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Questions during the presentation?

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IPL 2019 IRP: PUBLIC ADVISORY MEETING #4

September 30, 2019

WELCOME & OPENING REMARKS

Vince Parisi

IPL President and CEO

MEETING OBJECTIVES & AGENDA

Stewart Ramsay

Meeting Facilitator

AGENDA

Topic	Time (Eastern)	Presenter(s)
Registration	12:30 – 1:00	-
Welcome & Opening Remarks	1:00 – 1:15	Vince Parisi, President and CEO, IPL
Meeting Objectives & Agenda	1:15 – 1:20	Stewart Ramsay, Meeting Facilitator
Modeling and Scenario Recap	1:20 – 1:40	Patrick Maguire, Director of Resource Planning
Preliminary Model Results – Optimized Portfolios	1:40 – 2:30	Patrick Maguire, Director of Resource Planning
BREAK	2:30 – 3:00	
Portfolio Metrics	3:00 – 3:45	Patrick Maguire, Director of Resource Planning
Final Q&A, Concluding Remarks & Next Steps	3:45 – 4:00	Stewart Ramsay, Meeting Facilitator Patrick Maguire, Director of Resource Planning

MODELING AND SCENARIO RECAP

Patrick Maguire

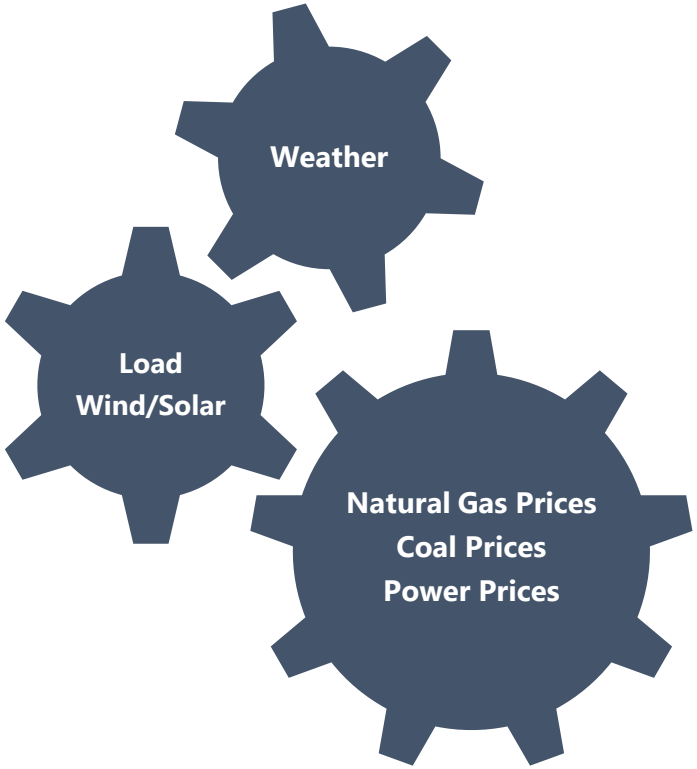
Director of Resource Planning

MODELING ASSUMPTIONS

- Solar Capacity Credit: re-calibrated capacity credit to reflect capacity contribution for tracking solar, which is higher than fixed tilt and rooftop. Capacity contribution validated by IPL tracking solar historical data
- Updated modeling constraints around new resources
- Releasing aero and recip capital costs, battery storage costs and operating characteristics
- Added 1x1 CCGT in 2034 in all portfolios: firm, dispatchable capacity on IPL's 138 kV system required with Harding Street Steam 5-7 retirements; final technology solution to be determined at a later date, but CCGT simply used as placeholder for now

CAPACITY EXPANSION

Stochastic Capacity Expansion



Portfolios optimized across a wide range of futures with dynamic commodity prices, load shapes, and renewable profiles through time and across iterations

KEY HIGHLIGHTS FROM CAPACITY EXPANSION RUNS

- Renewables being selected first, with storage and gas technology filling in remaining shortfall
- Small variations in capacity expansion between carbon tax and no carbon tax case because of model preference for renewables in both cases
- Results led IPL to determine fewer candidate portfolios stressed across range of scenarios better than assessment of more portfolios with slight variations

UNIT RETIREMENTS AND PORTFOLIOS

MODELED COAL RETIREMENTS

No Accelerated Retirements	**Portfolio 1**
Pete Unit 1 Retire 2021 Pete Units 2-4 Operational	**Portfolio 2**
Pete 1 Retire 2021; Pete 2 Retire 2023 Pete Units 3-4 Operational	**Portfolio 3**
Pete 1 Retire 2021; Pete 2 Retire 2023; Pete 3 Retire 2026; Pete Unit 4 Operational	**Portfolio 4**
Pete 1 Retire 2021; Pete 2 Retire 2023; Pete 3 Retire 2026; Pete 4 Retire 2030	**Portfolio 5**

RETIREMENTS IN ALL PORTFOLIOS

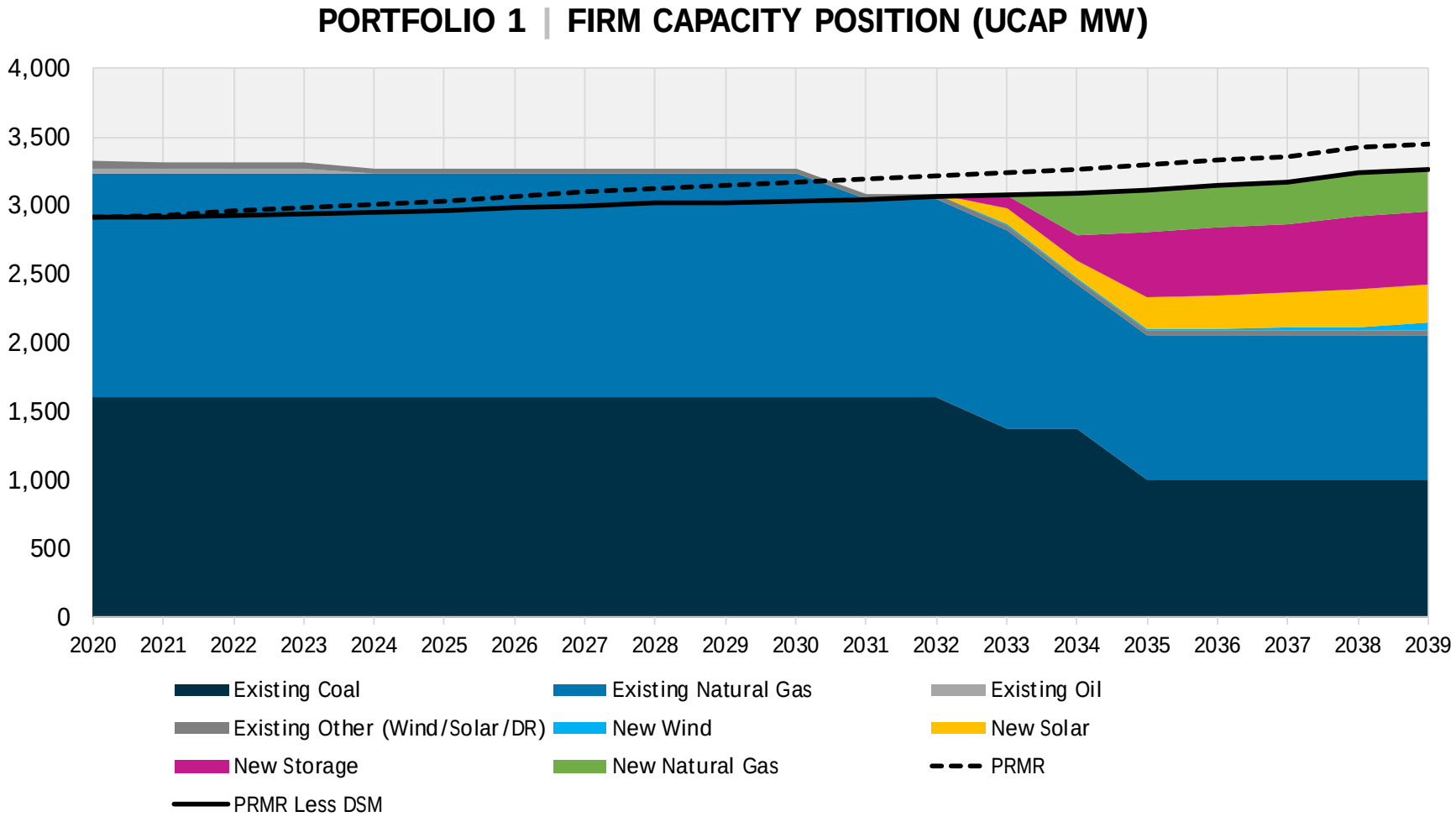
- 2024: Harding Street Oil 1-2 (37 MW)
- 2031: Harding Street ST 5-6 (189 MW)
- 2034: Harding Street ST 7 (394 MW)

PRELIMINARY MODEL RESULTS: OPTIMIZED PORTFOLIOS

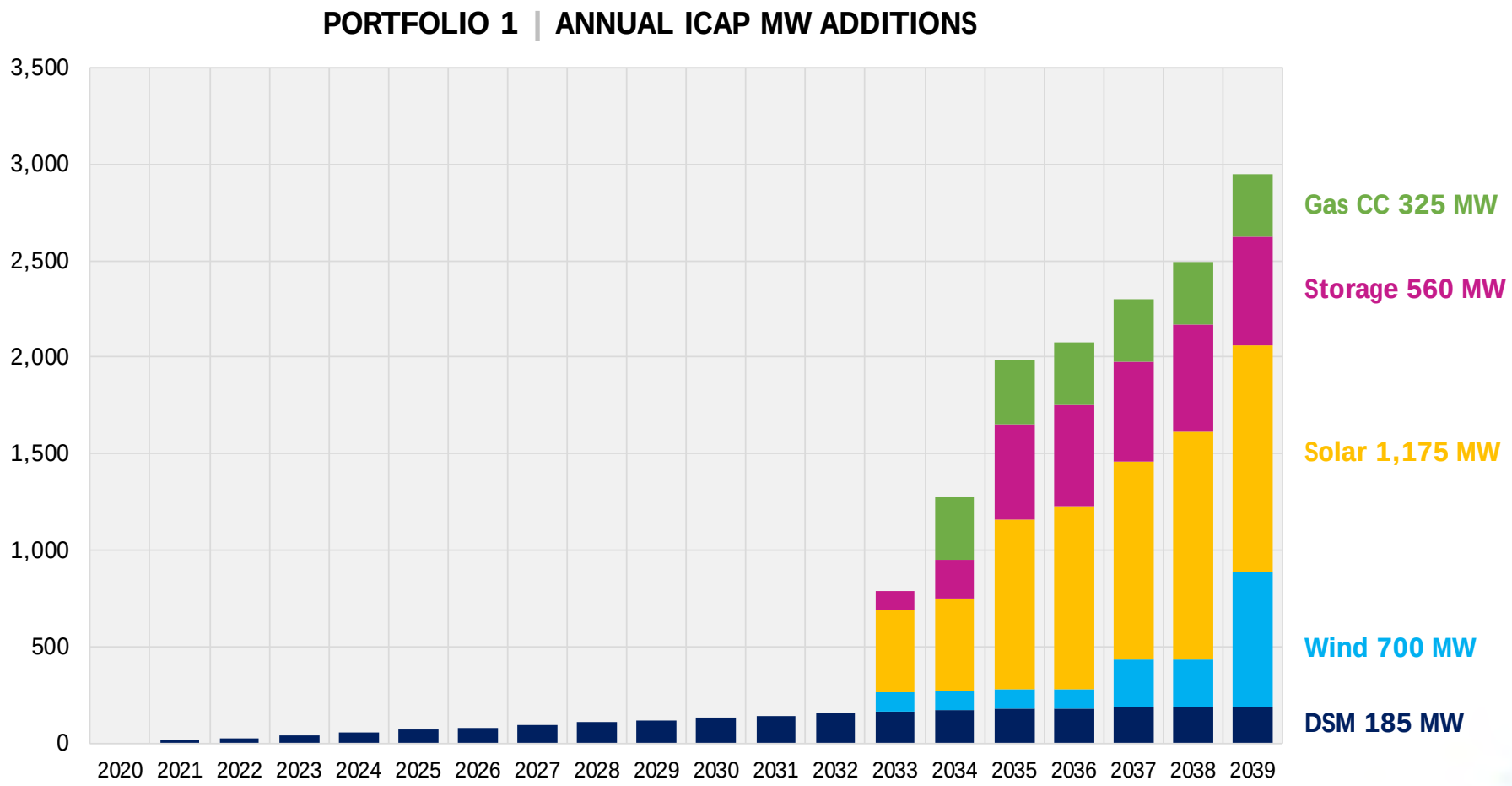
Patrick Maguire

Director of Resource Planning

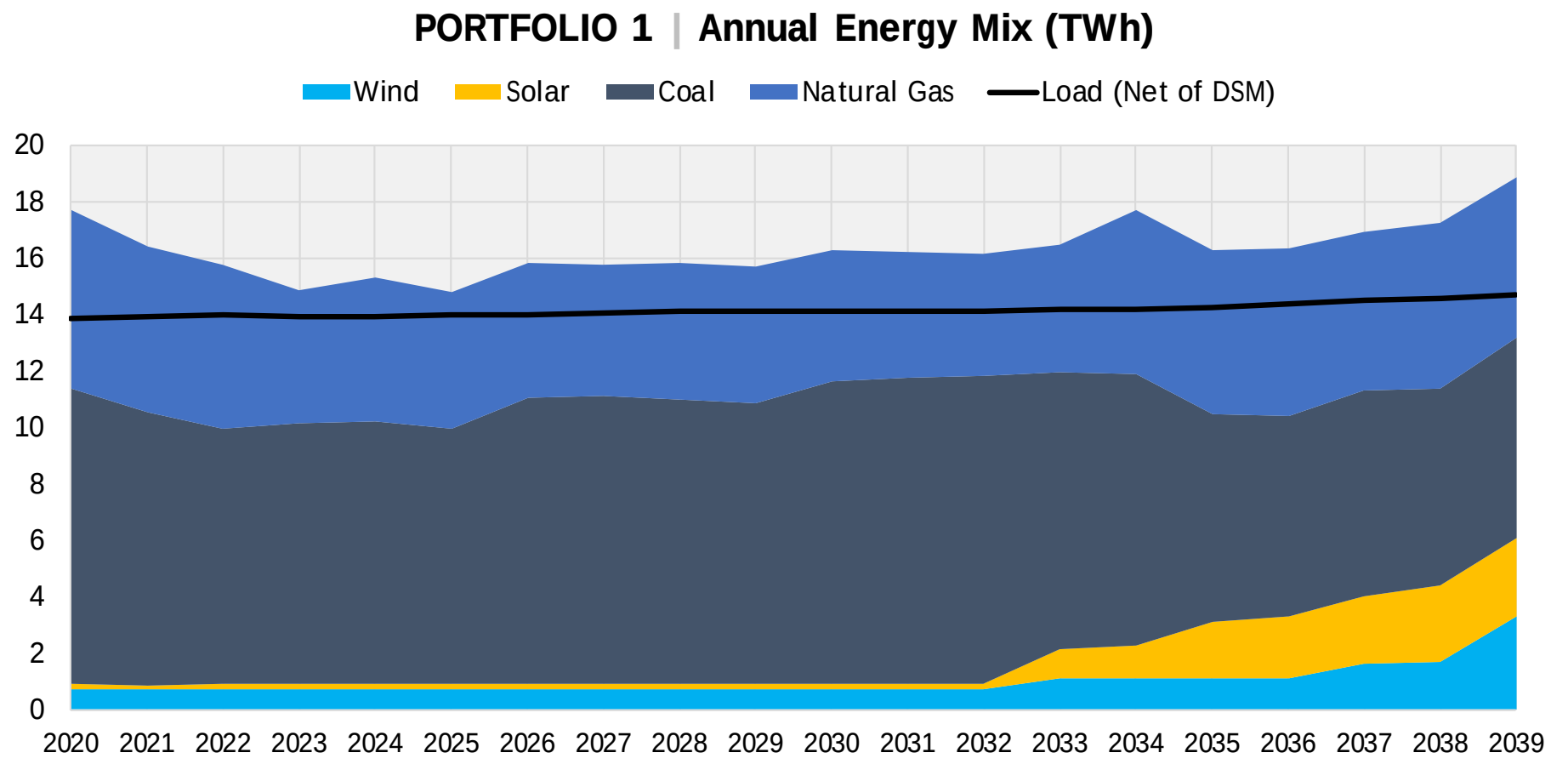
PORTFOLIO 1: FIRM UCAP POSITION



PORTFOLIO 1: ICAP MW ADDITIONS



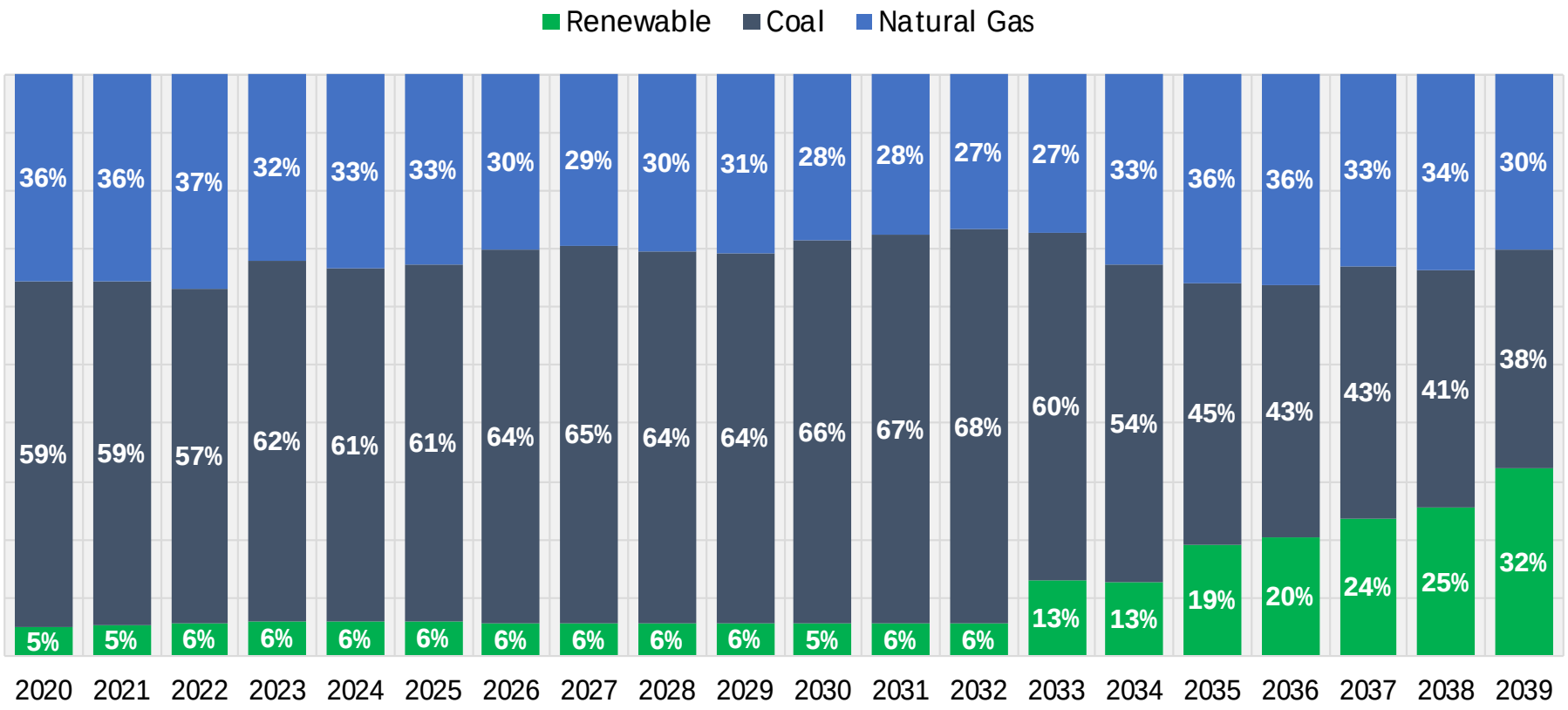
PORTFOLIO 1: REFERENCE CASE ENERGY MIX (1 OF 2)



Energy mix for portfolios will vary across scenarios

PORTFOLIO 1: REFERENCE CASE ENERGY MIX (2 OF 2)

PORTFOLIO 1 | Annual Produced Energy: Percent by Fuel Type



Energy mix for portfolios will vary across scenarios

PORTFOLIO 1 RECAP

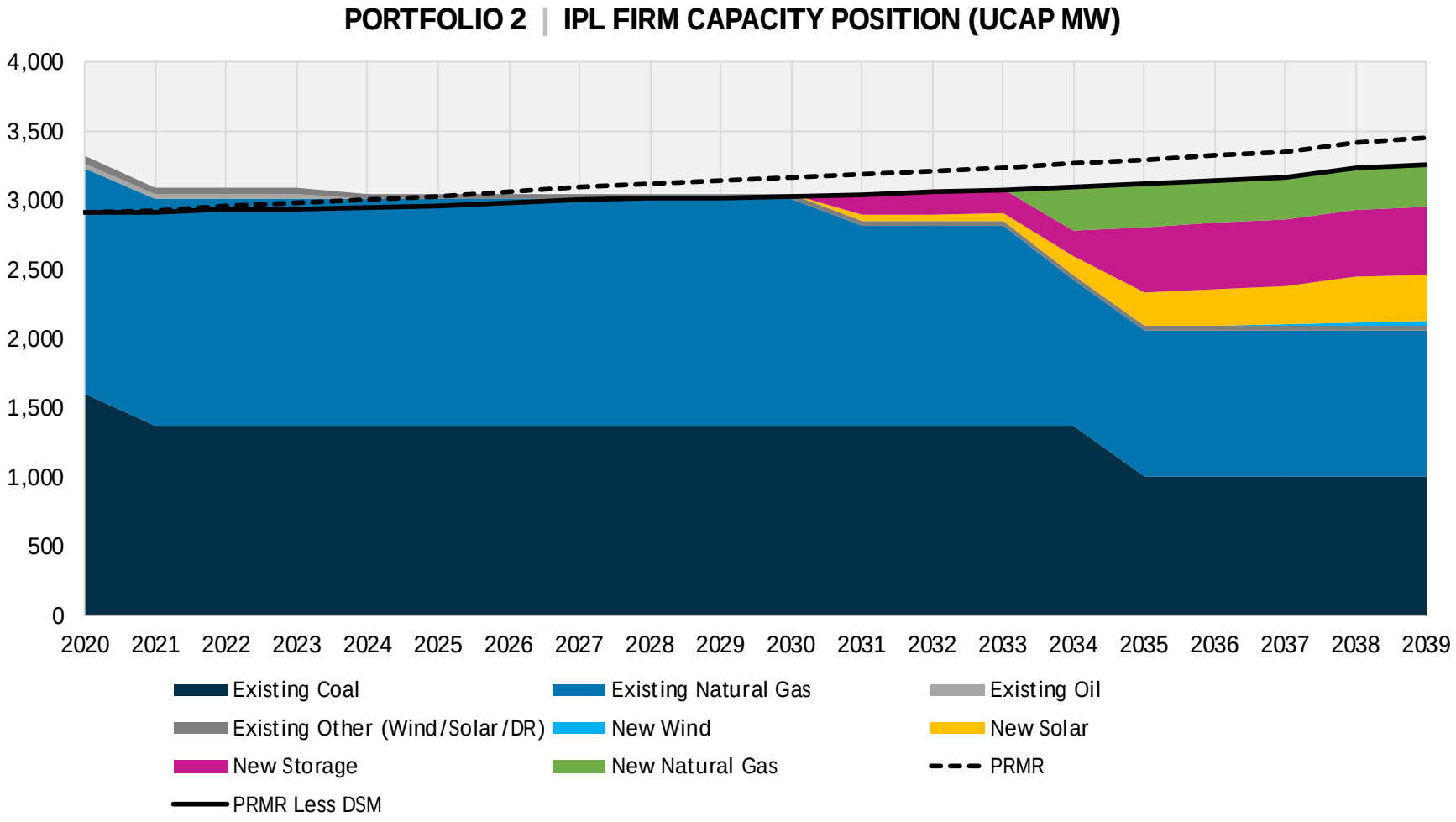
New Build by 2039

- First year short: 2033 (new DSM delays new build by 2 years)
- Wind: 700 MW
- Solar: 1,175 MW
- Storage: 560 MW
- Gas CCGT: 325 MW

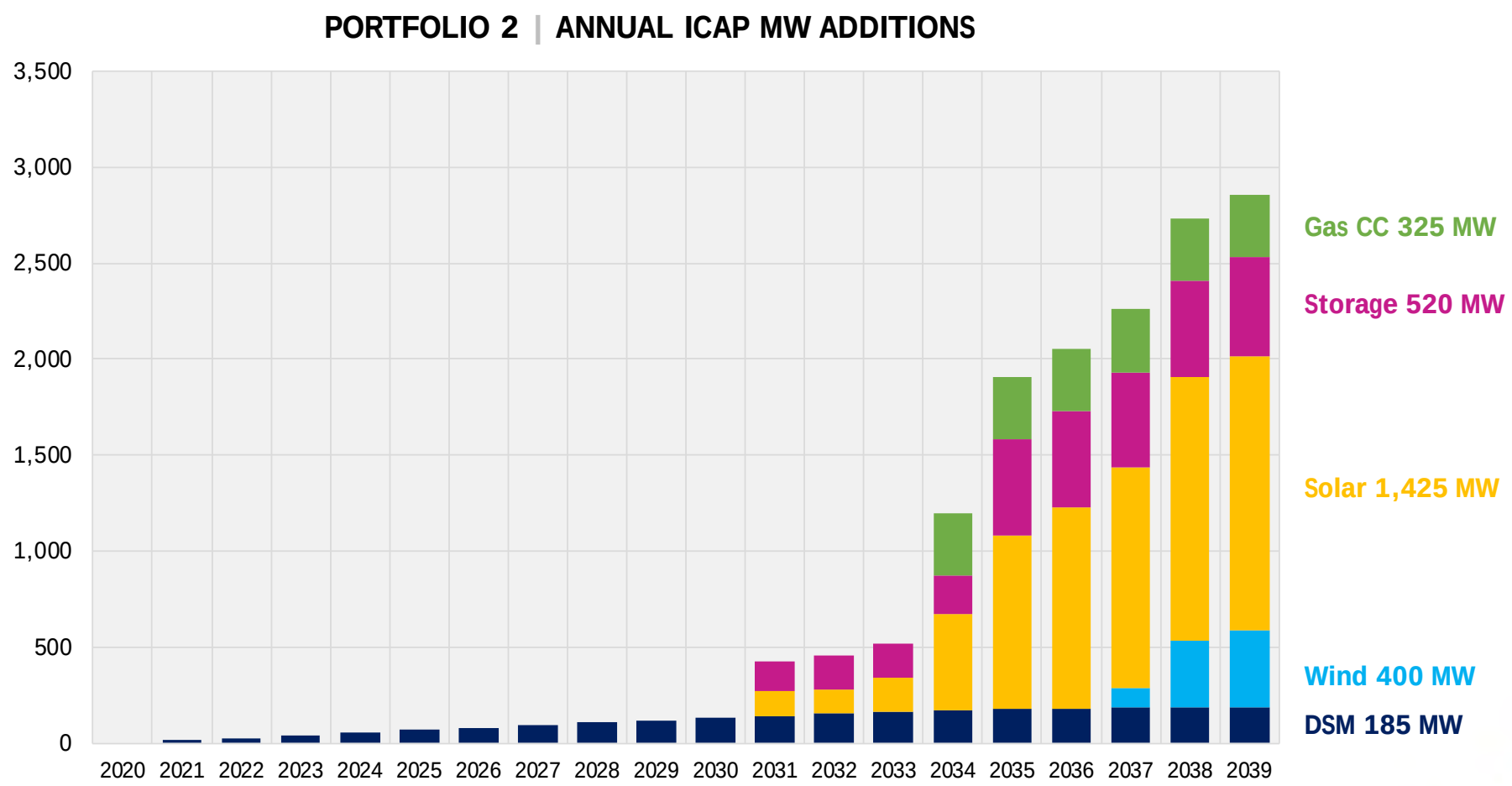
Retirements

- Petersburg
  - Pete 1: 2033
  - Pete 2: 2035
  - Total UCAP: 591 MW
- Harding Street:
  - HS ST5: 2031
  - HS ST6: 2031
  - HS ST7: 2034
  - Total UCAP MW: 583

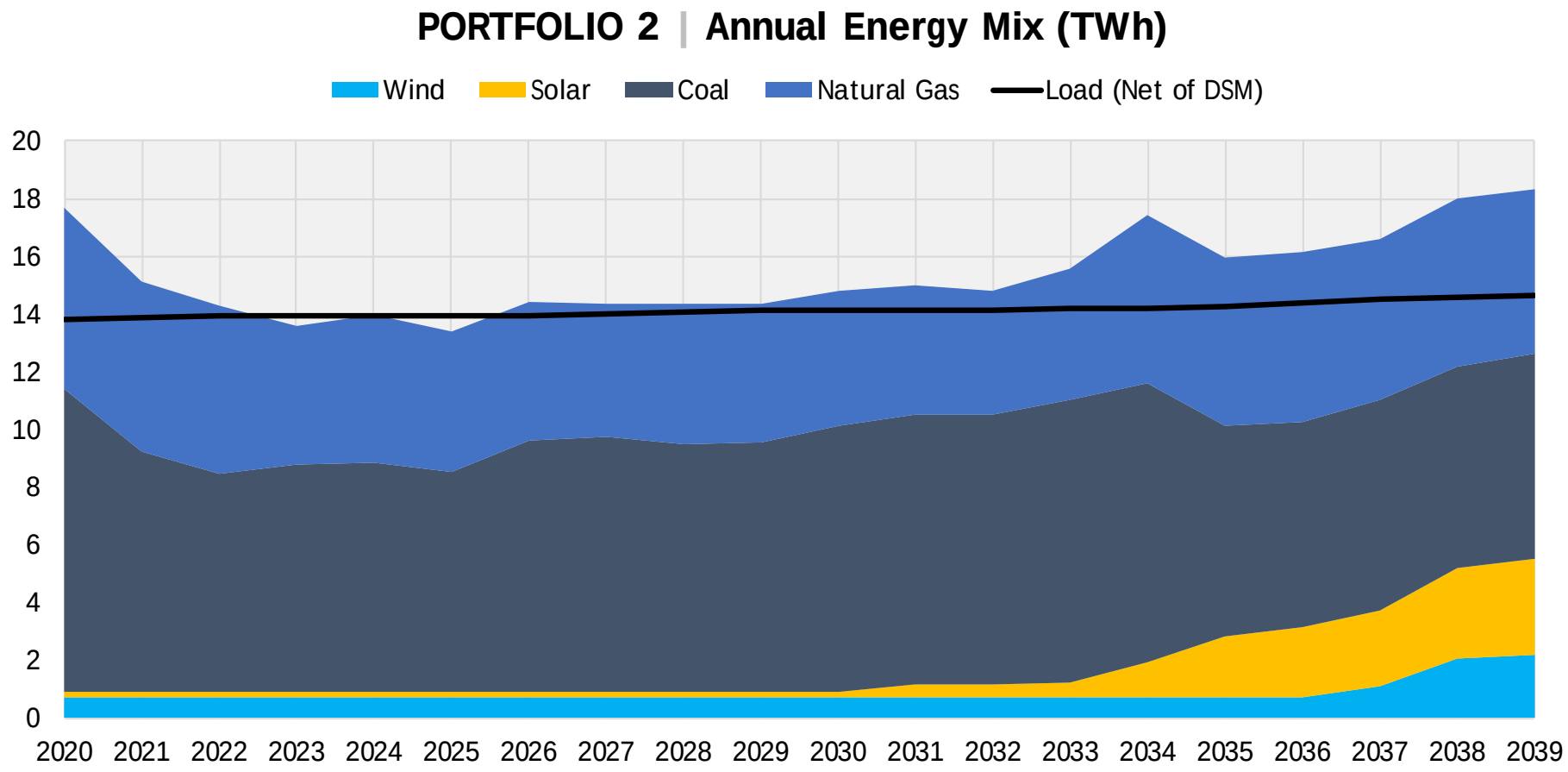
PORTFOLIO 2: FIRM UCAP CAPACITY



PORTFOLIO 2: ICAP MW ADDITIONS



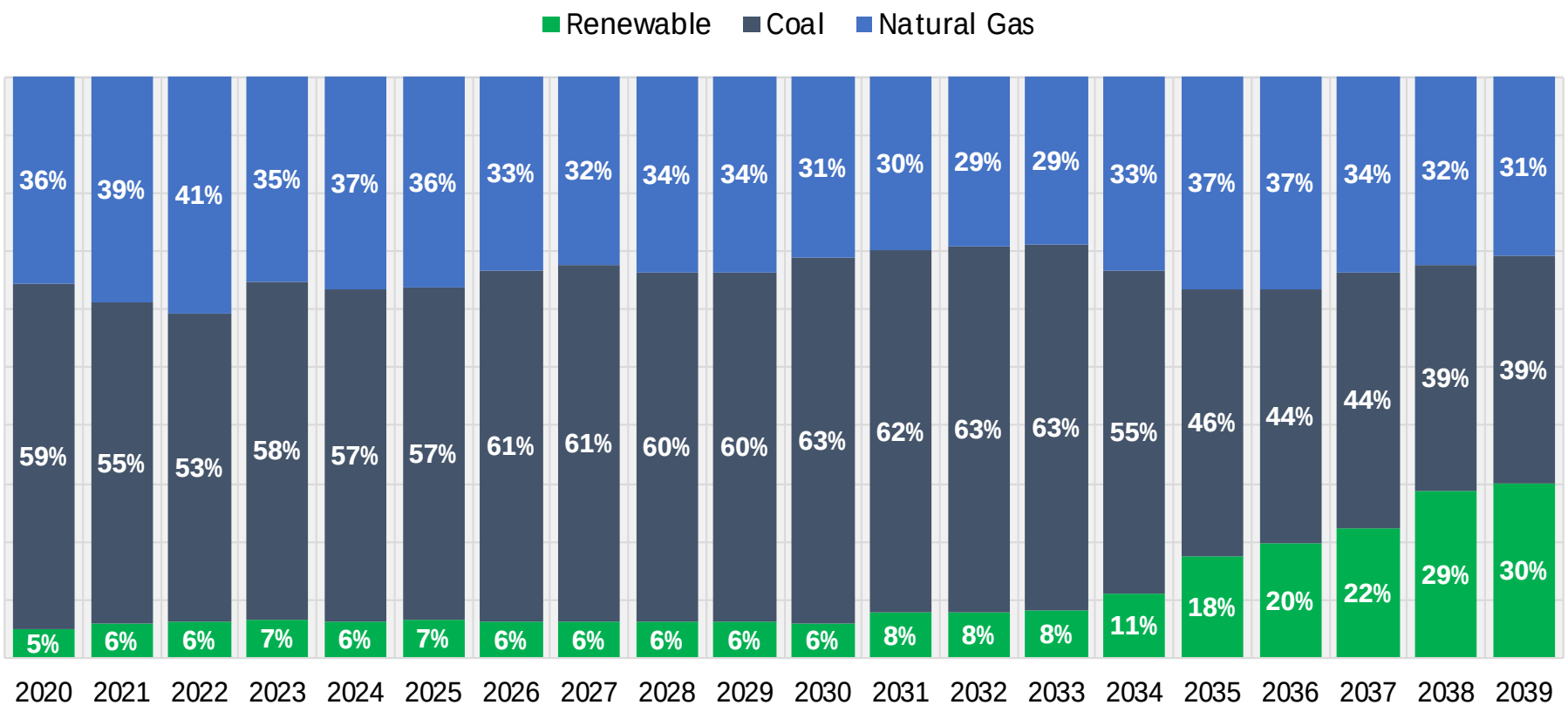
PORTFOLIO 2: REFERENCE CASE ENERGY MIX (1 OF 2)



Energy mix for portfolios will vary across scenarios

PORTFOLIO 2: REFERENCE CASE ENERGY MIX (2 OF 2)

PORTFOLIO 2 | Annual Produced Energy: Percent by Fuel Type



Energy mix for portfolios will vary across scenarios

PORTFOLIO 2 RECAP

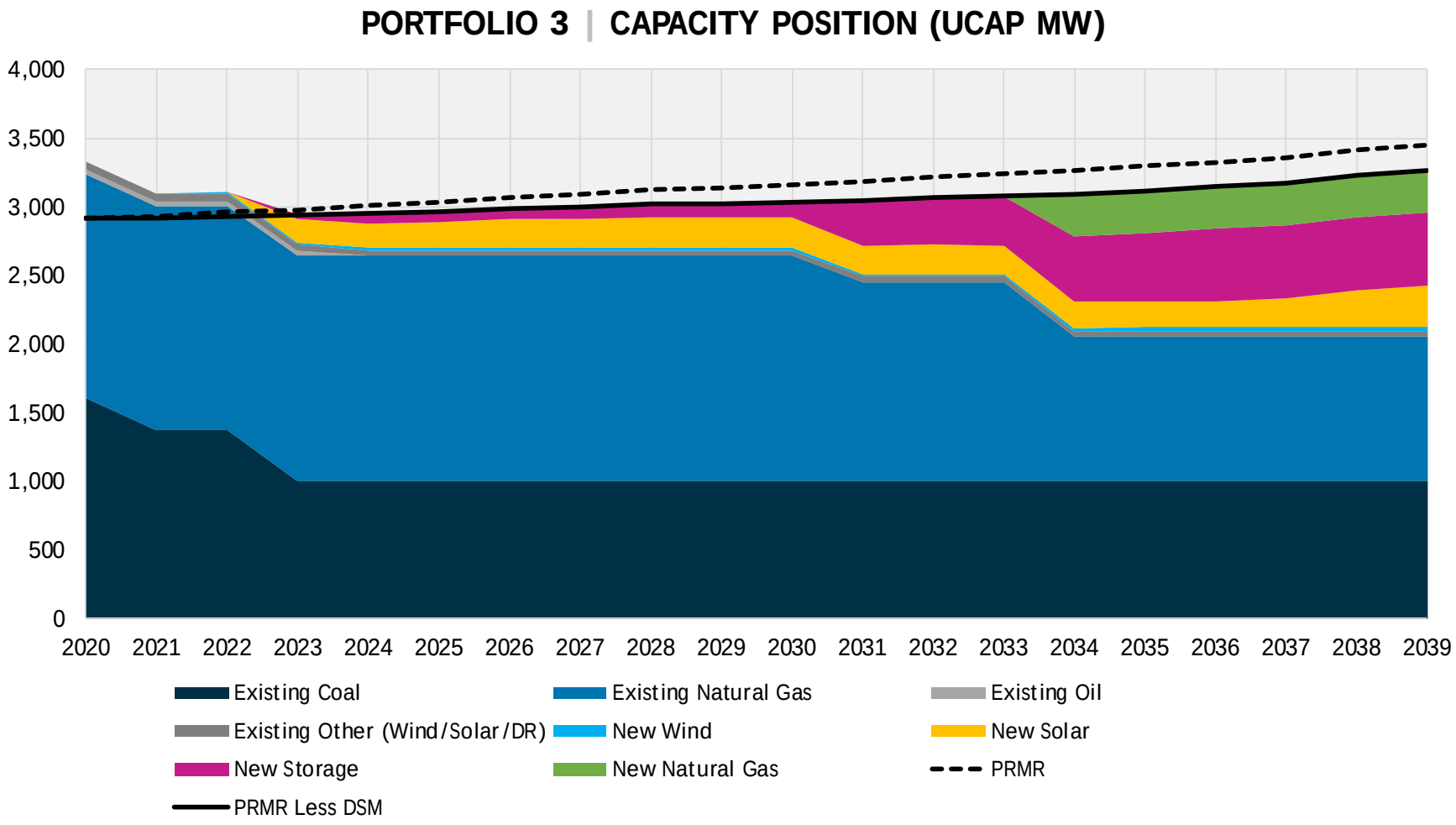
New Build by 2039

- First year short: 2031 (new DSM delays new build by 2 years)
- Wind: 400 MW
- Solar: 1,425 MW
- Storage: 520 MW
- Gas CCGT: 325 MW

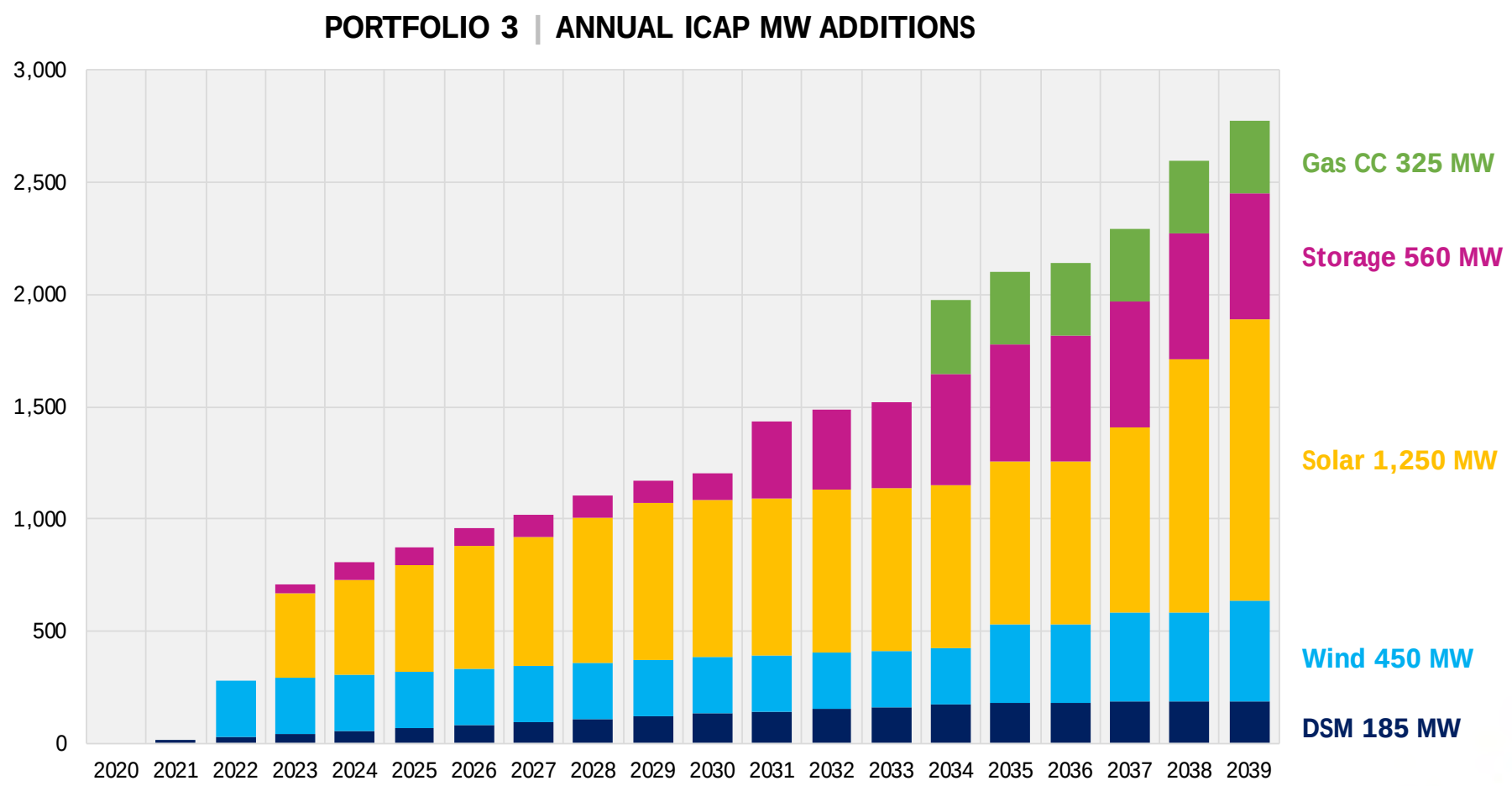
Retirements

- Petersburg
  - Pete 1: 2021
  - Pete 2: 2035
  - Total UCAP: 591 MW
- Harding Street:
  - HS ST5: 2031
  - HS ST6: 2031
  - HS ST7: 2034
  - Total UCAP MW: 583

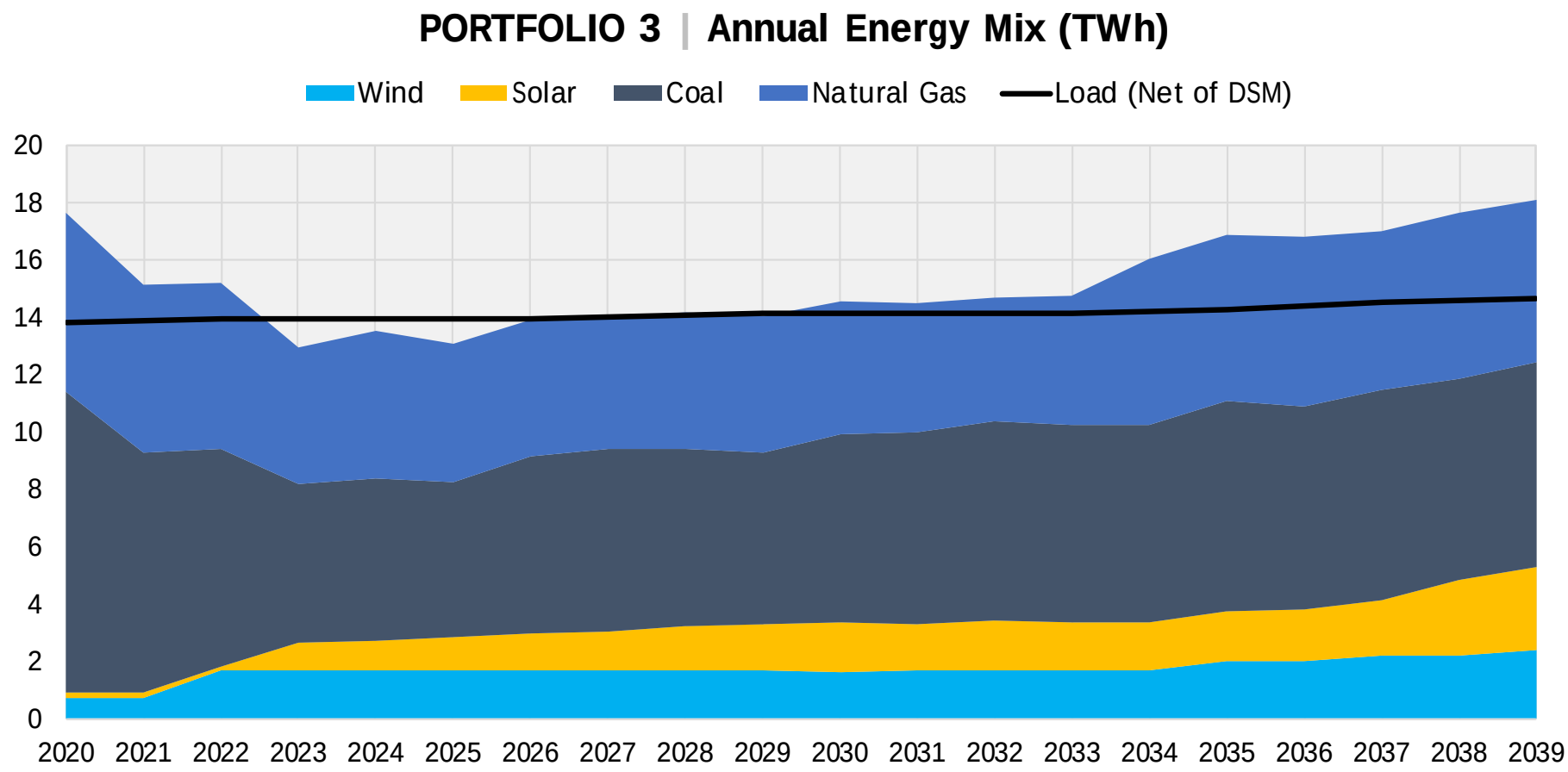
PORTFOLIO 3: FIRM UCAP CAPACITY



PORTFOLIO 3: ICAP MW ADDITIONS



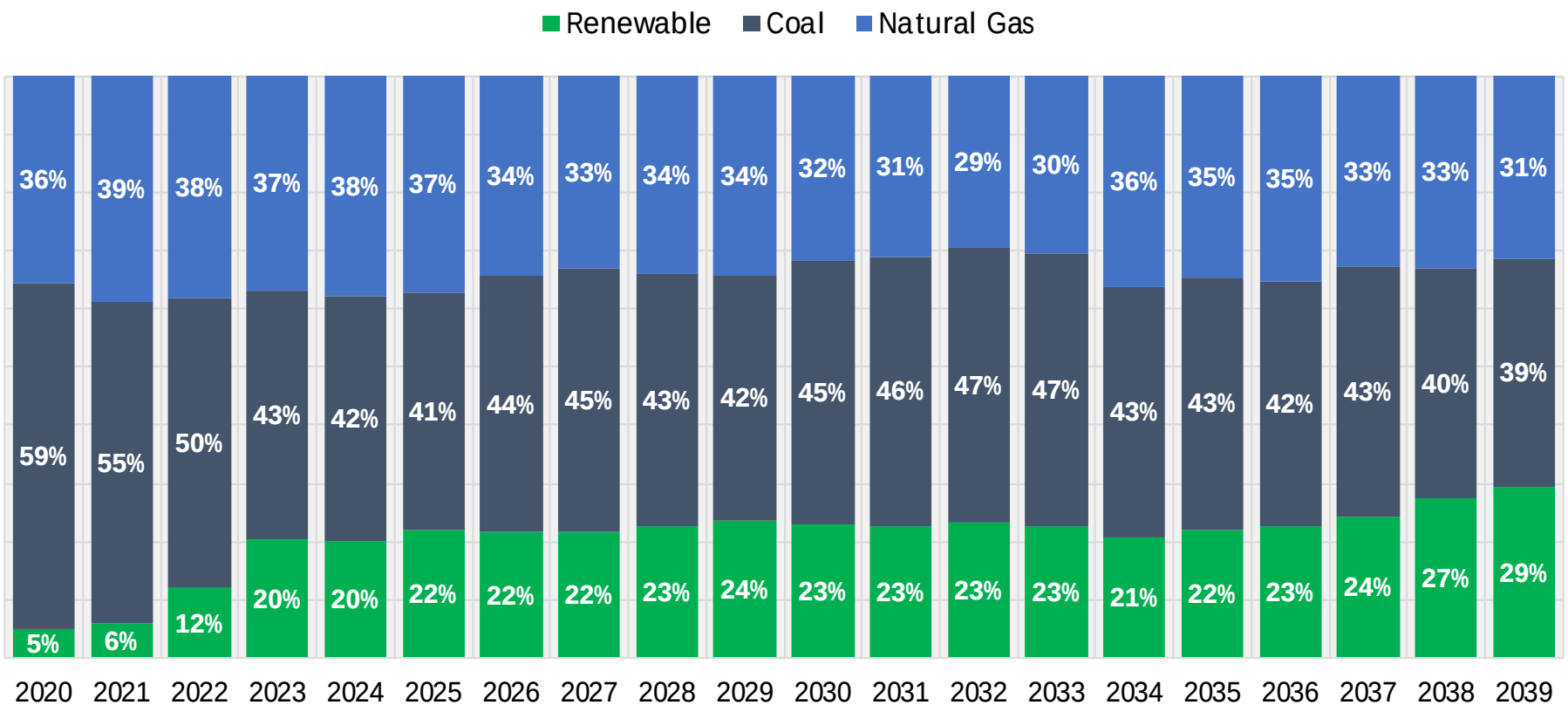
PORTFOLIO 3: REFERENCE CASE ENERGY MIX (1 OF 2)



Energy mix for portfolios will vary across scenarios

PORTFOLIO 3: REFERENCE CASE ENERGY MIX (2 OF 2)

PORTFOLIO 3 | Annual Produced Energy: Percent by Fuel Type



Energy mix for portfolios will vary across scenarios

PORTFOLIO 3 RECAP

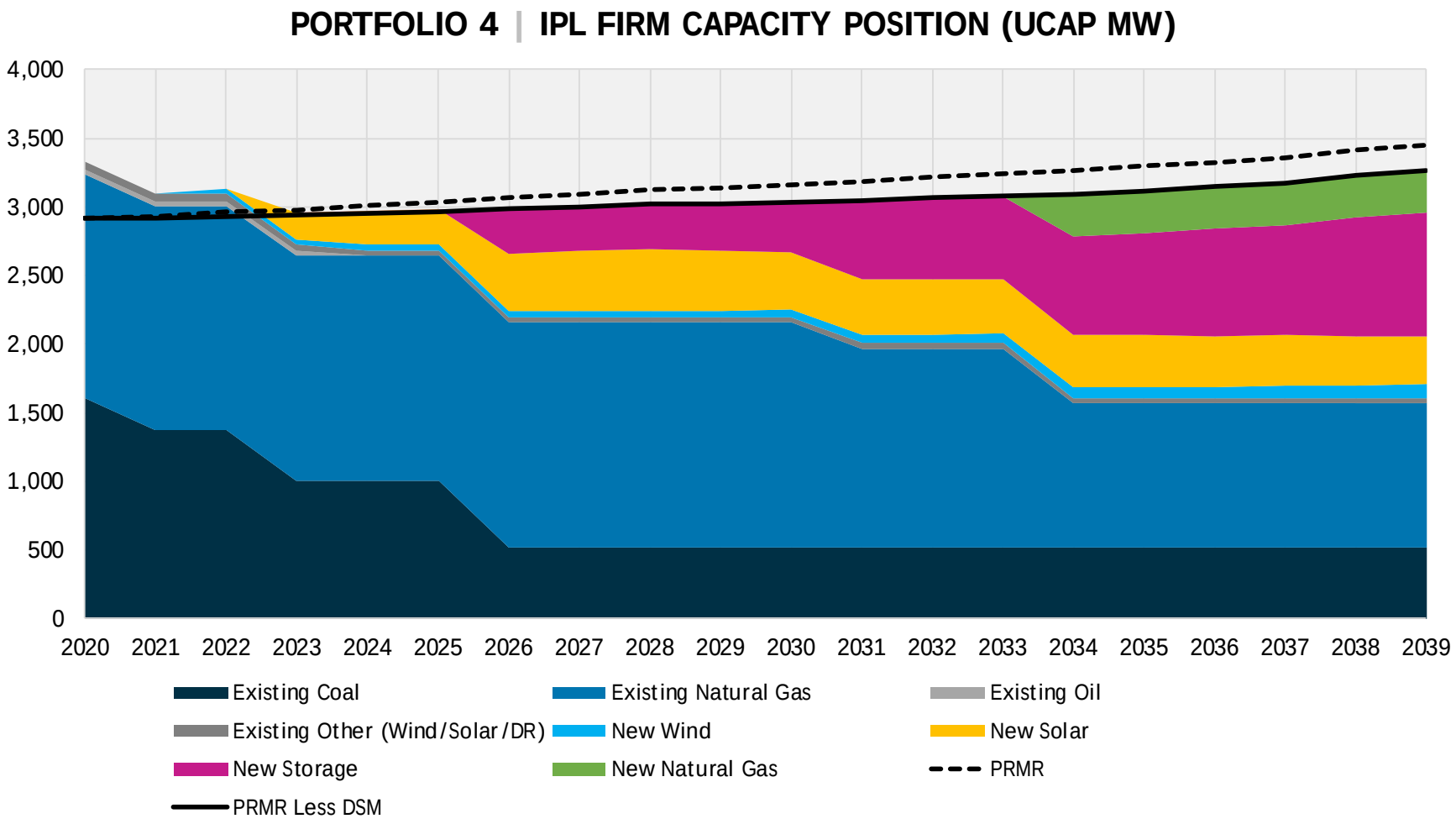
New Build by 2039

- First year short: 2023 (new DSM adds 40 MW UCAP in 2023)
- Wind: 450 MW
- Solar: 1,250 MW
- Storage: 560 MW
- Gas CCGT: 325 MW

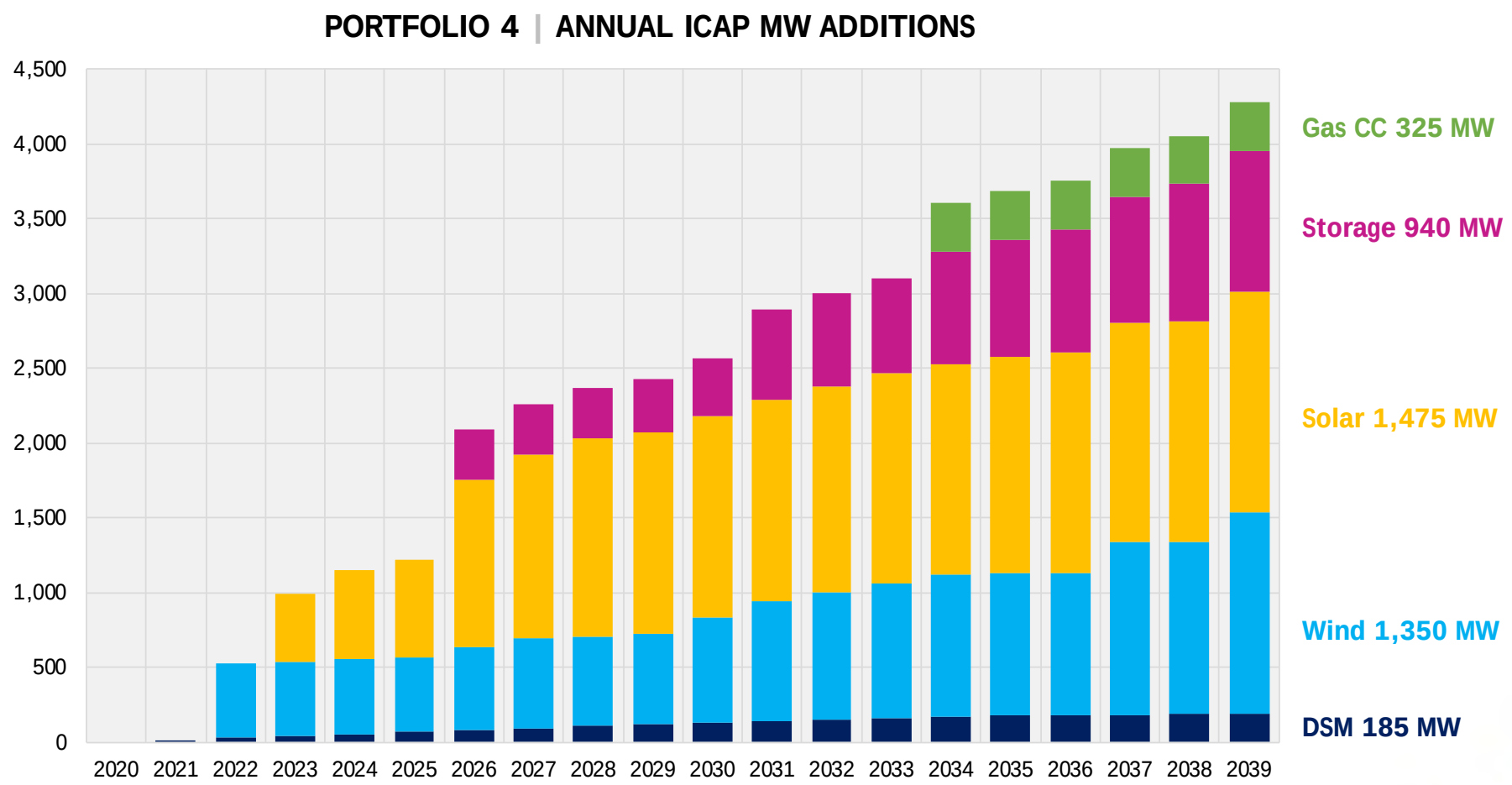
Retirements

- Petersburg
  - Pete 1: 2021
  - Pete 2: 2023
  - Total UCAP: 591 MW
- Harding Street:
  - HS ST5: 2031
  - HS ST6: 2031
  - HS ST7: 2034
  - Total UCAP MW: 583

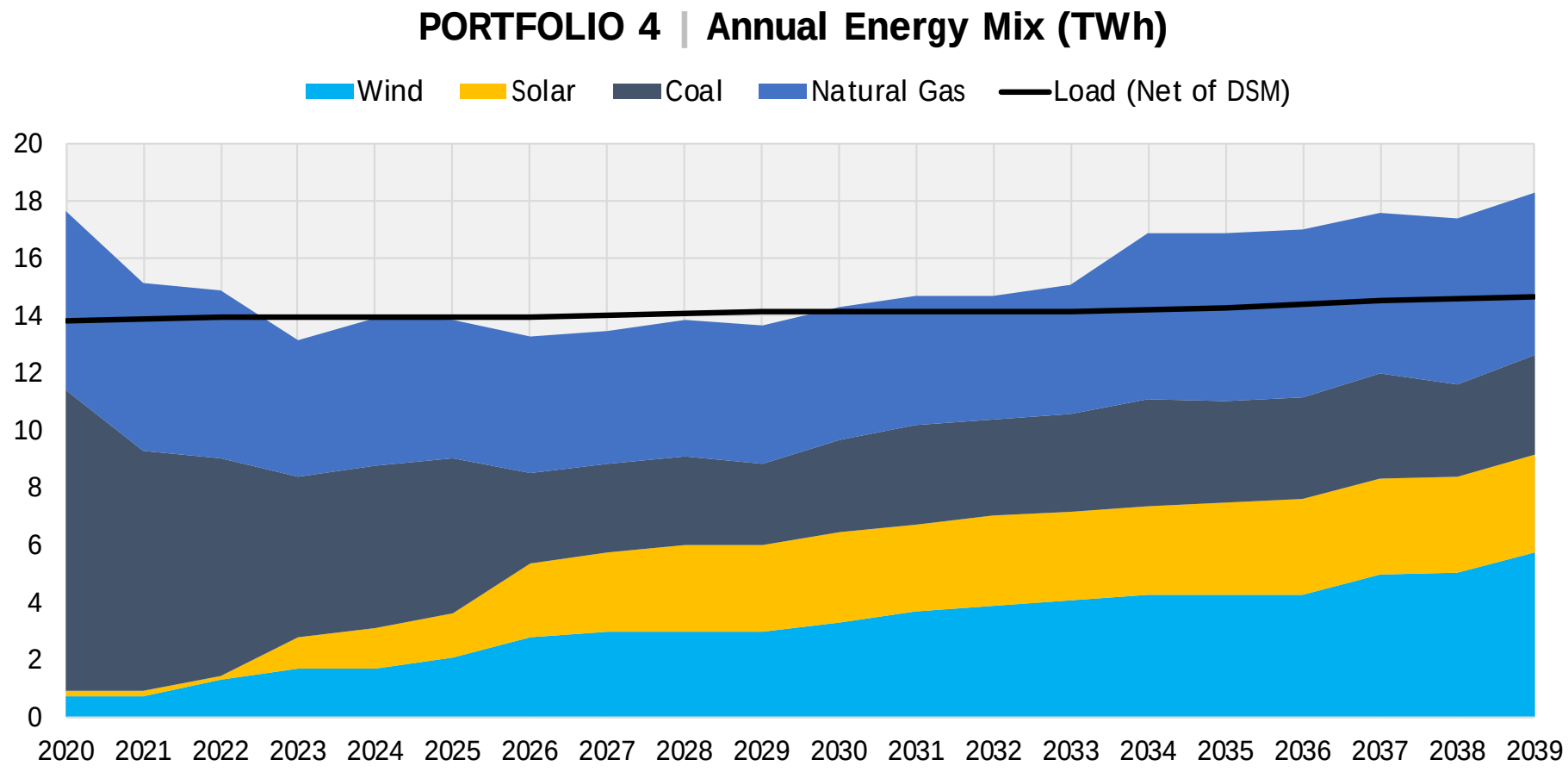
PORTFOLIO 4: FIRM UCAP CAPACITY



PORTFOLIO 4: ICAP MW ADDITIONS



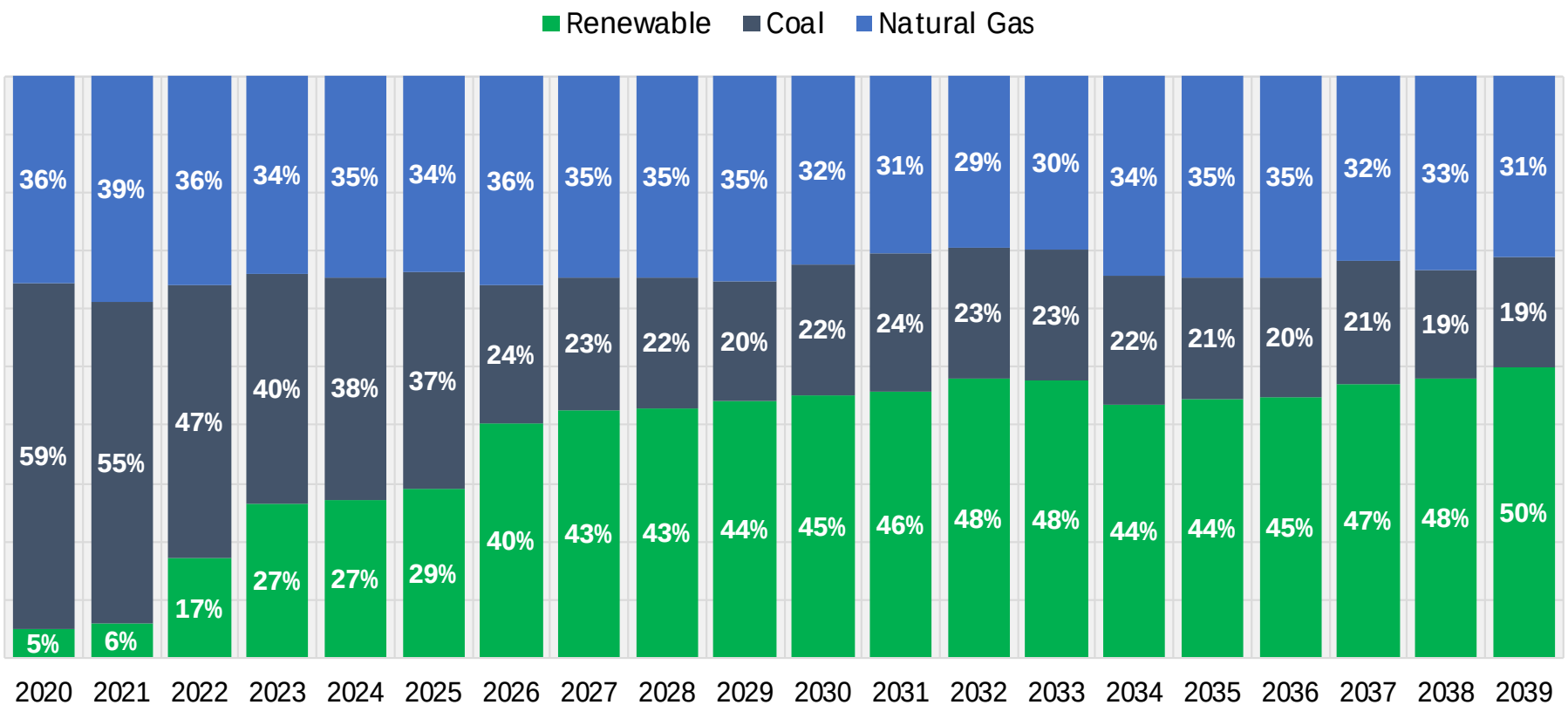
PORTFOLIO 4: REFERENCE CASE ENERGY MIX (1 OF 2)



Energy mix for portfolios will vary across scenarios

PORTFOLIO 4: REFERENCE CASE ENERGY MIX (2 OF 2)

PORTFOLIO 4 | Annual Produced Energy: Percent by Fuel Type



Energy mix for portfolios will vary across scenarios

PORTFOLIO 4 RECAP

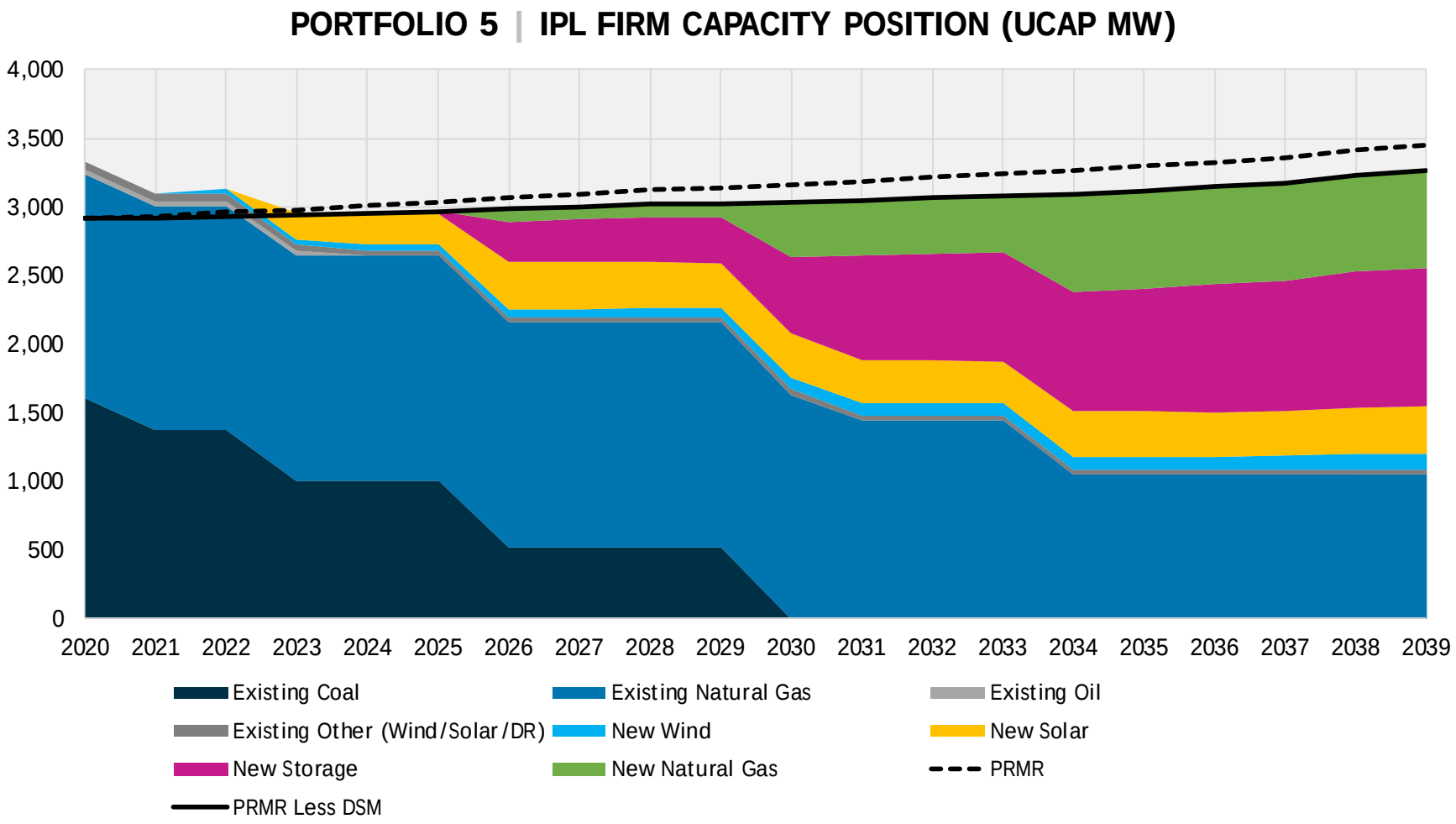
New Build by 2039

- First year short: 2023
- DSM: 185 MW
- Wind: 1,350 MW
- Solar: 1,475 MW
- Storage: 940 MW
- Gas CCGT: 325 MW

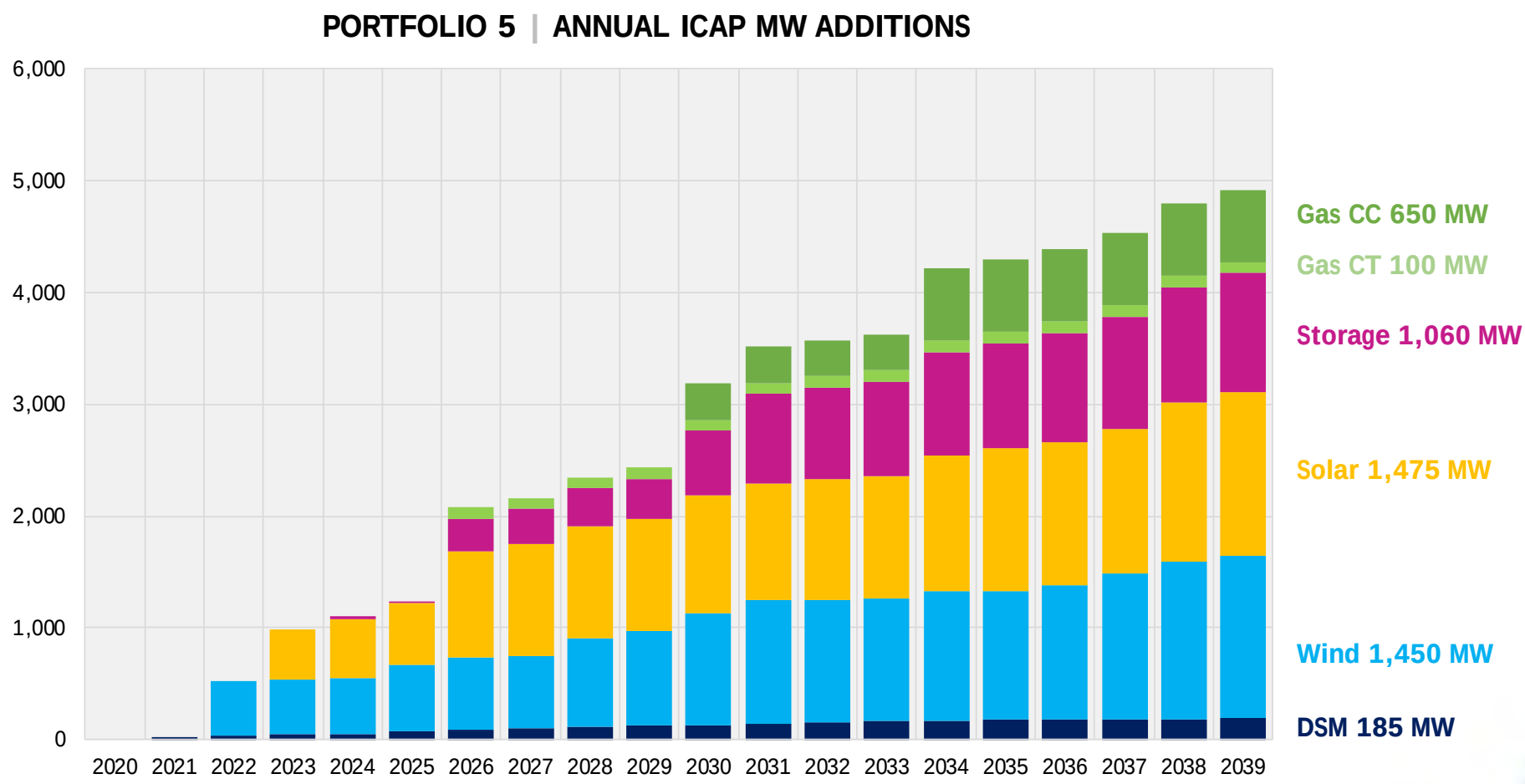
Retirements

- Petersburg
  - Pete 1: 2021
  - Pete 2: 2023
  - Pete 3: 2026
  - Total UCAP: 1,076 MW
- Harding Street:
  - HS ST5: 2031
  - HS ST6: 2031
  - HS ST7: 2034
  - Total UCAP MW: 583

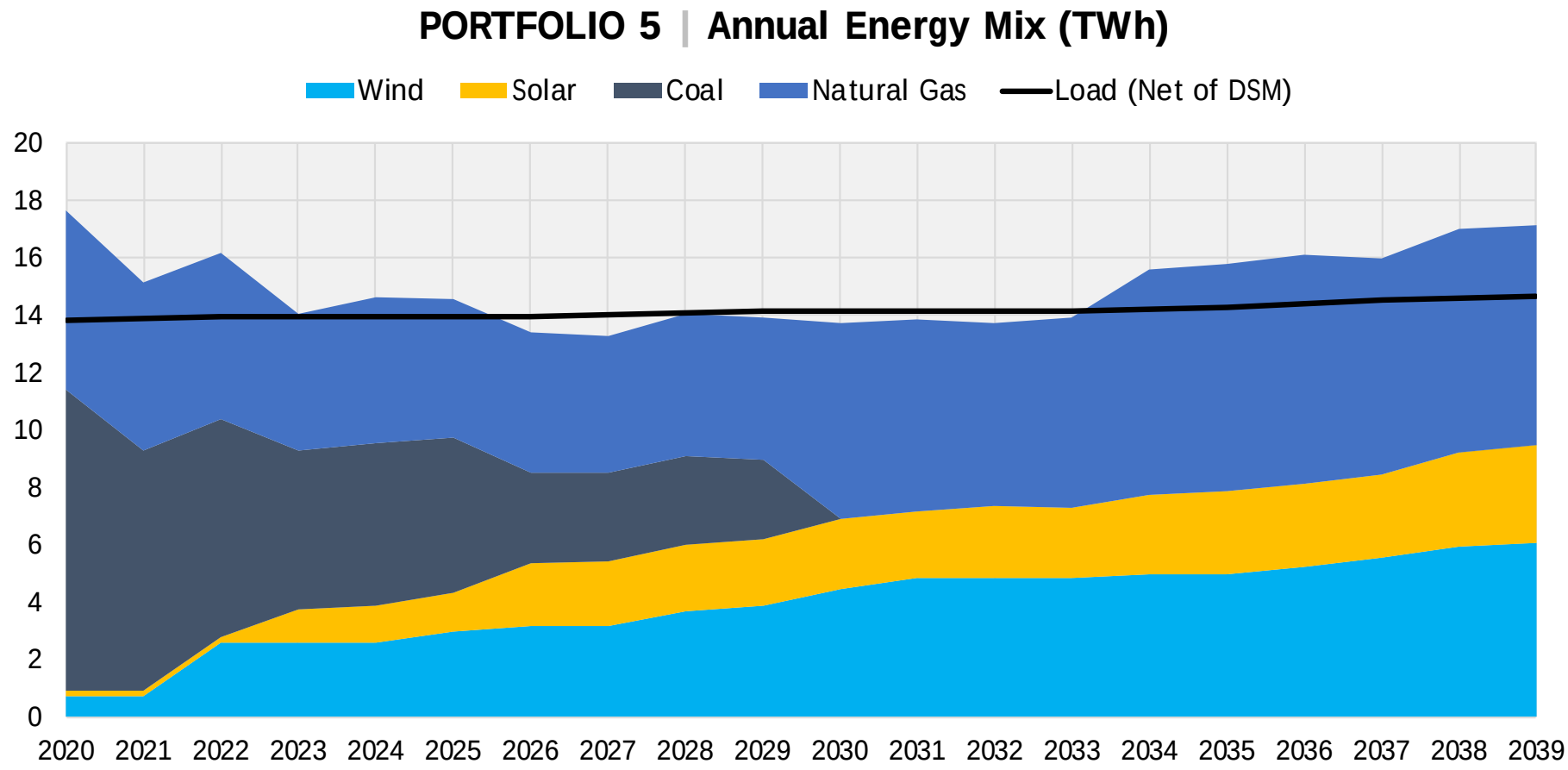
PORTFOLIO 5: FIRM UCAP CAPACITY



PORTFOLIO 5: ICAP MW ADDITIONS



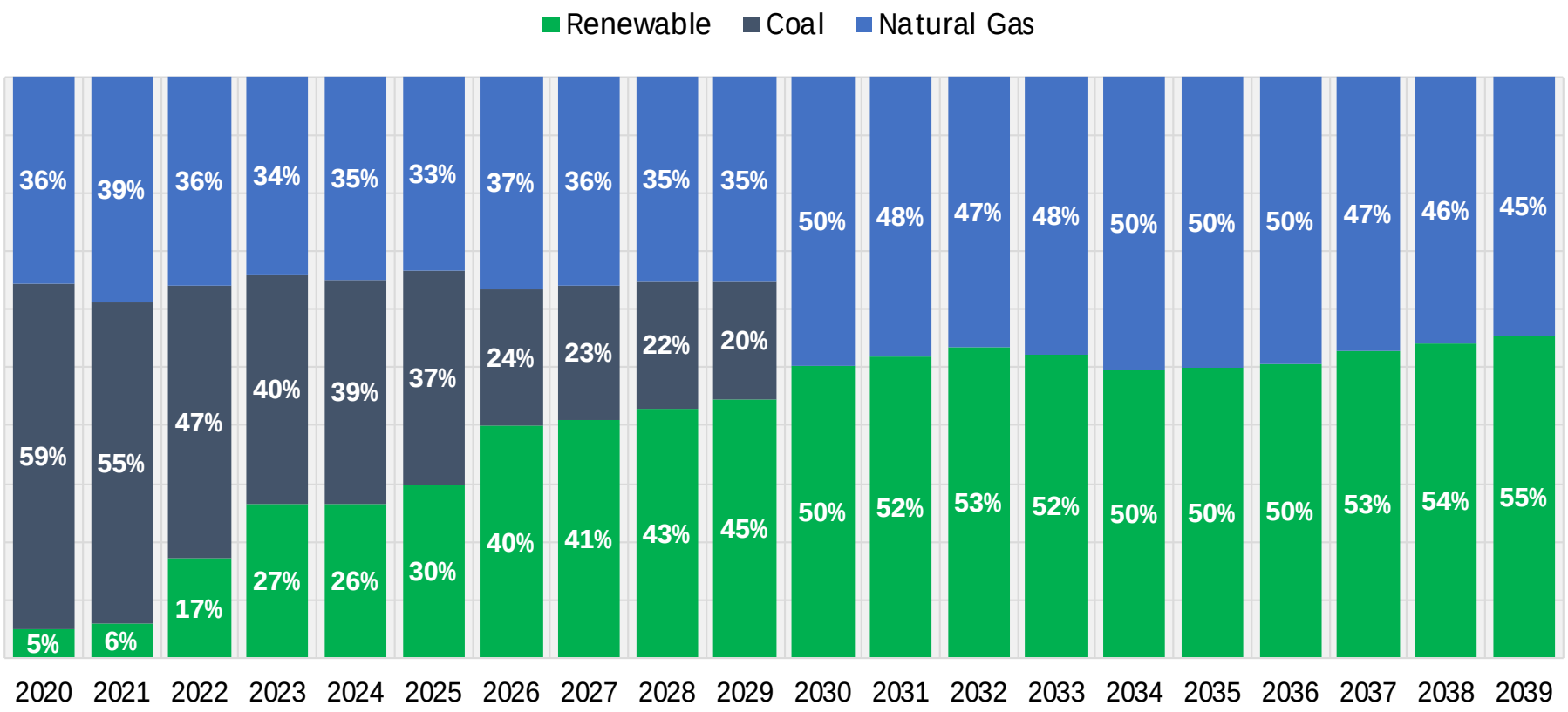
PORTFOLIO 5: REFERENCE CASE ENERGY MIX (1 OF 2)



Energy mix for portfolios will vary across scenarios

PORTFOLIO 5: REFERENCE CASE ENERGY MIX (2 OF 2)

PORTFOLIO 5 | Annual Produced Energy: Percent by Fuel Type



Energy mix for portfolios will vary across scenarios

PORTFOLIO 5 RECAP

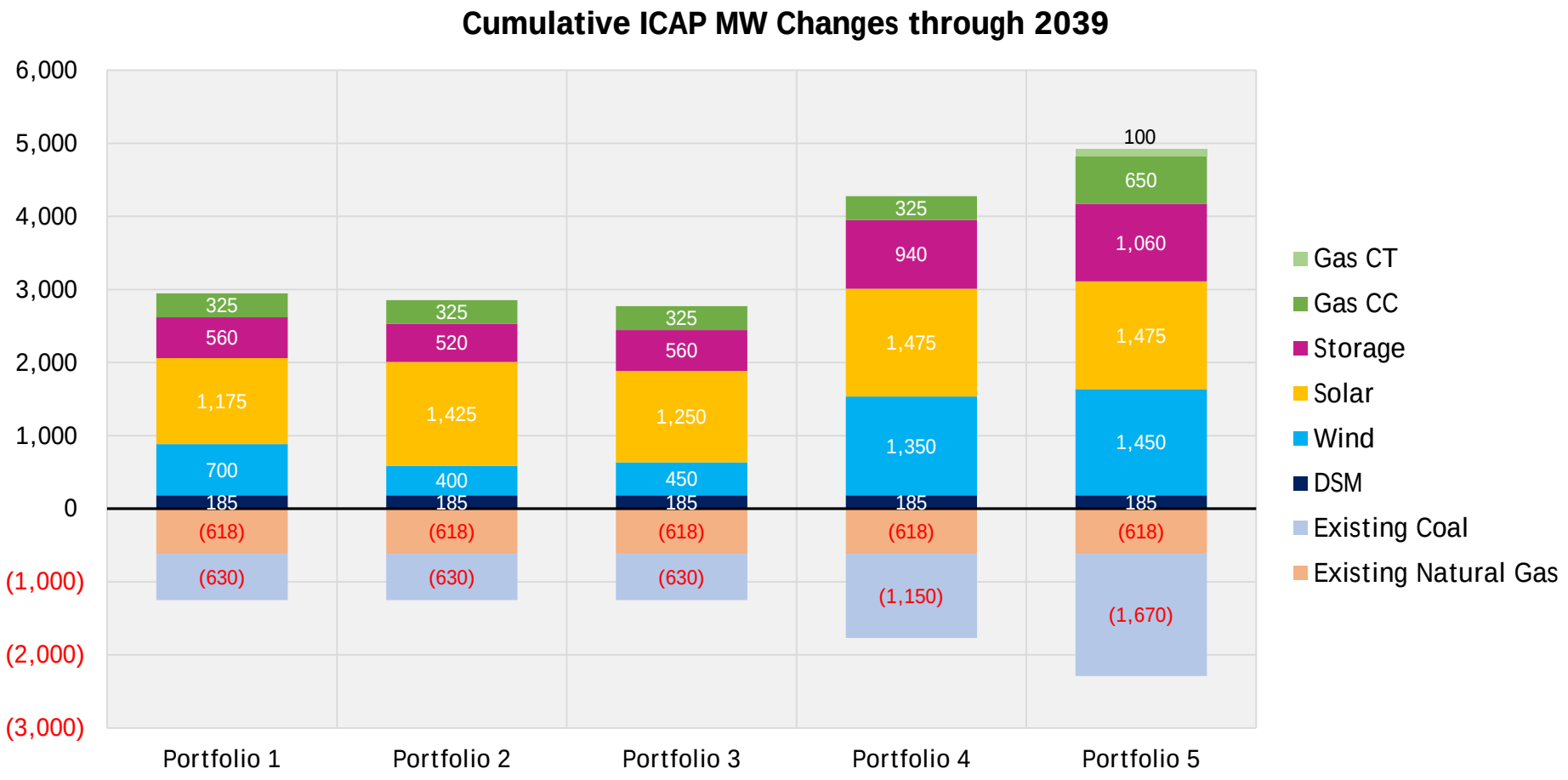
New Build by 2039

- First year short: 2023
- DSM: 185 MW
- Wind: 1,450 MW
- Solar: 1,475 MW
- Storage: 1,060 MW
- Gas CCGT: 650 MW
- Gas CT: 100 MW

Retirements

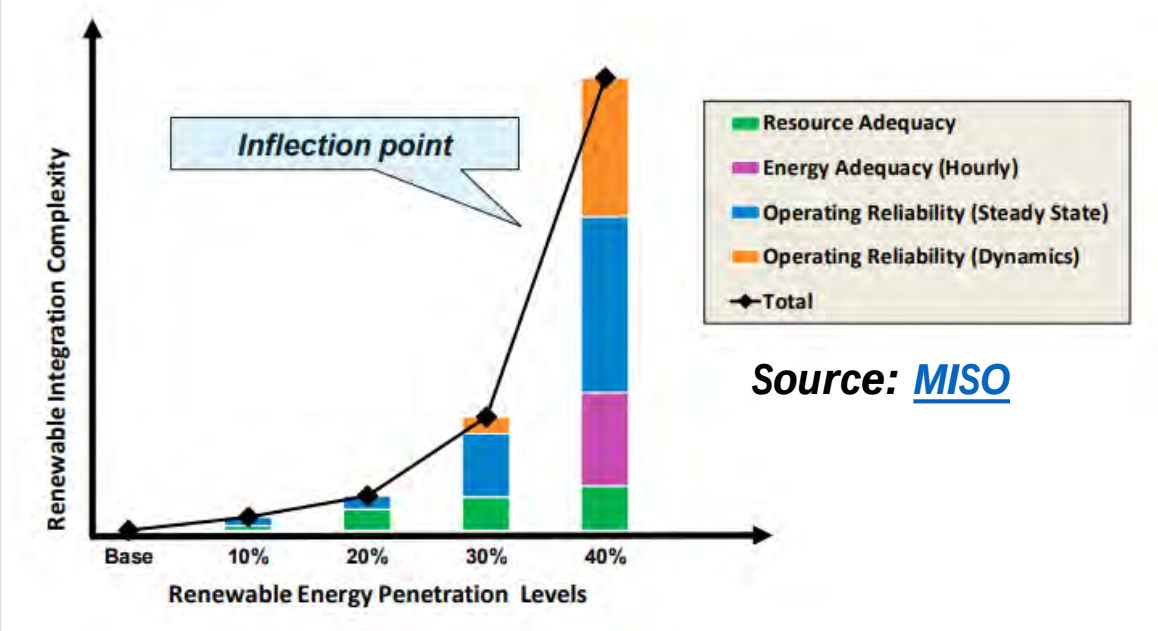
- Petersburg
  - Pete 1: 2021
  - Pete 2: 2023
  - Pete 3: 2026
  - Pete 4: 2030
  - Total UCAP: 1,600 MW
- Harding Street:
  - HS ST5: 2031
  - HS ST6: 2031
  - HS ST7: 2034
  - Total UCAP MW: 583

PORTFOLIO SUMMARIES



OBSERVATIONS AND TAKEAWAYS

- Clear that a high renewable future is expected in next 10-15 years: just a matter of timing and scale
- Studies from MISO indicate increased complexity of renewable integration as renewable energy share moves past 30%
- Level of IPL wind and solar build will change through time as company and industry work to solve issues and develop new modeling capabilities



Source: MISO

PORTFOLIO METRICS

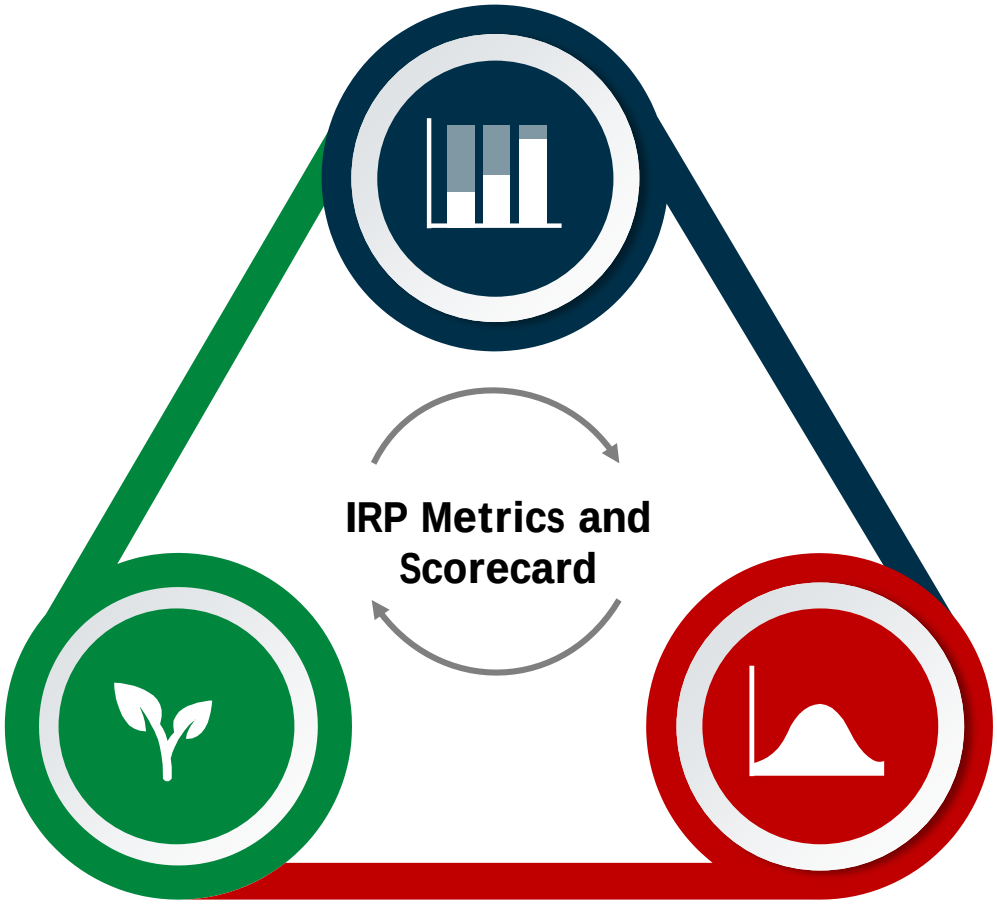
Patrick Maguire

Director of Resource Planning

IRP PORTFOLIO METRICS

COST

What is the impact on customer rates in the short term and long term?



ENVIRONMENTAL

Consideration of air and water impacts

RISK

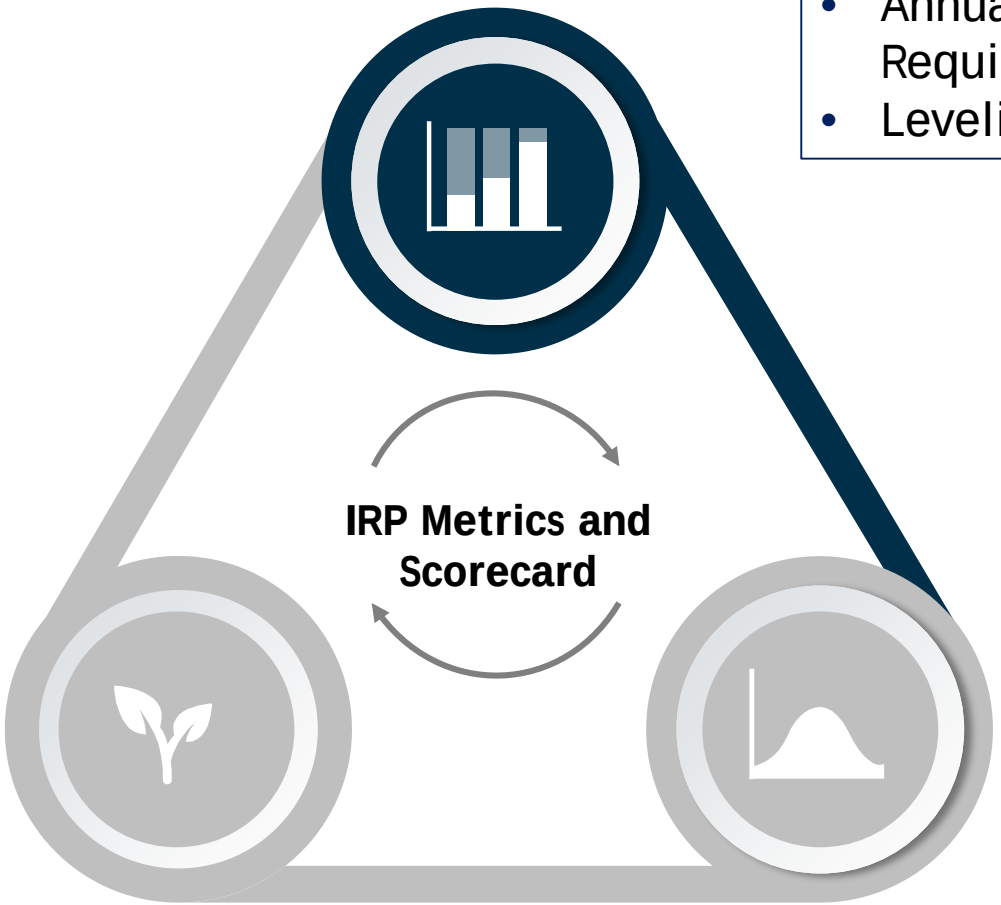
How much risk do the portfolios present to customers?

IRP PORTFOLIO METRICS

COST

What is the impact on customer rates in the short term and long term?

- 20-year PVRR
- Annual Revenue Requirement
- Levelized $/kWh rate



ENVIRONMENTAL

Consideration of air and water impacts

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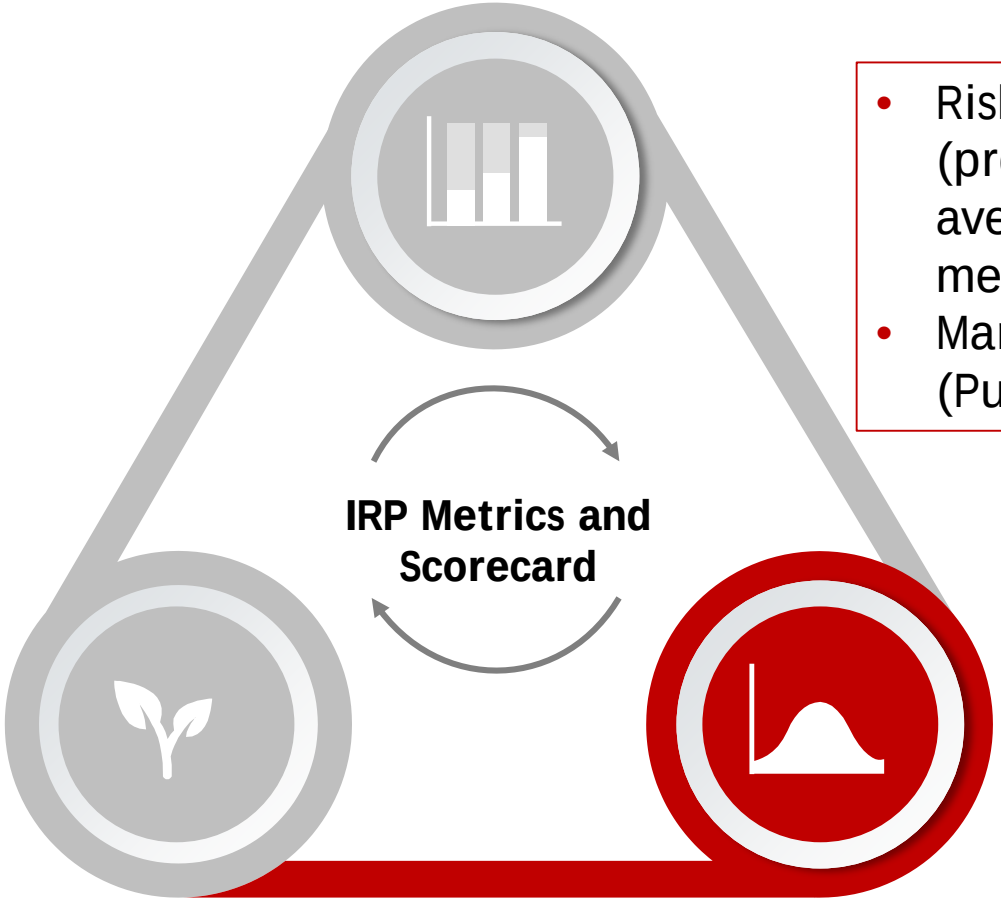
How much risk do the portfolios present to customers?

IRP PORTFOLIO METRICS

COST

What is the impact on customer rates in the short term and long term?



- Risk Premium (probability-weighted average above median)
- Market Interaction (Purchases and Sales)

ENVIRONMENTAL

Consideration of air and water impacts

RISK

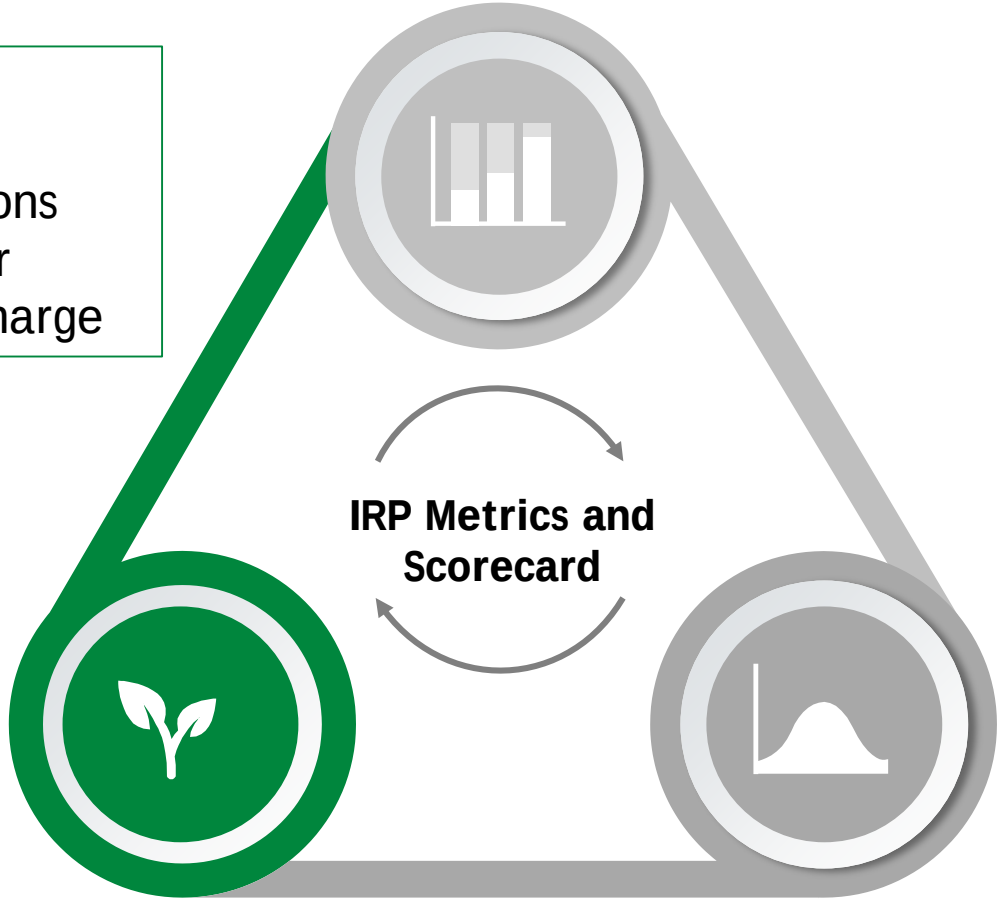
How much risk do the portfolios present to customers?

IRP PORTFOLIO METRICS

COST

What is the impact on customer rates in the short term and long term?

- CO_2 Emissions
- CO_2 Intensity
- NO_x, SO_2 Emissions
- Estimated water intake and discharge



ENVIRONMENTAL

Consideration of air and water impacts

RISK

How much risk do the portfolios present to customers?

Q&A, CONCLUDING REMARKS, & NEXT STEPS

Stewart Ramsay
Meeting Facilitator

Patrick Maguire
Director of Resource Planning

NEXT STEPS: SEP. 30 – DEC. 9

- Final optimized portfolios created and being run through full stochastic production cost model to generate PVRR and risk metrics
- Full optimization will provide metrics on cost, risk, emissions, market interaction, and more
- Additional portfolio runs to be conducted for DSM decrement analysis to test change in PVRR for adding additional decrements

NEXT STEPS

- **Next Meeting: December 9, 2019**
- Meeting #5 Material:
  - Final portfolio results
  - Preferred Resource Plan
  - Short-Term Action Plan
- **IRP Filing Date: December 16, 2019**

Email questions, comments, or other feedback to ipl.irp@aes.com

APPENDIX

ACRONYM LIST

Acronym	Name
CCGT/CC	Combined Cycle
ST	Steam Turbine
CT	Combustion Turbine
UCAP	Unforced Capacity
ICAP	Installed Capacity
PRMR	Planning Reserve Margin Requirement
DR	Demand Response
DSM	Demand Side Management
MISO	Midcontinent Independent System Operator
RIIA	Renewable Integration Impact Assessment
PVRR	Present Value Revenue Requirement