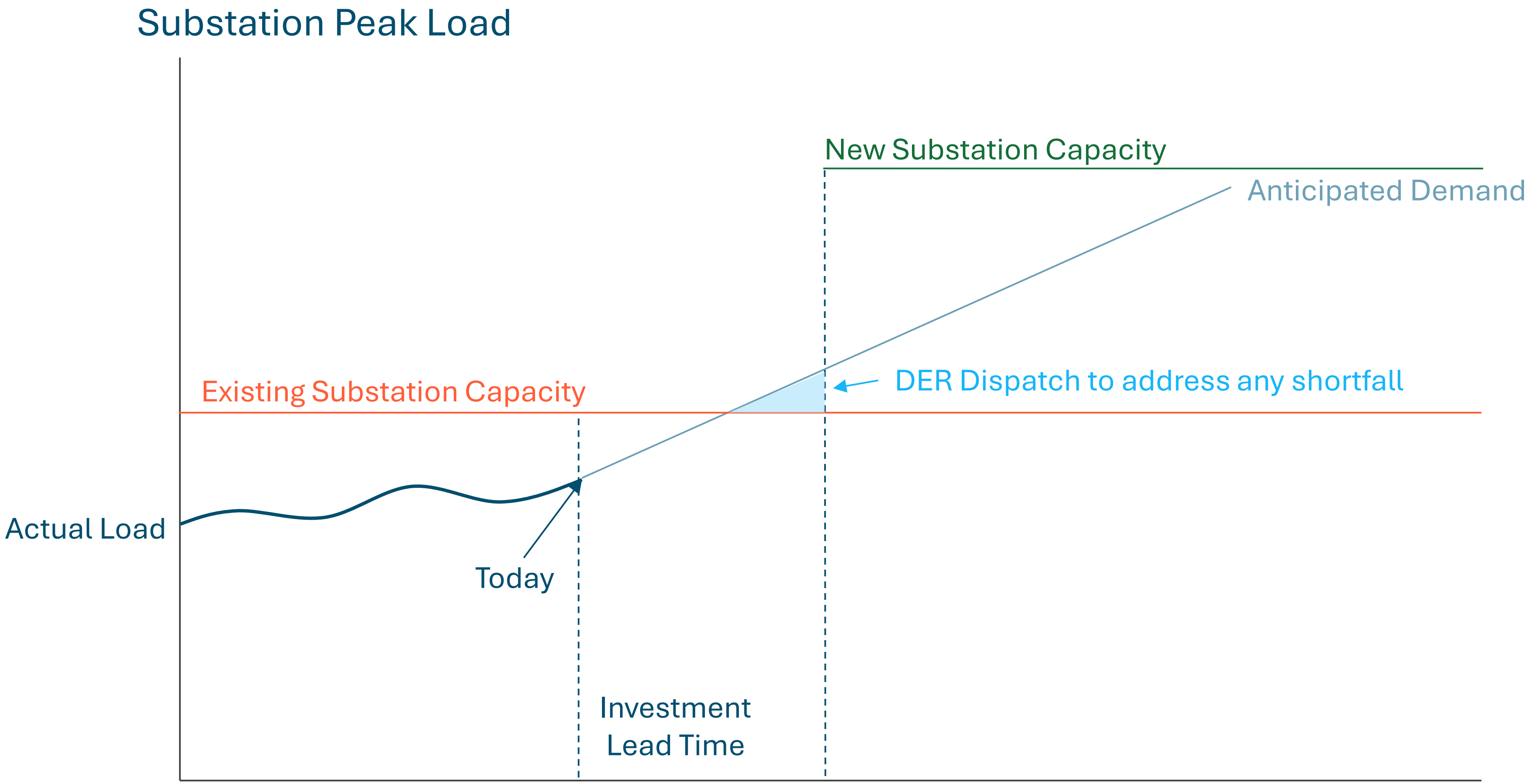

Without DER dispatch, EDCs must consider tradeoffs due to limited operational capacity

- **When new capacity cannot be built quickly enough, EDCs must consider their options:**
  - Deploying interim solutions (e.g., backup generator, short-term storage)
  - Asset degradation
  - Increased risk of customer outages
  - Connecting fewer customers, more slowly
- **Bridge-to-Wires DERs can avoid these tradeoffs, creating value for the distribution system**
- **Assessing the value depends on an approach that can sufficiently quantify a tradeoff, such as avoiding the cost for interim solutions**
- **The cost of backup generators provides a monetized cost that Bridge-to-Wires DER solutions can avoid**
  - We calculate a $/kW valuation from the average operating expenses of deploying a backup generator
  - We aim to capture non-rate impacts from non-DER interim solutions in the EJ value

Proposed Valuation Methodologies:

Environmental Justice Benefits

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Non-Rate Impacts to Environmental Justice Populations

Potentially Quantifiable Impacts

These impacts may be quantifiable, depending on the granularity of data that is readily available

Bridge to Wires:

- **Air Quality** - DERs could replace diesel generators with negative air quality impacts that could be used in B2W scenarios
- **Outages** – DERs could mitigate the chances of lost load in B2W scenarios

Qualitative Impacts

These impacts are not expected to be immediately quantifiable in $/kW-yr terms with a high level of confidence. They could be encompassed in an equity adder or multiplier or revisited in the future

Deferral or Bridge to Wires:

- **Construction –** DERs could defer the need for construction, which causes traffic, noise pollution, and general negative impacts to communities
- **Labor and Economics** – Construction may product jobs for local community members or boost local economic growth in stores

Defining Eligibility for Environmental Justice Compensation

Option 1: Qualified Customers Only

- Some benefits and costs only impact the participating customer, so only customers who are considered disadvantaged should be eligible
- This includes economic impact, individual lost load resiliency, or indoor air quality impacts
- For example, a wealthy customer in a low-income neighborhood would not receive this extra compensation

Option 2: All Customers in Designated Environmental Justice Populations

- Some benefits impact the entire local community, so all customers within an EJP, no matter their own household status, should receive this incentive to benefit the whole community
- This includes impacts to local air quality, neighborhood economics, or noise pollution
- For example, a wealthy customer in a low-income neighborhood would still receive this extra compensation since it benefits the entire EJP

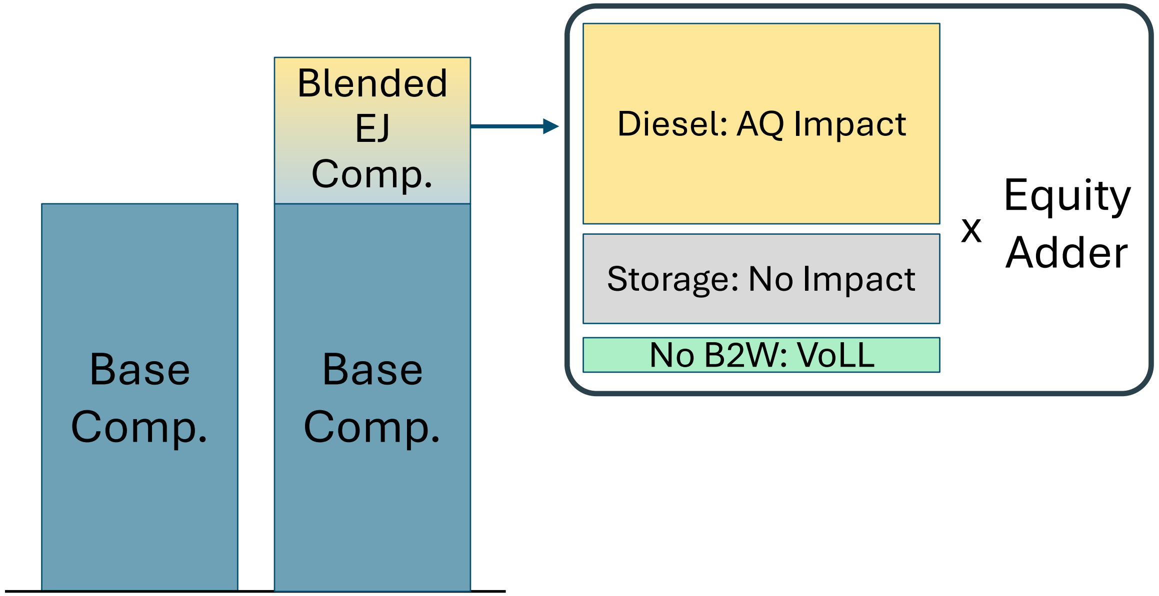
Mechanisms for Valuating and Compensating EJ Population Impacts

Bridge to Wires

In B2W cases, the average customer impact is a weighted average of three possible scenarios

1. Instead of DERs, its diesel generators, which has air quality impacts
2. Instead of DERs, its battery storage, which has no impact
3. Instead of DERs, there's no B2W solution, which leads to lost load

This is multiplied by an equity adder to account for non-quantified impacts

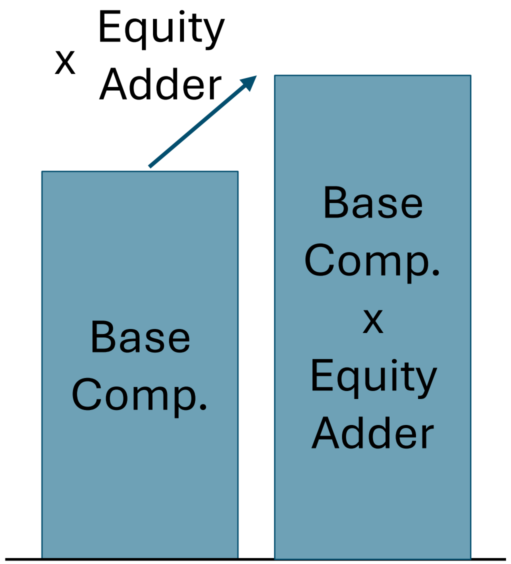


Deferral

Deferral EJP values are difficult to quantify

Rather than a specific value, we propose using an equity adder

- This accounts for qualitative benefits of DERs to EJ Populations, such as deferred construction disruptions. It could also be used to support participation for qualified individuals
- This approach may be developed in collaboration with stakeholders and via literature review



Scheduled Break

Potential Types of Compensation Mechanisms

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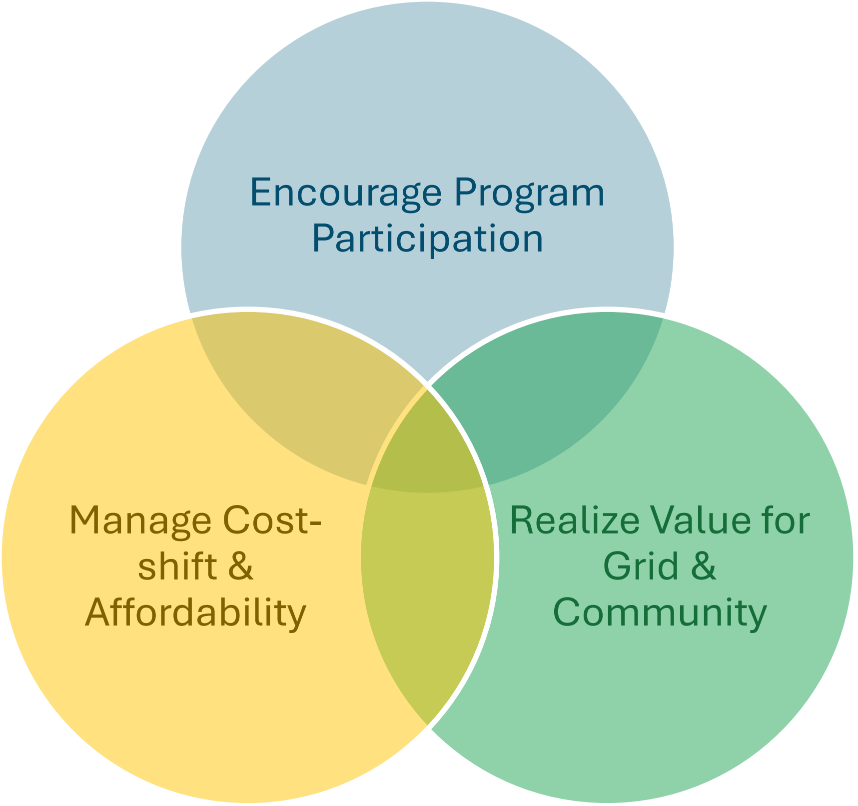
Compensation design must balance competing policy goals and ultimately be actionable

Key Policy Goals


Encourage Program Participation

Manage Cost-shift & Affordability

Realize Value for Grid & Community

+ Simplicity for participation & administration

Supporting Considerations

- **Compensation should provide enough certainty for participants to act on**
  - Clear signals, potential reservation payments
- **Compensation should incentivize behavior that increases value of DER to the grid**
  - Significant weight given to performance
  - Location-specific rates (by substation category)
  - Weighting to prioritize EJ or other non-rate impacts
- **Over the long term, compensation level should be rooted in the value provided to ratepayers**
  - Any adders should still come from the total pool of ratepayer value
  - Ideally both participants and ratepayers see net benefits

These considerations are reflected through a set of explicit compensation components

Compensation Components – Adopted from Baringa Study

Component	Description
Price	Incentive $ amount – total pool determined based on localized distribution grid services value
Volume	Total kW allotted for participation – based on expected localized distribution grid need
Tenor	Length of any applicable contract terms
Control	Degree of control for response (Natural behavior, contracted, or utility-controlled)
Availability	Agreed period/timing for providing grid services value
Allocation	How participating DERs may be selected
Stacking	Hierarchy and restrictions for participation in other incentive programs
Payment Basis	Basis for compensation ($/kW, $/MWh, or blend)
Performance	Means of evaluating successful delivery of grid services

Potential Tools for distributing compensation

- **Reservation payment** – set payments provided to all selected participants for committing to have capacity available within the established window
- **Performance payment** – payment issued to DERs that are called upon and respond to distribution capacity needs
- **Penalty** – penalties owed by DERs who receive reservation payments but fail to respond to distribution needs when called upon

Potential Compensation Structures (Non-Exhaustive)

1. Performance–only payment
2. Consistent upfront reservation payment + Performance-based payment
3. Reservation payment increased during active deferral or bridge-to-wires years
   + Performance-based payment
4. Reservation payment increased during active years
   + Penalty for non-response

What other structures might be appealing?

Performance-Only Payment structure provides strong price signals on call, though little future certainty

Performance – only payment

- Payment based on kW of capacity provided during specific call events
- Not all participants may be called during a given year, and contracting may be annual or multi-year basis
- Payments may be determined at the end of each year depending on the deferral value and # of kW called

Simplified Example:

Budget: $10 per year of deferral

Year	1	2	3	4	5	6	7	8	9	10
Deferral Value ($/kW)	-	-	-	-	10	10	10	10	-	-
Compensation from Calls ($/kW)	-	-	-	-	10	10	10	10	-	-
Compensation Total ($/kW)	-	-	-	-	10	10	10	10	-	-

Dollar values are purely illustrative. Examples shown do not account for discount rates, variation in contracting periods, or other factors. Compensation totals represent total payments to be split across all participants and kW called

Reservation payments provide greater certainty of value for participants, though add uncertainty in matching ratepayer value to compensation

Consistent reservation payment + Performance-based payment

- Reservation and performance payments come from the same pool of expected deferral value
- Both the reservation payments and any multi-year contracts present trade-offs between certainty of having the DER available and forecast uncertainty that deferral value will be present

Simplified Example:

Budget: $10 per year of deferral

Year	1	2	3	4	5	6	7	8	9	10
Deferral Value ($/kW)	-	-	-	-	10	10	10	10	-	-
Reservation Payments ($/kW)	1	1	1	1	1	1	1	1	-	-
Compensation from Calls ($/kW)	-	-	-	-	8	8	8	8	-	-
Compensation Total ($/kW)	1	1	1	1	9	9	9	9	-	-

Increased reservation payments can incentivize greater baseline participation during years of expected need

Reservation payment increased during active value (deferral or bridge-to-wires) years

+ Performance-based payment

- Increasing reservation payments during active years can increase likelihood of resource availability when needed
- Increased compensation can either come out of early year reservation payments or from call payments

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Deferral Value ($/kW)	-	-	-	-	10	10	10	10	-	-
Reservation Payments ($/kW)	1	1	1	1	3	3	3	3	-	-
Compensation from Calls ($/kW)	-	-	-	-	6	6	6	6	-	-
Compensation Total ($/kW)	1	1	1	1	9	9	9	9	-	-

Reservation payments with penalties may provide the most predictable value for active participants

Reservation payment increased during active years + Penalty for non-response

- Reservation payments would increase steeply for years of deferral, potentially lending greater importance to year-by-year contracting to appropriately match compensation with value
- This provides the greatest certainty for enrolled participants on a year-by-year basis
- Penalties must be severe to ensure the DERs perform as needed

Simplified Example:

Budget: $10 per year of deferral

Year	1	2	3	4	5	6	7	8	9	10
Deferral Value ($/kW)	-	-	-	-	10	10	10	10	-	-
Reservation Payments ($/kW)	1	1	1	1	9	9	9	9	-	-
Penalties for non-performance ($/kW)	-	-	-	-	-10	-10	-10	-10	-	-
Compensation Total (if performing) ($/kW)	1	1	1	1	9	9	9	9	-	-

Break-out Rooms

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Break-out Room Guidelines

- We will reserve 30-45 minutes for break-out rooms, depending on meeting time and ongoing discussion
- Participants will be randomly sorted into break-out rooms
- Moderators from MassCEC, DOER, E3, and RMI will be present in each room to help answer questions, take note of shared input, and otherwise support discussion
- We have a list of key questions to prompt conversation, and each room will start with a different set of questions but with opportunity to cycle through additional topics of interest
- Please be respectful of others' time and perspectives – We wish to allow everyone the opportunity to speak and be heard

Valuation Questions

- **What questions or concerns do you have related to the different options presented for valuing the benefits that DERs may provide to the distribution grid?**
- **Are there other approaches to valuing distribution grid services from DERs that you feel should be considered in this study?**
  - If recommending a new approach, what data/sources are available to support that approach?

Compensation Questions

- **Which compensation structure do you think best incentivizes participation?**

  Examples presented:

  - *Performance-only payment*
  - *Consistent upfront reservation payment + performance-based payment*
  - *Reservation payment increased during deferral or bridge-to-wires years + Performance-based payment*
  - *Reservation payment increased during active years + Penalty for non-response*
  - *Others?*

- **Does a performance-based payment or penalty for non-response provide a better incentive for participation during critical times?**
- **What other compensation structures should be considered?**

Implementation and Barriers to Entry Questions

- **How can we encourage customers to enroll?**
- **What barriers to entry might exist and how do we overcome them?**
- **Who do customers most trust for information about this type of program? What are your recommendations for customer outreach strategies?**
  - How do we gain customer trust?
  - What's the best way to disseminate information to customers that already have dispatchable DERs (e.g., batteries)?

Equity and Environmental Justice Questions

- **What impacts (benefits or burdens) might we expect EJ Populations to face as a result of a grid services program?**
  - From participating in such a program? From having neighbors participate? From a grid services program existing without their participation?
- **How might we quantify these impacts?**
  - Do these impacts have a clear financial value? (i.e. this would directly cost or save households $X, or indirectly result in health outcomes valued in other studies at $X)
  - If we're not able to quantify impacts in financial terms, is there some financial adder that we should use to reflect these impacts, and how could we justify such an adder? (i.e. projects in EJPs receive 5% greater compensation due to X increase in non-monetizable impacts)
- **How would challenges or barriers to entry for EJ populations differ from the wider population?**
  - How should these be dealt with? Can we alleviate or compensate for them without unintended negative impacts?

Breakout Room Reflections

- Facilitators in each room will share 1-3 key ideas discussed in their breakout room

- Facilitators will aggregate notes from each breakout room
  - If you have any additional comments to share, please add them to the chat

Closing and Next Steps

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This is only the beginning of the conversation!

- **Please share any questions or feedback after the meeting with:**
  - Grid@masscec.com
  - Andrew.Solfest@ethree.com
  - Bwebster@rmi.org
- **Let us know if you would prefer to share feedback in a 1-on-1 call or virtual meeting**
- **We are working to engage a series of focus groups of organizations representing Environmental Justice populations – we want to better understand key considerations for valuation and implementation**
  - If you feel you may be a good fit for this or can recommend others, please reach out

Upcoming Workshops

- **Workshop 1: December 2024**
  - Introduction to Study
- **Workshop 2: March 3, 2025**
  - Detailed analytical approach to Grid Services valuation
  - Introduction of compensation mechanisms and implementation considerations
- **Workshop 3: Spring 2025**
  - Feedback on Grid Services compensation mechanisms
  - Discussion of Near-Term Implementation Plan
- **Workshop 4: Late Spring/Early Summer 2025**
  - Presentation of findings and discussion of Long-Term Implementation Roadmap
- **Final Report: Summer 2025**

Workshop Resources and Communication

- **Workshop session slides and recordings will be made available on the MassCEC website:**
  - https://www.masscec.com/grid-modernization-and-infrastructure-planning/grid-services-study
  - This site also contains general information about the study and a primer for this workshop series
- **Future meeting announcements will be sent by email to the workshop mailing list**
  - If you are not on the list and would like to be added, please sign up here

Thank You

Video recording
will be ended now

Appendix

Balancing Policy Objectives:
Illustration of Cost Shifting

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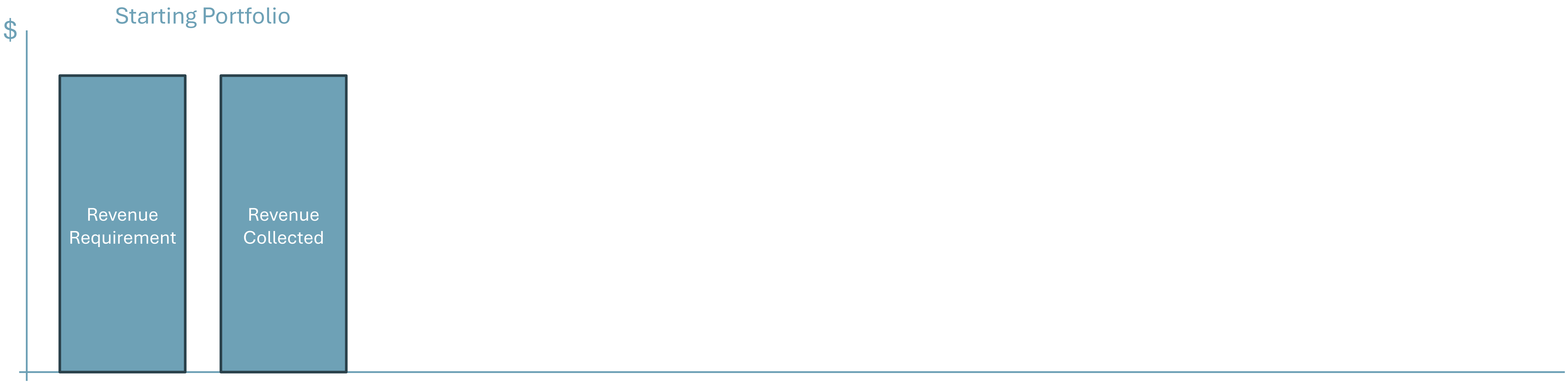
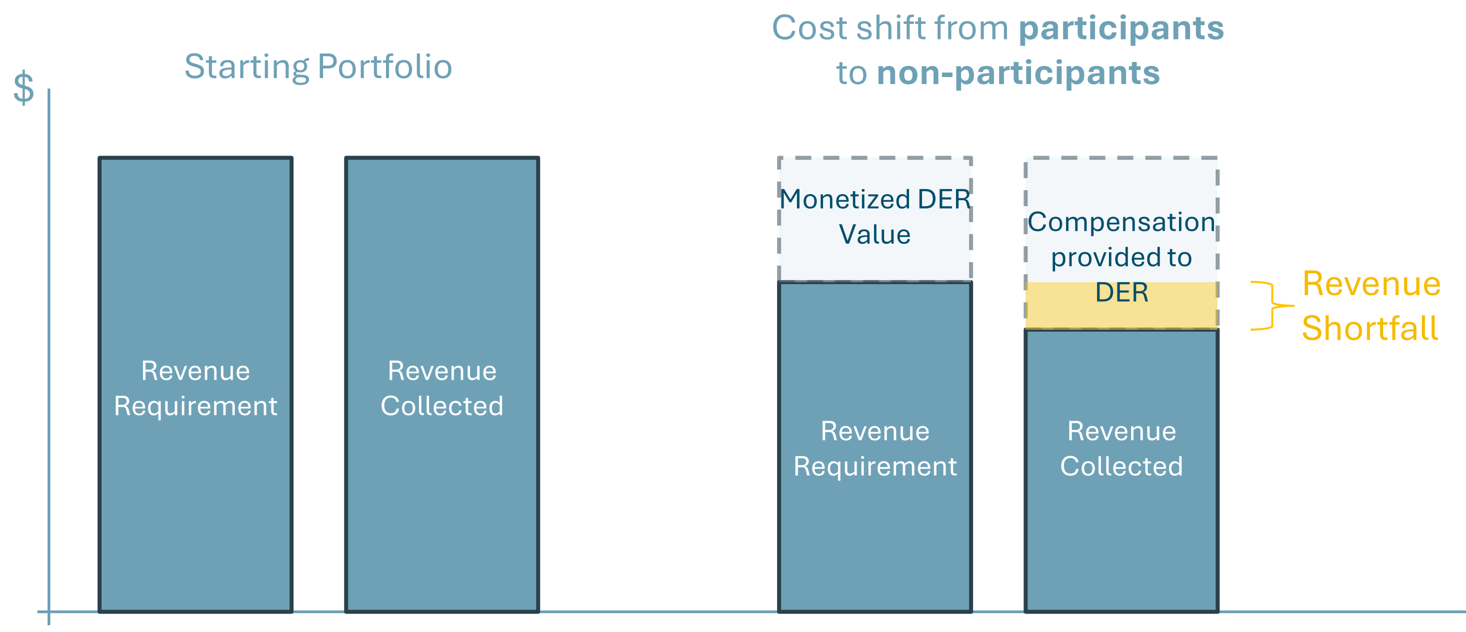
Alignment of DER compensation with monetized value to ratepayers avoids cost-shifting among customers



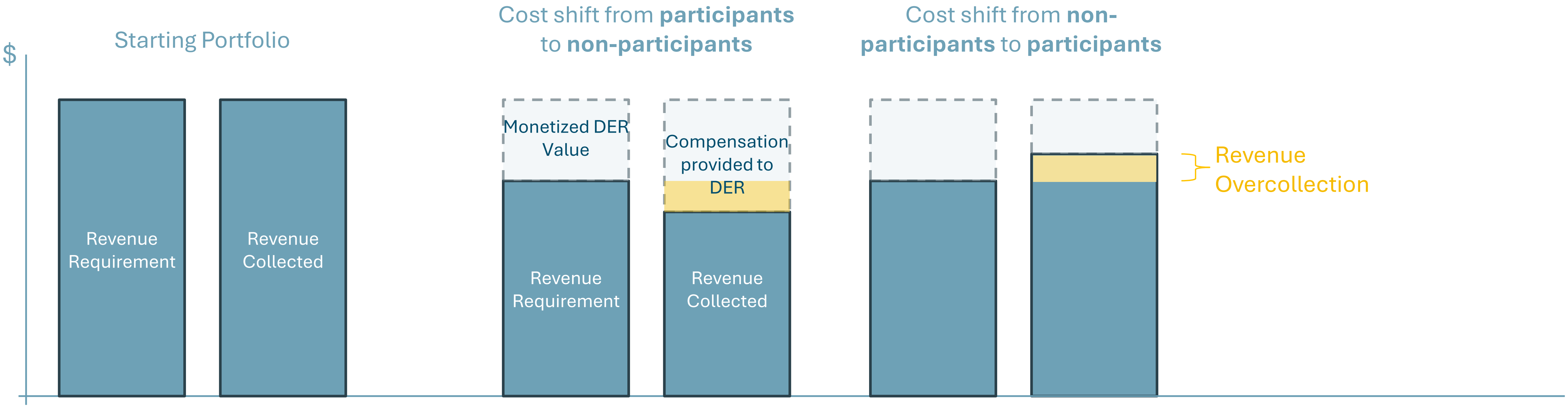
Alignment of DER compensation with monetized value to ratepayers avoids cost-shifting among customers



May be desirable for promoting market transformation or EJ goals (for targeted programs)

Creates affordability challenge for non-participants

Alignment of DER compensation with monetized value to ratepayers avoids cost-shifting among customers



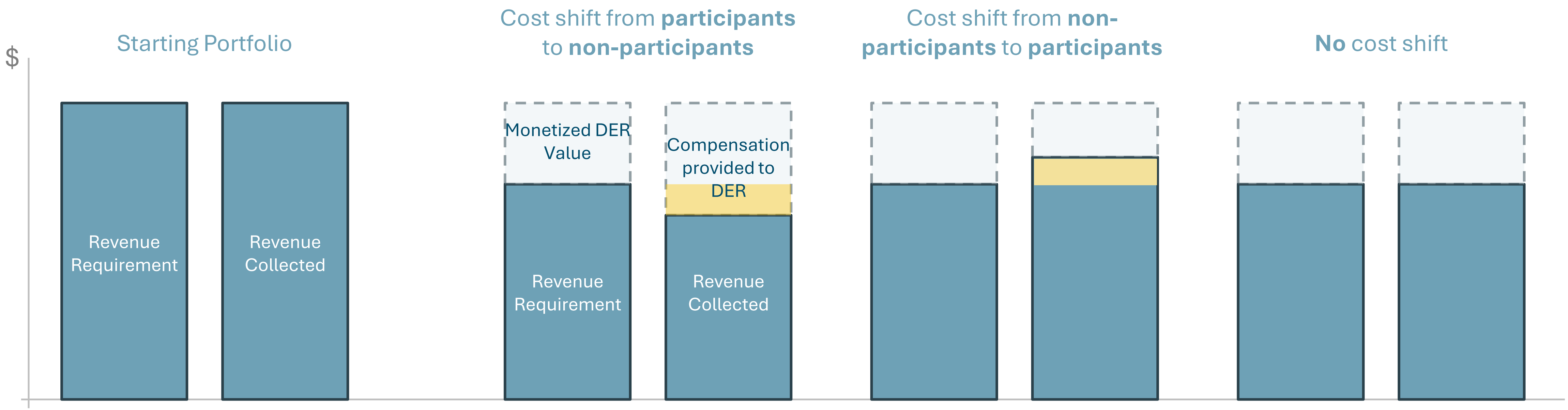
May be desirable for promoting market transformation or EJ goals (for targeted programs)

Creates affordability challenge for non-participants

May be desirable to collect additional revenue for other programs or affordability

Does not maximize DER participation

Alignment of DER compensation with monetized value to ratepayers avoids cost-shifting among customers



Cost shift from participants to non-participants

May be desirable for promoting market transformation or EJ goals (for targeted programs)

Creates affordability challenge for non-participants

Cost shift from non-participants to participants

May be desirable to collect additional revenue for other programs or affordability

Does not maximize DER participation

No cost shift

Promotes DER participation to a limited extent

No impact on non-participants

Deferral Value Modeling Example

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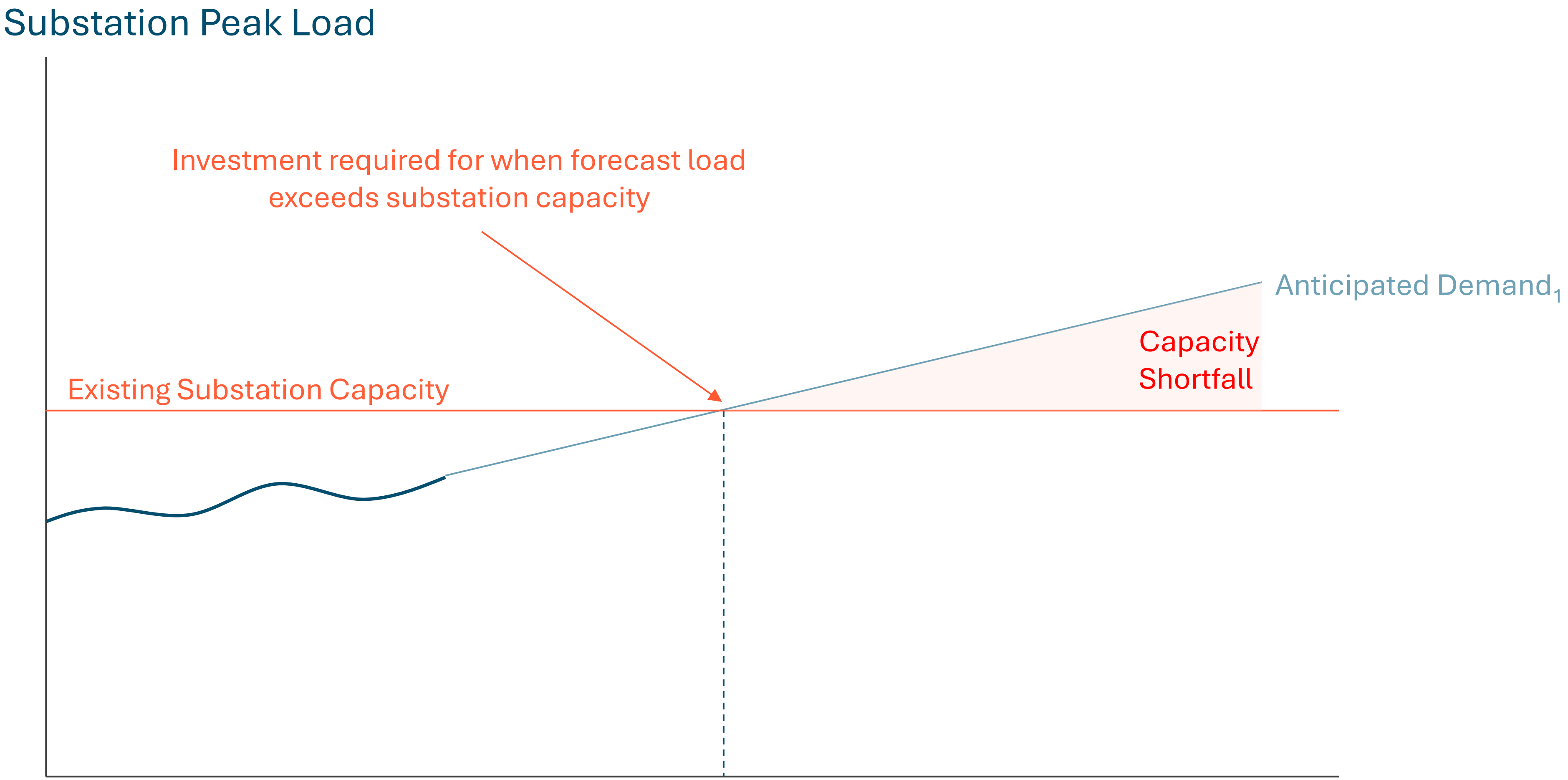
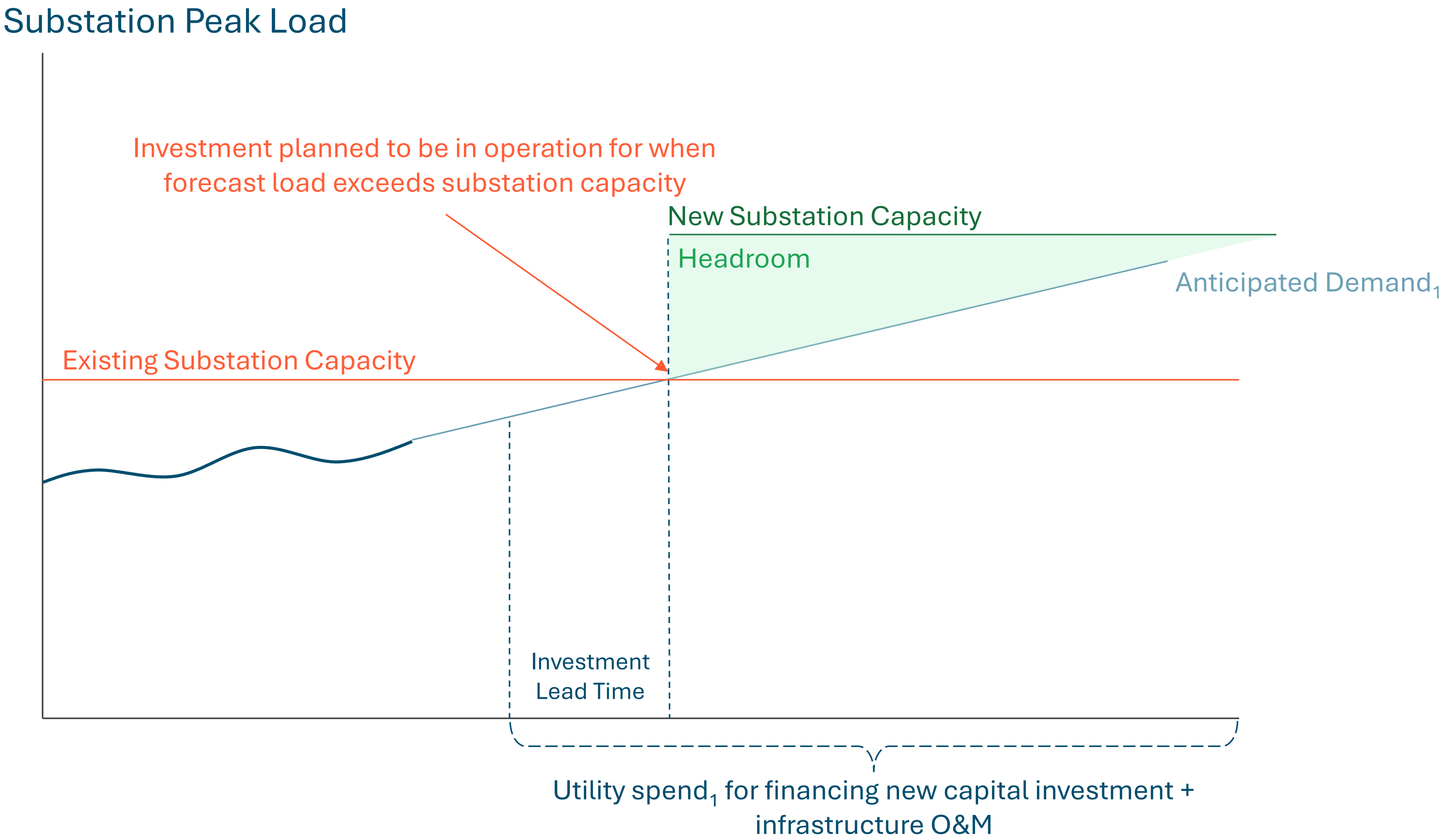
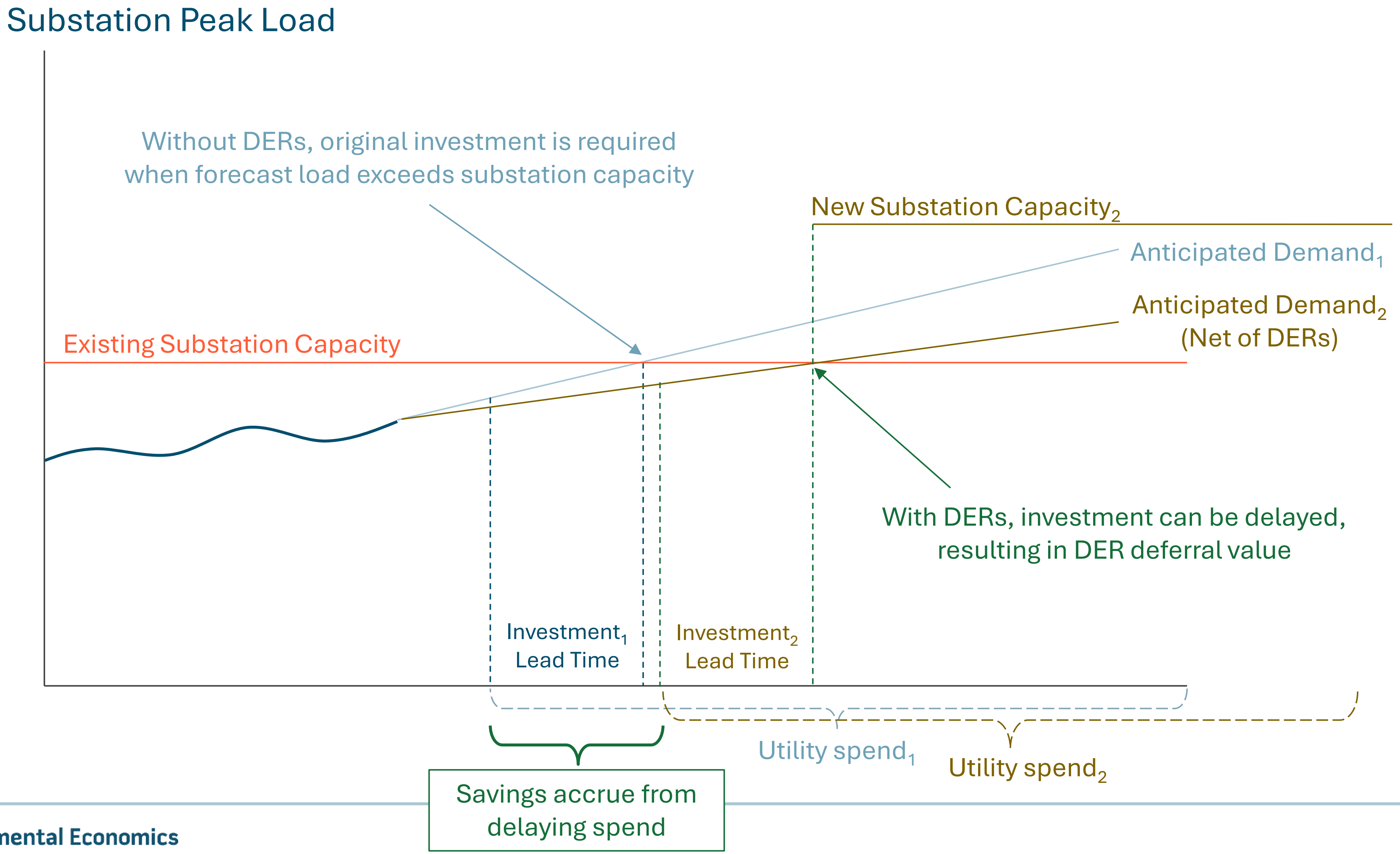
Delaying required investments provides benefit due to the time value of money



Investments to increase capacity incur capital and ongoing costs, increasing the revenue requirement



Deferral value reflects benefits of delaying investments related to the time value of money



Deferral Value is based on the discount value of the deferred investment

Years of Deferral	NPV of Revenue Requirement	Deferral Value
0	$61,766.34	$0.00
1	− $59,499.69	= $2,267
2	$57,316.21	$4,450
3	$55,212.87	$6,553
4	$53,186.71	$8,580
5	$51,234.90	$10,531
6	$49,354.72	$12,412
7	$47,543.54	$14,223
8	$45,798.82	$15,968
9	$44,118.13	$17,648
10	$42,499.12	$19,267
11	$40,939.52	$20,827
12	$39,386.32	$22,380
13	$37,875.27	$23,891
14	$36,403.46	$25,363
15	$34,967.98	$26,798
16	-	-

2030	2031	2032	2033	2034	2035
Revenue Requirement					
$12,500	$12,125	$11,750	$11,375	$11,000	$10,625
$0	$13,125	$12,731	$12,338	$11,944	$11,550
$0	$0	$13,781	$13,368	$12,954	$12,541
$0	$0	$0	$14,470	$14,036	$13,602
$0	$0	$0	$0	$15,194	$14,738
$0	$0	$0	$0	$0	$15,954
[illegible]	[illegible]	[illegible]	[illegible]	$0	$0
[illegible]	[illegible]	[illegible]	[illegible]	$0	$0
$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0

Decrease in Revenue Requirement compared to 0 years of deferral

Optionality Modeling Example

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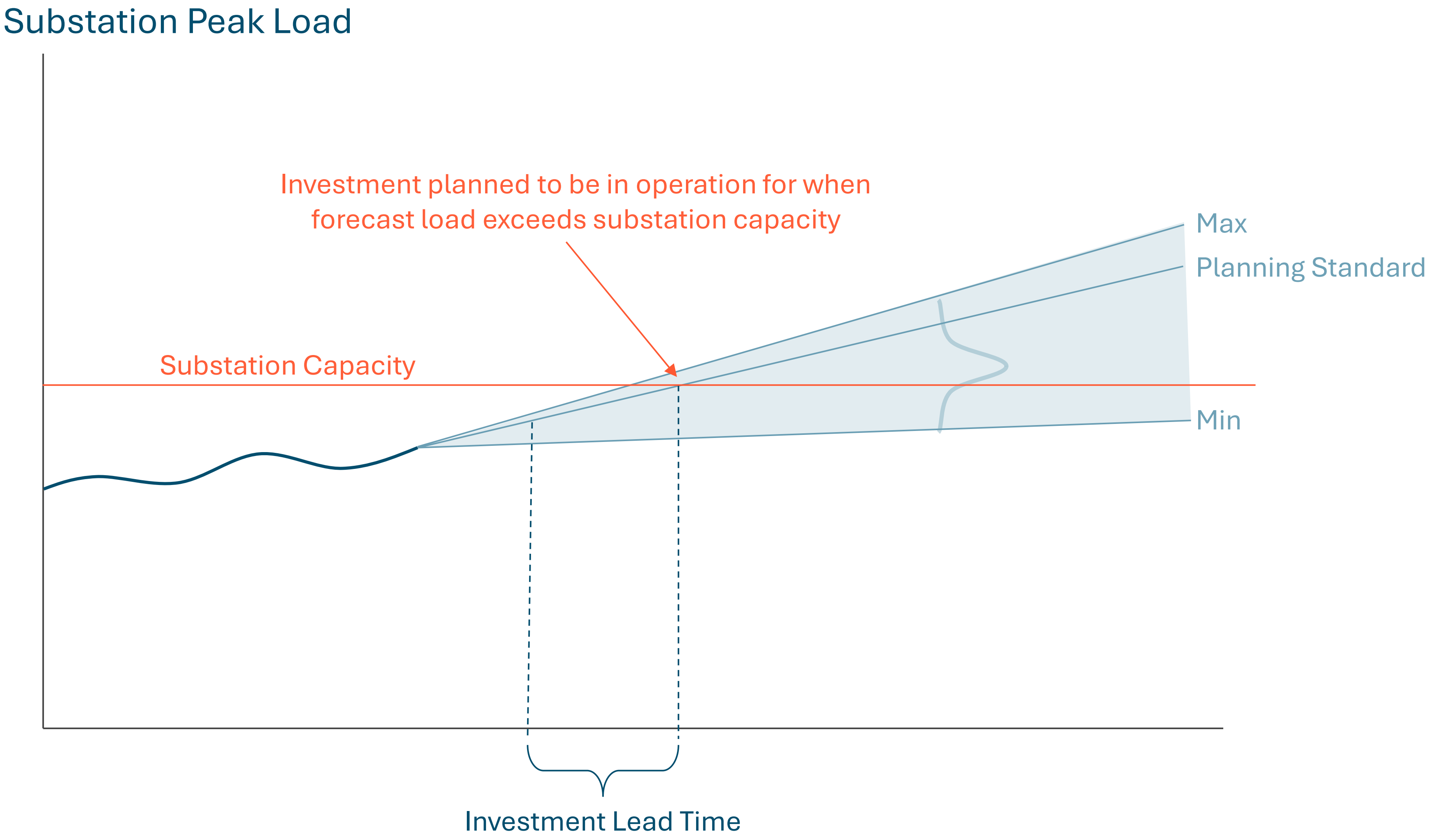
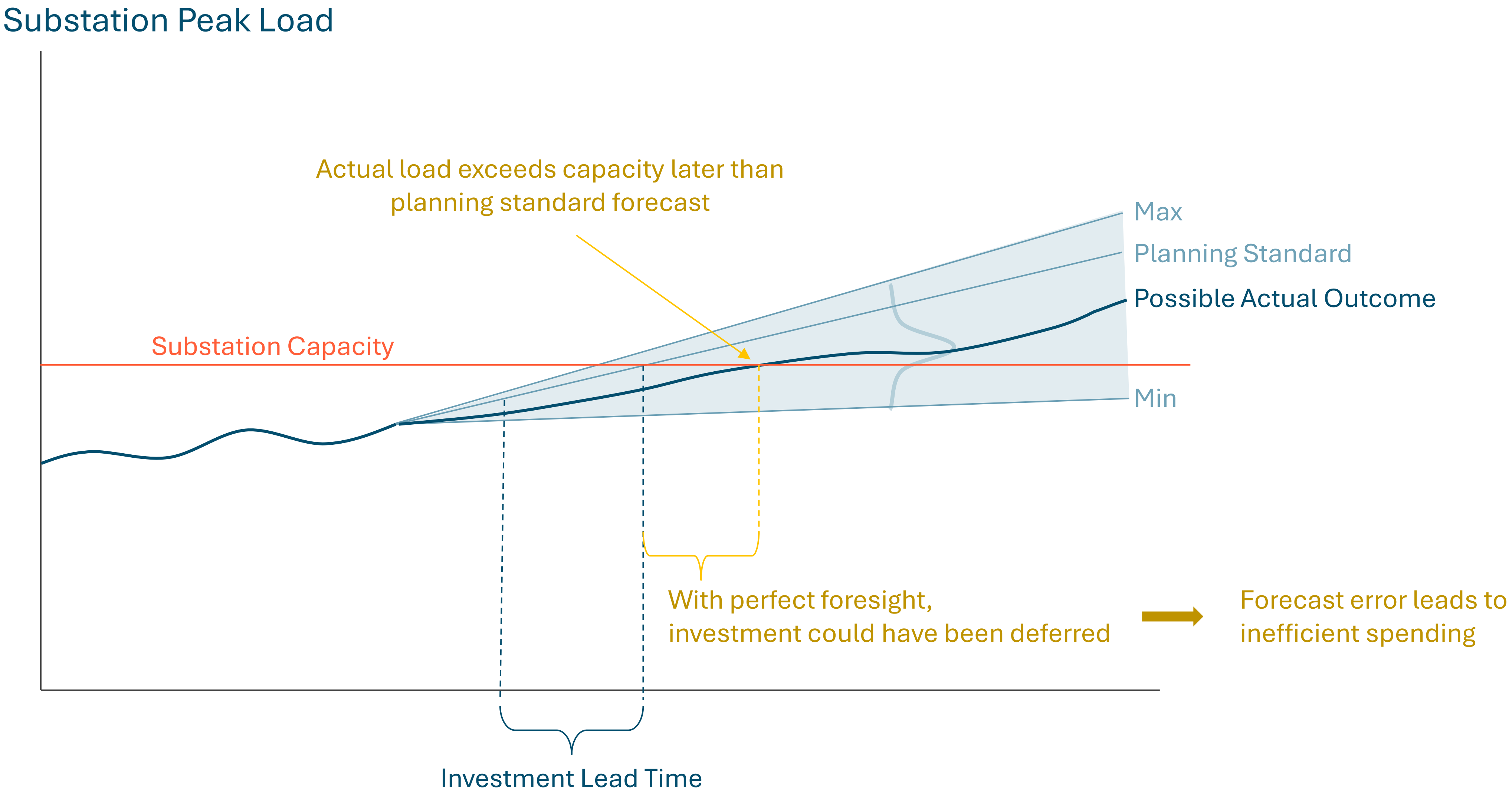
Forecasts of load growth used to plan investments are uncertain



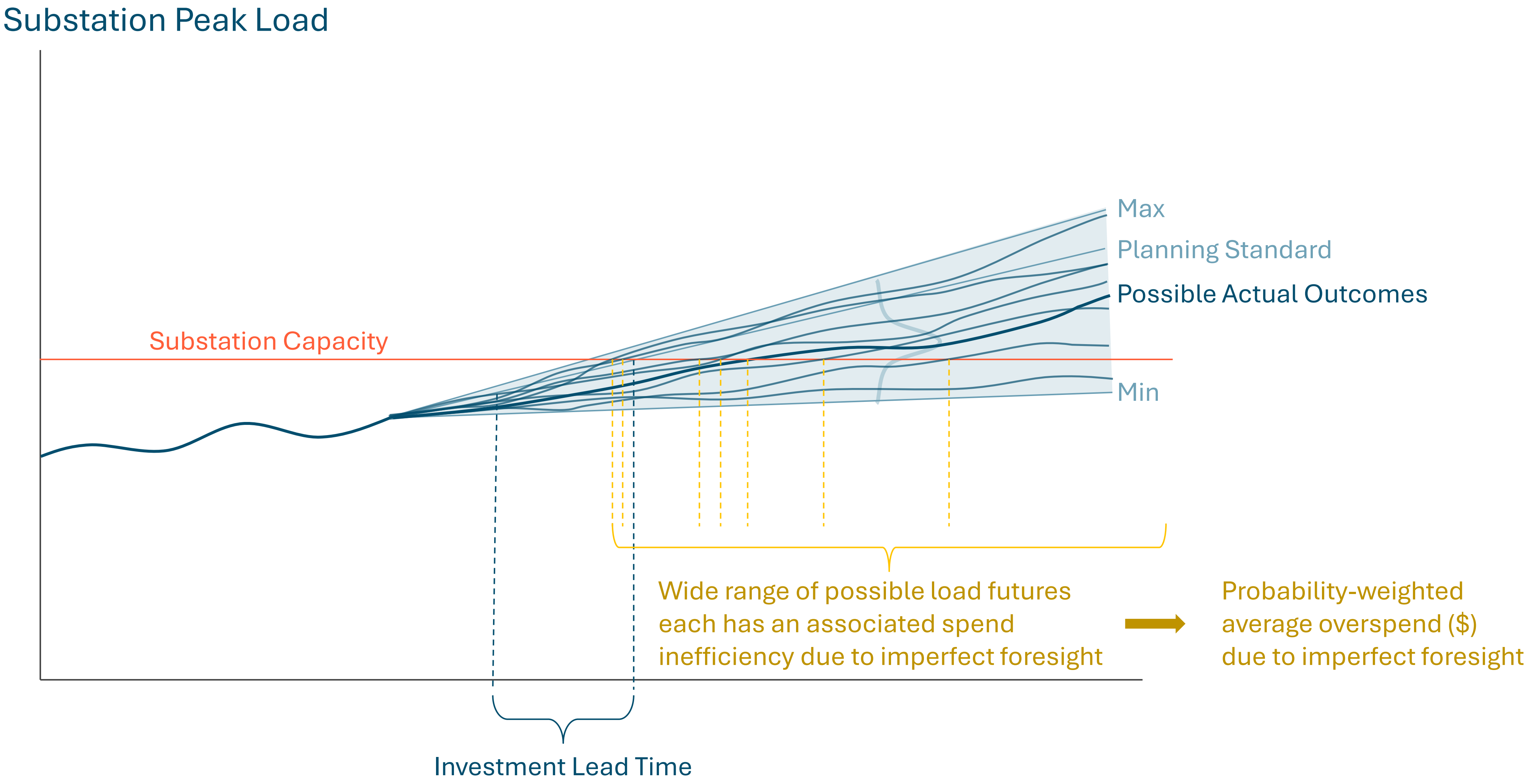
Actual future peak load growth may differ from planning forecast



With perfect foresight, investment could have been deferred

Forecast error leads to inefficient spending

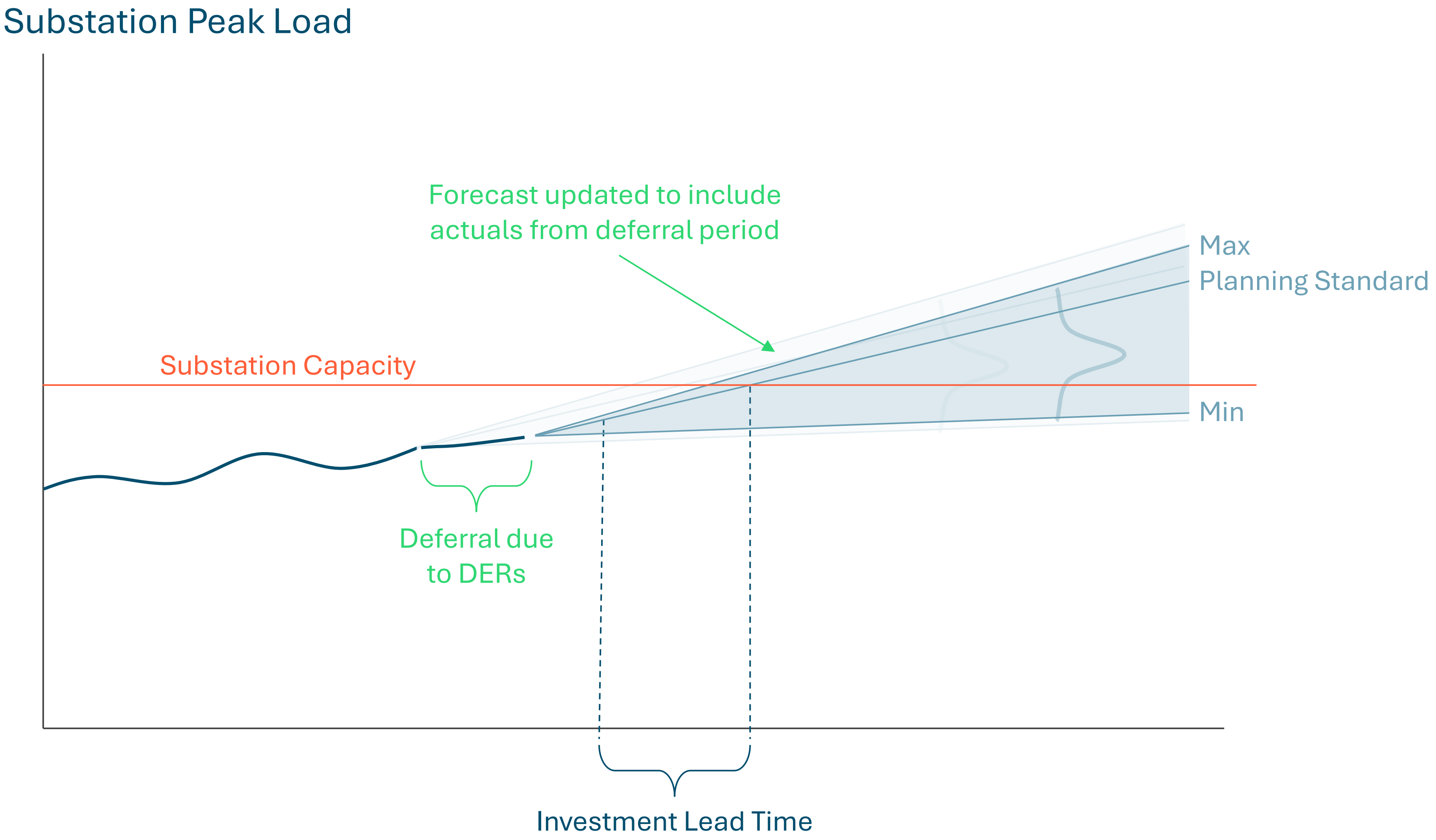
Any peak load growth future is just one of many possibilities



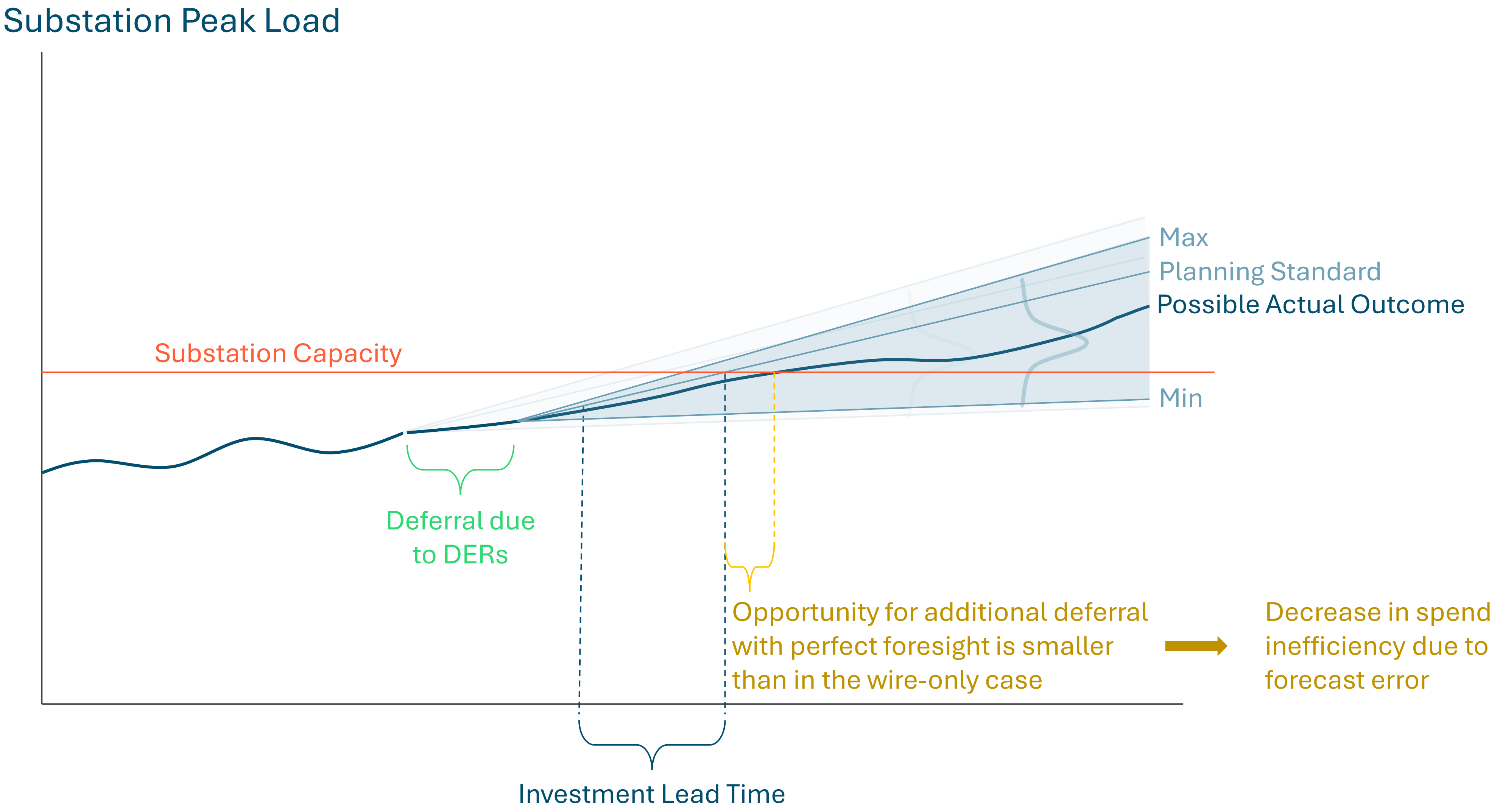
Wide range of possible load futures each has an associated spend inefficiency due to imperfect foresight

➡ Probability-weighted average overspend ($) due to imperfect foresight

Investment deferral with DERs allows for additional years of actual load data and a corresponding decrease in uncertainty



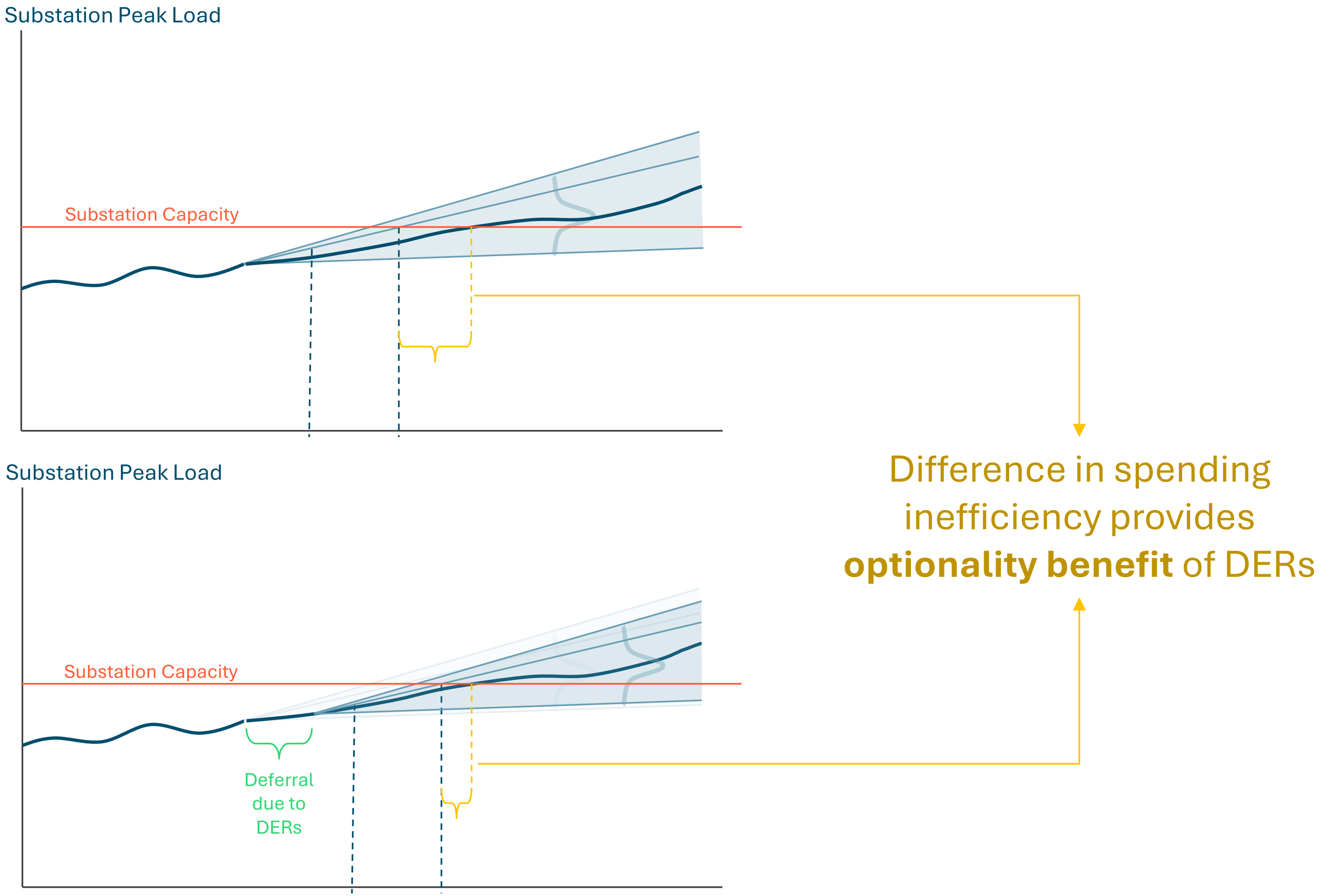
Actual future peak load growth will still differ from planning forecast, but by a smaller amount



Opportunity for additional deferral with perfect foresight is smaller than in the wire-only case

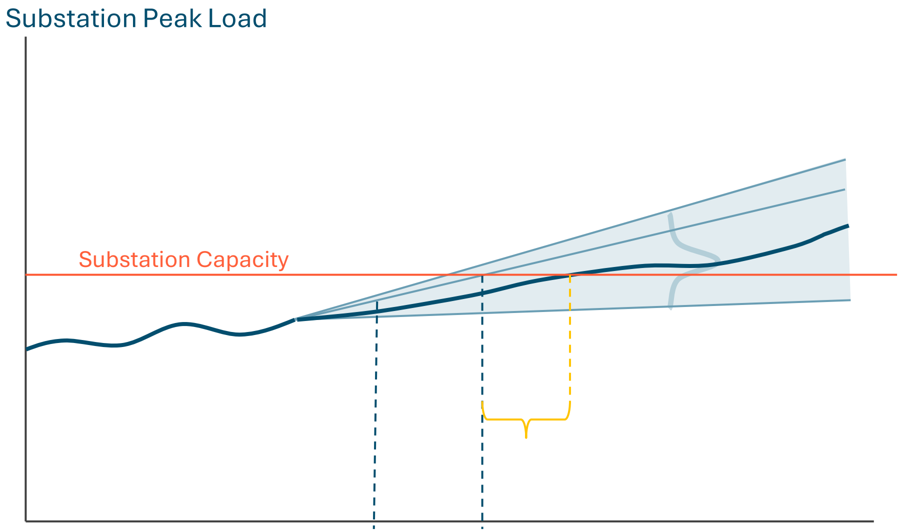
Decrease in spend inefficiency due to forecast error

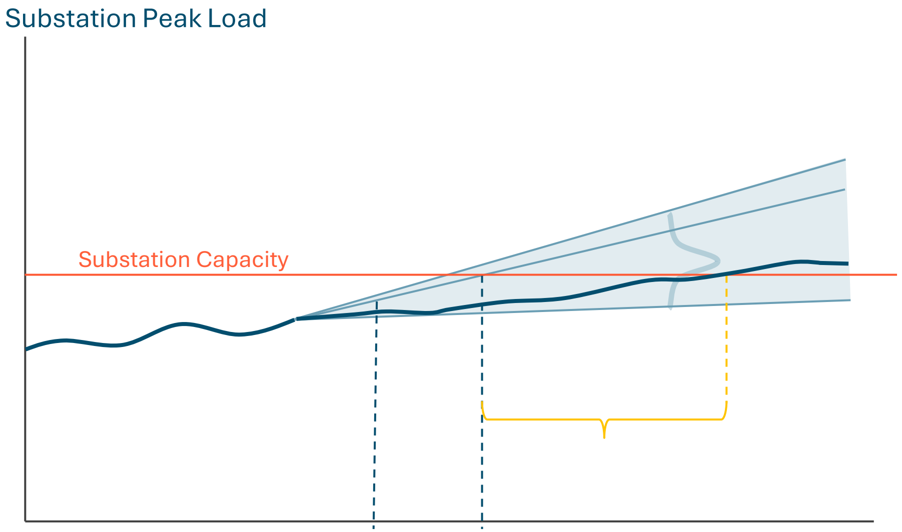
Optionality benefit captures the value of decreased uncertainty in the forecast used to determines investment timing

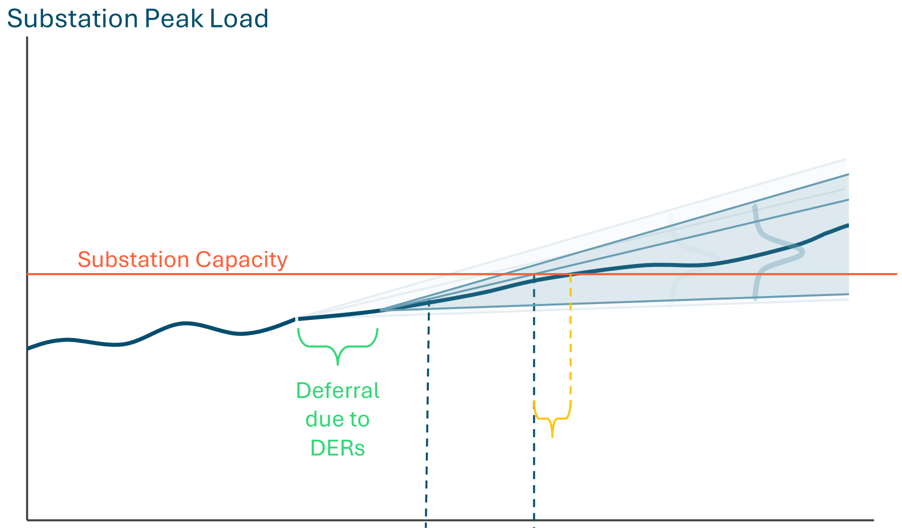


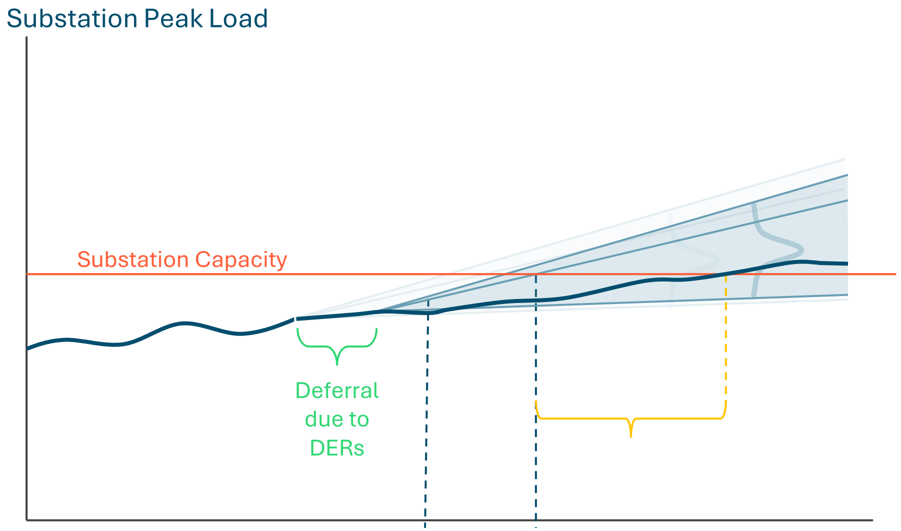
Difference in spending inefficiency provides **optionality benefit** of DERs

Difference in spend inefficiency calculated for thousands of possible actual load trajectories

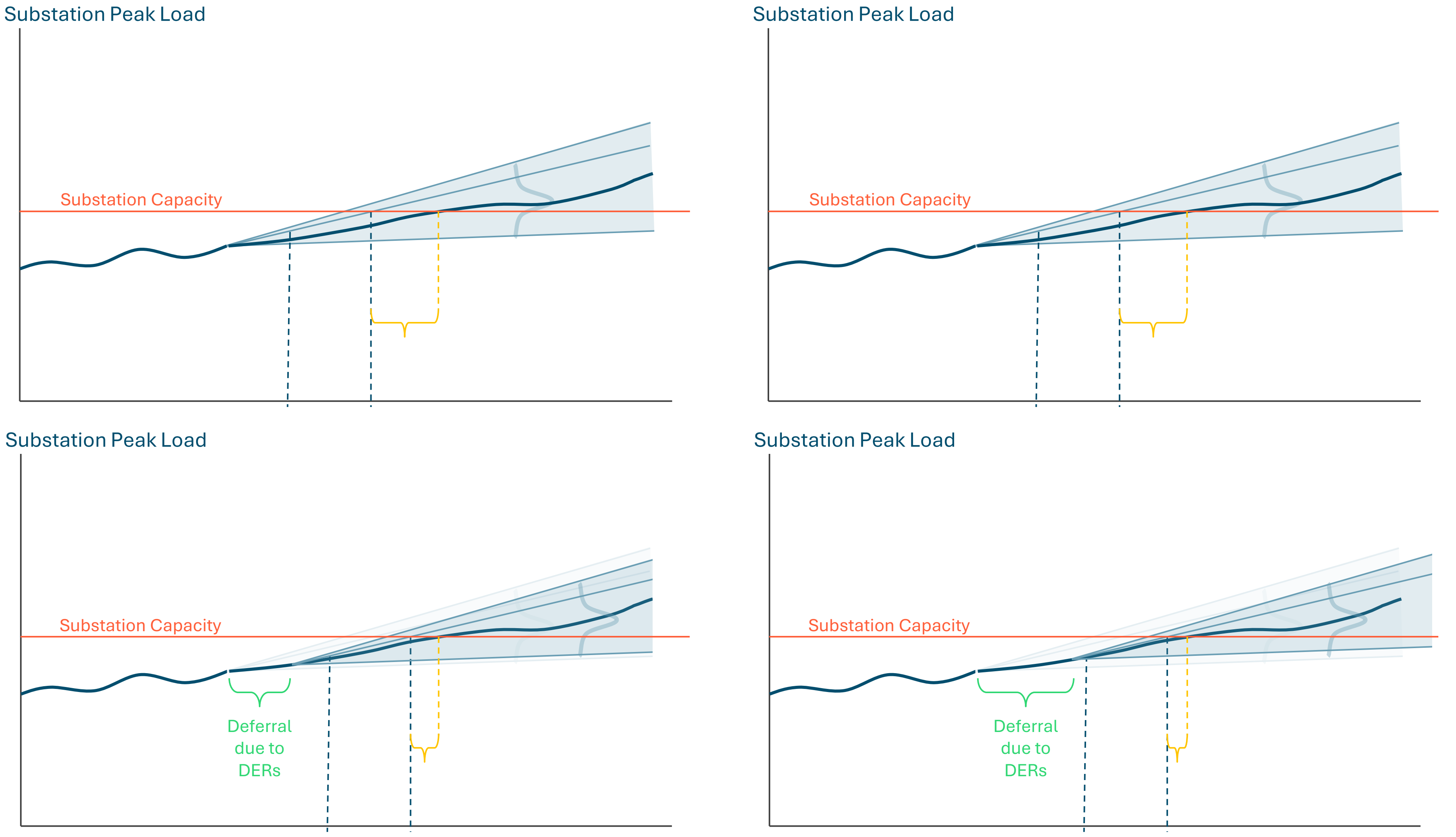








Difference in spend inefficiency calculated for different lengths of deferral due to DERs



Bridge-to-Wires Value Modeling Example

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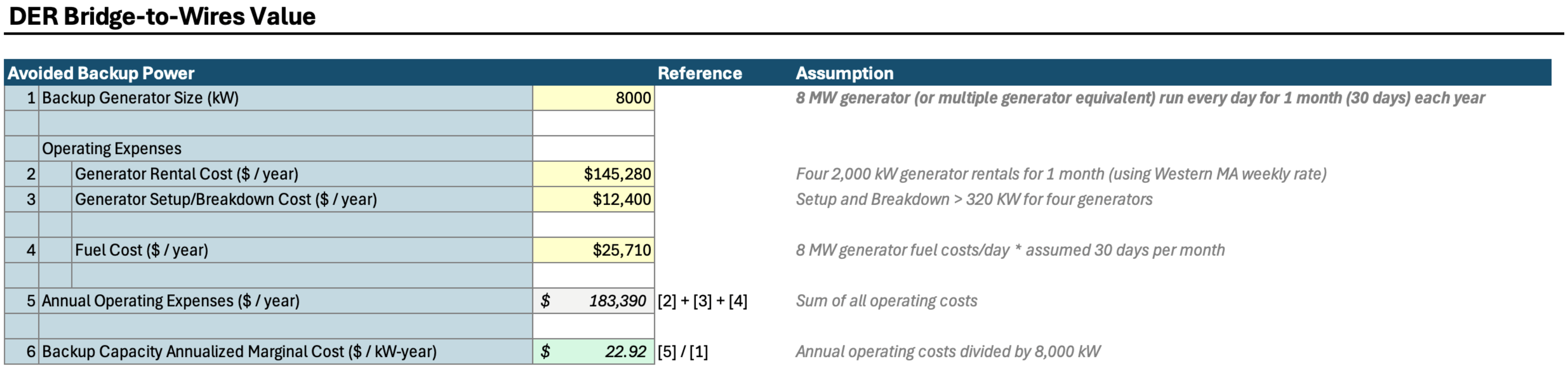
To quantify the value of Bridge-to-Wires solutions, one potential approach uses the cost of backup generators

- The cost for backup generators provides a monetized cost that Bridge-to-Wires DER solutions can avoid
- We calculate a $/kW valuation from the average operating expenses of deploying a backup generator



DER Bridge-to-Wires Value

Avoided Backup Power			Reference	Assumption
1	Backup Generator Size (kW)	8000		***8 MW generator (or multiple generator equivalent) run every day for 1 month (30 days) each year***
	Operating Expenses			
2	Generator Rental Cost ($ / year)	$145,280		*Four 2,000 kW generator rentals for 1 month (using Western MA weekly rate)*
3	Generator Setup/Breakdown Cost ($ / year)	$12,400		*Setup and Breakdown > 320 KW for four generators*
4	Fuel Cost ($ / year)	$25,710		*8 MW generator fuel costs/day * assumed 30 days per month*
5	Annual Operating Expenses ($ / year)	*$ 183,390*	[2] + [3] + [4]	*Sum of all operating costs*
6	Backup Capacity Annualized Marginal Cost ($ / kW-year)	*$ 22.92*	[5] / [1]	*Annual operating costs divided by 8,000 kW*

This does not address non-rate impacts of the DER solutions, which we aim to capture alongside the Environmental Justice value