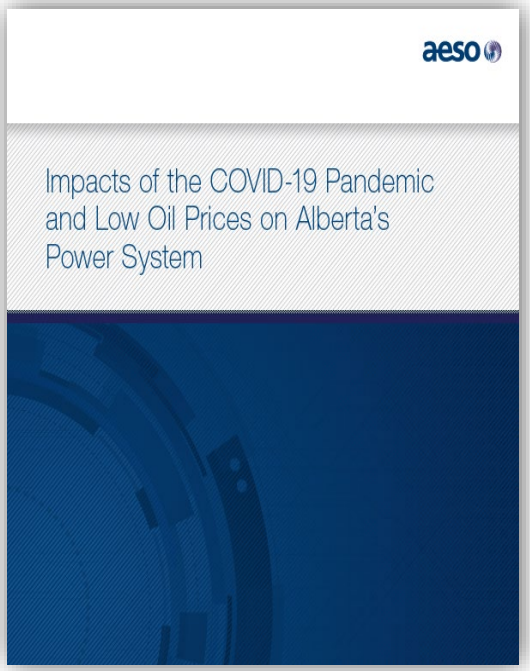
An Update on the Impact of COVID-19 and Low Oil Prices on Alberta's Power System

June 2020

Ongoing monitoring and reporting of the impact of COVID-19 and low oil prices

- In April 2020, the AESO provided to the stakeholders two reports with initial observations and scenarios on load and reliability
  - These analyses were in response to the declaration on March 17 of a public health emergency in Alberta related to the COVID-19 pandemic and the start of low oil prices due to a collapse in global demand and oversupply due to OPEC+ disputes
  - Scenarios tested a range of weakened economic conditions and oil production shut-ins
  - These scenarios were designed as stress cases and no supply adequacy concerns were revealed during these simulations
- The AESO published the following reports:
  - A stand-alone report with preliminary analysis on load
  - A supplement to the May 2020 Long-term Adequacy report with simulation results
- This memo presents an update on load trends and provides revised scenarios for the next two years



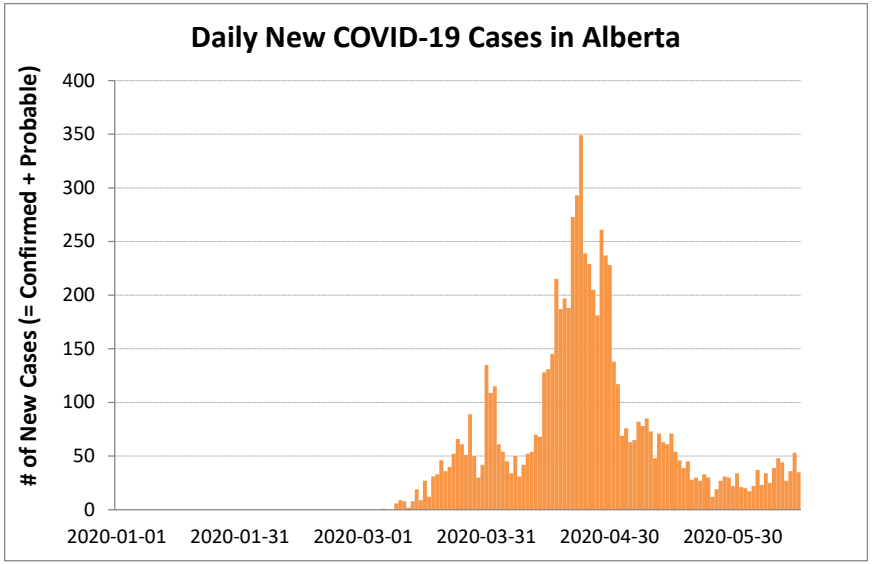
Highlights

- COVID-19 and low oil prices have had unique impacts on Alberta Internal Load (AIL)
  - COVID-19 directly impacted system load, which was the primary driver of downward trends in AIL in March-April
  - Load at behind-the-fence (BTF) industrial sites was stable until late April, and has since begun to decline due to persistently low oil prices
  - The decline in BTF load since May has negated the modest recoveries in system load
- As the province re-launches from the pandemic, the effects of a low oil price environment are expected to weigh more heavily on AIL growth
  - Load at oilsands sites has dropped mainly due to production reductions; other industrial loads including pipelines, oil and gas drilling, and gas processing facilities are also down
- Economic recovery back to 2019 levels may not occur in the next two years
  - Economic outlooks point to a decline in 2020 and modest growth in 2021
- Accordingly, the AESO's current 2-year AIL load forecast (based on P50 weather) indicates a drop between 273 and 353 MW on average in 2020 compared to 2019
- The AESO will continue to monitor economic and energy trends, with updates to be provided as needed

Context

Since the April memo, restrictions aimed at slowing COVID-19 have eased…

- Since April, the COVID-19 curve has been flattening due to a series of policies and measures

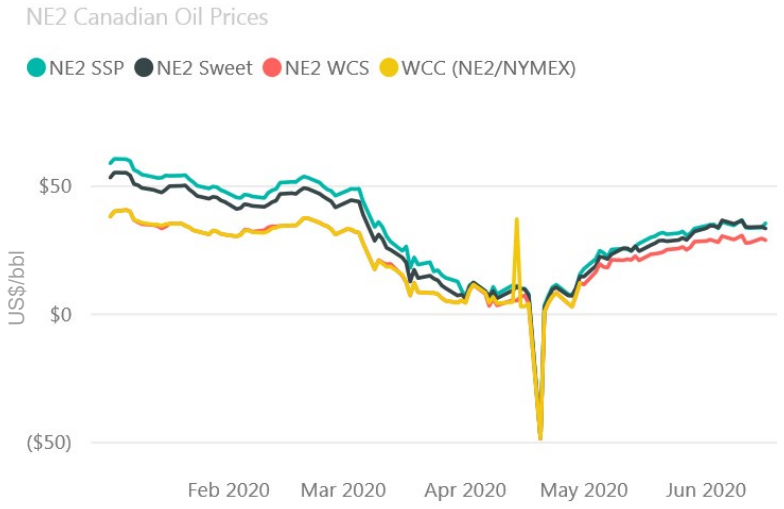


Source: AHS, June 15 2020; https://www.alberta.ca/stats/covid-19-alberta-statistics.htm

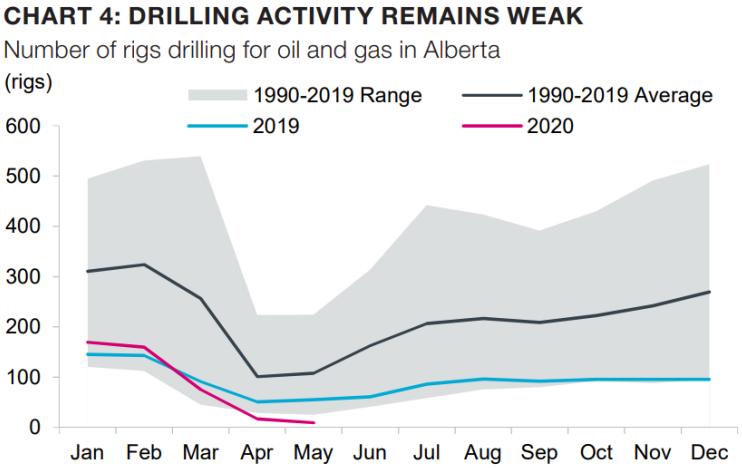
- The province is now relaunching the economy from the outbreak, following a staged recovery plan
  - On May 14th, restrictions on commercial activities were gradually lifted and employers were given more flexibility to no longer operate in a work-from-home only mode
  - The next phase of the Government of Alberta's Relaunch Strategy (date currently unannounced) is expected to open all workplaces and relax public gathering restrictions

… on the other hand, the energy sector has shown signs of deterioration…

- Global oil demand decreased in Q1 and Q2 2020 due to the global impact of COVID-19
  - Earliest recovery expected is fall of 2020 but could be later
- Global uncertainty has led to downward pressure in oil prices, including Alberta's Western Canadian Select (WCS)
- Oilsands producers have reacted by shutting in high cost heavy oil production as impact of pre-existing market issues are exacerbated with low oil prices
  - CAPEX cut of ~ $9 billion from Canadian oil producers
  - Alberta curtailment policy – production limit is expected to be maintained thru 2020
- New oil and gas activities are also down in response



Source: Daily Oil Bulletin

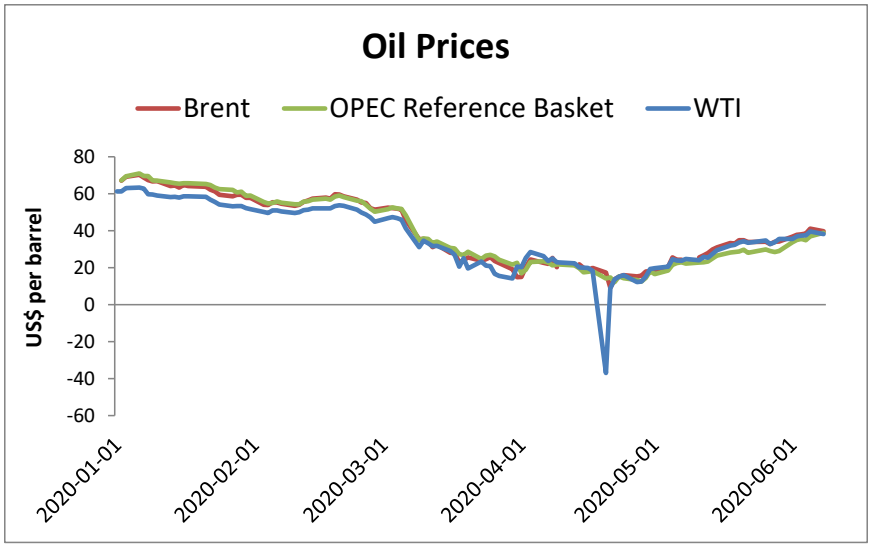


Source: Canadian Association of Oilwell Drilling Contractors

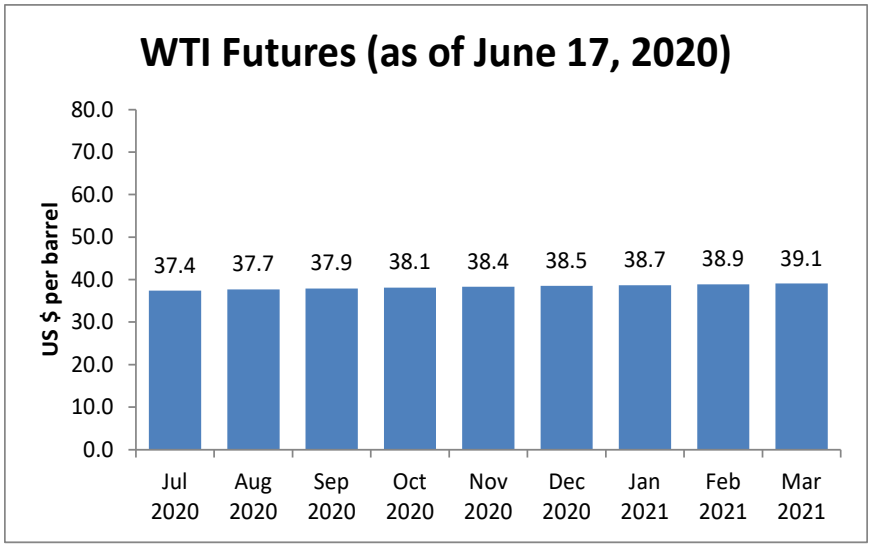
Copied from Alberta Finance and Treasury Board's Weekly Economic Review for the week of June 5, 2020 (link)

… and oil futures suggest Alberta energy sector has tough times ahead

- Brent, West Texas Intermediate (WTI) and WCS prices remain low and are expected to move modestly higher in the medium-term as supply and demand balance
  - OPEC+ deal in May amounted to the largest coordinated cut in history, but quota cheating has offset expected cuts
- Current market expectations suggest that price recovery is not expected to reach levels that would support the economics of Alberta producers
  - WTI future prices are expected to remain below US$40/bbl



Source: Quandl API queries of EIA and commodities market data

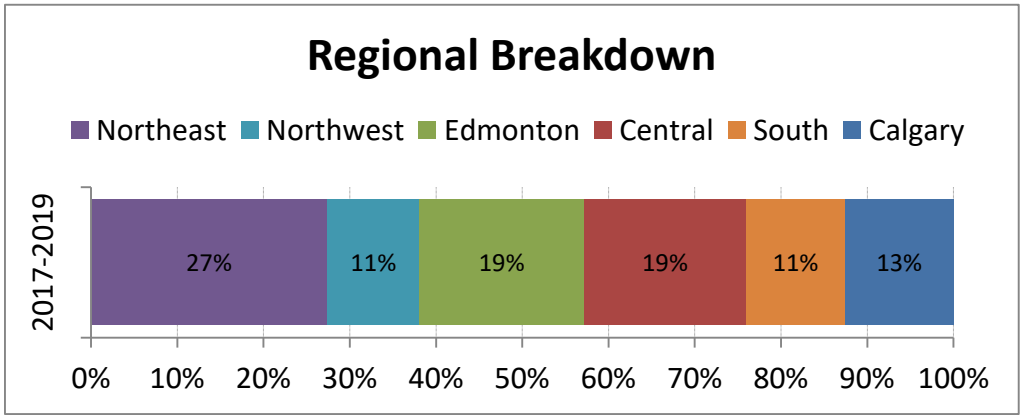


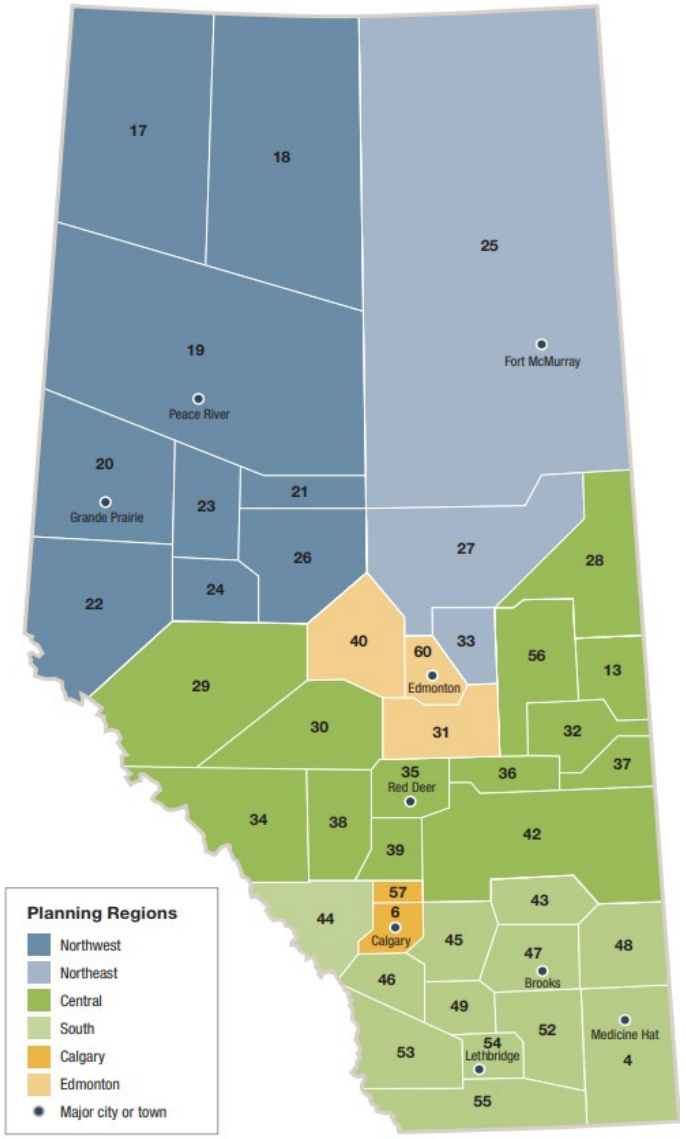
Source: marketwatch.com

Recent Observations and Analysis

Overview of the Alberta Interconnected Electricity System (AIES)

- The AESO divides the AIES into 6 transmission planning regions
  - Regions are further divided into 42 planning areas
- Industrialized regions contribute the most to load
  - Oil and gas-heavy regions: NE (includes Fort McMurray) + NW = ~38%
  - Other industrials and service regions: Edmonton + Central = ~38%
- Regions with a smaller industrial footprint account for ~24% of load
  - Calgary = ~13% ; South = ~11%





Source: https://www.aeso.ca/assets/Uploads/PlanningRegions-Nov26-PRINT.pdf

How to interpret the following analysis?

- Our analysis compares actual load values against a normalized load
  - Normalized load means values that would have been expected based on actual weather and season but without the effects of COVID-19 and low oil prices
  - Normalized load is a hypothetical load that is absent of these two major shocks*

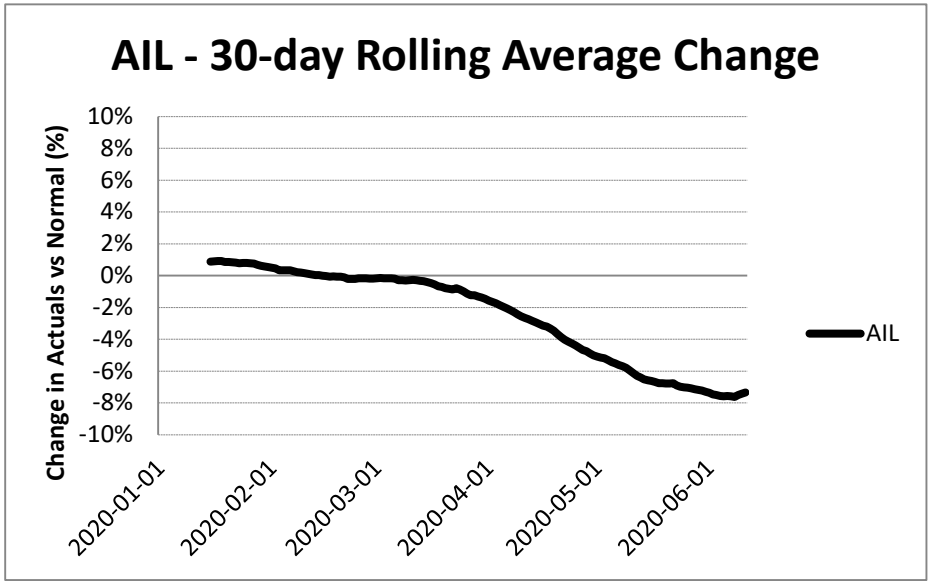
- February 2020 is set as the reference period
  - We re-base all comparisons between actual and normal load to February 2020 values
  - Given that COVID-19 and low oil prices began to impact Alberta load in March 2020, re-basing to February isolates the impact of COVID-19 and low oil prices within the larger baseline trend observed earlier in 2020

- The difference between actual and normalized load compared to the reference period can be interpreted as the load decline associated to COVID-19 and low oil prices
  - Difference estimates are smoothed via a moving average that is centered within a 30-day range – i.e., the April 30th estimate is the average of estimates from April 16 to May 15

* Normalized load is generated using a linear regression model with time series data of temperature and calendar/seasonal variables for each load type. The model period covers 2017 thru February 2020 (the reference period). The resulting coefficients are then used with observed temperature and calendar/seasonal variables since the reference period to calculate the predicted value for each load type. This methodological approach is similar to Cicala (2020), Shaffer, Leach and Rivers (2020), and TESLA Inc. (2020).

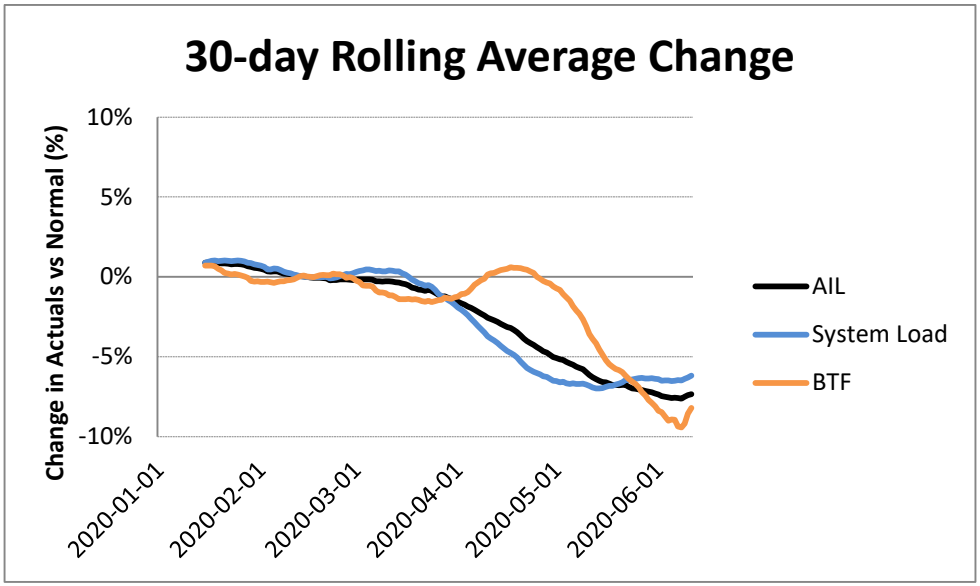
COVID-19 and low oil price impact to date on Alberta Internal Load

- Alberta internal load (AIL) has been negatively impacted by the confluence of factors such as measures imposed to control and flatten COVID-19 cases and reductions in industrial output in response to a low oil price environment
- AIL declined by almost 8% compared to normalized AIL benchmarked to the reference period



Unpacking AIL: system load and behind-the-fence load are responding differently

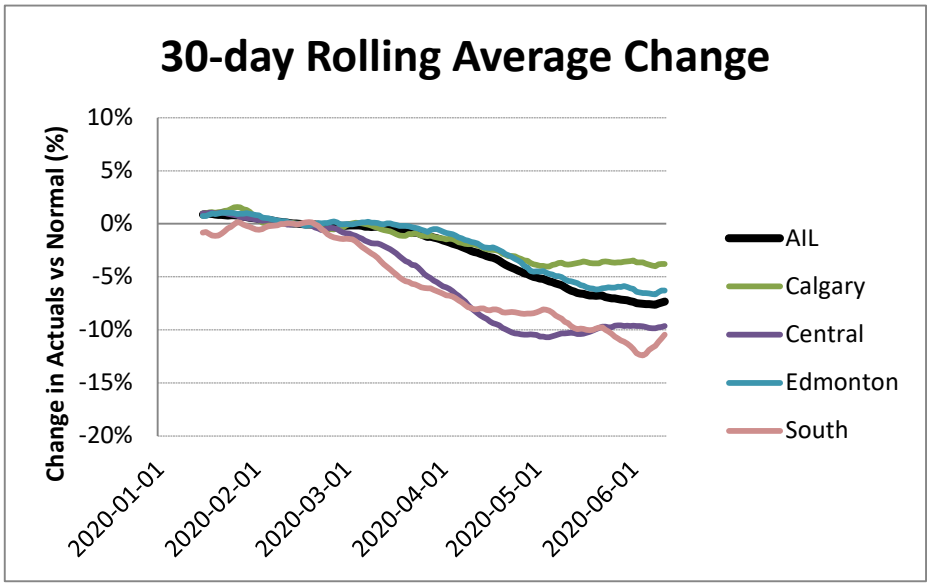
- AIL is composed of system load (73%) plus behind-the-fence (BTF) load (27%)*
  - From March through April, AIL declines were primarily driven by declines in system load while BTF held relatively constant
  - Since May system load showed signs of slight increases; but a declining BTF load has completely offset these incremental gains, leaving AIL relatively flat
    - Load reductions at BTF industrial sites and non-industrial sites were driven by persistently low oil prices and commercial/educational activities respectively
    - Non-industrial sites are a smaller portion of BTF load and include centres such as Medicine Hat and University of Alberta

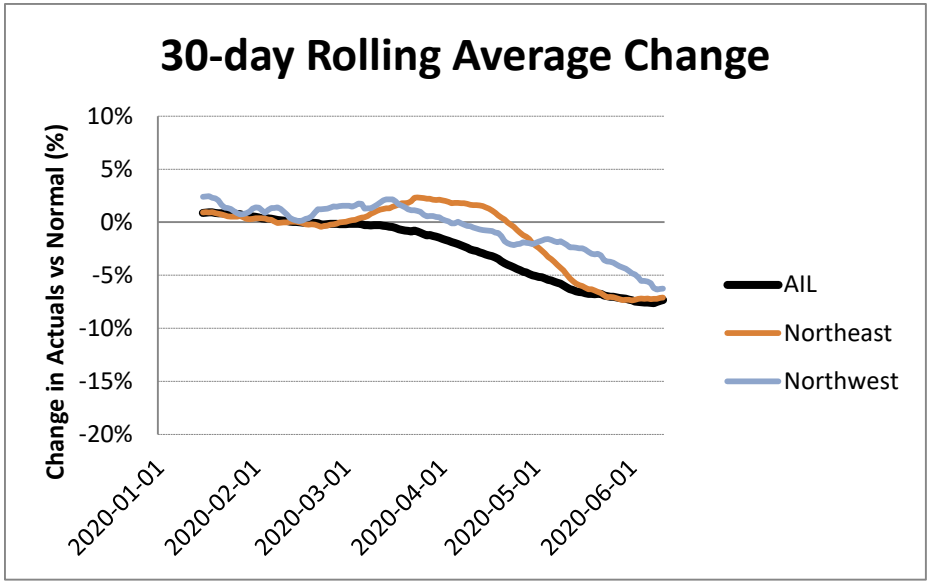


* For context, system load is generally represented by residential, commercial and industrial without self-supply; whereas behind-the-fence (BTF) represents load that is served by on-site generation, typically located at industrial sites

Regional assessment shows how COVID-19 and oil prices carry different impacts across Alberta

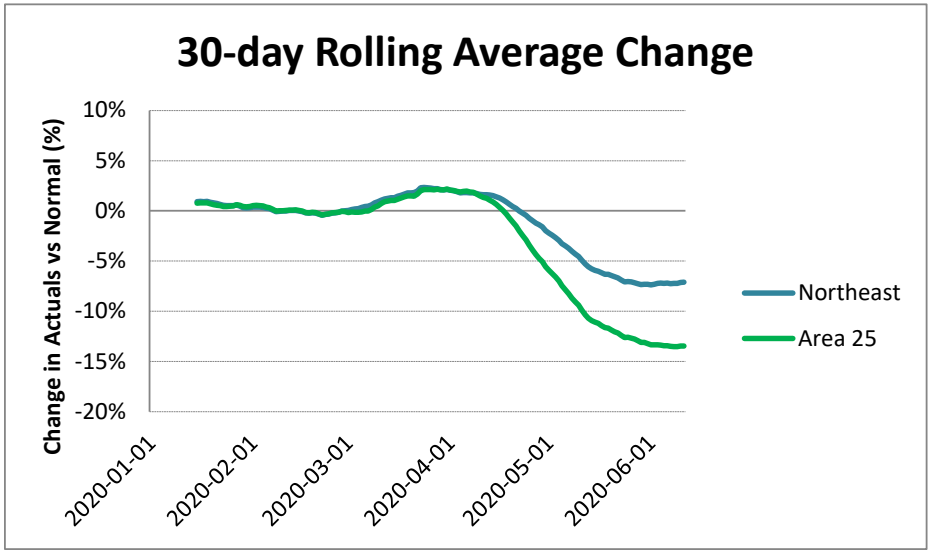
- AIL declines began with COVID-19, intensified with low oil prices
  - From a regional perspective, AIL declines are driven mostly by loads in regions that are densely-populated and/or with service-oriented commercial sectors (Calgary, Edmonton, Central and South; chart on left)
  - Northern regions had relative higher load up until mid-April; starting in May load from these regions started trending downward, which coincides with increased uncertainty in oil markets (chart on right)

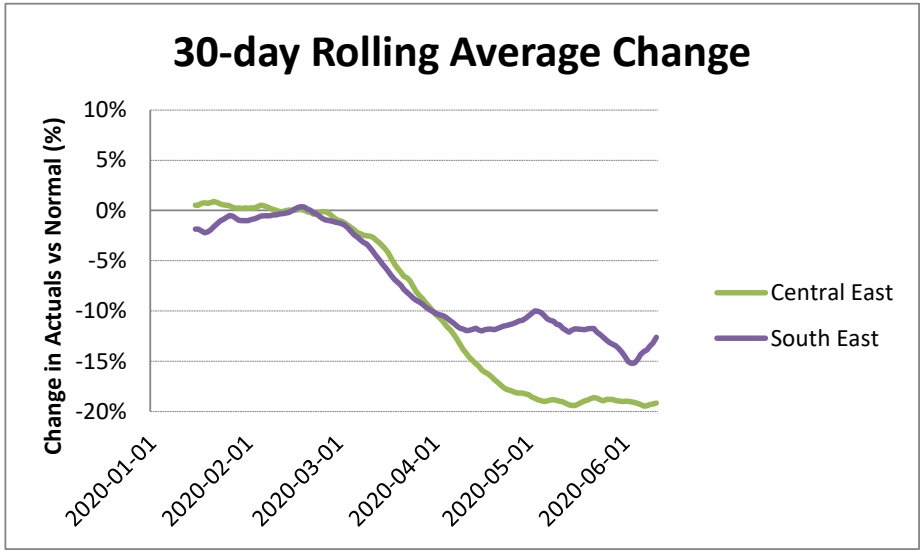




Oil prices impacting key sub-regions the most

- Energy sector is driving load declines, which is concentrated in eastern Alberta
  - Northeast region* has declined by 8% compared to normalized load benchmarked to the reference period, driven primarily by Fort McMurray (Area 25) which has declined by almost 15% (chart on left)
    - Load at oilsands sites are down due to a combination of seasonal outages and production reductions/shut-ins
    - Offsetting the decline in the Northeast region is Fort Saskatchewan (Area 33) where load has increased at some industrial sites
  - Loads in Central East and South East sub-regions** have also registered significant declines; these sub-regions have high industrial loads including pipelines, oil and gas drilling, and gas processing facilities





* NE regions is composed of Areas 25, 27 and 33

** Central East is composed of Areas 13, 28, 32, 36, 37, 42 and 56; South East is composed of Areas 4, 43, 47, 48 and 52

Load Forecast Scenarios

Exploring uncertainties through scenarios

- Alberta's economy and subsequent AIL growth will depend on post-pandemic recovery and the response to the volatility in oil markets
- Given the uncertainty on the future impact of COVID-19 and oil prices on Alberta's economy, a series of load scenarios are modelled to represent the potential load variances
  - Forecasts of economic data from Conference Board of Canada and Canadian banks are used as inputs into the load forecast model
  - These economic projections factor in the COVID-19 and oil price environments
- Quick recovery back to 2019 levels is not an expectation for the Alberta economy
  - Economic outlooks point to a decline in 2020 and modest growth in 2021
  - Scenarios range from a 'modest recovery' by 2022 to a 'slow recovery' by 2023
- Compared to the April reports, economic views have worsened
  - Updated economic assumptions demonstrate a deterioration in expectations for Alberta
  - Compared to 2019 Long Term Outlook (LTO), all the new economic scenarios result in lower projection for AIL
  - It should be noted that the 2019 LTO weather profile is based on P90 whereas all the other scenarios shown in this analysis are based on P50 weather assumptions

Scenarios summarized

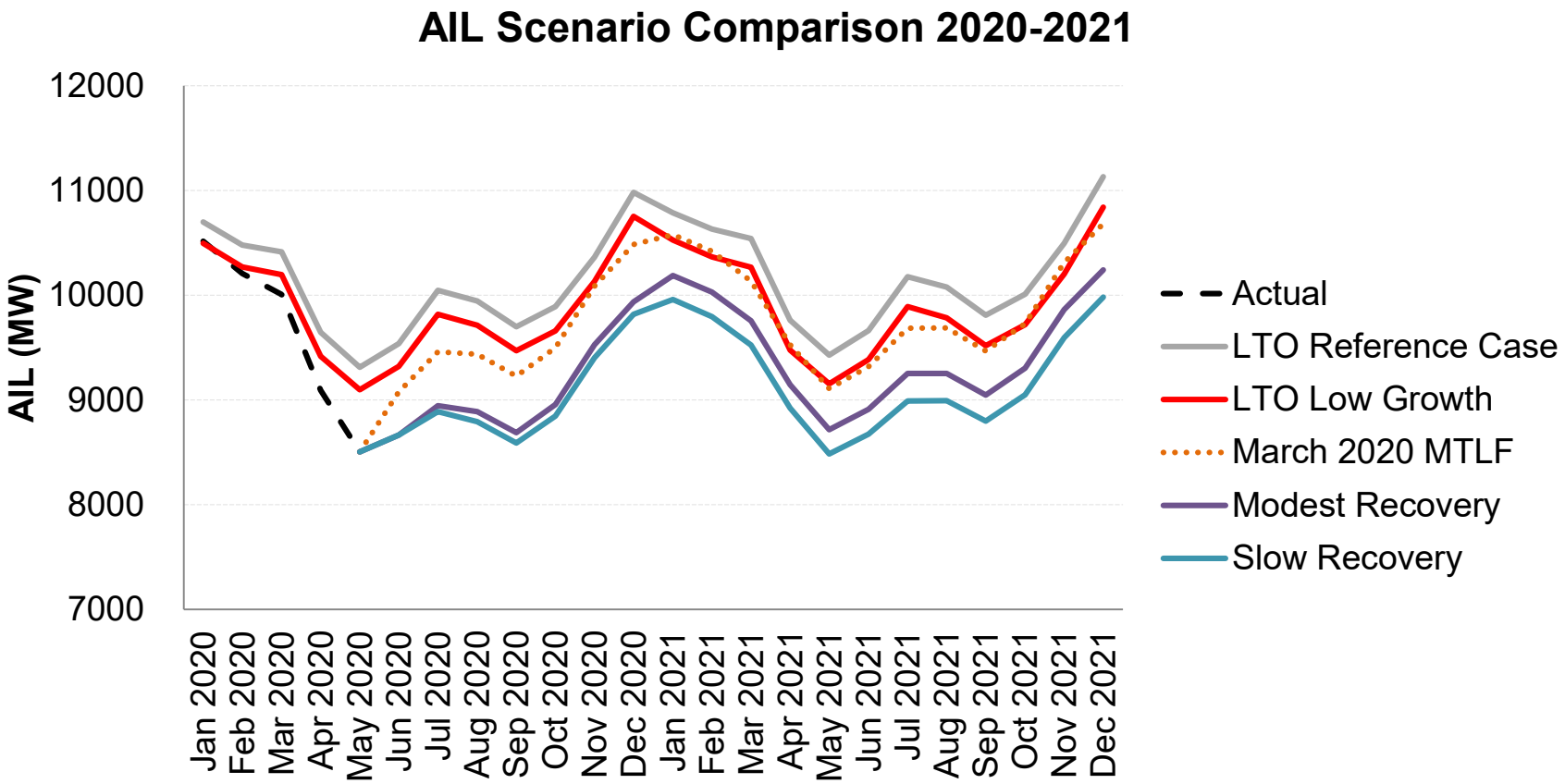
- Lower load on average is expected in 2020 compared to 2019[1]
  - Between 273 and 353 MW reduction in load on average in 2020 compared to projections produced prior to COVID-19 and low oil prices impacts ("March 2020 MTLF")
  - As economic outlooks worsen the energy outlook shows steeper decline

Scenario	LTO Low Growth[2]		March 2020 MTLF[3]		Modest Recovery[4]		Slow Recovery[5]	
Year	2020	2021	2020	2021	2020	2021	2020	2021
Real GDP Growth, %	1.1%	1.1%	2.4%	3.1%	-6.8%	6.5%	-11.2%	4.6%
Unemployment Rate, %	~6%	~6%	7.8%	8%	10.8%	9.2%	11.0%	9.7%
AIL Growth, YoY %	1.7%	0.6%	-0.1%	2.1%	-3.0%	2.4%	-3.8%	0.7%
Average AIL, MW	9,863	9,927	9,681	9,885	9,408	9,632	9,328	9,391
AIL Difference from "March 2020 MTLF", MW	+182	+42	-	-	-273	-253	-353	-494

1 9,695 MW average load in 2019
2 AESO 2019 LTO Low Growth Scenario
3 Economic Data from January 2020 CBOC Outlook
4 Economic Data from May 2020 CBOC Outlook
5 Economic Data from May 2020 RBC Outlook

Load forecast scenarios

- AIL forecast scenarios using updated economic outlook
  - Compared to 2019 LTO*, all the new economic scenarios result in lower projection for AIL



The 2019 LTO weather profile uses the 90th percentile of the last 10 years of historical weather whereas all the other scenarios shown in this analysis are based on 50th percentile weather assumptions

Looking at a longer time horizon

- These load scenarios provide an analysis of the current 2-year AIL outlook
- Further analysis is required to determine whether there are permanent effects on energy consumption due to the COVID-19 pandemic and the way Albertans respond to it
- Similarly, the impact of prolonged low oil prices can have disruptive consequences to the energy sector and the Alberta economy as a whole, that will need to be assessed from a load and co-generation perspective
- The AESO is assessing these trends and potential impacts in preparation for the next LTO
- We will continue monitoring and reporting on these developments as needed
- Questions or inquiries on the memo can be made at forecast@aeso.ca