WINDSOR-ESSEX REGION
INTEGRATED REGIONAL RESOURCE PLAN - APPENDICES

April 28, 2015

ieso
Independent Electricity System Operator

Windsor-Essex IRRP

Appendix A: Forecast Data Tables

Appendix A: Demand Forecasts

A.1 Gross Forecasts by Sub-System and Station

J3E/J4E Sub System Gross Demand (extreme weather)	*LTR*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*	*2029*	*2030*	*2031*	*2032*	*2033*
		Forecast																			
Kingsville TS	158	138	143	147	152	155	157	160	163	166	169	173	176	177	179	180	182	184	185	187	189
Belle River TS	59	45	46	46	47	48	49	49	50	51	51	52	53	53	54	55	55	56	57	58	58
Tilbury West TS	34	18	18	18	18	18	18	18	19	19	19	19	19	19	19	20	20	20	20	20	20
Tilbury TS	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lauzon TS	225	186	188	190	192	194	195	197	198	200	201	203	204	206	208	210	211	213	215	217	218
Walker TS #1	99	85	85	86	86	87	87	88	88	89	89	90	91	91	92	92	93	93	94	94	95
Walker TS #2	99	105	106	106	107	108	108	109	110	110	111	112	112	113	114	114	115	116	116	117	118
Essex TS	116	61	61	61	61	62	62	63	63	63	64	64	64	65	65	66	66	66	67	67	68
Crawford TS	90	73	73	74	74	75	75	76	76	76	77	77	78	78	79	79	80	80	81	81	82
Customer #1	65	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
Customer #2	65	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Customer #3	43	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Customer #4	43	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Customer #5	43	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Customer #6	57	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Subtotal	**N/A**	**800**	**808**	**817**	**827**	**834**	**842**	**849**	**856**	**864**	**871**	**879**	**886**	**892**	**899**	**905**	**911**	**918**	**924**	**930**	**937**

Additional Stations in the Windsor Essex Region		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Gross Demand (extreme weather)	LTR	Forecast																			
Keith TS T1	54	6	6	6	6	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7
Keith TS T22/T23	114	44	44	45	45	46	47	47	48	49	49	50	51	51	52	53	53	54	55	56	56
Malden TS	200	119	120	121	123	124	125	126	128	129	130	131	132	133	135	136	137	138	140	141	142
Windsor-Essex Total	**N/A**	**968**	**978**	**989**	**1001**	**1010**	**1019**	**1029**	**1038**	**1047**	**1057**	**1066**	**1075**	**1084**	**1092**	**1100**	**1109**	**1117**	**1126**	**1134**	**1143**

Kingsville Leamington Sub system		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Gross Demand (weather normal)	LTR	Forecast																			
Total	**N/A**	**155**	**160**	**165**	**169**	**172**	**174**	**177**	**178**	**181**	**183**	**186**	**188**	**191**	**193**	**196**	**199**	**201**	**204**	**206**	**209**

A.2 Conservation

The forecast conservation savings included in the demand forecasts for the Windsor-Essex IRRP were derived from the provincial conservation forecast, which aligns with the conservation targets described in the 2013 LTEP: "Achieving Balance: Ontario's Long-Term Energy Plan". The LTEP set an electrical energy conservation target of 30 TWh in 2032, with about 10 TWh of the energy savings coming from codes and standards, and the remaining 20 TWh from energy efficiency programs. The 30 TWh energy savings target will also lead to associated peak demand savings. Time-of-Use ("TOU") rate impacts and DR resources are focused on peak demand reduction rather than energy savings and, as such, are not reflected in the 30 TWh energy target and are considered separately in forecasting.

To assess the peak demand savings from the provincial conservation targets, two demand forecasts are developed. A gross demand forecast is produced that represents the anticipated electricity needs of the province based on growth projections, for each hour of the year. This forecast is based on a model that calculates future gross annual energy consumption by sector and end use. Hourly load shape profiles are applied to develop province-wide gross hourly demand forecasts. Natural conservation impacts are included in the provincial gross demand forecast, however the effects of the planned conservation are not included. A net hourly demand forecast is also produced, reflecting the electricity demand reduction impacts of C&S, energy efficiency programs, and TOU pricing. The gross and net forecasts were then compared in each year to derive the peak demand savings. In other words, the difference between the gross and net peak demand forecasts is equal to the demand impacts of conservation at the provincial level.

The above methodology was used to derive the combined peak demand savings, which was further broken down to three categories as shown in Figure B-1. Peak demand savings associated with load shifting in response to TOU rates were estimated using an econometric model based on customers' elasticity of substitution and the TOU price ratio. The remaining peak savings were allocated between C&S and EE programs based on their energy saving projections, with about 1/3 attributed to C&S and 2/3 to EE programs.

The resulting peak demand savings in each year are represented as a percentage of total provincial peak demand in Figure B-1, using 2013 as a base year.

Figure B-1: Approaches to Meeting Medium- and Long-Term Needs

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
C&S	0.0%	0.2%	0.5%	0.6%	1.1%	1.6%	1.9%	2.3%	2.5%	2.6%	2.8%	2.9%	3.1%	3.6%	4.1%	4.4%	4.8%	5.1%	5.4%	5.4%
TOU	0.2%	0.3%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%
EE programs	0.5%	0.8%	1.0%	1.1%	1.3%	2.1%	3.1%	3.2%	3.6%	4.2%	5.0%	5.3%	5.8%	6.0%	6.5%	6.6%	6.9%	7.4%	7.8%	7.8%
Total	0.8%	1.3%	1.9%	2.2%	2.7%	4.1%	5.4%	5.9%	6.5%	7.1%	8.1%	8.6%	9.3%	10.0%	11.0%	11.4%	12.1%	12.8%	13.5%	13.5%

These percentages were applied to the gross demand forecasts provided by the Windsor-Essex Region LDCs at the TS level to determine the peak demand savings assumed in the planning forecast. This allocation methodology relies on the assumption that the peak demand savings from the provincial conservation will be realized uniformly across the province. Actions recommended in the Windsor-Essex IRRP to monitor actual demand savings, and to assess conservation potential in the Region, will assist in developing Region-specific conservation assumptions going forward.

Existing DR resources are included in the base year and gross demand forecasts. Additional DR resources can be considered as potential options to meet regional needs.

A.2.1 Conservation Assumptions by Sub-Area and Station

The following tables show the expected peak demand impact of provincial energy targets at each TS, developed according to the methodology described above, for the purposes of the high-growth forecast.

Conservation Assumptions by Sub-System and Station

J3E/J4E Sub System	LTR	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Conservation		Forecast																			
Kingsville TS	158	1	2	3	3	4	6	9	10	11	12	14	15	16	18	20	21	22	24	25	26
Belle River TS	59	0	1	1	1	1	2	3	3	3	4	4	5	5	5	6	6	7	7	8	8
Tilbury West TS	34	0	0	0	0	0	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3
Tilbury TS	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lauzon TS	225	1	3	4	4	5	8	11	12	13	14	17	18	19	21	23	24	26	28	29	30
Walker TS #1	99	1	1	2	2	2	4	5	5	6	6	7	8	8	9	10	11	11	12	13	13
Walker TS #2	99	1	1	2	2	3	4	6	6	7	8	9	10	10	11	13	13	14	15	16	16
Essex TS	116	0	1	1	1	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	9
Crawford TS	90	1	1	1	2	2	3	4	4	5	5	6	7	7	8	9	9	10	10	11	11
Customer #1	65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Customer #2	65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Customer #3	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Customer #4	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Customer #5	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Customer #6	57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal	**N/A**	**5**	**10**	**14**	**16**	**20**	**31**	**41**	**45**	**50**	**55**	**64**	**69**	**75**	**81**	**89**	**94**	**100**	**107**	**114**	**115**

Additional Stations in the Windsor Essex Region		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Conservation	LTR	Forecast																			
Keith TS T1	54	0	1	1	1	1	2	3	3	3	3	4	4	5	5	6	6	7	7	8	8
Keith TS T22/T23	114	0	1	1	1	1	2	3	3	3	3	4	4	5	5	6	6	7	7	8	8
Malden TS	200	1	2	2	3	3	5	7	7	8	9	11	11	12	14	15	16	17	18	19	19
Windsor-Essex Total	**N/A**	**7**	**12**	**18**	**20**	**26**	**40**	**53**	**58**	**65**	**72**	**83**	**89**	**97**	**105**	**116**	**122**	**130**	**139**	**148**	**149**

Kingsville Leamington Sub system		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Conservation	LTR	Forecast																			
Total	**N/A**	**1**	**2**	**3**	**3**	**4**	**6**	**9**	**10**	**11**	**12**	**14**	**15**	**16**	**18**	**20**	**21**	**22**	**24**	**25**	**26**

A.2.2 Distributed Generation Assumptions by Sub-System and Station

J3E/J4E Sub System / Distributed Generation	LTR	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
		Forecast																			
Kingsville TS	158	15	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
Belle River TS	59	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Tilbury West TS	34	2	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Tilbury TS	10	2	7	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Lauzon TS	225	8	16	18	19	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Walker TS #1	99	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Walker TS #2	99	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Essex TS	116	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Crawford TS	90	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Customer #1	65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Customer #2	65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Customer #3	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Customer #4	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Customer #5	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Customer #6	57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal	**N/A**	**35**	**59**	**64**	**66**	**68**	**68**	**68**	**68**	**68**	**68**	**68**	**68**	**68**	**68**	**68**	**68**	**68**	**68**	**68**	**68**

Additional Stations in the Windsor Essex Region Distributed Generation	*LTR*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*	*2029*	*2030*	*2031*	*2032*	*2033*
		Forecast																			
Keith TS T1	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Keith TS T22/T23	114	21	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Malden TS	200	9	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Windsor-Essex Total	**N/A**	**65**	**63**	**69**	**71**	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**

Kingsville Leamington Sub system Distributed Generation	*LTR*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*	*2029*	*2030*	*2031*	*2032*	*2033*
		Forecast																			
Total	**N/A**	**15**	**21**	**21**	**21**	**21**	**21**	**21**	**21**	**21**	**21**	**21**	**21**	**21**	**21**	**21**	**21**	**21**	**21**	**21**	**21**

A.2.3 Reference Planning Forecast by Sub-System and Station

J3E/J4E Sub System Net Demand (extreme weather)	*LTR*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*	*2029*	*2030*	*2031*	*2032*	*2033*
		Forecast																			
Kingsville TS	158	121	120	124	127	129	130	130	133	134	136	137	139	140	140	139	140	140	140	140	142
Belle River TS	59	42	43	43	44	44	44	44	44	45	45	45	45	46	46	46	47	47	47	47	48
Tilbury West TS	34	15	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Tilbury TS	10	-2	-7	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8
Lauzon TS	225	177	169	168	169	169	168	167	167	167	168	167	167	167	167	167	168	168	168	168	169
Walker TS #1	99	83	82	82	82	82	82	81	81	81	81	80	80	80	80	80	80	80	80	79	80
Walker TS #2	99	103	103	103	104	104	103	102	102	102	102	102	101	101	101	101	101	101	100	100	101
Essex TS	116	59	60	59	59	59	59	58	58	58	58	58	58	58	58	58	58	57	57	57	58
Crawford TS	90	71	72	71	71	70	70	69	69	69	69	69	69	69	69	68	68	68	68	68	68
Customer #1	65	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
Customer #2	65	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Customer #3	43	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Customer #4	43	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Customer #5	43	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Customer #6	57	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Subtotal	**N/A**	**760**	**739**	**739**	**744**	**746**	**743**	**740**	**744**	**746**	**748**	**747**	**750**	**750**	**750**	**748**	**750**	**750**	**749**	**749**	**754**

Additional Stations in the Windsor Essex Region		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Net Demand (extreme weather)	LTR	Forecast																			
Keith TS T1	54	5	5	5	5	5	4	3	3	3	3	2	2	2	1	1	1	0	0	0	0
Keith TS T22/T23	114	23	42	42	42	43	43	43	43	43	44	44	44	45	45	45	45	46	46	46	47
Malden TS	200	109	117	117	117	117	117	116	117	117	117	117	117	118	118	118	118	118	118	118	120
Windsor-Essex Total	**N/A**	**897**	**903**	**903**	**909**	**911**	**907**	**903**	**907**	**909**	**912**	**910**	**913**	**914**	**914**	**911**	**914**	**915**	**913**	**913**	**920**

Kingsville Leamington Sub system		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Net Demand (extreme normal)	LTR	Forecast																			
Total	**N/A**	**148**	**147**	**151**	**155**	**156**	**157**	**157**	**158**	**159**	**160**	**161**	**162**	**164**	**165**	**166**	**167**	**169**	**169**	**171**	**173**

Low Demand Forecast

Windsor Essex	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Net Demand (extreme weather)										
Total	**919**	**930**	**941**	**951**	**961**	**972**	**982**	**992**	**1002**	**1013**

Windsor-Essex IRRP

Appendix B: LDC Profiles

Appendix B: LDC Profiles

B.1 LDC Description: E.L.K. Energy Inc.

Incorporated in 2000, E.L.K. Energy Inc. (E.L.K.) is the successor Local Distribution Company (LDC) to the Hydro-Electric Commission for the Town of Essex, Lakeshore Hydro Electric Commission and Kingsville Hydro-Electric Commission. The Corporation of the Town of Essex (Town of Essex) is the company's sole shareholder. E.L.K. serves more than 11,500 customers in the Towns of Essex, Lakeshore and Kingsville. Within these towns, which cover a large geographic area in southwestern Ontario, E.L.K. has six non-contiguous service areas, serving the communities of Belle River, Comber, Cottam, Essex, Harrow and Kingsville. The approximated total service area is approximately 22.26 sq km.

The majority of E.L.K.'s customer base remains residential in nature, making up approximately 88% of E.L.K.'s total customers. E.L.K. continues to invest in improving infrastructure as well as interactive tools that support our customers as we strive to create a greater customer experience, while doing so in a cost-effective manner.

With respect to conservation, in 2014, E.L.K. contracted with the Independent Electricity System Operator (IESO) to deliver a portfolio of IESO-Contracted Province-Wide CDM Programs to all customer segments including residential, commercial, industrial and low income. Program activities are centered on building a foundation for full program execution over the next six years of the program term, including staffing, procurement, and program delivery. E.L.K. has already focused on many of the these conservation programs in the past, concentrating on the small business lighting program, ERII, the Peaksaver Plus and Low Income Program, and will continue to do so in 2015.

E.L.K.'s remains a very strong and consistent cost-effective utility, which is evident by the positive financial ratios and operational effectiveness that is present in the Ontario Energy Board's (OEB's) mandated Scorecard. Further to achieving stability and positive results from a financial and operational effectiveness perspective, the OEB scorecard also shows E.L.K.'s service quality ratios all exceed the industry required targets. In addition, E.L.K. is pleased to have ranked in the top five of 73 utilities in the latest productivity and benchmarking research report issued by Pacific Economics Group Research LLC (PEG) who was retained by the OEB to conduct the report.

B.2 LDC Description: EnWin Utilities Ltd.

EnWin Utilities Ltd. ("EnWin") is a local electricity distribution company that is wholly owned by the Corporation of the City of Windsor. EnWin is incorporated pursuant to the Ontario Business Corporations Act and is licenced and regulated by the Ontario Energy Board ("OEB"). EnWin's corporate office and operations centre are both located in the City of Windsor. EnWin is also Windsor's licenced water system operator, under contract with the Windsor Utilities Commission.

EnWin serves approximately 86,000 electricity customers and 70,000 water customers in Windsor, Ontario. There are about 500 Windsor electricity customers not served by EnWin in a part of the former Sandwich South township which was annexed by the City of Windsor in 2003. These customers are served by Hydro One Networks Inc.

While approximately 90% of EnWin's customers are residential, the residential customer class only represents about 50% of EnWin's distribution revenue. The other half of EnWin's distribution revenue is from sales to commercial, institutional, and industrial customers. Windsor has an energy-intensive large manufacturing economy, which EnWin supports.

Due to changes in the Windsor and Ontario economies, EnWin has experienced significant reductions in consumption and demand in its service area since their peaks in 2005-2006. Usage appears to have stabilized in 2013 and 2014 at levels that are approximately 25% less than peak load. Nevertheless, EnWin's system reliability performance remains extremely strong. This is critical to support the remaining advanced manufacturing, which is extremely sensitive to power supply and quality. EnWin's performance is important to local economic sustainment and development in key sectors such as manufacturing and entertainment.

EnWin continues to invest in infrastructure, processes, and customer programs that support its customers, including the incorporation of proven technologies, cost-saving initiatives, and sophisticated conservation and demand management. This approach will sustain Windsor through a future of economic renewal and relatively flat load growth.

Despite the changes to its load profile, EnWin has managed to hold distribution rates stable at 2006 levels while funding reinvestment in infrastructure and generating strong returns for its shareholder. EnWin maintains a rating of 'A' from Standard & Poors. In the OEB Performance Scorecard, EnWin's results demonstrate positive outcomes that add value to the utility and deliver value to its customers.

B.3 LDC Description: Essex Powerlines Corporation

Essex Powerlines Corporation is wholly owned by Essex Power Corporation which is in turn wholly owned by the Town of Amherstburg, the Town of LaSalle, the Municipality of Leamington and the Town of Tecumseh.

Essex services approximately 29,000 customers in the owner municipalities but Essex does not service all customers within the respective municipalities' area except for the Town of LaSalle. In the other towns, the rural areas are serviced by Hydro One Networks Inc. Essex's customer base is primarily residential and small commercial customers and there are very few large industrial customers.

Essex has experienced economic factors over the past several years that have limited its growth. Essex has experienced load loss and will experience some load growth due to the Herb Gray Parkway but overall the forecast continues to be minimal for the next few years. Essex has continued to find processes and products to keep its costs in control while improving reliability and customer responsiveness during outage situations.

While Essex has limited growth in most of its areas, the need for the Leamington TS is important for overall system reliability and expansion of the green house industry in the Municipality of Leamington which may provide some spin off customers within Essex's service territory.