



**EPRI**

ELECTRIC POWER  
RESEARCH INSTITUTE

## **Generation Technologies in a Carbon-constrained World**

**IEEE Wind Power Symposium**

**April 21, 2006**

**Steve Gehl**

**Director, Strategic technology**

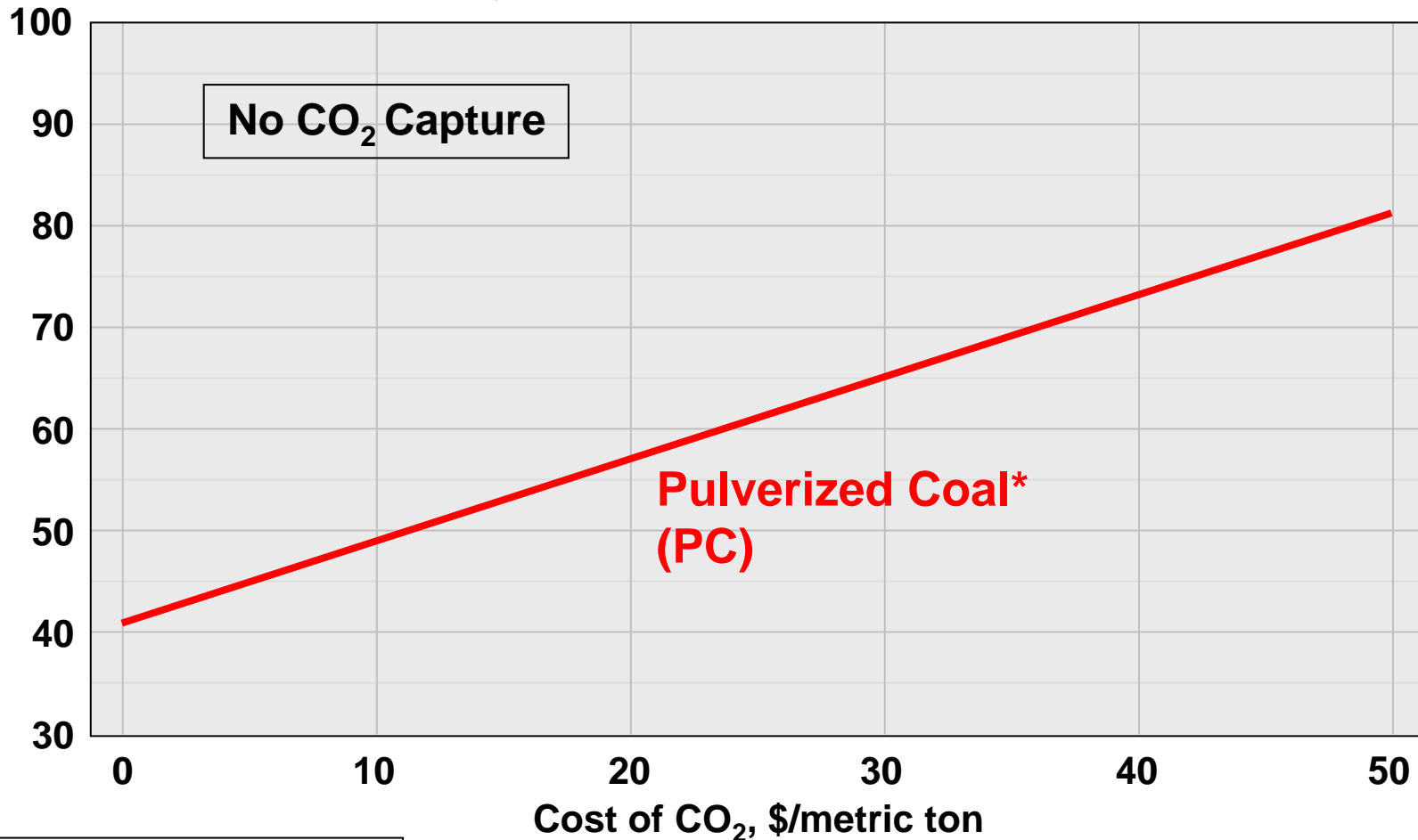
# Objective

---

Provide an objective and factual framework for discussing generation technologies and investment decisions in a carbon-constrained world

# Pulverized Coal Technology in 2010

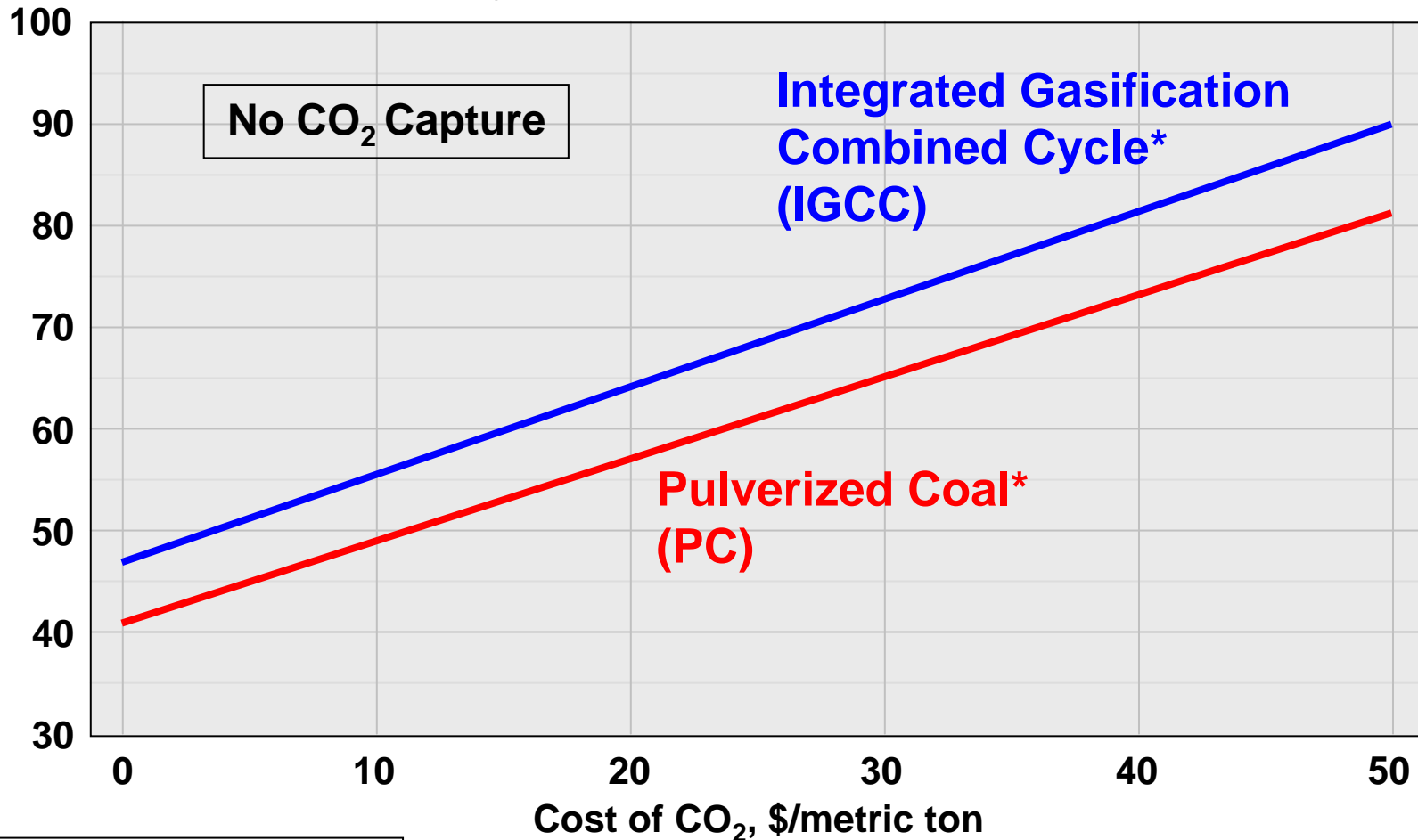
Levelized Cost of Electricity, \$/MWh



\*Coal @ \$1.50/mmBtu

# Coal Technologies in 2010

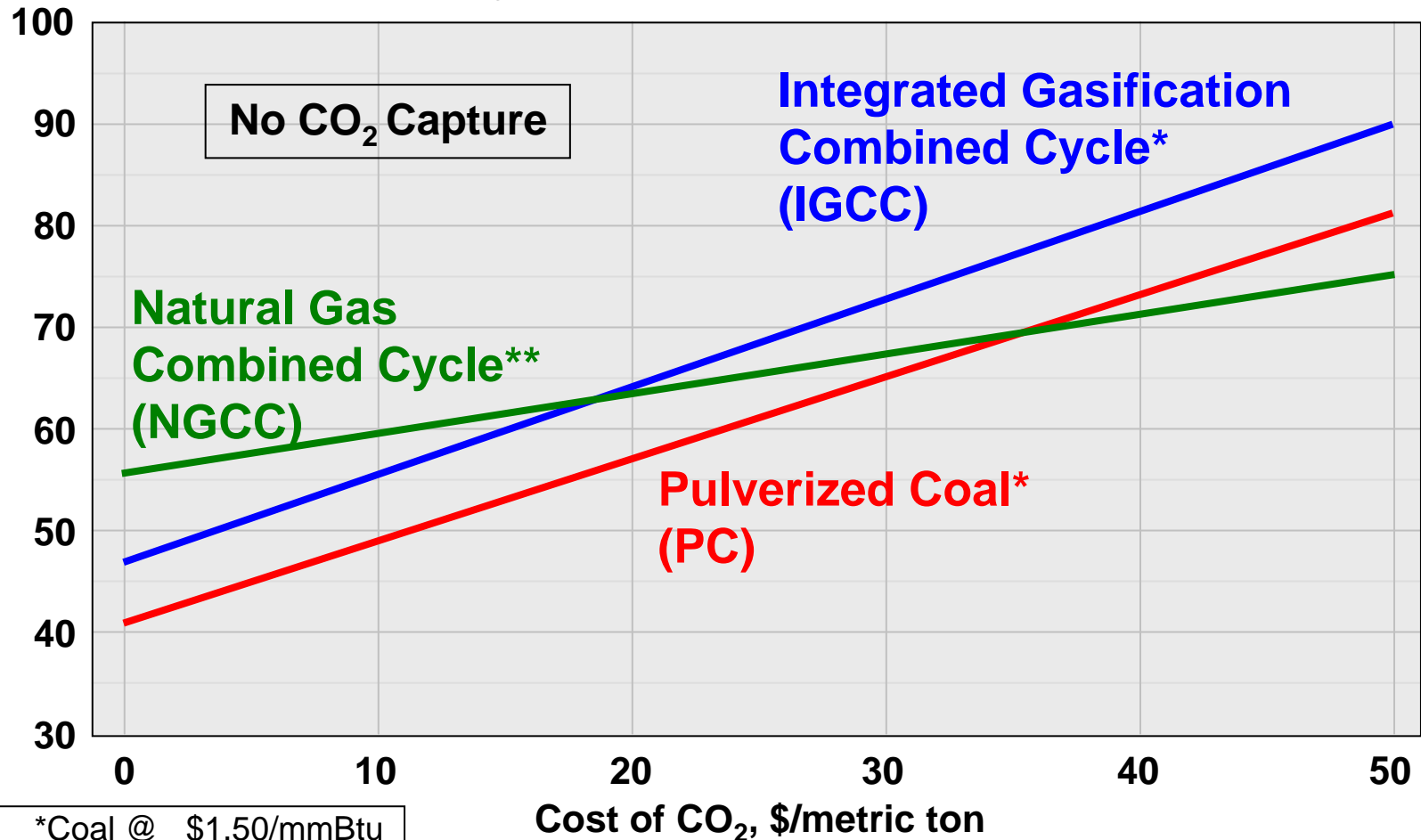
Levelized Cost of Electricity, \$/MWh



\*Coal @ \$1.50/mmBtu

# Fossil Fueled Technologies in 2010

Levelized Cost of Electricity, \$/MWh

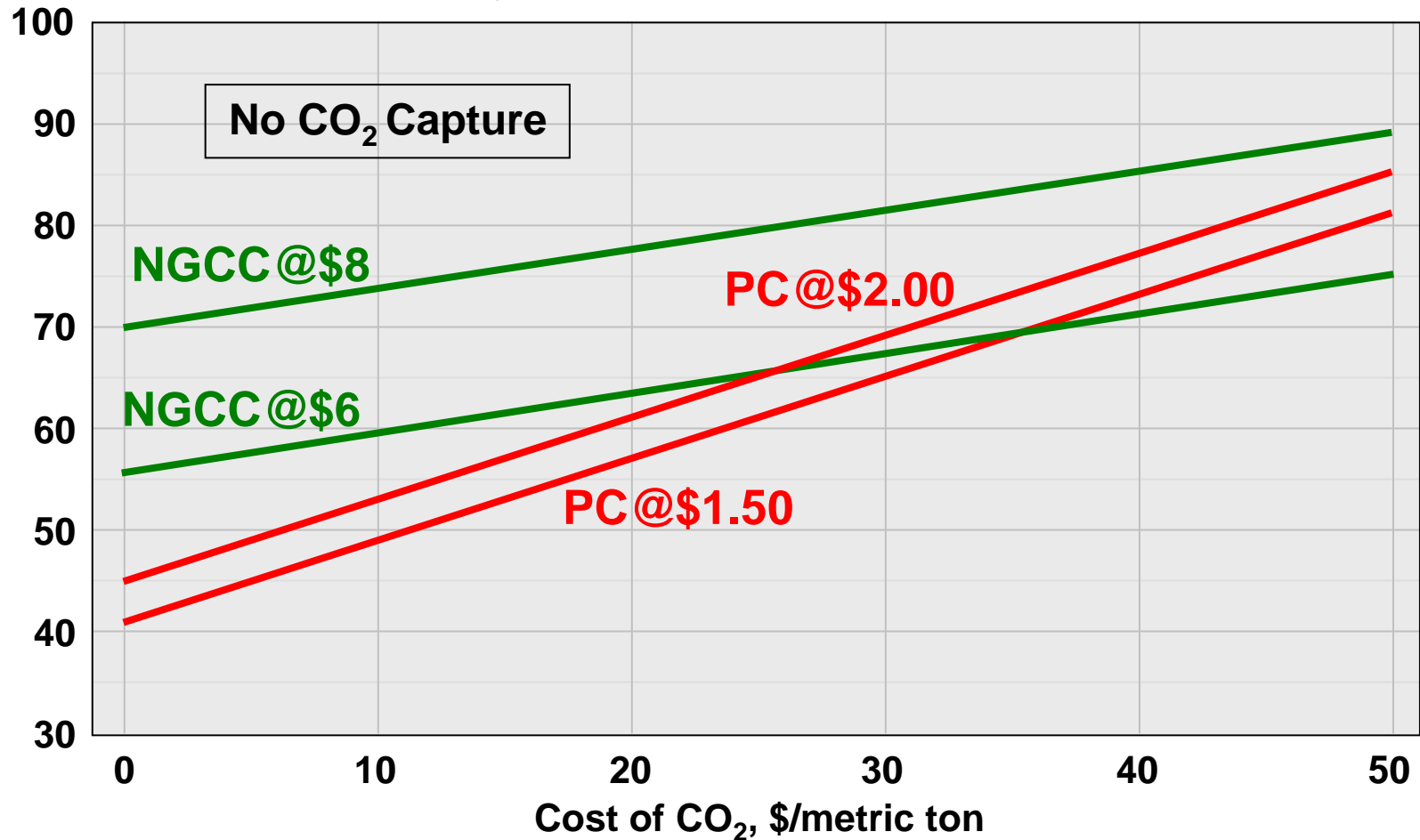


\*Coal @ \$1.50/mmBtu

\*\*Nat'l Gas @ \$6/mmBtu

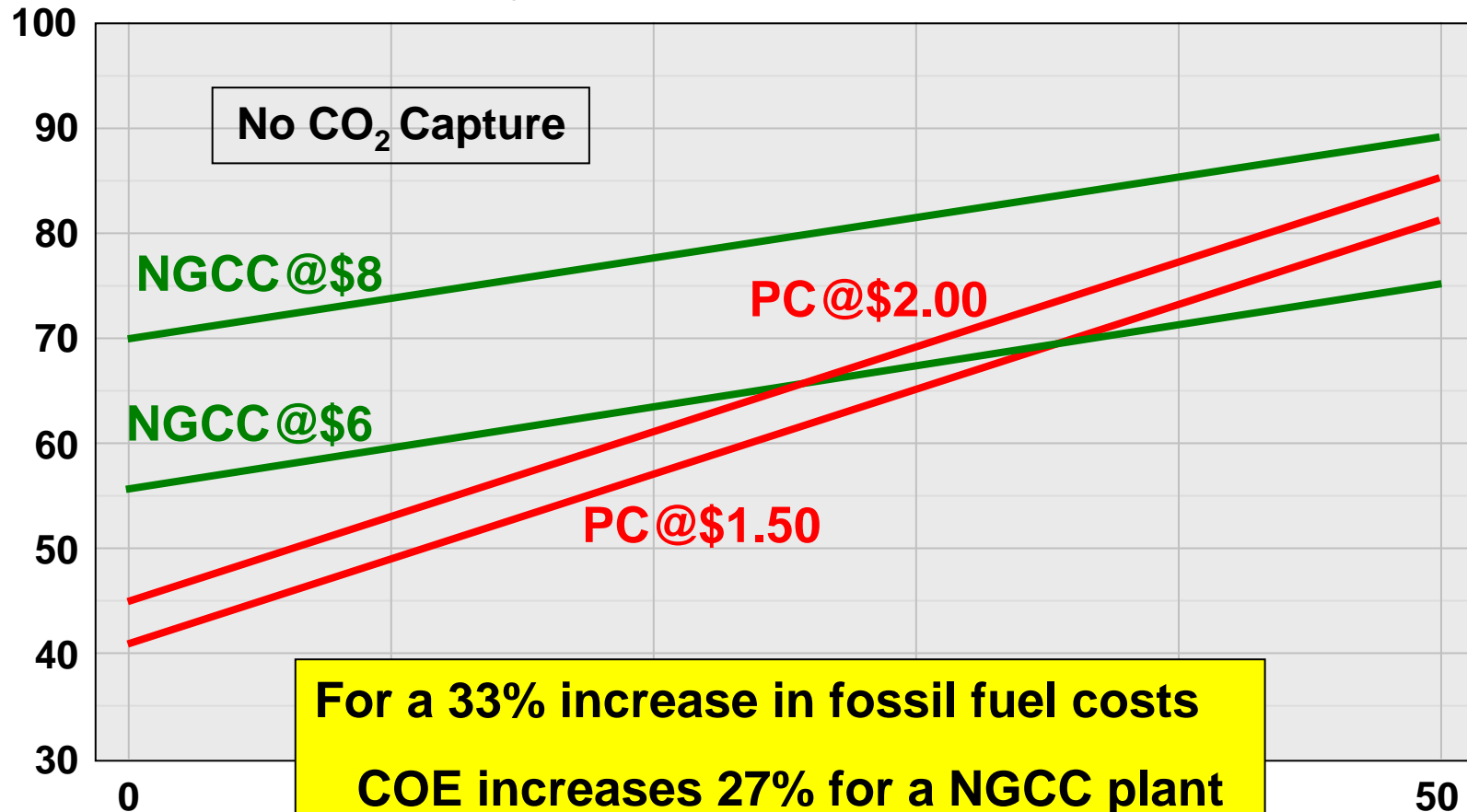
# Relative Sensitivities to Fossil Fuel Costs

Levelized Cost of Electricity, \$/MWh



# Relative Sensitivities to Fossil Fuel Costs

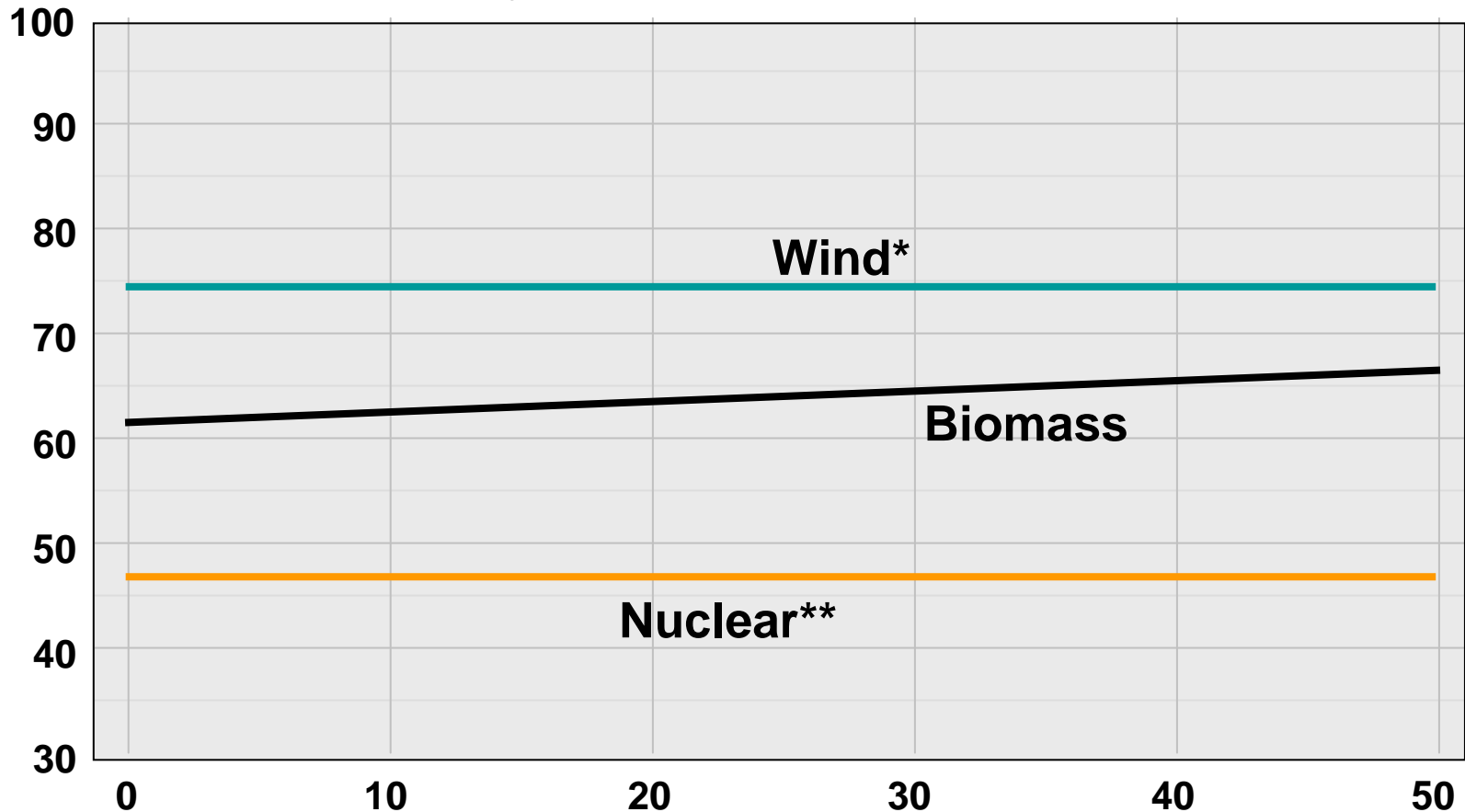
Levelized Cost of Electricity (COE), \$/MWh



**For a 33% increase in fossil fuel costs**  
**COE increases 27% for a NGCC plant**  
**COE increases 12% for a PC plant**

# Non-CO<sub>2</sub> Emitting Technologies in 2010

Levelized Cost of Electricity, \$/MWh

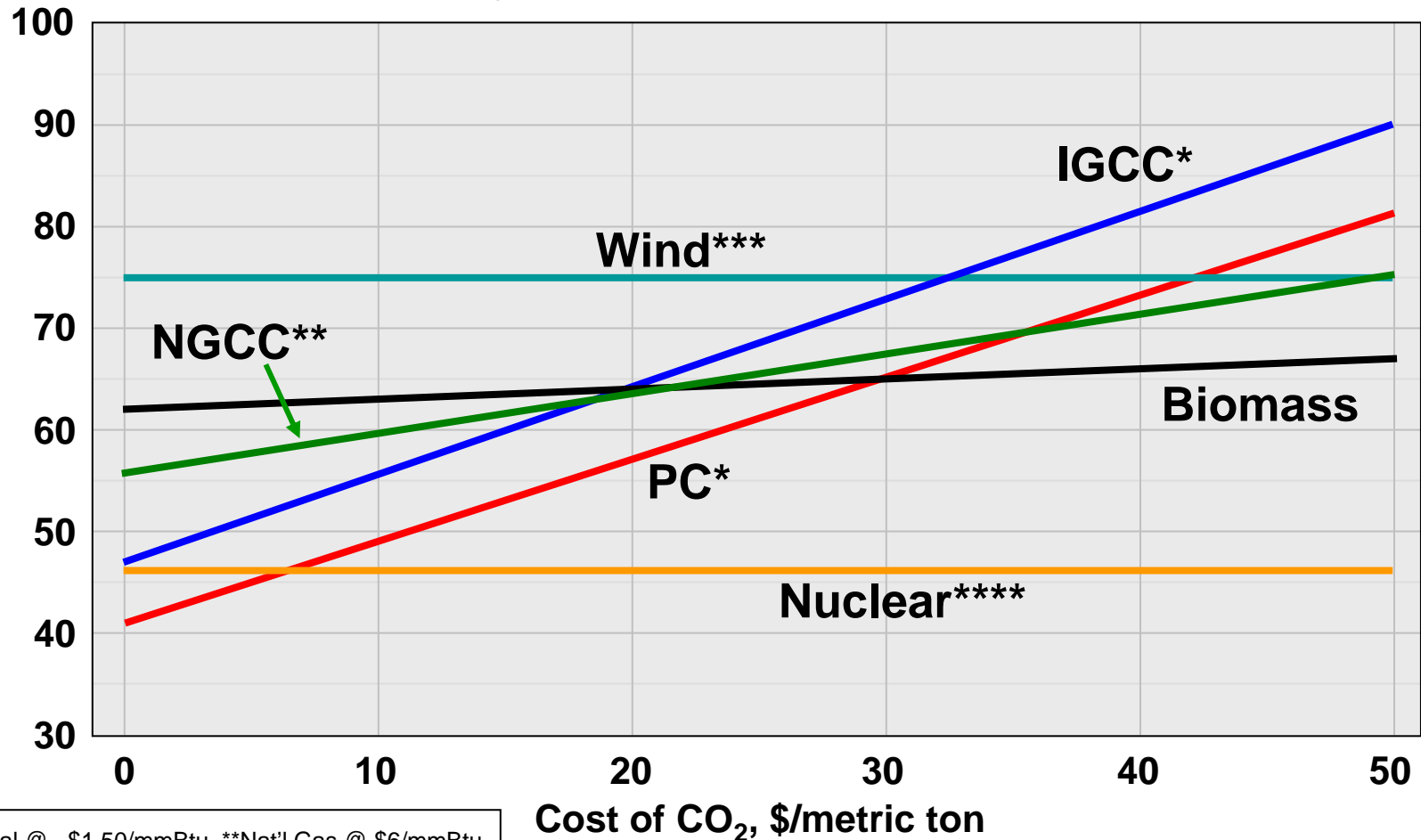


\* 29% Capacity Factor

\*\* \$1700/kw capital cost

# Comparative Costs of 2010 Generating Options

Levelized Cost of Electricity, \$/MWh

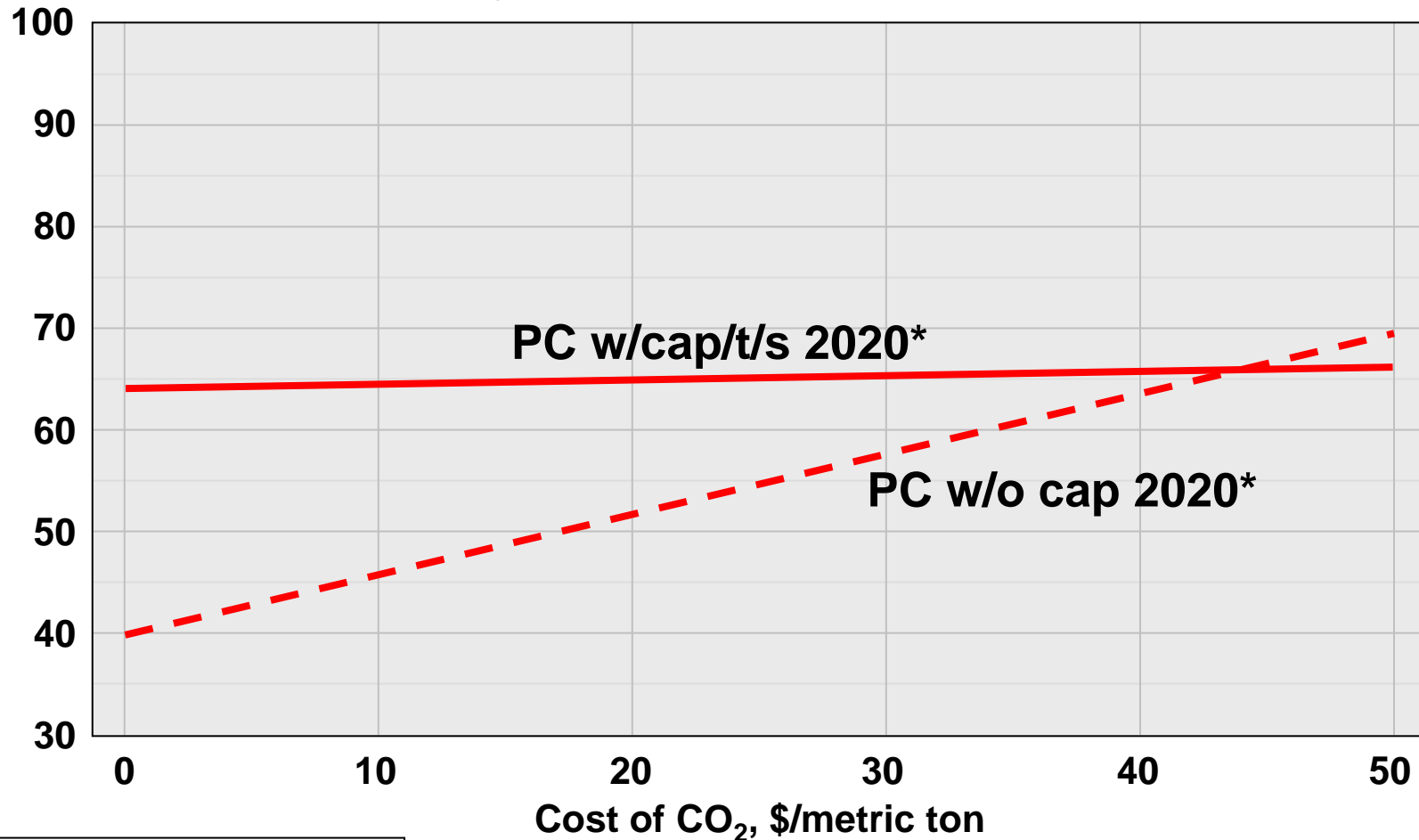


\*Coal @ \$1.50/mmBtu \*\*Nat'l Gas @ \$6/mmBtu  
 \*\*\*29% capacity factor \*\*\*\*\$1700/kw capital cost

# What's Possible By 2020

# Pulverized Coal with CO<sub>2</sub> capture/transport/storage

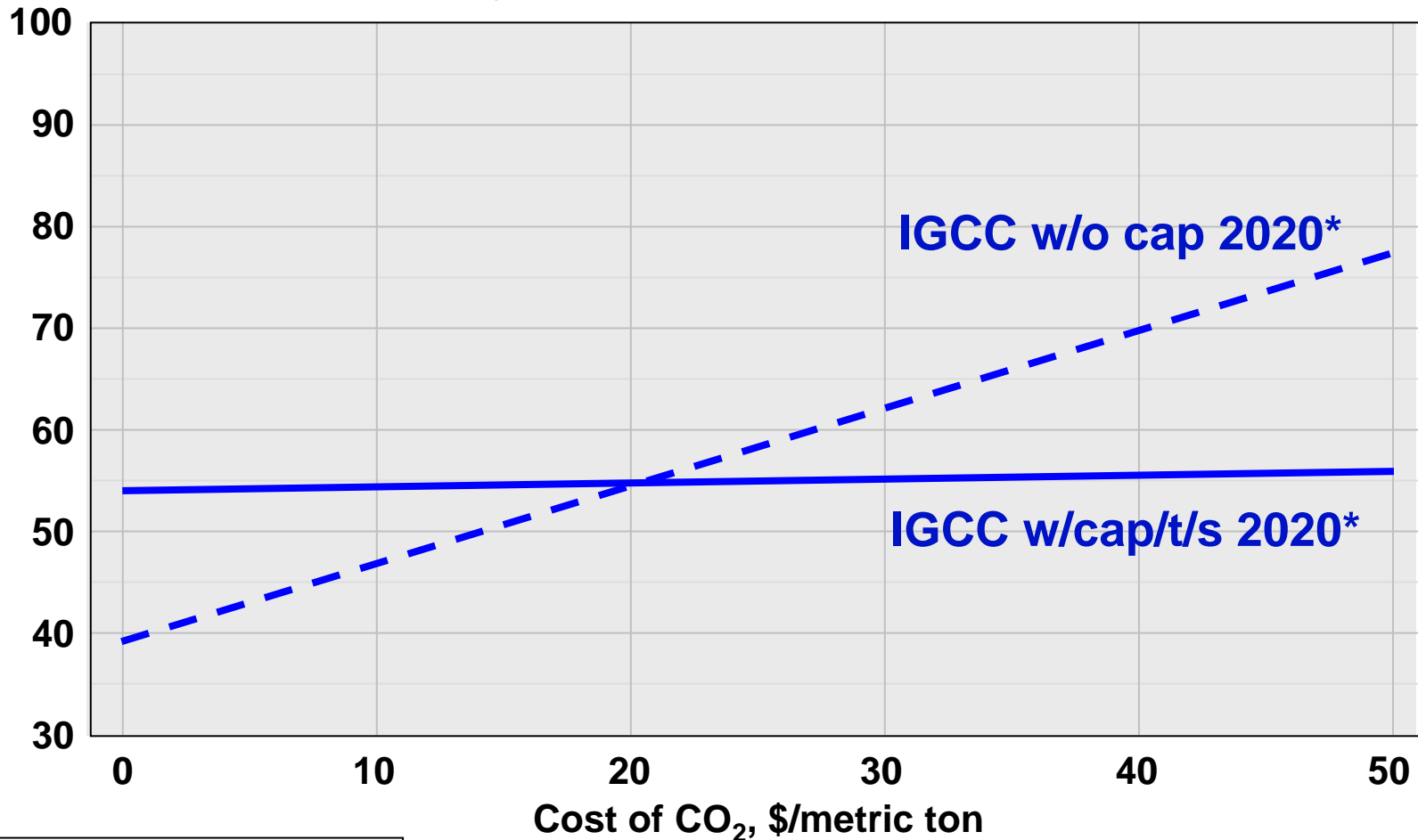
Levelized Cost of Electricity, \$/MWh



\*Coal @ \$1.50/mmBtu

# IGCC with CO<sub>2</sub> capture/transport/storage

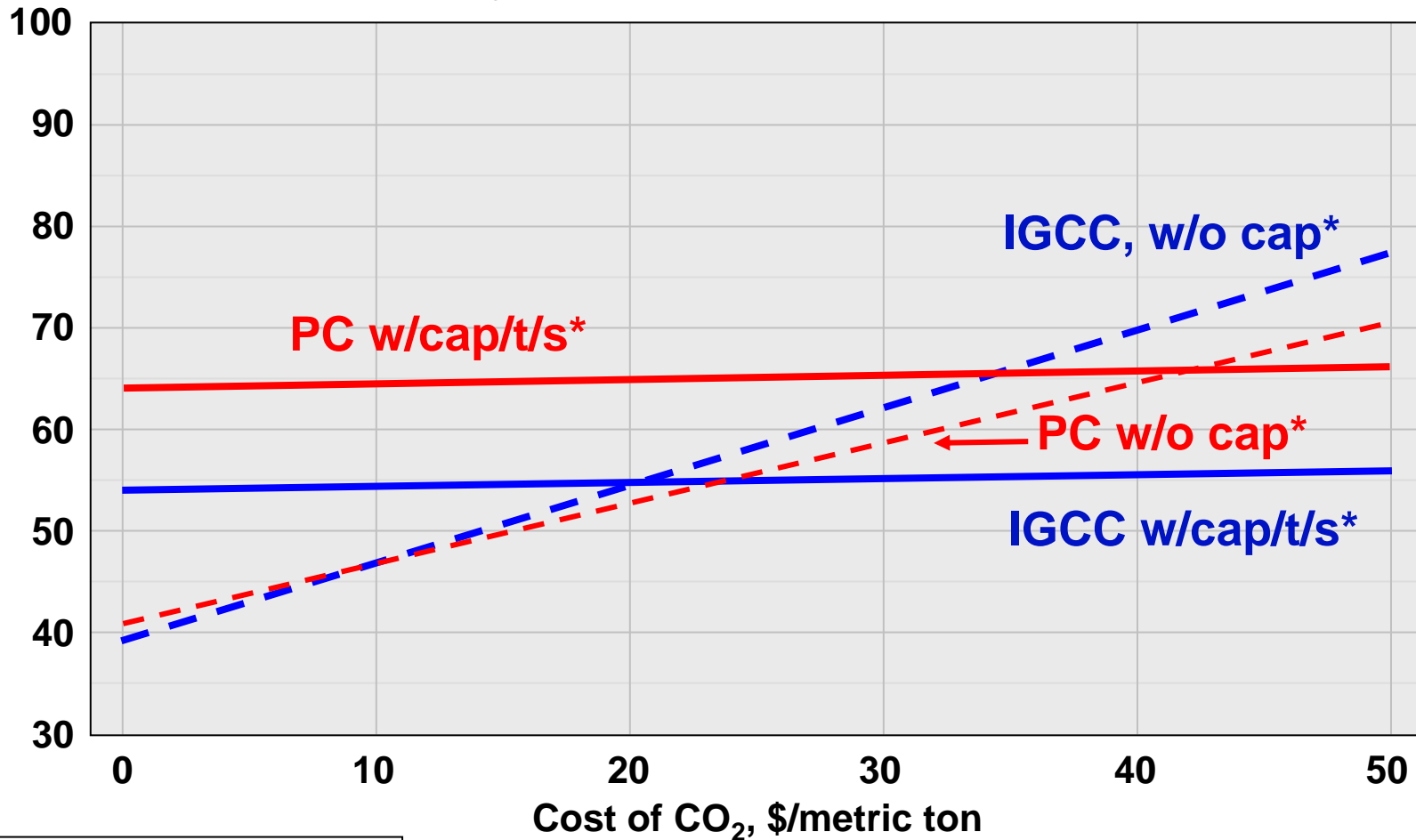
Levelized Cost of Electricity, \$/MWh



\*Coal @ \$1.50/mmBtu

# Comparison of IGCC and PC in 2020

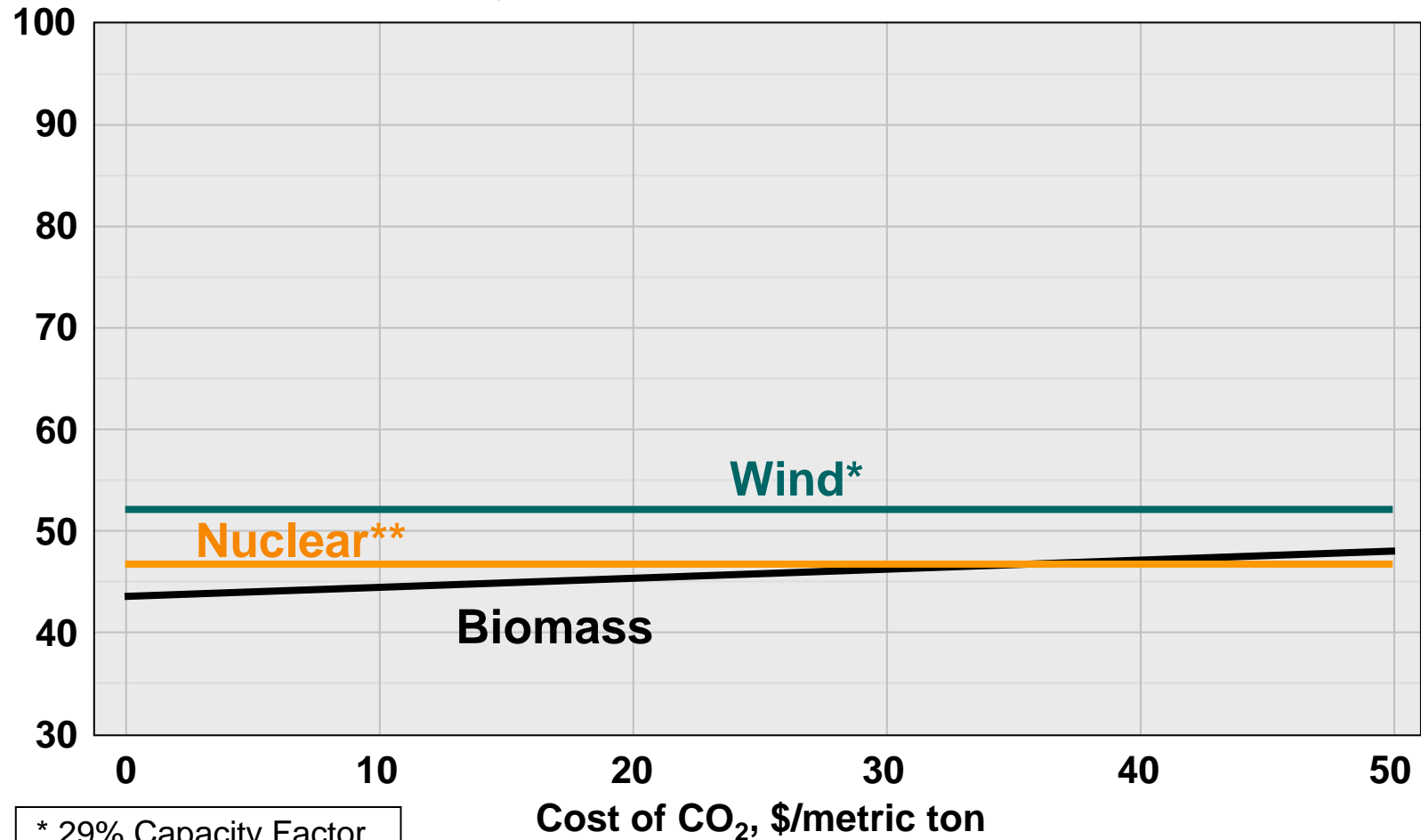
Levelized Cost of Electricity, \$/MWh



\*Coal @ \$1.50/mmBtu

# Non-CO2 Emitting Technologies in 2020

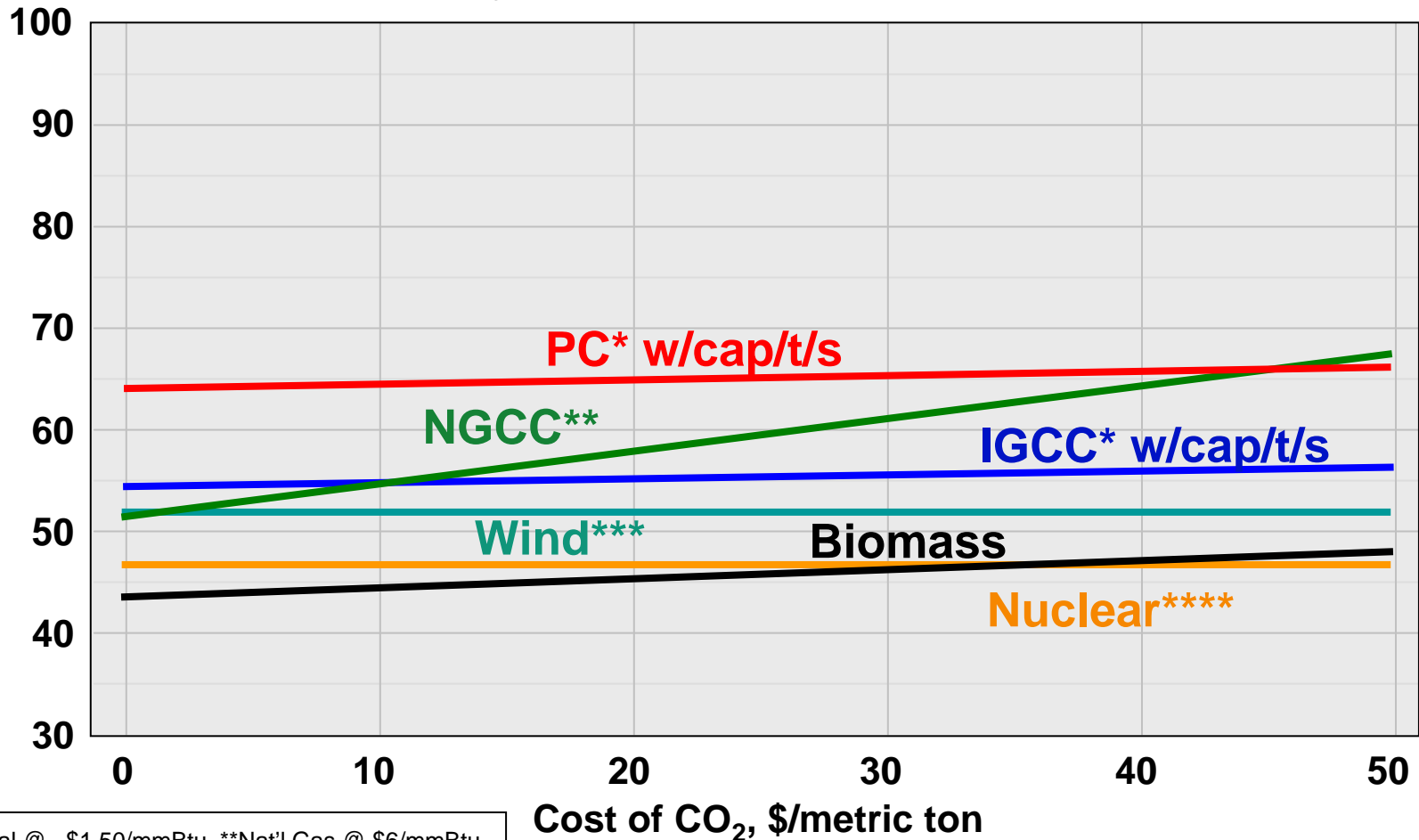
Levelized Cost of Electricity, \$/MWh



\* 29% Capacity Factor  
\*\* \$1700/kw

# Comparative Costs of 2020 Generating Options

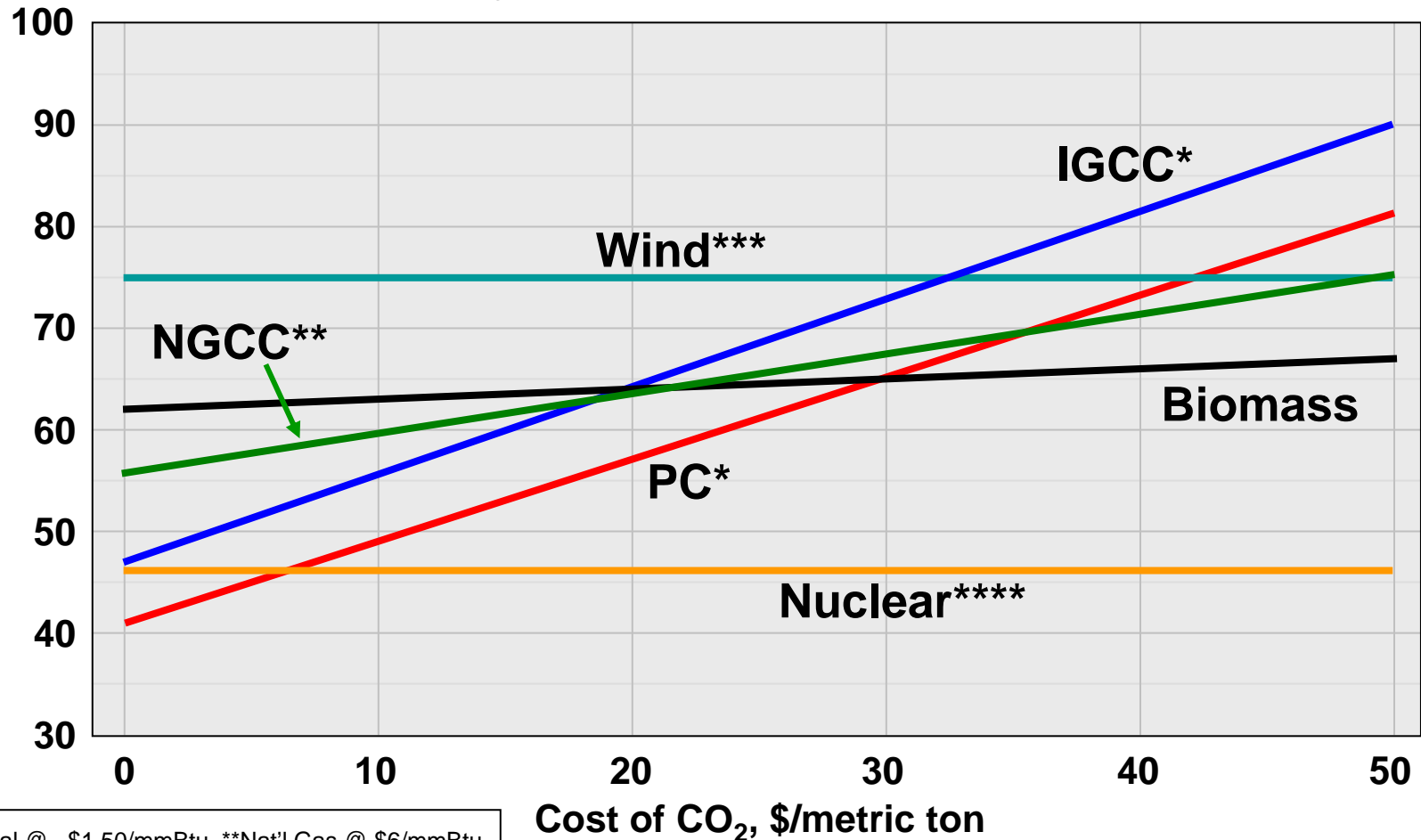
Levelized Cost of Electricity, \$/MWh



\*Coal @ \$1.50/mmBtu \*\*Nat'l Gas @ \$6/mmBtu  
 \*\*\*29% capacity factor \*\*\*\*\$1700/kw capital cost

# Comparative Costs of 2010 Generating Options

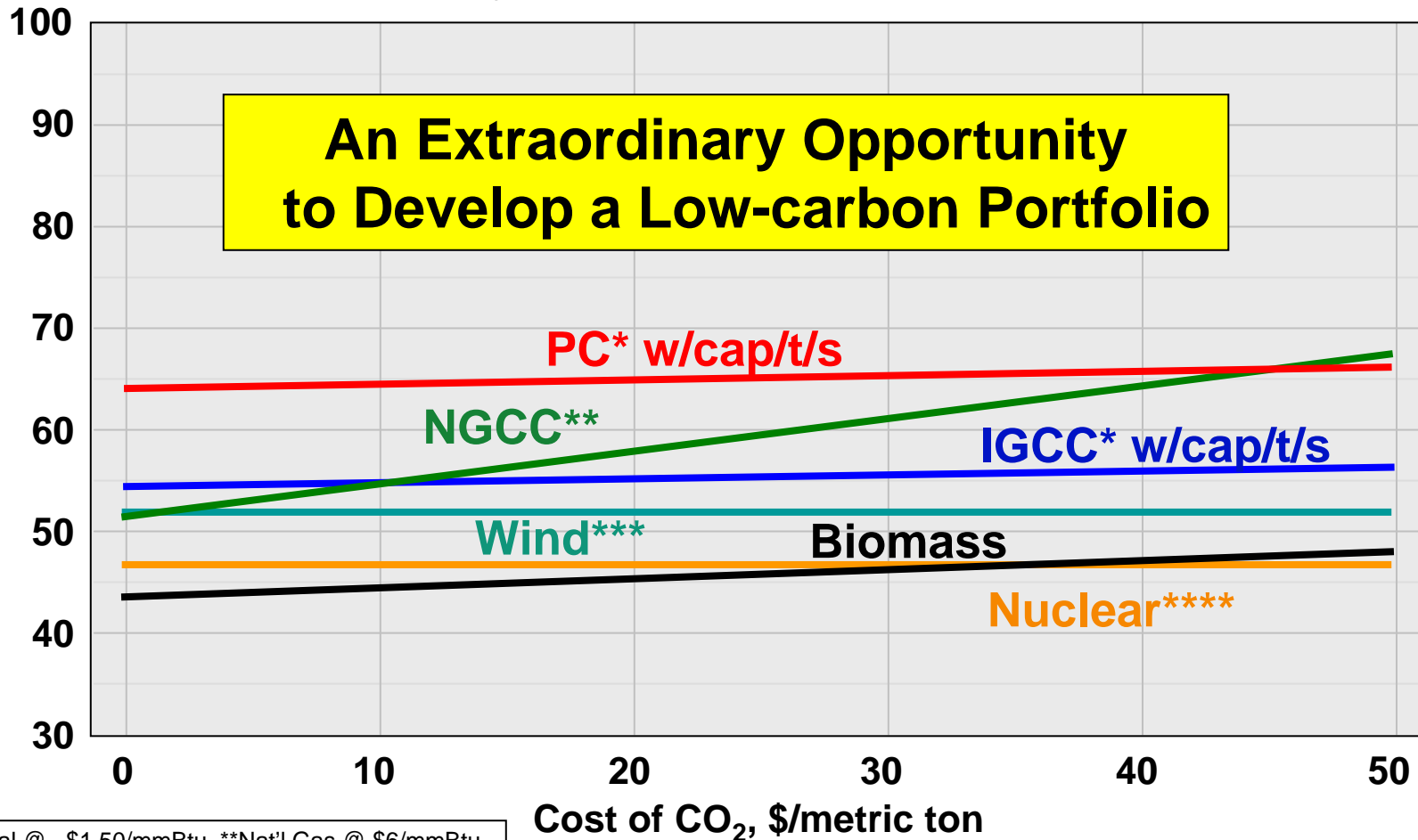
Levelized Cost of Electricity, \$/MWh



\*Coal @ \$1.50/mmBtu \*\*Nat'l Gas @ \$6/mmBtu  
 \*\*\*29% capacity factor \*\*\*\*\$1700/kw capital cost

# Comparative Costs of 2020 Generating Options

Levelized Cost of Electricity, \$/MWh



\*Coal @ \$1.50/mmBtu \*\*Nat'l Gas @ \$6/mmBtu  
 \*\*\*29% capacity factor \*\*\*\*\$1700/kw capital cost

# Closing Thoughts

- Four key uncertainties impacting near-term decisions on new generation:
  - Future cost of CO<sub>2</sub>
  - Future price of natural gas
  - Spent nuclear fuel storage
  - CO<sub>2</sub> capture and storage
- Extraordinary opportunity to develop and demonstrate a very low emissions portfolio of generation technologies by operation by 2020.

**Together...Shaping the Future of Electricity**

# Questions?

---

Contact:

Steve Gehl

EPRI

Ph: 650-855-2770

E-Mail: [sgehl@epri.com](mailto:sgehl@epri.com)