

# Decarbonized Economy

		Scenarios
		<b>Decarbonized Economy</b>
<i>20-Year PVRR (2023\$MM, 2023-2042)</i>		
<b>Generation Strategies</b>	<b>No Early Retirement</b>	<b>\$9,917</b>
	<b>Pete Refuel to 100% Gas (est. 2025)</b>	<b>\$9,546</b>
	<b>One Pete Unit Retires (2026)</b>	<b>\$9,955</b>
	<b>Both Pete Units Retire (2026 &amp; 2028)</b>	<b>\$9,923</b>
	<b>“Clean Energy Strategy” Both Pete Units Retire and Replaced with Wind, Solar &amp; Storage (2026 &amp; 2028)</b>	<b>\$9,690</b>
	<b>Encompass Optimization without predefined Strategy – Selects Pete 3 Refuel in 2025 &amp; Pete 4 Refuel in 2027</b>	<b>\$9,572</b>

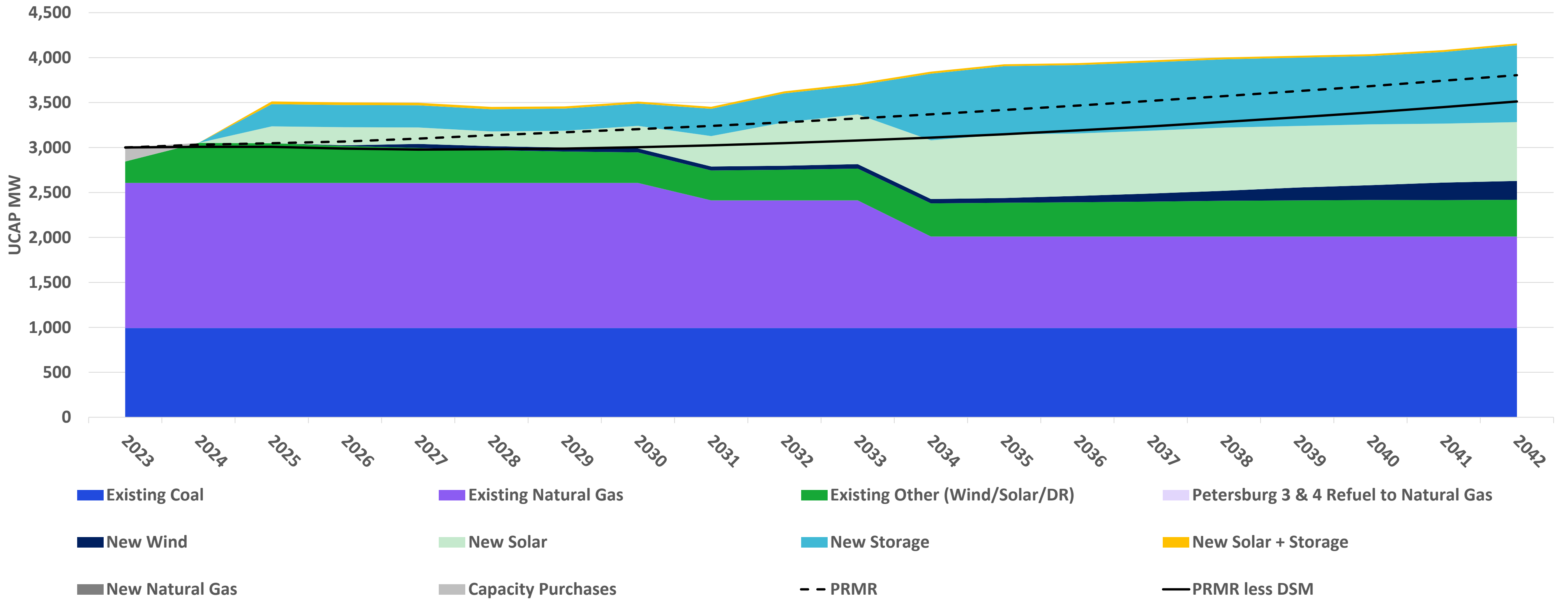
# A. No Early Retirement

Generation Strategy:  
*No Early Retirement*

Scenarios			
No Environmental Action	Current Trends	Aggressive Environmental	Decarbonized Economy
			<b>\$9,917</b>

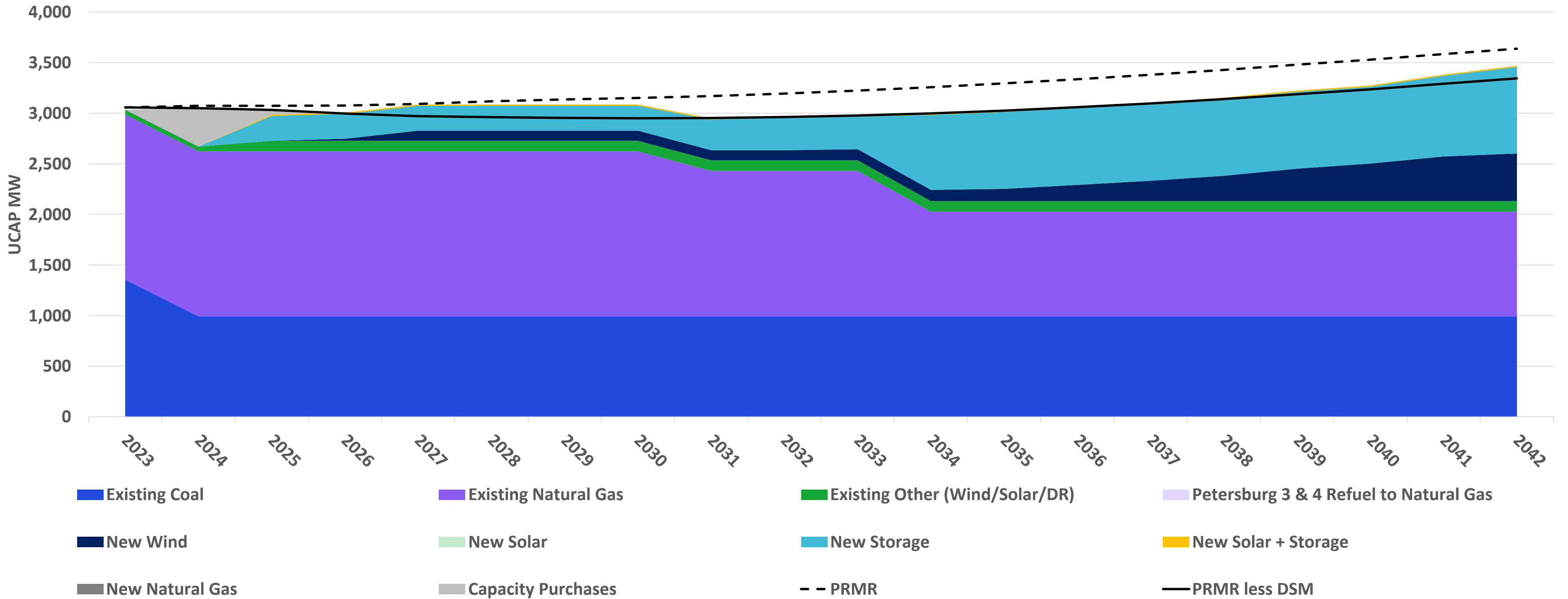
# No Early Retirement: Decarbonized Economy

## Firm Unforced Capacity Position – Summer



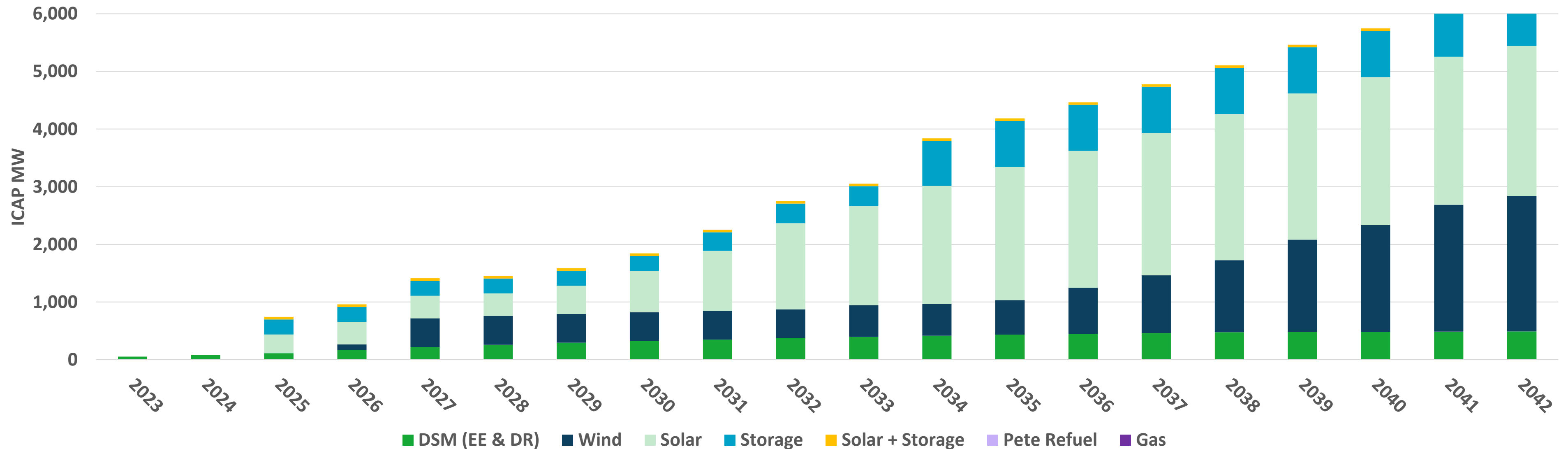
# No Early Retirement: Decarbonized Economy

## Firm Unforced Capacity Position – Winter



# No Early Retirement: Decarbonized Economy

## Installed Capacity Cumulative Additions (MW)

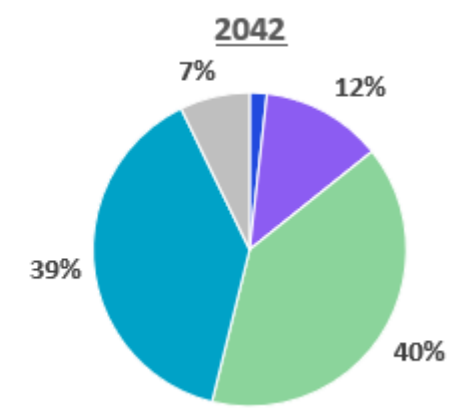
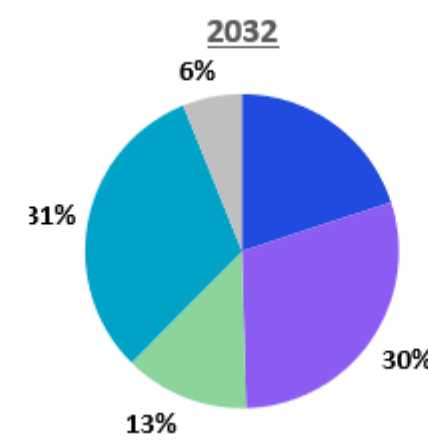
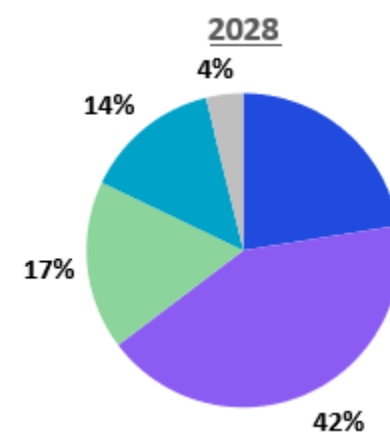
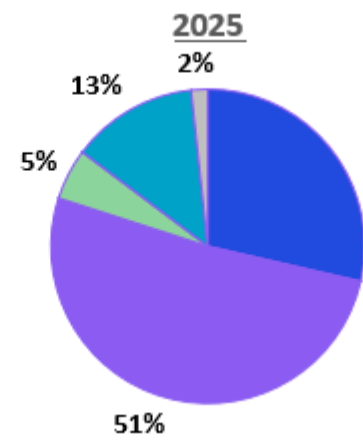
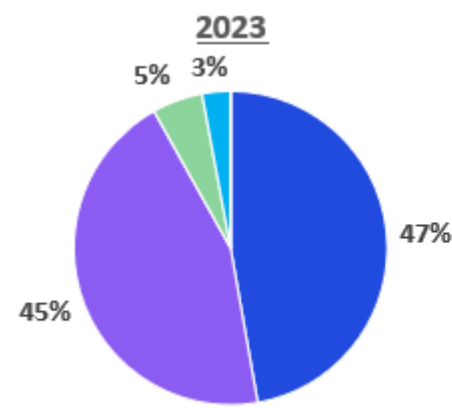
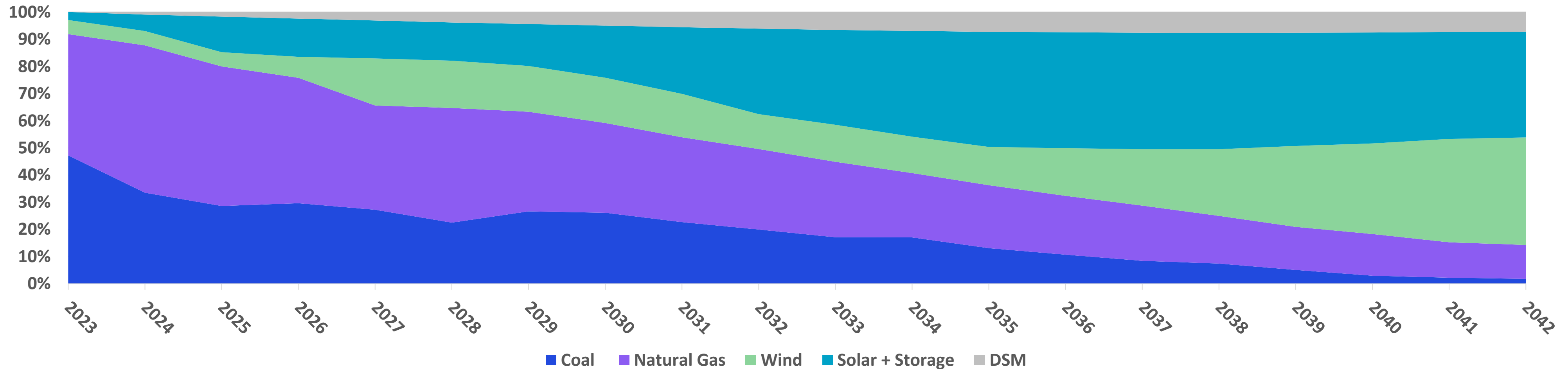


### Installed Capacity Incremental Additions (MW): 2023 - 2028

	<u>2023</u>	<u>2024</u>	<u>2025</u>	<u>2026</u>	<u>2027</u>	<u>2028</u>
Wind	0	0	0	100	400	0
Solar	0	0	325	65	0	0
Storage	0	0	260	0	0	0
Solar + Storage	0	0	45	0	0	0
Gas	0	0	0	0	0	0

# No Early Retirement: Decarbonized Economy

## Energy Mix %



Thermal MWh %	92%	Thermal MWh %	80%	Thermal MWh %	65%	Thermal MWh %	50%	Thermal MWh %	14%
Renewable/DSM MWh %	8%	Renewable/DSM MWh %	20%	Renewable/DSM MWh %	35%	Renewable/DSM MWh %	50%	Renewable/DSM MWh %	86%

# No Early Retirement: Decarbonized Economy

## Portfolio Overview Retirements

Harding Street:

- HS ST5 Nat Gas: 2030
- HS ST6 Nat Gas: 2030
- HS ST7 Nat Gas: 2033
- **Total Nat Gas Retired MW: 618 MW**

## Replacement Additions by 2042

- DSM: 490 MW
- Wind: 2,350 MW
- Solar: 2,600 MW
- Storage: 900 MW
- Solar + Storage: 45 MW
- Thermal: 0 MW

## Current Trends PVRR Summary 20-Year PVRR (2023\$MM, 2023-2042)

	Scenarios
	Decarbonized Economy
No Early Retirement	\$9,917
Pete Refuel to 100% Gas (est. 2025)	\$9,546
One Pete Unit Retires (2026)	\$9,955
Both Pete Units Retire (2026 & 2028)	\$9,923
"Clean Energy Strategy" Both Pete Units Retire and Replaced with Wind, Solar & Storage (2026 & 2028)	\$9,690
Encompass Optimization without predefined Strategy	\$9,572

# B. Pete Refuel by 2025

*20-Year PVRR  
(2023\$MM, 2023-2042)*

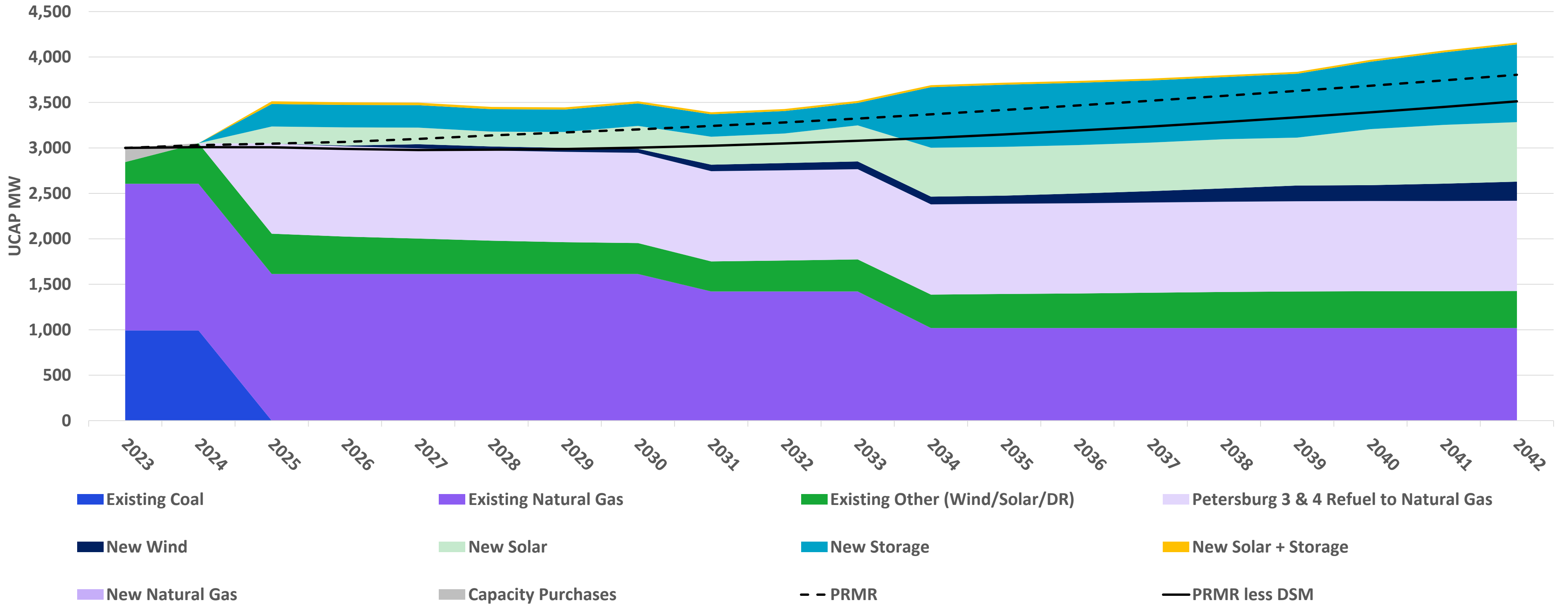
**Generation Strategy:  
*Pete Refuel to 100%  
Gas (est. 2025)***

Scenarios			
No Environmental Action	Current Trends	Aggressive Environmental	Decarbonized Economy
			<b>\$9,546</b>



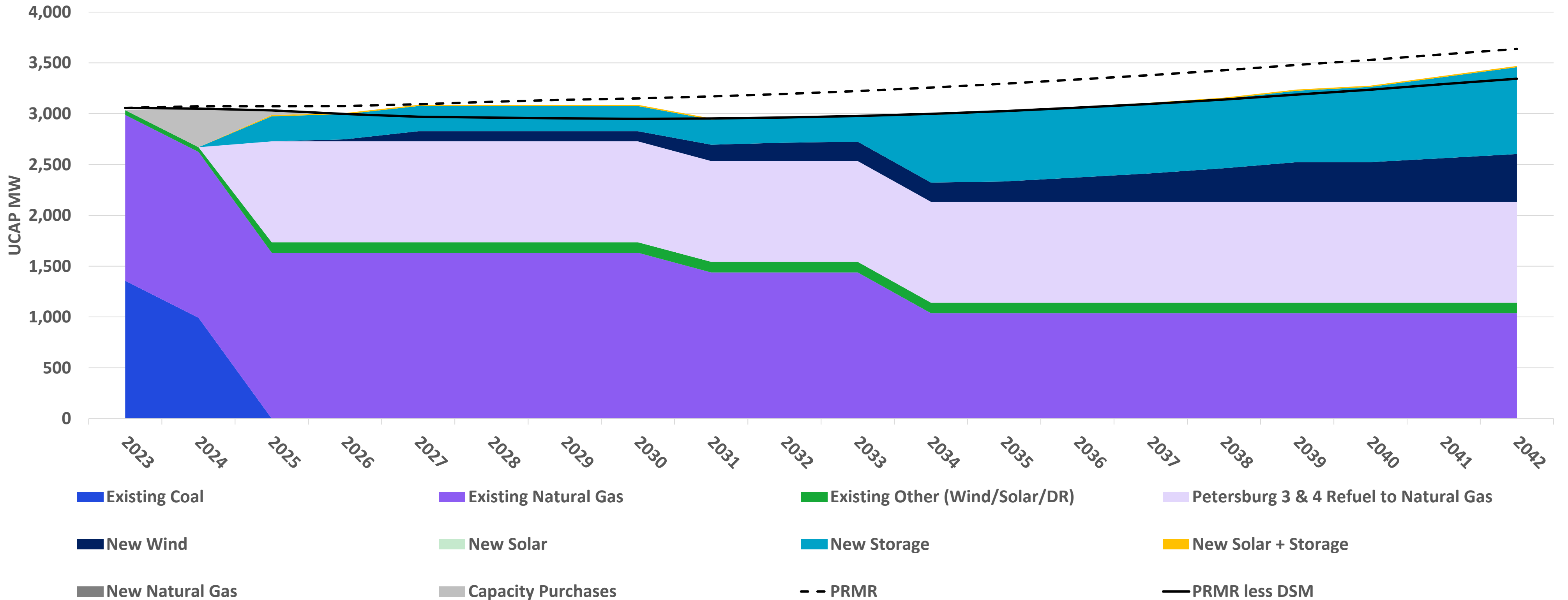
# Pete 3 & 4 Refuel in 2025: Decarbonized Economy

## Firm Unforced Capacity Position – Summer



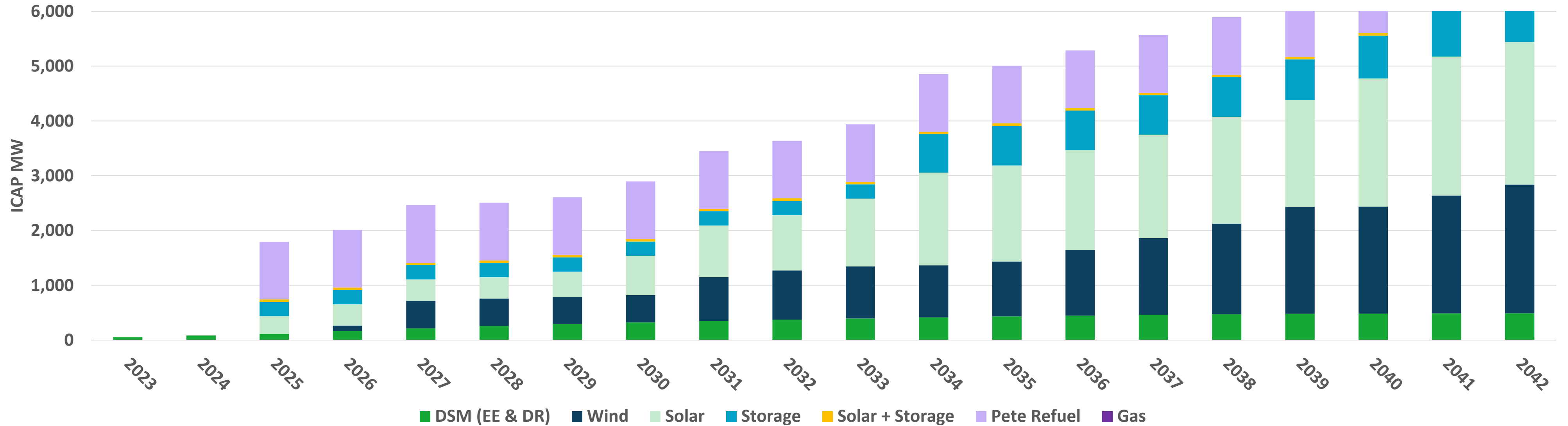
# Pete 3 & 4 Refuel in 2025: Decarbonized Economy

## Firm Unforced Capacity Position – Winter



# Pete 3 & 4 Refuel in 2025: Decarbonized Economy

## Installed Capacity Cumulative Additions (MW)

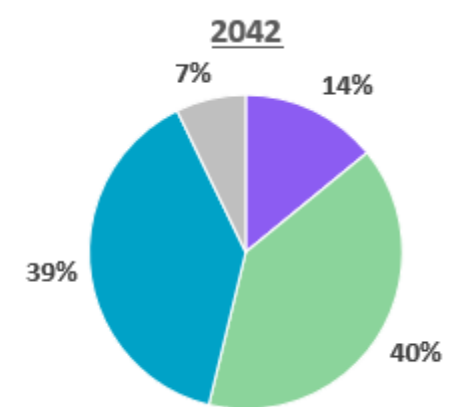
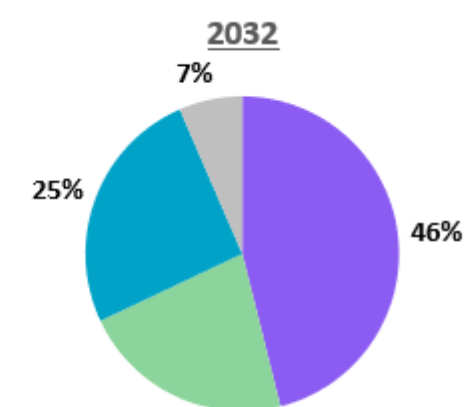
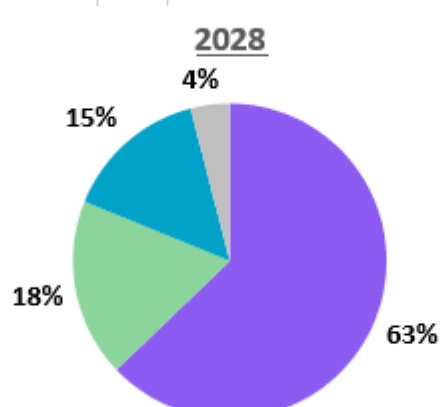
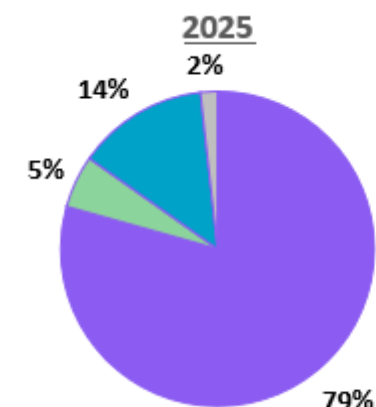
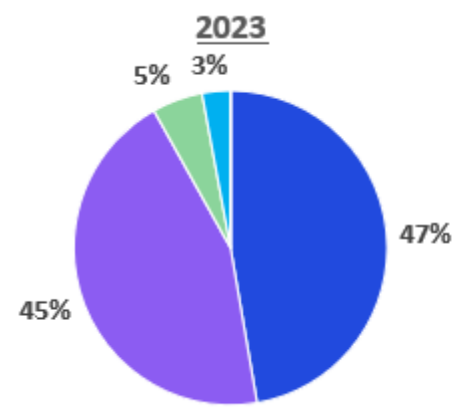
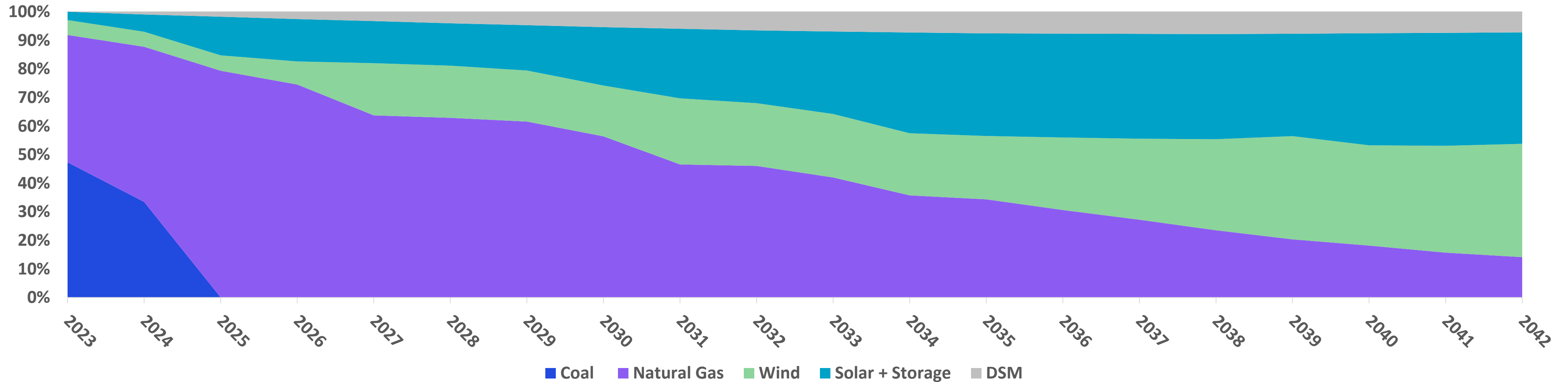


### Installed Capacity Incremental Additions (MW): 2023 - 2028

	<u>2023</u>	<u>2024</u>	<u>2025</u>	<u>2026</u>	<u>2027</u>	<u>2028</u>
Wind	0	0	0	100	400	0
Solar	0	0	325	65	0	0
Storage	0	0	260	0	0	0
Solar + Storage	0	0	45	0	0	0
Gas	0	0	0	0	0	0

# Pete 3 & 4 Refuel in 2025: Decarbonized Economy

## Energy Mix %



Thermal MWh %	92%	Thermal MWh %	79%	Thermal MWh %	63%	Thermal MWh %	46%	Thermal MWh %	14%
Renewable/DSM MWh %	8%	Renewable/DSM MWh %	21%	Renewable/DSM MWh %	37%	Renewable/DSM MWh %	54%	Renewable/DSM MWh %	86%

# Pete 3 & 4 Refuel in 2025: Decarbonized Economy

## Portfolio Overview

### Retirements

Petersburg:

- Pete 3 & 4 Coal: 2025 Refuel with Nat Gas
- **Total Refueled MW: 1,040 MW**

Harding Street:

- HS ST5 Nat Gas: 2030
- HS ST6 Nat Gas: 2030
- HS ST7 Nat Gas: 2033
- **Total Nat Gas Retired MW: 618 MW**

### Replacement Additions by 2042

- DSM: 490 MW
- Wind: 2,350 MW
- Solar: 2,600 MW
- Storage: 900 MW
- Solar + Storage: 45 MW
- Thermal: 0
- Pete 3 & 4 Refueled to Nat Gas: 1,052 MW

## Current Trends PVRR Summary

20-Year PVRR (2023\$MM, 2023-2042)

	Scenarios
	Decarbonized Economy
No Early Retirement	\$9,917
Pete Refuel to 100% Gas (est. 2025)	<b>\$9,546</b>
One Pete Unit Retires (2026)	\$9,955
Both Pete Units Retire (2026 & 2028)	\$9,923
"Clean Energy Strategy" Both Pete Units Retire and Replaced with Wind, Solar & Storage (2026 & 2028)	\$9,690
Encompass Optimization without predefined Strategy	\$9,572

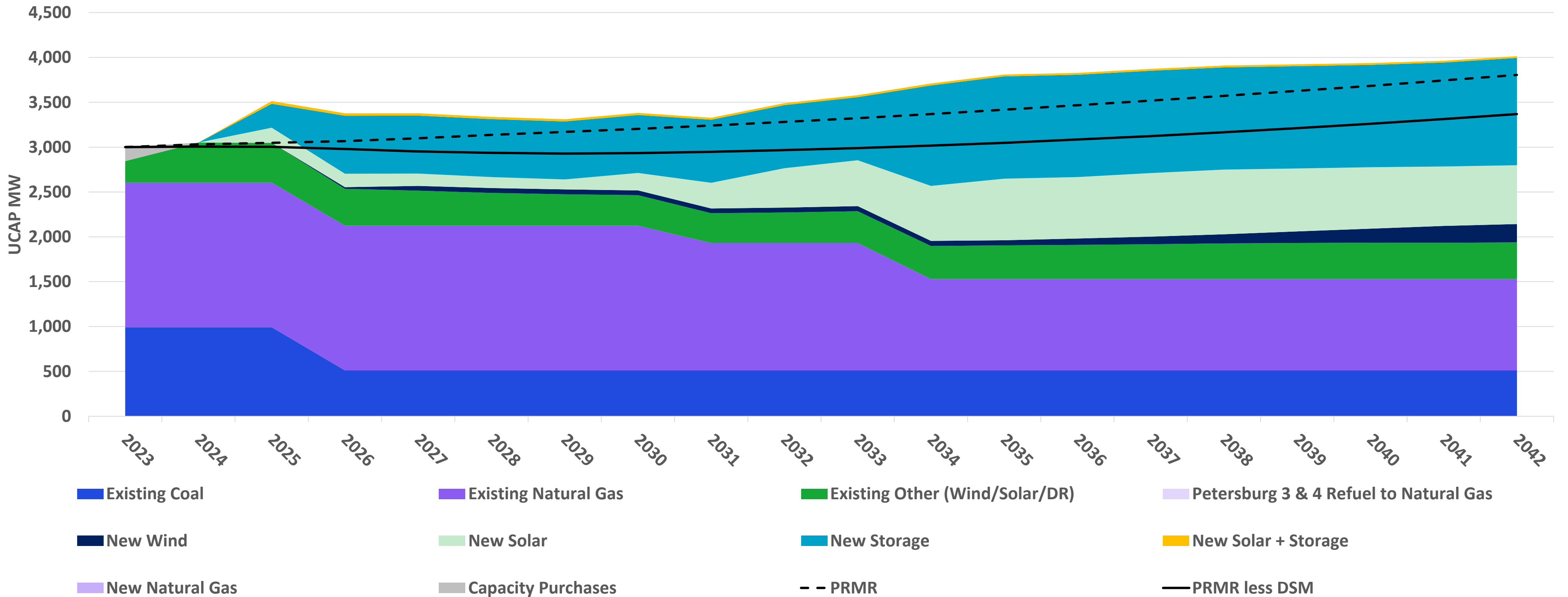
# C. One Pete Unit Retires (2026)

*20-Year PVRR  
(2023\$MM, 2023-2042)*  
**Generation Strategy:  
One Pete Unit Retires  
(2026)**

Scenarios			
No Environmental Action	Current Trends	Aggressive Environmental	Decarbonized Economy
			<b>\$9,955</b>

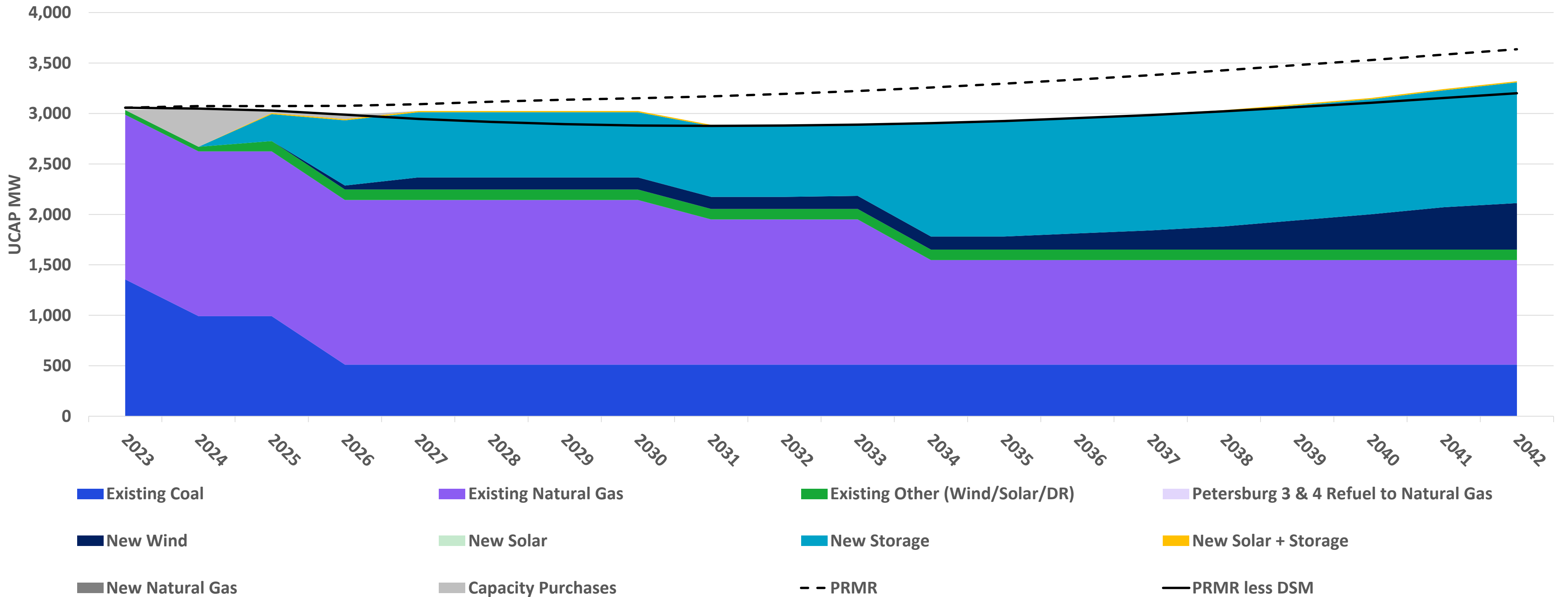
# One Pete Unit Retires (2026): Decarbonized Economy

## Firm Unforced Capacity Position - Summer



# One Pete Unit Retires (2026): Decarbonized Economy

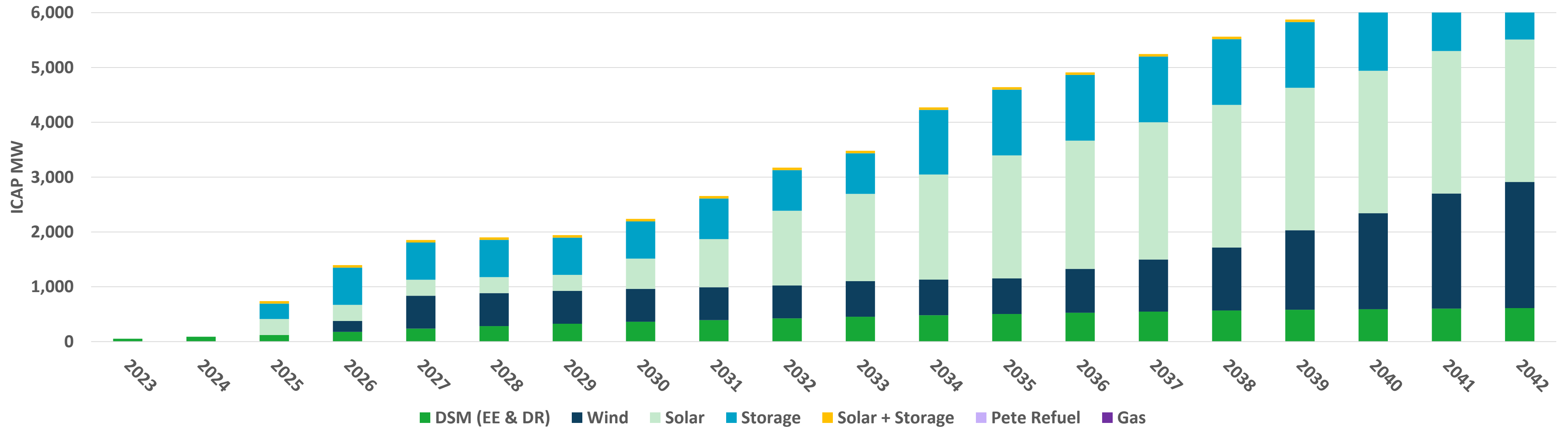
## Firm Unforced Capacity Position - Winter





# One Pete Unit Retires (2026): Decarbonized Economy

## Installed Capacity Cumulative Additions (MW)

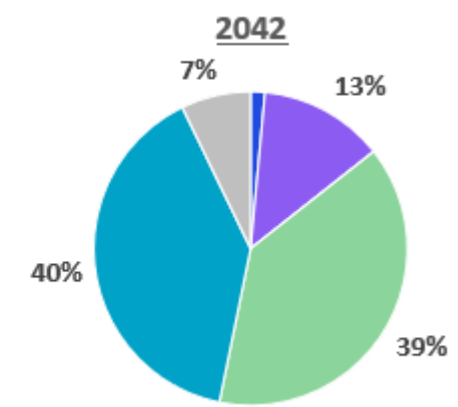
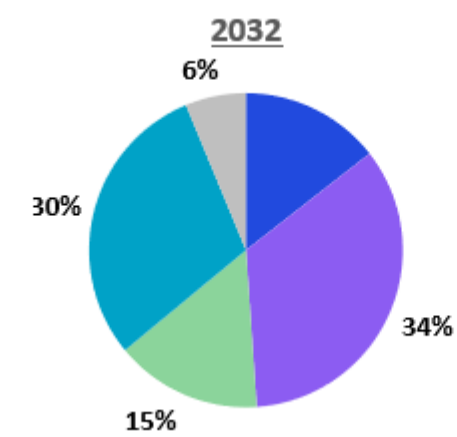
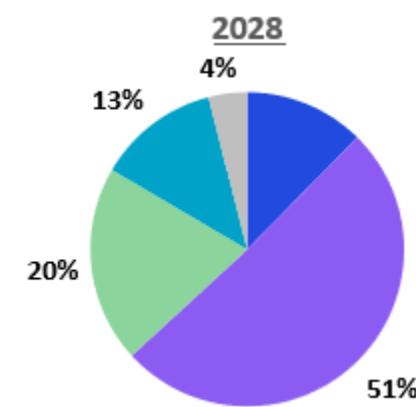
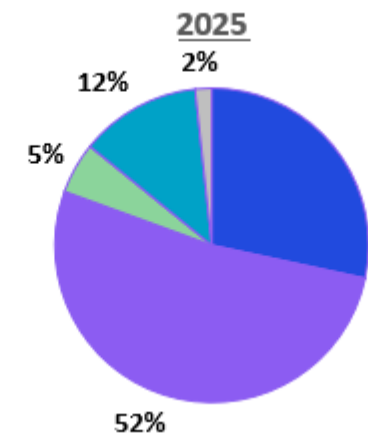
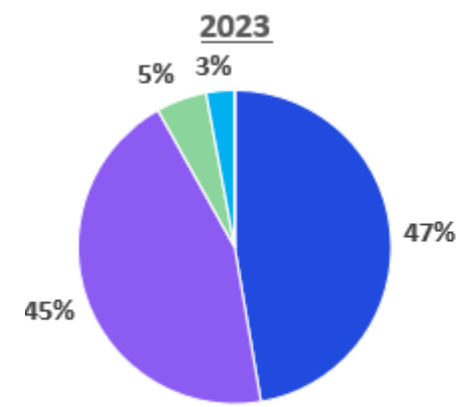
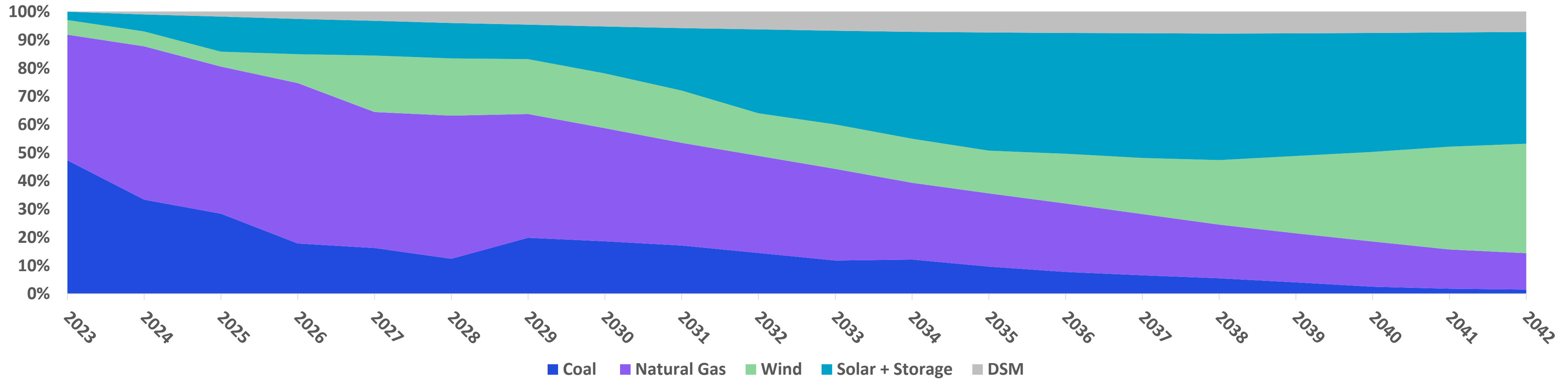


### Installed Capacity Incremental Additions (MW): 2023 - 2028

	<u>2023</u>	<u>2024</u>	<u>2025</u>	<u>2026</u>	<u>2027</u>	<u>2028</u>
Wind	0	0	0	200	400	0
Solar	0	0	293	0	0	0
Storage	0	0	280	400	0	0
Solar + Storage	0	0	45	0	0	0
Gas	0	0	0	0	0	0

# One Pete Unit Retires (2026): Decarbonized Economy

## Energy Mix %



Thermal MWh %	92%	Thermal MWh %	81%	Thermal MWh %	63%	Thermal MWh %	49%	Thermal MWh %	14%
Renewable/DSM MWh %	8%	Renewable/DSM MWh %	19%	Renewable/DSM MWh %	37%	Renewable/DSM MWh %	51%	Renewable/DSM MWh %	86%

# One Pete Unit Retires (2026): Decarbonized Economy

## Portfolio Overview

### Retirements

Petersburg:

- Pete 3 Coal: 2026
- **Total Coal Retired MW: 520 MW**

Harding Street:

- HS ST5 Nat Gas: 2030
- HS ST6 Nat Gas: 2030
- HS ST7 Nat Gas: 2033
- **Total Nat Gas Retired MW: 618 MW**

### Replacement Additions by 2042

- DSM: 610 MW
- Wind: 2,300 MW
- Solar: 2,600 MW
- Storage: 1,260 MW
- Solar + Storage: 45 MW
- Thermal: 0 MW

## Current Trends PVRR Summary

20-Year PVRR (2023\$MM, 2023-2042)

Scenarios	
Decarbonized Economy	
No Early Retirement	\$9,917
Pete Refuel to 100% Gas (est. 2025)	\$9,546
<b>One Pete Unit Retires (2026)</b>	<b>\$9,955</b>
Both Pete Units Retire (2026 & 2028)	\$9,923
"Clean Energy Strategy" Both Pete Units Retire and Replaced with Wind, Solar & Storage (2026 & 2028)	\$9,690
Encompass Optimization without predefined Strategy	\$9,572

# D. Both Pete Units Retire (2026 & 2028)

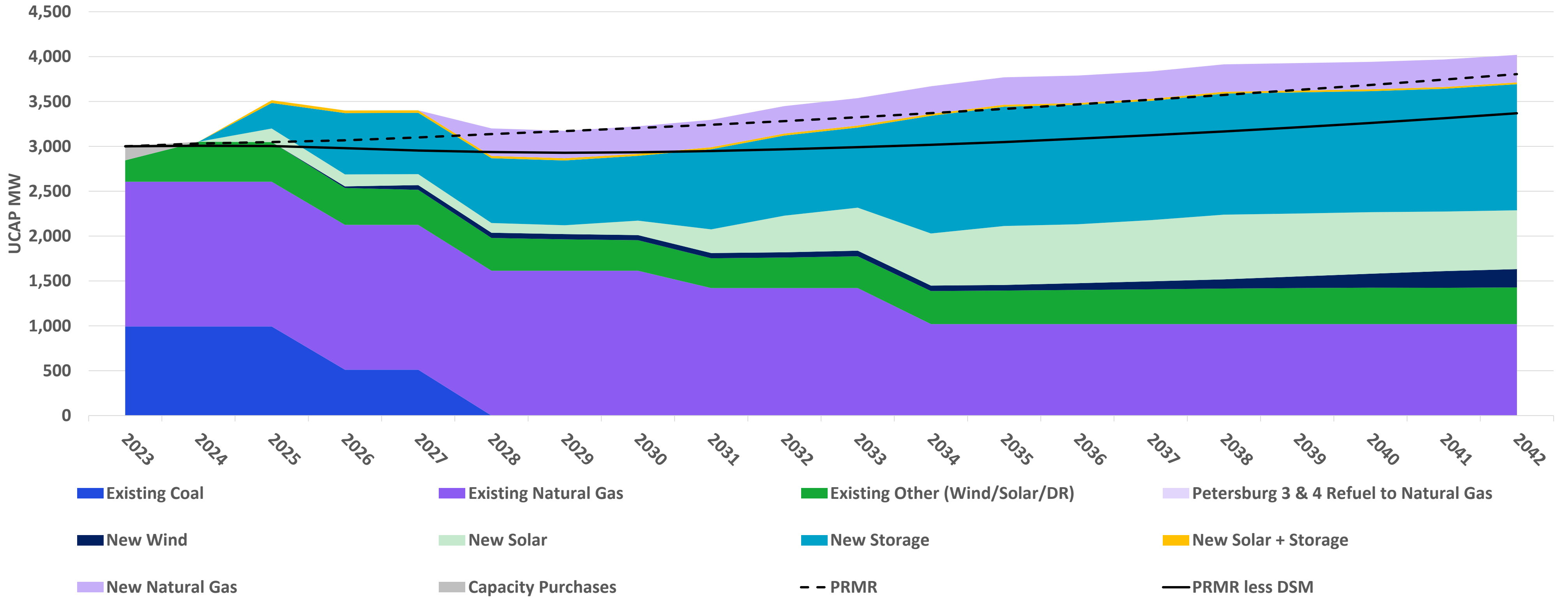
*20-Year PVRR  
(2023\$MM, 2023-2042)*  
**Generation Strategy:  
Both Pete Units Retire  
(2026 & 2028)**

Scenarios			
No Environmental Action	Current Trends	Aggressive Environmental	Decarbonized Economy
			<b>\$9,923</b>

# Both Pete Units Retire: Decarbonized Economy

2026 & 2028

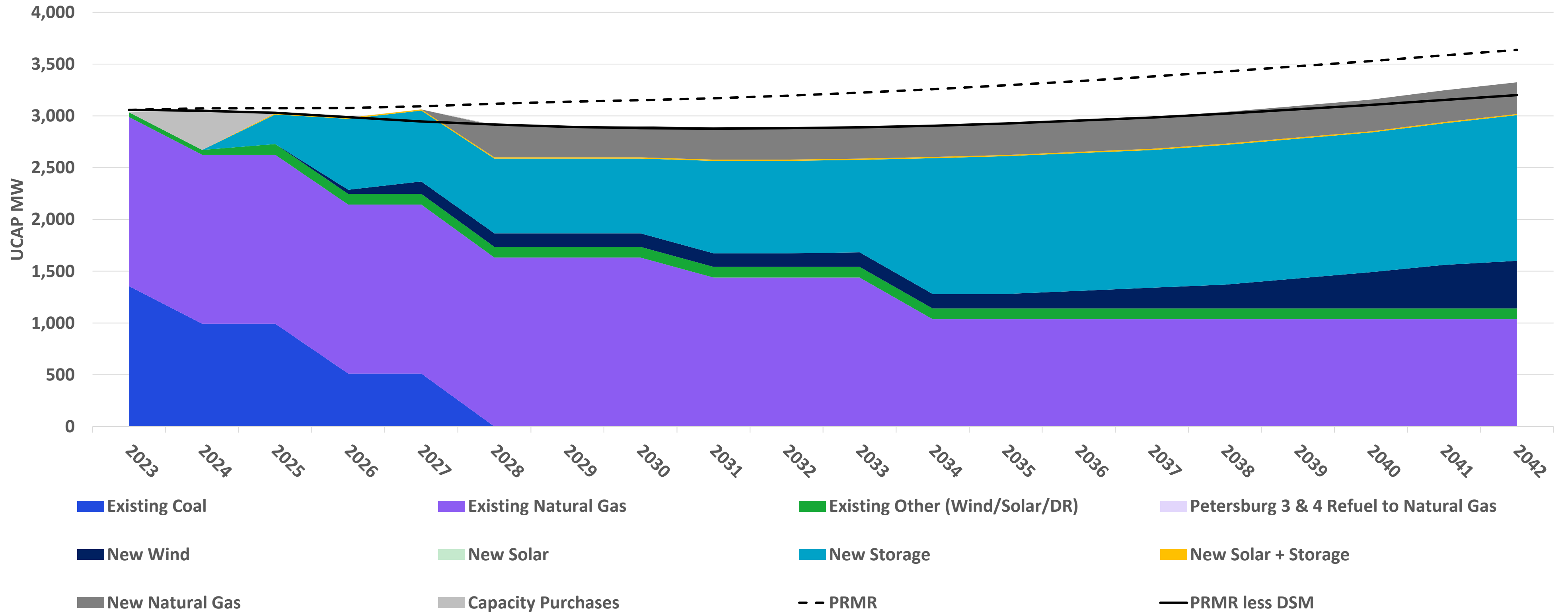
## Firm Unforced Capacity Position – Summer



# Both Pete Units Retire: Decarbonized Economy

2026 & 2028

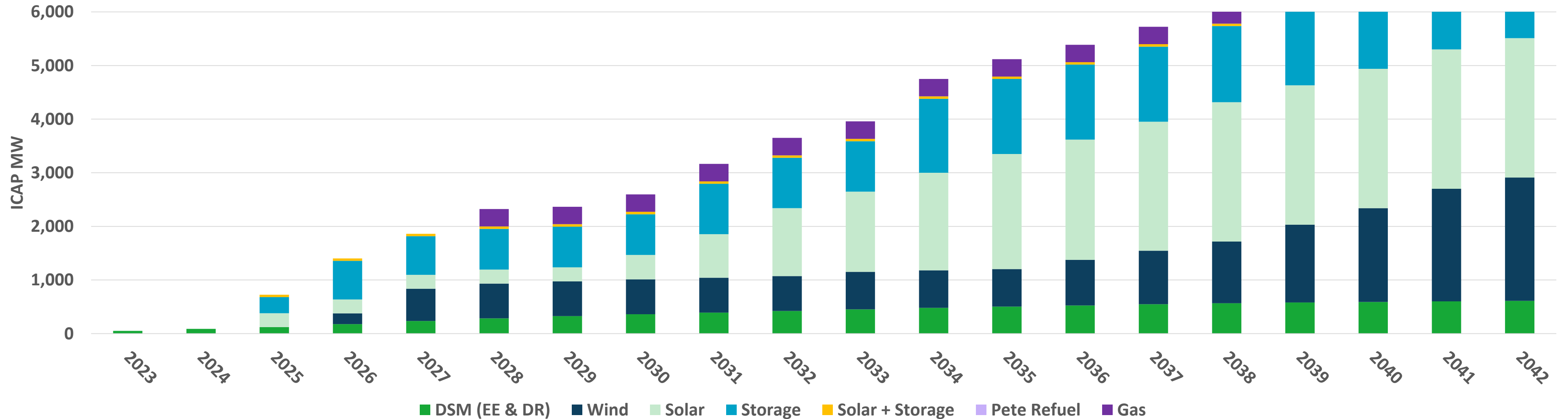
## Firm Unforced Capacity Position – Winter



# Both Pete Units Retire: Decarbonized Economy

2026 & 2028

## Installed Capacity Cumulative Additions (MW)



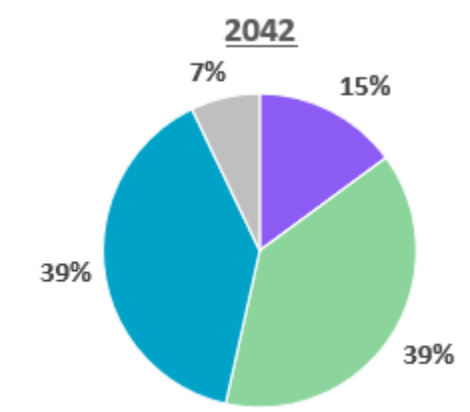
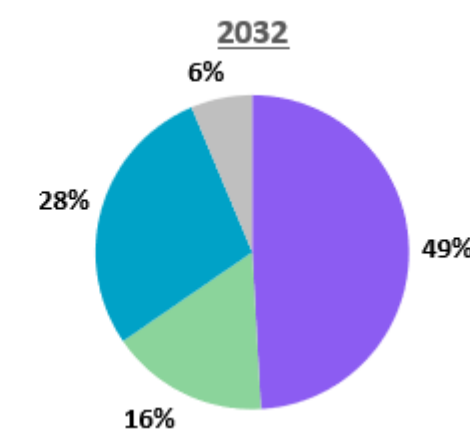
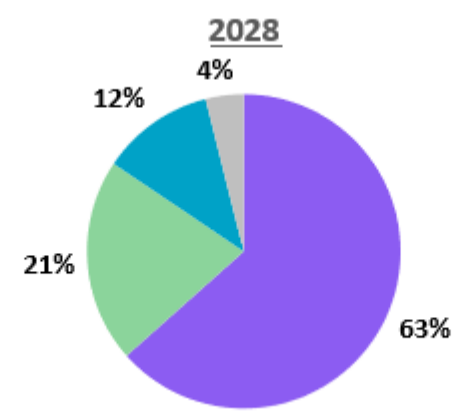
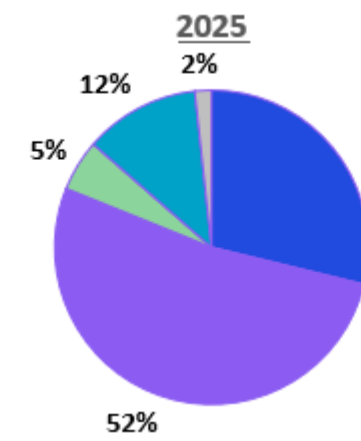
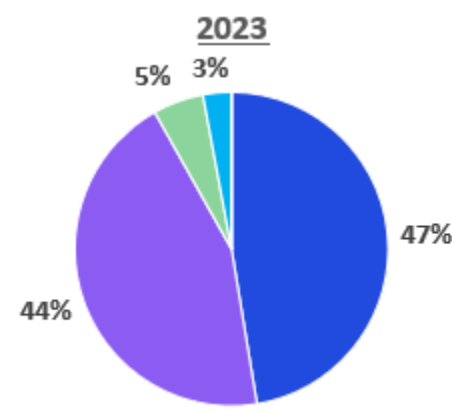
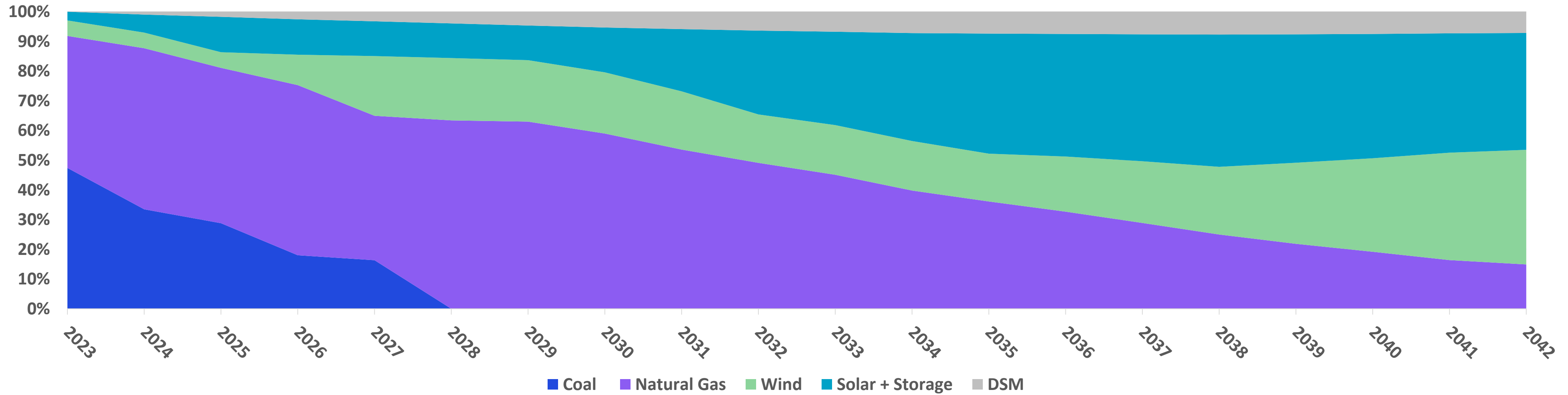
## Installed Capacity Incremental Additions (MW): 2023 – 2028

	<u>2023</u>	<u>2024</u>	<u>2025</u>	<u>2026</u>	<u>2027</u>	<u>2028</u>
Wind	0	0	0	200	400	50
Solar	0	0	260	0	0	0
Storage	0	0	300	420	0	40
Solar + Storage	0	0	45	0	0	0
Gas	0	0	0	0	0	325

# Both Pete Units Retire: Decarbonized Economy

2026 & 2028

## Energy Mix %



Thermal MWh %	92%	Thermal MWh %	81%	Thermal MWh %	63%	Thermal MWh %	49%	Thermal MWh %	15%
Renewable/DSM MWh %	8%	Renewable/DSM MWh %	19%	Renewable/DSM MWh %	37%	Renewable/DSM MWh %	51%	Renewable/DSM MWh %	85%



# Both Pete Units Retire: Decarbonized Economy

2026 & 2028

## Portfolio Overview

### Retirements

- Petersburg:
- Pete 3 Coal: 2026
- Pete 4 Coal: 2028
- **Total Coal Retired MW: 1,040 MW**
  
- Harding Street:
- HS ST5 Nat Gas: 2030
- HS ST6 Nat Gas: 2030
- HS ST7 Nat Gas: 2033
- **Total Nat Gas Retired MW: 618 MW**

### Replacement Additions by 2042

- DSM: 610 MW
- Wind: 2,300 MW
- Solar: 2,600 MW
- Storage: 1,480 MW
- Solar + Storage: 45 MW
- Thermal: 325 MW

## Current Trends PVRR Summary

20-Year PVRR (2023\$MM, 2023-2042)

	Scenarios
	Decarbonized Economy
No Early Retirement	\$9,917
Pete Refuel to 100% Gas (est. 2025)	\$9,546
One Pete Unit Retires (2026)	\$9,955
Both Pete Units Retire (2026 & 2028)	<b>\$9,923</b>
"Clean Energy Strategy" Both Pete Units Retire and Replaced with Wind, Solar & Storage (2026 & 2028)	\$9,690
Encompass Optimization without predefined Strategy	\$9,572

# E. Clean Energy Strategy

*Retire & Replace Pete with Clean Energy*

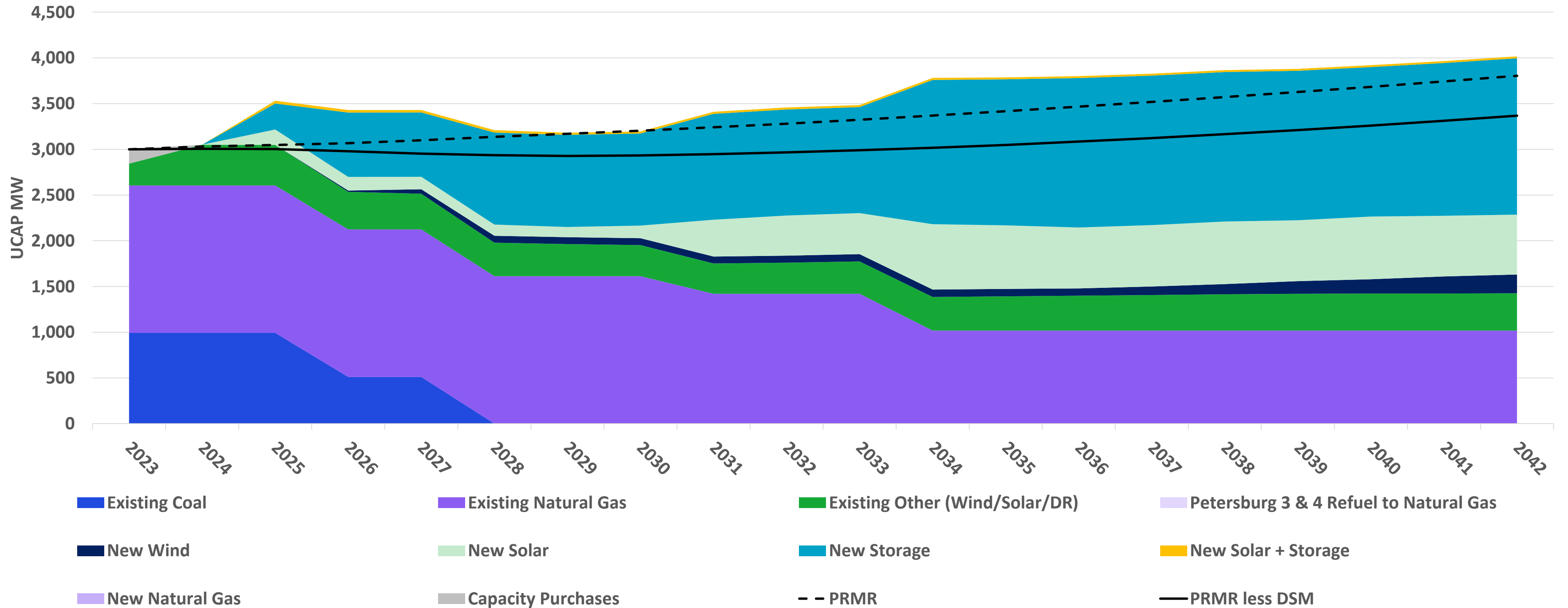
*20-Year PVRR  
(2023\$MM, 2023-2042)*  
**Generation Strategy:**  
*“Clean Energy Strategy”  
Both Pete Units Retire and  
Replaced with Wind, Solar  
& Storage (2026 & 2028)*

Scenarios			
No Environmental Action	Current Trends	Aggressive Environmental	Decarbonized Economy
			<b>\$9,690</b>

# Clean Energy Strategy: Decarbonized Economy

*Retire & Replace Pete with Clean Energy*

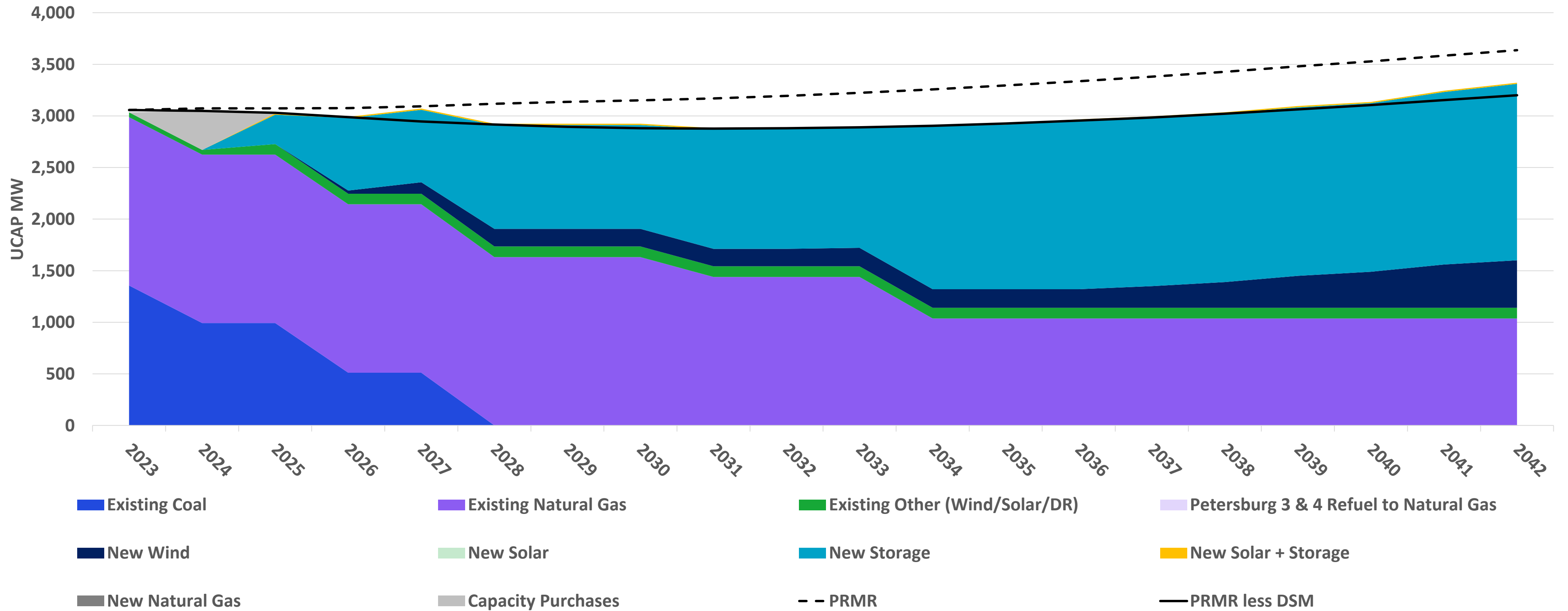
## Firm Unforced Capacity Position – Summer



# Clean Energy Strategy: Decarbonized Economy

*Retire & Replace Pete with Clean Energy*

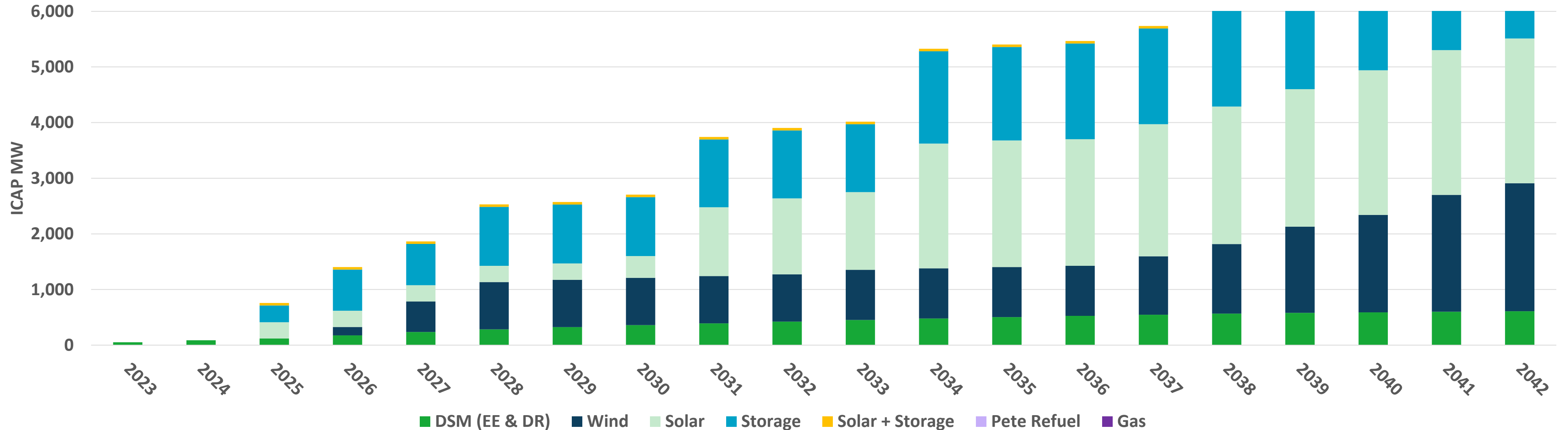
## Firm Unforced Capacity Position – Winter



# Clean Energy Strategy: Decarbonized Economy

*Retire & Replace Pete with Clean Energy*

## Installed Capacity Cumulative Additions (MW)



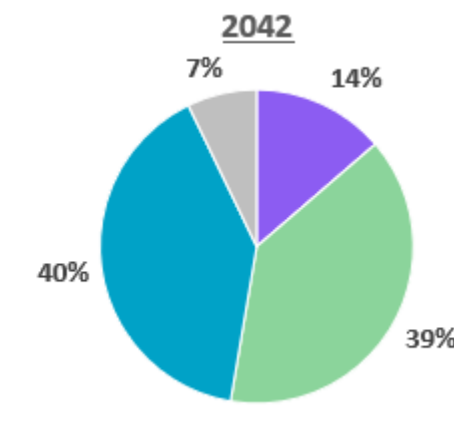
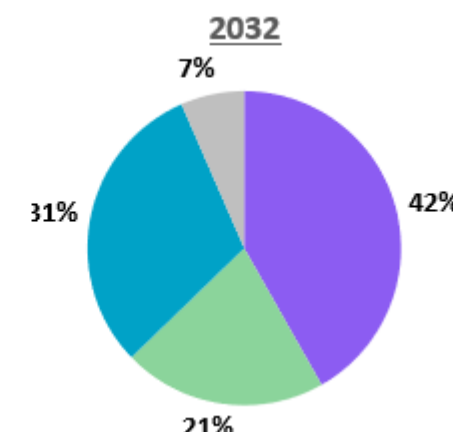
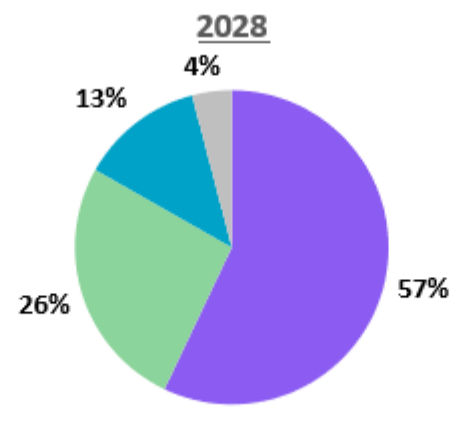
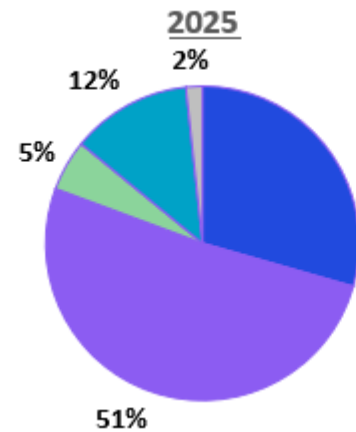
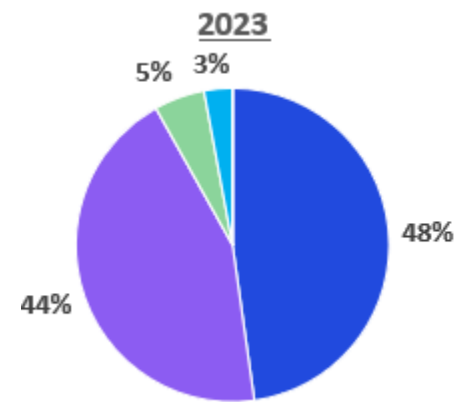
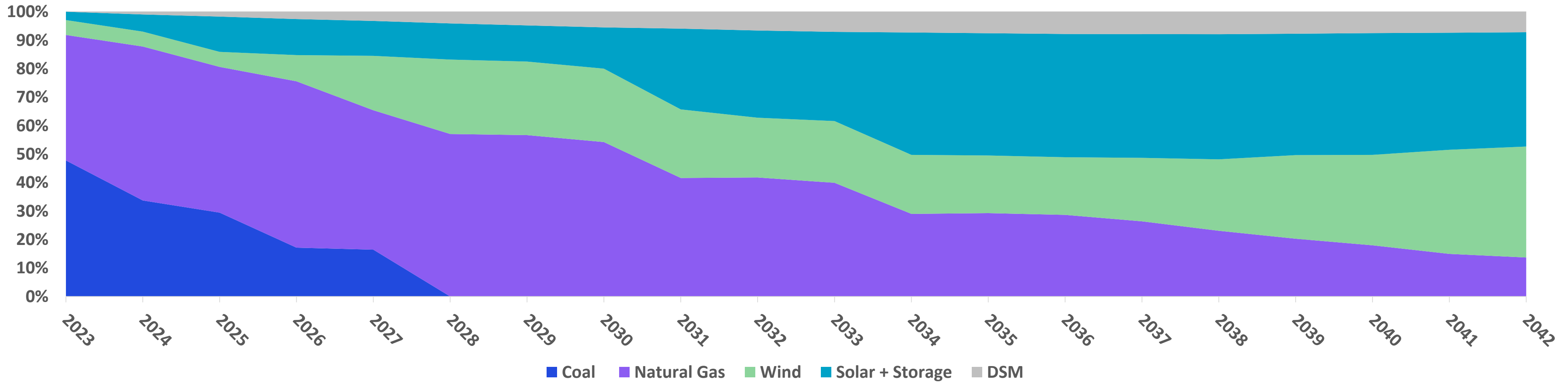
### Installed Capacity Incremental Additions (MW): 2023 – 2028

	<u>2023</u>	<u>2024</u>	<u>2025</u>	<u>2026</u>	<u>2027</u>	<u>2028</u>
Wind	0	0	0	150	400	300
Solar	0	0	293	0	0	0
Storage	0	0	300	440	0	320
Solar + Storage	0	0	45	0	0	0
Gas	0	0	0	0	0	0

# Clean Energy Strategy: Decarbonized Economy

*Retire & Replace Pete with Clean Energy*

## Energy Mix %



Thermal MWh %	92%	Thermal MWh %	81%	Thermal MWh %	57%	Thermal MWh %	42%	Thermal MWh %	14%
Renewable/DSM MWh %	8%	Renewable/DSM MWh %	19%	Renewable/DSM MWh %	43%	Renewable/DSM MWh %	58%	Renewable/DSM MWh %	86%

# Clean Energy Strategy: Decarbonized Economy

*Retire & Replace Pete with Clean Energy*

## Portfolio Overview

### Retirements

Petersburg:

- Pete 3 Coal: 2026
- Pete 4 Coal: 2028
- **Total Coal Retired MW: 1,040 MW**

Harding Street:

- HS ST5 Nat Gas: 2030
- HS ST6 Nat Gas: 2030
- HS ST7 Nat Gas: 2033
- **Total Retired Nat Gas MW: 618 MW**

### Replacements by 2042

- DSM: 610 MW
- Wind: 2,300 MW
- Solar: 2,600 MW
- Storage: 1,800 MW
- Solar + Storage: 45 MW
- Thermal: 0 MW

## Current Trends PVRR Summary

*20-Year PVRR (2023\$MM, 2023-2042)*

	Scenarios
	Decarbonized Economy
No Early Retirement	\$9,917
Pete Refuel to 100% Gas (est. 2025)	\$9,546
One Pete Unit Retires (2026)	\$9,955
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<b>"Clean Energy Strategy" Both Pete Units Retire and Replaced with Wind, Solar &amp; Storage (2026 &amp; 2028)</b>	<b>\$9,690</b>
Encompass Optimization without predefined Strategy	\$9,572



# F. Encompass Optimization

Selects Pete 3 Refuel in 2025  
& Pete 4 Refuel in 2027

*20-Year PVRR  
(2023\$MM, 2023-2042)*

**Generation Strategy:  
Encompass Optimization  
without predefined  
Strategy – Selects Pete 3  
Refuel in 2025 & Pete 4  
Refuel in 2027**

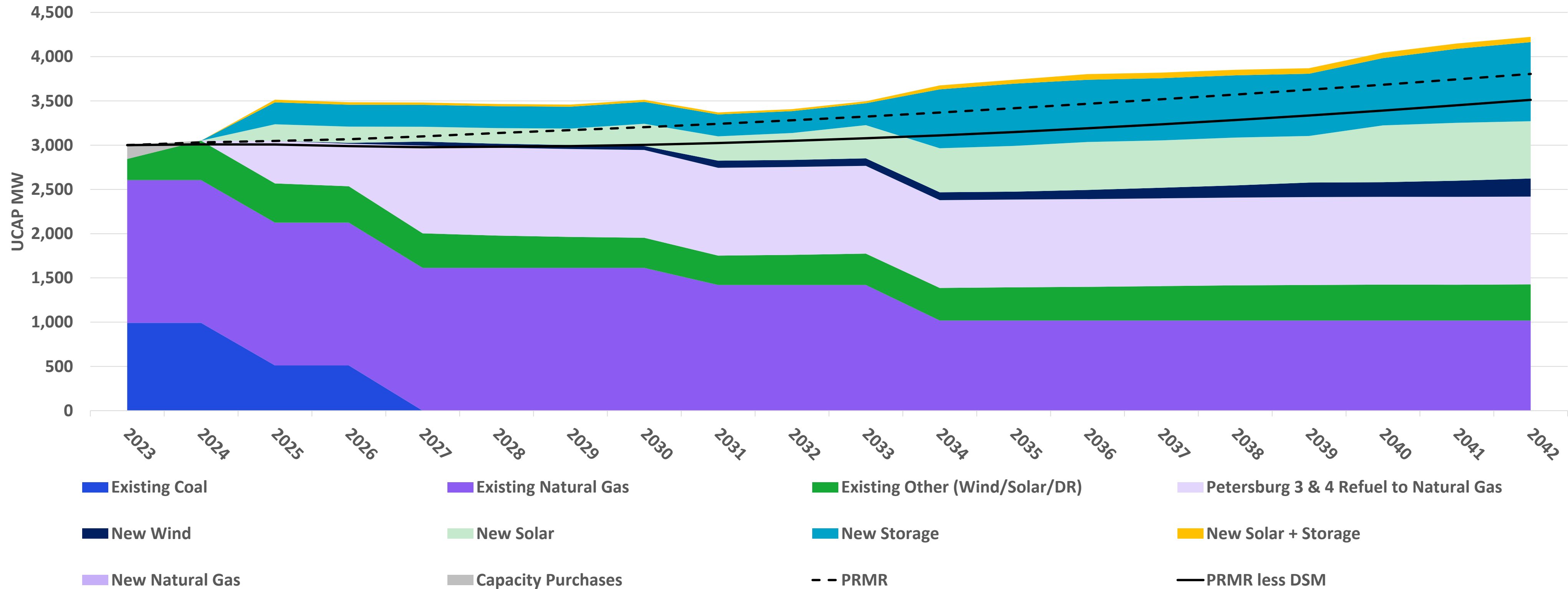
Scenarios			
No Environmental Action	Current Trends	Aggressive Environmental	Decarbonized Economy
			<b>\$9,572</b>



# Encompass Optimization: Decarbonized Economy

Selects Pete 3 Refuel in 2025 & Pete 4 Refuel in 2027

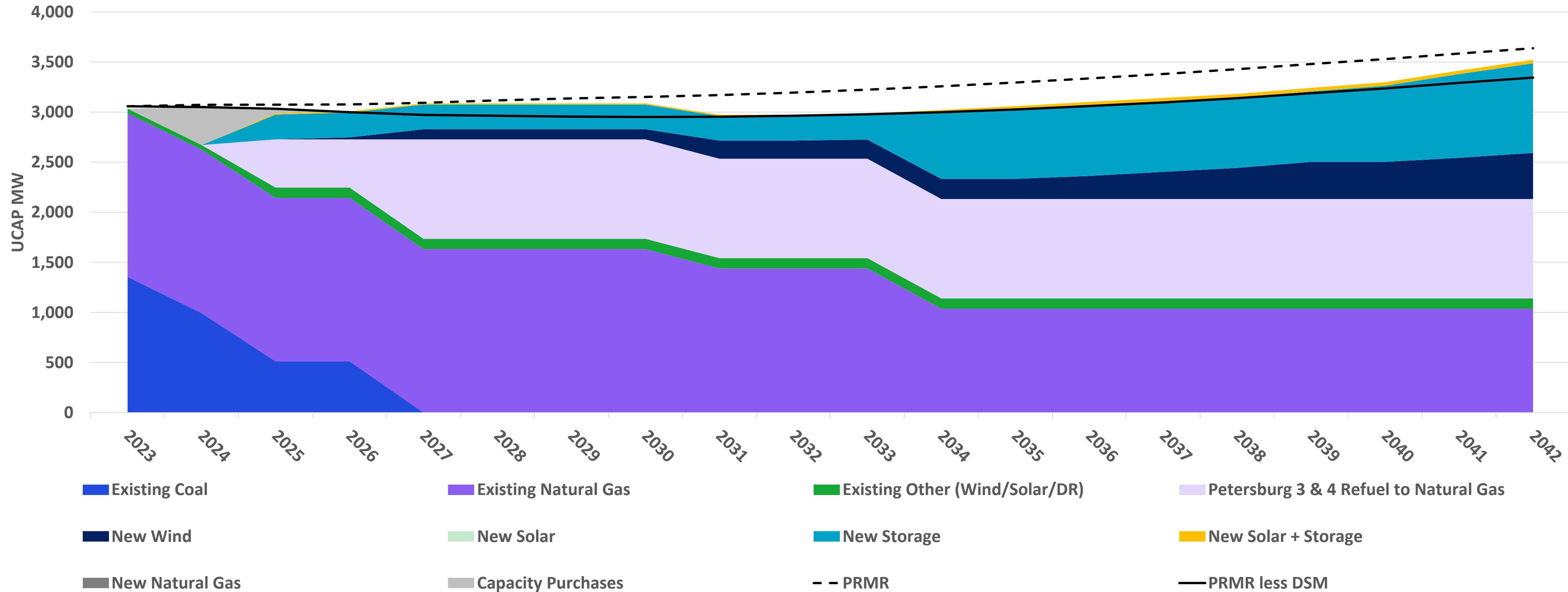
## Firm Unforced Capacity Position - Summer



# Encompass Optimization: Decarbonized Economy

Selects Pete 3 Refuel in 2025 & Pete 4 Refuel in 2027

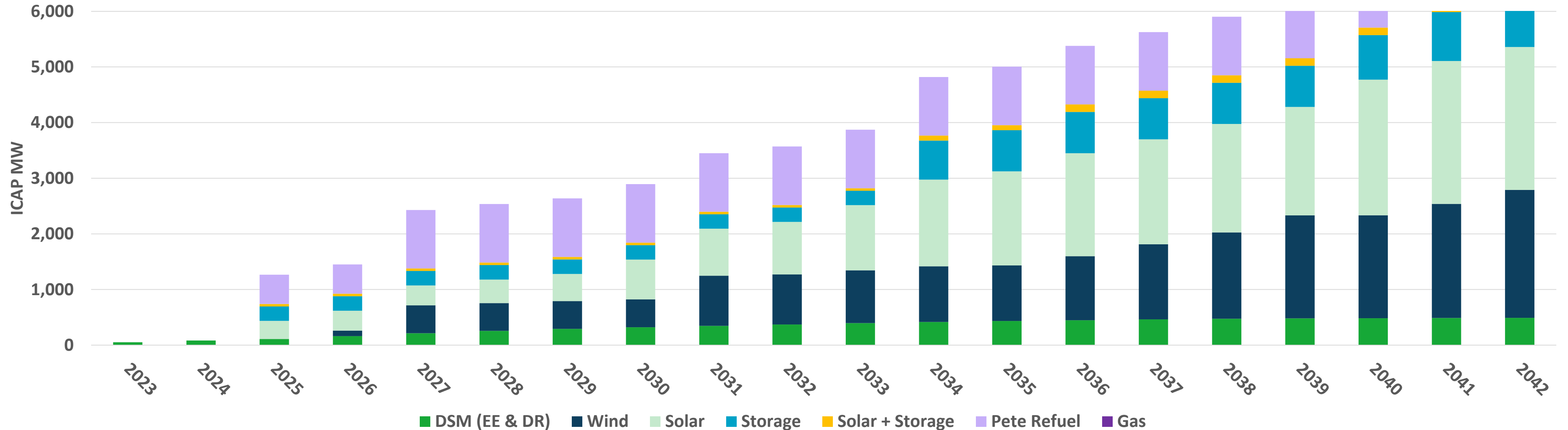
## Firm Unforced Capacity Position - Winter



# Encompass Optimization: Decarbonized Economy

Selects Pete 3 Refuel in 2025 & Pete 4 Refuel in 2027

## Installed Capacity Cumulative Additions (MW)



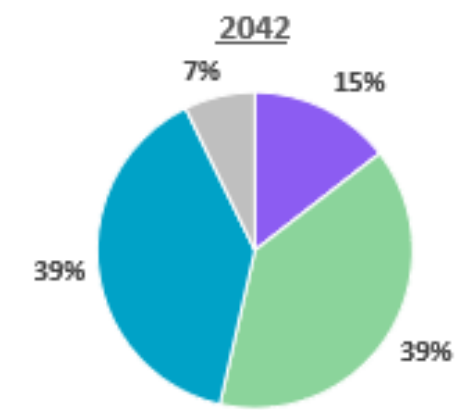
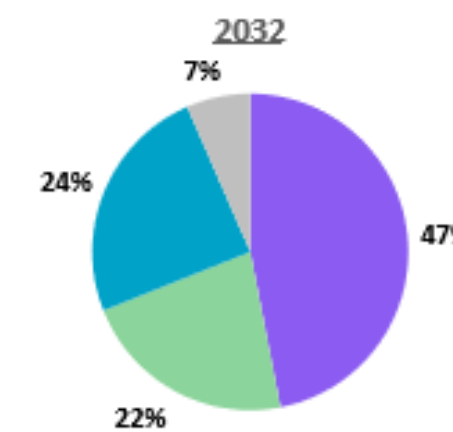
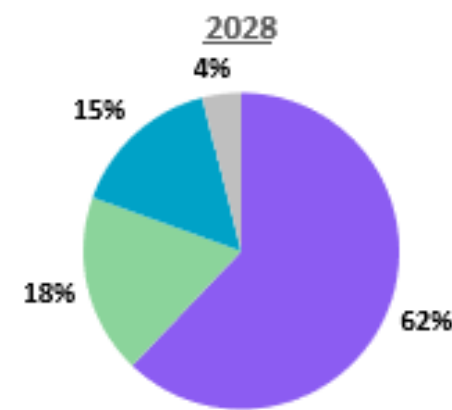
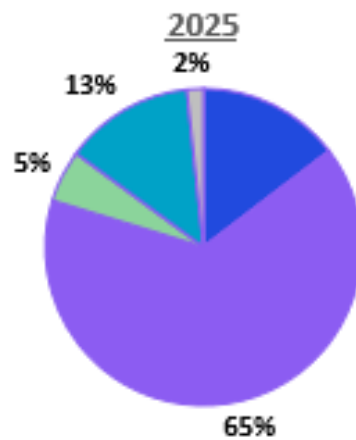
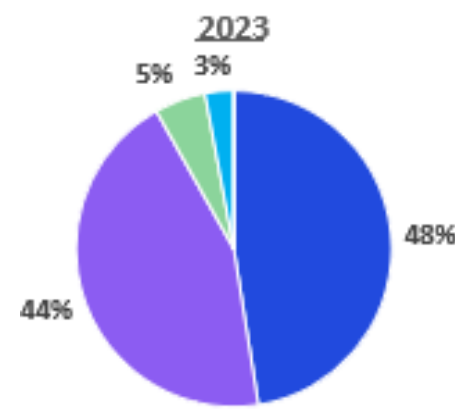
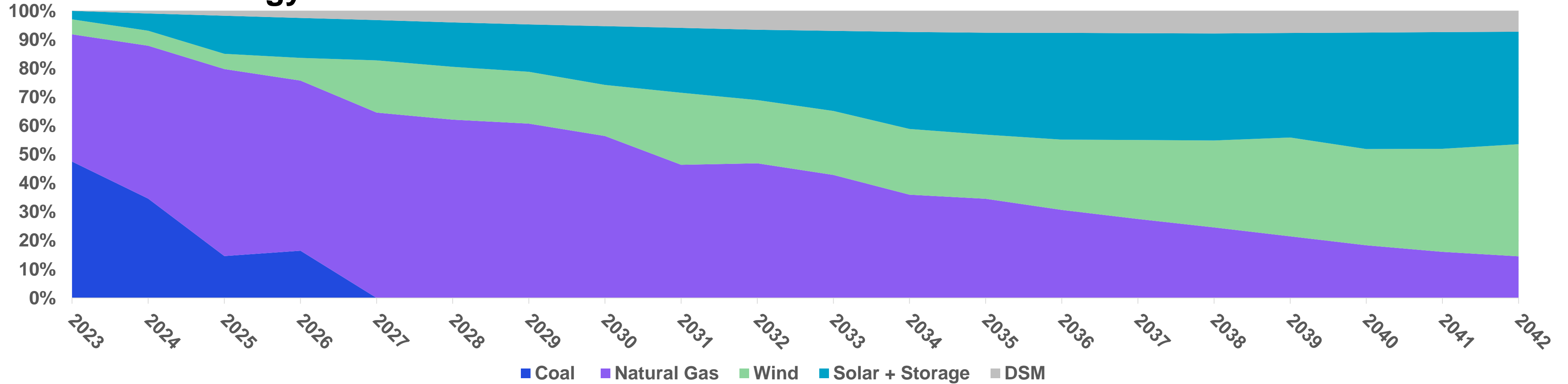
## Installed Capacity Incremental Additions (MW): 2023 - 2028

	<u>2023</u>	<u>2024</u>	<u>2025</u>	<u>2026</u>	<u>2027</u>	<u>2028</u>
Wind	0	0	0	100	400	0
Solar	0	0	325	33	0	65
Storage	0	0	260	0	0	0
Solar + Storage	0	0	45	0	0	0
Gas	0	0	0	0	0	0

# Encompass Optimization: Decarbonized Economy

Selects Pete 3 Refuel in 2025 & Pete 4 Refuel in 2027

## Energy Mix %



Thermal MWh %	92%	Thermal MWh %	80%	Thermal MWh %	62%	Thermal MWh %	47%	Thermal MWh %	15%
Renewable/DSM MWh %	8%	Renewable/DSM MWh %	20%	Renewable/DSM MWh %	38%	Renewable/DSM MWh %	53%	Renewable/DSM MWh %	85%

# Encompass Optimization: Decarbonized Economy

Selects Pete 3 Refuel in 2025 & Pete 4 Refuel in 2027

## Portfolio Overview

### Retirements

Petersburg:

- Pete 3 Coal: 2025
- Pete 4 Coal: 2027
- **Total Refueled MW: 1,040 MW**

Harding Street:

- HS ST5 Nat Gas: 2030
- HS ST6 Nat Gas: 2030
- HS ST7 Nat Gas: 2033
- **Total Nat Gas Retired MW: 618 MW**

### Replacement Additions by 2042

- DSM: 490 MW
- Wind: 2,300 MW
- Solar: 2,568 MW
- Storage: 940 MW
- Solar + Storage: 135 MW
- Thermal: 0
- Pete 3 & 4 Refueled to Nat Gas: 1,052 MW

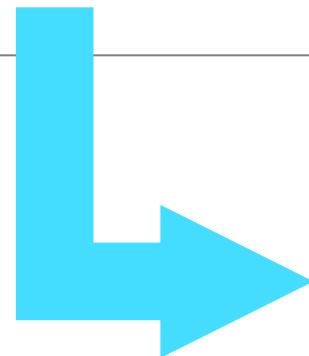
## Current Trends PVRR Summary

20-Year PVRR (2023\$MM, 2023-2042)

Scenarios	
Decarbonized Economy	
No Early Retirement	\$9,917
Pete Refuel to 100% Gas (est. 2025)	\$9,546
One Pete Unit Retires (2026)	\$9,955
Both Pete Units Retire (2026 & 2028)	\$9,923
"Clean Energy Strategy" Both Pete Units Retire and Replaced with Wind, Solar & Storage (2026 & 2028)	\$9,690
<b>Encompass Optimization without predefined Strategy</b>	<b>\$9,572</b>

# Portfolio Matrix

20-Year PVRR (2023\$MM, 2023-2042)		Scenarios			
		No Environmental Action	Current Trends (Reference Case)	Aggressive Environmental	Decarbonized Economy
Generation Strategies	No Early Retirement	\$7,111	\$9,572	\$11,349	\$9,917
	Pete Refuel to 100% Gas (est. 2025)	\$6,621	\$9,330	\$11,181	\$9,546
	One Pete Unit Retires (2026)	\$7,462	\$9,773	\$11,470	\$9,955
	Both Pete Units Retire (2026 & 2028)	\$7,425	\$9,618	\$11,145	\$9,923
	"Clean Energy Strategy" Both Pete Units Retire and Replaced with Wind, Solar & Storage (2026 & 2028)	\$9,211	\$9,711	\$11,184	\$9,690
	Encompass Optimization without predefined Strategy	\$6,610	\$9,262	\$10,994	\$9,572



### Encompass Optimization Results by Scenario:

Refuels Petersburg Units 3 & 4 in 2025	Refuels Petersburg Unit 3 in 2025 & Refuels Petersburg Unit 4 in 2027	Refuels Petersburg Unit 4 in 2027	Refuels Petersburg Unit 3 in 2025 & Refuels Petersburg Unit 4 in 2027
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