

# Commercial & Industrial

Market Applications

Today and Tomorrow

A novice's look at the experts'  
views

# Sectors

- ❑ Commercial power parks
- ❑ Industrial power quality
- ❑ Integrated building efficiency

# Issues for Each Sector

- ❑ Current applications & configurations
- ❑ Tomorrow's applications & configurations
- ❑ Needed federal actions

# What is a Hybrid System?

- ❑ Is it a combo of two or more technologies?
- ❑ Is it a combo of two or more "fuels"?
- ❑ Does a hybrid have to include natural gas device or source?
- ❑ Does it have to include renewable device or source?

# What is a Hybrid System?

- ❑ Must it contain storage?
- ❑ Are there size constraints?
- ❑ Should a hybrid include fuel cells?

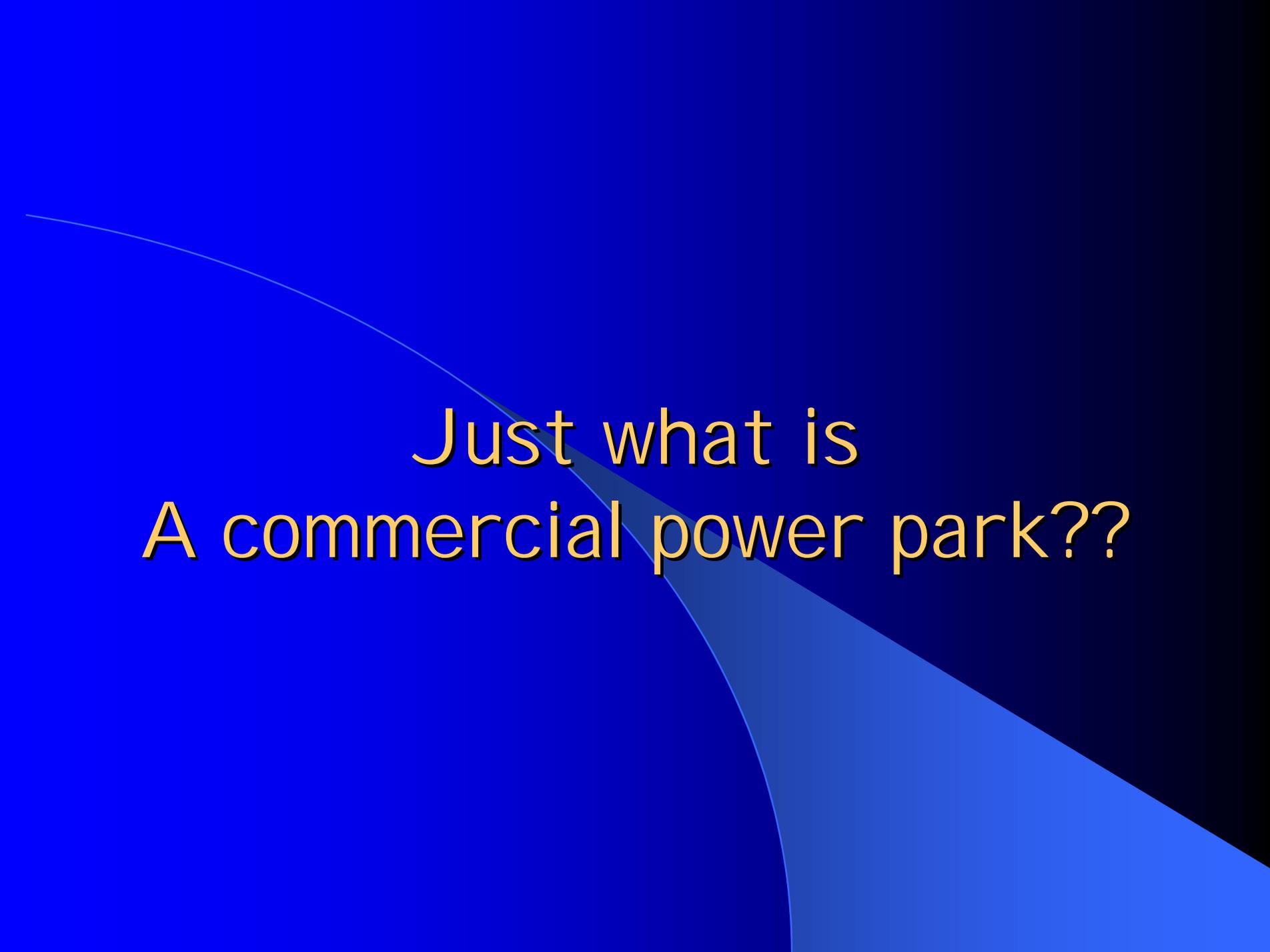
# What is a Hybrid System?

An apparent working consensus

- Sufficient conditions for a hybrid are that it:
  - be comprised of any two or more different conversion devices

OR

- rely on two or more different energy resources

The background is a solid blue color. A white curved line starts from the top left and curves downwards towards the center. A white circular shape is positioned in the lower right quadrant, partially overlapping the blue background.

Just what is  
A commercial power park??

# Commercial Power Park View 1

- A cogeneration operation
  - User interested in easy access to electricity, heat, process steam
  - From a variety of sources and generation technologies (coal, gas, biomass)
  - Readily available and inexpensive
  - Pulp and paper industry – e.g.

# Commercial Power Park View 2

- ❑ Commercial enterprises that require:
  - High power quality
  - High power availability
  - High reliability (redundancy)

# Park Characteristics

## View 2

- ❑ Typically a cooperative or region of commercial interests
- ❑ Gas turbines and microturbines and maybe other conversion devices
- ❑ Power network within park with some dedicated turbines
- ❑ Integrated with each other and grid

# Park Users View 2

- ❑ IT & high tech businesses
- ❑ Hospitals
- ❑ Universities
- ❑ Laboratories

# Commercial Power Park View 3

- Extend park to include:
  - Sport complexes
  - Industry
  - Other commerce
  - Other conversion technologies  
(anaerobic digestors)

# Commercial Power Park Compromise

- Include all views with emphasis on:
  - Need for high quality, availability and reliability
  - Use for high-tech industries, with nod to others
  - Use of a combination of conversion devices in a minigrid with connection to grid

# Commercial Park

## Today's applications/configurations

- All previous mentioned, plus:
  - Pig and dairy wastes, anaerobic digesters, wind turbines, gas turbines
  - Gas turbines (that use landfill and natural gas) in landfills
  - PV & wind to pump water

# Interlude

Controversy's candles have burnt out  
and all our issues stand tiptoe

# Commercial Park

## Today's drivers

- ❑ Tax incentives for customers
- ❑ Available waste material for CHP
- ❑ Available applications for CHP
- ❑ Need to avoid poor power or outages
- ❑ Real-time information for rates (to create a demand based on real cost)

# Commercial Park

## Today's drivers

- ❑ Environmental
- ❑ Deregulation
- ❑ Public relations benefits
- ❑ Transmission constraints
- ❑ Early adopters

# Commercial Park

## Improvements to increase markets

- ❑ Cost – cost – cost reductions
- ❑ Real-time pricing of energy
- ❑ Fairer pricing of natural gas for small users
- ❑ Deregulation to eliminate arbitrary utility barriers

# Commercial Park

Improvements to increase markets

- ❑ Low-cost, real-time communication control network
- ❑ Global warming response
- ❑ Interconnection standard
- ❑ Demand-side management
- ❑ Bundling power to build ability to optimize use of different sources

# Tomorrow's applications/configurations

— Wind + x —

— PV + x —

— Wave + x —

— Bio + x —

— Fuel cells + x —

# Tomorrow's applications/configurations

- systems with carbon sequestration —
  - PV reversible fuel cell —
  - Green power parks —
  - Bio + syngas + fuel cells —
  - Fuel cells in closed system —

# Tomorrow's Drivers

- ❑ Better economics than traditional systems
- ❑ Avoidance of T&D costs
- ❑ High quality and reliability, especially for special applications (high-tech, hospitals, etc.)

# Tomorrow's Drivers

- ❑ Energy independence
- ❑ Utility intransigence
- ❑ Increasing fossil prices (natural gas)
- ❑ Volatility of gas prices
- ❑ Land-use issues
- ❑ Pollution prevention
- ❑ High  $\eta$  hybrids

# Interlude

Will enterprises of great pith and moment in this regard their currents turn awry if they lose the name of federal action?

# Needed Federal Actions

- ❑ Fund demonstrations
- ❑ Create an organization focused on hybrids
- ❑ Look at long-term production and distribution
- ❑ Understand intermittency issues as they relate to hybrids

# More Federal Actions, Please

- ❑ Understand weather patterns (through better modeling)
- ❑ Support research to understand the effect of intermittency on the grid
- ❑ Promote FERC policies that support value of intermittencies

# Yet More

- ❑ Address stand-by charges at federal level
- ❑ Address interconnection standards at federal level
- ❑ Re-examine PURPA's 25% fossil limitation rule
- ❑ Examine gas quality and clean up standards for use in turbines and fuel cells

# Even More

- ❑ Understand the intermittency of renewables in DG environment and how to optimize configurations
- ❑ Determine the value of hybrids in the spot market
- ❑ Research the importance of increasing penetration of DG technologies in natural gas distribution infrastructure

# You want more!?

- ❑ Develop better tools for power flow analysis of T&D, especially wrt distributed generation
- ❑ Federal government should discuss (and practice) conservation

# There's the rub

For what dreams may come when we  
have shuffled off this immortal grid  
must give us pause