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PENN STATE WORKFORCE EDUCATION AND DEVELOPMENT INITIATIVE

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*Tables supporting presentation to the Penn State
Society for Workforce Education & Development:*

Your Electrifying Utility Bill

**A Forecast of Pennsylvania
Economic and Workforce Changes
Resulting from Removal of
Electricity Rate Caps**

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Information presented in this document is preliminary and is offered for discussion only.



Please Note: *These Estimates Are Preliminary*

Impact estimates provided in this document are considered preliminary to final estimates and are offered for discussion to help improve the final estimates. In development is a comprehensive research report, Tossing the Cap: Benchmarks for the Impact of Electricity Rate Increases in Pennsylvania, that contains final impact estimates of the impact of the rate cap removal. Working on the more comprehensive report are Rose Baker, Matthew Loiacono, Laura Miller, David Passmore, and Shakoor Ward. The authors appreciate the assistance of Adam Cooper (computational advice), Regional Economic Models, Inc., Amherst, Massachusetts, Amy Glasmeier (information sharing), Penn State Center for Policy Research on Energy, Environment, and Community Well-Being, and Herbert Reininger (design consultation), Penn State Outreach Marketing Communications.

This research is conducted through the Penn State Workforce Education and Development (WED) Initiative, an alliance between the College of Education and Penn State Outreach. For a guide to information on the web about the WED Initiative, see <http://PSU-WEDI-Guide.notlong.com>.

The research reported in this document is not funded currently by any source external to Penn State. The Penn State WED Initiative often conducts research analysis about topics and issues—such as the removal of the electricity rate cap—that, at times, are the focus of vigorous debate and public attention and that frequently are associated with diverse stakeholders who represent divergent opinions. The Initiative adds value to this debate, attention, and discussion by conducting and reporting research and analysis outcomes affecting economic and workforce development using the most objective, data-driven approaches possible. The research and analysis of the WED Initiative are pursued independent of the commercial or political interests of any actual or potential sponsor of WED Initiative work.

Summary of the Study Plan

Focus

For most of the previous century, all three aspects of the electricity utility industry in the United States—generation, transmission, and distribution of electricity—have been treated as a natural monopoly in which utilities were guaranteed a positive rate of return through regulation. This regulated market structure gave Pennsylvanian's some of the highest electricity rates in the nation.

Pennsylvania's 1996 *Electric Generation Customer Choice and Competition Act* (Act 138 of 1996, 66 Pa. C.S. § 2801 *et seq.*) deregulated the Pennsylvania's electricity industry and allowed consumers to select the company that provided their electricity through *Pennsylvania's Electric Choice Program*. After restructuring, utilities competed for consumers who could freely select the company, either an incumbent or new entrant into the market, that provides their electricity.

The *Act* also placed an upper limit, or a cap, on the price of electricity charged per kilowatt hour (kWh) consumed (which is a rate). Rate caps shielded customers from significant volatility in the wholesale electricity market, but, at the same time, insulated them from price incentives to conserve electricity. Electricity rate caps were mandated to remain until all stranded costs were recovered by Pennsylvania's seven major utility companies.

Stranded costs are associated with investments that were made by private utility companies under regulated markets. Usually these investments were made for the construction of new



electricity generation capacity, often nuclear, which actually was ordered or approved by Commonwealth regulators. These costs could not be recouped under deregulated markets, so the Commonwealth felt an ethical obligation to recover these costs through a charge, a Competitive Transition Charge, that appears on Pennsylvania consumers' electricity bills. A schedule for expiration of rate caps was established for each electricity provider, the last of which will expire in 2010. Starting in 2011, all Pennsylvania electricity rate caps will be eliminated, unless some delay in cap elimination is approved.

Many observers anticipate that electricity rates will rise for Pennsylvanians after rate caps are removed. Some experience with the effects of rate cap removal in Pennsylvania is available. Rate caps already have expired for 15% of Pennsylvania electricity consumers. The consequences for electricity prices have been mixed. For instance, customers of Duquesne Power and Light, which serves the Pittsburgh region, did not experience high rate increases when caps expired. However, when rate caps expired in Pike County, Pennsylvania, rates increased by 70%. There are concerns that, if rates increase for all of Pennsylvania on a scale similar to Pike County's, the price shock of electricity rate increases will affect the Pennsylvania economy negatively.

The aim of our study is to forecast the economic, demographic, and workforce effects of each 10% increase in electricity rates for Pennsylvania's residential, commercial, and industrial customers from 2011 through 2015. We are not prescient about the rate changes that will occur under rate cap removal. Rate changes are likely to depend on many factors related to electricity companies and the regions they serve. We have chosen a 10% rate increase as a benchmark for gauging the impact of rate changes. The economic model we have chosen to forecast these impacts indicates that the response of the Pennsylvania economy to rate changes is linear over the foreseeable range of possible rate changes that could occur. Therefore, the effects of a rate change of, say, 20% will change the impacts that we forecast by a factor of two.

Methods

The Pennsylvania REMI Policy Insight Model (see <http://www.remi.com> for a description) was applied to forecast the economic, demographic, and workforce effects of a 10% increase in electricity rates for Pennsylvania from 2011 through 2015. The analytical methods applied to forecast these effects are complex and will be described fully in a report of our final impact estimates that is in preparation. In brief, we first prepared a baseline forecast for the Pennsylvania economy through 2015. Then, we conducted a rate increase forecast through 2015 that included a simulation of a 10% electricity price increase for residential, commercial, and industrial customers in Pennsylvania. We conducted this rate increase forecast for four separate alternative electricity sales conditions to test the sensitivity of our impact estimates to uncertainties in the future of electricity sales. The difference between the rate increase forecast and the baseline forecast revealed the forecasted impact of a 10% electricity price increase.



Summary of Findings for 10% Price Increase

Changes Quantity and Dollar Value of Sales

Contained in Table 1 are two forecasts from which inputs to the simulations conducted in this study were extracted. The first row of Table 1 displays a forecast of the deviation from linear growth in the quantity in megawatt hours (mWh) of electricity sold retail in Pennsylvania from 2011 through 2015 under three conditions:

- *10% higher growth rate than baseline*—Shows a forecast of the difference in the quantity of mWh that would be sold between the baseline and 10% higher growth rate than baseline growth.
- *10% lower growth rate than baseline*—Displays a forecast of the difference in the quantity of mWh that would be sold between the baseline and 10% lower growth rate than baseline growth.
- *No change from 2006*—Contains a forecast of the difference in the quantity of mWh that would be sold between the baseline and an extreme conservation scenario in which mWh sales between 2011 and 2015 continued at 2006 levels.

Table 1. Forecasted Deviation of mWh and Dollar Value of Pennsylvania Electricity Sales from Baseline Linear mWh Sales with 10% Higher Electricity Price/kWh than 2006 by Level of mWh Sales in Residential (Res), Commercial (Com), and Industrial (Ind) Customer Classes, 2011-2015

Sales By Year	Deviation From Baseline, 2011–2015											
	Baseline Linear mWh Sales Growth			10% Higher Rate of mWh Sales Growth than Linear Forecast			10% Lower Rate of mWh Sales Growth than Linear Forecast			No Change from 2006 mWh Sales		
	Res	Com	Ind	Res	Com	Ind	Res	Com	Ind	Res	Com	Ind
Δ Quantity mWh (MM)												
2011				1.92	2.38	0.27	-1.92	-2.38	-0.27	-4.43	-6.26	-0.68
2012				2.01	2.48	0.28	-2.01	-2.48	-0.28	-5.30	-7.33	-0.80
2013				2.10	2.59	0.30	-2.10	-2.59	-0.30	-6.18	-8.41	-0.92
2014		[baseline]		2.19	2.70	0.31	-2.19	-2.70	-0.31	-7.05	-9.49	-1.05
2015				2.27	2.81	0.32	-2.27	-2.81	-0.32	-7.92	-10.57	-1.17
Δ Total \$ value with 10% \uparrow in ϵ per kWh (MM 2006\$)												
2011	\$581.86	\$541.06	\$507.31	\$800.81	\$811.51	\$538.13	\$362.90	\$270.62	\$476.49	\$77.74	-\$171.08	\$430.24
2012	\$590.90	\$552.24	\$508.58	\$819.81	\$834.97	\$540.80	\$362.00	\$269.51	\$476.37	-\$12.73	-\$282.83	\$417.51
2013	\$599.95	\$563.41	\$509.86	\$838.81	\$858.44	\$543.47	\$361.09	\$268.39	\$476.24	-\$103.21	-\$394.58	\$404.78
2014	\$609.00	\$574.59	\$511.13	\$857.81	\$881.91	\$546.15	\$360.19	\$267.27	\$476.11	-\$193.68	-\$506.33	\$392.04
2015	\$618.05	\$585.77	\$512.40	\$876.81	\$905.38	\$548.82	\$359.29	\$266.15	\$475.99	-\$284.16	-\$618.09	\$379.31

Source: Calculations by staff of the Penn State Workforce Education and Development Initiative. Baseline linear growth of mWh sales assumed the same growth rate in the 2011–2015 period as the average growth between 1990 and 2006 (1.8%).

Notes: The Energy Information Administration counted 5,884,732 Pennsylvania retail electricity customers (5,190,697 residential, 665,763 commercial, 28,272 industrial) during 2006 (http://www.eia.doe.gov/cneaf/electricity/epa/customers_state.xls) who paid an average of 8.63 cents per kilowatts per hour (kWh) of electricity purchased (10.35¢/kWh for residential, 8.94¢/kWh for commercial, 6.63¢/kWh for industrial) (http://www.eia.doe.gov/cneaf/electricity/epa/average_price_state.xls).

The second row of Table 1 contains a forecast of deviations from linear growth in the dollar value of electricity sold retail in Pennsylvania from 2011 through 2015 based upon a 10% increase in the price per kWh of electricity for each customer class. Increases in aggregate electricity costs are forecasted for the baseline case as well as under 10% high and lower sales conditions. In some years and for residential and commercial customer classes, however, the “No Change from 2006 mWh Sales” (extreme conservation) scenario produces lower



aggregate electricity costs. The dollar values shown in the second row of Table 1 were inputs to our simulations of the effects of electricity price changes on the Pennsylvania economy, demography and workforce.

Macroeconomic and Demographic Impacts of 10% Increase in Electricity Prices

Shown in Table 2 is the forecasted impact on employment by source of demand of a 10% increase in electricity price under four mWh quantity scenarios for three classes of customers. Most affected by electricity price increases under each scenario is employment that is created as a result of purchases of goods and services by Pennsylvania households.

Table 2. Forecasted Change in Pennsylvania Private Nonfarm Employment^a by Source of Final Demand, with 10% Higher Electricity Price/kWh than 2006, by Level of mWh Sales for Residential (Res), Commercial (Com), and Industrial (Ind) Customer Classes, 2011-2015

Source by Year	Baseline	Change From Baseline, 2011, 2013, 2015											
		Baseline Linear mWh Sales Growth			10% Higher Rate of mWh Sales Growth than Linear Forecast			10% Lower Rate of mWh Sales Growth than Linear Forecast			No Change from 2006 mWh Sales		
		Res	Com	Ind	Res	Com	Ind	Res	Com	Ind	Res	Com	Ind
All Sources^b													
2004	6,127,327												
2010	6,514,540												
2011	6,555,148	-2,792	-1,725	-1,790	-3,659	-2,492	-1,857	-1,672	-857	-1,654	-359	558	-1,500
2013	6,607,202	-3,316	-2,434	-2,847	-4,177	-3,489	-2,921	-1,826	-1,143	-2,583	413	1,513	-2,248
2015	6,704,091	-3,623	-2,732	-3,258	-4,459	-3,901	-3,314	-1,872	-1,219	-2,908	1,208	2,475	-2,417
Intermediate Demand													
2004	1,316,338												
2010	1,425,953												
2011	1,442,559	-424	-340	-461	-580	-502	-488	-266	-173	-435	-57	112	-394
2013	1,469,087	-500	-549	-863	-694	-820	-915	-304	-270	-810	65	341	-708
2015	1,496,238	-547	-646	-1,054	-768	-975	-1,122	-324	-307	-986	197	588	-827
Local Consumption													
2004	2,458,890												
2010	2,574,191												
2011	2,577,686	-1,911	-1,050	-930	-2,618	-1,550	-982	-1,197	-533	-875	-257	347	-794
2013	2,576,211	-1,970	-1,153	-1,178	-2,739	-1,727	-1,251	-1,195	-562	-1,105	297	804	-957
2015	2,595,862	-2,068	-1,164	-1,268	-2,908	-1,766	-1,352	-1,218	-544	-1,185	813	1,218	-977
Government													
2004	74,924												
2010	79,902												
2011	80,410	-12	-4	6	-17	-6	6	-8	-2	6	-2	1	5
2013	81,328	-31	-11	17	-43	-16	18	-19	-5	16	1	6	14
2015	82,001	-46	-16	27	-64	-24	29	-28	-8	25	9	12	22
Investment													
2004	350,773												
2010	359,101												
2011	360,314	-366	-127	-189	-502	-187	-200	-229	-64	-178	-49	42	-162
2013	361,833	-576	-231	-330	-798	-345	-351	-351	-114	-310	55	141	-270
2015	367,954	-563	-252	-330	-791	-381	-352	-332	-119	-308	217	236	-253



Source by Year	Change From Baseline, 2011, 2013, 2015												
	Baseline	Baseline Linear mWh Sales Growth			10% Higher Rate of mWh Sales Growth than Linear Forecast			10% Lower Rate of mWh Sales Growth than Linear Forecast			No Change from 2006 mWh Sales		
		Res	Com	Ind	Res	Com	Ind	Res	Com	Ind	Res	Com	Ind
Exports to Rest of Nation													
2004	1,762,564												
2010	1,878,048												
2011	1,891,720	43	-155	-155	59	-229	-164	27	-79	-146	6	51	-133
2013	1,907,804	68	-363	-337	95	-541	-357	42	-179	-316	-6	206	-277
2015	1,945,157	51	-468	-408	73	-704	-435	30	-224	-382	-26	391	-321
Exports to Rest of World													
2004	163,838												
2010	197,345												
2011	202,459	0	-12	-27	0	-18	-29	0	-6	-26	0	4	-23
2013	210,879	2	-27	-62	2	-40	-66	1	-13	-58	0	16	-51
2015	216,879	-1	-35	-78	-1	-52	-83	0	-17	-73	-1	29	-61

Source: Regional policy simulation with Pennsylvania REMI Policy Insight Model (2007) by staff of the Penn State Workforce Education and Development Initiative.

^aEmployment = number of jobs, full-time plus part-time, by place of work. Full-time and part-time jobs are counted equally. Employees, sole proprietors, and active partners are included, but unpaid farm, government, and family workers as well as volunteers are not included.

^bTotal employment = Intermediate (employment needed to satisfy demand for material inputs to the production of final goods) + Local Consumption (employment needed to satisfy demand for consumer goods) + Government (employment needed to satisfy demand for goods and services by government expenditures) + Investment Activity (employment needed to satisfy demand for capital goods) + Exports to Rest of Nation (employment needed to satisfy demand for a region's goods and services from areas in the rest-of-nation region) + Exports To Rest of World (employment needed to satisfy demand for a region's goods and services from the rest of the world).

Displayed in Table 3 are the forecasted impacts of 10% price increases on selected macroeconomic and demographic indicators for output, income, and population. As might be anticipated logically, the 10% higher mWh quantity scenario created the largest effects on the macroeconomic and demographic indicators, and the extreme conservation scenario (“No Change from 2006 mWh Sales”) produced the smallest effects.

Table 3. Forecasted Change in Pennsylvania Economic and Demographic Indicators, with 10% Higher Electricity Price/kWh than 2006, by Level of mWh Sales for Residential (Res), Commercial (Com), and Industrial (Ind) Customer Classes, 2011-2015

Indicator by Year	Change From Baseline, 2011, 2013, 2015												
	Baseline	Baseline Linear mWh Sales Growth			10% Higher Rate of mWh Sales Growth than Linear Forecast			10% Lower Rate of mWh Sales Growth than Linear Forecast			No Change from 2006 mWh Sales		
		Res	Com	Ind	Res	Com	Ind	Res	Com	Ind	Res	Com	Ind
Gross State Product (MM 2006\$)													
2004	\$438,967												
2010	\$528,456												
2011	\$544,706	-\$196	-\$144	-\$180	-\$268	-\$213	-\$191	-\$122	-\$73	-\$170	-\$26	\$48	-\$154
2013	\$576,474	-\$236	-\$241	-\$344	-\$328	-\$360	-\$365	-\$143	-\$119	-\$323	\$31	\$149	-\$282
2015	\$612,074	-\$266	-\$306	-\$445	-\$373	-\$460	-\$474	-\$157	-\$145	-\$416	\$97	\$272	-\$350
Total Output (MM 2006\$)													
2004	\$701,618												
2010	\$843,924												
2011	\$869,313	-\$308	-\$230	-\$316	-\$421	-\$339	-\$334	-\$193	-\$117	-\$298	-\$41	\$76	-\$270
2013	\$918,305	-\$356	-\$381	-\$613	-\$494	-\$568	-\$650	-\$216	-\$187	-\$575	\$50	\$236	-\$503
2015	\$975,674	-\$389	-\$478	-\$795	-\$546	-\$721	-\$846	-\$229	-\$228	-\$743	\$150	\$428	-\$624



Indicator by Year	Change From Baseline, 2011, 2013, 2015												
	Baseline	Baseline Linear mWh Sales Growth			10% Higher Rate of mWh Sales Growth than Linear Forecast			10% Lower Rate of mWh Sales Growth than Linear Forecast			No Change from 2006 mWh Sales		
		Res	Com	Ind	Res	Com	Ind	Res	Com	Ind	Res	Com	Ind
Real Disposable Personal Income (MM 2006\$)													
2004	\$351,925												
2010	\$404,690												
2011	\$411,355	-\$623	-\$180	-\$164	-\$853	-\$266	-\$173	-\$390	-\$92	-\$154	-\$84	\$60	-\$140
2013	\$424,284	-\$649	-\$207	-\$210	-\$902	-\$310	-\$223	-\$393	-\$101	-\$197	\$102	\$143	-\$171
2015	\$439,789	-\$675	-\$224	-\$234	-\$950	-\$339	-\$250	-\$396	-\$105	-\$219	\$281	\$227	-\$180
Population													
2004	12,377,382												
2010	12,484,839												
2011	12,515,573	-2,322	-695	-607	-3,183	-1,026	-642	-1,455	-354	-571	-315	230	-519
2013	12,599,586	-5,830	-1,890	-1,775	-8,054	-2,813	-1,884	-3,584	-937	-1,670	-183	1,023	-1,473
2015	12,701,422	-8,461	-2,860	-2,780	-11,780	-4,292	-2,956	-5,104	-1,385	-2,607	1,648	2,138	-2,235

Source: Regional policy simulation with *Pennsylvania REMI Policy Insight Model* (2007) by staff of the Penn State Workforce Education and Development Initiative.

Definitions of Indicators:

Gross State Product as a final demand concept = local consumption + investment activity + government + (exports - imports).

Total Output = amount of production, including all intermediate goods purchased plus Gross State Product.

Real Disposable Personal Income = sum of wage and salary disbursements, supplements to wages and salaries, proprietors' income with inventory valuation and capital consumption adjustments, rental income of persons with capital consumption adjustment, personal dividend income, personal interest income, and personal current transfer receipts, less contributions for government social insurance and personal taxes, deflated by the personal consumption expenditure price index.

Population reflects mid-year estimates of the numbers of people, including survivors from the previous year, births, special populations, and three types of migrants (economic, international, and retired).

Assessment of Impacts of 10% Increase in Electricity Prices

Assessment of the impact of the removal of electricity price caps in Pennsylvania depends on the perspective chosen for assessment. At the macro-level, the forecasted impacts represent relatively small changes. For instance, for the baseline case, 9,613 jobs are forecasted to be lost in 2015 as a result of a 10% electricity price increase. On an individual basis, this loss of employment opportunity could represent much hardship and distress. One job = one household = major personal adjustments.



The Pennsylvania economy is forecasted to employ 6,704,091 workers in 2015. In the case of baseline linear growth in mWh sales, job loss forecasted to result from a 10% electricity price is 0.14% of total 2015 employment. On an economy-wide basis, a job loss of this size might represent no more employment change than expected from the ordinary ebb and flow of employment that occurs commonly in a stable Pennsylvania economy. Some analysts suggest that retail electricity prices actually could rise 40% to 70% after rate caps are removed. Based on information about Pennsylvania employment shown in Table 2, a price increase of 70% could result in a range of 2015 Pennsylvania employment changes between -1.2% in the scenario with the highest rate of mWh sales growth and -0.06% under a 10% lower rate of mWh sales growth, which represents losses of between 81,718 and 41,993 jobs, respectively.



Interestingly, 2015 employment is slightly higher than the baseline employment—by 1,266 workers—in the extreme conservation scenario.

What might appear like a hiccup for a large, robust Pennsylvania economy, might devastate individual families. Electricity price increases will affect budget allocations in most Pennsylvania households. High income households might be able to absorb electricity price increases. Yet, electricity price increases might require low income households to make tough budget choices about energy conservation and about shifting of budget expenditures toward electricity and away from luxuries and even some necessities.

Indeed, another dimension of the findings of this research is that the burden of job and income losses that could result from removal of electricity price caps could fall hardest on low income groups. Pennsylvanians in the lowest 20% of the income distribution are likely to bear two times the job loss and loss of personal income that is borne by the highest 20% of the Pennsylvania income distribution. More information about the distributional effects of electricity price increases will be available in our final report.