

State
Utility
Forecasting
Group

INDIANA ELECTRIC UTILITY INFRASTRUCTURE

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CHARACTERISTICS OF INDIANA ELECTRICITY INDUSTRY

- From the Energy Information Administration (2002)
 - Indiana had the 4th cheapest electricity
 - Indiana ranked 14th in generating capacity
 - Indiana ranked 10th in electricity generated
 - Indiana emitted the 3rd most sulfur dioxide
 - a contributor to acid rain
 - Indiana emitted the 2nd most nitrogen oxides
 - a contributor to smog
 - Indiana emitted the 4th most carbon dioxide
 - a contributor to global warming?

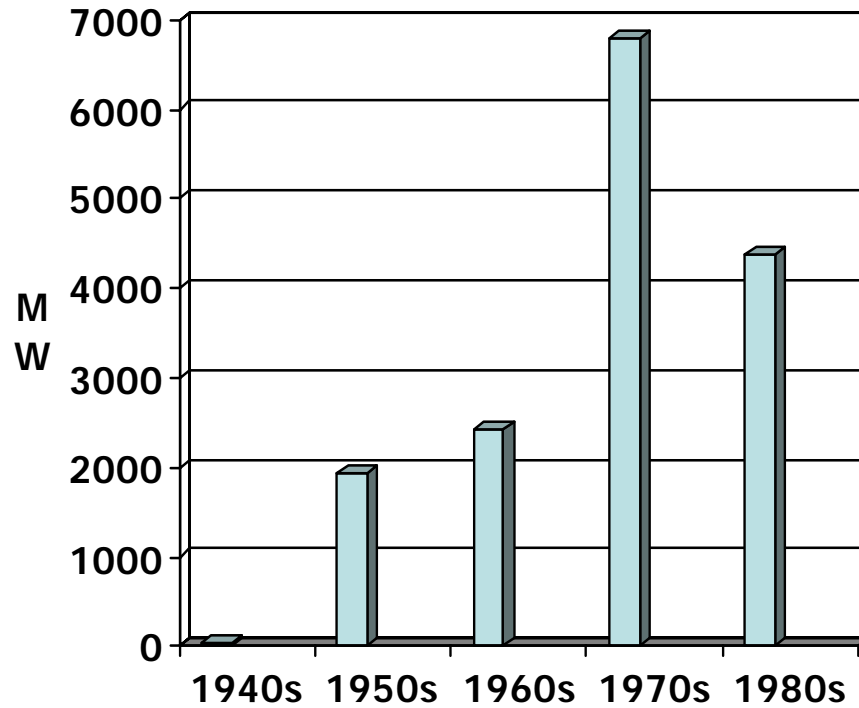
MORE CHARACTERISTICS OF INDIANA ELECTRICITY INDUSTRY

- **Percentage of Indiana electricity generated from various sources (EIA)**
 - **coal** **93.7%**
 - **natural gas** **3.0%**
 - **other gases** **2.4%**
 - **petroleum** **0.5%**
 - **hydroelectric** **0.3%**
 - **renewables** **0.1%**
- **Note: this is not the same as electricity consumed**
 - **Electricity does not recognize state borders**
 - **Indiana-Michigan Electric Co. has a large nuclear plant in Michigan which supplies a lot of electricity to Indiana**
 - **There are other plants outside the state that serve Indiana customers, as well as plants inside Indiana that export power**

COAL-FIRED GENERATION

- **Indiana ranks #2 in the nation in the amount of coal consumed by electric utilities**
- **That makes for a cheap, reliable source of electricity**
- **But it puts Indiana at risk for increased environmental regulations**
 - **Clean Air Act Amendments (1990)**
 - **Clean Air Interstate Rule (2005)**
 - **Clean Air Mercury Rule (2005)**
 - **New Source Review**
- **The coal-fired generation fleet is aging**
 - **No new plants in the last 20 years**

COAL-FIRED GENERATING CAPACITY BY DECADE INSTALLED



Decade	MW	# of Units
1940s	45	1
1950s	1937	20
1960s	2415	10
1970s	6799	17
1980s	4373	9

RETIREMENTS/REPOWERING OF COAL-FIRED GENERATORS

- **American Electric Power retires Breed Generating station (1993)**
- **In late 1990s, IPALCO retires Perry Generating Station from producing electricity (still makes steam)**
- **NIPSCO shuts down Mitchell Generating Station (2002)**
- **Cinergy converts Noblesville Generating Station from coal to natural gas (2003)**
- **Vectren announces shutdown of Culley unit 1 by end of 2006**
- **Causes**
 - **Environmental regulations**
 - **SO₂, NO_x, mercury**
 - **New source review**
 - **Age of plants**
 - **Maintenance costs**
 - **Efficiency**

ARE THERE OTHER PLANTS WITH SIMILAR CHARACTERISTICS?

- **Eagle Valley**
 - All units installed in the 1950s
 - All units less than 100 MW
- **Edwardsport**
 - Units installed in 1940s and 1950s
 - All units less than 100 MW
- **Other stations have a mix of older, smaller and relatively newer/larger units**

RECENT EVENTS

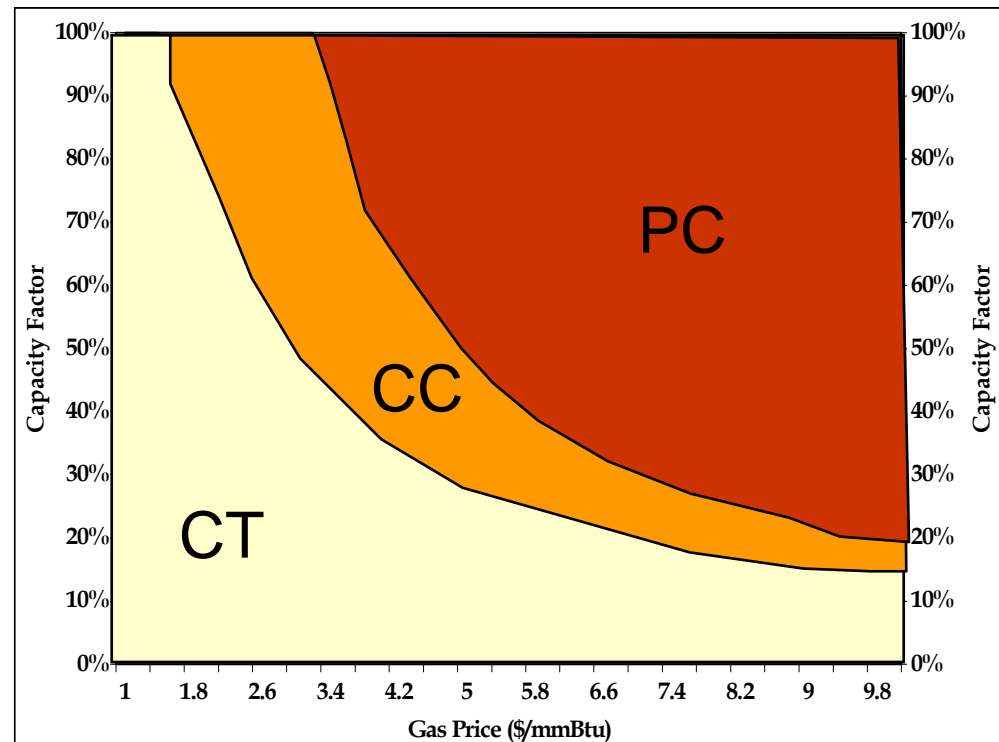
- **Federal action leads to increased wholesale market activity and opens the door to deregulation (1990s)**
- **Neighboring states pass deregulation laws (Illinois, Michigan, Ohio)**
- **Wholesale market price spikes in the Midwest (1998, 1999)**
- **Large numbers of merchant natural gas-fired generators are proposed/constructed (1999-2002)**
- **Natural gas prices increase dramatically**
 - **Wellhead prices in 1990s, generally < \$2/thousand cubic feet**
 - **Wellhead prices now, generally \approx \$5-\$6/thousand cubic feet**
- **Over-construction of plants keeps wholesale prices low**
 - **Merchant generators struggle to compete**

WHAT CAUSED THE RECENT RUSH TO NATURAL GAS?

- **Historically, the state (and region) has been long on baseload capacity and short on peaking capacity**
- **Fear of deregulation and stranded costs made utilities avoid large investments**
- **Price spikes of 1998 and 1999 brought new players to the market (merchant plants)**
- **All of the above favor new generation that is low construction cost/high operating cost (natural gas) over high construction cost/low operating cost (coal)**

ECONOMIC COMPETITION BETWEEN COAL AND NATURAL GAS

- Figure shows which type of unit is most economic at various usage levels for various natural gas prices
 - PC = Pulverized coal
 - CC = Combined cycle
 - CT = Combustion turbine
- Capital costs, maintenance costs, and efficiencies assumed by SUFG
- Coal cost is assumed to be \$1/mmBtu



ADDITIONAL FACTORS AFFECTING THE CHOICE BETWEEN COAL AND NATURAL GAS

- **Senate Enrolled Act 29 (2002) provides for a greater rate of return for regulated “clean coal” technologies**
- **Senate Enrolled Act 378 (2005) provides tax reductions for integrated coal gasification power plants**
 - **Approved by State Senate and House this week**
- **EPA issued its Clean Air Interstate Rule and Clean Air Mercury Rule (2005)**
 - **Clear Skies legislation proposed at the Federal level**

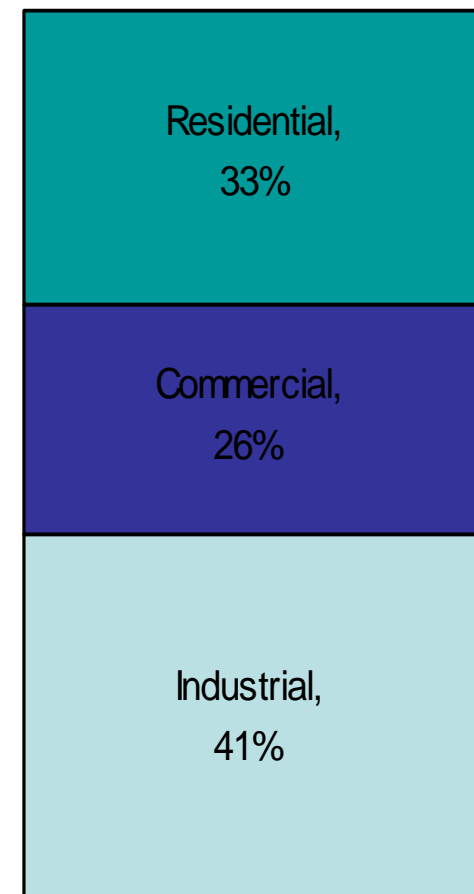
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- **This is SUFG's 9th set of electricity projections for Indiana since our formation in 1985**
 - It was released in 2003
 - The 10th set of projections is being prepared for release later this year
- **Projections of total electrical energy demand by residential, commercial and industrial sectors**
- **Projection of peak demand**
- **Projection of average energy prices**
- **Projection of capacity requirements**
- **Other issues of interest**

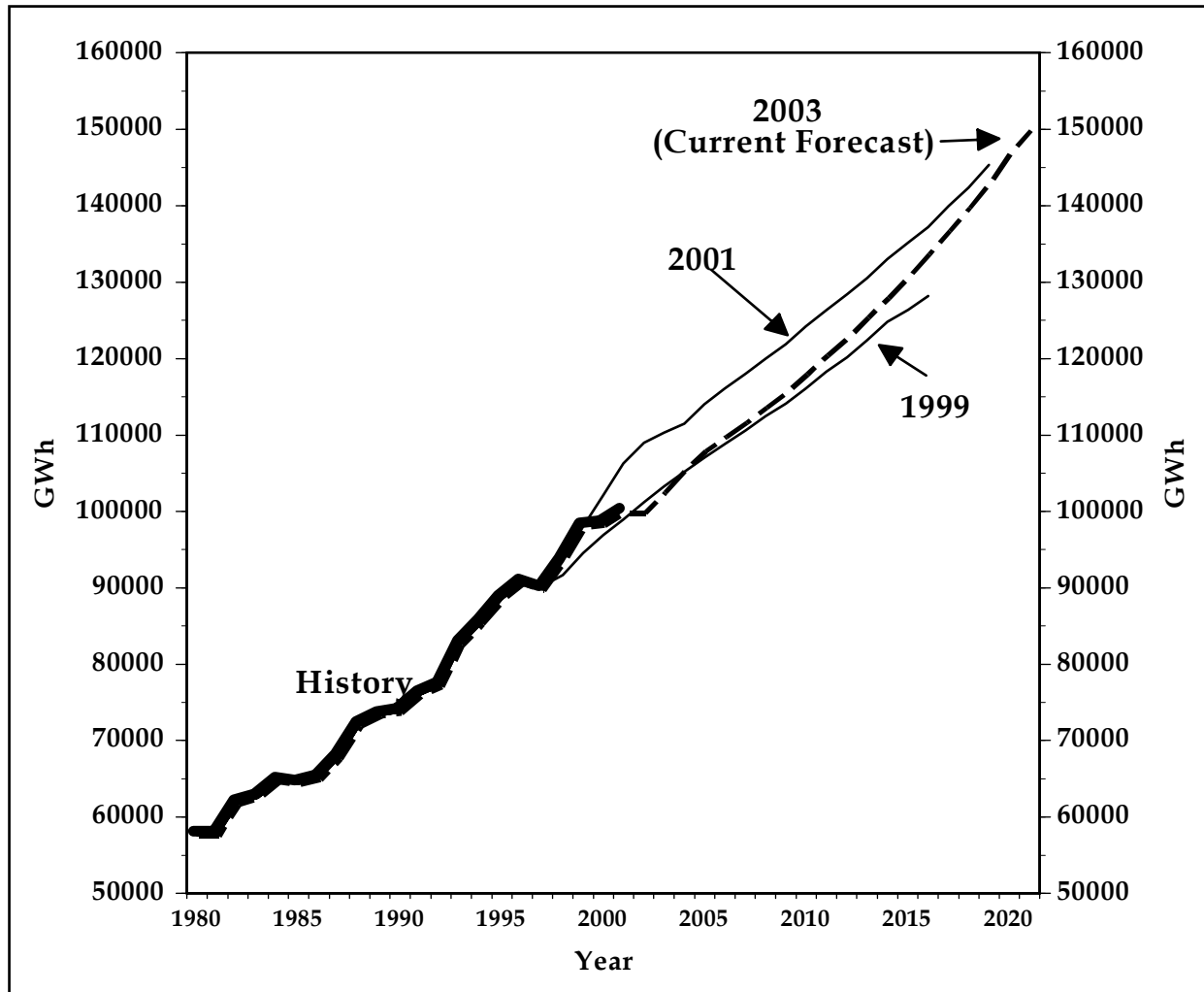
FORECASTING ELECTRICITY DEMAND BY SECTOR

- **RESIDENTIAL DEMAND**
 - Estimated from demographics, households, household income, and energy prices
- **COMMERCIAL DEMAND**
 - Estimated from floor space inventory, end use intensity, employment growth, and energy prices
- **INDUSTRIAL DEMAND**
 - Estimated from industrial activity and energy prices

(Approx Proportions)

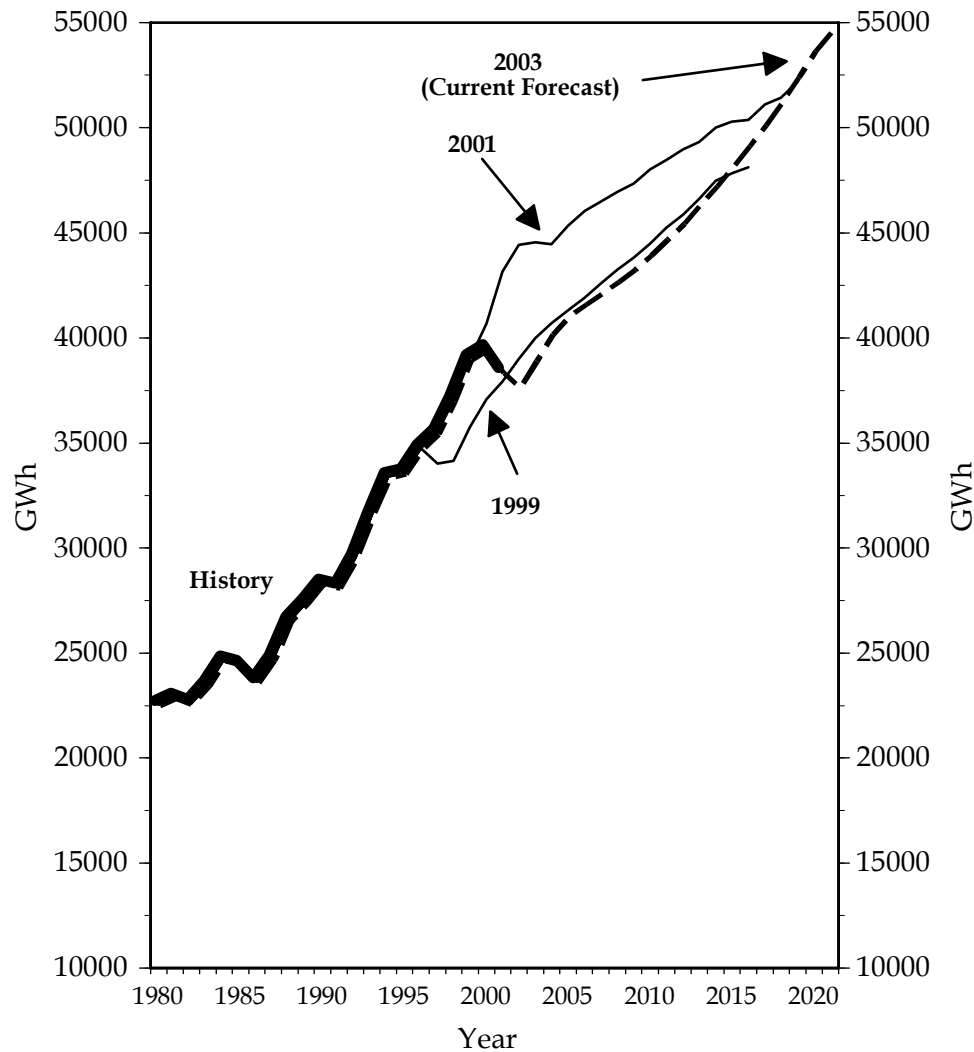


TOTAL INDIANA ELECTRICITY DEMAND (GWh)



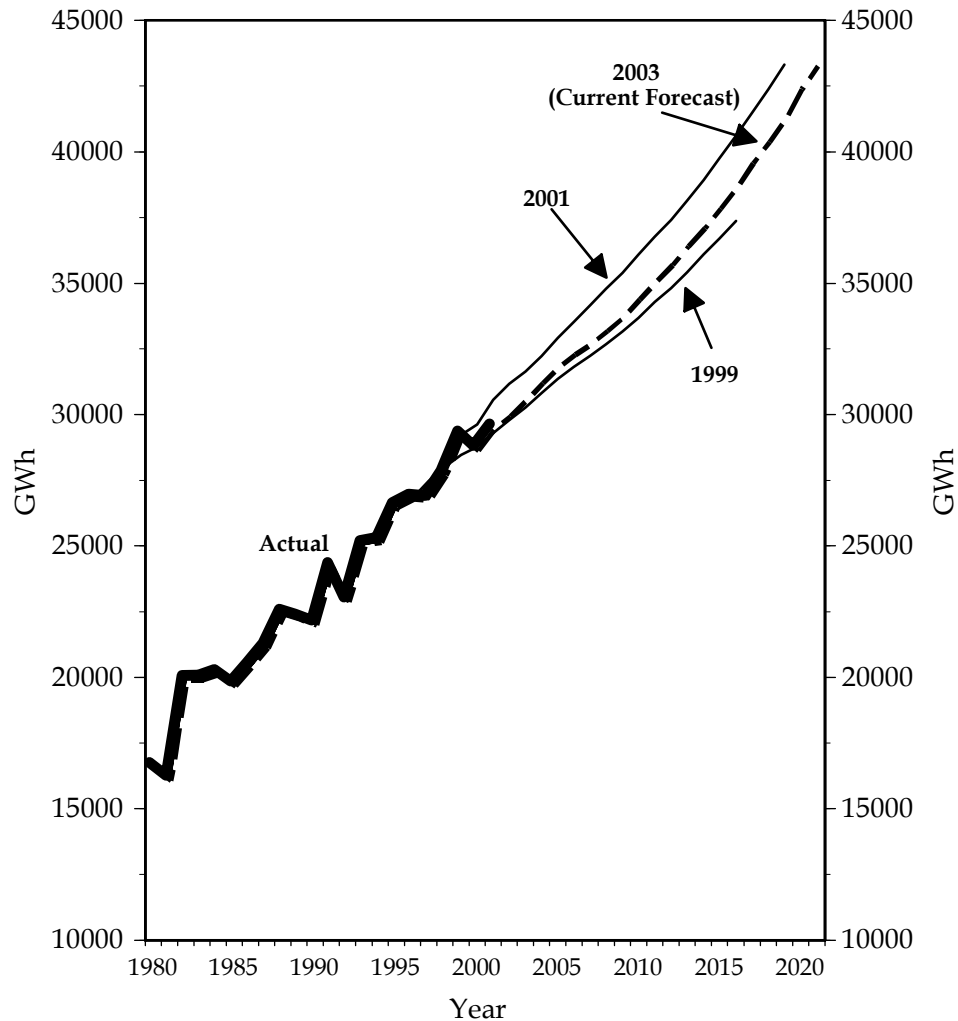
Estimated Annual Percent Growth
Residential 1.95%
Commercial 2.71%
Industrial 1.97%
Total 2.16%

TOTAL INDIANA INDUSTRIAL ELECTRICITY DEMAND (GWh)



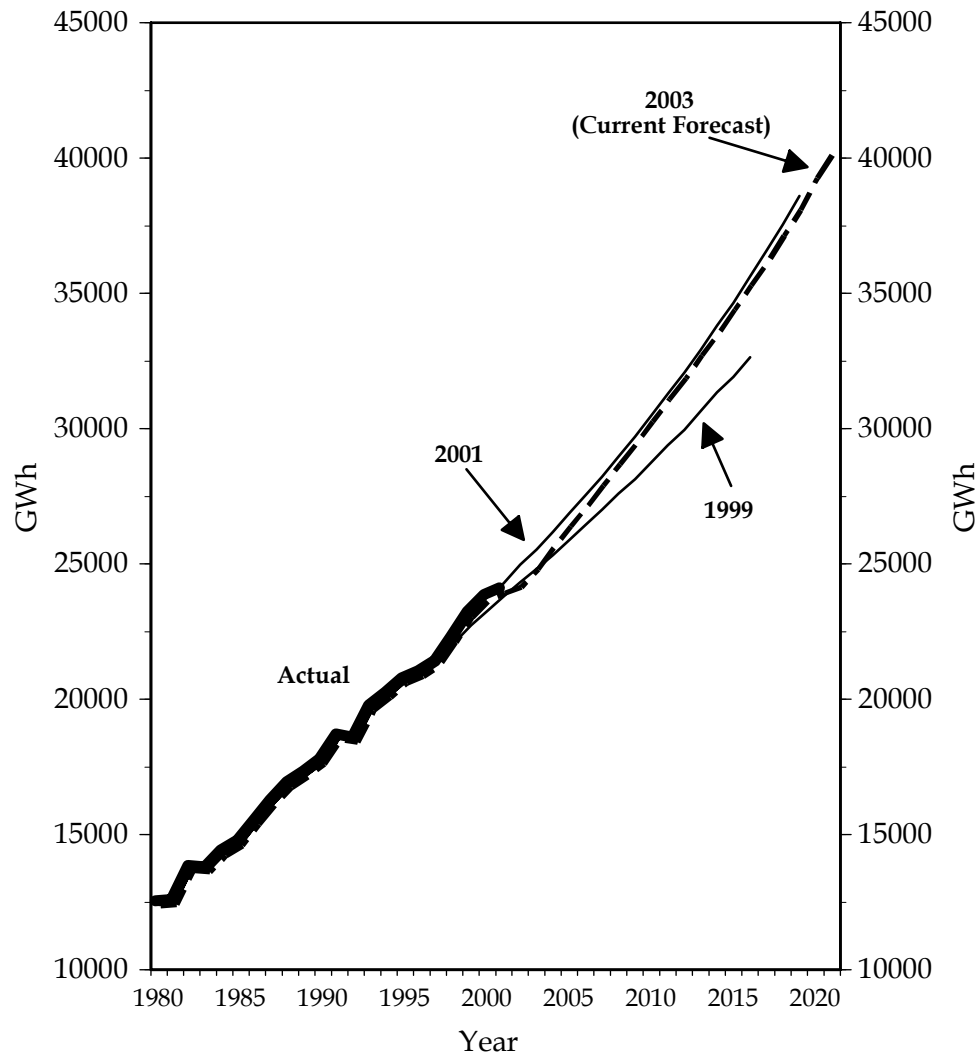
- **Industrial demand has been severely impacted by slowdown in manufacturing**

TOTAL INDIANA RESIDENTIAL ELECTRICITY DEMAND (GWh)



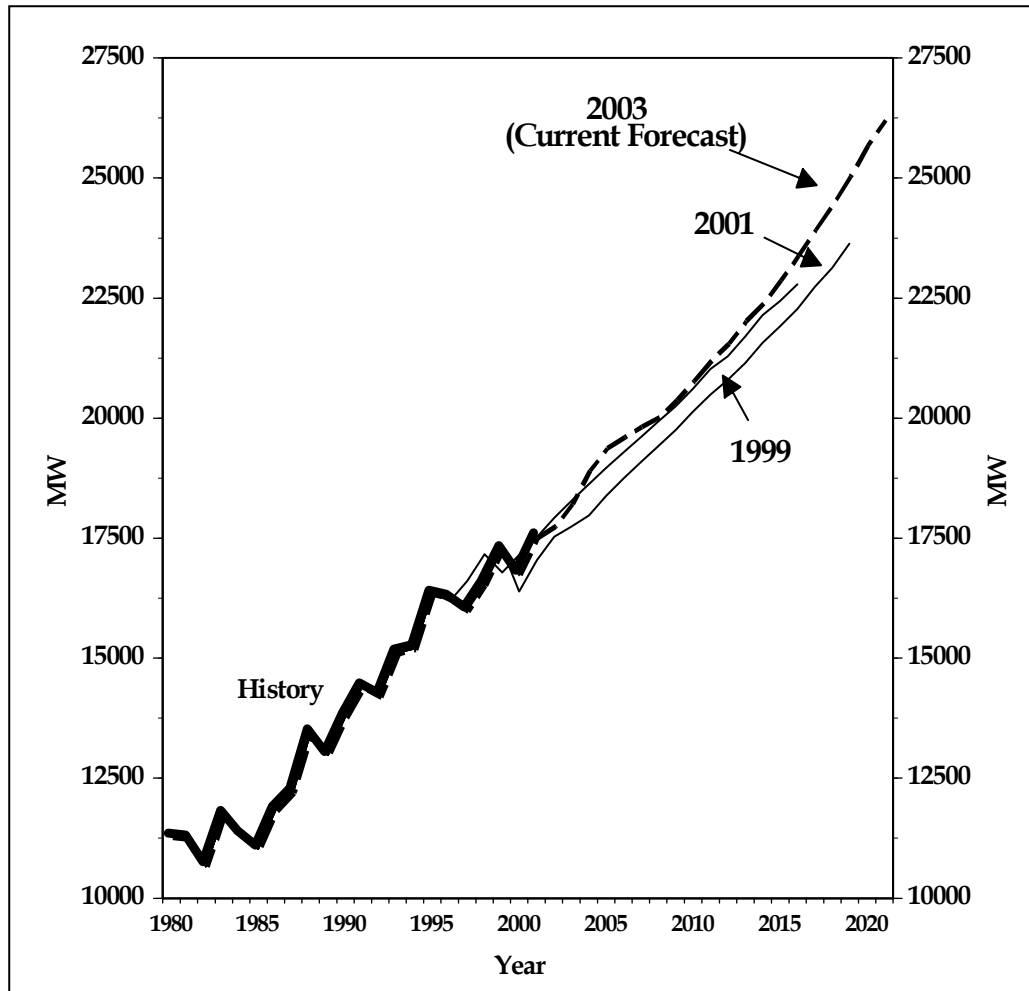
- Residential demand is impacted to a lesser degree by reduced household income

TOTAL INDIANA COMMERCIAL ELECTRICITY DEMAND (GWh)



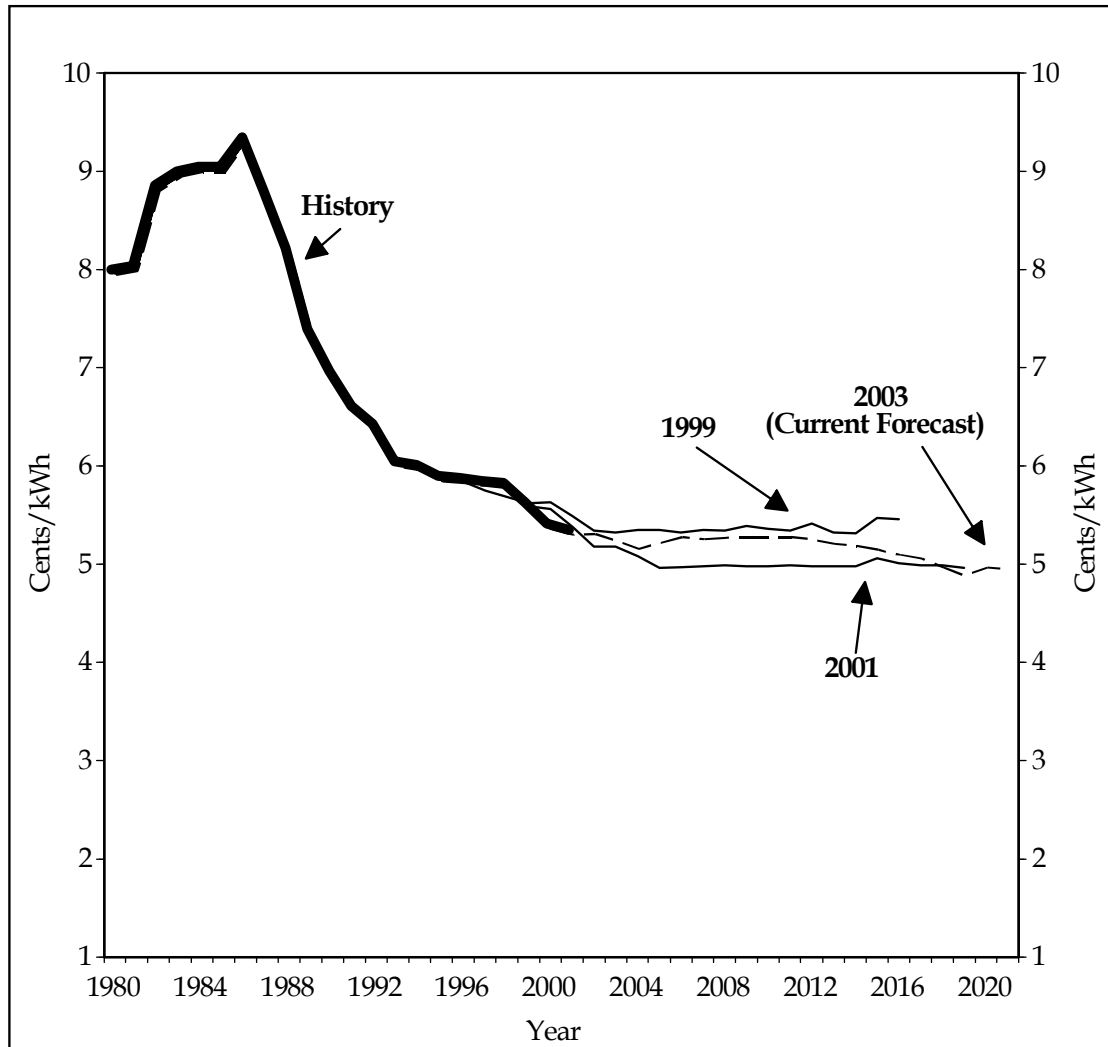
- **Commercial demand is so far relatively unaffected, and is forecast to grow at its brisk historical pace of recent years**

TOTAL INDIANA PEAK ELECTRICITY DEMAND



- Peak load demand is forecast at close to the 2001 estimate
- It is not as sensitive to the economy because it is driven by residential demand (especially air conditioning)
- Total energy is more influenced by industrial demand

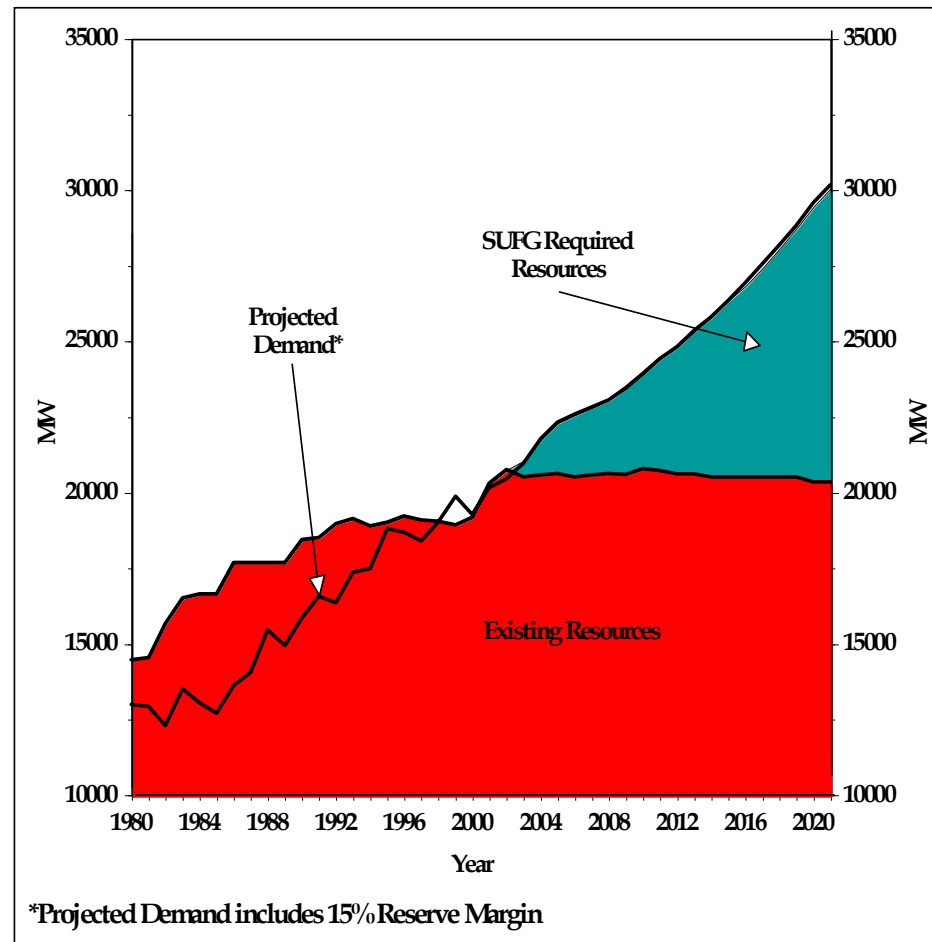
AVERAGE REAL INDIANA ELECTRICITY PRICE (\$2001)



- **Forecast is for largely stable average real energy prices**
- **Further declines are discouraged by needs for capacity**
- **The state's high fraction of coal-fired generation weighs against increases**

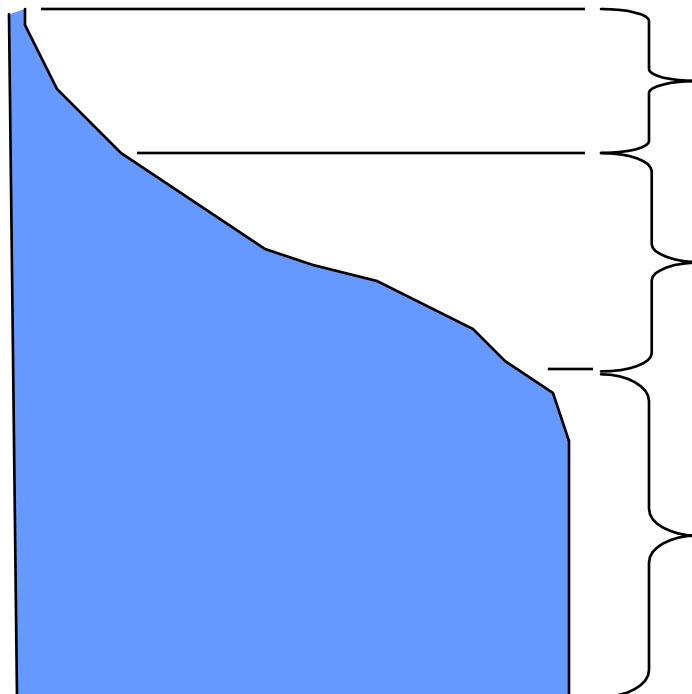
INDIANA UTILITY CAPACITY SHORTFALLS

- Existing and approved electricity utility supplies are forecast to fall short of predicted demand in both the near term and later
- This could be addressed by conservation, added purchases from merchant generators or other utilities, and/or constructing new capacity



CATEGORIES OF LOAD AND GENERATION

Relative
Load



Peak Load: Lower Capital,
High Operation Cost
- typically natural gas-fired

Cycling Load: Moderate Capital,
Moderate Operation Cost
- typically mix of gas and small coal-fired

Base Load: High Capital,
Low Operation Cost
- typically large coal-fired

Fraction of Hours

INDIANA CAPACITY REQUIREMENTS BY TYPE

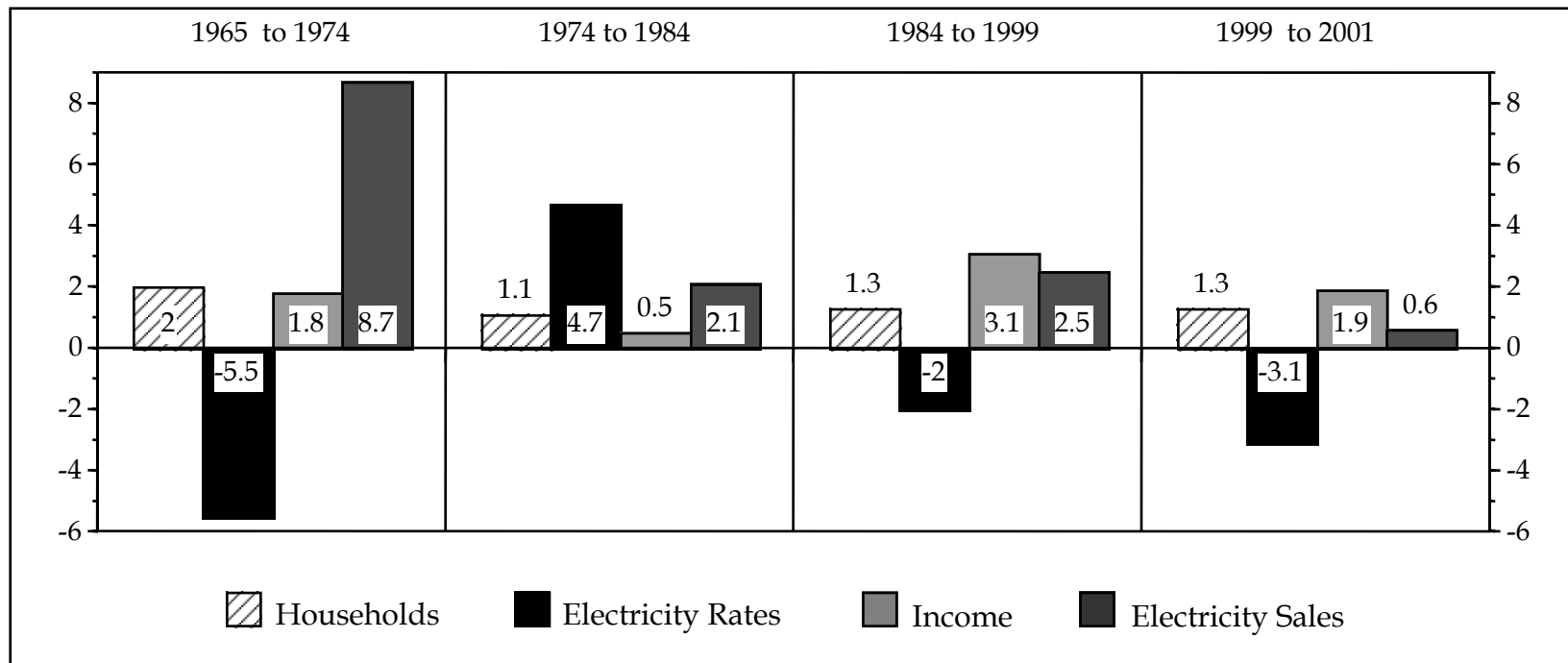
- Previous forecasts have identified shortfalls, but 2003 shows some acceleration
- Other recent forecasts showed greatest need in Peaking capacity
- This is the first SUFG forecast that has the greatest need in Base Load capacity

	Fore- cast	Peak	Cycl- ing	Base Load	Total	Pct 2002 Cap
5-year Shortfall (MW)	2003	650	740	1060	2450	10.7%
	2001	820	520	770	2110	9.2%
	1999	1250	200	500	1950	8.5%
10-Year Shortfall (MW)	2003	1030	1220	2480	4730	20.7%
	2001	1170	1090	1580	3840	16.8%
	1999	1700	200	1500	3400	14.9%

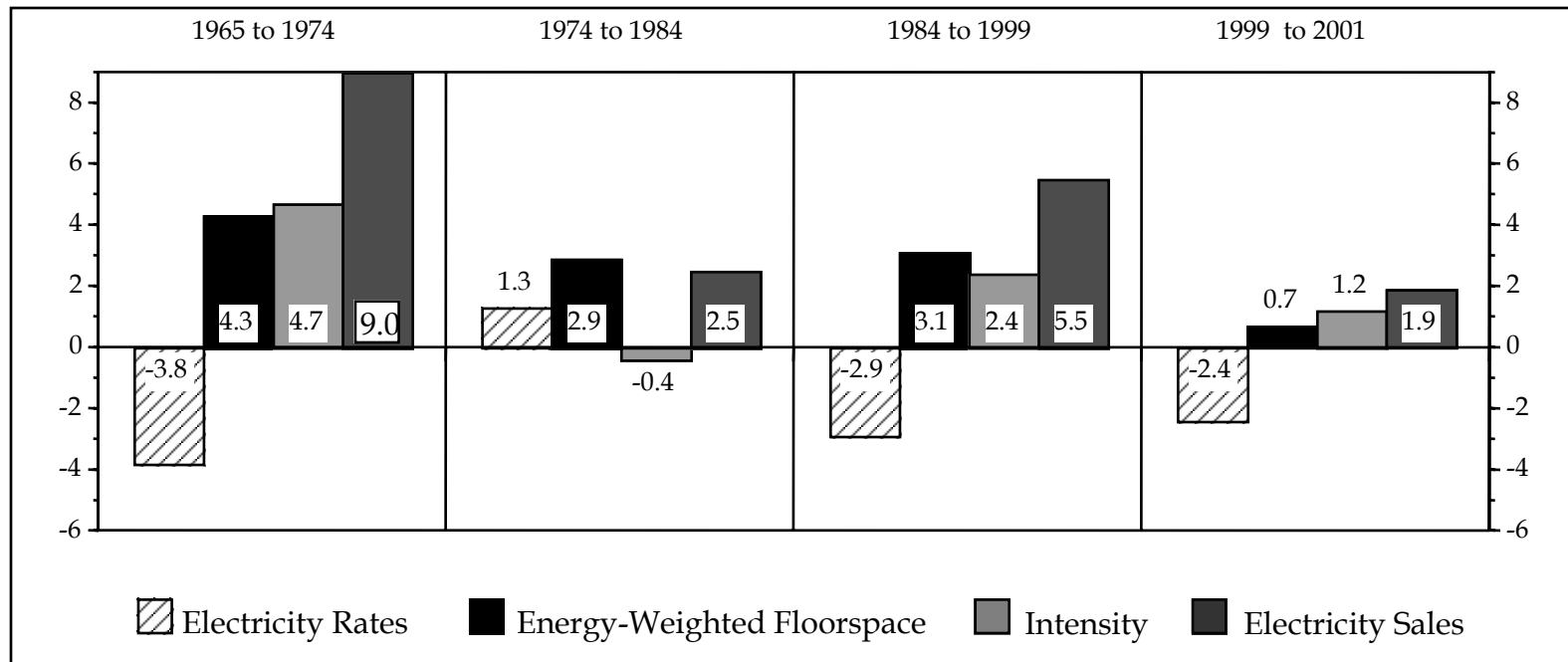
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SUPPLEMENTAL SLIDES

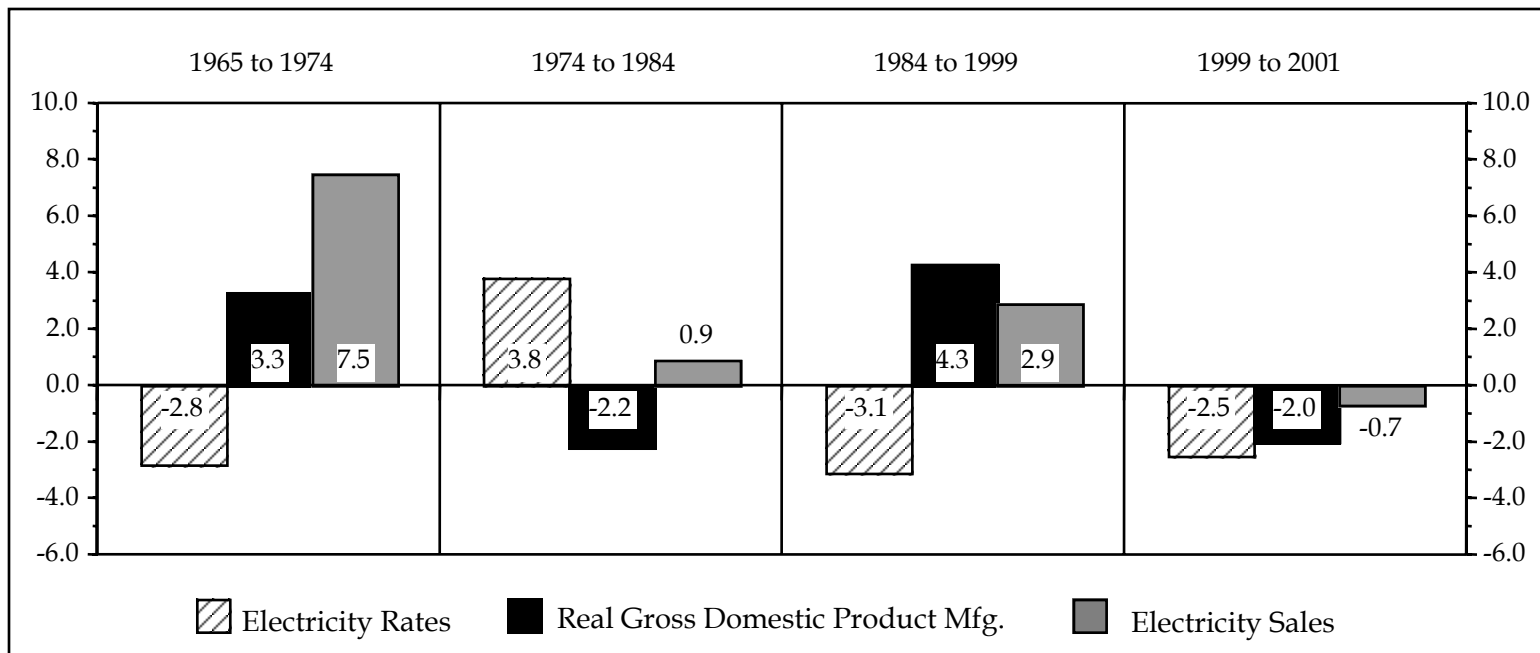
STATE HISTORICAL TRENDS IN THE RESIDENTIAL SECTOR (ANNUAL PERCENT CHANGE)



STATE HISTORICAL TRENDS IN THE COMMERCIAL SECTOR (ANNUAL PERCENT CHANGE)



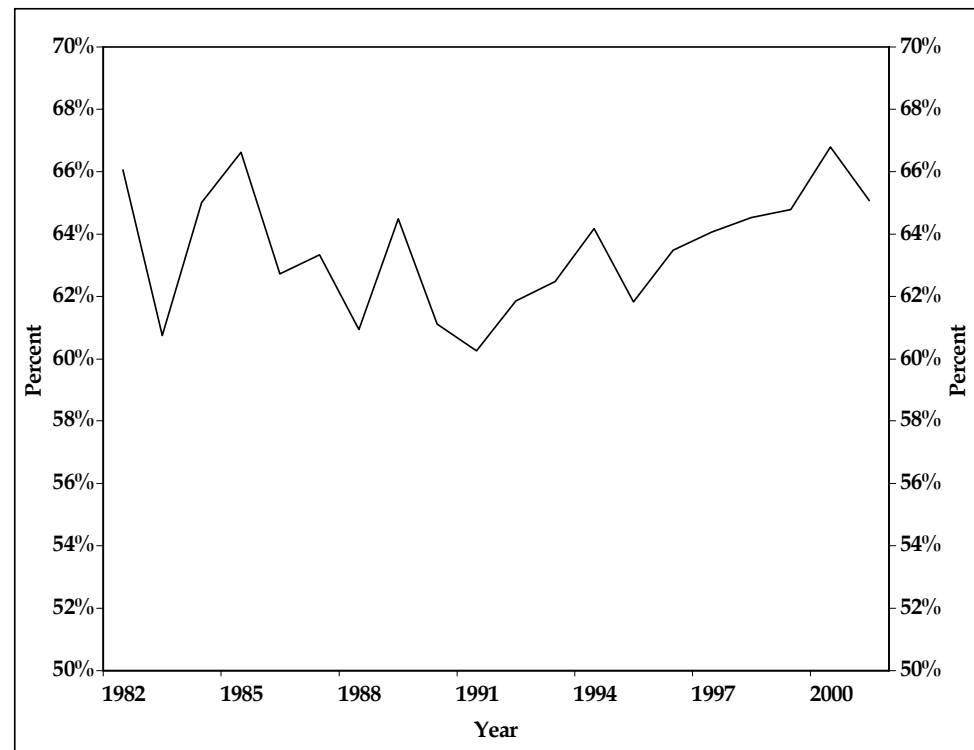
STATE HISTORICAL TRENDS IN THE INDUSTRIAL SECTOR (ANNUAL PERCENT CHANGE)



IMPACT OF THE ECONOMY ON ELECTRICITY CAPACITY USAGE

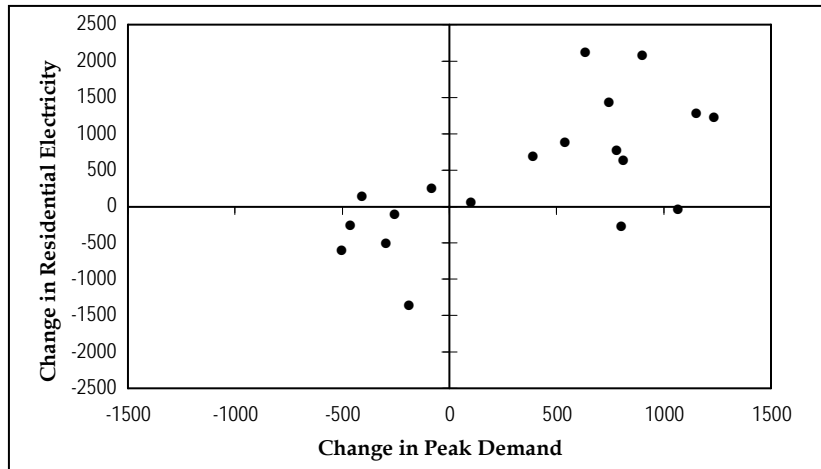
- **Load factor decreases when peak demand grows faster than total energy**
- **Large variations in load factor occur from year to year due to weather variations**
- **The lowest load factors occur during the slow economic periods of the early 1980s and 90s.**

Historical Statewide Load Factor

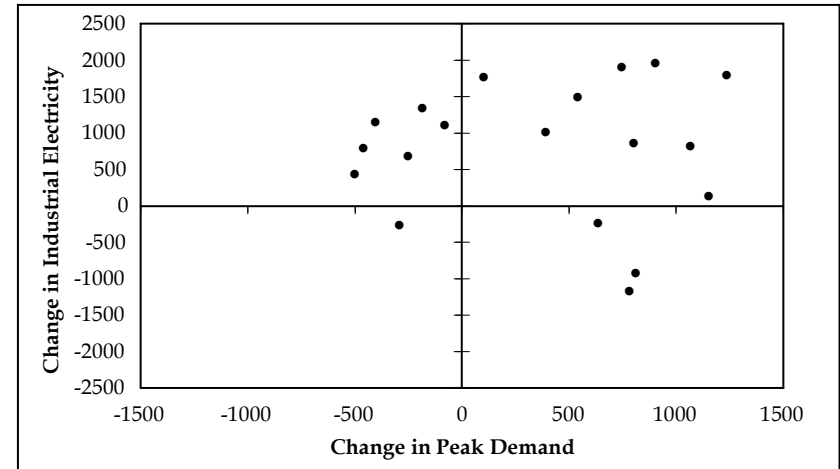


CHANGE IN PEAK DEMAND VS. CHANGE IN SECTORAL ELECTRICITY USE

Residential

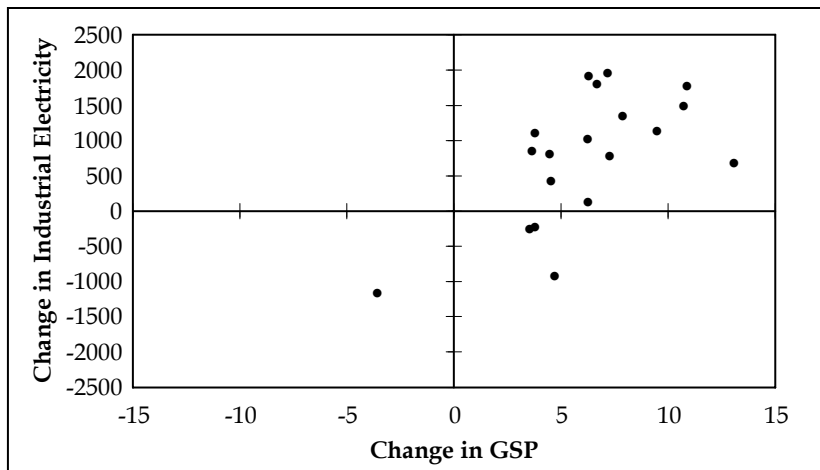


Industrial



INDUSTRIAL SECTOR IS SENSITIVE TO THE ECONOMY AND IS THE LARGEST CONSUMER

Change in GSP vs. Change in Industrial Use



Percentage of Total Energy Requirements

