



IPAMS

Electric Resource Planning and the Impact on Natural Gas

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Confidential Draft. Working Document for Discussion Only



Key Drivers for Resource Planning

- ▶ **Cost of natural gas**
- ▶ **Future carbon costs**
- ▶ **Capital costs**
 - ▶ Wind
 - ▶ Solar
 - ▶ Gas combustion turbines or combined cycle
- ▶ **Resource needs**
 - ▶ Peak day capacity
 - ▶ Energy

Relative Economics Energy Costs Only

▶ Gas CT

▶ \$7/MMbtu X 10,000 btu/kwh = \$70/MWh

▶ Gas CC

▶ \$7/mmbtu X 7,000 btu/kwh = \$49/MWh

▶ Wind

▶ All-in cost w/subsidies = \$60/MWh

▶ Less credit for 12.5% capacity = -\$8/MWh

▶ Total energy cost = \$52/MWh

▶ Solar

▶ All-in cost w/subsidies = \$120/MWh

▶ Less credit for 50% capacity = -\$41/MWh

▶ Total energy cost = \$79/MWh

▶ Coal

▶ \$20/MWh

Relative Economics with Carbon Energy Costs Only

- ▶ **Gas CT**
 - ▶ \$7/MMbtu X 10,000 btu/kwh = \$70/MWh
 - ▶ \$40/ton (2020) =
- ▶ **Gas CC**
 - ▶ \$7/mmbtu X 7,000 btu/kwh = \$49/MWh
- ▶ **Wind**
 - ▶ All-in cost w/subsidies = \$60/MWh
 - ▶ Less credit for 12.5% capacity = -\$8/MWh
 - ▶ Total energy cost = \$52/MWh
- ▶ **Solar**
 - ▶ All-in cost w/subsidies = \$120/MWh
 - ▶ Less credit for 50% capacity = -\$41/MWh
 - ▶ Total energy cost = \$79/MWh
- ▶ **Coal**
 - ▶ \$20/MWh





Relative Economics New Assets Energy and Capacity Costs

▶ **Gas CT**

- ▶ $\$7/\text{MMbtu} \times 10,000 \text{ btu/kwh} = \$70/\text{MWh}$
- ▶ $\$6/\text{kw-month (10\% capacity factor)} = \$82/\text{MWh}$
- ▶ **Total = \$152/MWh**

▶ **Gas CC**

- ▶ $\$7/\text{mmbtu} \times 7,000 \text{ btu/kwh} = \$49/\text{MWh}$
- ▶ $\$10/\text{kw-month (35\% capacity factor)} = \$39/\text{MWh}$
- ▶ **Total = \$88/MWh**

▶ **Wind**

- ▶ **All-in cost = \$60/MWh**

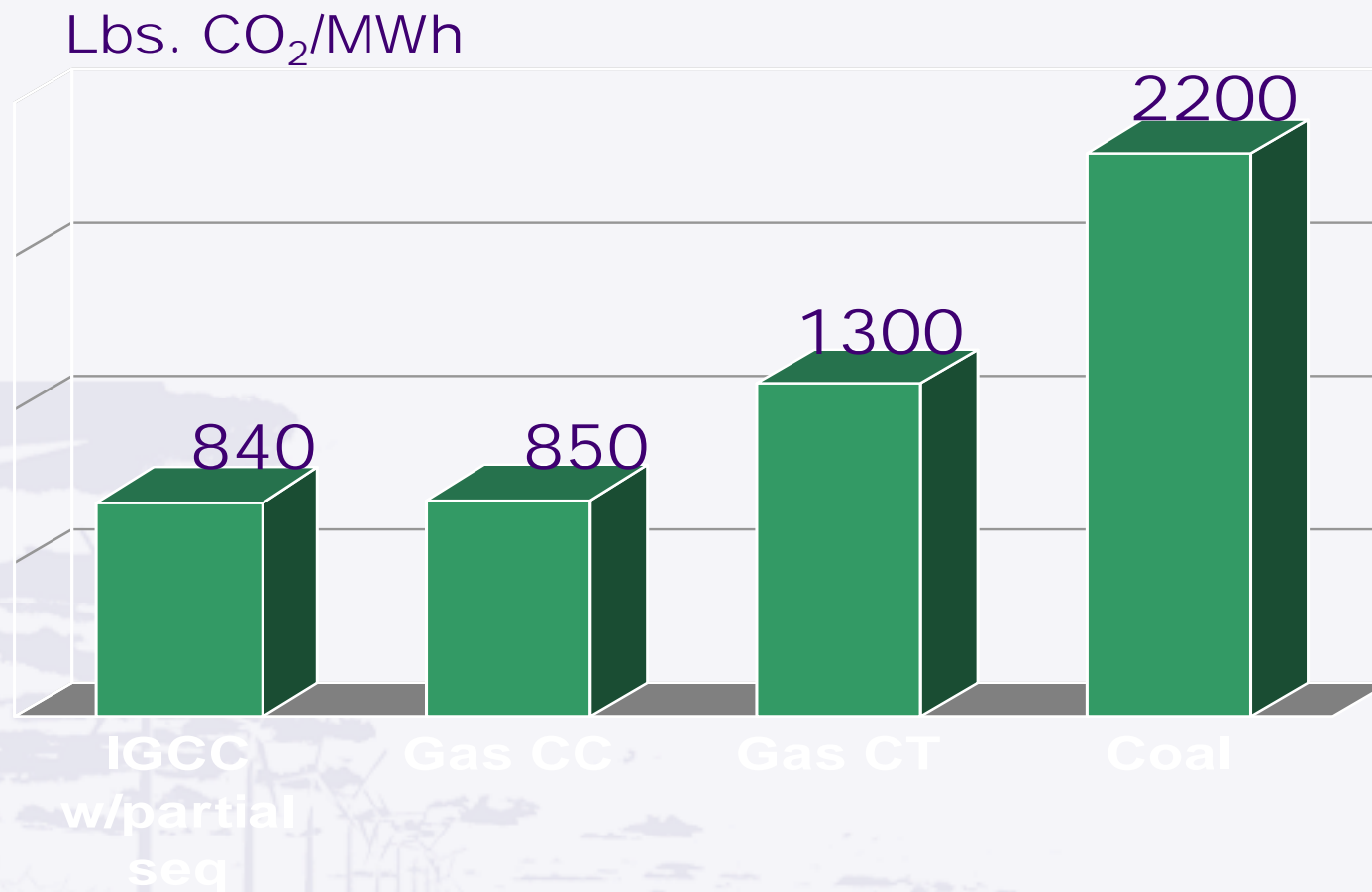
▶ **Solar**

- ▶ **All-in cost = \$120/MWh**

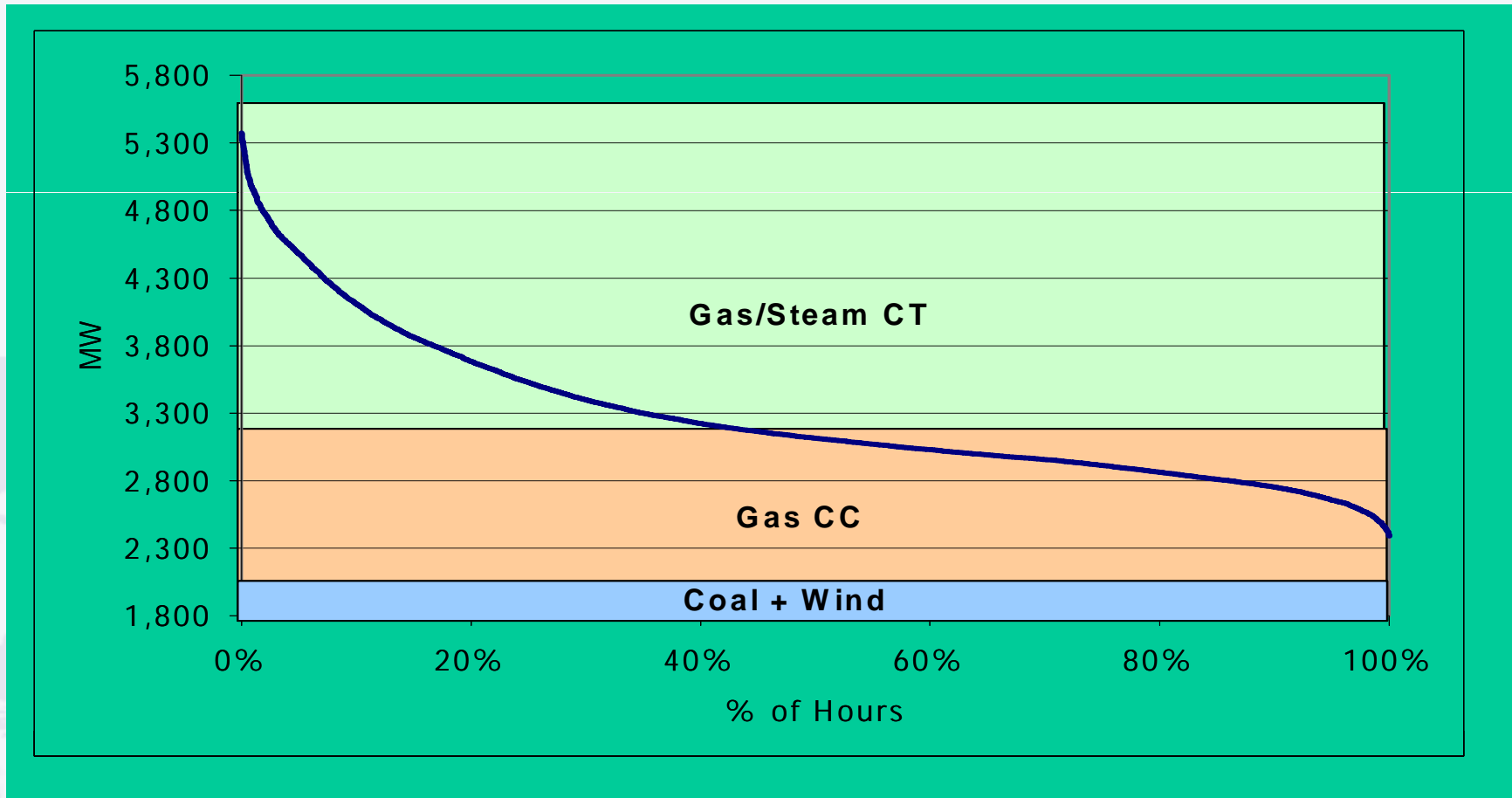
▶ **Coal**

- ▶ **\$20/MWh**

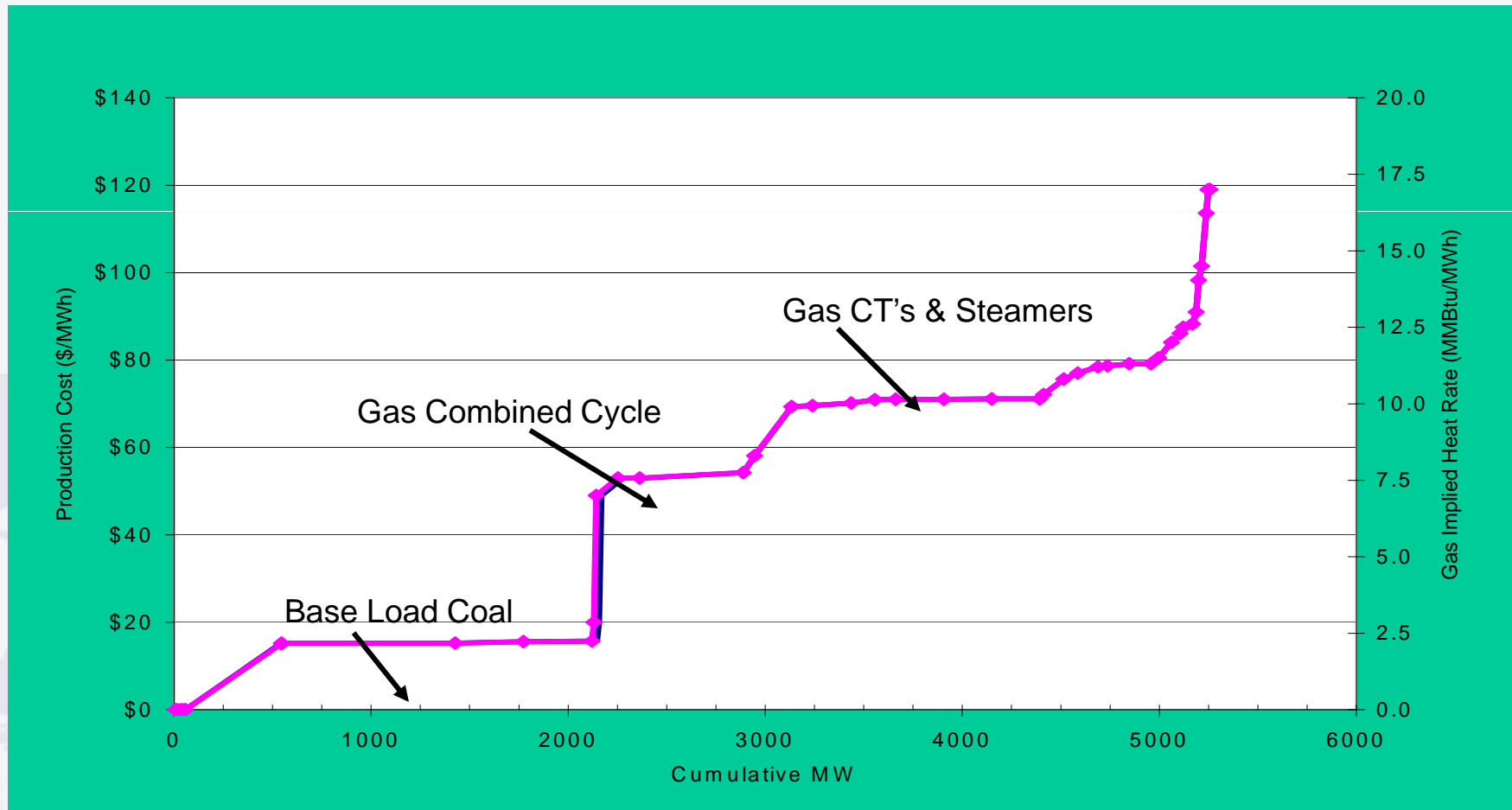
General Carbon Assumptions



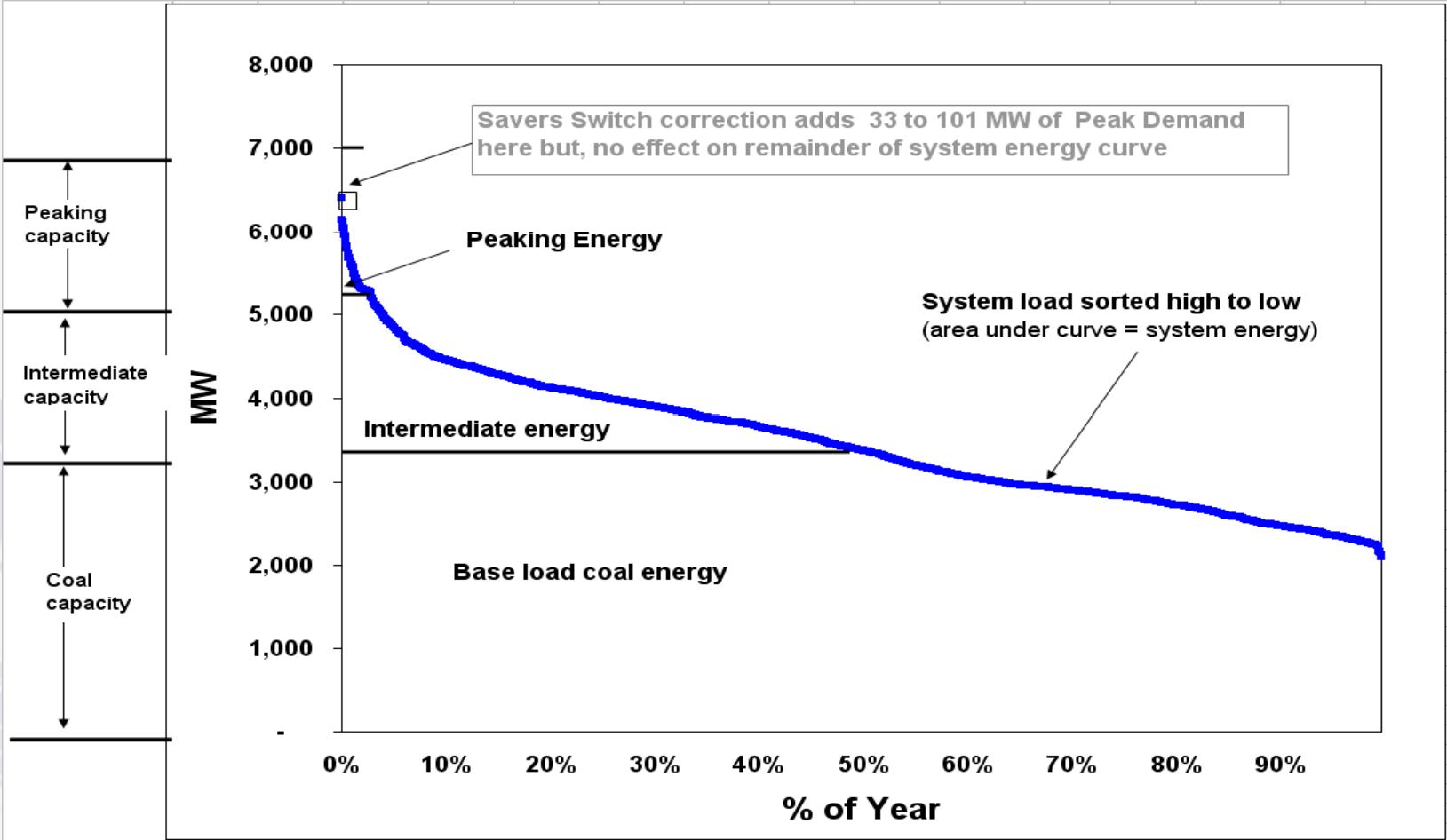
Load Duration Curve



Generation Supply Curve



PSCo Load Duration Curve



All-Source Review

- ▶ Up to 700 MW more intermittent resources (Wind & solar)
- ▶ Add wind ratably 100 to 200 MW per year
- ▶ 200 MW set aside for solar with thermal storage
- ▶ Retire Cameo 1&2 (73 MW) and Arapahoe 3&4 (156 MW)

