

**ENERGY PROBE TFP ISSUES & QUESTIONS**  
**TECHNICAL CONFERENCE, JANUARY 14-15, 2019**  
**Exhibit KTX2.1 Redacted January 17, 2019**  
**EB-2018-0218**

**ISSUE #1: PSE's Sample of Comparator Utilities**

- a. Does the sample of companies that PSE has used for its TFP growth calculations (the "TFP sample") include Hydro One Transmission? If so, what is the justification for including it when all other utilities in the sample are US companies?
- b. Please confirm/disconfirm that there are 47 US utilities in PSE's TFP sample.

**ISSUE #2: Logarithmic Growth Rates**

- a. Please confirm that reported Annual Average Growth Rate of the Industry TFP Index in PSE's Report, Table 3, p.10 (i.e., -1.71% for the period 2004-2016) is the simple arithmetic average of annual logarithmic growth rates of that Index as reported in the Table.
- b. Confirm/disconfirm that the simple arithmetic average of the annual % changes in the Industry TFP Index in Table 3 is -1.67% for the period 2004-2016.

**ISSUE #3: Does the analysis of the US utilities' TFP Indexes support PSE's "aggregate index approach"?**

- a. Please confirm/disconfirm that PSE calculated TFP indexes for each of the 47 US companies and that these index data and TFP growth rates calculated thereon are not discussed or reported in PSE's report.
- b. Please confirm/disconfirm that the company-specific TFP indexes calculated by PSE are correctly shown in the attached Table A.
- c. Please confirm/disconfirm that the annual % changes in each US company's TFP Index as shown in the accompanying Table B are calculated correctly.
- d. Please confirm/disconfirm that there are 564 observations of the annual % change in TFP for the 47 US utilities in PSE's TFP sample and that 209 are positive.
- e. Please confirm/disconfirm that the distribution of annual % changes in TFP for all US companies in the PSE sample is correct as shown in the accompanying Chart A.

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**ISSUE #4: INDUSTRY OUTPUT GROWTH**

- a. In Table 7 of PSE's report, the Output Quantity Index growth rate was 0.72% for the study period 2004-2016 and 0.48% for the sub-period 2010-2016. To what factors or events does PSE attribute this decline?
- b. As shown in the accompanying Chart B, US electricity generation grew at an average annual rate of 3.95% in the period 1949-2017 but only 0.42% in its study period 2004-2016. Does PSE expect long-term future growth in electricity generation of 0.42%?
- c. As shown in the accompanying Chart C, Canadian electricity generation grew at an average annual rate of 3.9% in the period 1950-2017 but and 0.97% in PSE's study period 2004-2016. What reasons could be given for the higher growth rate of electricity output in Canada during the study period?

**ISSUE #5: DOES PSE'S DETERMINATION OF THE LONG-TERM GROWTH RATE TREND IN TFP FOLLOW THE BOARD'S REQUIREMENTS?**

- a. How far into the future does PSE expect that its estimated -1.71% annual TFP industry growth will prevail?
- b. What Board decisions does PSE rely upon to justify the use of the 2004-2016 study period that it has adopted for its long-term industry trend?

**TABLE A REDACTED**

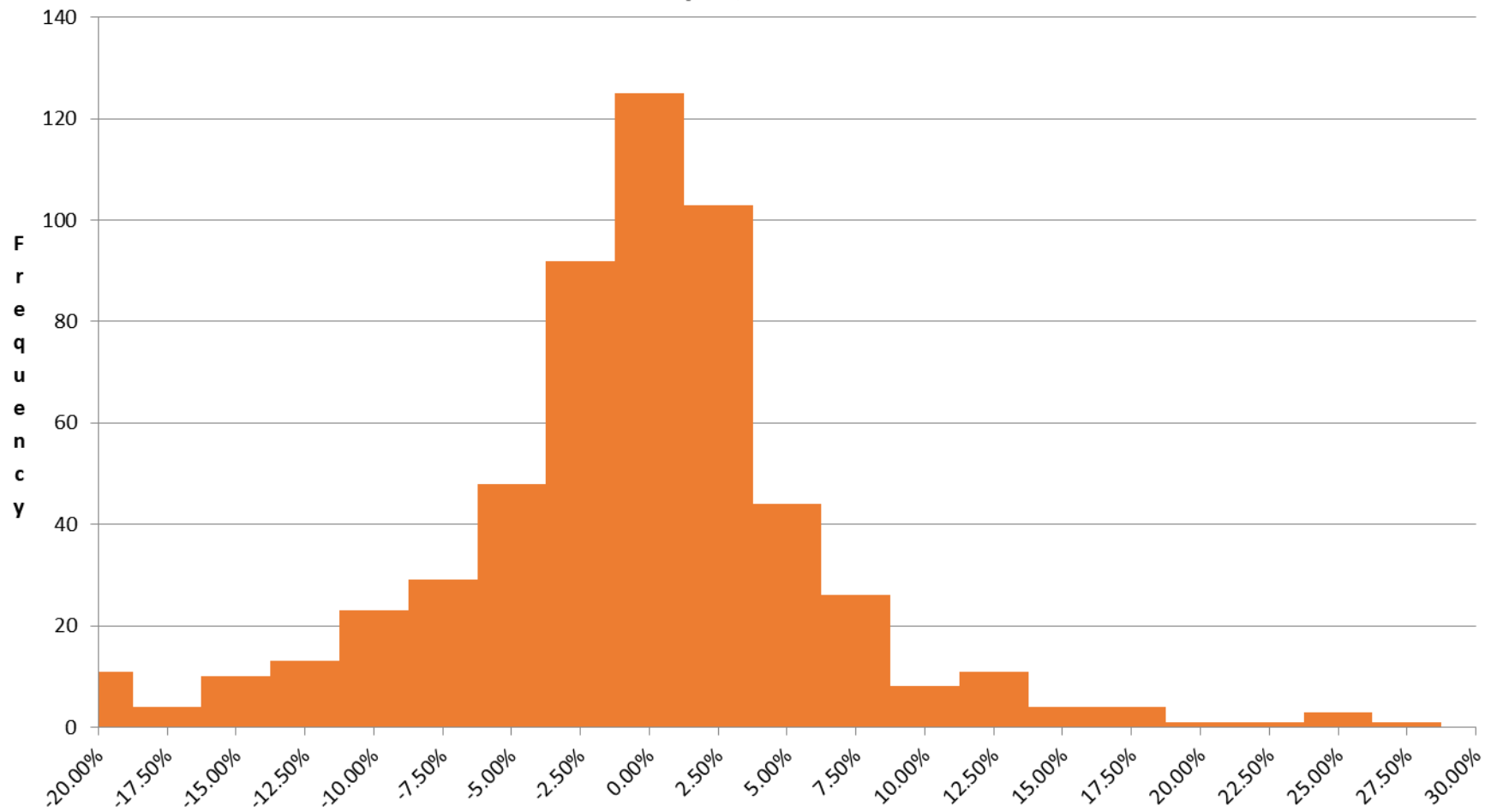
TPF INDEX	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
	1.000	1.012	1.073	1.026	1.010	1.023	0.985	0.988	0.962	0.928	0.895	0.848	0.839
	1.000	1.017	0.944	0.946	0.934	0.866	0.868	0.861	0.842	0.846	0.837	0.817	0.730
	1.000	0.825	0.885	1.038	0.881	0.818	0.833	0.891	0.918	1.051	1.003	0.936	0.824
	1.000	1.035	1.006	1.069	1.192	1.158	1.017	1.002	0.999	0.967	0.984	0.966	0.970
	1.000	1.0117	1.0294	1.0143	0.9961	1.0215	1.0233	0.9821	0.9306	0.8640	0.8797	0.9647	0.9280
	1.000	0.905	0.888	0.825	0.747	0.794	0.790	0.748	0.727	0.696	0.677	0.695	0.659
	1.000	1.0188	1.0577	1.0532	1.0104	1.0366	1.0003	0.9982	0.9787	0.9688	0.9730	0.9499	0.9463
	1.000	1.051	1.094	1.108	1.086	1.049	1.065	1.022	1.070	1.037	1.150	1.076	1.128
	1.000	0.868	0.904	0.932	0.946	0.951	0.933	0.937	0.879	0.732	0.733	0.657	0.667
	1.000	0.994	0.978	0.980	0.963	0.973	0.915	0.960	0.980	0.980	0.927	0.919	0.890
	1.000	1.067	1.065	0.879	0.872	0.915	0.911	0.941	0.947	0.918	0.933	0.950	0.647
	1.000	0.918	1.062	1.078	1.101	1.089	0.923	0.902	0.892	0.893	0.893	0.883	0.863
	1.000	1.041	1.101	1.080	1.103	1.082	1.108	1.020	0.961	0.967	0.956	0.932	0.903
	1.000	0.985	0.998	0.990	0.961	0.931	0.892	0.767	0.823	0.820	0.831	0.790	0.767
	1.000	0.992	1.137	1.163	1.140	1.184	1.161	1.103	1.106	1.041	1.022	1.048	1.017
	1.000	0.949	0.751	0.662	0.467	0.463	0.461	0.467	0.465	0.451	0.440	0.435	0.414
	1.000	0.949	0.906	0.929	0.916	0.915	0.945	0.929	0.931	0.898	0.892	0.885	0.843
	1.000	0.711	0.983	0.971	0.969	0.944	0.960	0.941	0.913	0.898	0.932	0.901	0.871
	1.000	1.004	1.019	1.034	1.069	1.071	1.002	0.923	0.833	0.757	0.686	0.610	0.609
	1.000	1.014	0.996	0.876	0.938	1.073	1.014	0.998	0.922	0.957	0.961	0.946	0.963
	1.000	1.011	1.072	1.097	1.047	1.082	1.040	1.021	0.973	0.824	0.839	0.849	0.801
	1.000	1.052	1.012	1.069	1.036	1.064	1.135	1.122	0.952	1.207	0.928	1.026	1.035
	1.000	0.952	1.040	1.020	0.988	0.974	0.761	0.673	0.600	0.528	0.476	0.465	0.426
	1.000	1.019	0.939	0.926	0.952	0.937	0.904	0.867	0.736	0.662	0.596	0.449	0.410
	1.000	1.017	0.940	0.838	0.761	0.673	0.670	0.650	0.642	0.610	0.575	0.556	0.492
	1.000	0.936	0.980	0.954	1.020	0.945	0.898	0.872	0.824	0.760	0.640	0.586	0.559
	1.000	1.248	1.259	1.314	1.225	1.069	1.066	0.995	1.010	1.008	0.978	0.923	0.922
	1.000	1.056	1.017	1.017	1.088	1.083	1.119	1.219	1.167	1.271	1.246	1.223	1.150
	1.000	0.968	0.959	0.880	0.922	0.921	0.942	0.933	0.916	0.927	0.920	0.912	0.878
	1.000	1.056	1.071	1.089	1.090	1.073	1.089	1.164	1.009	0.852	0.832	0.981	0.965
	1.000	0.924	0.997	0.963	1.038	0.975	1.116	0.919	1.075	0.955	0.901	0.882	0.781
	1.000	1.001	0.955	0.925	0.911	0.903	0.868	0.853	0.891	0.962	0.995	0.980	0.978
	1.000	1.031	0.995	0.958	0.963	0.846	0.834	0.783	0.666	0.660	0.569	0.558	0.545
	1.000	0.898	1.120	1.091	1.121	1.124	0.988	0.950	0.936	0.940	0.912	0.872	0.814
	1.000	1.037	1.046	1.109	1.068	1.033	0.972	0.941	1.045	0.821	0.789	0.798	0.791
	1.000	1.070	1.141	0.972	0.926	0.929	0.946	0.972	0.987	0.862	0.738	0.744	0.825
	1.000	1.042	0.959	1.455	1.512	1.669	1.536	1.720	1.149	1.045	0.978	0.970	0.966
	1.000	0.951	0.939	0.926	0.903	0.877	0.892	0.897	0.875	0.862	0.835	0.810	0.796
	1.000	0.885	0.796	0.702	0.586	0.529	0.457	0.467	0.459	0.452	0.437	0.426	0.400
	1.000	0.822	0.914	0.871	0.833	0.847	0.833	0.831	0.836	0.839	0.757	0.770	0.696
	1.000	1.009	0.964	0.897	0.879	0.853	0.833	0.804	0.791	0.750	0.701	0.649	0.625
	1.000	1.023	0.955	0.976	0.921	0.937	0.851	0.855	0.814	0.785	0.723	0.708	0.732
	1.000	0.981	0.937	1.154	0.945	0.901	0.923	0.930	0.953	0.896	0.692	0.841	0.734
	1.000	0.762	0.780	0.793	0.799	0.847	0.856	1.205	1.387	1.330	1.434	1.248	1.127
	1.000	0.989	1.043	0.937	1.003	1.120	0.976	1.079	1.017	0.970	0.970	0.939	0.878
	1.000	1.015	1.124	1.155	1.219	1.228	1.233	1.212	1.249	1.296	1.288	1.331	1.343
	1.000	0.98005	0.958	0.977	0.958	1.000	0.930	0.957	0.950	0.964	0.969	0.979	0.987

## TABLE B REDACTED

TFP Annual Simple Growth Rates	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average Annual Growth Rate	
	1.230%	5.973%	-4.321%	-1.618%	1.355%	-3.749%	0.252%	-2.617%	-3.477%	-3.548%	-5.292%	-1.035%	-1.404%
	1.660%	-7.153%	0.229%	-1.319%	-7.263%	0.231%	-0.830%	-2.113%	0.381%	-1.047%	-2.326%	-10.678%	-2.519%
	-17.537%	7.332%	17.273%	-15.104%	-7.124%	1.819%	6.893%	3.104%	14.458%	-4.590%	-6.692%	-11.992%	-1.013%
	3.499%	-2.811%	6.264%	11.520%	-2.817%	-12.234%	-1.461%	-0.275%	-3.174%	1.737%	-1.846%	0.390%	-0.101%
	1.170%	1.752%	-1.471%	-1.792%	2.551%	0.173%	-4.024%	-5.244%	-7.157%	1.812%	9.666%	-3.803%	-0.531%
	-9.516%	-1.912%	-7.064%	-9.418%	6.238%	-0.524%	-5.310%	-2.827%	-4.166%	-2.759%	2.695%	-5.190%	-3.313%
	1.881%	3.818%	-0.425%	-4.067%	2.595%	-3.500%	-0.213%	-1.956%	-1.012%	0.437%	-2.376%	-0.380%	-0.433%
	5.085%	4.137%	1.217%	-1.996%	-3.320%	1.518%	-4.089%	4.724%	-3.067%	10.861%	-6.400%	4.785%	1.121%
	-13.227%	4.159%	3.079%	1.506%	0.567%	-1.882%	0.417%	-6.151%	-16.739%	0.102%	-10.317%	1.398%	-3.091%
	-0.631%	-1.595%	0.246%	-1.798%	1.034%	-5.964%	4.989%	2.074%	-0.001%	-5.430%	-0.816%	-3.144%	-0.920%
	6.685%	-0.181%	-17.465%	-0.800%	4.990%	-0.481%	3.289%	0.594%	-3.007%	1.577%	1.859%	-31.861%	-2.900%
	-8.158%	15.653%	1.504%	2.090%	-1.028%	-15.315%	-2.211%	-1.092%	0.093%	-0.068%	-1.022%	-2.336%	-0.991%
	4.095%	5.804%	-1.900%	2.125%	-1.908%	2.398%	-8.000%	-5.715%	0.587%	-1.126%	-2.485%	-3.193%	-0.776%
	-1.476%	1.292%	-0.847%	-2.890%	-3.113%	-4.184%	-14.069%	7.368%	-0.371%	1.373%	-5.008%	-2.827%	-2.062%
	-0.762%	14.617%	2.264%	-1.971%	3.846%	-1.934%	-4.984%	0.208%	-5.880%	-1.763%	2.493%	-2.901%	0.269%
	-5.102%	-20.892%	-11.850%	-29.425%	-0.891%	-0.467%	1.417%	-0.407%	-3.152%	-2.432%	-1.044%	-4.863%	-6.592%
	-5.067%	-4.596%	2.566%	-1.398%	-0.086%	3.268%	-1.703%	0.202%	-3.529%	-0.668%	-0.800%	-4.776%	-1.382%
	-28.932%	38.261%	-1.130%	-0.286%	-2.513%	1.640%	-1.929%	-2.977%	3.353%	-1.316%	-3.287%	-3.359%	-0.206%
	0.432%	1.492%	1.474%	3.310%	0.205%	-6.440%	-7.869%	-9.760%	-9.141%	-9.339%	-11.079%	-0.113%	-3.902%
	1.419%	-1.821%	-12.027%	7.069%	14.454%	-5.495%	-1.642%	-7.610%	3.862%	0.418%	-1.601%	1.767%	-0.101%
	1.075%	6.061%	2.298%	-4.547%	3.347%	-3.880%	-1.784%	-4.758%	-15.281%	1.798%	1.227%	-5.703%	-1.679%
	5.246%	-3.831%	5.599%	-3.029%	2.659%	6.710%	-1.184%	-15.183%	26.879%	-23.160%	10.582%	0.840%	1.011%
	-4.820%	9.248%	-1.875%	-3.166%	-1.438%	-21.862%	-11.523%	-10.947%	-11.886%	-9.841%	-2.463%	-8.270%	-6.570%
	1.908%	-7.851%	-1.352%	2.788%	-1.597%	-3.478%	-4.141%	-15.145%	-10.012%	-9.959%	-24.608%	-8.836%	-6.857%
	1.666%	-7.586%	-10.756%	-9.275%	-11.514%	-0.406%	-3.012%	-1.240%	-5.064%	-5.615%	-3.380%	-11.456%	-5.637%
	-6.423%	4.701%	-2.596%	6.885%	-7.402%	-4.906%	-2.879%	-5.493%	-7.833%	-15.745%	-8.441%	-4.642%	-4.565%
	24.838%	0.815%	4.444%	-6.787%	-12.766%	-0.228%	-6.650%	1.507%	-0.233%	-2.969%	-5.674%	-0.030%	-0.311%
	5.634%	-3.710%	-0.034%	6.980%	-0.442%	3.370%	8.894%	-4.263%	8.943%	-1.987%	-1.829%	-5.959%	1.300%
	-3.193%	-0.937%	-8.206%	4.689%	-0.086%	2.345%	-1.043%	-1.726%	1.151%	-0.731%	-0.918%	-3.725%	-1.032%
	5.623%	1.352%	1.696%	0.122%	-1.569%	1.488%	6.917%	-13.335%	-15.507%	-2.386%	17.837%	-1.600%	0.053%
	-7.575%	7.845%	-3.357%	7.750%	-6.074%	14.437%	-17.638%	16.952%	-11.121%	-5.703%	-2.111%	-11.443%	-1.503%
	0.123%	-4.590%	-3.149%	-1.482%	-0.889%	-3.899%	-1.717%	4.437%	7.917%	3.495%	-1.524%	-0.249%	-0.127%
	3.058%	-3.429%	-3.693%	0.418%	-12.127%	-1.402%	-6.135%	-14.968%	-0.871%	-13.810%	-1.869%	-2.360%	-4.766%
	-10.197%	24.677%	-2.577%	2.759%	0.278%	-12.106%	-3.809%	-1.464%	0.343%	-2.930%	-4.412%	-6.595%	-1.336%
	3.659%	0.934%	6.026%	-3.682%	-3.310%	-5.952%	-3.168%	11.072%	-21.405%	-3.984%	1.130%	-0.799%	-1.623%
	6.992%	6.662%	-14.784%	-4.754%	0.327%	1.808%	2.724%	1.512%	-12.660%	-14.366%	0.809%	10.919%	-1.234%
	4.211%	-7.972%	51.685%	3.963%	10.340%	-7.958%	12.002%	-33.203%	-9.033%	-6.433%	-0.853%	-0.430%	1.360%
	-4.856%	-1.312%	-1.338%	-2.565%	-2.888%	1.731%	0.635%	-2.476%	-1.552%	-3.114%	-2.989%	-1.716%	-1.870%
	-11.463%	-10.116%	-11.828%	-16.552%	-9.699%	-13.574%	2.263%	-1.793%	-1.564%	-3.276%	-2.520%	-6.064%	-7.182%
	-17.821%	11.179%	-4.663%	-4.397%	1.679%	-1.650%	-0.177%	0.532%	0.357%	-9.694%	1.661%	-9.583%	-2.715%
	0.916%	-4.473%	-7.000%	-1.978%	-2.955%	-2.351%	-3.489%	-1.632%	-5.107%	-6.598%	-7.382%	-3.770%	-3.818%
	2.338%	-6.663%	2.167%	-5.593%	1.650%	-9.140%	0.523%	-4.877%	-3.561%	-7.917%	-1.971%	3.350%	-2.474%
	-1.887%	-4.545%	23.243%	-18.132%	-4.624%	2.397%	0.796%	2.503%	-6.070%	-22.775%	21.617%	-12.679%	-1.680%
	-23.800%	2.386%	1.659%	0.700%	6.111%	1.012%	40.802%	15.065%	-4.119%	7.798%	-12.971%	-9.640%	2.084%
	-1.056%	5.461%	-10.197%	7.082%	11.600%	-12.809%	10.533%	-5.771%	-4.657%	0.015%	-3.125%	-6.530%	-0.788%
	1.531%	10.711%	2.756%	5.540%	0.700%	0.479%	-1.737%	3.068%	3.782%	-0.660%	3.341%	0.908%	2.535%
	-1.995%	-2.226%	2.004%	-1.978%	4.377%	-7.015%	2.907%	-0.730%	1.502%	0.511%	0.992%	0.891%	-0.063%
Column Average	-1.905%	1.832%	-0.132%	-1.798%	-0.607%	-2.723%	-0.472%	-2.401%	-2.932%	-3.740%	-1.607%	-4.027%	-1.709%

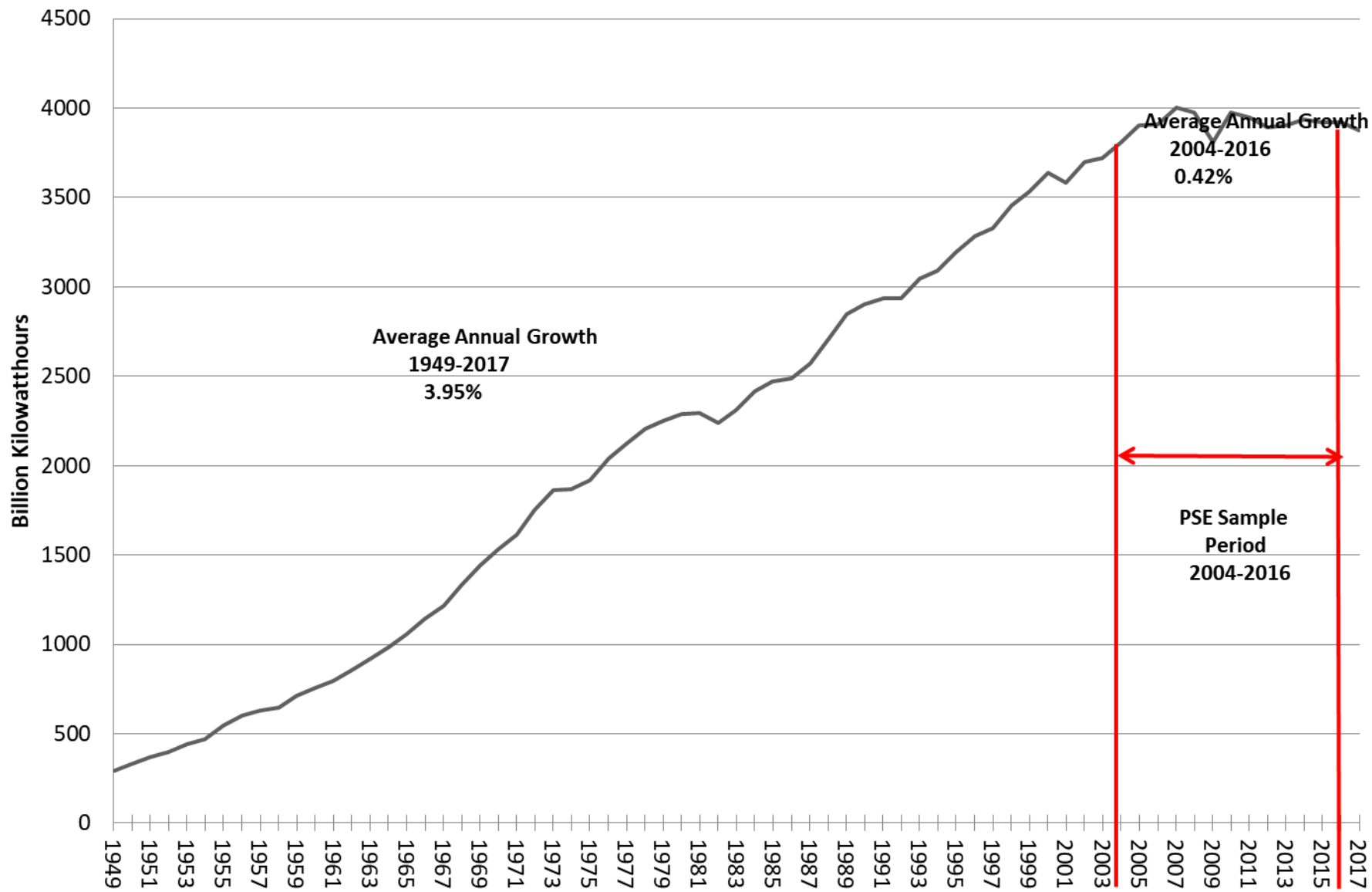
CHART A

TFP Annual Growth Rates  
PSE Report  
US Sample, 2005-2016



**CHART B**

**US Net Electricity Generation: Electric Power Sector**



— US Energy Information Administration. Monthly Energy Review, Nov 2018

CHART C

### Electricity Generation by Canadian Utilities 1950-2017

