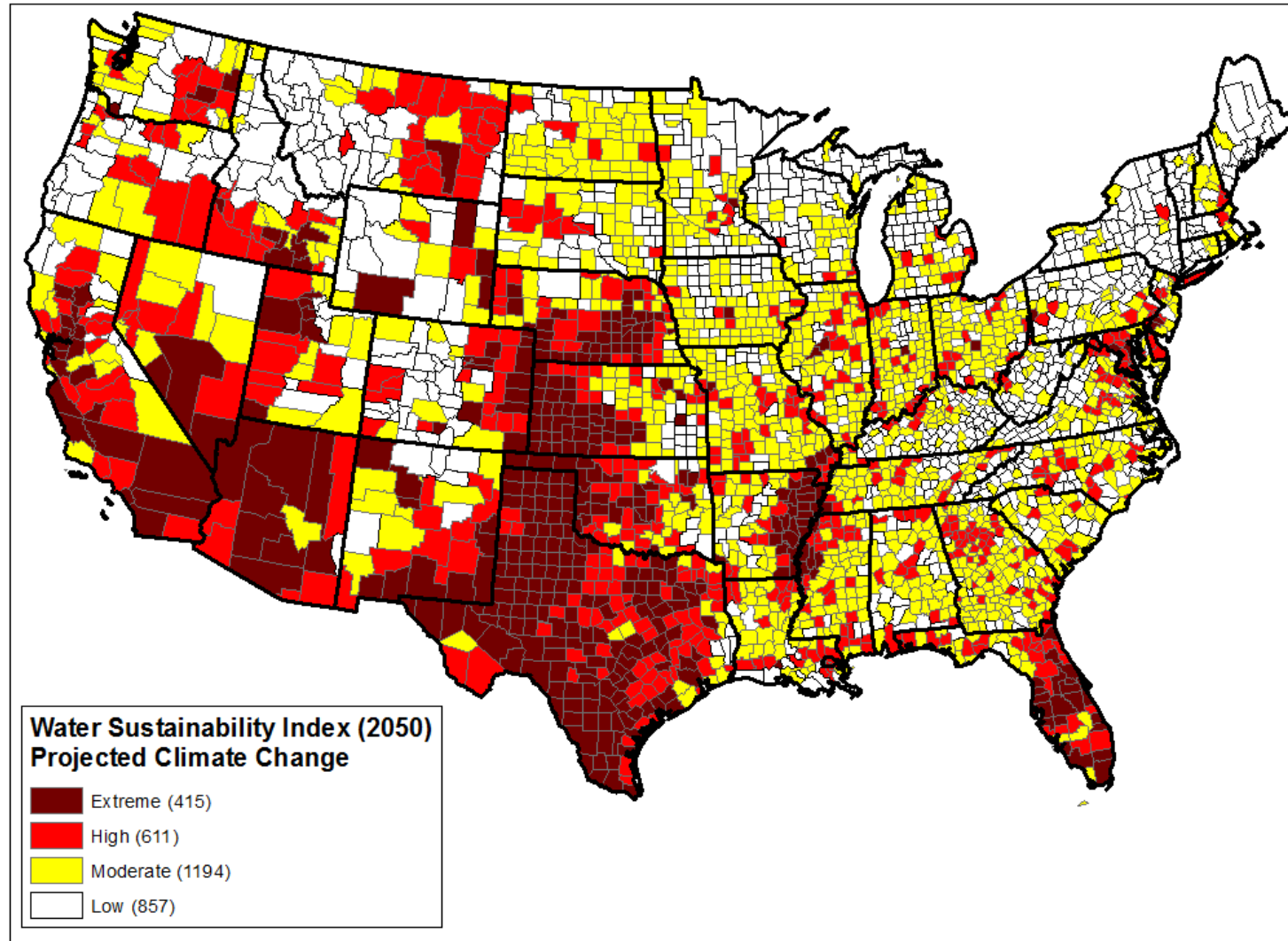


# Synergies Between Energy, Water Use and GHG Mitigation in Texas

Paul Faeth  
Institute for Public Research  
CNA

Washington Energy Policy Conference  
April 9th, 2013

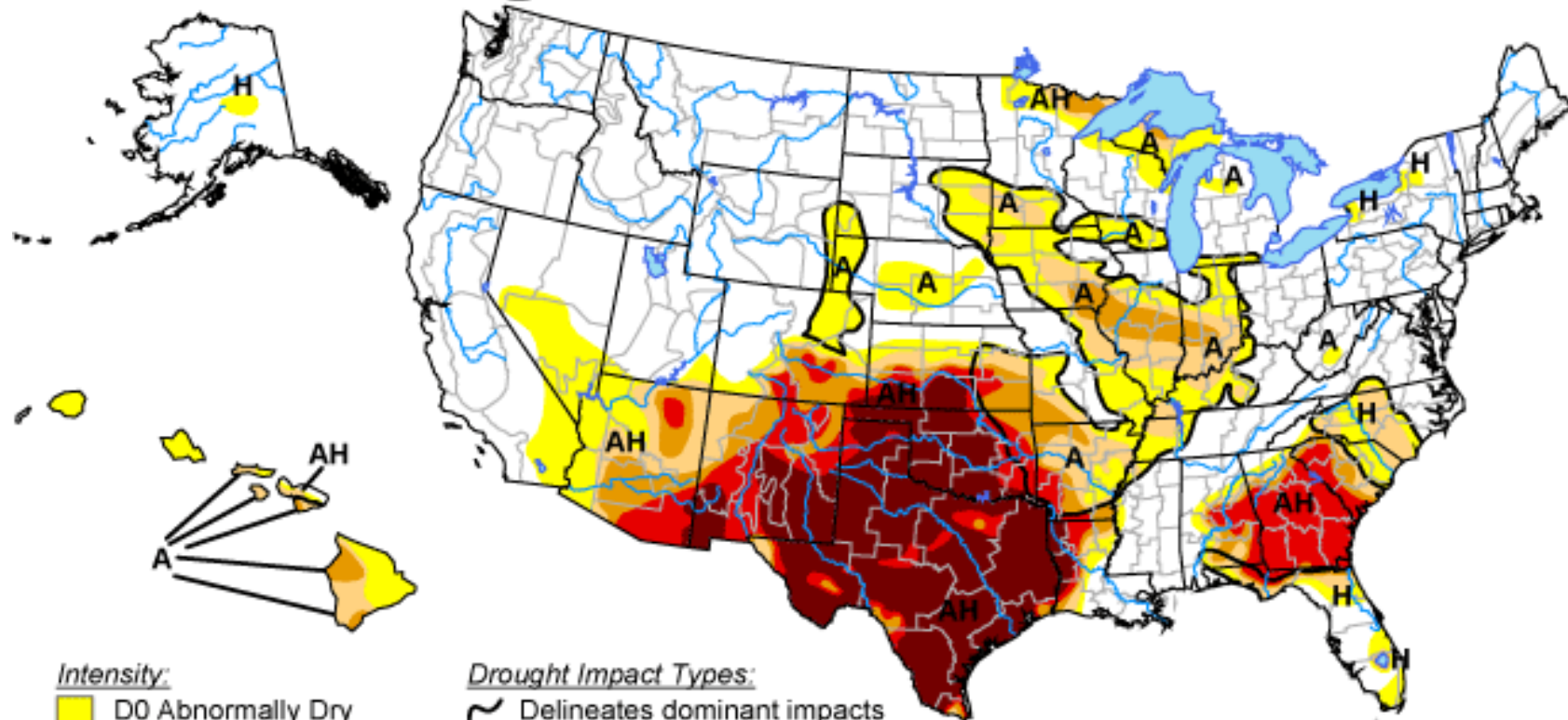
# Demand and CC could threaten water sustainability








SOURCE: Roy, et al., 2010.

# U.S. Drought Monitor


September 13, 2011  
Valid 8 a.m. EDT



Intensity:

-  D0 Abnormally Dry
-  D1 Drought - Moderate
-  D2 Drought - Severe
-  D3 Drought - Extreme
-  D4 Drought - Exceptional

Drought Impact Types:

-  Delineates dominant impacts
- A = Agricultural (crops, pastures, grasslands)
- H = Hydrological (water)

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://drought.unl.edu/dm>



Released Thursday, September 15, 2011

Author: Mark Svoboda, National Drought Mitigation Center

# Generation options for the Texas Power Sector

|              | <u>Model Plant Size</u> |      |     |     |
|--------------|-------------------------|------|-----|-----|
|              | OT                      | REC  | Dry | NA  |
| Conv_Coal    | 500                     | 500  |     |     |
| Conv_Gas     | 250                     | 250  | 250 |     |
| Conv_Nuke    |                         | 1000 |     |     |
| Adv_Coal     |                         |      |     |     |
| Adv_Coal_CCS |                         |      |     |     |
| NGCC         |                         | 250  | 250 |     |
| NGCC_CCS     |                         | 250  | 250 |     |
| Wind         |                         |      |     | 100 |
| PV           |                         |      |     | 25  |

# Environmental attributes of some generation options

|              | Water (ac-ft/MWh) |                    | Air Emissions (lb/MWh) |               |                       |                       | GHGs (t/MWh)          |
|--------------|-------------------|--------------------|------------------------|---------------|-----------------------|-----------------------|-----------------------|
|              | <i>WITHDRAWAL</i> | <i>CONSUMPTION</i> | <i>Mercury</i>         | <i>PM 2.5</i> | <i>SO<sub>2</sub></i> | <i>NO<sub>x</sub></i> | <i>CO<sub>2</sub></i> |
| CONV_COAL    | 0.020             | 0.0019             | 0.000011               | 0.12          | 0.74                  | 0.65                  | 0.9                   |
| NGCC         | 0.010             | 0.0007             | 0                      | 0             | 0                     | 0.06                  | 0.4                   |
| ADV_COAL_CCS | 0.041             | 0.0038             | 0                      | 0.074         | 0.08                  | 0.49                  | 0.1                   |
| WIND         | 0                 | 0                  | 0                      | 0             | 0                     | 0                     | 0                     |

SOURCES: Macknick et al., 2011. NETL on-line tool.

# Scenarios tested

---

1. Baseline from ERCOT, extended to 2040
2. Water consumption limited to calculated 2010 amount
3. High efficiency, 0.67% annual drop in demand
4. High wind cost, i.e. no drop from 2010 cost
5. Carbon cap, 40% decline by 2040

# Scenarios tested

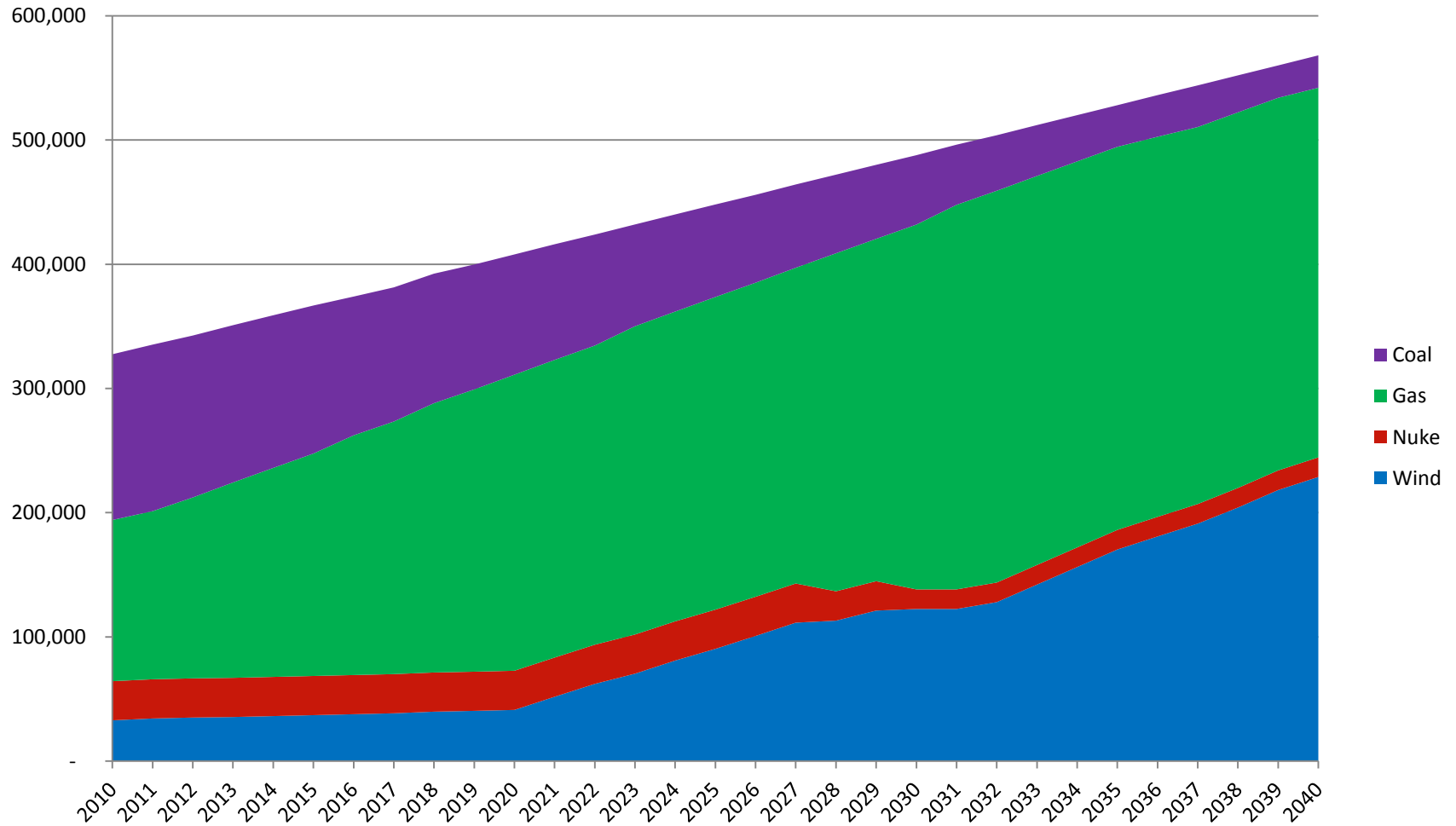
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**DISCLAIMER: The results shown here are subject to change.**

# Baseline fuel mix

(GWh)

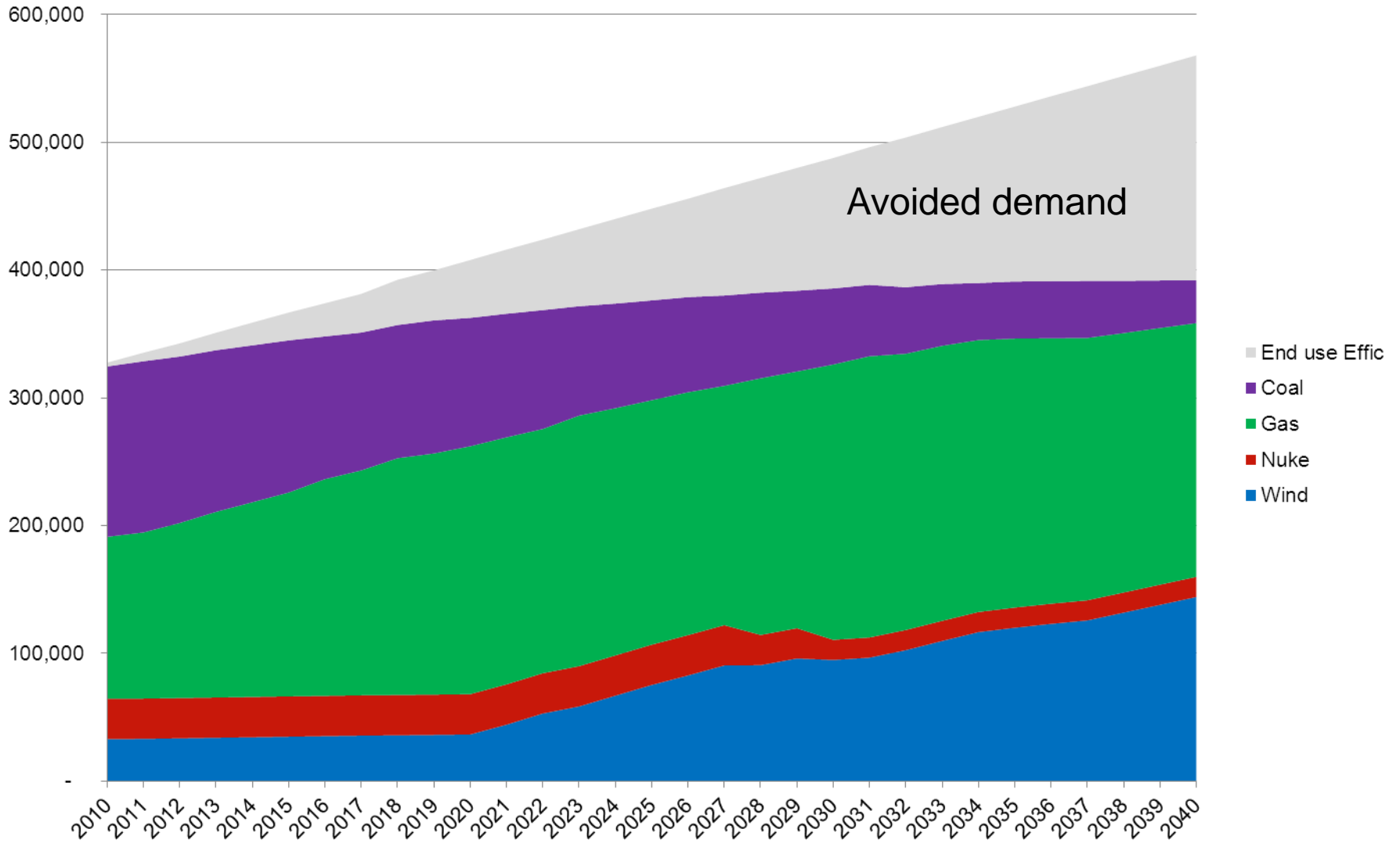


\*Preliminary results, subject to change



# High efficiency

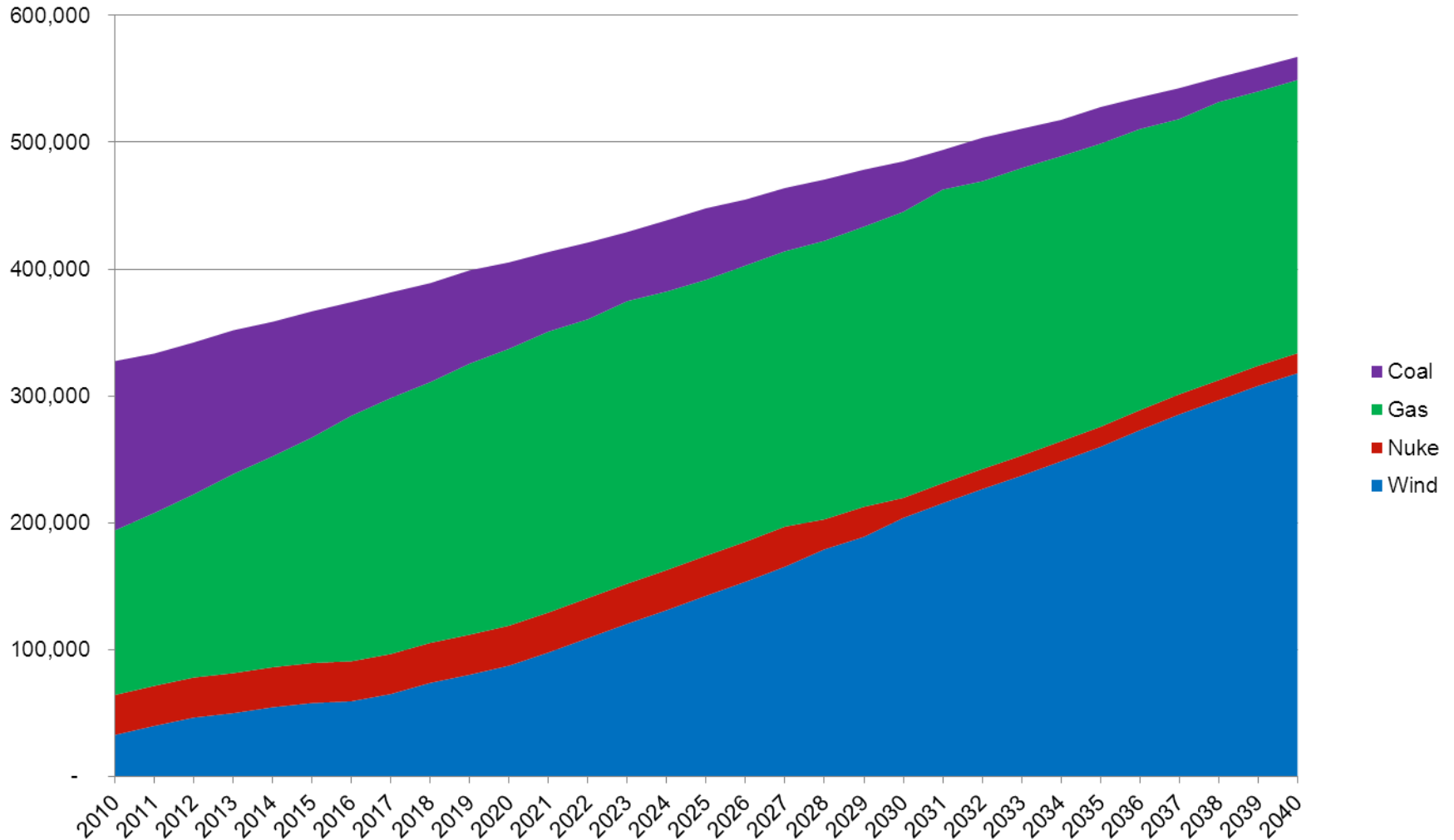
(GWh)



\*Preliminary results, subject to change

# CO<sub>2</sub> cap

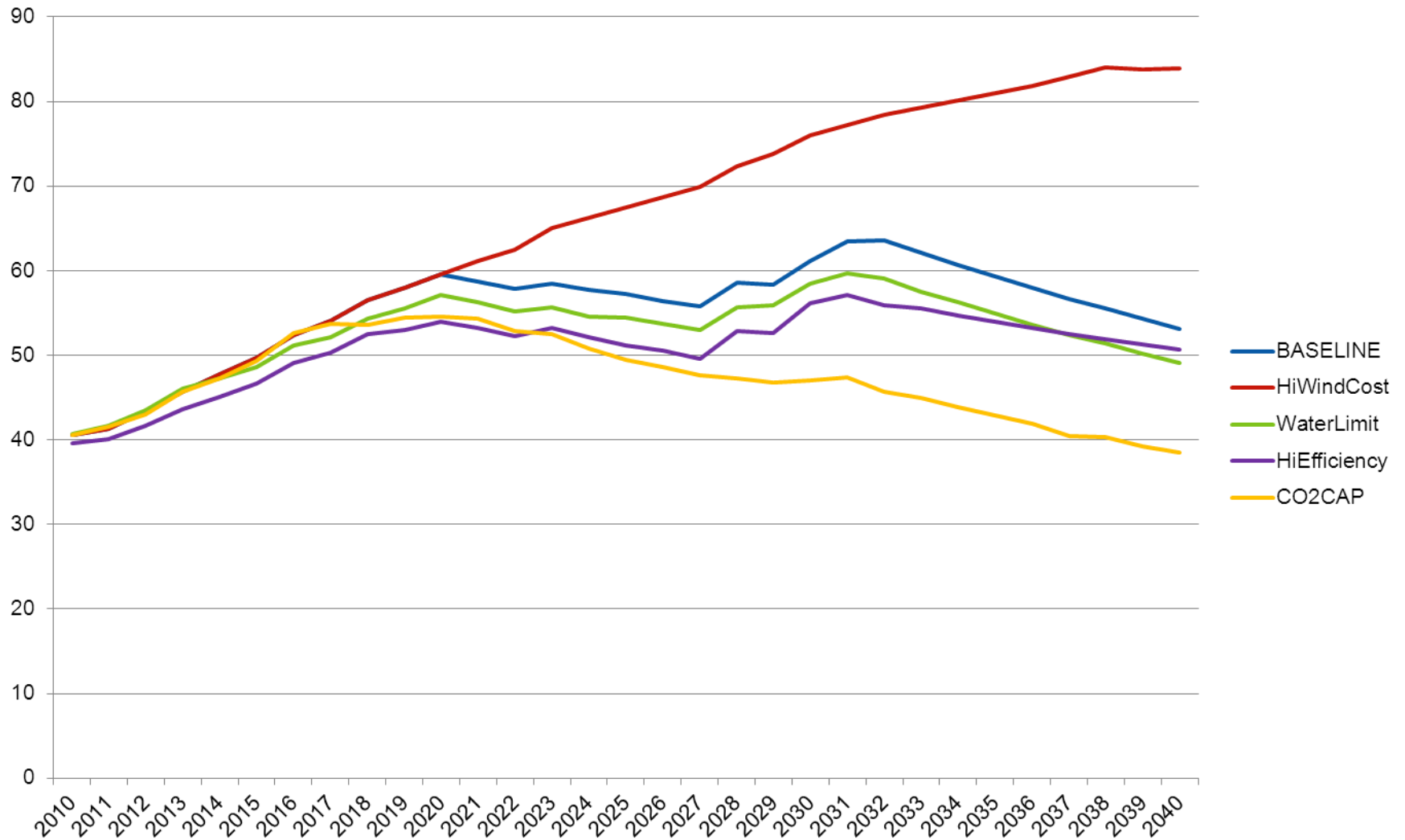
(GWh)



\*Preliminary results, subject to change

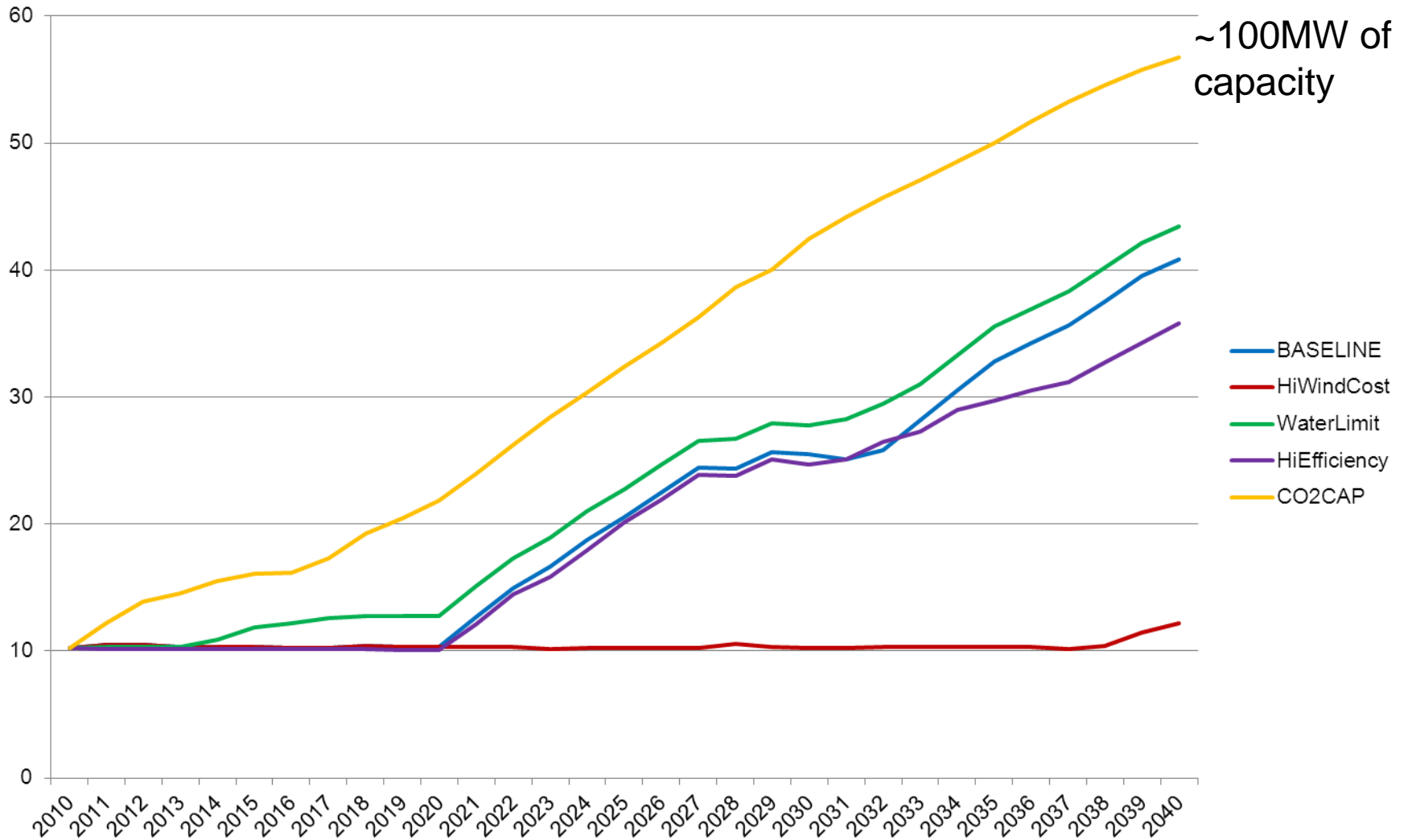
# Gas Generation %

(73% demand growth)



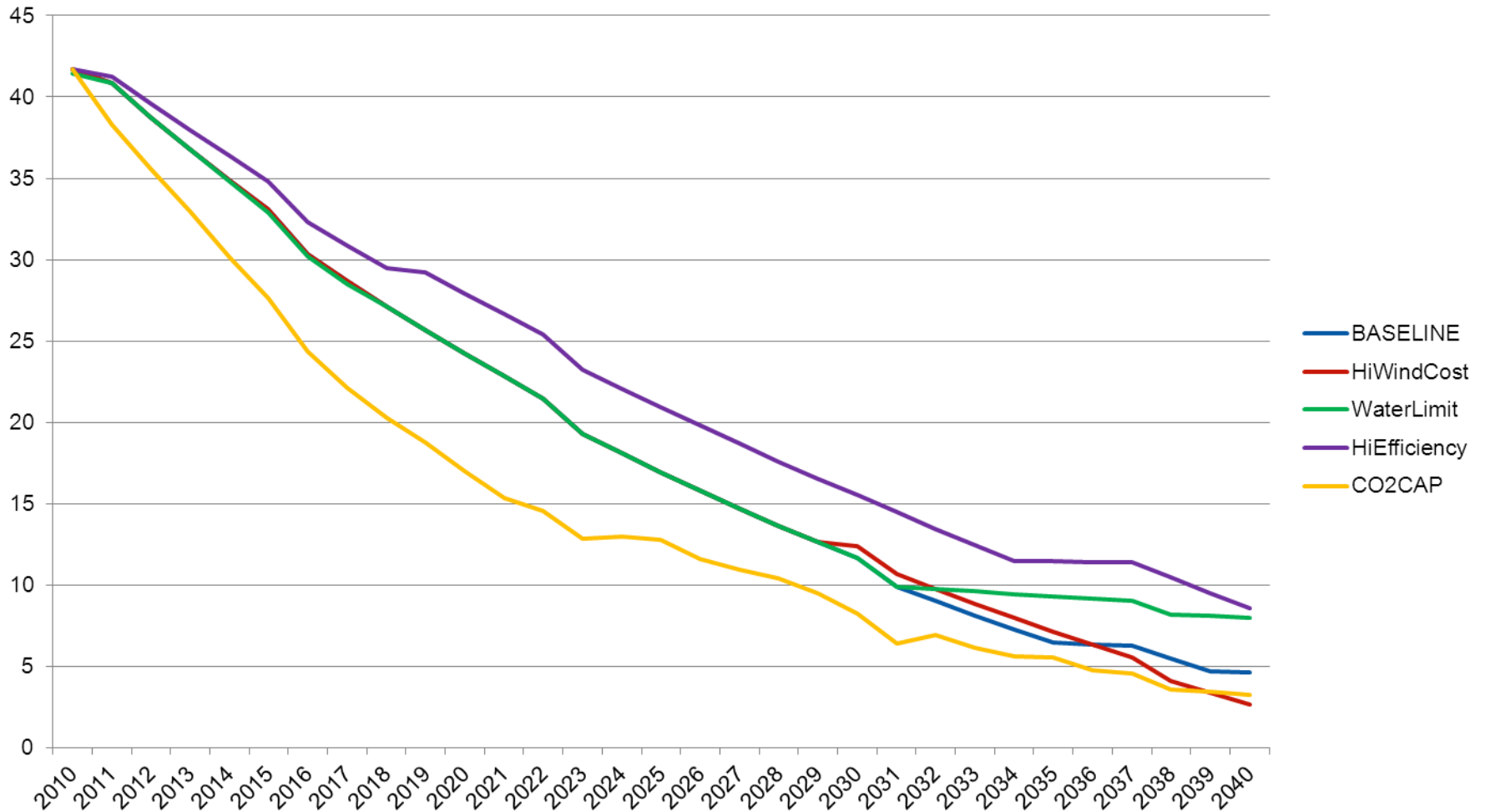
\*Preliminary results, subject to change

# Wind Generation %



\*Preliminary results, subject to change

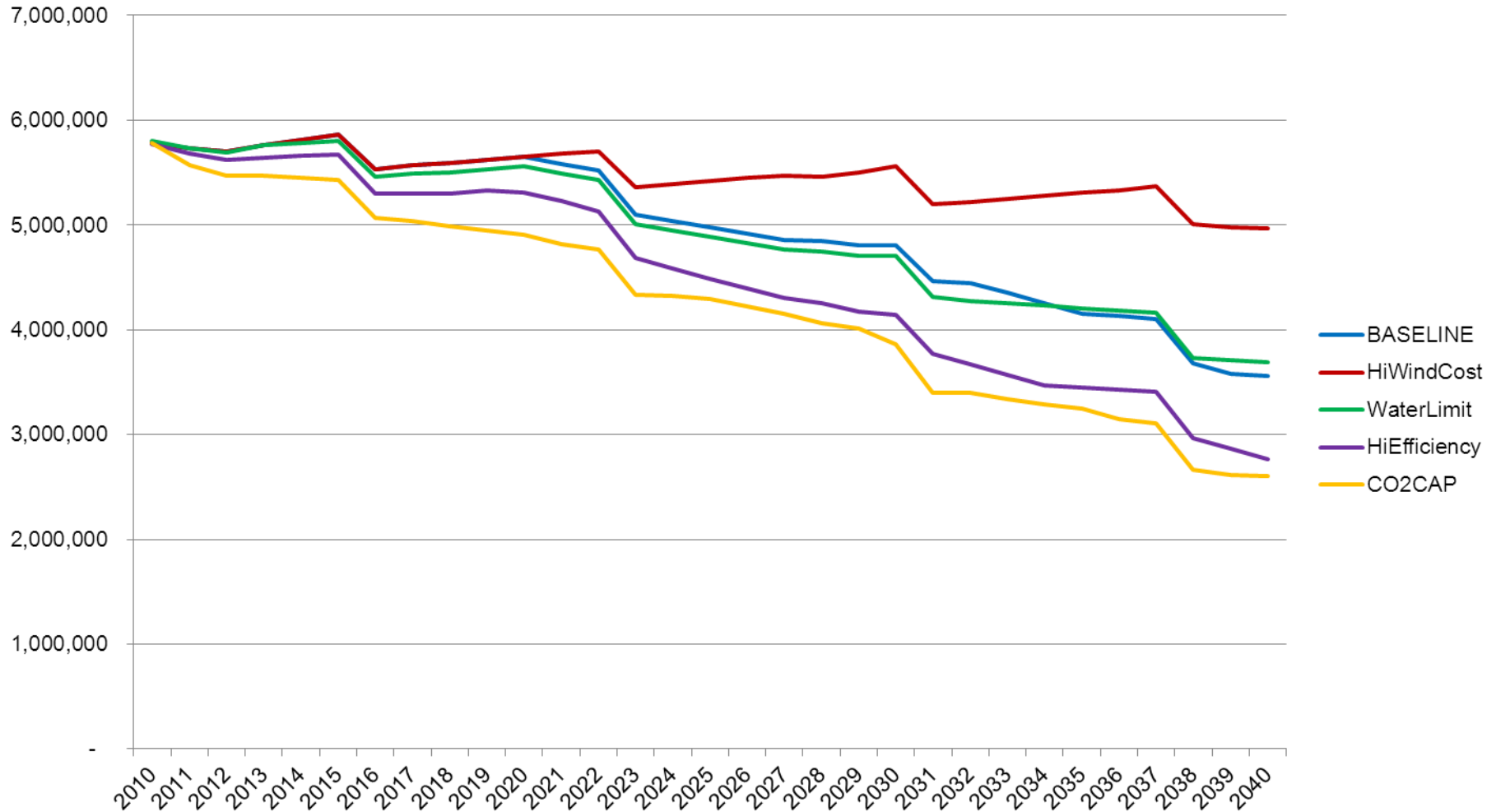
# Coal Generation %



\*Preliminary results, subject to change

# Water withdrawals

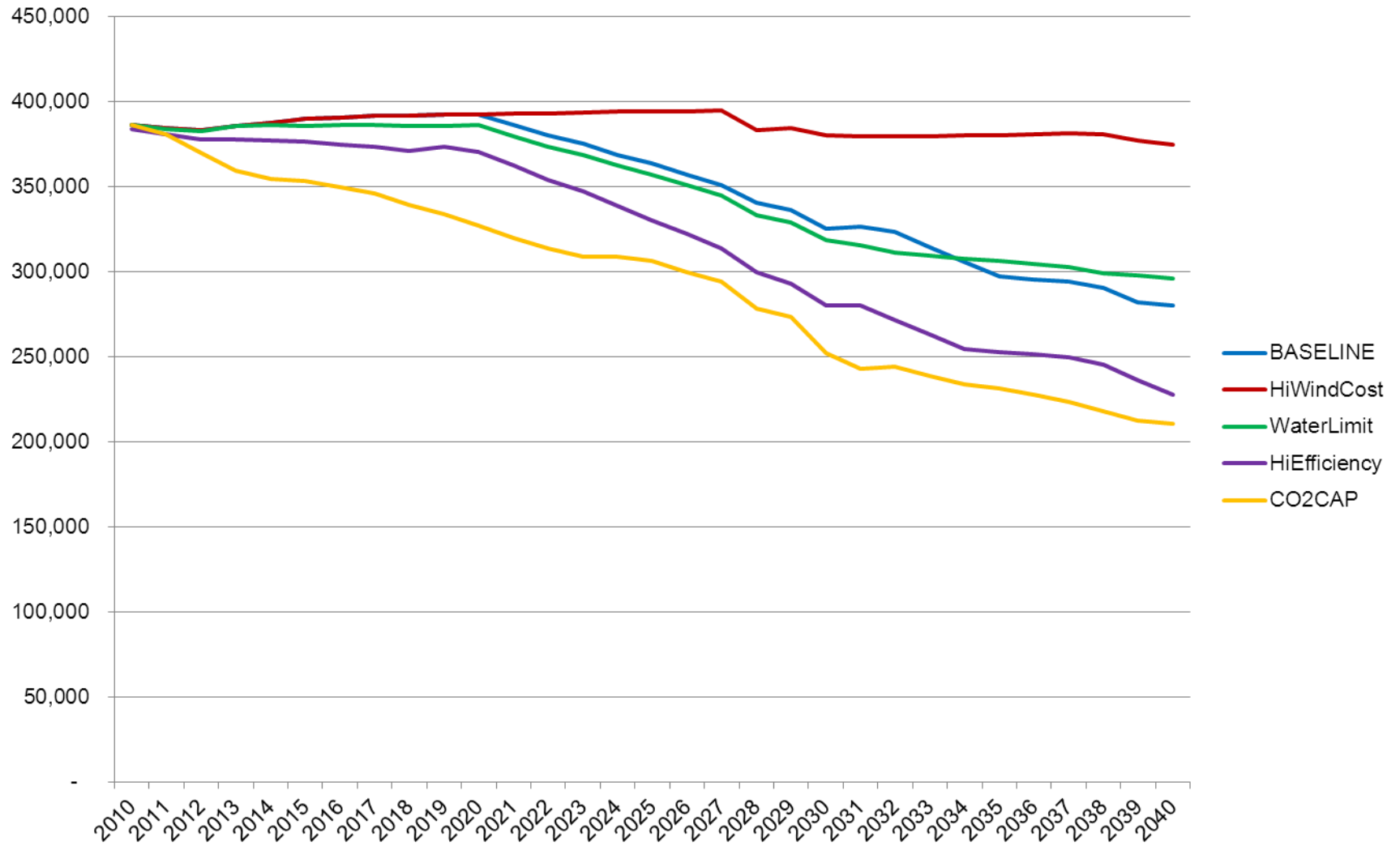
(ac-ft/yr)



\*Preliminary results, subject to change

# Water consumption

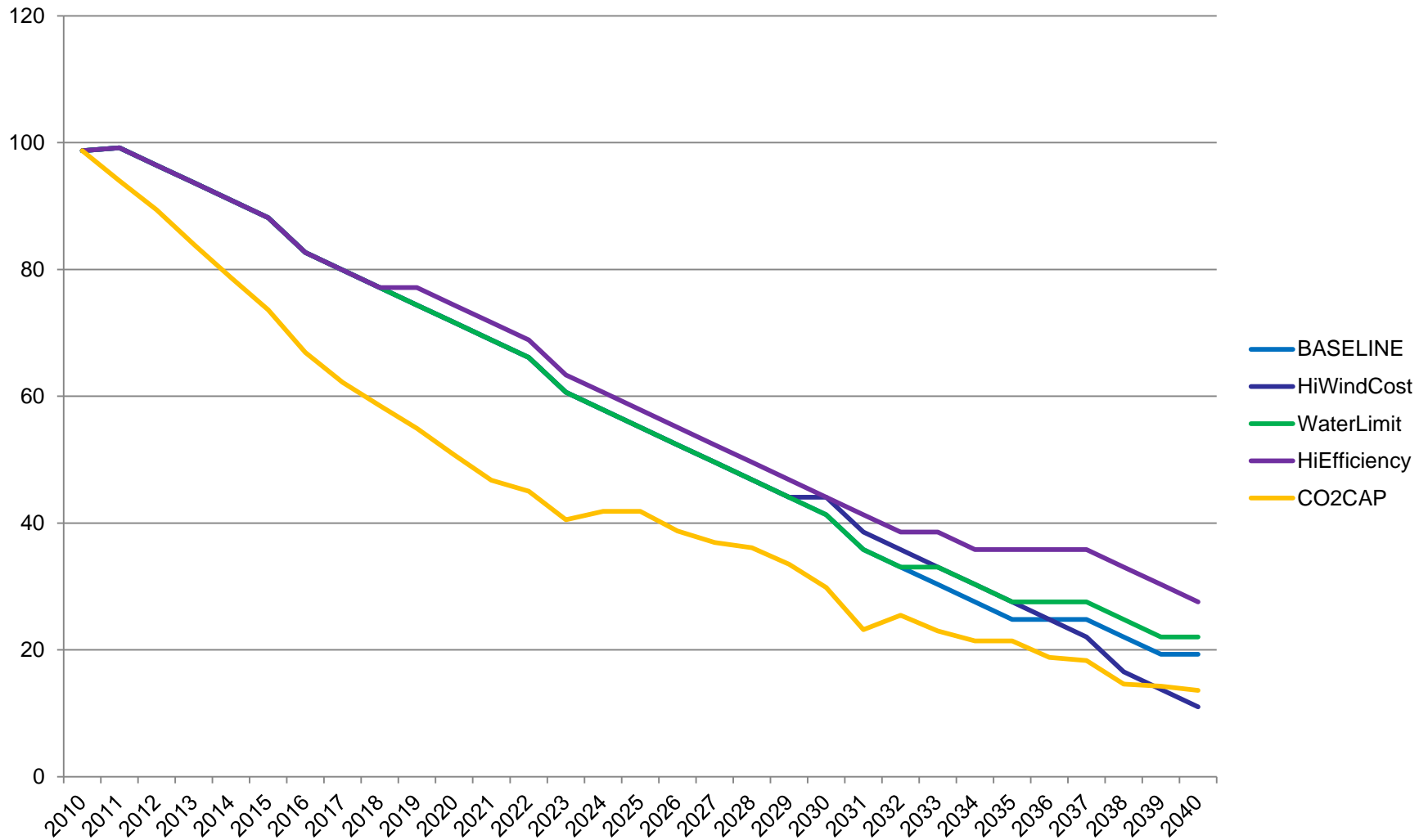
(ac-ft/yr)



\*Preliminary results, subject to change

# SO<sub>2</sub> emissions

(million lbs)

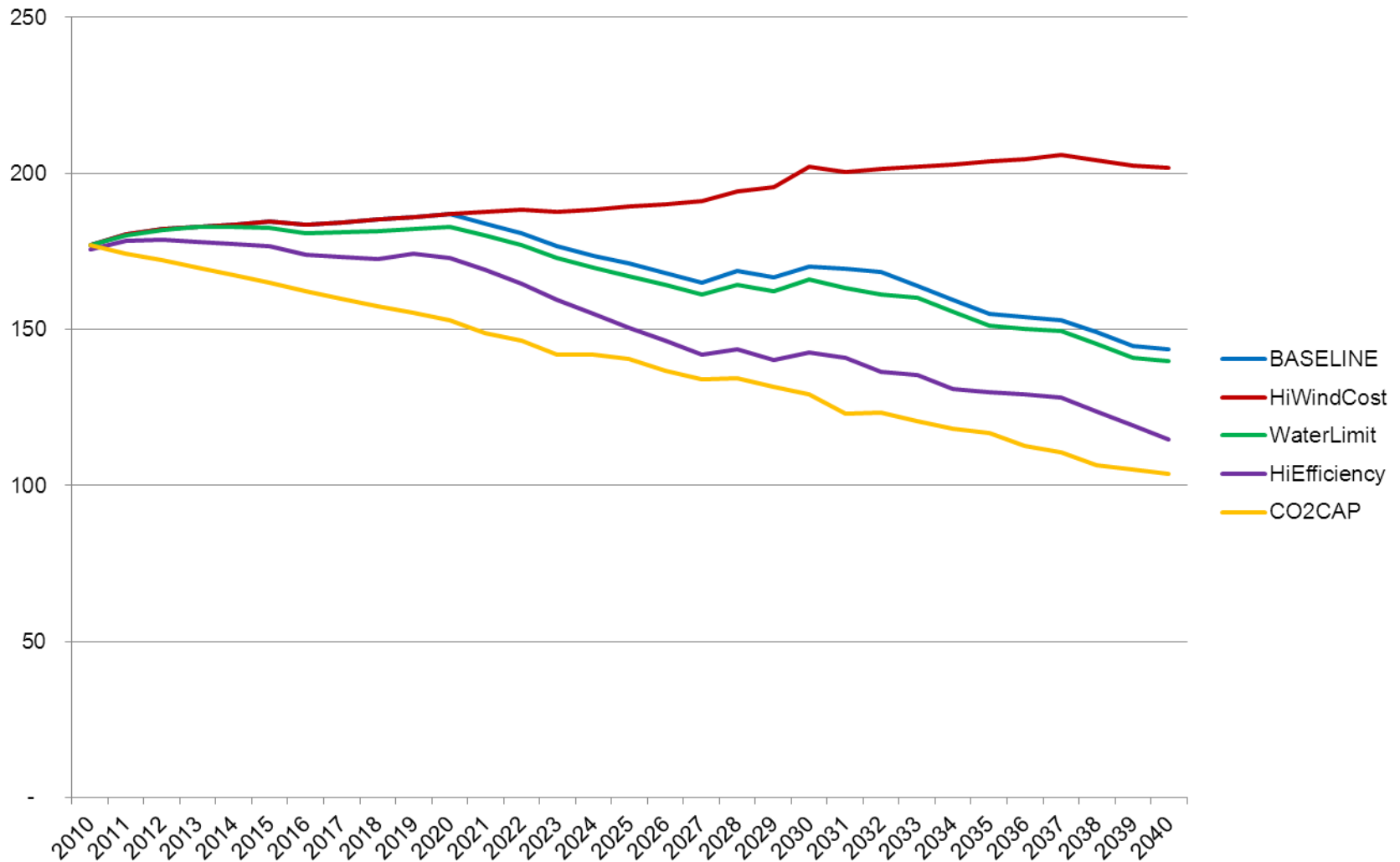


\*Preliminary results, subject to change



# CO<sub>2</sub> emissions

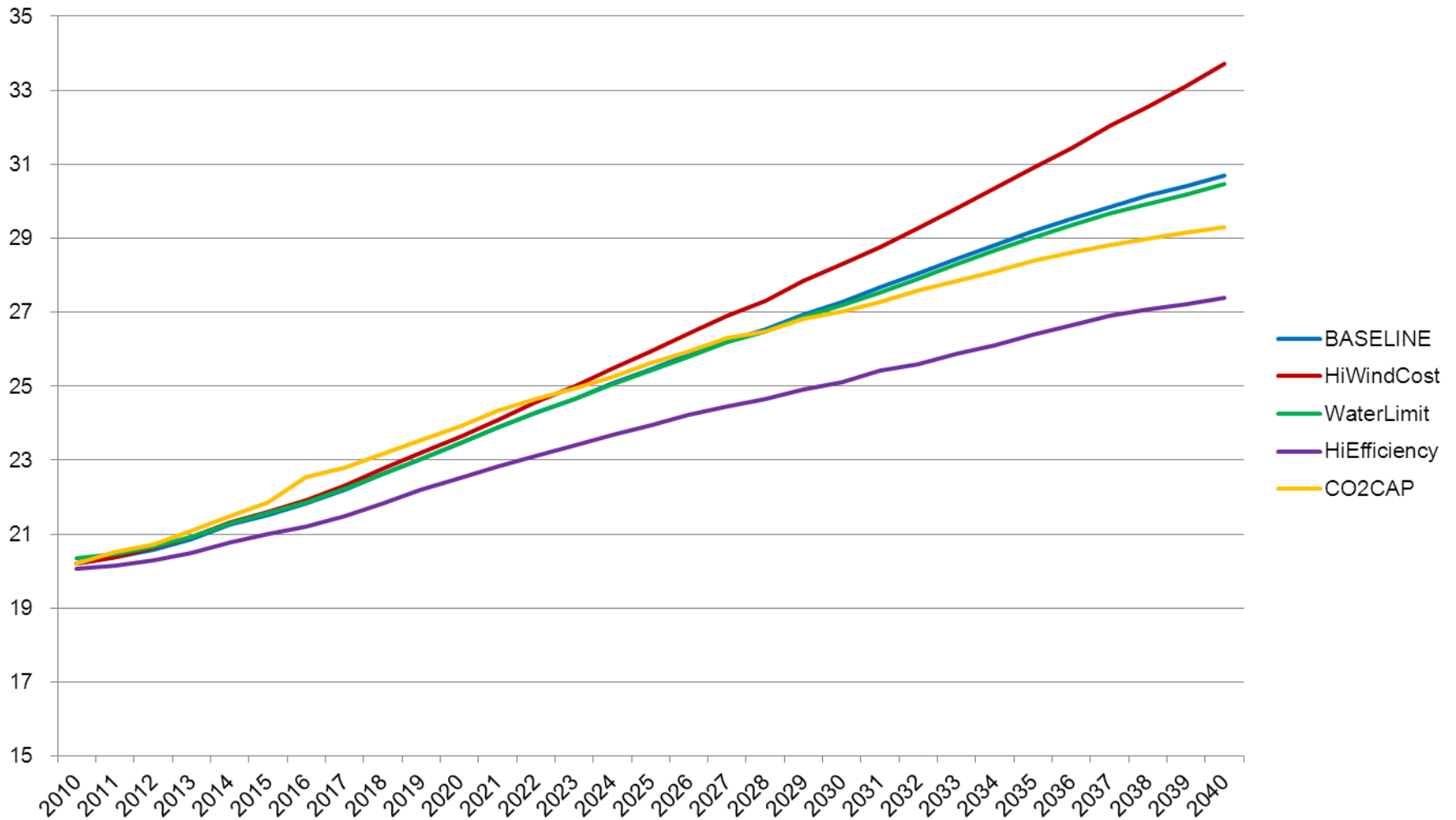
(million tons)



\*Preliminary results, subject to change

# Total system costs

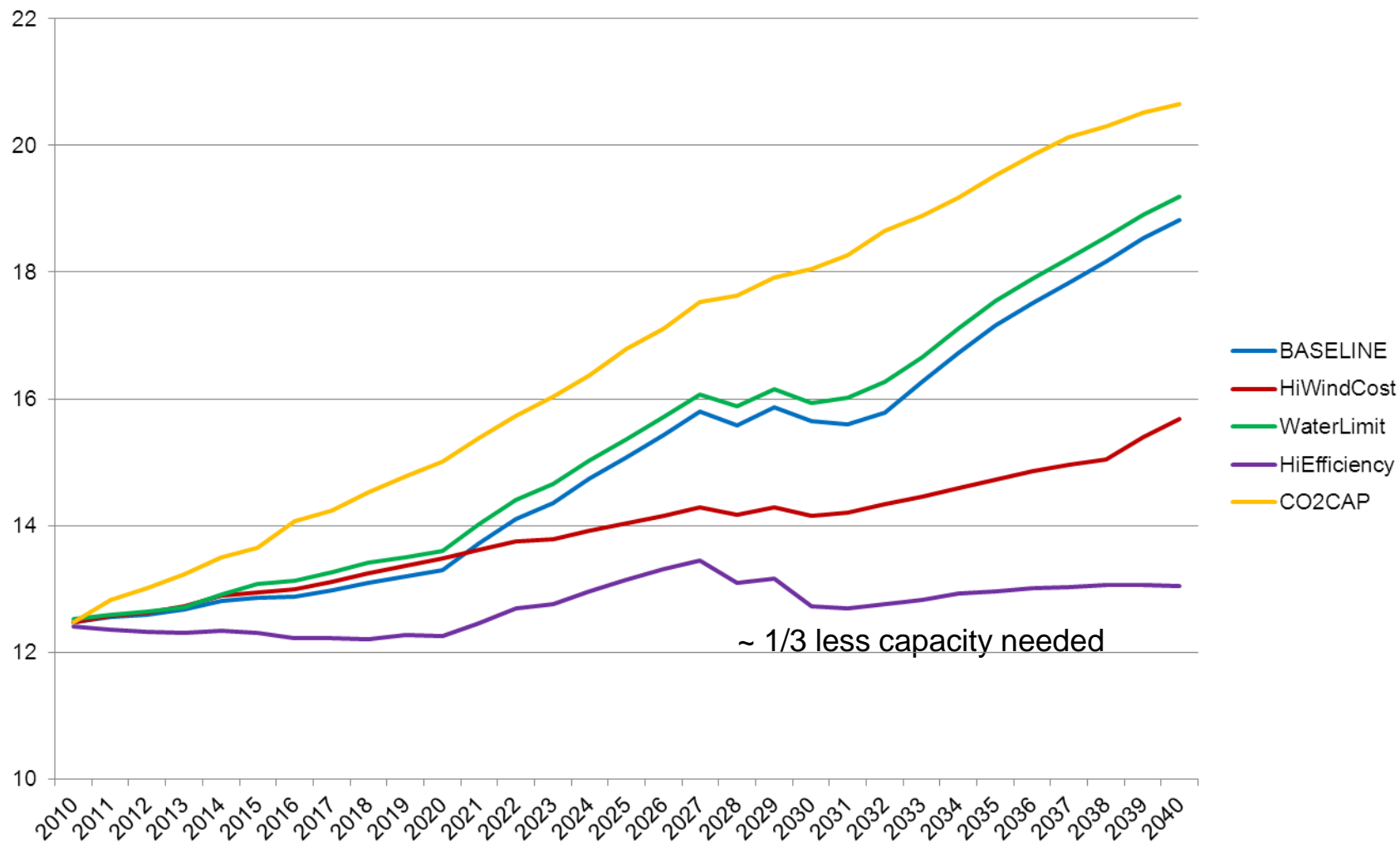
(\$billion)



\*Preliminary results, subject to change

# Fixed costs

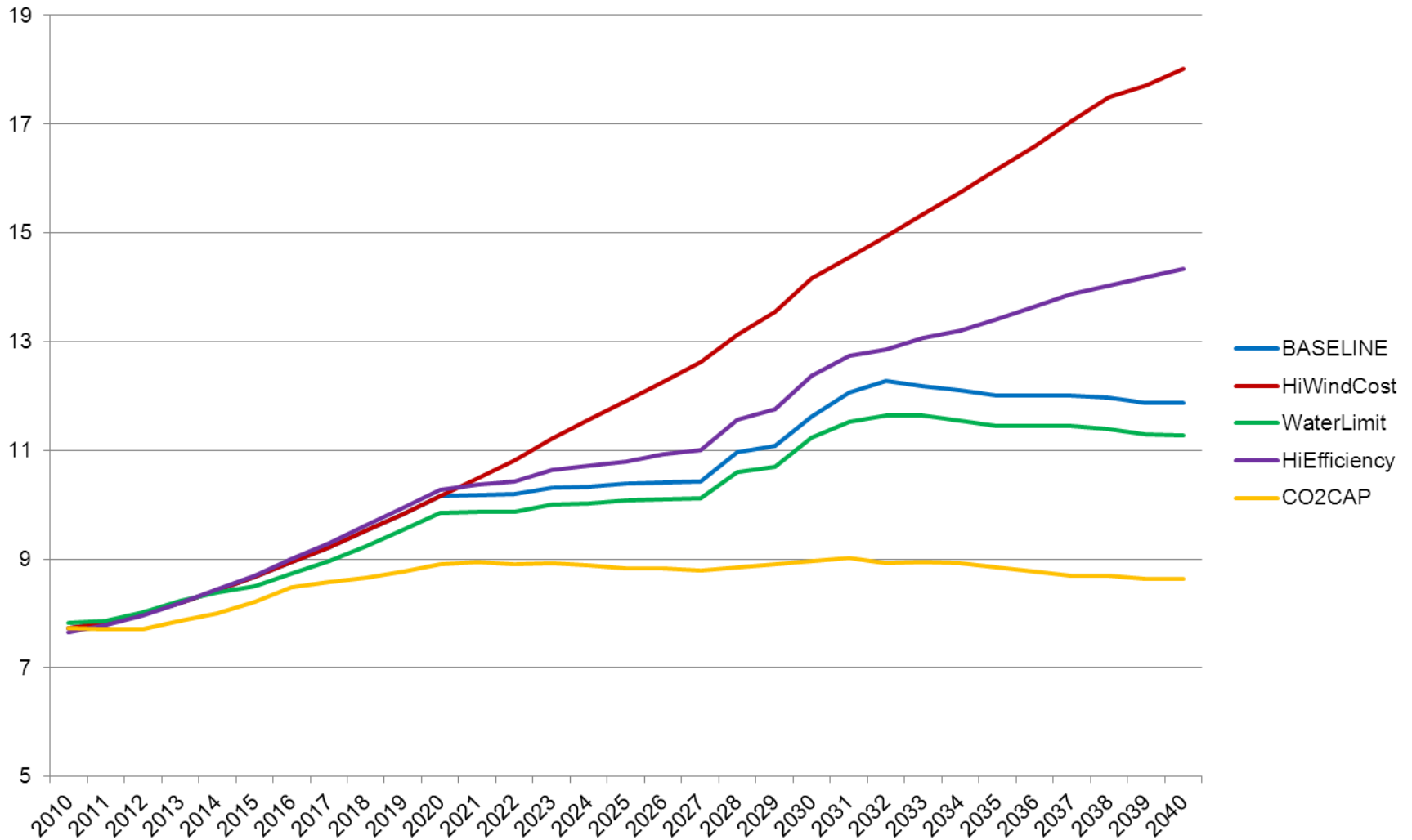
(\$billion)



\*Preliminary results, subject to change

# Variable costs

(\$billion)



\*Preliminary results, subject to change

# Contact:

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