



# **CT RPS Compliance Cost Scenario Analysis**

March 27, 2013

Sustainable Energy Advantage, LLC





## RPS Demand Scenarios

- Adjusted market demand targets
- Size and shape of contracted tier



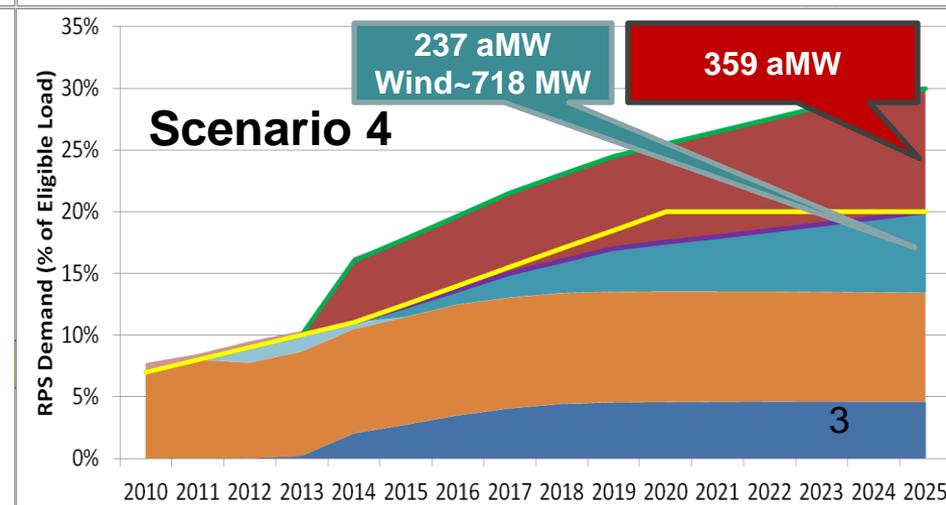
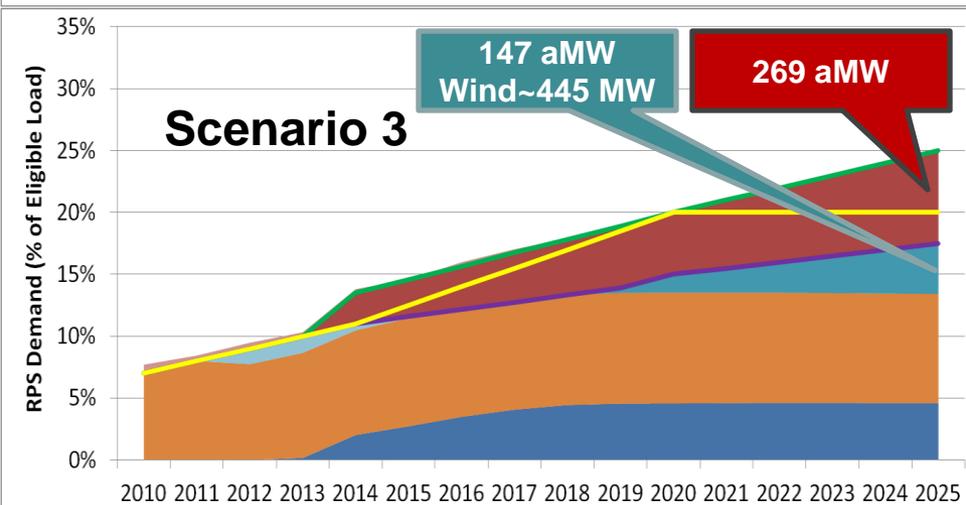
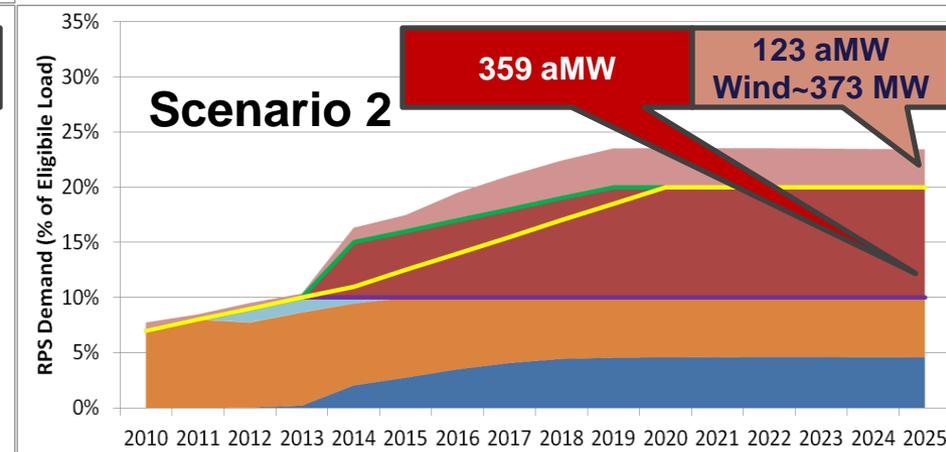
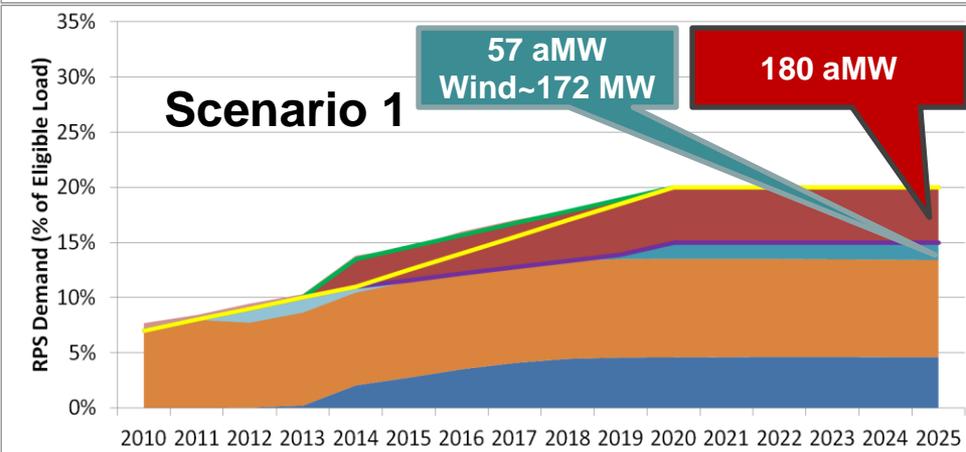
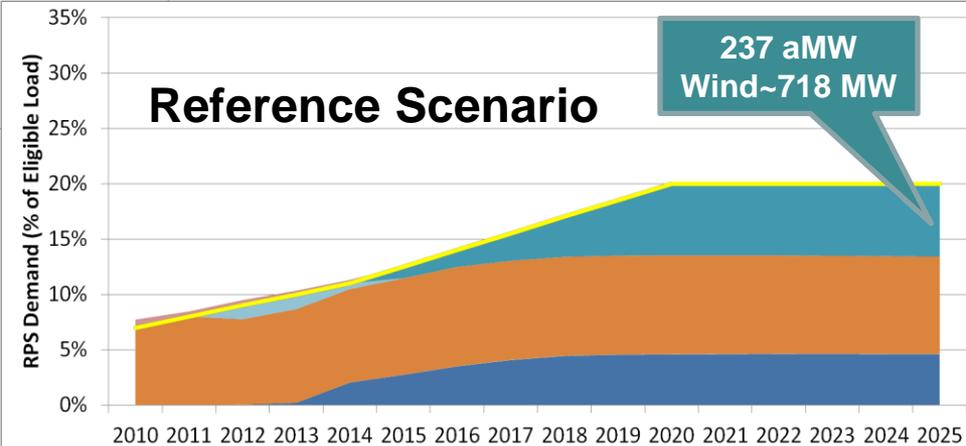
# RPS Demand Target Scenarios: Descriptions

RPS Demand Scenario	Market Tier Target in 2020	Market Tier Target in 2025	Contracted Tier	Shorthand Name
<b>Reference Case</b>	20%	20%	None	<i>20% by 2020</i>
<b>Scenario 1</b>	15%	15%	2014-2020 Ramp from 2.5% to 5%	<i>20% by 2020 w/ 5% Contracted</i>
<b>Scenario 2</b>	10%	10%	2014-2020 Ramp from 5% to 10%	<i>20% by 2020 w/ 10% Contracted</i>
<b>Scenario 3</b>	15%	17.5%	2014-2025 Ramp from 2.5% to 7.5%	<i>25% by 2025 w/ 7.5% Contracted</i>
<b>Scenario 4</b>	17.5%	20%	2014-2025 Ramp from 5% to 10%	<i>30% by 2025 w/ 10% Contracted</i>

# RPS Target Scenarios

- Existing In-State Programs
- Committed Regional Supply Targeting CT
- ACP
- Remaining Class I Demand from Mkt
- Contracted Tier (Hydro-Elig.)
- Squeezed out of Market
- Class I Reference
- Combined Market and Contracted
- Modified Class I Market

aMW = average megawatts; assumes 100% capacity factor





## Supply Outlook

- Reference Case: Common Assumptions
- Reference Case: High and Low outlook
- Supply-demand balance by Scenario
- Compliance Costs by Scenario



# Defining the Reference Case: Common Assumptions

- Cape Wind @ contracted amount (363 MW)
- Ramp up to ~2,100 GWh of *incremental* imports by 2025
- No expansion of ties to neighboring control areas; utilize existing transmission space and no additional investment assumed
- RE supply is limited by availability of long-term PPAs
  - validated in comparison to supply available from current development pipeline
- NESCOE RFP: no incremental PPAs beyond current statutory commitments
- Biomass:
  - Eligibility → revised MA regs for fuel and efficiency standards.
  - Jonesboro, W., Schiller, Greenville assumed partially MA eligible in '13-'15; 0% thereafter
  - Reduced operations observed in 2011 apply to all large woody biomass plants through 2012, returning to 85% of historic full-production levels beginning 1/1/2014.
- ~ 50% (84/166 MW) of ME Class I refurbishment certification applications approved



# Bounding the Reference Case

## Low Supply Assumptions

- PTC/ITC: Extend through 2014, linear 4 year phase-out to 0% by 2018
- RI Federal OSW: None
- LFG By Pipeline: 16 MW
- Assumes existing in-state policies
- No network transmission upgrades.
- FCM Revenue: RE Exemption from MOPR applies to FCA 8 and thereafter, but for ME, no capacity credit due to lack of capacity deliverability

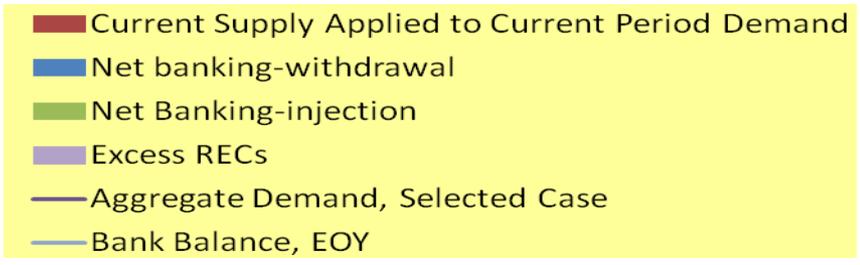
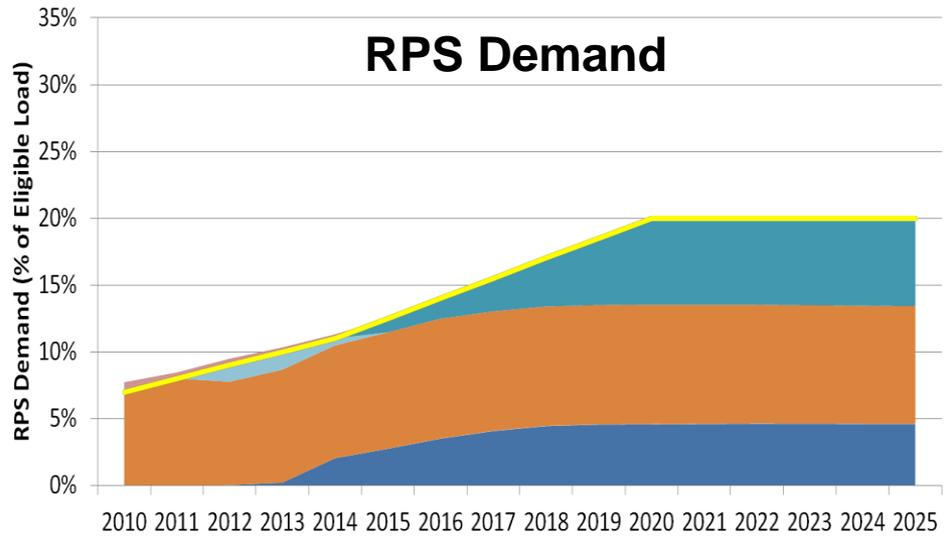
## High Supply Assumptions

- PTC/ITC: Extend through 2015, then phase down to 50% by 2020
- RI Federal OSW: 450 MW
- LFG By Pipeline: 32 MW
- CT: assumes existing in-state policies
- Rest of NE: probability of success increased for certain projects in recognition of “tilt” policies
- Network Tx assumed built late-2016 (ME) to mid-2018 (NH).
- FCM revenue: assumes RE exemption from MOPR applies to FCA 8 and thereafter, but no FCM revenue for Maine generation until 2017

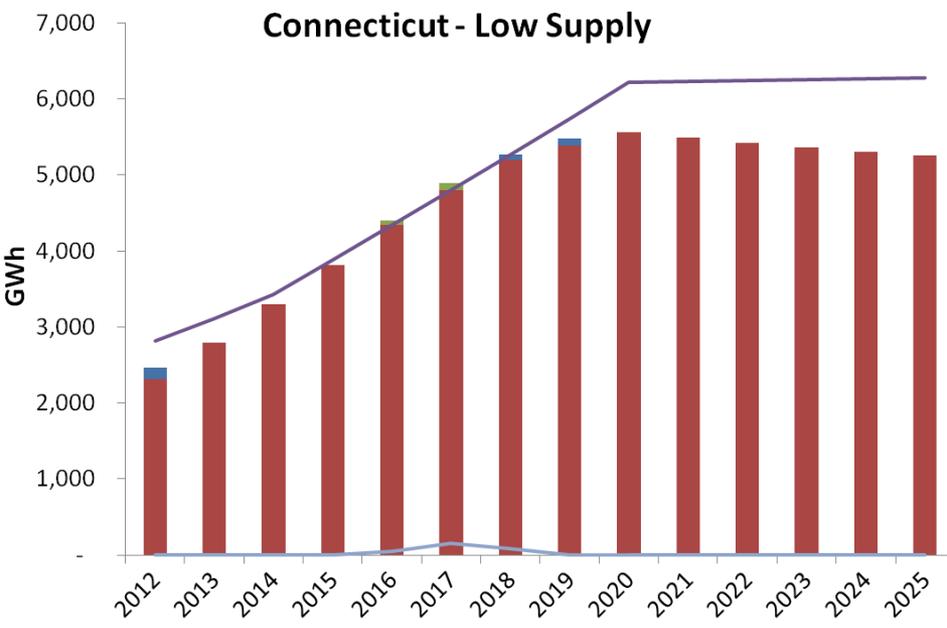


# Reference Case: 20% by 2020

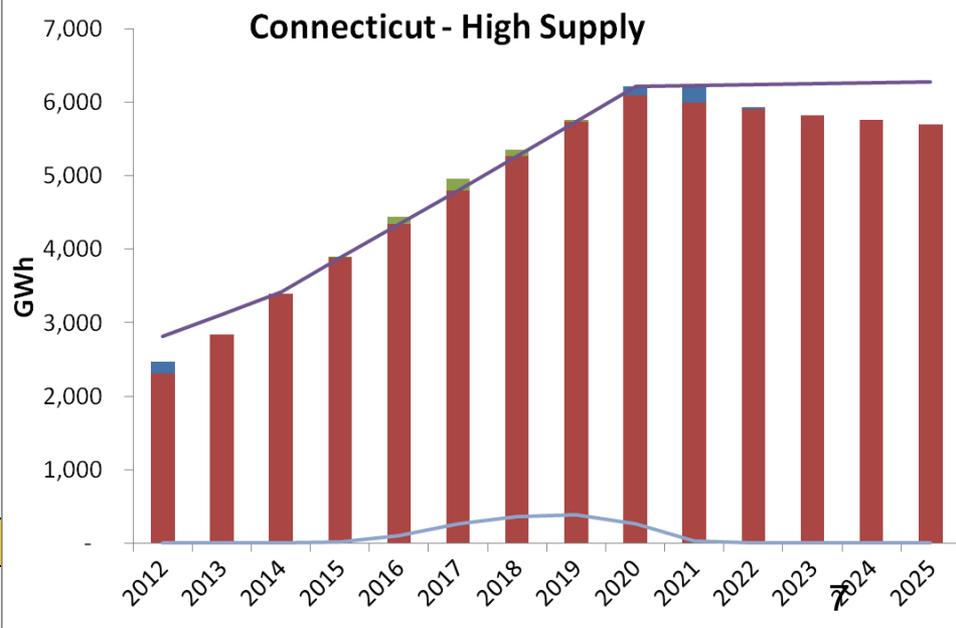
## RPS Demand



## Connecticut - Low Supply



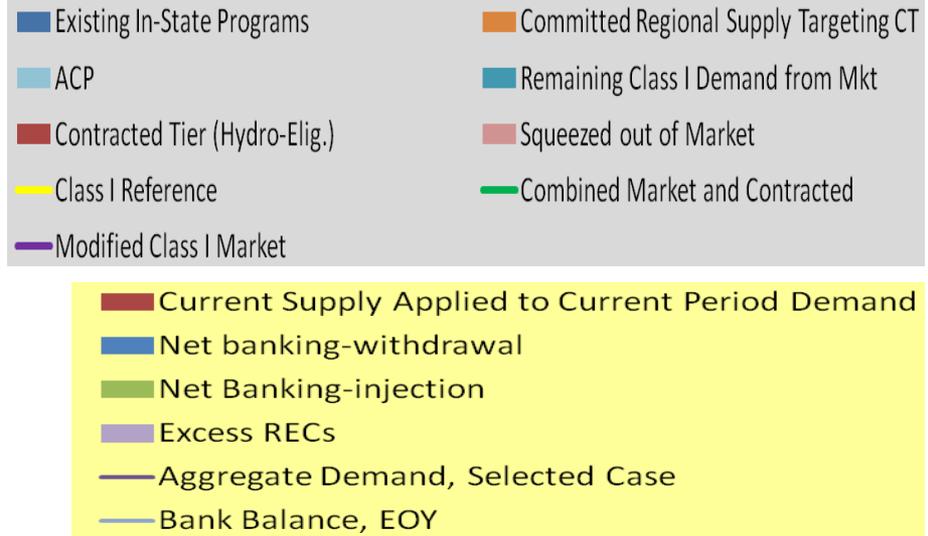
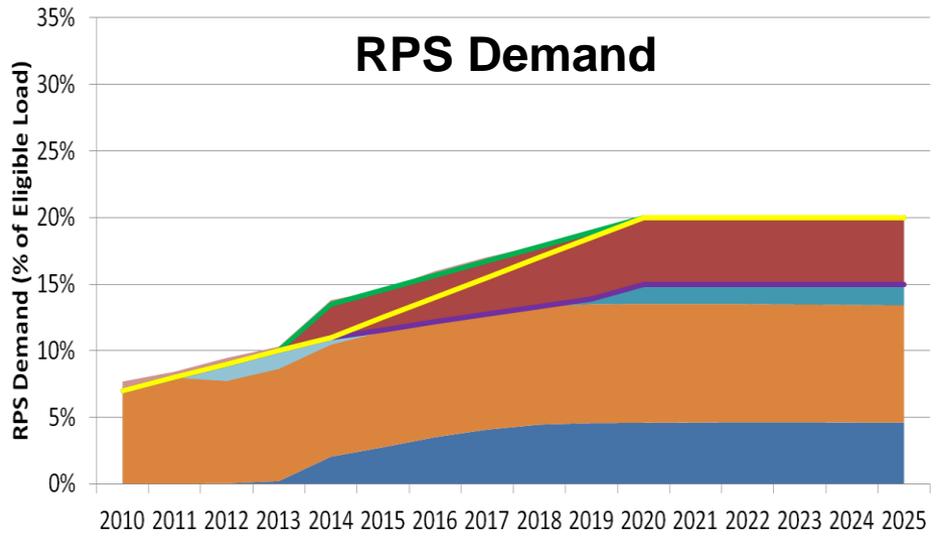
## Connecticut - High Supply



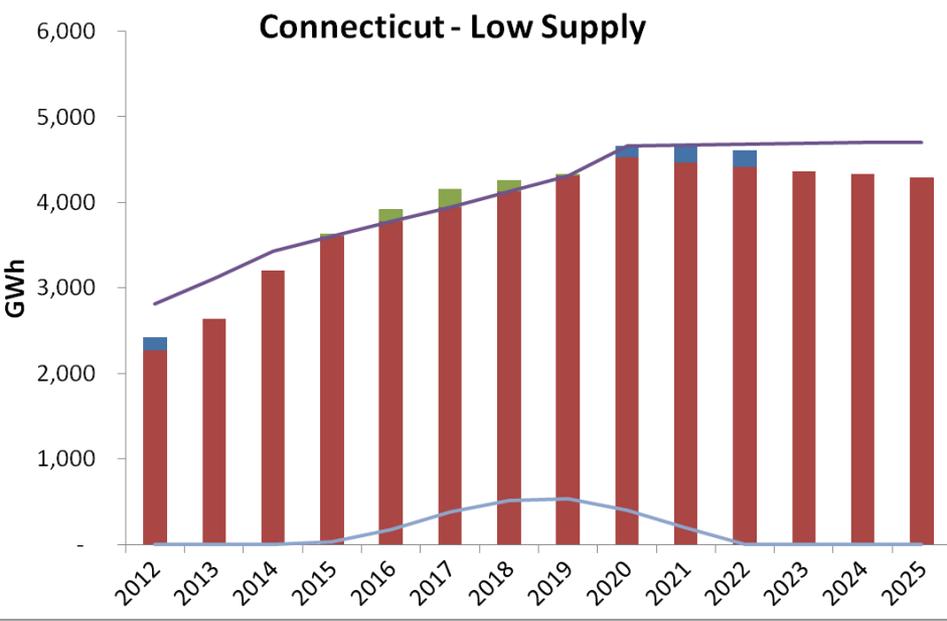


# Scenario 1: 20% by 2020 w/ 5% Contracted

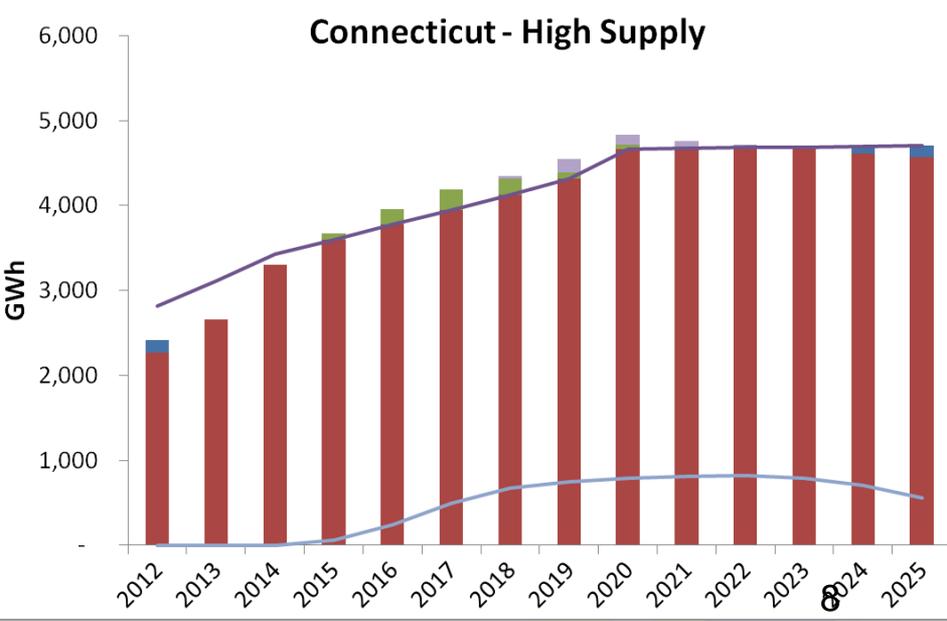
## RPS Demand



## Connecticut - Low Supply

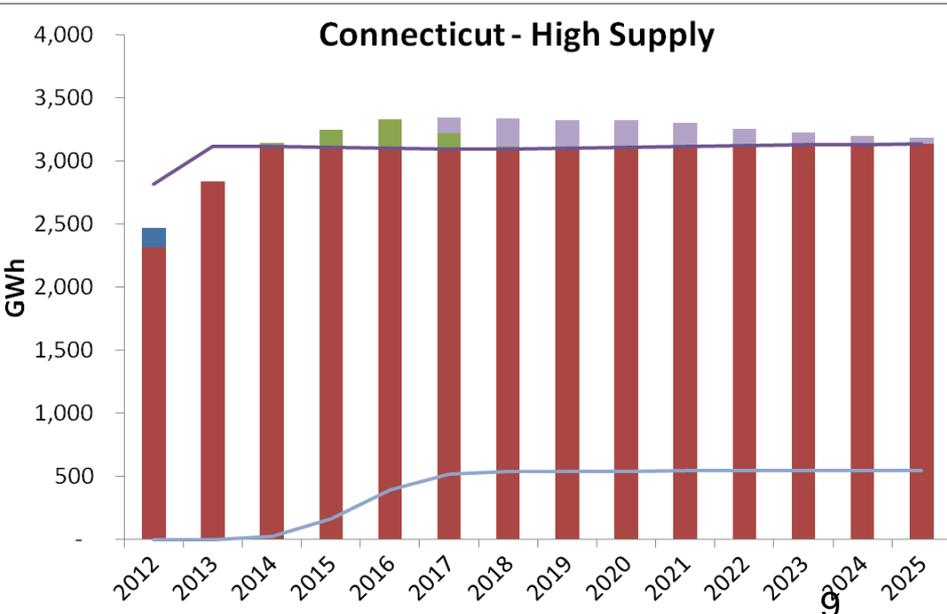
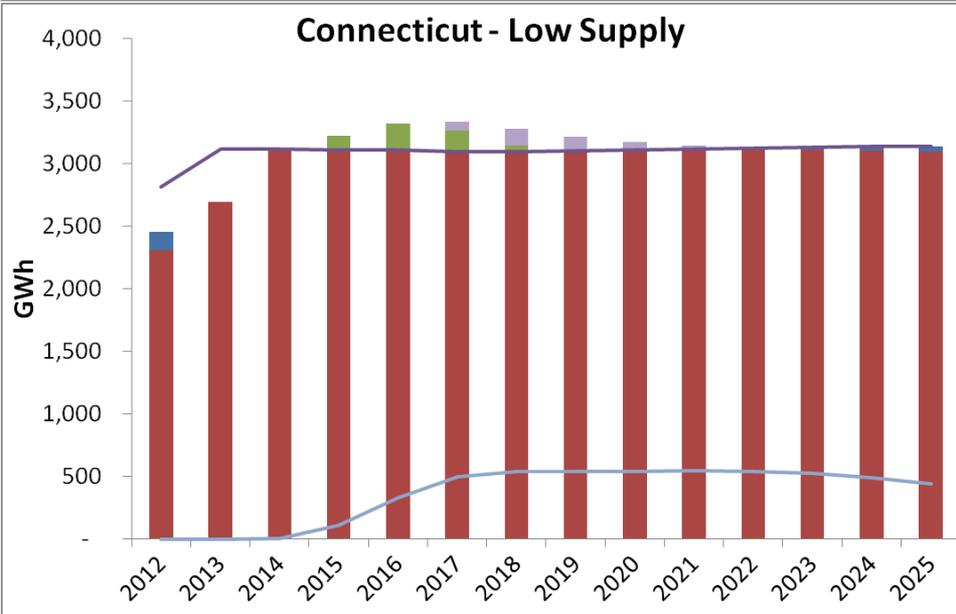
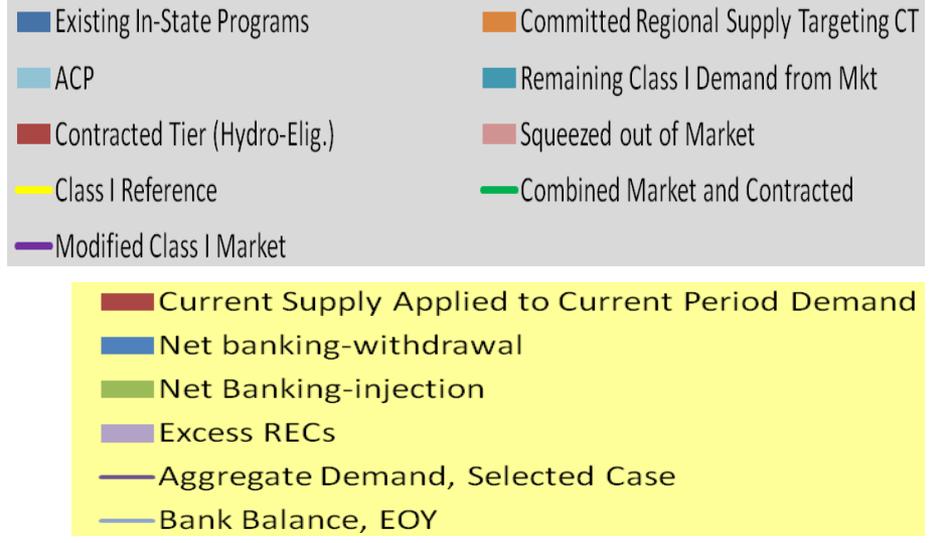
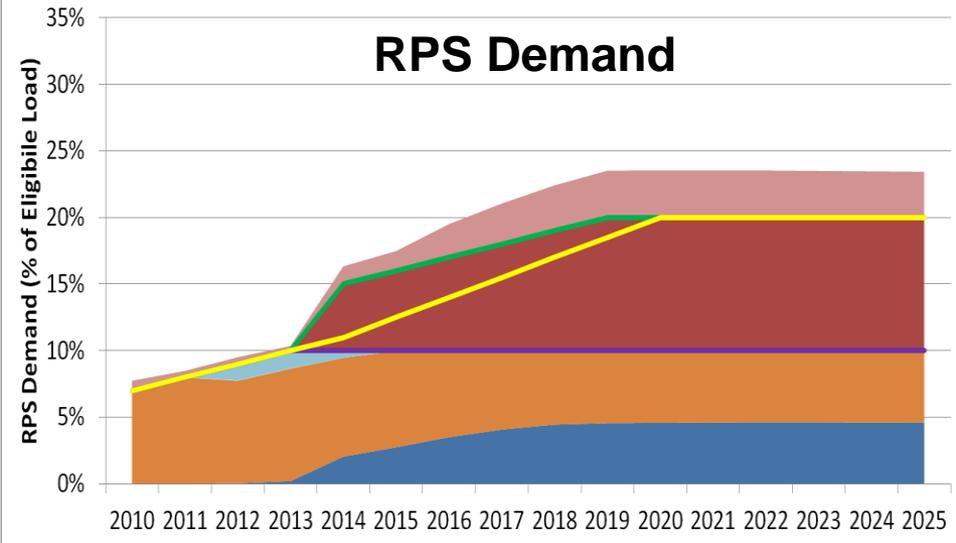


## Connecticut - High Supply



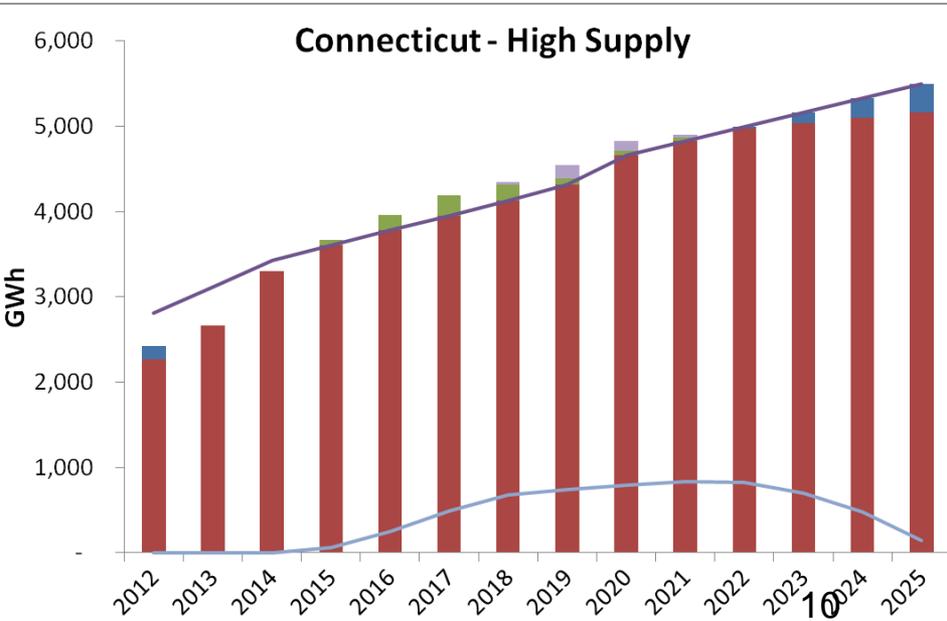
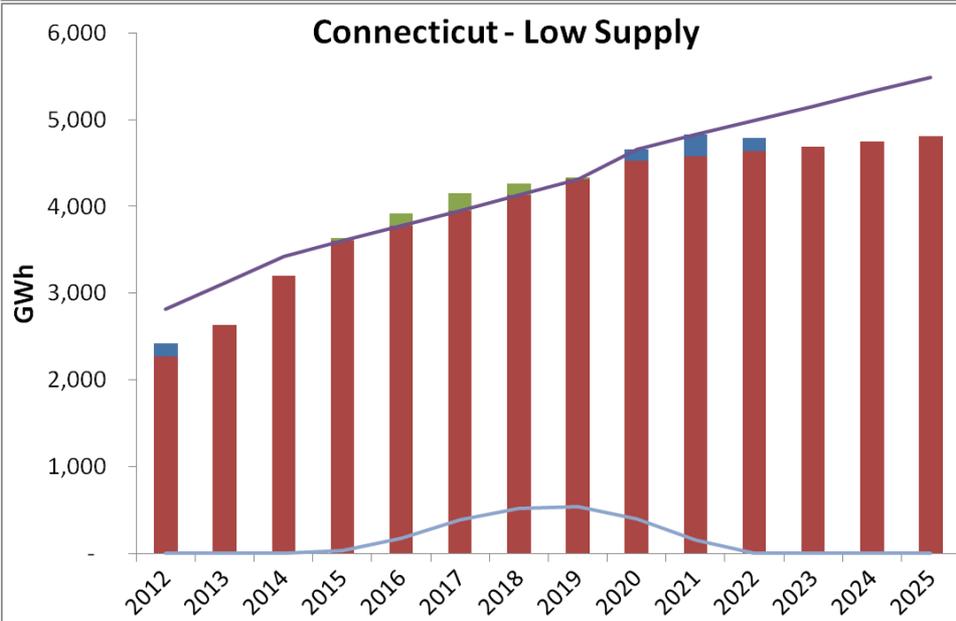
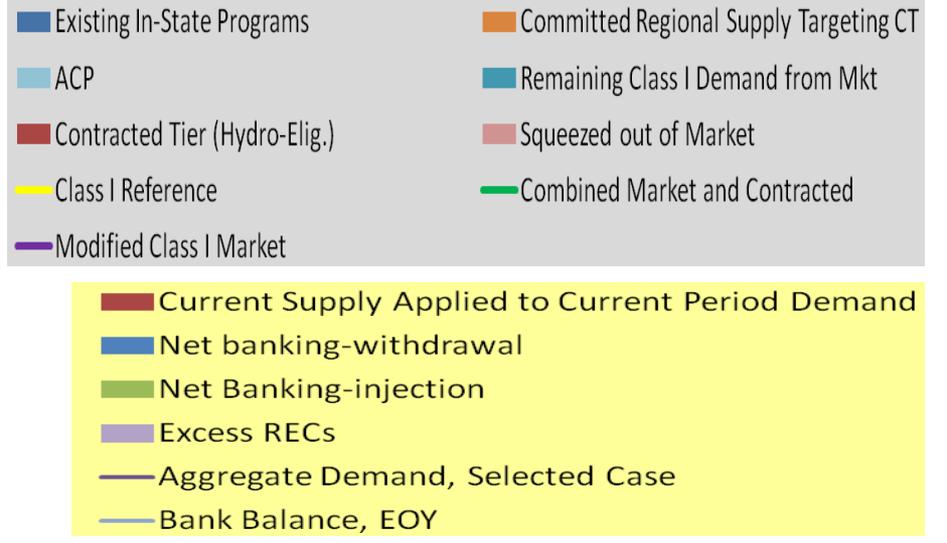
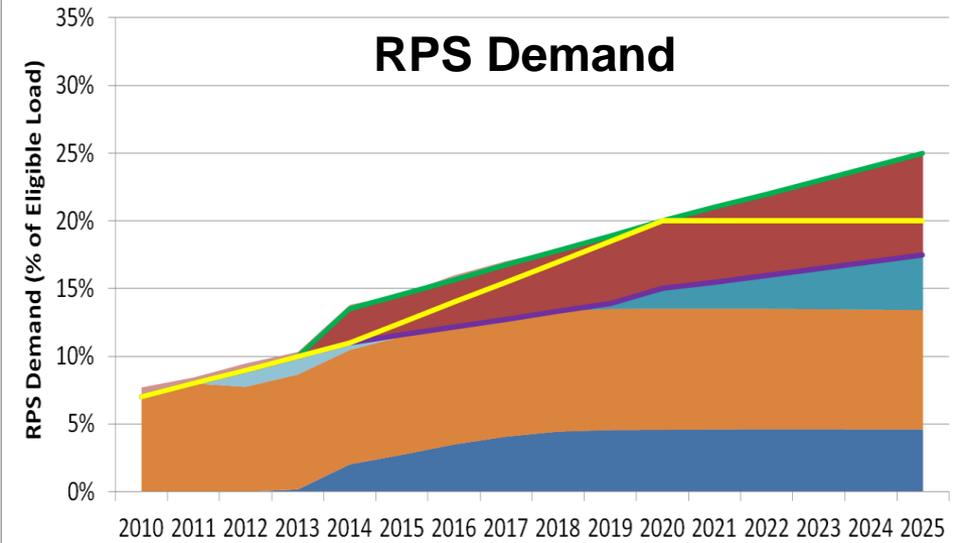


# Scenario 2: 20% by 2020 w/ 10% Contracted



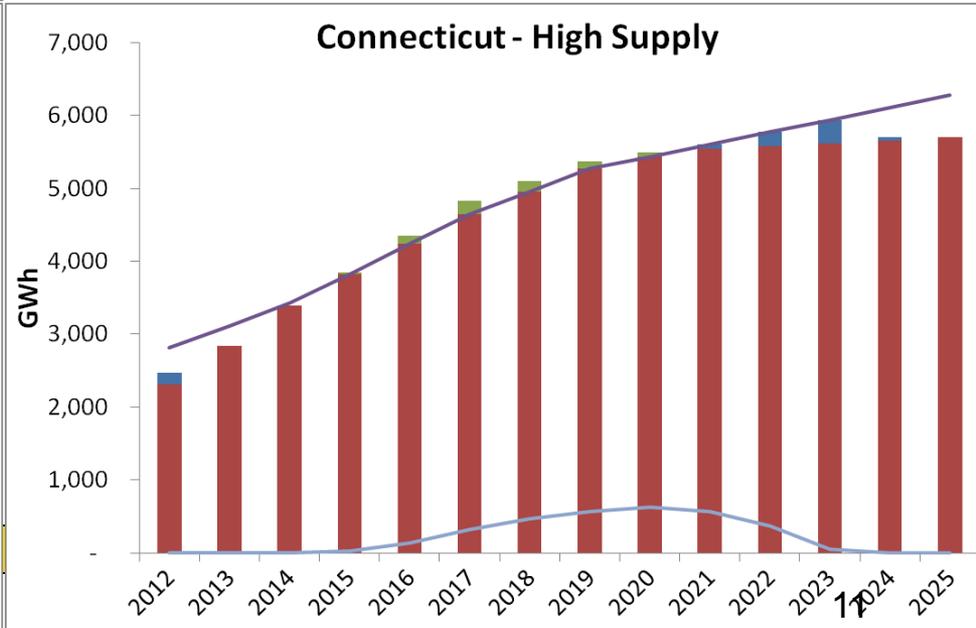
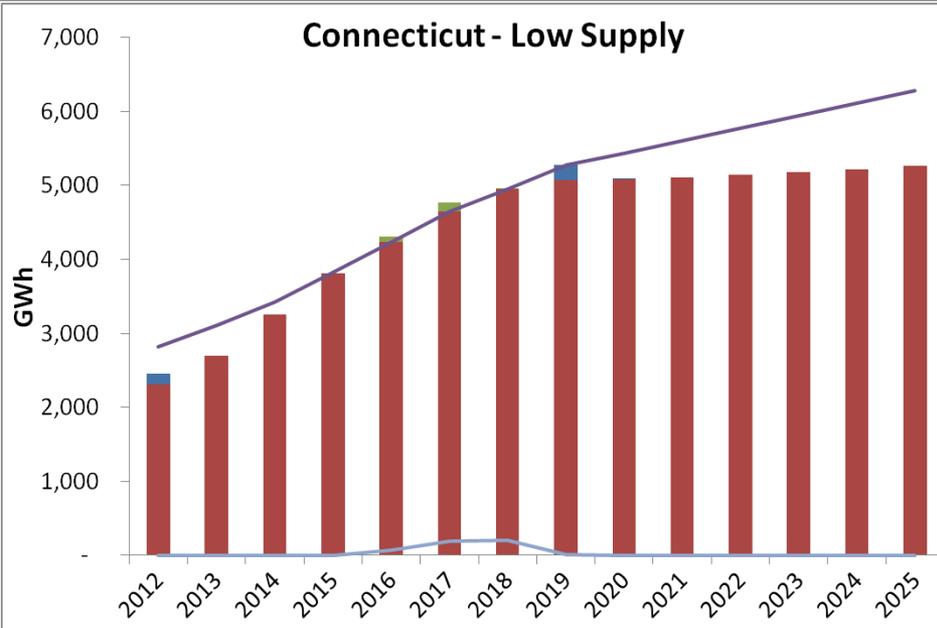
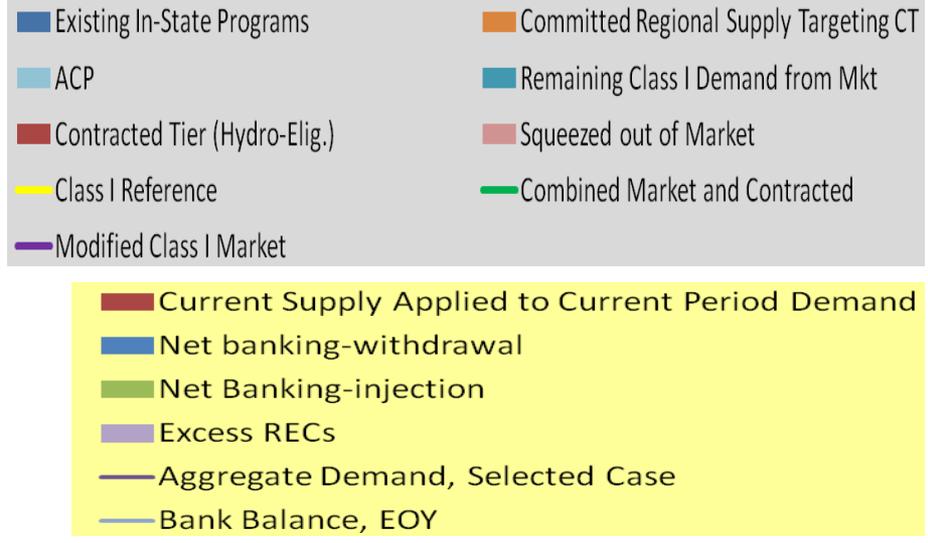
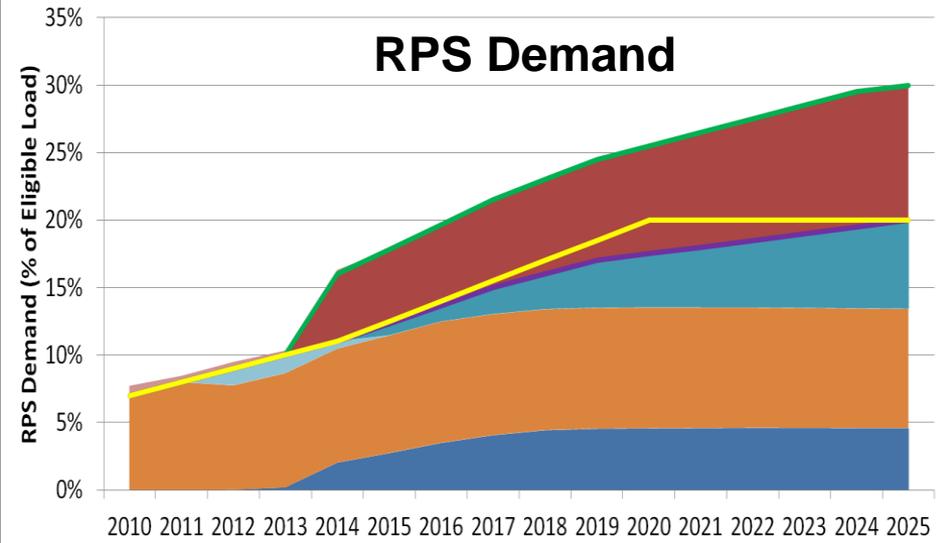


# Scenario 3: 25% by 2025 w/ 7.5% Contracted





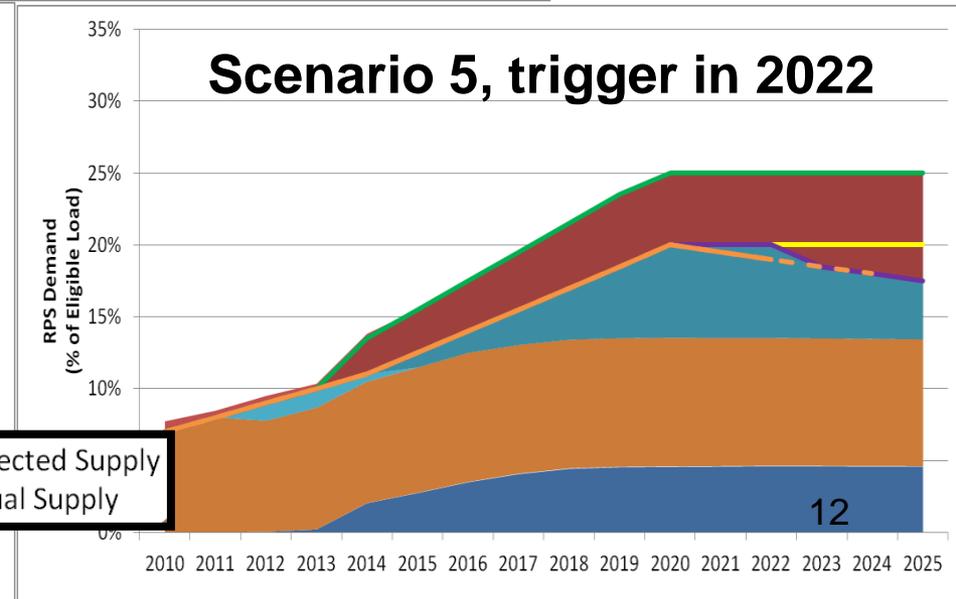
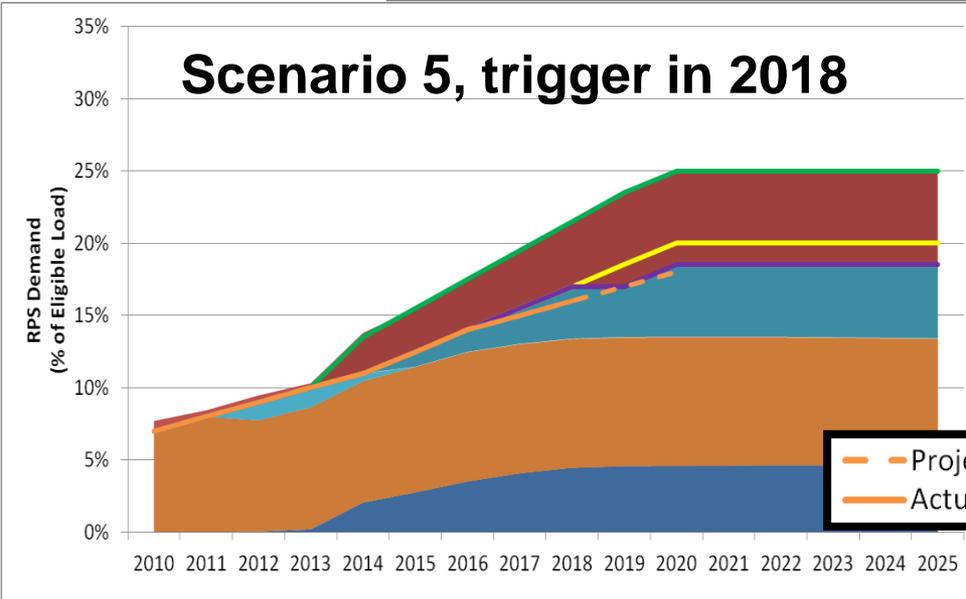
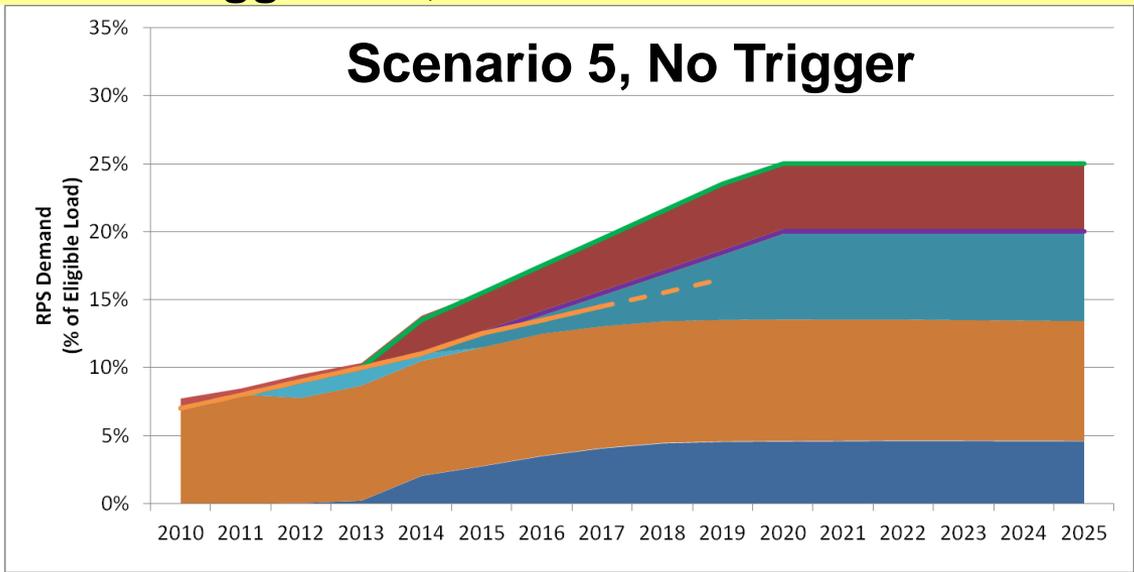
# Scenario 4: 30% by 2025 w/ 10% Contracted





# Scenario 5 – Market Based Trigger

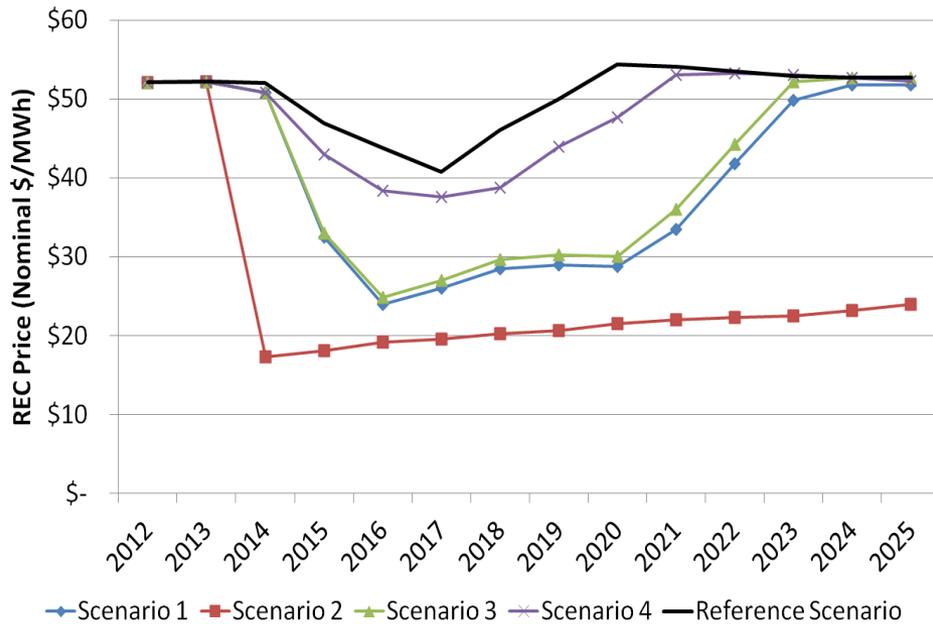
Illustrative: Market tier status quo, plus modest contracted tier, until trigger met, under 3 alternative futures



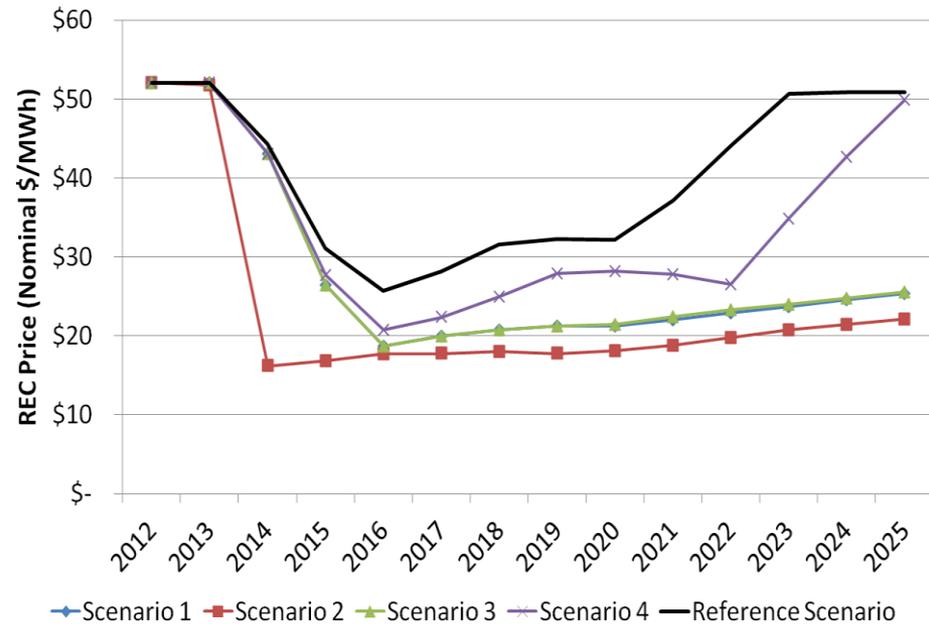
Projected Supply  
Actual Supply

# REC Price Forecasts

REC Price Forecast (\$/MWh) - Low Supply Cases

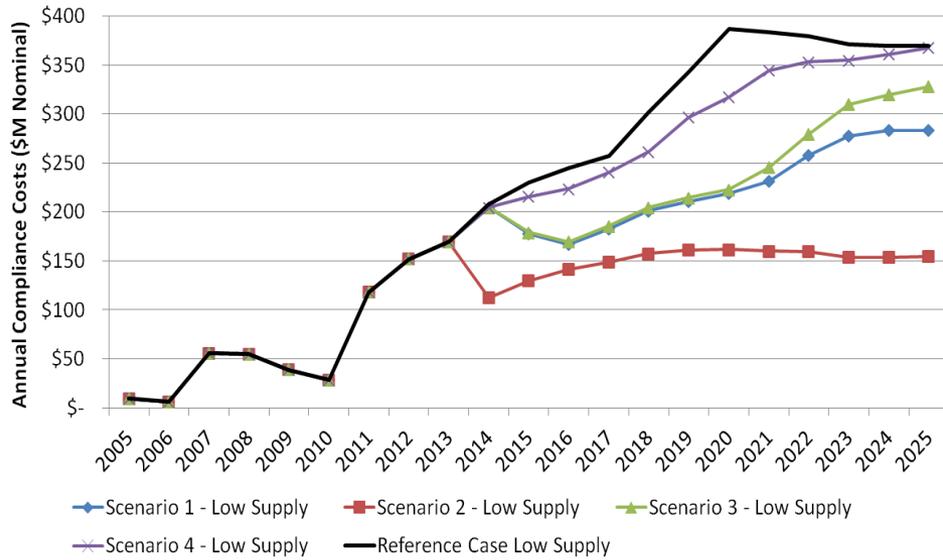


REC Price Forecast (\$/MWh) - High Supply Cases

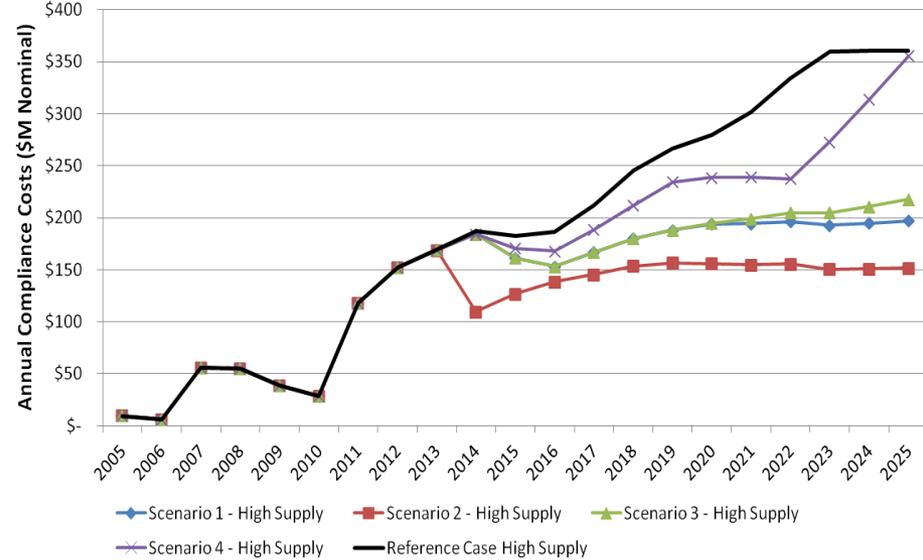


# Compliance Costs - Annual

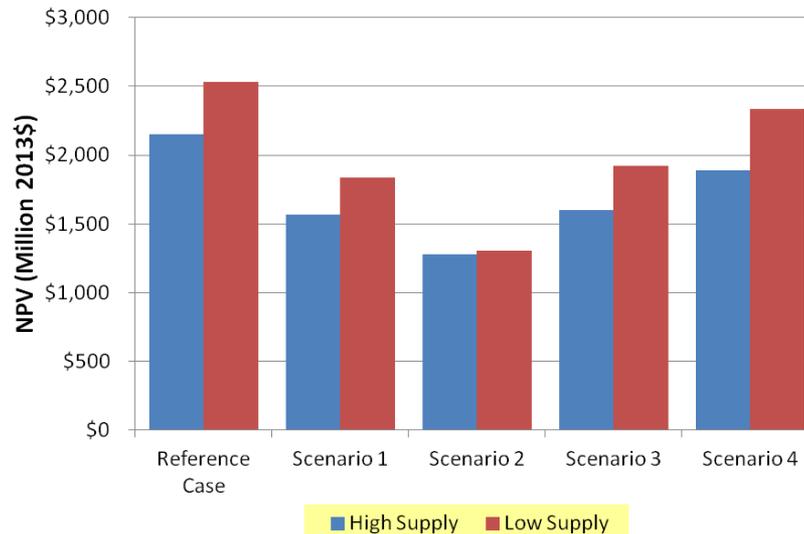
Annual Costs - Low Supply



Annual Costs - High Supply



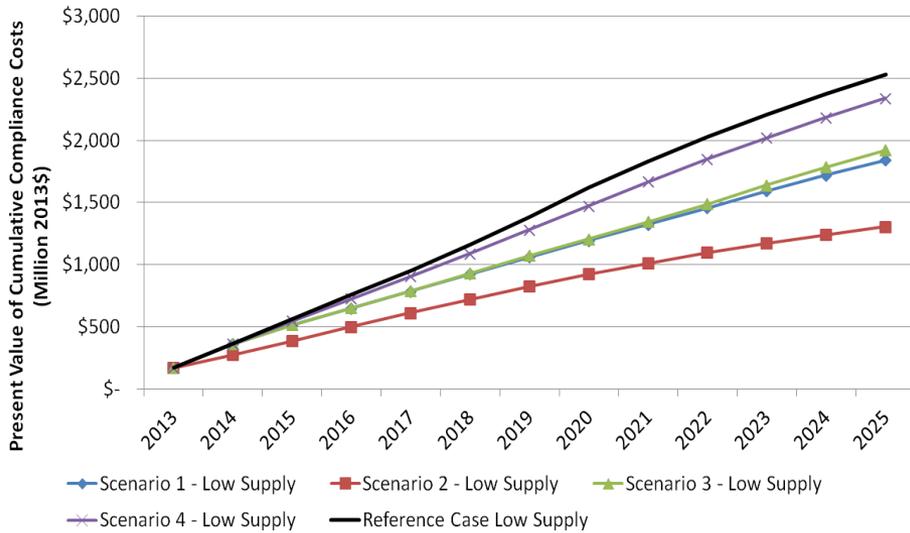
Net Present Value of Compliance Costs (2013-2025)



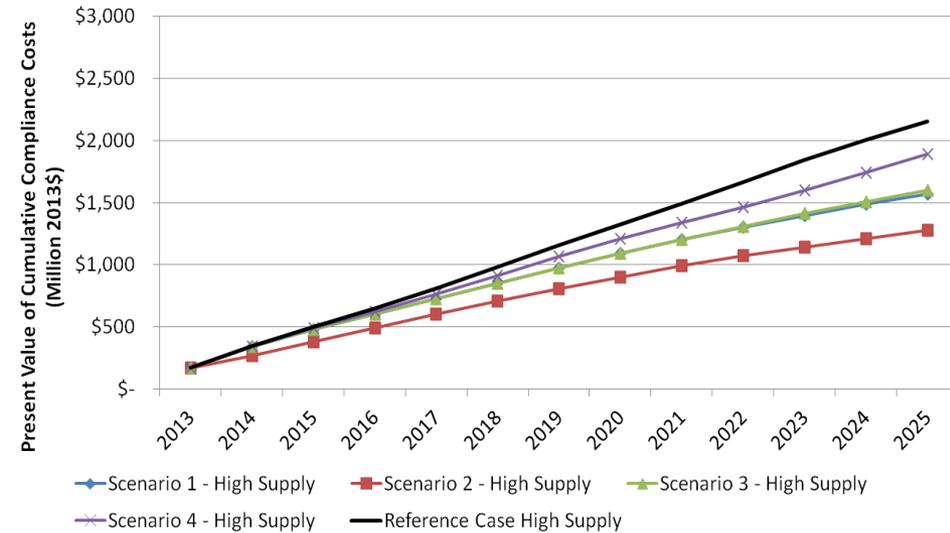


# Compliance Costs – Cumulative

### Cumulative Costs - Low Supply (2013-2025)



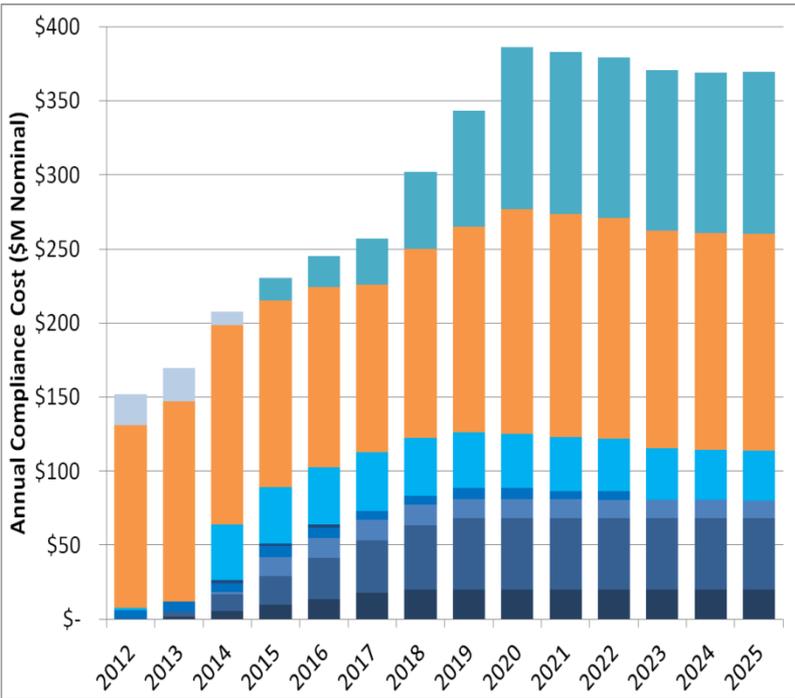
### Cumulative Costs - High Supply (2013-2025)



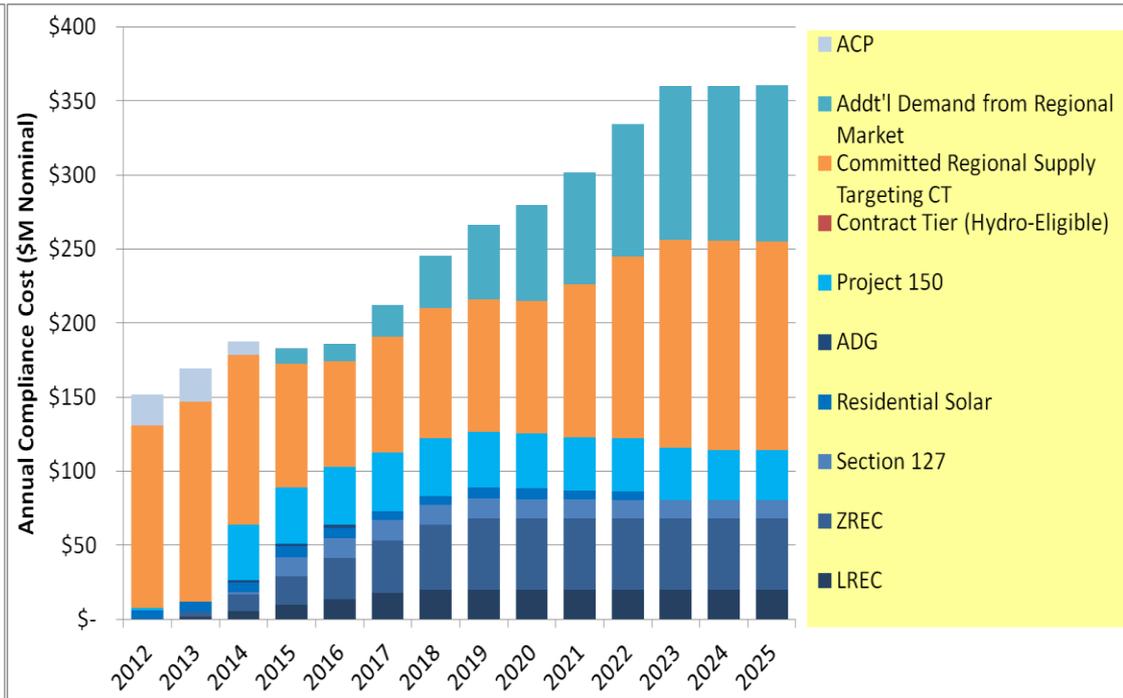


# Contribution to Total Compliance Cost by Sector (Reference Scenario)

## Low Supply



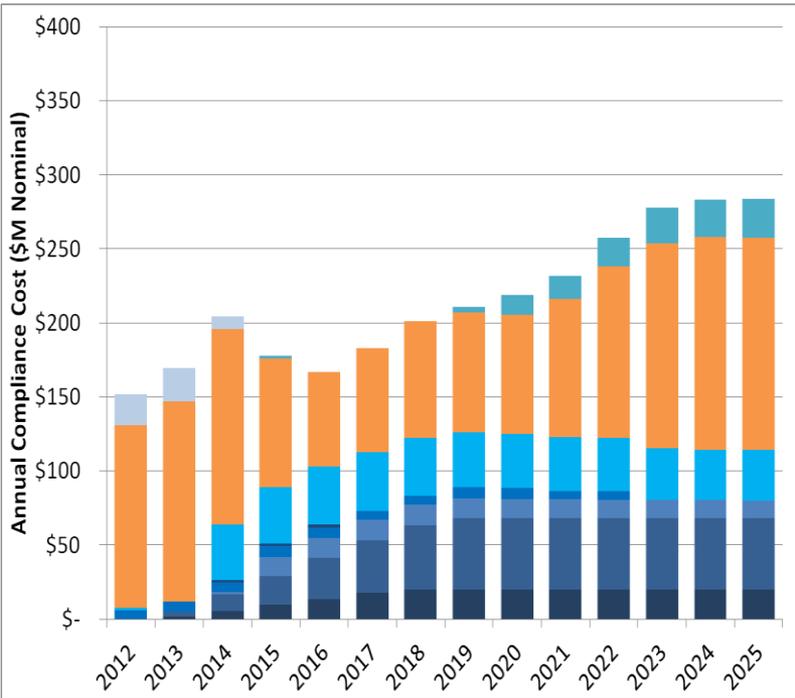
## High Supply



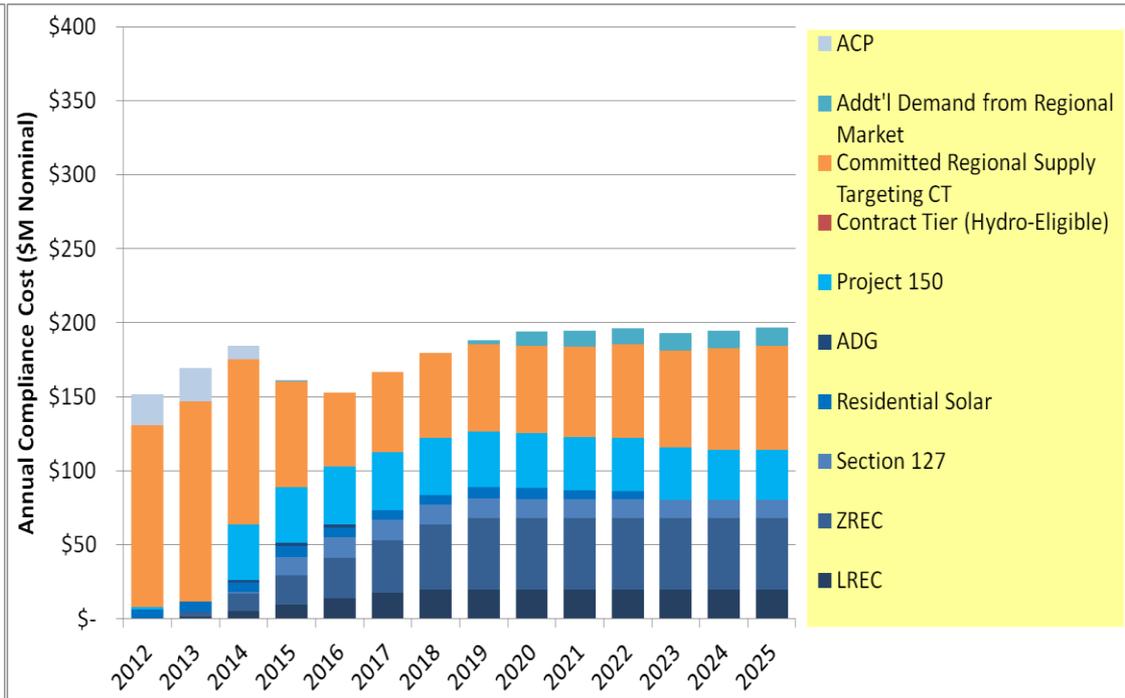


# Contribution to Total Compliance Cost by Sector (Scenario 1)

## Low Supply



## High Supply



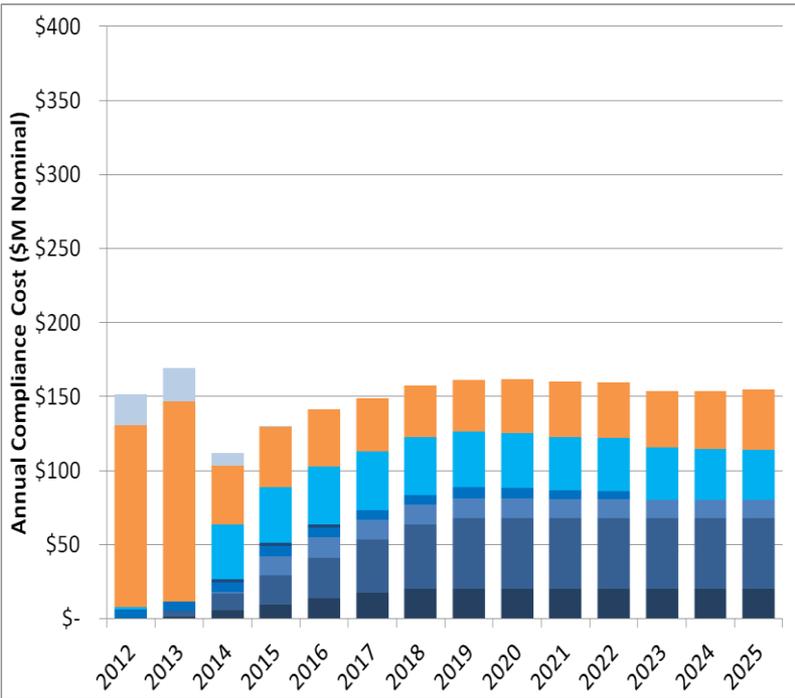
- ACP
- Add'l Demand from Regional Market
- Committed Regional Supply Targeting CT
- Contract Tier (Hydro-Eligible)
- Project 150
- ADG
- Residential Solar
- Section 127
- ZREC
- LREC



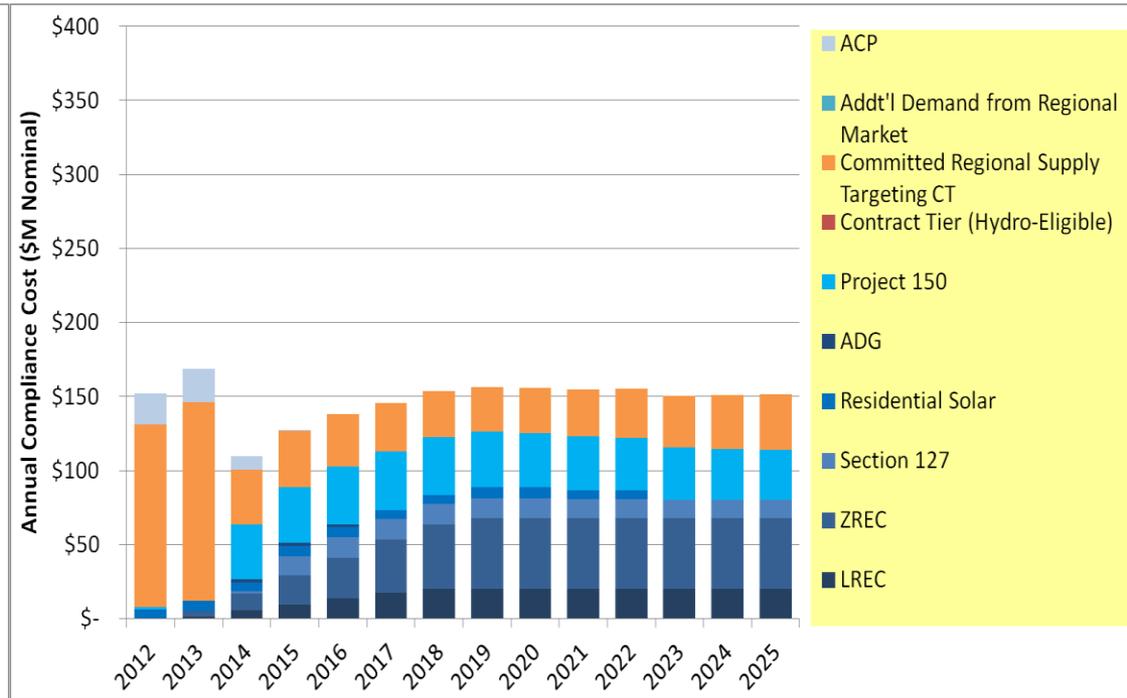


# Contribution to Total Compliance Cost by Sector (Scenario 2)

## Low Supply



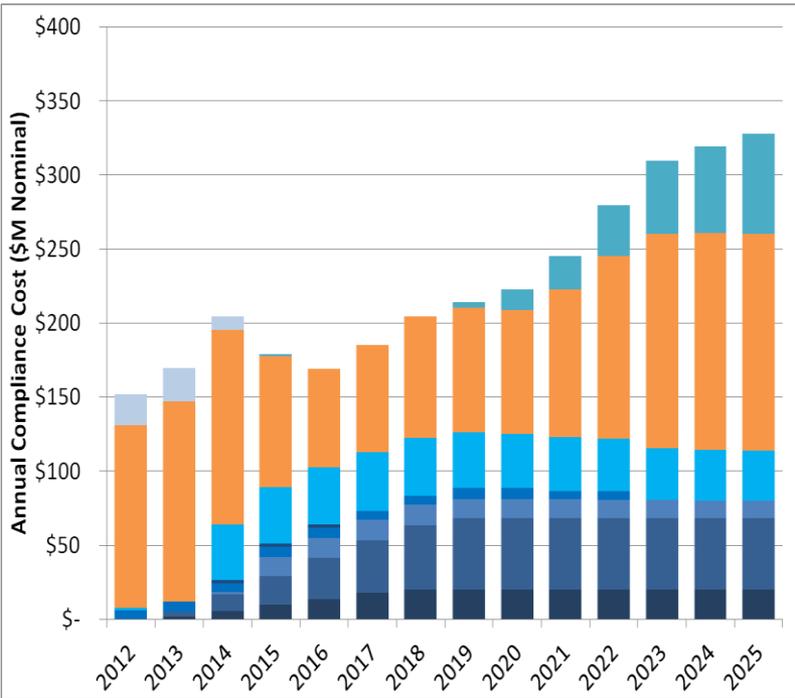
## High Supply



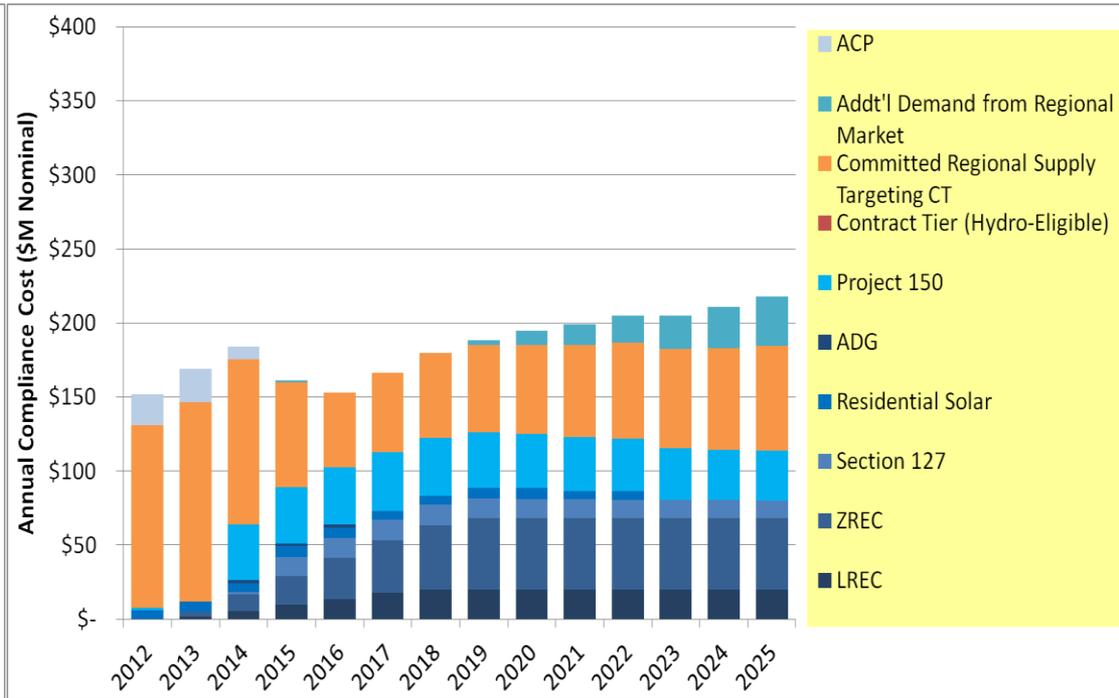


# Contribution to Total Compliance Cost by Sector (Scenario 3)

## Low Supply



## High Supply

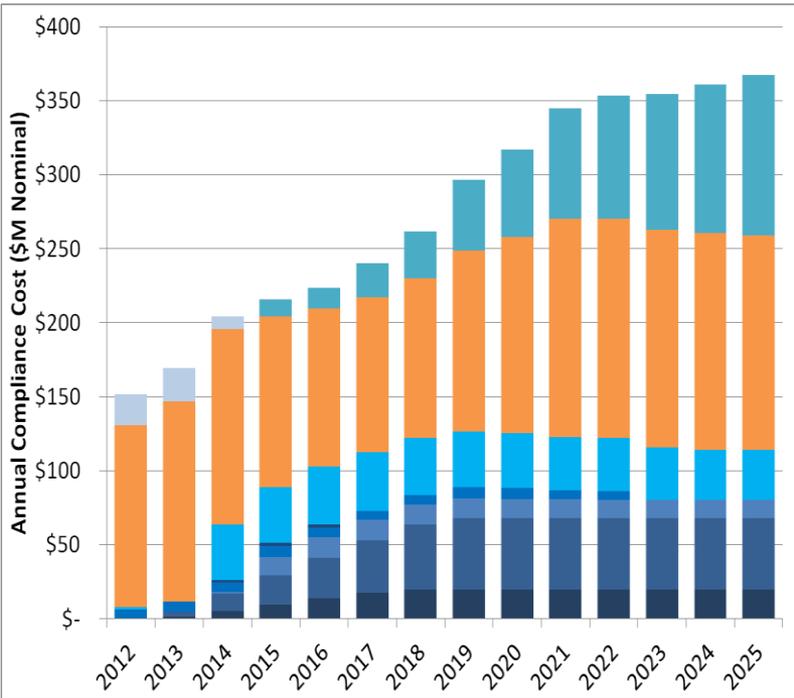


- ACP
- Add'l Demand from Regional Market
- Committed Regional Supply Targeting CT
- Contract Tier (Hydro-Eligible)
- Project 150
- ADG
- Residential Solar
- Section 127
- ZREC
- LREC

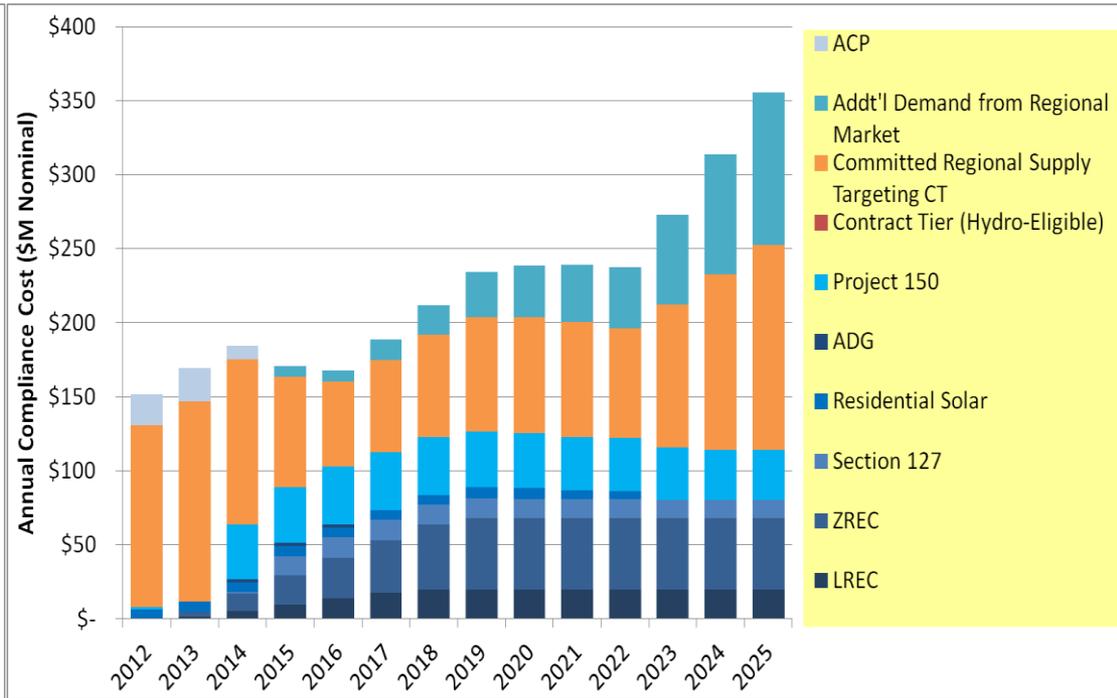


# Contribution to Total Compliance Cost by Sector (Scenario 4)

## Low Supply



## High Supply



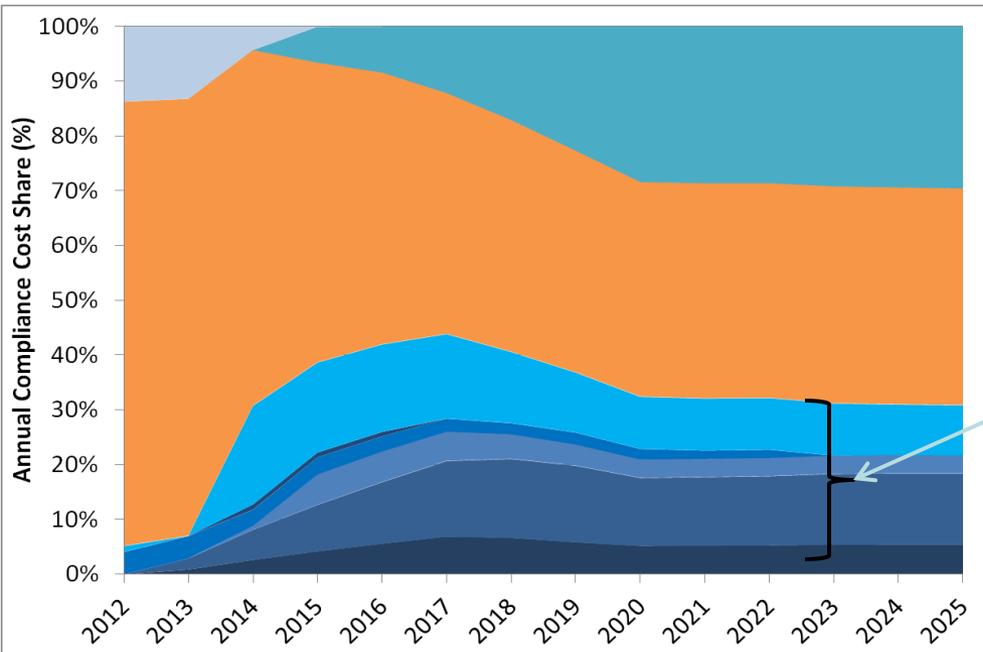
- ACP
- Addt'l Demand from Regional Market
- Committed Regional Supply Targeting CT
- Contract Tier (Hydro-Eligible)
- Project 150
- ADG
- Residential Solar
- Section 127
- ZREC
- LREC



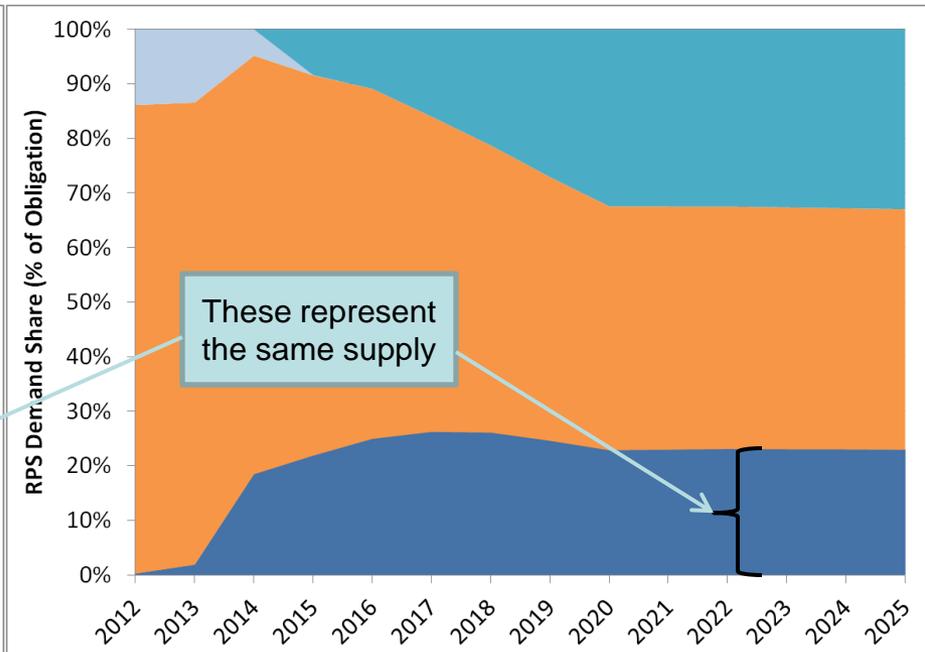


# Share of Cost vs. Share of Energy (Reference - Low Supply)\*

## Cost Share



## Energy Share



- LREC
- Section 127
- ADG
- Contract Tier (Hydro-Eligible)
- Add'l Demand from Regional Market
- ZREC
- Residential Solar
- Project 150
- Committed Regional Supply Targeting CT
- ACP

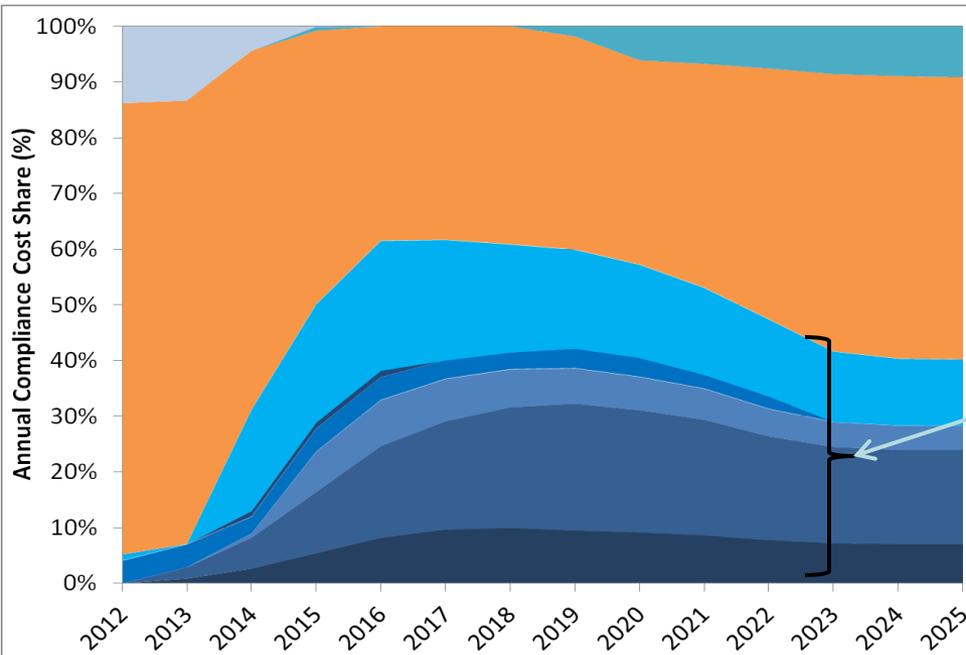
- Existing In-State Programs
- Committed Regional Supply Targeting CT
- ACP
- Remaining Class I Demand from Mkt
- Contracted Tier (Hydro-Elig.)

\*These slides are intended to illustrate the relative share of cost vs. energy for each resource type under the various policy scenarios. They are only shown for low supply, as the relative shares under the high supply cases shows the same relationship both within and across scenarios

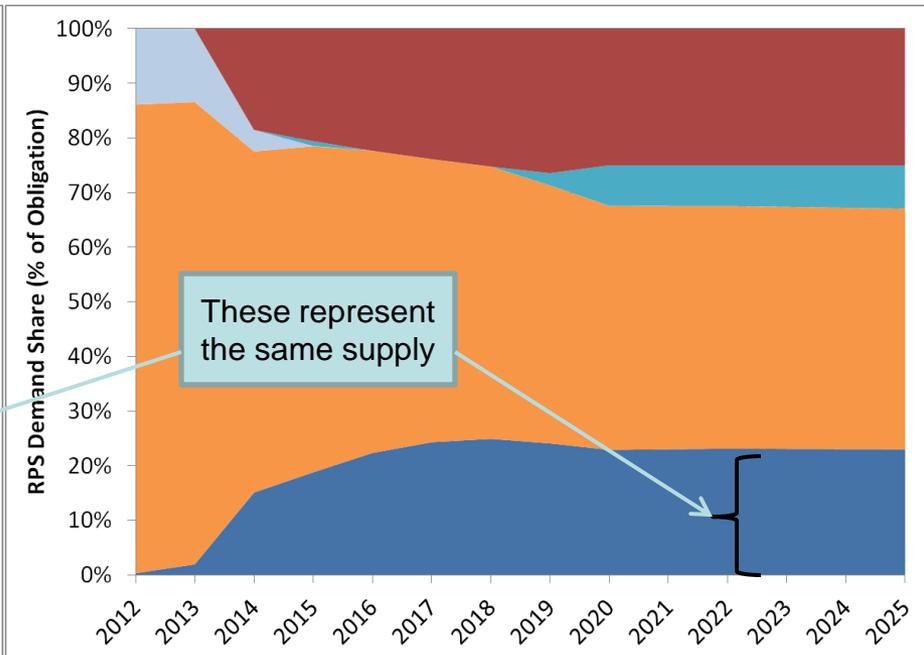


# Share of Cost vs. Share of Energy (Scenario 1 - Low Supply)\*

## Cost Share



## Energy Share



- LREC
- Section 127
- ADG
- Contract Tier (Hydro-Eligible)
- Add'tl Demand from Regional Market
- ZREC
- Residential Solar
- Project 150
- Committed Regional Supply Targeting CT
- ACP

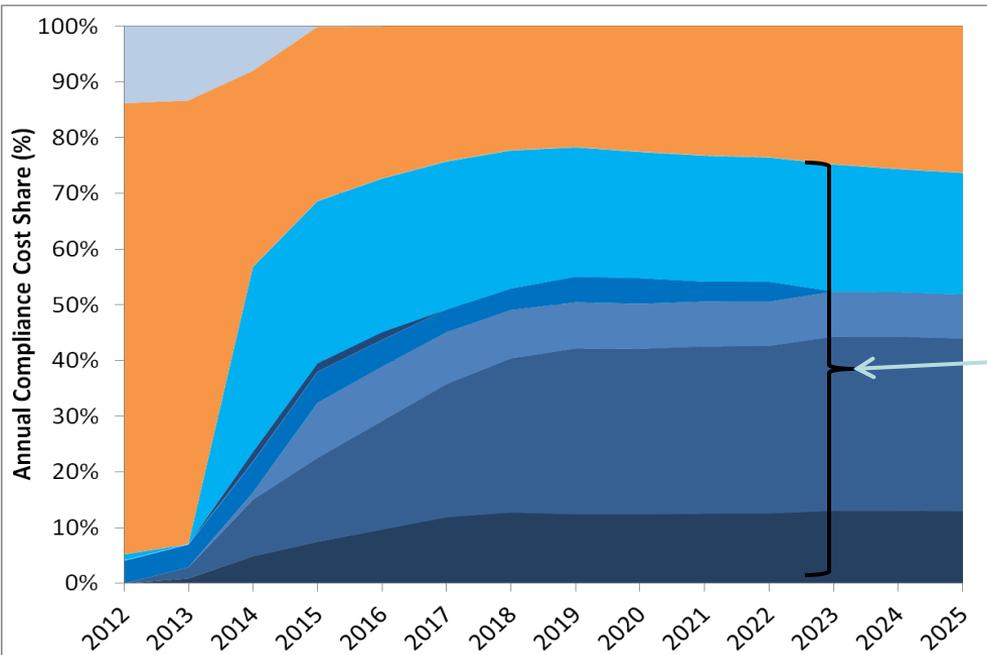
- Existing In-State Programs
- Committed Regional Supply Targeting CT
- ACP
- Remaining Class I Demand from Mkt
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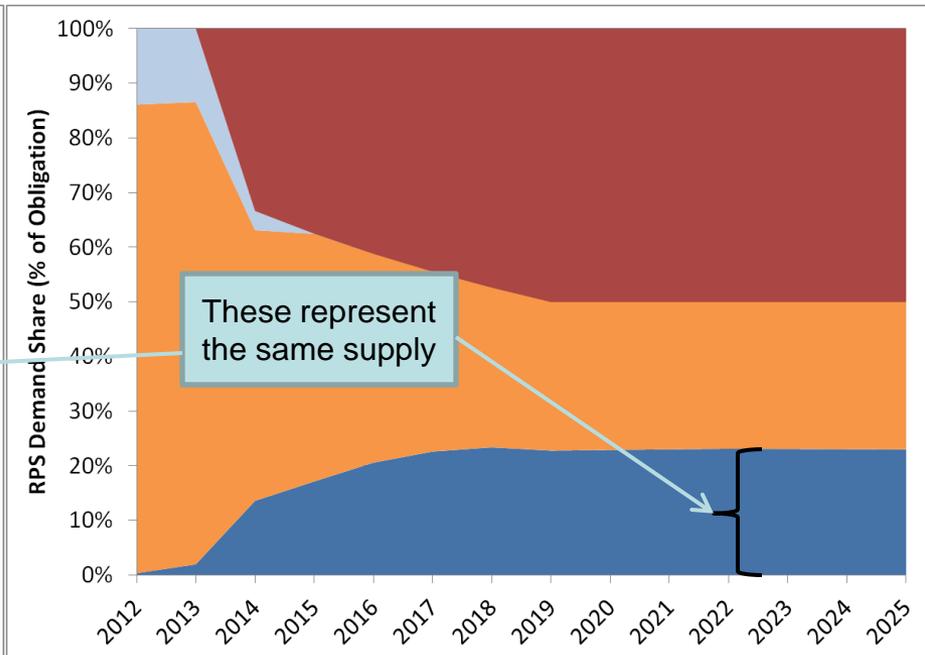


# Share of Cost vs. Share of Energy (Scenario 2 - Low Supply)\*

## Cost Share



## Energy Share



- LREC
- Section 127
- ADG
- Contract Tier (Hydro-Eligible)
- Add'l Demand from Regional Market
- ZREC
- Residential Solar
- Project 150
- Committed Regional Supply Targeting CT
- ACP

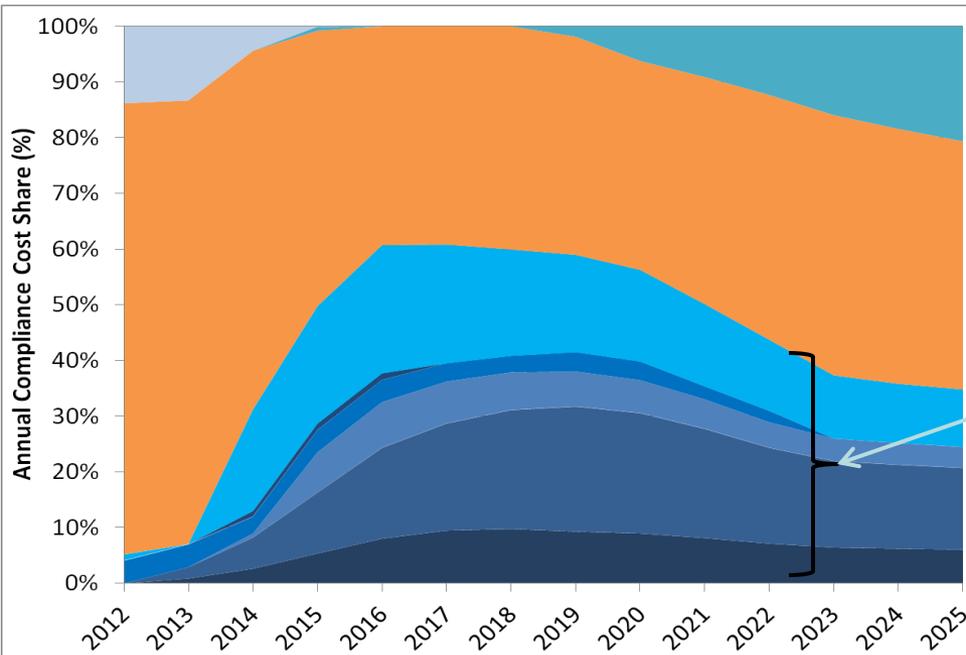
- Existing In-State Programs
- Committed Regional Supply Targeting CT
- ACP
- Remaining Class I Demand from Mkt
- Contracted Tier (Hydro-Elig.)

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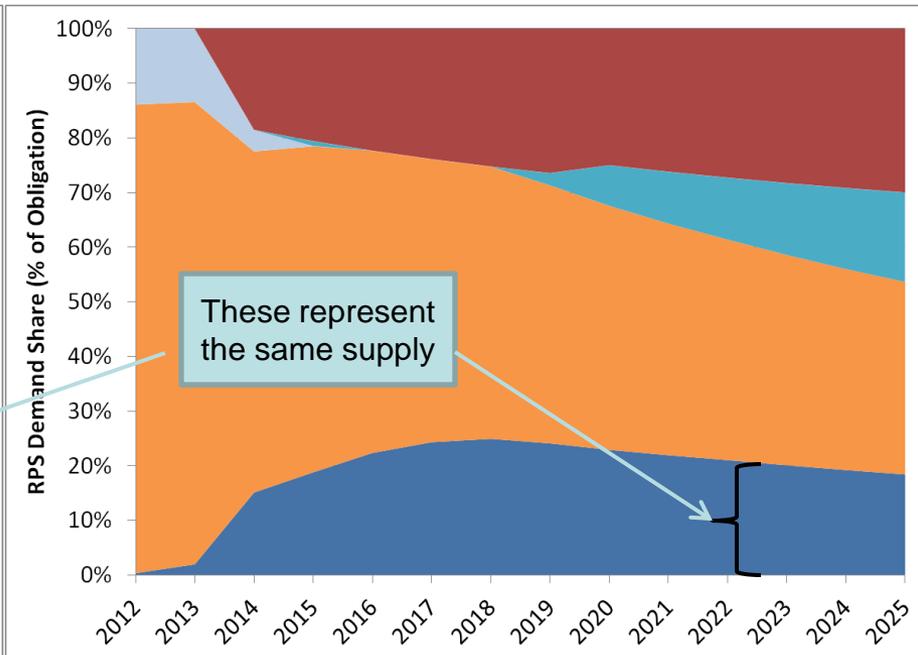


# Share of Cost vs. Share of Energy (Scenario 3 - Low Supply)\*

## Cost Share



## Energy Share



- LREC
- Section 127
- ADG
- Contract Tier (Hydro-Eligible)
- Add'l Demand from Regional Market
- ZREC
- Residential Solar
- Project 150
- Committed Regional Supply Targeting CT
- ACP

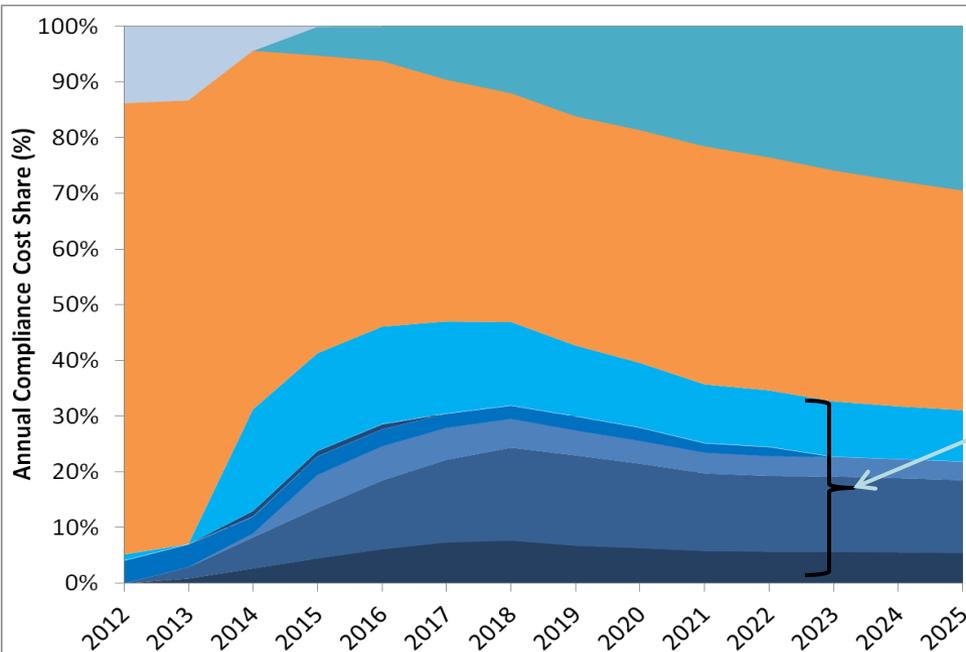
- Existing In-State Programs
- Committed Regional Supply Targeting CT
- ACP
- Remaining Class I Demand from Mkt
- Contracted Tier (Hydro-Elig.)

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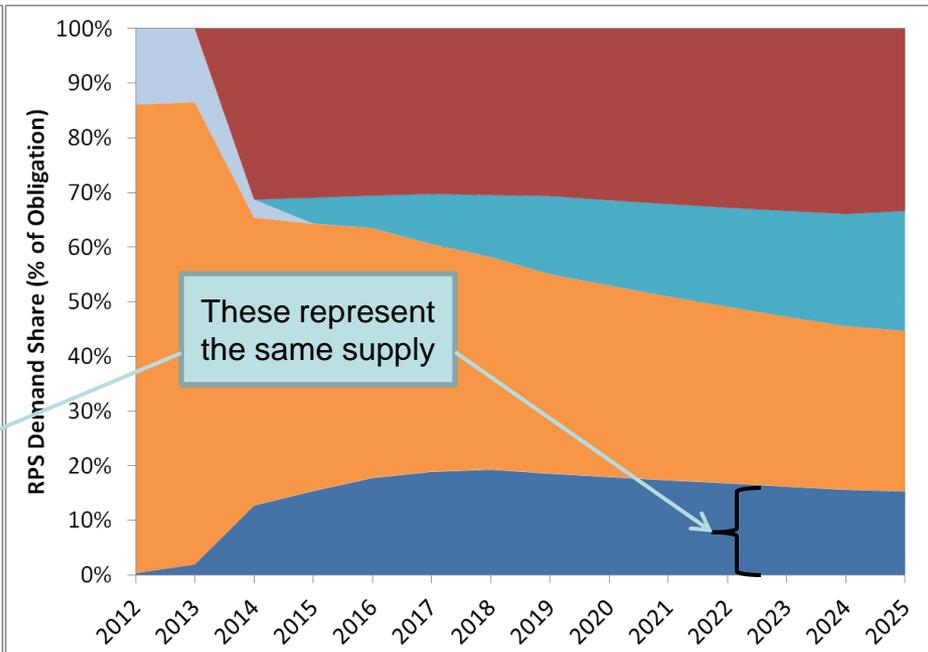


# Share of Cost vs. Share of Energy (Scenario 4 - Low Supply)\*

## Cost Share



## Energy Share



- LREC
- Section 127
- ADG
- Contract Tier (Hydro-Eligible)
- Addt'l Demand from Regional Market
- ZREC
- Residential Solar
- Project 150
- Committed Regional Supply Targeting CT
- ACP

- Existing In-State Programs
- Committed Regional Supply Targeting CT
- ACP
- Remaining Class I Demand from Mkt
- Contracted Tier (Hydro-Elig.)

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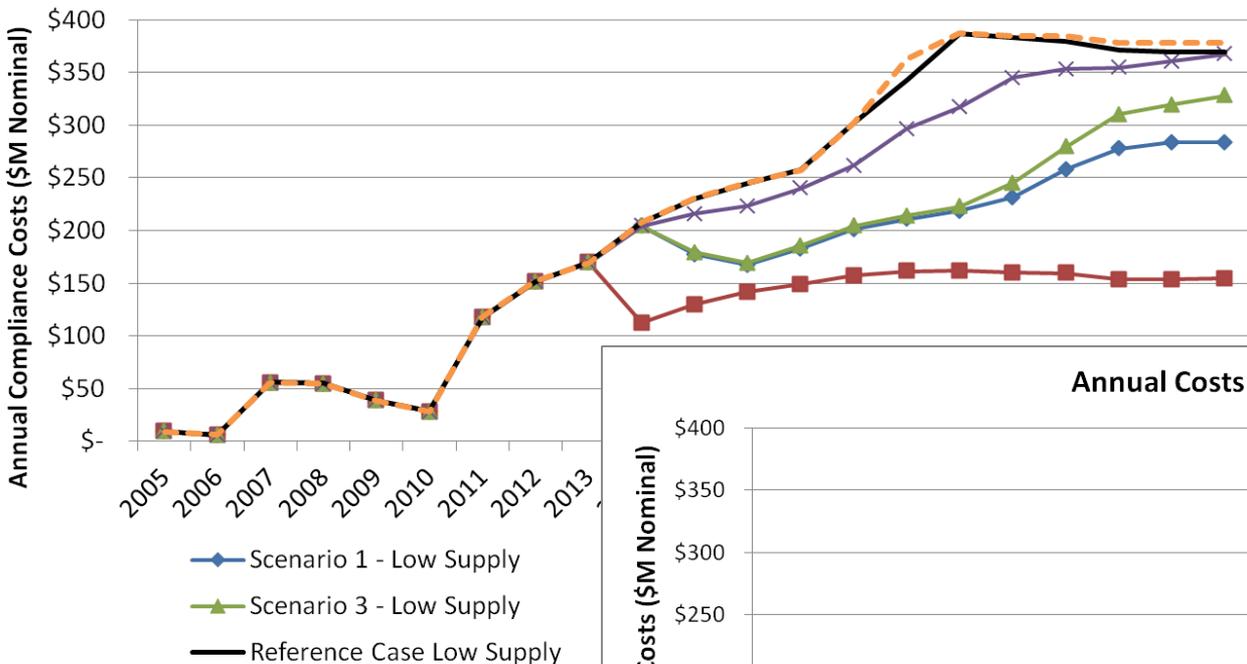
## Sensitivity Analysis

- ACP Risk
- Contracted Tier at discount to market
- Cost of meeting supply-demand gap with various resources

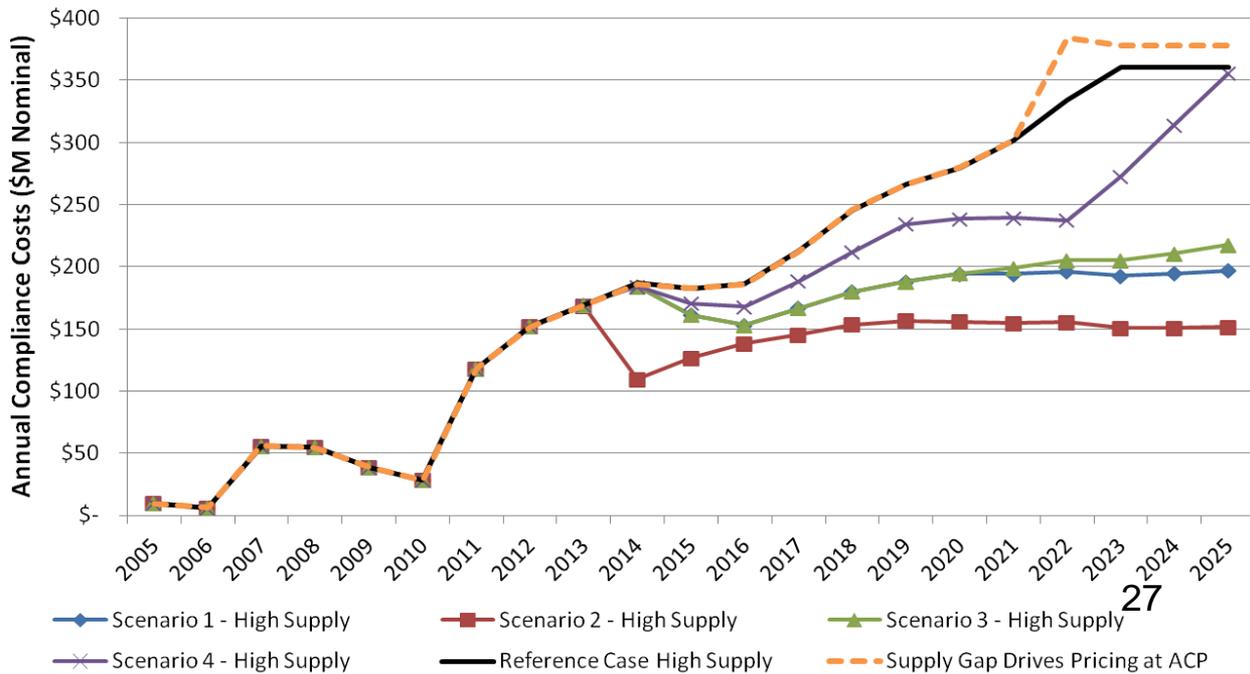


# Reference Case Sensitivity: Supply Gap Drives ACP Pricing

### Annual Costs - Low Supply



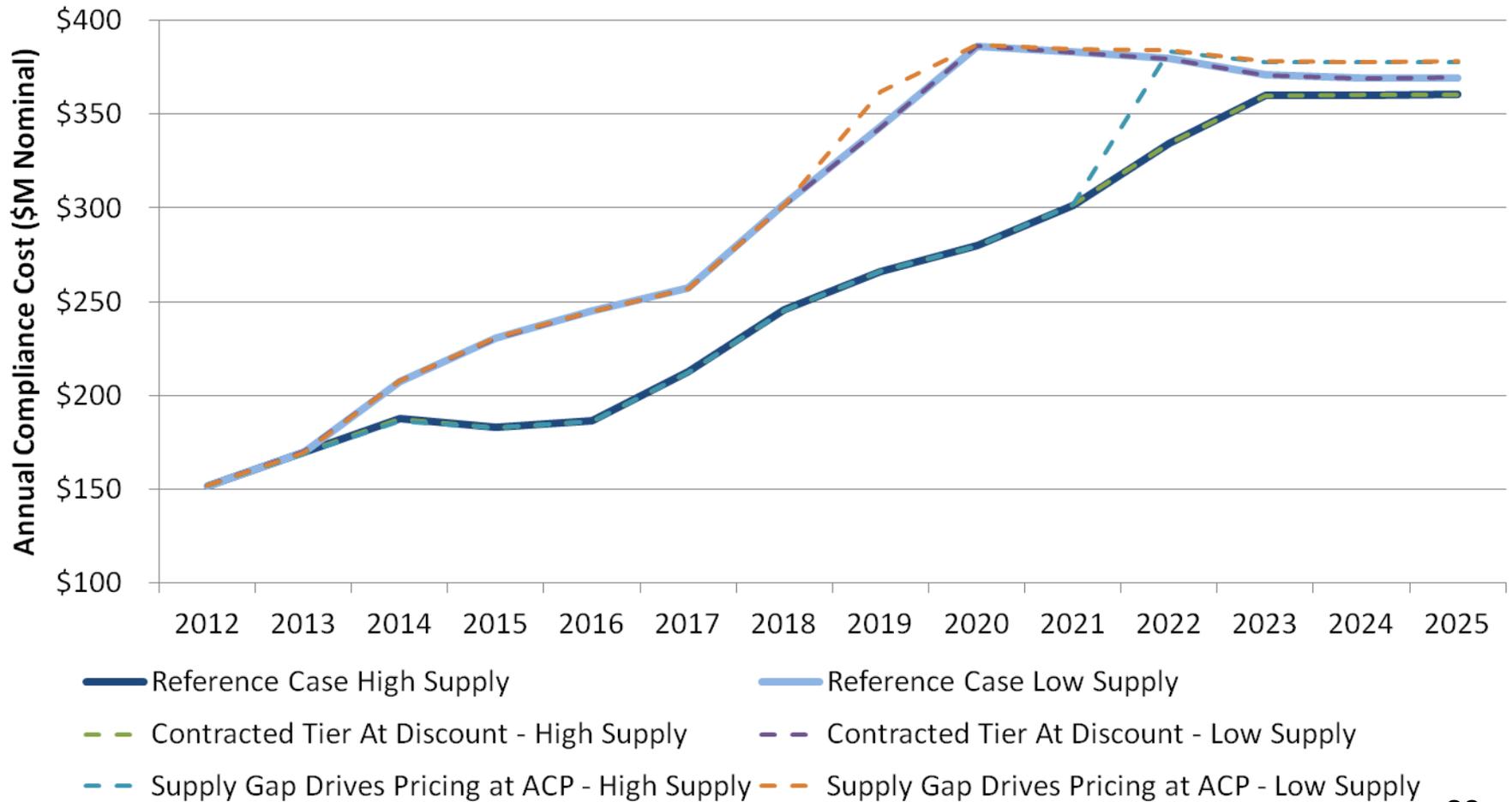
### Annual Costs - High Supply





# Reference Case Sensitivities: Annual Costs

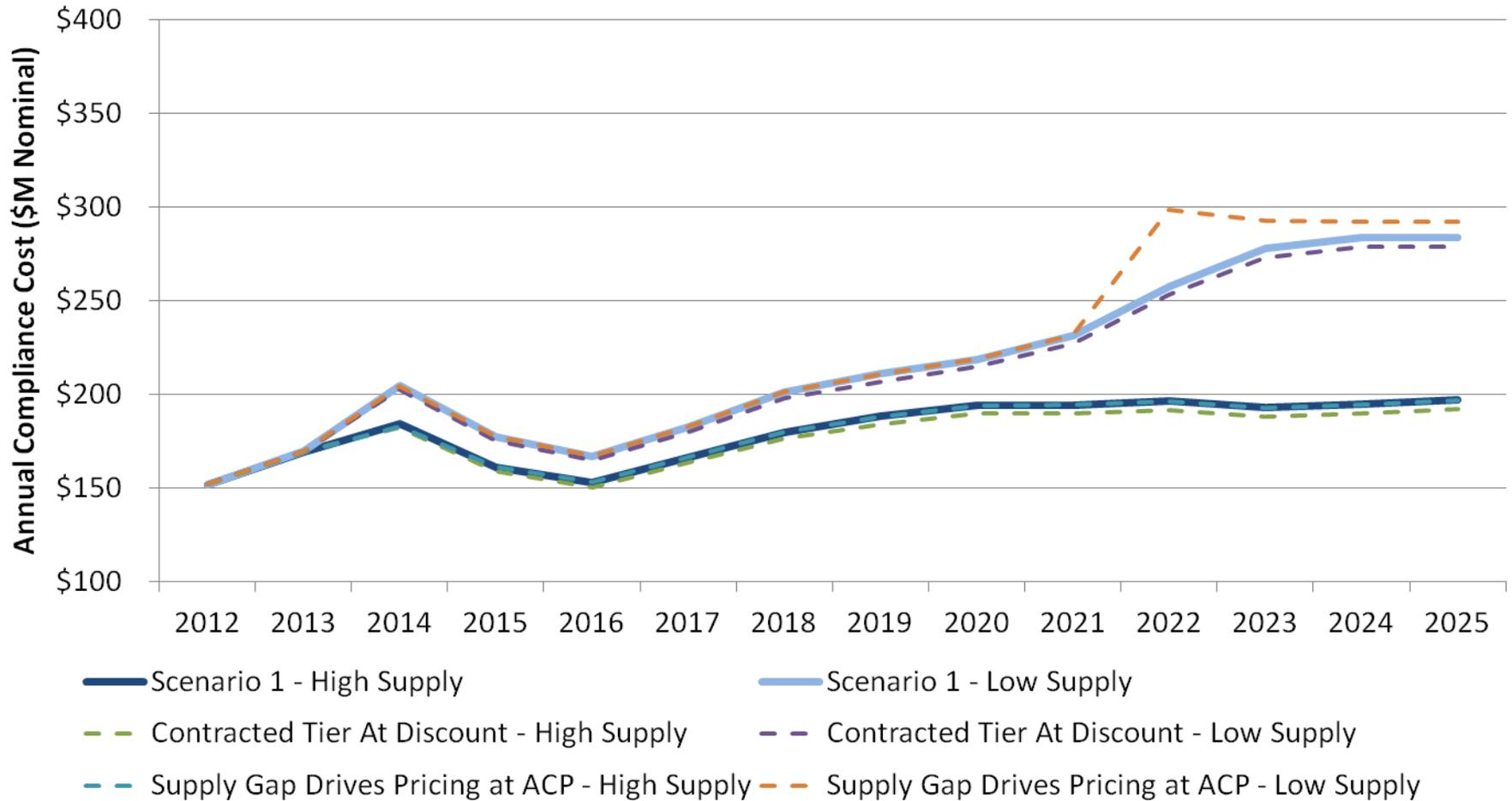
## Annual Costs - Reference Case and Sensitivities





# Scenario 1 Sensitivities: Annual Costs

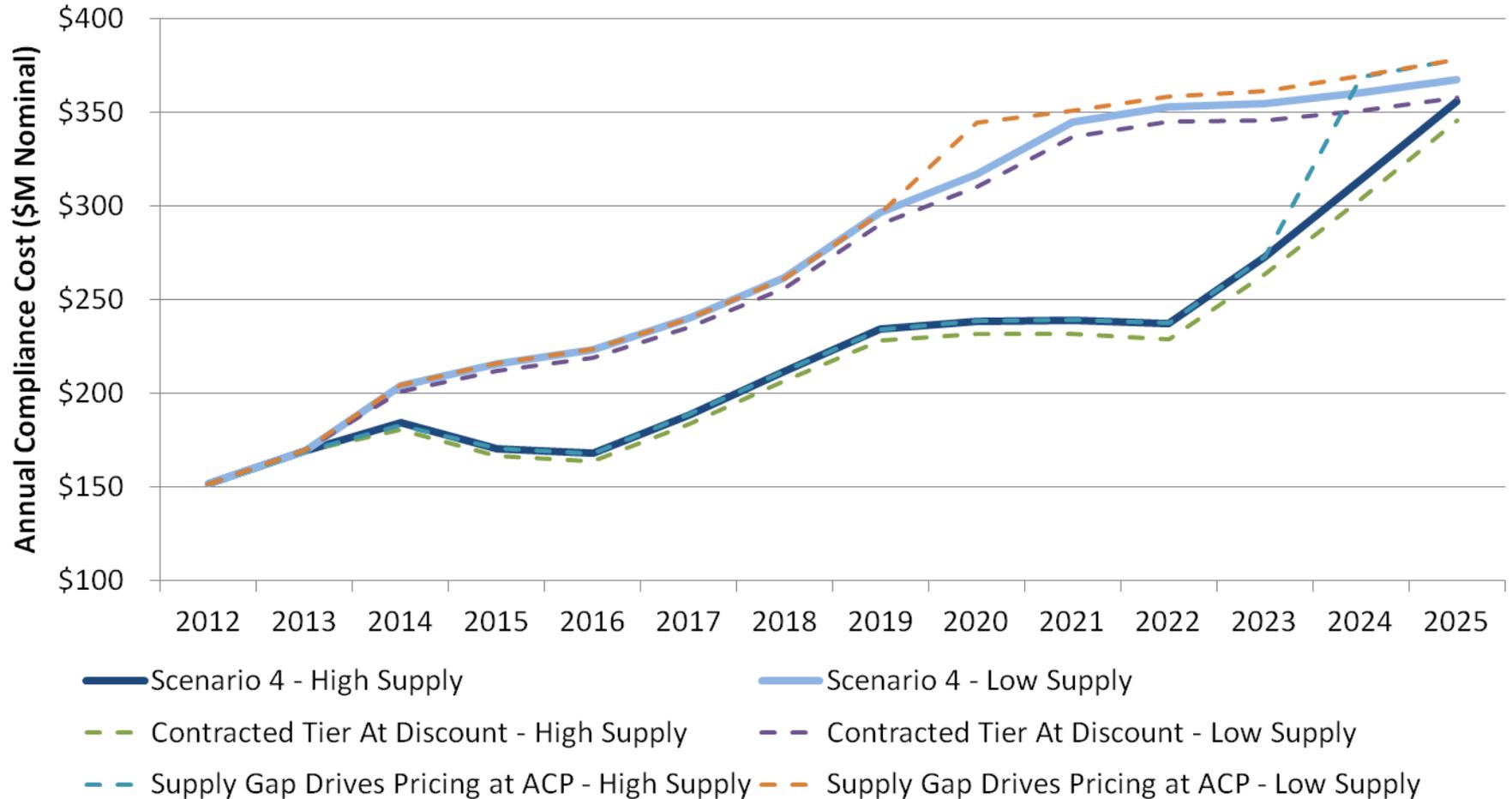
## Annual Costs - Scenario 1 and Sensitivities





# Scenario 4 Sensitivities: Annual Costs

## Annual Costs - Scenario 4 and Sensitivities





# Cost Sensitivities for Filling 100 aMW Block by 2025: Single Year Compliance Cost (above market)

Scenario	Supply Case	Spot (ACP Risk) <sup>1</sup>	NESCOE Procurement <sup>2</sup>	Additional In-State Programs <sup>3</sup>	Contracted Tier <sup>4</sup>
Reference	High Supply	\$48,180,000	\$44,564,748	\$88,767,797	\$0.00
Reference	Low Supply	\$48,180,000	\$46,188,852	\$88,767,797	\$0.00
Scenario 3	High Supply	\$48,180,000	\$22,363,252	\$88,767,797	\$0.00
Scenario 3	Low Supply	\$48,180,000	\$46,173,084	\$88,767,797	\$0.00
Scenario 4	High Supply	\$48,180,000	\$43,697,508	\$88,767,797	\$0.00
Scenario 4	Low Supply	\$48,180,000	\$45,826,188	\$88,767,797	\$0.00

1: = 100 aMW \* 8760 \* \$55 (ACP)

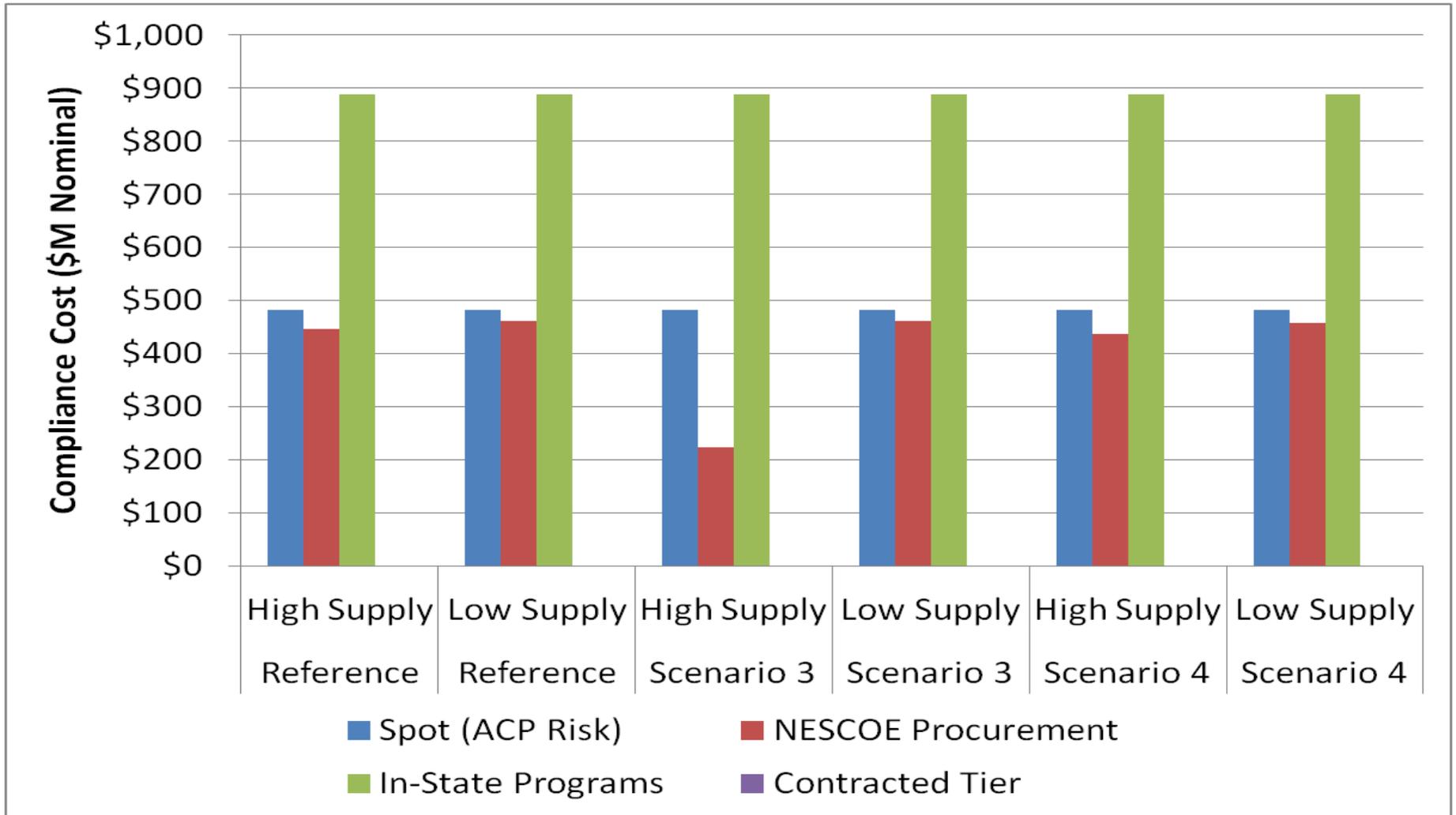
2: = 100 aMW \* 8760 \* Price Forecast in 2025 [**worst case scenario, assumes contracts at marginal cost of entry for LT PPA; could be lower if PPA supply is sub-marginal, etc.**]

3: LREC/ZREC/Res Solar @ same total budget ratios w/ goal seek to reach 100 aMW of capacity by 2025

4: Assumes that contract will be at no premium to market



# Cost Sensitivities for Filling 100 aMW Block by 2025: Single Year Compliance Cost (above market)





## **Sustainable Energy Advantage, LLC**

**10 Speen Street  
Framingham, MA 01701  
508.665.5850  
[www.seadvantage.com](http://www.seadvantage.com)**

**Bob Grace  
tel. 508.665.5855  
[bgrace@seadvantage.com](mailto:bgrace@seadvantage.com)**



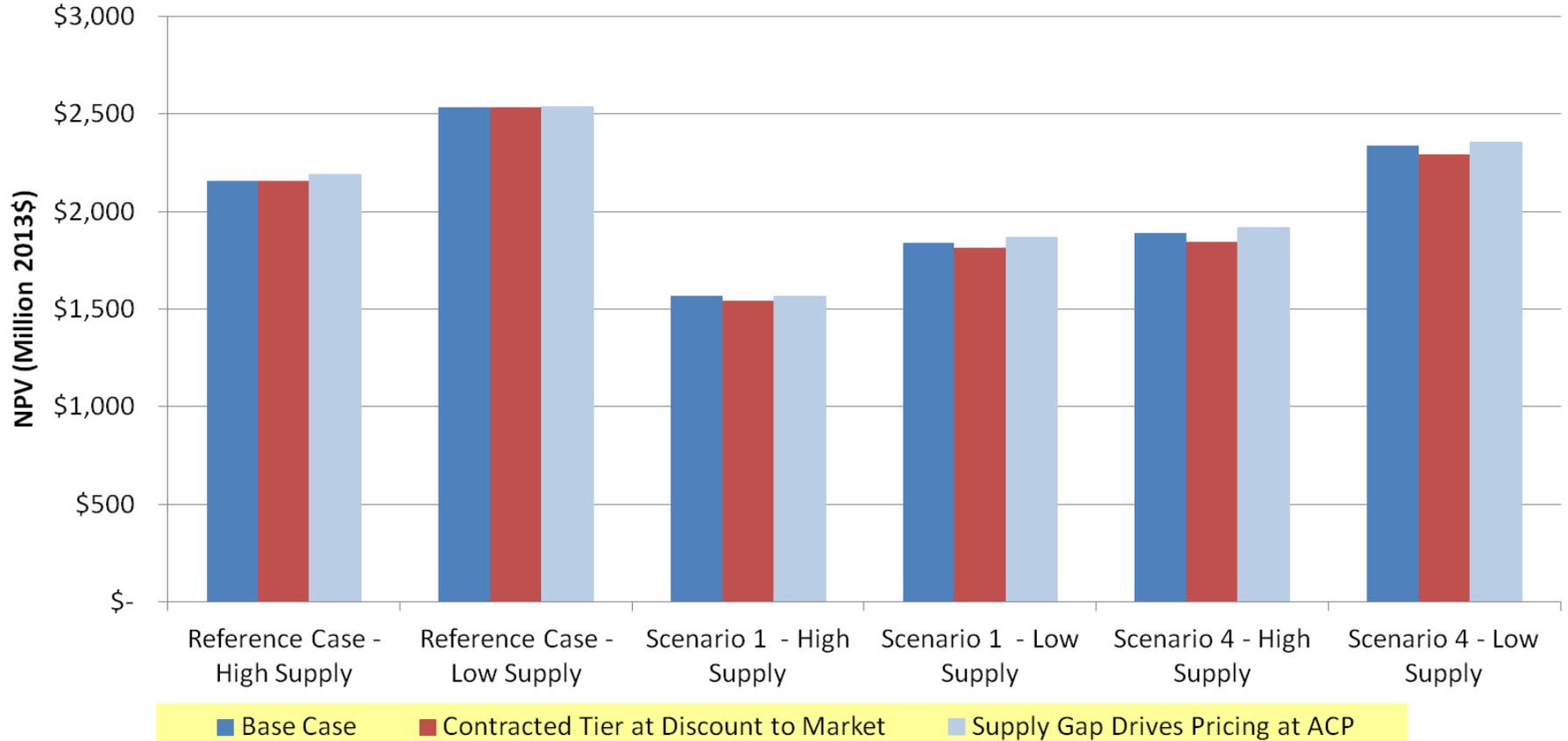
## Appendix

- NPV Results for Sensitivity Analyses
- Underlying Cost Assumptions



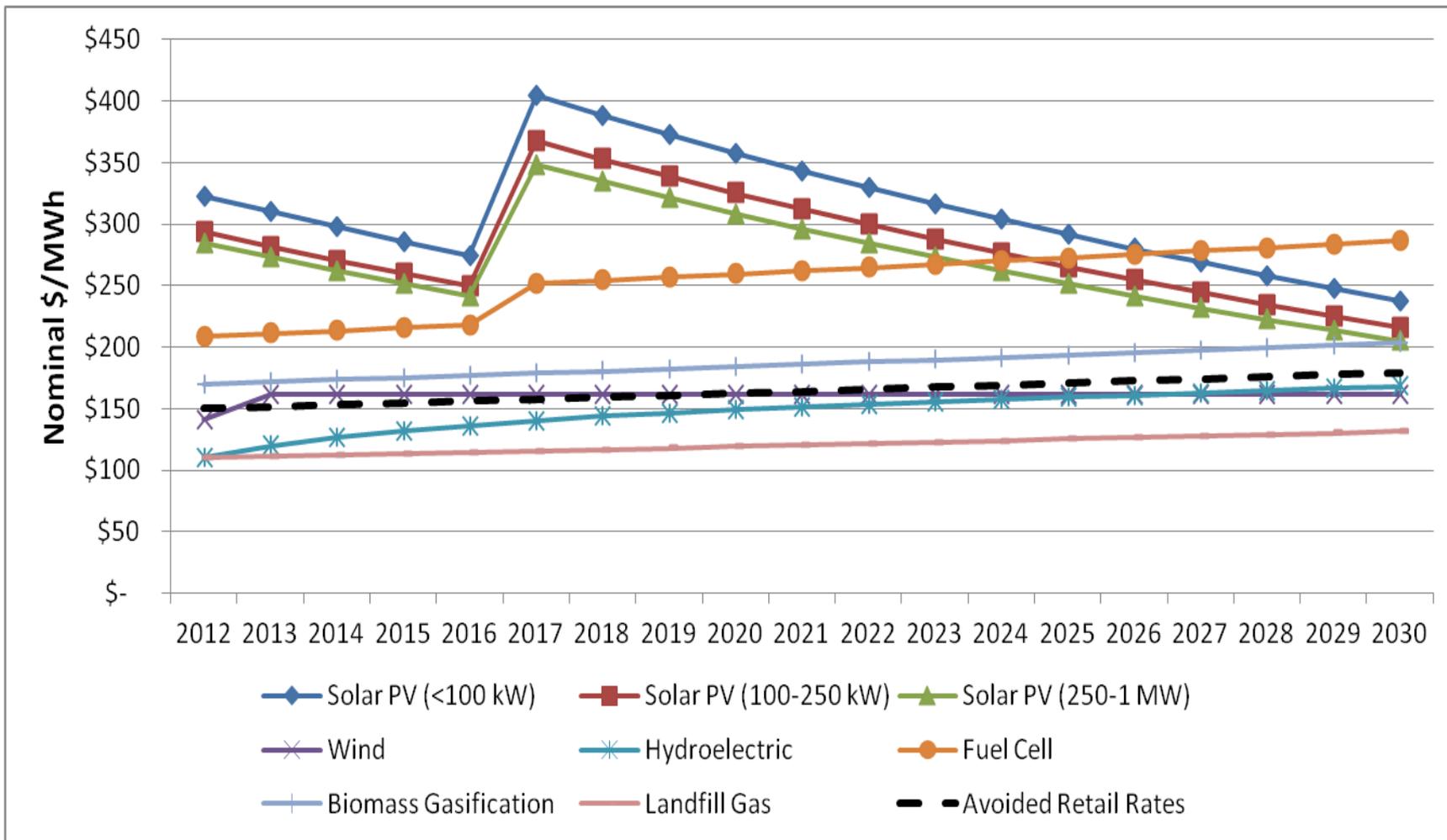
# Sensitivities: Reference, Scenario 1 & 4

Total Compliance Costs 2013-2025: Sensitivity Analysis





# Underlying Cost Projections: LRECs & ZRECs





# Underlying Cost Projections: ZRECs

