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Real-time electricity data (RTED)

Presentation to Energy Modelling Initiative, February 11 2021

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Agenda

- Introduction
- Project background
 - What / why / who
 - Early development
 - Current undertakings
- Demonstration of prototype
- Feedback from EMI community



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A decorative footer image showing a close-up of solar panels with a grid pattern, set against a background of green trees.

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Introduction

- Project team
 - NRCan (Low Carbon Energy Sector, CanmetENERGY)
 - Canada Energy Regulator
 - Statistics Canada / CCEI

- Goal of today's session
 - Inform EMI community on work done to date
 - Discuss the future vision for this project
 - Receive feedback and commentary



Project Background

- Objective: Deliver “real-time” high frequency electric system data by province in a single access point including indicators on:
 - Demand (load and load forecast),
 - Generation and trade (generation by energy source, interchange between jurisdictions), and
 - Pricing
- Two-phased approach
 - Demonstration and evaluation
 - Larger scale deployment



Project Background – Why?

- Frequency of current data does not capture the dynamic nature of electricity markets
- Most timely data are 3 months behind
- This is held by all provincial transmission system operators, but only made public by a few



Project Background - Benefits

- Will support the work of policy experts and researchers
- Enable assessment of grid reliability and resilience and improve situational awareness by allowing for real time monitoring
- Support international collaboration and facilitate a better understanding of interchange and trade in the grid
- Reinforce transparency and public trust by informing Canadians about the state of the grid
- Consolidated in a central publically accessible location



Project Background – Potential applications

- Researchers
 - Validate and improve models **with recent data from all across Canada** (e.g. load and generation forecast, unit commitment and dispatch models, control algorithms)
- Aggregators or other participants in flexibility markets
 - Manage distributed energy resources to optimize revenue
- Recent specific examples
 - Marginal emissions from electricity generation
 - Pandemic impacts on electricity demand



Project Background – Phased approach

Phase 1: Demonstration and evaluation

- Early development
 - Development of project benefits
 - Survey of publically available data
 - Prototype dashboard
- Current undertakings
 - StatCan/CCEI infrastructure development
 - Respondent frame, P/T, utility, and TSO stakeholder engagement
 - Assessment of technical and financial requirements for larger scale program



Project Background – Phased approach

Phase 2: Large-scale deployment

● Vision

- National statistical program to collect consistent high frequency data, disseminated publically through accessible database and visualization dashboard.
- Includes data from all P/T system operators or utilities

● Requirements

- Business case assessing benefits and the costs
- Evaluate data collection mechanisms (consider response burden, need for consistency)
- Identify ideal data timeliness (consider sensitive nature of information, and analysis needs)



Demonstration of CER Prototype Dashboard

- Visual demonstration
- Design elements
- Technical considerations in development



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Feedback session

- Questions and comments please



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Annex



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Annex - International examples

- The US Energy Information Administration (EIA)'s [Hourly Electric Grid Monitor](#).
- The European Union's [ENTSO-E](#).



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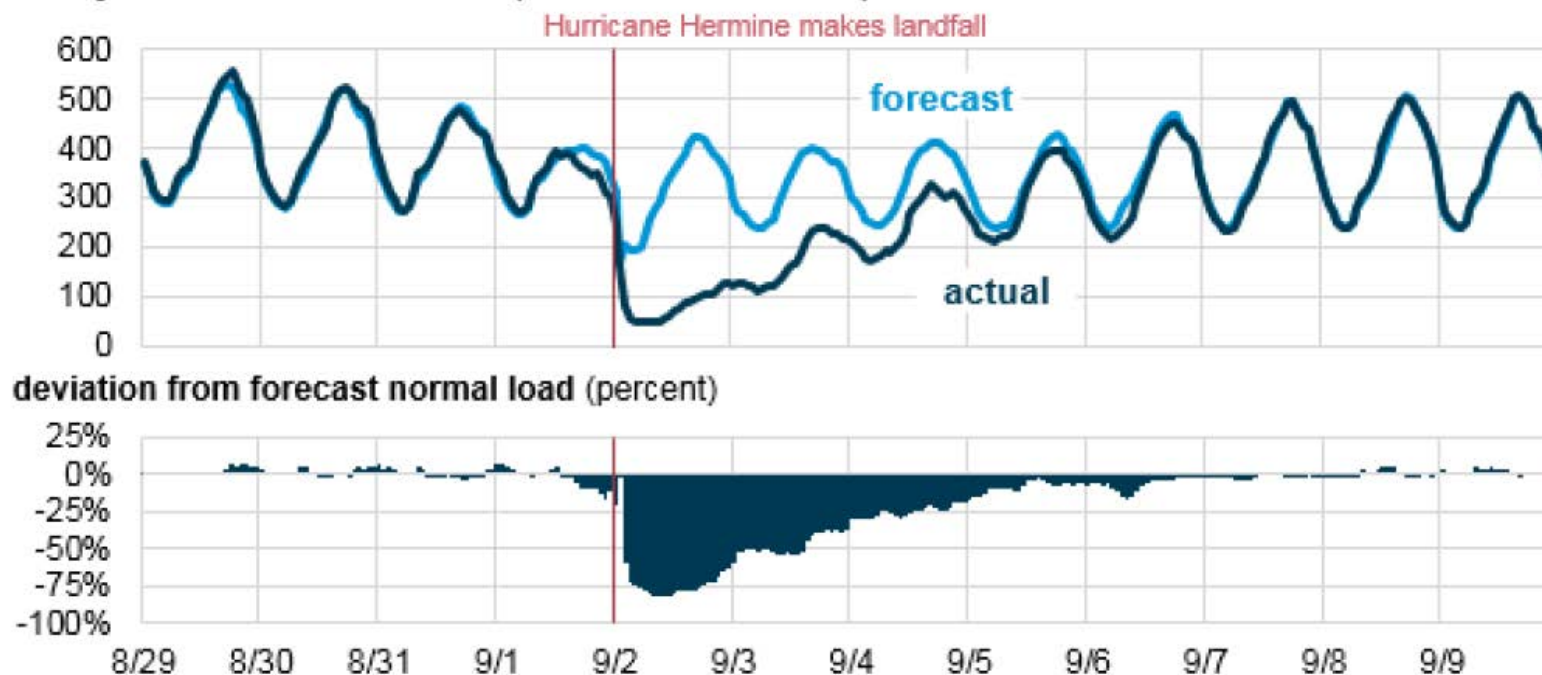
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Annex - High Frequency Data Examples

City of Tallahassee electricity balancing authority (Aug 29 - Sep 9, 2016)



hourly actual and forecast load (thousand kilowatthours)



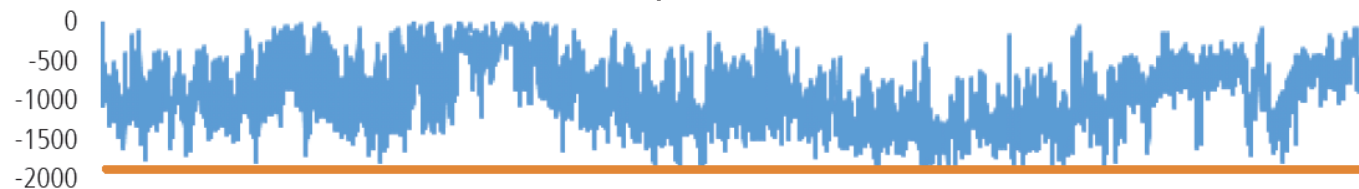
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Annex - High Frequency Data Examples

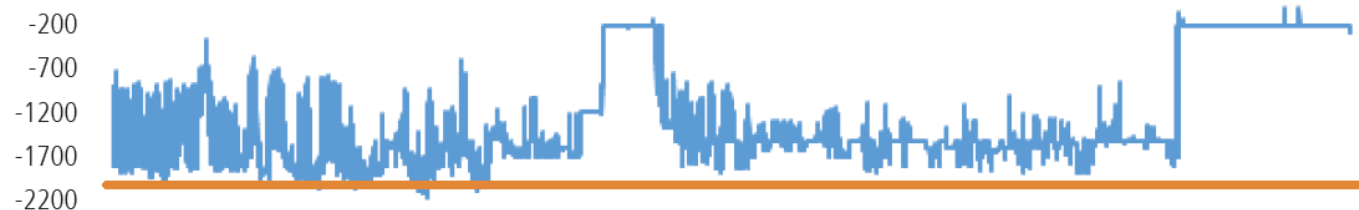
Ontario (IESO) Exports to New York (NYISO)



Quebec (Hydro Quebec) Exports to New York (NYISO)

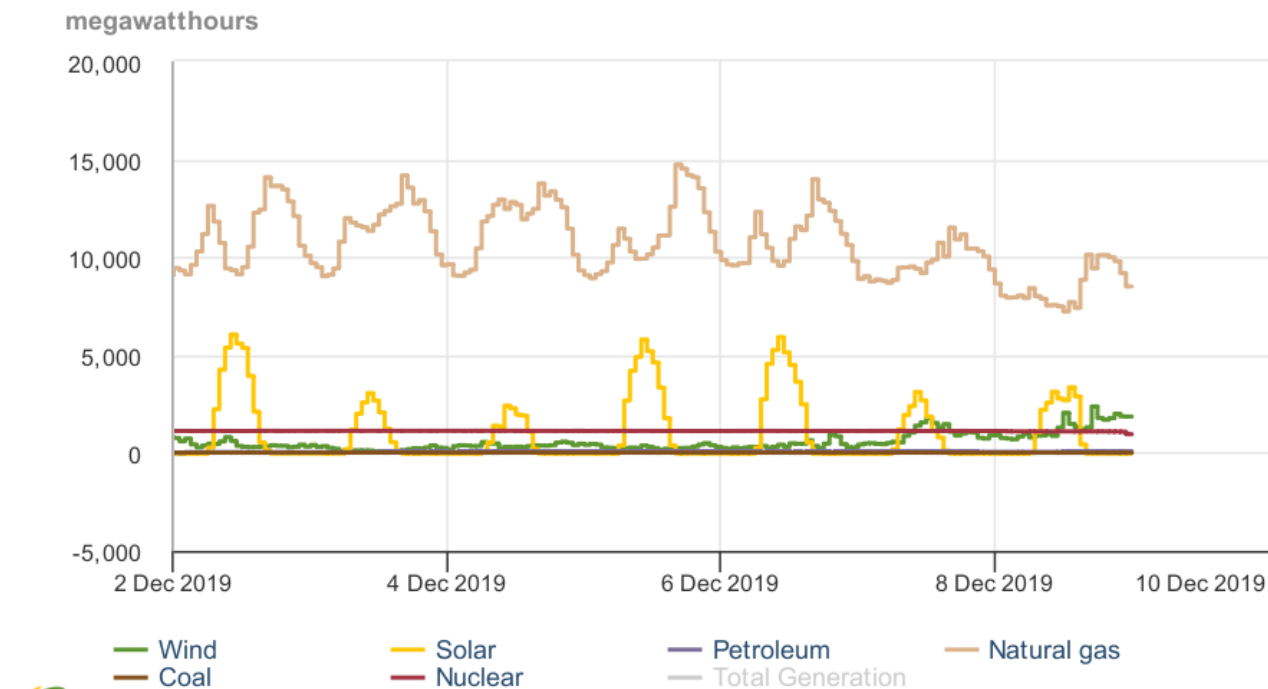


Quebec (Hydro Quebec) Exports to New England (ISO-NE)



Annex - High Frequency Data Examples

California Independent System Operator (CISO) electricity generation by energy source 12/2/2019 – 12/9/2019, Pacific Time



Source: U.S. Energy Information Administration



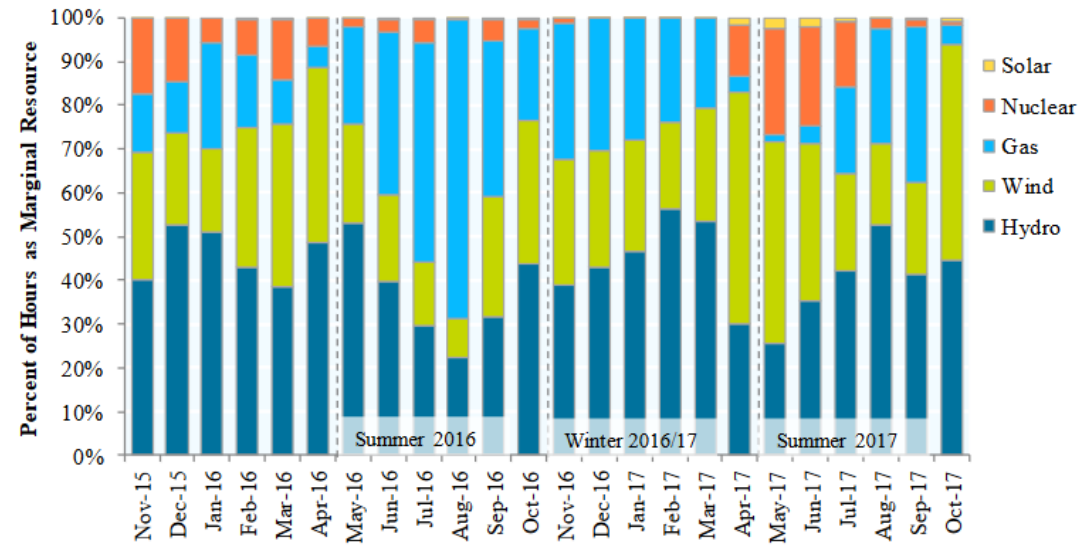
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Annex - High Frequency Data Examples

*Figure A-6: Share of Resource Type Setting the Real-Time MCP
November 2015 – October 2017
(% of Intervals)*



Source: Monitoring Report on the IESO-Administered Electricity Markets for the period from May 2017 to October 2017, page 49



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Annex - High Frequency Data Examples

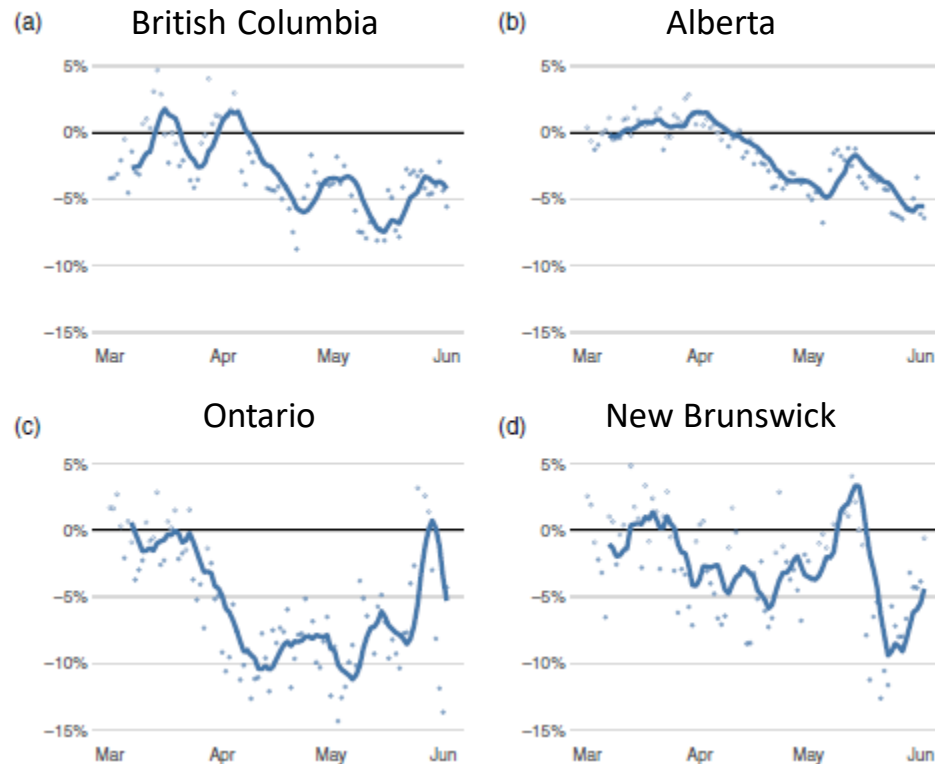
Ontario – Electrical generation marginal emissions factors, 2019

MEF	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec	Full Year
1	117	111	87	55	49	65	106	78	52	46	81	97	79
2	106	101	78	47	40	53	90	65	43	40	70	86	68
3	95	89	70	42	36	46	80	56	39	35	64	77	61
4	94	88	68	39	30	39	71	48	35	32	57	74	56
5	87	81	63	37	30	39	63	44	32	31	51	67	52
6	86	81	70	44	33	40	65	48	34	35	50	66	54
7	90	87	85	59	45	47	73	56	46	46	58	73	64
8	106	102	101	74	60	64	91	71	60	66	78	86	80
9	124	120	113	84	73	79	108	83	72	79	94	105	94
10	132	127	114	84	75	85	122	96	72	78	103	112	100
11	142	130	112	78	79	89	133	105	78	79	109	115	104
12	140	137	106	84	78	90	143	110	83	80	112	123	107
13	143	133	107	83	73	93	151	117	85	78	108	124	108
14	139	129	102	80	75	98	158	125	87	74	106	120	108
15	135	125	95	72	75	97	162	129	87	74	104	120	106
16	134	122	92	69	71	96	162	130	89	69	101	117	104
17	130	118	91	73	74	102	167	135	92	74	103	115	106
18	140	126	100	82	83	109	180	150	106	85	111	126	116
19	164	141	104	79	82	111	184	157	103	91	138	153	126
20	174	155	120	84	81	115	180	148	111	107	138	153	131
21	174	159	135	102	89	114	170	149	116	101	136	146	133
22	167	154	128	99	91	114	171	142	106	90	129	140	127
23	156	146	114	85	79	104	155	123	86	73	117	131	114
24	136	127	100	68	61	81	130	96	66	58	99	115	95
Full day	130	120	98	71	65	82	130	103	74	68	97	110	96

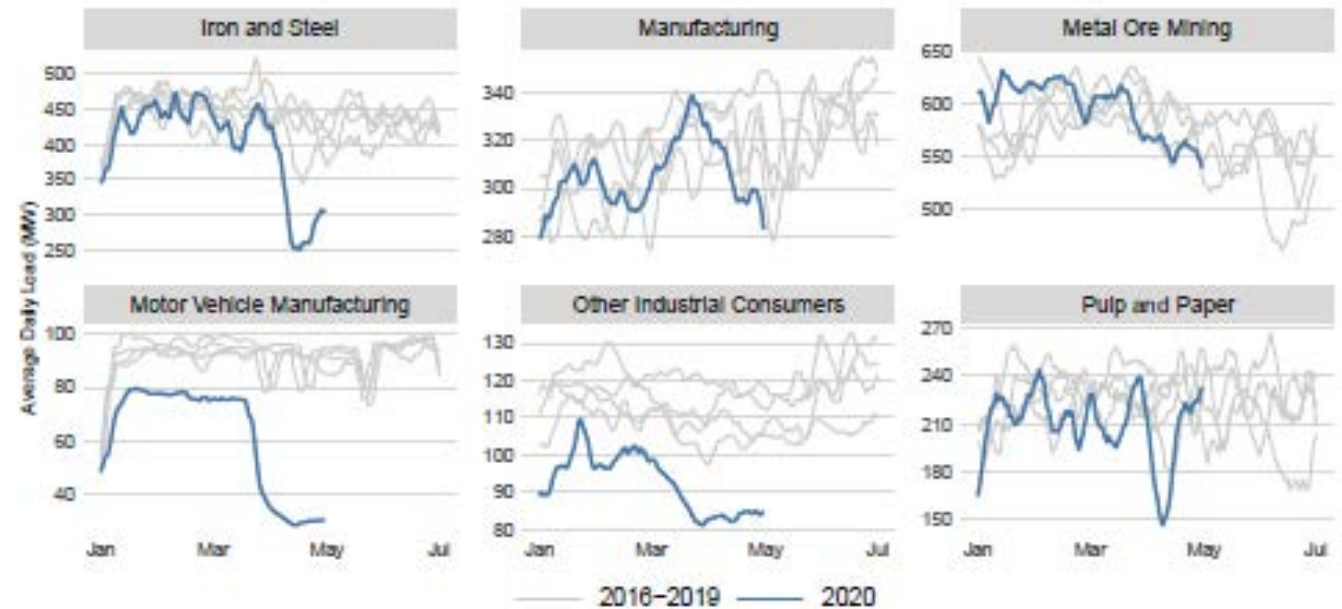


Annex - High Frequency Data Examples

Daily Electricity Demand Relative to Expected Demand During COVID-19



Industrial Electricity Demand in Ontario by Sector, 2016–2020



Source: Leach, A., Rivers, N., Shaffer, B. Canadian Electricity Markets during the COVID-19 Pandemic: An Initial Assessment, August 2020

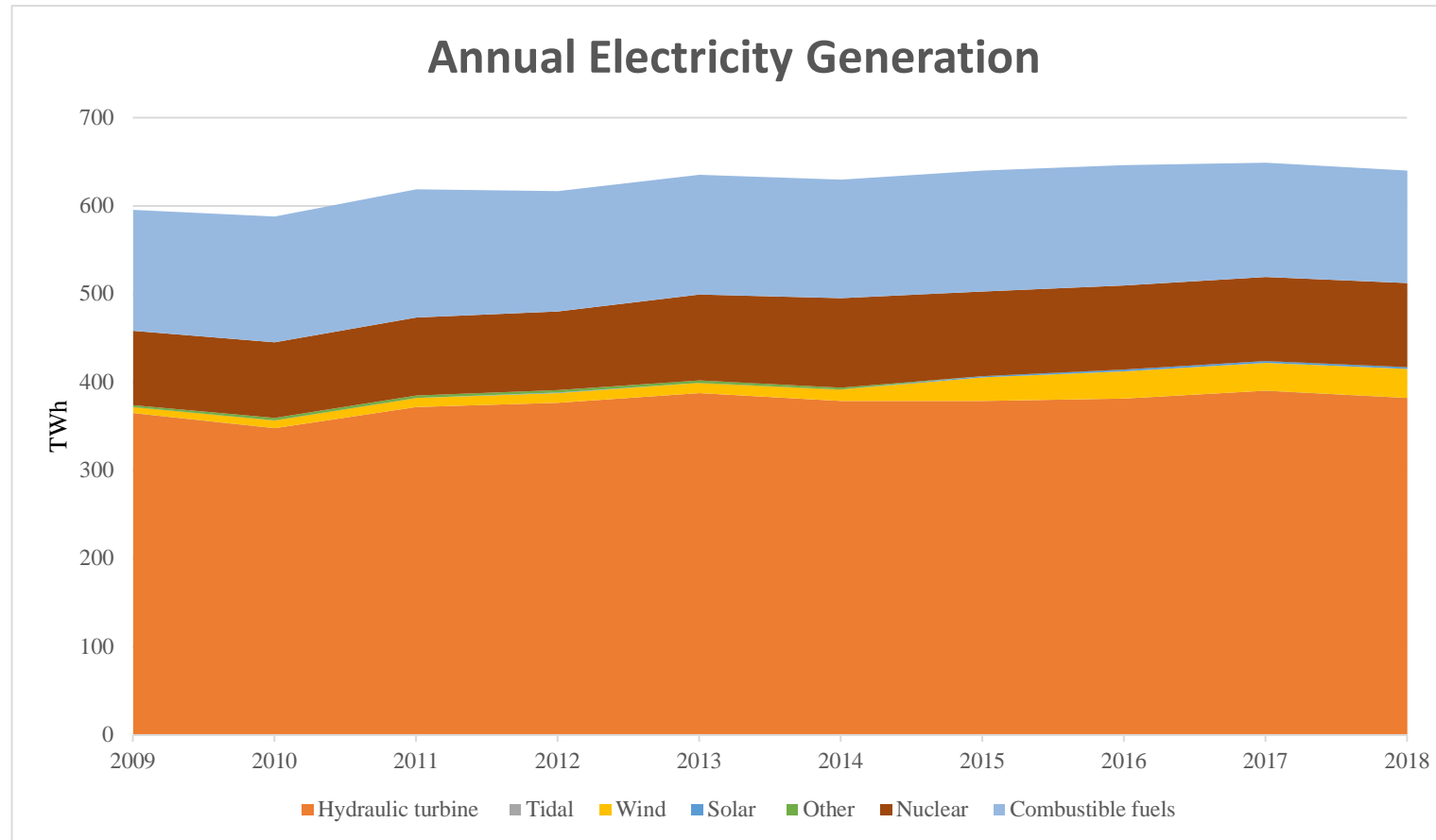


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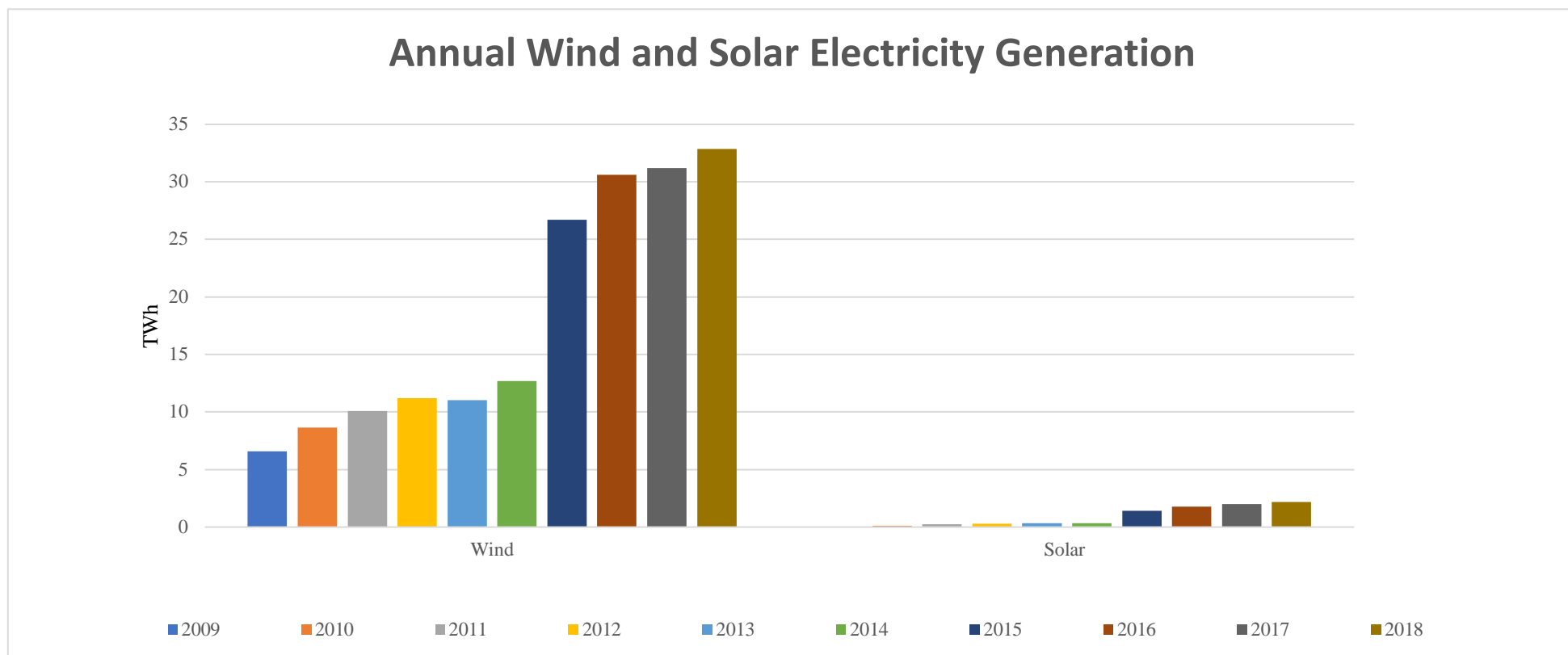
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Annex - Current statistics

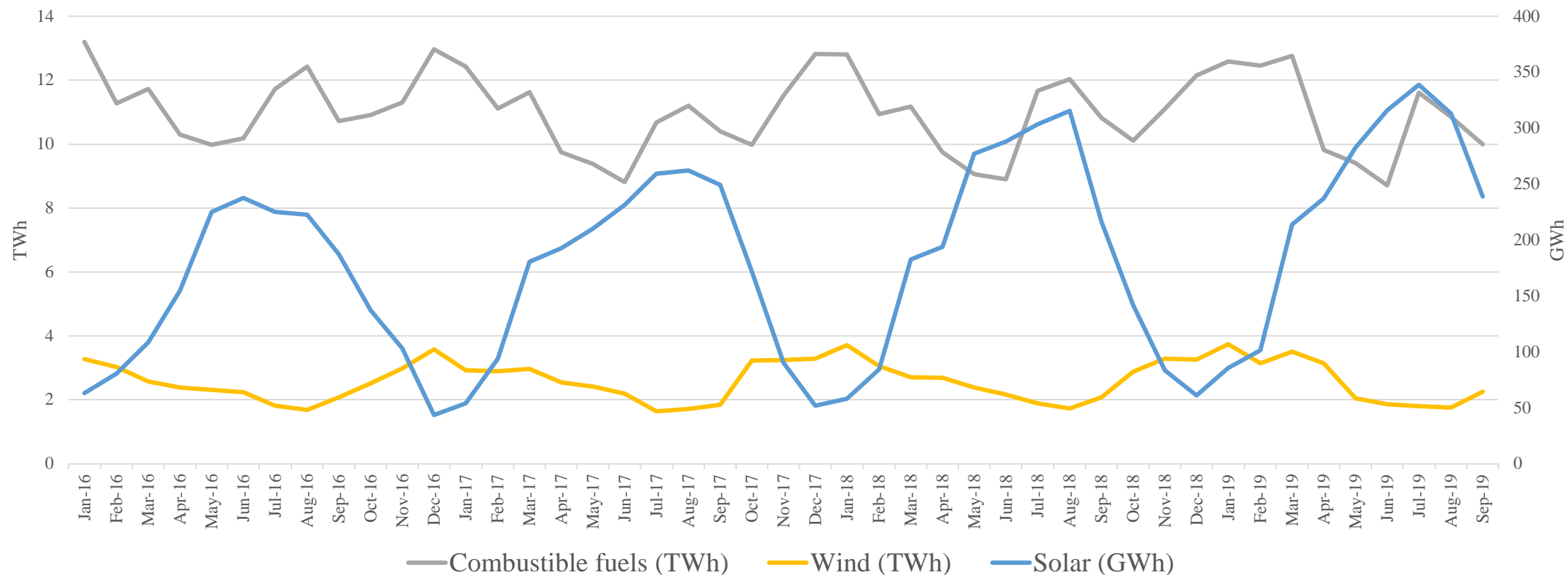


Annex - Current statistics



Annex - Current statistics

Monthly Electricity Generation



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