Unpacking the Disconnect Between Wholesale and Retail Electric Rates

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Background

- 2017 DOE Staff Report to the Secretary on Electricity Markets and Reliability noted a disconnect between falling wholesale electricity prices and flat or rising retail investor-owned utility electricity prices between 2008 and 2016.

- DOE asked LBNL to develop an assessment of any trends and drivers for utility costs, retail sales, and/or retail rates vis-à-vis wholesale market prices at a regional level over some historical time period.
Research Plan

Lit Review
- Perform literature review to better understand recent historical analyses of utility cost, retail sales, and retail rate drivers vis-à-vis wholesale market prices

Assess Data
- Gauge data availability based on areas identified in literature
- Determine what data to collect and analyze

Analyze Data
- Perform analysis on data set that seeks to validate and build upon a subset of findings in the literature

Report Results
- Present results of data analysis
Possible Drivers of Retail Electric Rate Changes

Exogenous Drivers

- State Market & Policy Issues
- Wholesale Market Conditions
- Macroeconomic Conditions

Electric Utility Cost Impacts

Exogenous Drivers

- State Market & Policy Issues
- Wholesale Market Conditions
- Macroeconomic Conditions

Retail Sales Impacts

Retail Rate Impacts
Literature Review

- Lots of literature on historical analysis of retail electric utility rate trends
  - Concentrated on Investor Owned Utilities (IOU) or industry as a whole
  - Very little attention paid to Public Power and Cooperative utilities

- Analytical results generally reported at national level
  - State/regional characteristics are frequently incorporated (see below)

- Many analyses focus on quantifying the rate impacts from a specific set of state-level market & policy issues:
  - Retail competition & industry restructuring [1-7]
  - Wholesale market development [4]
  - State clean energy standards [3, 7-9]
  - Natural gas price declines [7]
  - Economic recession [3, 7]
Other analyses focus on characterizing the key trends at the utility that may act as drivers of retail electric rates:

- Higher distribution system capital investments [10-14]
- Higher transmission system capital investments [11-17]
- Higher generation capital investments [12-14]
- Lower fuel and purchased power costs [18]
- Lower electricity sales [3]

Limited research on impacts from state-level regulatory or ratemaking mechanisms:

- Very small retail rate impacts due to decoupling (+/- 2% of retail rates) [19-21]
- Modest longer term cost reductions due to multi-year rate plans, but little to no discussion of retail rate impacts [22]
Focus on Utility Costs and Retail Sales Trends Instead of Drivers for These Trends

**Exogenous Drivers**

- State Market & Policy Issues
- Wholesale Market Conditions
- Macro-economic Conditions

**Retail Rate Trends**

**Electric Utility Cost Trends**

**Retail Sales Trends**
Observations Based on Literature Review

1. Retail electricity sales have exhibited very modest increases or decreases
2. Fuel and purchased power (FPP) costs have generally declined putting downward pressure on retail rates
3. Capital expenditures have generally been increasing, putting upward pressure on retail rates
4. The degree of expansion in capital expenditures by category (i.e., generation, distribution, transmission) varies and has seen inconsistent growth over time
Available Data Sources – Retail Electric Utilities

- **FERC Form 1**
  - Reporting required of all major U.S. electric utilities (1M+ MWh annual sales)
  - Contains detailed data on revenues, costs, and sales
  - ABB Ventyx includes data from 2007-2016

- **EIA Form 861**
  - Reporting required of all US electric industry distributors
  - Contains aggregate data on revenues and sales; no cost information at a utility level
  - ABB Ventyx includes data from 2007-2016
Choosing Between FERC Form 1 & EIA Form 861

- We chose to focus on the single data source that was most robust and consistent with the literature we were able to review
  - Focus analysis on investor-owned utilities (IOUs)
    - Limited literature to guide any analysis of non-IOUs
    - FERC Form 1 limited to larger IOUs; EIA includes many different types of utilities, including IOUs of all sizes
  - Focus analysis on utility cost trends
    - FERC Form 1 has utility-level cost data; EIA Form 861 does not
  - Focus analysis on retail sales trends
    - EIA Form 861 provides both delivery-only and bundled service retail sales data; FERC Form 1 only has total retail sales data
- FERC Form 1 provided complete reporting of utility costs, at various levels of granularity, and sufficient detail on retail sales to understand broader trends driving retail rates
  - Dataset constructed of only IOUs that had all data elements of interest in all years in the analysis period 2007-2016
  - Converted all dollars to Real $2016 using CPI
  - Aggregated utility-level data up to NERC Region
## Data Collection – Retail Electric Utilities

- **Retail Sales**: Electric sales to ultimate consumers (Annual kWh)
- **Revenue**: Collected revenue from electric sales to ultimate consumers (Annual $)
- **Utility Costs**: Incurred costs by the utility grouped by major category (Annual $)
  - **Fuel**: Costs incurred to procure fuel for utility-owned generation facilities
  - **Purchased Power**: Costs incurred to procure electricity from third-parties for ultimate consumers
  - **Operations & Maintenance (O&M)**: Costs incurred in the operation and maintenance of all utility facilities to generate and deliver electricity to ultimate consumers
  - **Total**: Costs incurred in the operation, maintenance, and financing of all utility facilities to generate and deliver electricity to ultimate consumers
- **Plant in Service Additions**: Capital expenditures incurred by the utility (Annual $)
  - **Generation**: Capital expenditures towards generation facilities
  - **Distribution**: Capital expenditures towards distribution facilities
  - **Transmission**: Capital expenditures towards transmission facilities
  - **Other**: Capital expenditures towards anything outside of prior 3 categories
Utilities in states with retail competition collect revenues to cover 1) commodity (i.e., generation) costs from only those customers who take commodity service; and 2) transmission and distribution costs from all ratepayers.

- FERC Form 1 does not collect sales data that differentiates between commodity-only customers and all customers.
- Derived all-in retail rate (i.e., collected revenue per unit retail sales) will understate the true all-in retail rate.

Utilities in ERCOT have no commodity service obligations; therefore have no FERC Form 1 reported fuel or purchased power costs.

- Since the research is seeking to better understand the relationship between wholesale and retail rates, an analysis of ERCOT utilities lacks the ability to assess a key component of utility costs that are affected by changes in wholesale electricity costs.
- Dropped all utilities in ERCOT from this analysis.
Available Data Sources – Wholesale Market Prices

- **FERC Form 1**
  - Reporting required of all major U.S. electric utilities (1M+ MWh annual sales)
  - Contains detailed data on wholesale market transactions
  - ABB Ventyx includes data from 2007-2016

- **ICE Power Indices**
  - Contains wholesale market transactions at key hubs across the U.S.
  - ABB Ventyx includes data from 2007-2016
Choosing Between FERC Form 1 & ICE Power Indices

- **FERC Form 1**
  - Reflects utility-specific short-term wholesale market transactions resulting in better representation of wholesale market prices that utilities in our sample faced
  - Data quality issues
    - Low volumes for some regions (e.g., FRCC) resulting in no price data in certain years (e.g., 2008, 2015, 2016)
    - Produced annual average prices ($/MWh) that substantially exceeded retail rates for specific utilities (e.g., Delmarva, PPL, West Penn Power)

- **ICE Power Indices data**
  - Hub-level prices are based on short-term wholesale market transactions of utilities that may or may not be in our FERC Form 1 sample
  - Data quality issues
    - ABB Ventyx does not have any hubs for certain regions (e.g., ASCC, FRCC, HICC, SPP)
    - High volume of transactions in some regions; less so for some others BUT reasonable annual average wholesale market prices are produced

- **Elected to use ICE Power Indices data over FERC Form 1**
  - Aggregated up to NERC regions
  - All dollars converted to Real 2016 using CPI
All data from FERC Form 1 for utilities in ASCC, ERCOT, FRCC, HICC, and SPP were dropped from the analysis because no ICE Power Indices data was available.
Final Data Sample

% of All IOUs reporting FERC Form 1 in ABB Ventyx

Total counts based on distinct utility names in ABB Ventyx FERC Form 1 with ‘IOU’ Ownership Type
### Final Data Sample

#### Investor Owned Utilities

<table>
<thead>
<tr>
<th>NERC Region</th>
<th>Utility Name</th>
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<tr>
<td>WECC</td>
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National Trend in Retail vs. Wholesale Prices

Retail Rate = \( \Sigma \text{Collected Revenue} / \Sigma \text{Retail Sales} \)

Wholesale Rate = \( \Sigma \text{ICE Hub Revenues} / \Sigma \text{ICE Hub Volume} \)

- Retail rates have declined (annual average change of -0.8%/yr) much less than wholesale rates (annual average change -6.2%/yr)
- Divergence between wholesale and retail rates has grown between 2007 (5.4¢/kWh) and 2016 (8.8¢/kWh)
  - Most of that divergence occurred between 2008 and 2009 when wholesale rates dropped from 7.8 to 3.8¢/kWh
- Assessment of long-term trends in divergence depends greatly on the starting point for analysis and is likely complicated by greater volatility in wholesale prices over time
Regional Trends in Retail and Wholesale Rates

- All included NERC regions between 2007 and 2016 saw increasing divergence between retail and wholesale rates.

- Utilities in 2 regions (NPCC, RFC) saw average annual retail rate decreases (-0.9%/yr and -2.2%/yr, respectively).

- Utilities in 3 regions (MRO, SERC, WECC) experienced slight average annual retail rate increases (<0.2%/yr) despite reductions in wholesale costs.
Research Questions based on Literature Review

- Are IOUs seeing reductions in fuel and purchased power costs over time?
- Are total IOUs costs coming down over time?
- Are some non-fuel IOU cost categories increasing over time, thereby offsetting the reductions in fuel and purchased power costs? If so, which ones?
- What types of capital investments are IOUs making?
General trend in all regions was for fuel and purchased power costs to decline over time.

Regional differences existed in how stable and consistent those reductions are throughout the analysis period (e.g., NPCC & RFC vs. SERC & WECC).

This may suggest regional differences in underlying drivers of FPP costs - wholesale market price trends and/or retail sales trends.
All Regions Experience Wholesale Market Price Declines

- Trends in fuel and purchased power costs over analysis period coincides with broader wholesale market price trends
- Wholesale market prices enter FPP through short-term purchases and long-term contracts
  - Also act as a proxy for broader fuel cost changes
- Regional differences exist in how FPP costs reflect annual wholesale market cost trends

**Graphs:**
- NPCC
- MRO
- RFC
- SERC
- WECC

**Legend:**
- Wholesale Rate ($2016/kWh – right axis)
- Purchased Power Costs ($B2016)
- Fuel Costs ($B2016)
2 of 5 Regions Experienced Retail Sales Decrease

NPCC saw measurable reduction in retail sales (-1.1%/yr)

WECC saw modest annual load expansion (0.5%/yr) while RFC saw modest load contraction (-0.4%/yr)

MRO and SERC saw negligible average annual changes in sales (+/- 0.1%/yr), but varying levels of annual changes

Consistent regional FPP cost declines were not necessarily due to reductions in retail sales
2 of 5 Regions Experienced Total Utility Cost Declines

- Utilities in NPCC and RFC experienced clear downward trends in total utility costs.
- MRO, SERC, and WECC showed substantial variability over time but ended the analysis period with slightly lower utility costs than at the beginning.
- With fuel costs shrinking over time but total utility costs fluctuating, regional differences may be driven by changes in non-fuel costs.
Utilities in RFC experienced a modest upward trend in total non-fuel utility costs.

NPCC, MRO, SERC, and WECC showed much clearer year-over-year increases in non-fuel costs. This suggests there are regional differences in the degree to which non-fuel cost increases are offsetting FPP cost reductions.
Non-Fuel Cost Elements

- Non-fuel related cost elements are comprised of:
  - **Non-fuel O&M**: Operations and maintenance activities associated with all utility facilities to generate and deliver electricity to ultimate consumers, except for fuel and purchased power related costs.
  - **Capital-related expenditures**: Costs incurred from past and present investments in utility plant (e.g., debt service costs, taxes, depreciation).

- Unlike non-fuel O&M costs which generally exhibit modest annual changes, utility investments are often times quite large but infrequently incurred.
  - Accordingly, expect to see substantial annual variability in utility plant in service additions (i.e., investments).

- To better compare/contrast trends among all major utility cost elements, focus on:
  - Average annual changes over the entire analysis period rather than annual changes each and every year.
  - Plant in service additions as a proxy for capital-related expenditures to understand if and what types of current investment may be driving broader increases in non-fuel costs.
5 of 5 Regions Saw Annual Increases in Non-Fuel O&M Costs

- Utilities in NPCC and MRO saw average annual non-fuel O&M cost increases of nearly 3.0%/yr
- RFC, SERC, and WECC experienced increases of 2.0%/yr or less
- Annual FPP cost reductions were considerably larger, in most cases, than annual increases in non-fuel O&M costs
- Expect that this would erode some but not all of the FPP cost savings

**Non-Fuel O&M Costs**

<table>
<thead>
<tr>
<th>Region</th>
<th>Growth Rate (2007-2016)</th>
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<tbody>
<tr>
<td>NPCC</td>
<td>-10%</td>
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<tr>
<td>MRO</td>
<td>-8%</td>
</tr>
<tr>
<td>RFC</td>
<td>-6%</td>
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<tr>
<td>SERC</td>
<td>-4%</td>
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<tr>
<td>WECC</td>
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**FPP Costs**

<table>
<thead>
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<th>Region</th>
<th>Growth Rate (2007-2016)</th>
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<td>-10%</td>
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<td>MRO</td>
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<td>SERC</td>
<td>-4%</td>
</tr>
<tr>
<td>WECC</td>
<td>-2%</td>
</tr>
</tbody>
</table>
5 of 5 Regions Saw Increases in Plant in Service Additions

- SERC experienced 11%/yr average annual growth rate in plant in service additions
- All other regions saw average annual growth of ~4%/yr to 6%/yr
- This suggests there may have been regional differences in the magnitude and type of capital expenditures which were increasingly being undertaken
Utilities in MRO and SERC were predominantly investing in generation assets (64% and 56% of total plant in service additions, respectively).

RFC and WECC also sizably invested in generation resources (~35%).

Utilities in NPCC divested of generation assets during industry restructuring (i.e., 1990s), so focused on T&D investments.
Utilities in NPCC were predominantly investing in distribution assets (59% of total plant in service additions)

RFC and WECC also invested sizably in distribution resources (42% and 35%, respectively)

SERC and MRO spent less than 25% of their total plant in service additions on distribution system infrastructure
3 of 5 Regions Saw Modest Transmission Investments

- NPCC spent 33% while utilities in WECC spent 22% of total plant in service additions on transmission assets.
- The other three regions invested 16% or less of their plant in service additions on transmission.
Study Results – Key Reasons for the Disconnect

- Retail and wholesale rates were increasingly disconnected across all included NERC regions between 2007 and 2016
  - RFC and NPCC saw sizable average annual retail rate decreases (-2.2%/yr and -0.9%/yr) while utilities in MRO, SERC, and WECC experienced slight average annual retail rate increases (<0.2%/yr)
  - All NERC regions experienced substantial reductions in wholesale market prices (-4.9%/yr to -7.1%/yr)

- Reductions in wholesale prices happened concurrently with reductions in IOU fuel and purchased power costs, but sizable regional differences in the degree of FPP cost reductions existed
  - NPCC experienced average annual reduction in FPP costs of ~9%/yr while WECC saw slightly more than a 1%/yr contraction
Study Results – Key Reasons for the Disconnect (2)

- Reductions in IOU FPP costs were offset in part by increases in Non-Fuel O&M costs, but modest regional differences in the degree of these cost impacts existed.
  - Utilities in MRO and NPCC generated ~3%/yr average annual growth in Non-Fuel O&M costs while utilities in all other regions produced average annual increases that were 2%/yr or less.

- Reductions in IOU FPP costs were also offset in part by increases in capital expenditures, but regional differences in the magnitude and type of investments existed.
  - SERC saw 11%/yr average annual growth in Plant in Service additions while WECC saw less than 4%/yr growth.
  - NPCC saw majority of Plant in Service additions come from Distribution investments while utilities in SERC and MRO invested predominantly in Generation assets; WECC spent roughly similarly on Distribution and Generation.
Study Results – Key Reasons for the Disconnect (3)

- Reductions in retail sales tended to mitigate the effect on retail rates from reductions in total utility costs, but regional differences existed that were sometimes counterintuitive and suggest the value in a more detailed analysis of utility costs vis-à-vis general rate case filings and decisions to better understand retail rate changes over time.
  - WECC saw annual average growth in retail sales of 0.5%/yr while operating costs remained flat (on average) which would be expected to produce lower retail rates; instead the annual average change in retail rates was 0.1%/yr.
  - MRO saw annual average growth in retail sales of 0.1%/yr and annual average reduction in operating costs of 0.5%/yr which would be expected to produce lower retail rates; instead ratepayers saw an average increase in retail rates of 0.2%/yr.
Future Research Opportunities

- Quantitatively analyze general rate case filings, especially cost of service studies, to develop a more detailed and robust understanding of utility cost trends
- Qualitatively assess the regulatory, market, and policy drivers of these observed cost trends that may have contributed to the disconnect between retail and wholesale electric rates historically
- Quantitatively estimate the marginal effect of different key regulatory, market, and policy drivers of these observed cost trends that produced the disconnect between retail and wholesale electric rates historically
- Identify key regulatory, market, and policy drivers of retail rates over the next 10 years and quantify the range of possible impacts to determine the degree to which the current disconnect between retail and wholesale rates will increase or decrease
References

References


References


