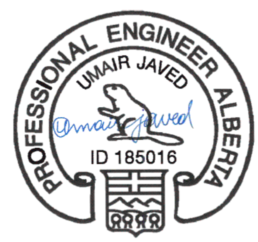
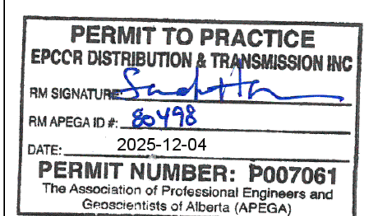
EPCOR DISTRIBUTION & TRANSMISSION INC.

Distribution Deficiency Report (DDR) for Meadowlark Transformer Capacity Increase

Revision 1

Company	**Role**	**Name**	**Date**	**Signature/Stamp**
EDTI	Prepared	Umair Javed, P. Eng.	Dec 03, 2025	 2025-12-03
EDTI	Approved	Sarah Hanson, P. Eng.	Dec 03, 2025	

APEGA Permit to Practice P07061

1.0 Abbreviations

AESO: Alberta Electric System Operator

ASP: Area Structure Plan

CoE: City of Edmonton

DTS: Demand Transmission Service

EDTI: EPCOR Distribution & Transmission Inc.

DDR: Distribution Deficiency Report

DFO: Distribution Facility Owner

GDP: Gross Domestic Product

LCR: Life-cycle replacement (replacement of assets for end-of-life reasons)

N-0: all distribution circuits and transmission elements in service (normal operating condition)

N-1: failure of a single transmission element or single distribution circuit (emergency operating condition)

NIS: Not in Service

pf: power factor = MW/MVA

POD: Point of Delivery

STS: Supply Transmission Service

TFO: Transmission Facility Owner

TUC: Transportation/Utility Corridor

WEM: West Edmonton Mall

OLTCs: On-Load Tap Changers

Document History

Revision	Date	Author	Description
Rev 0	Oct 4, 2024	Michael Smeding	New Release
Rev 1	Dec 03, 2025	Umair Javed	Revised DDR for Transmission Supply Constraints and Transformers’ Upgrade Dates per New Service Proposal

1.0 ABBREVIATIONS 2
1.0 EXECUTIVE SUMMARY 5
2.0 EXISTING SYSTEM DESCRIPTION 8
2.1 MEADOWLARK SUBSTATION SLD 10
2.2 MEADOWLARK DISTRIBUTION TIES 11
2.3 MEADOWLARK POD HISTORICAL PERFORMANCE 12
3.0 EDTI DISTRIBUTION PLANNING CRITERIA 15
3.1 DISTRIBUTION CIRCUIT LOADING POLICY 15
3.2 POD LOADING POLICY 16
4.0 HISTORICAL AND FORECAST LOAD DEMAND 17
4.1 LOAD FORECASTING METHODOLOGY 17
4.2 LOAD GROWTH DRIVERS 18
4.3 LOAD FORECASTING RESULTS 19
4.4 MEADOWLARK POD SUMMARY 19
5.0 DEFICIENCY ASSESSMENT 23
6.0 IDENTIFIED ALTERNATIVES 25
6.1 ALTERNATIVE I – DISTRIBUTION SWITCHING 25
6.2 ALTERNATIVE II – POD TRANSFORMER SIZE INCREASE AT LCR 26
6.3 ALTERNATIVE III – JASPER POD EXPANSION AND THREE (3) NEW CIRCUITS 27
7.0 COST COMPARISON 29
8.0 PREFERRED ALTERNATIVE 30
8.1 MEADOWLARK POD N-1 FIRM CAPACITY 30
8.2 DISTRIBUTION CIRCUITS CONSTRAINTS 30
8.3 EFFECTIVENESS OF PREFERRED ALTERNATIVE II 31
8.4 EFFECTIVENESS OF ALTERNATIVE III 31
9.0 CONCLUSION 33

1.0 EXECUTIVE SUMMARY

EPCOR Distribution & Transmission Inc. (EDTI) is requesting system access service from the Alberta Electric System Operator (AESO) to address forecast capacity concerns in Southwest Edmonton (supplied by Meadowlark POD) beyond the next 10 years. EDTI is submitting this Distribution Deficiency Report (DDR) in conjunction with the System Access Service Request (SASR) to fulfill Stage 0 requirements.

EDTI forecasts that load at Meadowlark POD will exceed the substation's rated N-1 Firm Capacity in 2032. The N-1 Firm Capacity at Meadowlark POD is limited by the transformation capacity of the three existing 40 MVA 72/15 kV transformers. EDTI DFO has been informed by the TFO that lifecycle replacements for the three 40 MVA 72/15 kV transformers at Meadowlark POD are currently planned for 2026 (T1), 2029 (T2), and 2030 (T3), respectively. Given the timing of the forecast deficiency in relation to the planned transformer lifecycle replacements, and given that a transmission power transformer has an estimated lifespan of 55-60 years, EDTI DFO and the TFO have recognized there is an opportunity to coordinate the transformer lifecycle replacements with the emerging capacity need at Meadowlark POD for the benefit of both transmission and distribution customers. EDTI forecasts that the summer coincident peak load at Meadowlark POD will reach 78.1 MVA in 2032. In the event of a forced outage to any of the three 40 MVA 72/15 kV transformers at Meadowlark POD, this loading will exceed the thermal limits of the remaining two transformers in-service. By 2048, the end of the 25-year forecast period, the Meadowlark POD summer coincident peak load is forecast to reach 121.4 MVA, which would exceed the PODs N-1 Firm Capacity by 43.9 MVA and the winter coincident peak load is forecast to reach 134.2 MVA, which would exceed the PODs N-1 Firm Capacity by 42.2 MVA.

This assessment is based upon EDTI's distribution planning criteria for feeders and PODs, which states:

- All 500 mcm 15 kV radial distribution feeders are planned to operate at or below their design load rating of 6.5 MVA under N-0 in summer and 7.5 MVA under N-0 in winter
- All 750 mcm 15 kV radial distribution feeders are planned to operate at or below their design load rating of 8.5 MVA under N-0 in summer and 8.7 MVA under N-0 in winter
- All 500 mcm 15 kV radial distribution feeders are planned to operate at or below their emergency load rating of 10.0 MVA under N-1 in summer and 11.2 MVA under N-1 in winter
- All 750 mcm 15 kV radial distribution feeders are planned to operate at or below their emergency load rating of 12.8 MVA under N-1 in summer and 13.2 MVA under N-1 in winter
- All PODs shall operate at or below their N-1 firm capacity

In this Distribution Deficiency Report (DDR), EDTI demonstrates that transmission investment is required to resolve capacity concerns emerging in 2032 and worsening over the remainder of the 25-year forecast period. EDTI is submitting this SASR and DDR now while there is an opportunity to coordinate with the TFO lifecycle replacement project, as once installed the replacement transformers have a life expectancy of 55-60 years. The following solution alternatives were considered:

Distribution supply alternative

EDTI DFO has evaluated the distribution alternatives described below.

Alternative I – Distribution Switching

a) Load transfers from Meadowlark POD to adjacent Jasper POD, Petrolia POD, or Garneau POD, using existing distribution circuits and ties

Transmission supply alternatives

EDTI DFO proposes the transmission alternatives described below. This proposal is based on EDTI DFO's present understanding of the TFO's design standards and practices that are applicable to PODs.

Alternative II – POD Transformer Size Increase at Lifecycle Replacement

a) Coordinate with TFO to increase the capacity of the existing 40 MVA 72/15 kV transformers T1, T2, and T3, at Meadowlark POD to 50 MVA at their time of life-cycle replacement, currently planned in 2026, 2029, and 2030, respectively – per the TFO.

Alternative III – Jasper POD Expansion and Install Three (3) New Circuits

Note, this solution depends on the spare feeder breaker not being required for other distribution issues that might arise between now and the years of construction.

Note, Jasper POD only has 1 spare feeder breaker position remaining. Petrolia POD and Garneau POD do not have available feeder breaker positions remaining.

a) Prepare new 15 kV breaker at Jasper POD; Install new circuit from Jasper POD to off-load approximately 8.5 MVA from existing Meadowlark circuits.

b) Expansion of Jasper POD to provide the remaining two (2) feeder breakers and offload approximately 17 MVA from Meadowlark circuits.

Alternative I is not technically feasible as insufficient distribution capacity combined with circuit topology make resolution by distribution switching not possible. A brief comparison of distribution costs associated with the two technically acceptable alternatives II and III is provided in Table 1 below.

EDTI DFO has not estimated the transmission costs associated with the two alternatives, and requests the AESO to involve the appropriate TFO through the AESO's Connection Process to assess these alternatives. If the AESO directs EDTI TFO to prepare a facility application for any transmission upgrades, this facility application will include an estimate of the transmission capital cost.

Table 1: Cost of Solution Alternatives

Alternative	**II**		**III**	
Descriptor	**POD Transformer Size Increase at Lifecycle Replacement**		**Jasper POD Expansion and Install Three (3) New Circuits**	
Total Feeders Length (km)	0		~12.7 km	
Estimated Costs ($2024)	b	TBD	c	TBD
			d	24.3
Total Distribution Costs (+/- 50%, $2024)	**$ 0.0 M**		**$ 24.3 M**	

b and c refer to components of the various transmission alternatives, to be determined by EDTI TFO

Alternative II is EDTI DFO's preferred alternative as alternative II is best suited to make use of existing infrastructure and investments at Meadowlark POD by not stranding feeder breaker capacity, while also preserving capacity at adjacent PODs to accommodate load growth in their respective service areas. As the POD transformers at Meadowlark are already planned for lifecycle replacement, it is expected that Alternative II will involve minimal incremental transmission costs on top of what is already required for lifecycle replacement[1]. Once installed, the new transformers have a 55-60 year life expectancy which will make replacement for capacity reasons in the future more difficult to justify.

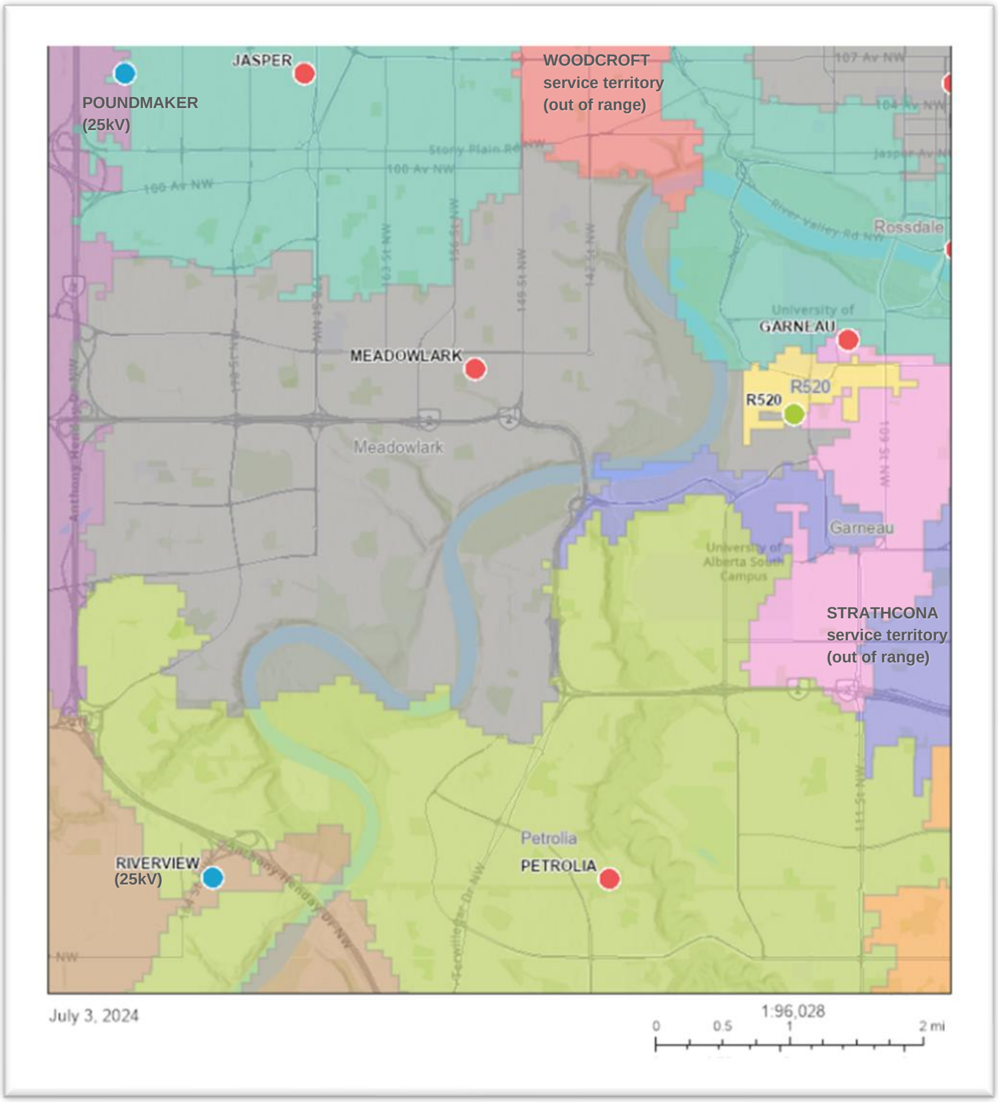
EDTI will not be requesting a change to its DTS contract at Meadowlark POD at this time.

The requested in-services date (ISD) for the proposed development is to align with EPCOR TFO lifecycle replacement plans which are planned to take place between 2026 and 2030, with the final transformer replacement being completed in 2030.

2.0 EXISTING SYSTEM DESCRIPTION

Meadowlark POD is located 15404 - 84 Avenue NW, Edmonton, AB. Figure 1 below shows the existing Meadowlark POD service area and the adjacent 15 kV POD service areas. The service area covers the southwest portion of the City of Edmonton. Meadowlark POD is adjacent to the 15 kV EDTI Jasper POD to the north, Garneau POD to the east, and Petrolia POD to the south. Meadowlark POD is bounded at the west by EPCOR's 25 kV POD service territory.

Figure 1: Meadowlark POD Service Area



Meadowlark POD services a mixture or commercial and residential customers. Table 1 below provides a summary of the customer counts by rate class supplied by Meadowlark POD. Residential customers are located throughout the service area. Commercial customers are located along major thoroughfares throughout the service area (e.g. 178 street, 170th street, 87th avenue, etc.).

Table 1: Meadowlark POD Customers by Rate Class

Rate Class	Customer Count
Residential	29,698
Commercial/Industrial < 50 kVA	1058
Commercial/Industrial 50 – 149 kVA	121
Commercial/Industrial 150 < 4999 kW	35
Primary Commercial/Industrial 150 < 4999 kW	4
Commercial/Industrial 5000+ kW	2
Security Lighting	137
Unmetered	203
Total	**31,258**

Meadowlark POD service area presently has a small amount of Distribution Connected Generation (DCG) connected within. A summary of the DCG connected via Meadowlark POD is shown in Table 2 below. EDTI is not aware of any significant DG additions planned for the Meadowlark service area that would significantly impact the deficiencies described within this report. EDTI presently does not have any plans to construct DCG within the service area.

Table 2: DCG connected to Meadowlark POD

Type	Size [kW]	Number of Sites	Aggregate Nameplate [MW]
Photovoltaic	**0 – 4.9**	100	0.38
	5.0 – 9.9	233	1.66
	10.0 – 49.9	70	0.98
	50.0 – 150.0	2	0.23
	150.0 – 249.9	0	0.0
	250.0 – 4999	0	0.0
Total		405	3.25

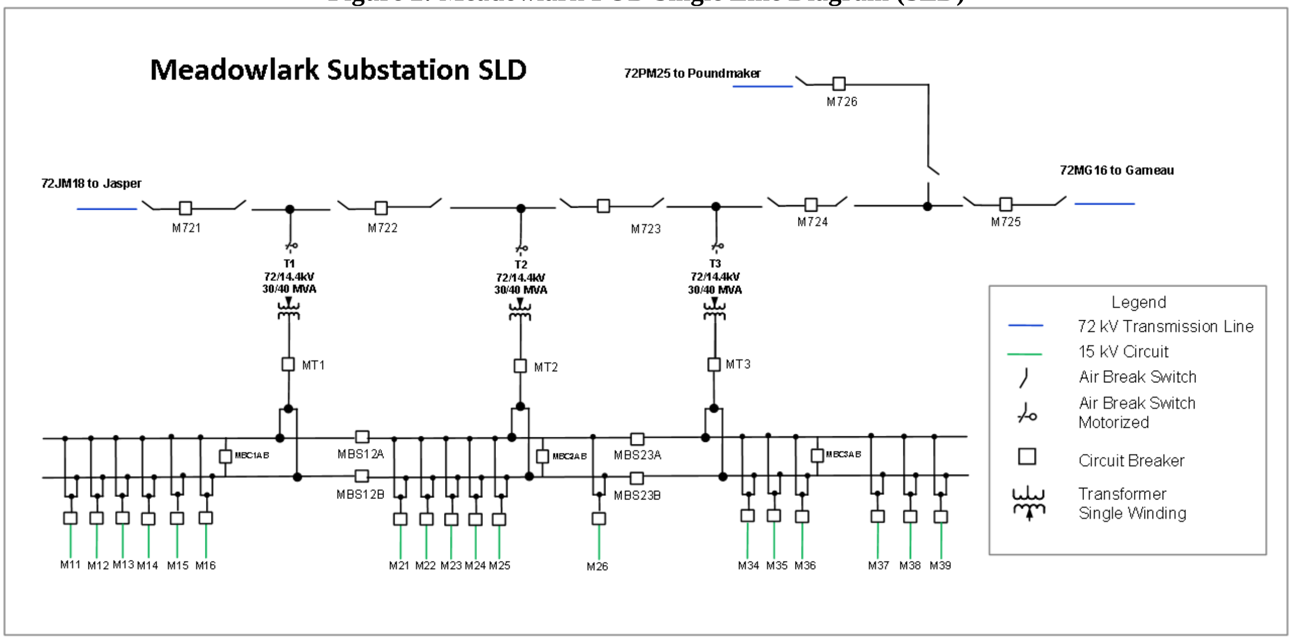
As shown in the table above, all DCG within the Meadowlark service area are < 1 MW; in addition, all DCG are of the solar photovoltaic generation type. Due to the nature of the DCG (numerous distinct microgeneration sites), small aggregate size overall, and intermittency of the DCG connected, EDTI has not communicated with DCG operators as an option to mitigate the distribution deficiency.

Throughout this document, distribution circuit names with prefixes M, J, G, and P refer to circuits supplied by Meadowlark POD, Jasper POD, Garneau POD, and Petrolia POD, respectively.

2.1 Meadowlark Substation SLD

The single line diagram (SLD) for Meadowlark POD is shown in Figure 2 below. As per the SLD, Meadowlark POD is supplied by the three 72 KV transmission circuits 72JM18 72MG16, and 72PM25. 15 kV load at the POD is currently supplied by three 30/40 MVA 72/15 kV transformers, each connected to a 15 kV bus with six (6) circuit positions. Presently all circuit breakers are in use at the Meadowlark POD.

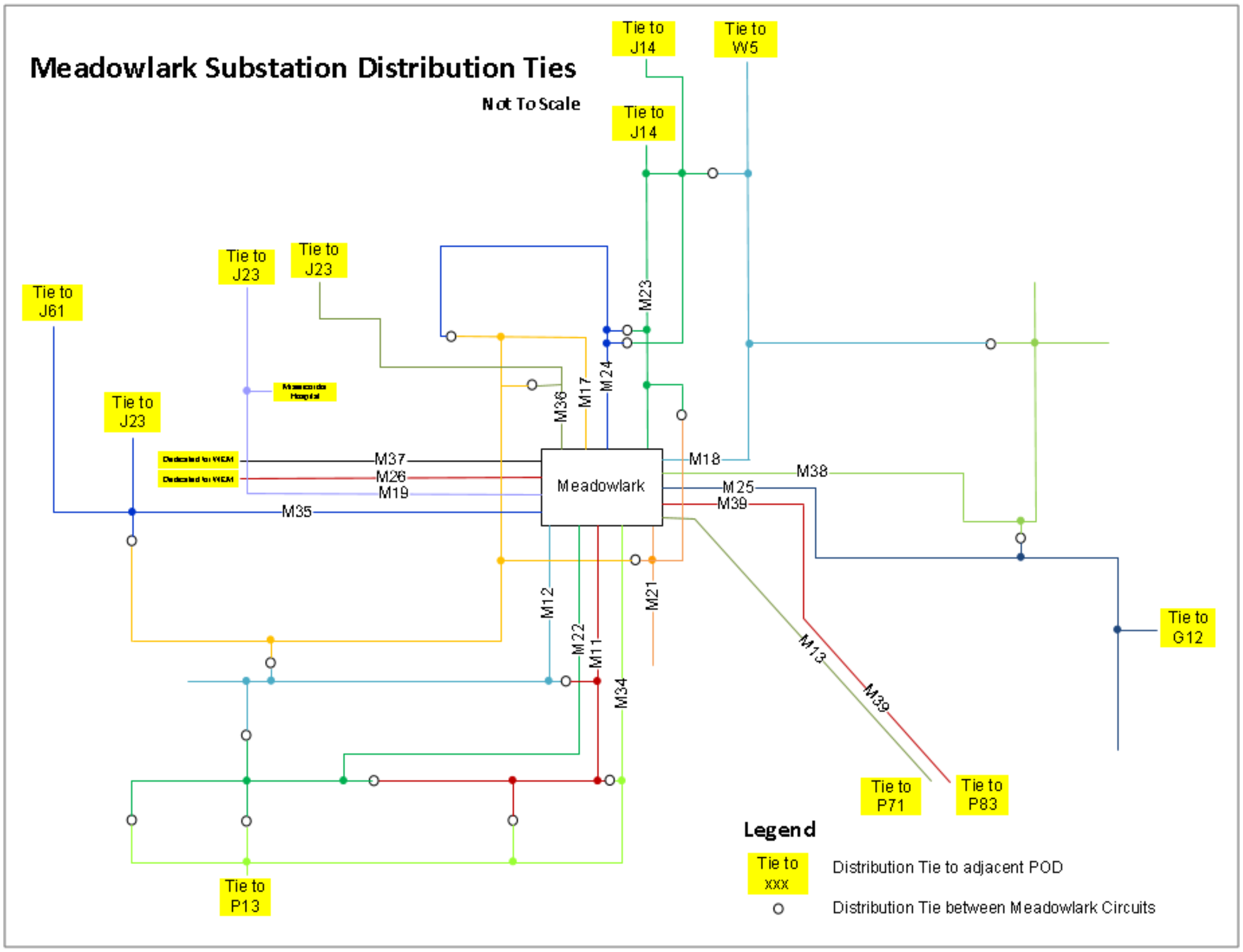
Figure 2: Meadowlark POD Single Line Diagram (SLD)



2.2 Meadowlark Distribution Ties

Figure 3 below shows a schematic diagram of the circuits supplied by Meadowlark POD and the main line distribution circuit ties to adjacent PODs. The Meadowlark POD service area has several significant geographical barriers, including the 25 kV service territory to the west, and the North Saskatchewan River to the southeast, which limit the potential number of available ties to adjacent POD circuits. Ties to circuits supplied by adjacent PODs are highlighted in yellow.

Figure 3: Meadowlark POD Distribution Circuit Ties



2.3 Meadowlark POD Historical Performance

2.3.1 SAIFI and SAIDI

See Table 3 below for EDTI's 10-year overall System Average Interruption Frequency Index (SAIFI) and System Average Interruption Duration Index (SAIDI).

Table 3: EDTI 2014-2023 SAIFI and SAIDI Historical Performance

Index	EDTI 2014-2023 Average
SAIFI	1.01
SAIDI	0.81

2.3.2 Meadowlark POD Outage History

EDTI began recording scheduled transmission element outages where no customer load was lost in 2018 at Meadowlark POD. The 2018-2023 historical scheduled transformer outage data for the development area of Meadowlark is presented in Table 4 below. This data is reflective of the contingency of concern to be addressed – loss of a Meadowlark POD transformer. EDTI plans its system such that all load interrupted due to transmission outages can be fully restored via transmission switching within the POD. This is required due to the design of EDTI's distribution system, which is unable to provide full contingency support for a transmission outage due to their typical durations and the magnitude of load involved. As can be observed from the data, the longest such outage required was 610 hours.

Table 4: Meadowlark POD Scheduled Transformer Outages

PLANNED OUTAGES					
OUTAGE NUMBER	**OUTAGE TITLE**	**START**	**END**	**DURATION**	**REASON**
OE100044	TX1 @ Meadowlark	Oct 22, 2018 7:00 AM	Oct 27, 2018 5:00 PM	130	disconnect replacement
OE100045	TX2 @ Meadowlark	Oct 29, 2018 7:00 AM	Nov 3, 2018 5:00 PM	130	disconnect replacement
OE100094	TX3 @ Meadowlark S/S	Nov 5, 2018 7:30 AM	Nov 9, 2018 5:00 PM	105.5	Metering Cutover
OE100211	TX2 @ Meadowlark	Mar 18, 2019 7:00 AM	Mar 29, 2019 5:00 PM	274	DGA
OE100266	TX1 @ Meadowlark	Apr 15, 2019 7:00 AM	Apr 18, 2019 5:00 PM	82	Interlock wiring
OE100311	Outage to 72JM18 and Tx1 @ Meadowlark and Jasper S/S	Jun 28, 2019 10:00 PM	Jun 30, 2019 10:00 PM	48	72kV BF Protection Upgrade Project
OE100326	Outage to Meadowlark TX1	Jul 5, 2019 10:00 PM	Jul 7, 2019 5:00 PM	43	72kV BF Protection Upgrade
OE100503	TX3 @ Meadowlark	Nov 16, 2020 7:00 AM	Nov 27, 2020 5:00 PM	274	Disconnect and VT replacement
OE100960	TX1 @ Meadowlark	Dec 14, 2020 7:00 AM	Dec 14, 2020 5:00 PM	10	TX1 Oil Leak Repair
OE101127	TX3 @ Meadowlark	Jan 30, 2021 7:00 AM	Jan 31, 2021 5:00 PM	34	Investigate repair / Damaged Cables

PLANNED OUTAGES					
OUTAGE NUMBER	**OUTAGE TITLE**	**START**	**END**	**DURATION**	**REASON**
OE101056	TX1 @ Meadowlark	May 10, 2021 7:00 AM	May 10, 2021 5:00 PM	10	Meadowlark TX1 Tap Changer Maintenance
OE101057	TX2 @ Meadowlark	May 11, 2021 7:00 AM	May 11, 2021 5:00 PM	10	Meadowlark TX2 Tap Changer Maintenance
OE101986	Meadowlark S/S Tx2 outage	Feb 7, 2022 7:00 AM	Feb 11, 2022 5:00 PM	106	Tx2 outage to provide clearance for 72PM25 stringing
OE101367	TX2 @ Meadowlark	Apr 11, 2022 7:00 AM	Apr 22, 2022 5:00 PM	274	Meadowlark TX2 Secondary Feeder Recabling
OE101368	TX1 @ Meadowlark	May 2, 2022 7:00 AM	May 13, 2022 5:00 PM	274	Meadowlark TX1 Secondary Feeder Recabling
OE102894	TX3 @ Meadowlark	Jun 9, 2022 7:00 AM	Jun 9, 2022 5:00 PM	10	Meadowlark TX3: Outage for Engineering to measure secondary cabinet. UGT to assist.
OE105993	TX3 @ Meadowlark	Jul 17, 2023 7:00 AM	Jul 28, 2023 5:00 PM	274	Meadowlark S/S Tx3 bay isolation
OE107165	TX3 @ Meadowlark	Nov 14, 2023 7:00 AM	Nov 18, 2023 5:00 PM	106	Meadowlark: TX3 Fan Replacement
OE107166	TX2 @ Meadowlark	Nov 27, 2023 7:00 AM	Dec 2, 2023 5:00 PM	130	Meadowlark: TX2 Zone CVT Replacement
OE107502	TX1 @ Meadowlark	Jan 22, 2024 7:00 AM	Jan 26, 2024 5:00 PM	106	Meadowlark S/S Tx1 bay outage
OE107449	TX2 @ Meadowlark	Jan 29, 2024 7:00 AM	Feb 23, 2024 5:00 PM	610	Meadowlark S/S Tx2 Bay Outage
OE107877	TX3 @ Meadowlark	May 6, 2024 7:00 AM	May 9, 2024 5:00 PM	82	TX3 Doble / MAB3, MDS6, MDS7 Disconnect Maintenance
OE107589	TX1 @ Meadowlark	Sep 16, 2024 7:00 AM	Sep 27, 2024 5:00 PM	274	Meadowlark: (TX1 Zone) Trenwa Install Outage C
OE107588	TX2 @ Meadowlark	Oct 1, 2024 7:00 AM	Oct 7, 2024 5:00 PM	154	Meadowlark: (TX2 Zone) Trenwa Install Outage B and M722 Densimeter Repair
OE107587	TX3 @ Meadowlark	Oct 8, 2024 7:00 AM	Oct 18, 2024 5:00 PM	250	Meadowlark: (TX3 Zone) Trenwa Install Outage A and TX3 Doble and MAB3, MDS6, MDS7 Disconnect Maintenance

See Table 5 below for a 10-year list (i.e. 2013-2023) of historical customer outages occurring at Meadowlark POD due to loss of transmission supply; incidents were only observed for the past four years. Note, EDTI does not keep record of the magnitude of load lost. The data reflects operation in compliance with EDTI's N-1 firm POD loading planning criteria where load was restored via transmission switching.

Table 5: Meadowlark POD Loss of Transmission Supply CHI

Incident number	Substation	Date (yyyy/mm/dd)	Customers Impacted	Duration (hours)	Customer Hours of Interruption	Root Cause Asset
INC 15013568	MEADOWLARK	2020/12/22	12	1.97	23.6	P4346
INC 15014954	MEADOWLARK	2021/03/31	8,733	0.09	824.8	TX3 @ MEADOWLARK
INC 16016136	MEADOWLARK	2021/06/08	14,306	1.86	3373.9	TX2 - REACTOR CABLE FAILURE
INC 16017591	MEADOWLARK	2021/08/16	6,396	0.02	142.1	M3T1
INC 18001423	MEADOWLARK	2022/06/16	3,576	0.13	475.8	M24 BREAKER MALFUNCTION
INC 211002741	MEADOWLARK	2022/12/05	732	0.02	17.7	M23C5 CB TRIP
INC 211002742	MEADOWLARK	2022/12/05	761	0.03	21.8	M23C4 TRIP
INC 113003002	MEADOWLARK	2023/08/04	10,394	0.39	989.8	72PM25

Note, not all customers were impacted for the full duration for each recorded incident.

3.0 EDTI DISTRIBUTION PLANNING CRITERIA

3.1 Distribution Circuit Loading Policy

Design Rating and Emergency Rating are two important parameters that EDTI considers for distribution planning purposes.

- During normal operating condition (N-0), the loading on an EDTI distribution circuit shall not exceed the circuit's Design Rating, which corresponds to 2/3 of the circuit's Emergency Rating. For 15 kV 500 mcm distribution feeders, EDTI's Design Rating is 6.5 MVA in summer and 7.5 MVA in winter. For 15 kV 750 mcm distribution feeders, EDTI's Design Rating is 8.5 MVA in summer and 8.7 MVA in winter.
- During emergency operating condition (N-1), the loading on an EDTI distribution circuit shall not exceed the circuit's Normal Rating for duration of more than three days.
- At no time shall the loading on an EDTI distribution circuit exceed the circuit's Emergency Rating. For 15 kV 500 mcm distribution feeders, EDTI's Emergency Rating is 10 MVA in summer and 11.2 MVA in winter. For 15 kV 750 mcm distribution feeders, EDTI's Emergency Rating is 12.8 MVA in summer and 13.2 MVA in winter.

3.1.1 Design Rating

The Design Rating is the maximum acceptable distribution circuit load under normal operating conditions. Loaded to Design Rating, each circuit has the reserve capacity to pick up 50% of the load on any adjacent circuit during contingency situations. In practice, it may not be possible to transfer the entire load from a faulted circuit to two adjacent circuits, due to circuit configurations, infrastructure limitations and load distributions.

3.1.2 Normal Rating

The Normal Rating is the maximum load a cable can be operated at without reducing its service life. Normal daily load cycling, peak loading for 8 hours with the average load throughout the day no more than 75% of the peak ratings, is assumed. If the load criterion is exceeded, the cable may experience thermal degradation and accelerated cable failure. If loaded to a level between the Design Rating and the Normal Rating, it will not be possible to take full advantage of the circuit's load transfer capability to support N-1 contingency conditions.

3.1.3 Emergency Rating

The Emergency Rating is the maximum load that EDTI is capable of operating a circuit under a contingency situation, when load is transferred from an adjacent circuit that has experienced an outage. It is expected that loss of cable life will occur, which is based upon "the assumption that the maximum number of emergency periods will not exceed 3 periods in any 12 consecutive months nor on average of 1 period per year for the life of the cable. The maximum duration of any one period should not exceed 36 hours."[1] If the cable loading exceeds the Emergency Rating, it is expected that the feeder will experience acute thermal degradation resulting in an accelerated cable failure, reducing the asset life of the cable.

3.2 POD Loading Policy

The Firm Capacity of a POD is an important parameter that EDTI DFO considers for distribution planning purposes. EDTI DFO defines a POD's firm capacity as the maximum load that the POD can supply without overloading any transmission equipment under an N-1 contingency. N-1 contingencies include, but are not limited to, the loss of a single transmission line supply to a POD or the loss of a single transformer at a POD. The thermal capability of terminal equipment at the POD may further restrict the firm N-1 capacity. All PODs are to operate at or below their N-1 firm capacity. EDTI shall increase the N-1 Firm Capacity of a POD in a timely manner if the connected coincident peak load is forecasted to exceed its N-1 Firm Capacity within the 10-year forecast period.

[1] CSA Standard C68.1 Appendix G, note 3

4.0 HISTORICAL AND FORECAST LOAD DEMAND

4.1 Load Forecasting Methodology

EDTI uses a hybrid and multilayered load forecasting methodology that combines economic theory, statistical techniques and end-use methods to forecast electricity peak demands at the system level, POD levels and distribution circuit levels. EDTI DFO has determined that load demand in the Edmonton area is highly sensitive to weather conditions. Furthermore, the DFO found that the majority of load growth can be explained by three parameters: gross domestic product (GDP), population growth and housing starts. EDTI's load forecasting methodology can be summarized as follows:

- Weather normalization – As electricity peak demands in the Edmonton region are sensitive to weather conditions, historical peak load demands - both summer and winter - are separated into two components (weather sensitive load and non-weather sensitive load) using the Jackknife analysis. Non-weather sensitive peak demands have higher correlation with load growth factors in the city of Edmonton and they allow for more accurate regression models. Based on the past twenty years of daily temperature during system peak, EDTI DFO has determined the 90th percentile temperature, provided in the table below. The DFO produces a 90th percentile summer and winter peak forecast at the system and POD levels.

Table 6: 90th percentile temperatures

	Summer	**Winter**
90^{th} percentile	33.9°C	-32.8°C

- System level load forecasting – Multiple linear regression analysis is deployed to model the system level coincident load based on historical hourly system loading data, historical and forecasted GDP for the Edmonton area, historical and forecasted housing starts, historical and forecasted population growth.

- POD level coincident and non-coincident peaks – EDTI DFO categorizes each POD as residential, mixed/commercial, or industrial depending on the POD’s load profile. Residential PODs are the most sensitive to weather conditions whereas industrial PODs are the least sensitive. Depending on the type of the POD, weather sensitivity is adjusted and different predictors are used for the regression analysis. In addition, an area study is performed for each POD to set the upper limit of load growth and historical growth is examined to validate the regression model. Lastly, any anticipated load transfers and special loads are included, as well as forecasted load impacts due to Electric Vehicles, Heat Pumps, and Photovoltaic Solar installations. Coincident peaks are computed from the POD non-coincident peaks using coincidence factors derived from historical data.
- The winter/summer power factor recorded at each of the PODs in 2021 is used as the winter/summer forecast for years 2022 to 2031.

4.2 Load Growth Drivers

Load growth within the Meadowlark service area is driven by several factors, including but not limited to:

- Development of the new Valley Line West LRT along Stony Plain Road. Construction of the new LRT line itself will require the connection of two new traction power substations (TPSS) within Meadowlark service area, with each TPSS adding approximately 1 MVA of load in 2026. The development of the new LRT line is expected to drive high-density mixed-use developments along the LRT corridor in accordance with City of Edmonton planning policy. These developments are expected to be large and discrete in nature, and have not been included in current load forecast unless an application for service has been received, which occurs when a project reaches the execution stage. One such high-density development has already been completed.
- Throughout the territory supplied by Meadowlark, it is becoming increasingly common for homes in mature neighborhoods to be demolished, their lots subdivided, and redeveloped as two new homes. This is increasing the load density within the Meadowlark POD service area. The City of Edmonton has indicated its desire to further incentivize these types of redevelopments through policy.
- In the future, electrification of transportation is expected to be a large source of load growth within the Meadowlark POD service area. Potential load growth from such developments has been included in the load forecast provided in this DDR.

4.3 Load Forecasting Results

Non-coincident peak load demand for the past five years and the next 10 years is provided in Table 7 and Table 8 for the summer and winter season, respectively. POD peak load data, including apparent power [MVA] and power factor [pf], is provided for Meadowlark, Jasper, Petrolia, and Garneau PODs. The 5-year historical POD transformer loading data – in MVA - is provided for the Meadowlark POD transformers. Circuit peak load data - in MVA - is provided for 15 kV distribution circuits in Meadowlark service area and for circuits supplied by adjacent PODs with direct distribution ties to Meadowlark POD. As can be observed in Table 7, EDTI observed higher than normal summer loading in 2024 due to an extended heat wave that increased POD loading. EDTI forecasts at 90th percentile temperatures for future years, and given that the deficiency arises late in the 10-year forecast period, the 25-year long term load forecast for Meadowlark POD has been included in Table 9. Highlighted in red in these tables are exceedances of either EDTI DFO's feeder loading policy or POD loading policy, discussed above in section 3.0.

4.4 Meadowlark POD Summary

Eighteen out of eighteen 15 kV feeder breakers at Meadowlark POD have distribution feeders connected to them. As shown in Table 7 and Table 9, the demand at Meadowlark POD is forecasted to exceed the POD's N-1 transformer capability in 2032. The winter demand at Meadowlark POD is forecast to exceed the POD's N-1 transformer capability in 2036.

Table 7: Summer Non-Coincident Peak Load Demand

Historic and Forecast Load - Summer Peak				LOADING - RECORDED							FORECAST LOAD									
			W	[2019]	[2020]	[2021]	[2022]	[2023]		[2024YTD]	[2024]	[2025]	[2026]	[2027]	[2028]	[2029]	[2030]	[2031]	[2032]	[2033]
SUB		CAPACITY[1]	or	Peak	Peak	Peak	Peak	Peak		Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak
No	POD/Tx/Feeder	MVA	S	MVA	MVA	MVA	MVA	MVA	PF	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA
Meadowlark	POD	77.5	S	53.1	50.9	57.4	68.7	53.7	0.98	67.0	62.7	66.6	67.9	69.4	70.9	72.7	74.5	76.3	78.1	79.6
	T1[2]	40.0	S	15.0	13.7	18.6	20.7	19.7	-	21.9	EDTI does not forecast at the POD transformer level.									
	M11	6.5	S	5.5	6.3	6.8	5.9	5.8	-	7.3	6.1	6.1	6.2	6.4	6.6	6.8	7.0	7.3	7.6	8.0
	M12	8.5	S	3.4	3.8	4.8	4.3	4.4	-	6.5	4.6	5.5	5.7	5.7	5.9	6.1	6.2	6.5	6.7	7.0
	M13	6.5	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	M17	6.5	S	4.6	4.9	5.4	5.3	5.6	-	5.6	5.8	6.5	6.6	6.7	6.7	6.8	6.9	7.1	7.2	7.4
	M18	6.5	S	3.4	3.8	4.5	4.1	4.4	-	4.6	4.6	4.6	4.8	5.0	5.2	5.4	5.7	6.1	6.4	6.8
	M19	6.3	S	0.9	0.9	1.2	1.0	1.0	-	1.3	1.1	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.4	1.4
	T2[2]	40.0	S	16.7	8.1	7.5	21.6	15.6	-	16.6	EDTI does not forecast at the POD transformer level.									
	M21	6.5	S	2.7	3.0	3.4	3.3	3.1	-	3.9	3.3	3.4	3.4	3.5	3.7	3.8	4.0	4.2	4.4	4.7
	M22	6.5	S	5.2	5.4	6.5	6.2	6.0	-	7.0	6.2	6.3	6.3	6.4	6.5	6.6	6.8	6.9	7.1	7.3
	M23	6.5	S	2.4	2.7	2.9	2.7	2.7	-	3.1	2.8	2.9	2.9	3.0	3.1	3.1	3.1	3.2	3.2	3.4
	M24	6.5	S	2.8	2.9	3.0	2.8	2.6	-	3.0	2.7	2.7	2.7	2.7	2.8	2.8	2.8	2.8	2.8	2.8
	M25	6.5	S	1.5	1.4	1.6	1.5	1.4	-	1.6	2.4	2.4	2.5	2.5	2.5	2.6	2.8	2.9	3.1	3.3
	M26	8.5	S	-	-	-	-	-	-	-	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
	T3[2]	40.0	S	15.4	10.1	19.8	25.3	23.4	-	25.9	EDTI does not forecast at the POD transformer level.									
	M34	6.5	S	6.2	7.1	7.2	6.5	6.1	-	7.4	6.3	6.5	6.7	6.9	7.2	7.5	7.9	8.3	8.8	9.4
	M35	8.5	S	3.9	4.4	5.5	4.8	4.7	-	6.9	4.9	5.7	5.7	5.8	5.9	6.1	6.2	6.5	6.7	6.9
	M36	8.5	S	3.1	3.1	3.2	3.2	3.3	-	-	3.3	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
	M37	8.5	S	-	-	-	-	5.2	-	5.5	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2
	M38	6.5	S	3.9	4.4	4.7	4.6	4.2	-	4.4	4.4	4.5	4.6	4.7	4.9	5.1	5.4	5.7	6.0	6.4
	M39	6.3	S	-	-	-	3.2	4.4	-	5.1	4.6	4.7	4.8	5.0	5.1	5.4	5.6	5.9	6.2	6.6
Jasper	POD	148.6	S	133.2	127.0	138.4	129.5	118.9	0.93	129.3	115	117.2	117.3	117.4	117.5	117.7	118	118.3	118.6	119
	J14	8.5	S	5.4	5.4	6.1	5.8	5.4	-	6.1	5.5	6.4	6.4	6.4	6.4	6.4	6.5	6.5	6.6	6.7
	J23	8.5	S	7.3	7.0	6.3	6.4	6.4	-	7.1	6.5	6.5	6.5	6.5	6.6	6.6	6.6	6.6	6.6	6.6
	J61	8.5	S	5.2	6.6	7.2	6.6	6.0	-	8.7	6.1	6.2	6.2	6.2	6.2	6.3	6.4	6.5	6.6	6.8
Petrolia[3]	POD	83.3	S	84.4	92.7	104.1	88.0	83.8	0.98	92.2	87.7	81.7	83.7	85.7	87.7	89.6	91.6	93	94.1	96.9
	P13	6.5	S	5.0	8.1	10.5	8.2	6.7	-	9.7	6.9	6.9	7.0	7.1	7.3	7.4	7.7	8.0	8.3	8.6
	P71	8.5	S	5.9	6.2	5.0	4.4	6.3	-	4.7	6.5	7.2	7.7	8.4	8.7	8.9	9.2	9.5	9.9	10.3
	P83	8.5	S	4.7	5.5	6.8	7.1	4.4	-	5.2	4.6	4.7	4.8	5.0	5.2	5.4	5.7	6.0	6.4	6.9
Garneau	POD	117	S	85.8	85.8	85.8	74.1	69.6	0.92	84.6	71	71.9	72.7	74	75.6	77.4	79.2	80.5	81.7	82.3
	G12	8.5	S	6.0	6.2	7.6	7.1	7.0	-	8.4	7.6	7.7	7.9	8.1	8.3	8.6	8.9	9.2	9.5	10.0
Woodcroft[4]	POD	76	S	58.0	58.2	73.6	66.6	65.3	0.92	70.4	67.1	68.9	70.1	70.7	71.4	72.1	72.9	73.9	75	76.2
	W5	6.5	S	5.2	5.6	7.6	4.3	4.4	-	4.9	4.7	5.5	5.6	5.7	5.9	6.1	6.3	6.6	7.0	7.3

1. N-1 Firm Capacity for PODs, Transformer Capacity (seasonally dependent), and Design Capacity for Circuits
2. Transforming loading historiacal data points do not accuractely reflect coincident transformer loading under normal operating conditions as a Meadowlark Bus LCR project was occuring during the majority of the data points.
3. In 2025, EDTI DFO is scheduled to complete D14 Feeder which is expected to offload 6 MVA from Petrolia
4. The Capacity at Woodcroft is expected to increase to 100 MVA in 2026 with the completion of P2582.

Table 8: Winter Non-Coincident Peak Demand

Historic and Forecast Load - Winter Peak				LOADING - RECORDED						FORECAST LOAD									
			W	[2019]	[2020]	[2021]	[2022]	[2023]		[2024]	[2025]	[2026]	[2027]	[2028]	[2029]	[2030]	[2031]	[2032]	[2033]
SUB		CAPACITY[1]	or	Peak	Peak	Peak	Peak	Peak		Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak
No	POD/Tx/Feeder	MVA	S	MVA	MVA	MVA	MVA	MVA	PF	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA
Meadowlark	POD	92.0	W	56.6	54.2	54.4	61.7	62.4	0.99	65.7	70	71.5	73.2	75.1	77.2	79.5	81.6	83.7	85.5
	T1[2]	40.0	W	10.8	19.0	10.4	21.7	22.4	-	EDTI does not forecast at the POD transformer level.									
	M11	7.5	W	5.9	6.1	5.8	5.9	5.9	-	6.2	6.3	6.4	6.6	6.8	7.1	7.4	7.7	8.1	8.6
	M12	8.7	W	4.6	4.7	5.2	4.9	5.6	-	5.8	6.8	6.9	7.0	7.1	7.3	7.6	7.8	8.1	8.4
	M13	7.5	W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	M17	7.5	W	5.7	5.6	5.6	5.4	5.3	-	5.5	6.3	6.4	6.5	6.5	6.6	6.8	7.0	7.1	7.4
	M18	7.5	W	4.4	4.5	4.6	4.6	4.7	-	5.0	5.1	5.3	5.5	5.7	6.0	6.4	6.8	7.2	7.7
	M19	6.5	W	1.1	1.1	1.2	1.2	1.3	-	1.4	1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.7	1.8
	T2[2]	40.0	W	9.1	18.1	8.9	16.7	16.7	-	EDTI does not forecast at the POD transformer level.									
	M21	6.5	W	3.6	3.6	3.6	3.5	4.0	-	4.3	4.4	4.5	4.6	4.7	4.9	5.1	5.4	5.7	5.9
	M22	7.5	W	6.1	5.9	6.1	6.2	6.6	-	6.8	6.9	7.0	7.0	7.1	7.3	7.5	7.7	7.9	8.1
	M23	7.5	W	3.0	3.0	2.8	3.0	3.1	-	3.2	3.3	3.4	3.4	3.5	3.6	3.6	3.7	3.7	3.9
	M24	7.5	W	2.1	2.3	2.2	2.2	3.1	-	3.1	3.1	3.2	3.2	3.2	3.3	3.3	3.3	3.3	3.3
	M25	7.5	W	2.0	1.8	1.9	1.9	1.7	-	3.0	3.0	3.1	3.1	3.2	3.3	3.5	3.6	3.8	4.1
	M26	8.7	W	-	-	-	-	-	-	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
	T3[2]	40.0	W	10.3	10.4	13.9	22.8	23.1	-	EDTI does not forecast at the POD transformer level.									
	M34	7.5	W	6.2	6.6	5.6	5.6	5.5	-	5.9	6.1	6.3	6.6	6.9	7.3	7.8	8.3	8.9	9.6
	M35	8.7	W	4.9	5.4	5.2	5.2	5.5	-	5.7	6.5	6.6	6.7	6.9	7.0	7.2	7.4	7.7	7.9
	M36	8.7	W	3.3	3.2	3.2	4.0	4.0	-	4.0	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
	M37	8.7	W	-	-	-	-	4.3	-	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
	M38	7.5	W	4.4	4.4	4.2	4.5	4.0	-	4.3	4.4	4.5	4.7	4.9	5.2	5.5	5.8	6.3	6.7
	M39	6.5	W	-	-	-	4.5	4.6	-	5.0	5.0	5.2	5.3	5.6	5.8	6.1	6.5	6.9	7.3
Jasper	POD	148.6	W	112.6	107.4	108.0	109.8	106.7	0.94	99.6	101.8	101.9	102.1	102.3	102.6	102.9	103.3	103.8	104.3
	J14	8.7	W	5.3	5.2	5.1	5.2	5.4	-	5.5	6.3	6.4	6.4	6.5	6.4	6.5	6.6	6.6	6.7
	J23	8.7	W	6.2	6.2	5.3	5.3	5.8	-	5.9	5.9	5.9	6.0	6.0	6.1	6.1	6.1	6.1	6.1
	J61	8.7	W	5.7	6.3	6.2	6.1	6.1	-	6.3	6.3	6.4	6.4	6.4	6.5	6.6	6.7	6.9	7.1
Petrolia[3]	POD	98.3	W	86.0	83.4	84.8	78.6	80.6	0.98	84.5	78.7	81	83.3	85.6	87.9	90.1	91.9	93.1	96.4
	P13	7.5	W	5.1	7.0	7.3	6.0	6.3	-	6.6	6.6	6.7	6.9	7.0	7.3	7.6	7.9	8.3	8.7
	P71	8.7	W	6.5	6.3	5.3	6.0	7.7	-	8.0	8.6	9.2	10.0	10.3	10.5	10.9	11.3	11.7	12.2
	P83	8.7	W	6.0	6.3	6.0	4.5	4.4	-	4.7	4.8	4.9	5.1	5.3	5.6	6.0	6.4	6.9	7.3
Garneau	POD	125	W	67.4	67.4	67.4	73.5	58.4	0.92	60	60.8	61.7	62.9	64.6	66.5	68.3	69.6	70.8	71.4
	G12	8.7	W	8.2	8.2	8.4	8.6	8.5	-	9.2	9.3	9.5	9.7	9.9	10.2	10.5	10.9	11.3	11.8
Woodcroft[4]	POD	89	W	59.6	60.2	63.4	62.2	62.5	0.92	63.6	65.4	66.7	67.4	68.2	69	70	71.1	72.4	73.6
	W5	7.5	W	5.5	5.6	8.7	5.0	6.8	-	7.1	7.9	8.0	8.2	8.4	8.6	8.9	9.2	9.6	10.0

1. N-1 Firm Capacity for PODs, Transformer Capacity (seasonally dependent), and Design Capacity for Circuits
2. Transforming loading historiacal data points do not accuractely reflect coincident transformer loading under normal operating conditions as a Meadowlark Bus LCR project was occuring during the majority of the data points.
3. In 2025, EDTI DFO is scheduled to complete D14 Feeder which is expected to offload 6 MVA from Petrolia
4. The Capacity at Woodcroft is expected to increase to 100 MVA in 2026 with the completion of P2582.

Table 9: Meadowlark POD 25-Year Long Term Load Forecast

25 YEAR FORECAST LOAD

		W	[2024]	[2025]	[2026]	[2027]	[2028]	[2029]	[2030]	[2031]	[2032]	[2033]	[2034]	[2035]	[2036]	[2037]	[2038]	[2039]	[2040]	[2041]	[2042]	[2043]	[2044]	[2045]	[2046]	[2047]	[2048]
SUB	**CAPACITY[1]**	**or**	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak
No	**MVA**	**S**	**MVA**	**MVA**	**MVA**	**MVA**	**MVA**	**MVA**	**MVA**	**MVA**	**MVA**	**MVA**	**MVA**	**MVA**	**MVA**	**MVA**	**MVA**	**MVA**	**MVA**	**MVA**	**MVA**	**MVA**	**MVA**	**MVA**	**MVA**	**MVA**	**MVA**
Meadowlark	77.5	S	62.7	66.6	67.9	69.4	70.9	72.7	74.5	76.3	78.1	79.6	80.7	83.4	86.2	89.1	92.2	95.3	98.5	101.6	104.7	107.7	110.8	113.5	116.2	118.8	121.4
	92.0	W	65.7	70.0	71.5	73.2	75.1	77.2	79.5	81.6	83.7	85.5	86.7	89.9	93.2	96.7	100.2	104.0	107.7	111.3	114.9	118.5	121.9	125.2	128.3	131.3	134.2

1. N-1 Firm Capacity

5.0 DEFICIENCY ASSESSMENT

This section focuses on evaluating the deficiencies in supply of distribution load for the Meadowlark service area.

As per EDTI DFO's POD loading policy (section 3.2), the transmission N-1 firm capacity is defined as the maximum load that the POD can supply without overloading any transmission equipment under an N-1 emergency operating condition. The term "Unsupplied Load" refers to any distribution load that is predicted to be unserved under POD N-1 emergency conditions, due to the distribution load exceeding the remaining available transmission capacity at Meadowlark POD, and due to the distribution load exceeding the available circuit tie capacity from adjacent PODs[2].

5.1.1 Meadowlark POD Contingency Load Table

Table 10 presents the contingency load table for the forecast deficiency during summer peak periods at Meadowlark POD. The deficiency of concern is the loss of one of the three POD transformers at Meadowlark POD. Violations of EDTI DFO's POD loading policy are highlighted in yellow. "Unsupplied Load" is highlighted in red.

Table 10: 2023-2032 Summer Load Contingency Table at Meadowlark POD

				CONTINGENCY LOAD TABLE - SUMMER PEAK - 2023-2033									
		[2023]		[2024]	[2025]	[2026]	[2027]	[2028]	[2029]	[2030]	[2031]	[2032]	[2033]
		Peak		Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak
		MVA		MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA
T1 or T2 or T3 Contingency at Meadowlark	Meadowlark Total Load	53.7		62.7	66.6	67.9	69.4	70.9	72.7	74.5	76.3	78.1	79.6
	N-1 Capacity	77.5		77.5	77.5	77.5	77.5	77.5	77.5	77.5	77.5	77.5	77.5
	Back up from Jasper	7.1		6.9	6.5	6.5	6.4	6.3	6.2	2.0	2.0	1.9	1.8
	Back up from Petrolia	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Back up from Garneau	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Back up from Woodcroft	2.1		1.8	1.0	0.9	0.8	0.6	0.0	0.0	0.0	0.0	0.0
	Total Unsupplied Load	**0.0**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**

Back-up capacity from circuits supplied by adjacent PODs is not forecast to be available from 2033 onwards due to load growth and load additions concentrated in geographical areas that make it so the distribution ties cannot be used without exceeding their capacity limitations. Distribution circuit tie capacity is dependent on switching points, distribution asset capacities, and circuit topology i.e. where / how load is actually connected and distributed along the circuit. For the purposes of evaluating/developing alternatives, EDTI has also provided the longer term forecast summer load

[2] Available circuit capacity is determined with consideration to the length of outages observed for transmission elements and with consideration to technical limitations required to safely and reliably operate EDTIs distribution system.

contingency table at Meadowlark POD for the years 2034 to 2048 in Table 11 below. Exceedances of EDTI DFO’s N-1 POD loading policy are highlighted in yellow. “Unsupplied Load” is highlighted in red.

Table 11: 2034 – 2048 Summer Load Contingency Table at Meadowlark POD

		CONTINGENCY LOAD TABLE - SUMMER PEAK - 2034-2048														
		[2034]	[2035]	[2036]	[2037]	[2038]	[2039]	[2040]	[2041]	[2042]	[2043]	[2044]	[2045]	[2046]	[2047]	[2048]
		Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak
		MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA	MVA
T1 or T2 or T3 Contingency at Meadowlark	Meadowlark Total Load	80.7	83.4	86.2	89.1	92.2	95.3	98.5	101.6	104.7	107.7	110.8	113.5	116.2	118.8	121.4
	N-1 Capacity	77.5	77.5	77.5	77.5	77.5	77.5	77.5	77.5	77.5	77.5	77.5	77.5	77.5	77.5	77.5
	Backup from adjacent PODs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Unsupplied Load	3.2	5.9	8.7	11.6	14.7	17.8	21.0	24.1	27.2	30.2	33.3	36.0	38.7	41.3	43.9

As can be shown from Table 10 and Table 11 above, the identified deficiency is forecast to begin in 2032 with a 1.6 MVA shortfall and increases to 43.9 MVA by the end of the 25-year forecast period, 2048.

5.1.2 Meadowlark POD Load Trend Graphs

EDTI does not currently forecast load profiles for future years at the hourly level. EDTI is currently unable to provide a meaningful load trend graph in the year of the forecast deficiency, 2032.

6.0 IDENTIFIED ALTERNATIVES

The deficiency assessment in section 5 has demonstrated a POD N-1 deficiency will emerge in 2032 given load growth in the Meadowlark POD service Area. The deficiency is forecast to increase to 43.9 MVA by 2048. To alleviate transmission deficiency when it is forecast to occur, the following solution alternatives were explored:

Distribution Alternatives

6.1 Alternative I – Distribution Switching

This alternative leverages the existing distribution circuit ties shown in Section 2.2 to explore the possibility of distribution load transfers from Meadowlark POD to adjacent POD service areas to resolve the identified capacity issue. EDTI has determined alternative I is not technically viable. Limitations on utilizing adjacent distribution capacity to resolve the deficiency are summarized in Table 12 below.

Table 12: Adjacent Distribution Circuit Limitations

Adjacent Circuit	Limitation / Issue
G12	Circuit G12 is forecast to exceed summer design rating in 2029 and cannot support additional load from circuit M25.
J14	Circuit J14 is forecast to exceed summer design rating in 2025 and cannot support additional load from circuit M23 in the circuit's existing configuration.
J23	Circuit J23 is forecast to have ~70 amps of available capacity at the end of the 10-year forecast in 2033; however this circuit provides N-1 support to circuits M19, M35, and M36. Circuit M19 provides standby service to the Misercordia Hospital.
J61	Circuit J61 is forecast to have ~70 amps of available capacity at the end of the 10-year forecast in 2033; which is insufficient to adequately support additional load from circuit M35.
P13	Circuit P13 is forecast to exceed design rating in 2030 and cannot support additional load from circuit M34.
P71	Circuit P71 is forecast to exceed design rating in 2028 and cannot support additional load from circuit M13.
P83	Circuit P83 is forecast to have ~60 amps of available capacity at the end of the 10-year forecast in 2033; however EPCOR is exploring solutions for nearby Petrolia circuit design exceedances that will likely involve the use of circuit P83 (load was recently moved from

Adjacent Circuit	Limitation / Issue
	P83 to circuit M39 in support of this activity). Therefore circuit P83 cannot be used to support additional load from circuit M39.
W5	Circuit W5 is forecast to exceed summer design rating in 2031 and cannot be used to support additional load from circuit M18.

Alternative I is not considered technically viable to resolve the identified capacity issue by 2032 or in the years following. Even if all available capacity from adjacent POD circuits could be utilized, it amounts to only 200 amps (4.8 MVA), which is 39.1 MVA less than the needed 43.9 MVA shortfall identified. EDTI requires new transmission capacity and / or transmission investment to connect new distribution circuits to resolve the issue, and particularly over the longer term as shown in Table 11 of Section 5.0.

Transmission Alternatives

6.2 Alternative II – POD Transformer Size Increase at LCR

This alternative consists of expanding the capacity of Meadowlark POD between 2026 and 2030 by coordinating with the TFO to replace the current 40 MVA 72/15 kV transformers with, at-minimum, 50 MVA 72/15 kV transformers at the time of their scheduled lifecycle replacements. Lifecycle replacements are currently planned for 2026 (T1), 2029 (T2), and 2030 (T3) per EPCOR TFO. No distribution work is required to implement this solution.

EDTI DFO expects Alternative II will add 11.6 MVA of N-1 POD firm capacity to the Meadowlark POD service area. This alternative addresses the deficiency forecast, beginning in 2032 and remains a viable solution until 2037, 11 years short of the 25-year forecast period, 2048. The remaining 32.3 MVA shortfall will look to be addressed through existing distribution switching and/or distribution reconfiguration projects determined at the time closer to the identified need arising. For context regarding the longevity of this alternative, the expected life of a new POD transformer is between 55-60 years. By the end of the 25-year forecast period, 2048 the first transformer replaced at Meadowlark POD in 2026 will have more than 34-years of life expectancy remaining.

With the upgrade to 50 MVA transformers, the transformer capacity will increase to approximately 100 MVA in summer and 118.8 MVA in winter (or 97.5 MVA summer and 115.8 MVA winter after accounting for reactor losses). However, it is important to note that Meadowlark POD will remain limited by transmission supply constraints, with available capacity restricted to 89.1 MVA in summer and 101.4 MVA in winter[3].

If Alternative II is pursued, the AESO may direct EDTI TFO to prepare a facility application for the requested transmission upgrades. This facility application will include an estimate of the transmission capital cost.

Alternative II is considered technically viable.

6.3 Alternative III – Jasper POD Expansion and Three (3) New Circuits

Note, this solution depends on the spare feeder breakers not being required for other distribution issues that might arise between now and the years of construction.

Note, Jasper POD only has 1 spare feeder breaker position remaining.

This alternative consists of completing a POD expansion project and building three new circuits from Jasper POD. The first new circuit would be required by 2032, while the second and third circuits would be required in 2036 and 2039 respectively. Preliminary evaluation suggests that 178 Street could be used as the alignment for the three feeders with upgrade and expansion to the existing ductline. In total, the following scope is anticipated:

- ~3.0 km of ductline, from MN1083 located south of 100 Avenue to 76 Avenue located south of White Mud Drive. The crossing of White Mud Drive along 178 Ave will be more costly than typical ductline construction.
- ~3.2 km of 750 MCM Cu EPR cable for Feeder 1, offloading circuit M35 entirely.
- ~3.9 km of 750 MCM Cu EPR cable for Feeder 2, offloading circuit M12 entirely.
- ~5.6 km of 750 MCM Cu EPR cable for Feeder 3, offloading circuit M22 entirely.

Jasper POD has N-1 firm capacity of 148 MVA. OLTCs on both X and Y windings of either transformer are unable to maintain adequate voltage for load exceeding ~74 MVA, which results in 148 MVA (74 MVA+74 MVA) N-1 firm POD capacity.

Based on preliminary information provided by EPCOR TFO, ECPOR DFO understands that Meadowlark POD, Petrolia POD, and Garneau POD cannot be expanded without first further expanding the footprint of

[3] The most limiting contingency at Meadowlark is a contingency on 72PM25 or Poundmaker Tx4. Under this contingency, the load at both Meadowlark and Garneau must be supplied by 72JM18, 72RG1, and 72RG7. The configuration with the highest available capacity requires supplying Meadowlark Tx1 and Tx2 via 72JM18 (61MVA summer/68MVA winter) and supplying Meadowlark Tx3 via 72MG16 / 72RG7 (this supplies approximately 28.1MVA summer/33.3MVA winter, as the capacity supplied by 72RG7 must also be used to supply Garneau Tx1 and Tx2). The Meadowlark summer firm capacity is therefore 61MVA + 28.1MVA = 89.1MVA and 101.4MVA winter.

the respective property. Only Jasper POD has potential to be expanded without further expanding the footprint of the respective property.

Alternative III is considered technically viable.

7.0 COST COMPARISON

A summary comparison of costs for the two alternatives considered is shown in Table 13 below. Only the distribution costs associated with each alternative have been estimated. If a transmission alternative is pursued, the AESO may direct EDTI TFO to prepare a facility application for the requested transmission upgrades. This facility application will include an estimate of the transmission capital cost.

Table 13: Distribution Cost Comparison

Alternative	Description	Estimated Costs (+/- 50%, $MM, $2024)
II	**POD Transformer Size Increase at Lifecycle Replacement**	
	Transmission Costs	**TBD**
	Total Costs for Alternative II	**TBD**
III	**Jasper POD Expansion and Three New Circuits from Jasper POD**	
	Distribution Costs	
	New Ductline with Whitemud Crossing	**16.1**
	New J74 circuit	**2.1**
	New JXX circuit	**2.5**
	New JXY circuit	**3.6**
	Transmission Costs	**TBD**
	Total Costs for Alternative III	**TBD**

8.0 PREFERRED ALTERNATIVE

EDTI prefers Alternative II – POD Transformer Size Increase at Lifecycle Replacement. EDTI prefers this alternative for the following reasons:

1. By coordinating with the TFO POD transformer lifecycle replacement project, a relatively small incremental cost is expected to be required considering the magnitude of capacity gains that will be realized (11.6 MVA). This cost is expected to be less than Alternative III, while also carrying less risk.
2. The life expectancy of the POD transformers to be installed as part of the TFO lifecycle replacement is expected to be between 55-60 years. In 2048, approximately half-way through the POD transformers lifecycle for the transformers that the TFO is planning to replace in 2026-2030, Meadowlark POD is still forecast to have 10.1 MVA of remaining POD N-1 Firm Capacity. Without a POD transformer capacity increase, there is significant risk the POD transformers will need to be replaced earlier than otherwise required for lifecycle reasons.
3. As EDTI DFO replaces 500 mcm 15 kV distribution circuit cables for lifecycle replacement reasons, EDTI DFO installs 750 mcm 15 kV cable as standard. Additional N-1 POD transformation capacity at Meadowlark POD will allow EDTI DFO to more effectively make use of this incremental capacity. Without an increase in POD transformation capacity, EDTI DFO will be unable to fully utilize this incremental distribution circuit capacity to support customer loads; and will in fact need to partially or fully offload several Meadowlark circuits to adjacent POD service areas in order to not exceed Meadowlark POD's N-1 limit.

Pending the completion of transmission-related assessment and associated costs, EDTI would use the following implementation strategy in section 8.1 and 8.2 to address the identified deficiencies.

8.1 Meadowlark POD N-1 Firm Capacity

Upon completion of the capacity increase of Meadowlark POD, the POD N-1 firm capacity constraint at Meadowlark POD will be reduced to 32.3 MVA by the end of the 25-year forecast period, 2048 The new POD N-1 firm capacity at Meadowlark POD is expected to be 89.1 MVA in summer and 101.4 in winter due to transmission supply constraints as described in section 6.2 (pending final project implementation and TFO analysis).

8.2 Distribution Circuits Constraints

As identified in Section 5.0, the deficiency identified violates EDTI's POD N-1 Firm Loading policy during a POD transformer outage and as such Meadowlark POD loading is the primary concern in this DDR. Distribution circuit constraints will be addressed via conventional distribution solutions internal to Meadowlark POD such as cable upgrades, and circuit reconfiguration optimally timed to address need. The solutions required to address identified circuit deficiencies that exist are similar in scope and cost regardless of Alternative II and Alternative

III and thus have been omitted from detailed analysis in this DDR.

However, with respect to Alternative II and Alternative III and their ability to resolve distribution constraints, the preferred alternative provides Meadowlark POD with the capacity required to enable fuller use the 15 kV feeder breakers at Meadowlark POD.

As EDTI DFO performs lifecycle replacements on existing 500 mcm circuits the feeder cable will be replaced with 750 mcm (EDTI standard) providing for an increased distribution circuit capacity on those circuits. Without additional POD transformation capacity, EDTI DFO will be unable to make use of this incremental capacity.

8.3 Effectiveness of Preferred Alternative II

The effectiveness of the preferred alternative is evident in the following Table 14, whereby the POD N-1 Firm Capacity at Meadowlark POD has increased to 89.1 MVA in summer and 101.4 MVA in winter, providing additional capacity to accommodate load growth at Meadowlark POD forecast over the 25-year forecast period.

8.4 Effectiveness of Alternative III

The effectiveness of Alternative III is evident in the following Table 15, whereby Meadowlark POD loading has been reduced below the POD N-1 Firm Capacity for the duration of the 25-year forecast period and with the selected expansion, Jasper POD loading will also remain below its respective POD N-1 Firm Capacity. However, in resolving the issue EDTI has used the last remaining spare circuit position at Jasper POD, and limited Meadowlark PODs ability to utilize incremental capacity gains that otherwise would be available due to lifecycle replacement of 500 mcm 15 kV circuit cable. Alternative III is less flexible in accommodating unexpected developments that may occur over the 25-year forecast period and over the 50-year expected life of the POD transformers being replaced by the TFO. There is significant risk that EDTI DFO might be required to initiate a POD transformer upgrade of the same scope as the preferred Alternative II relatively early into their life expectancy if Alternative III is selected.

Table 14: Alternative II –25 Year Load Forecast for Impacted PODs after Solution Implementation

25 YEAR FORECAST LOAD

SUB No	CAPACITY[1] MVA	W or S	[2024] Peak MVA	[2025] Peak MVA	[2026] Peak MVA	[2027] Peak MVA	[2028] Peak MVA	[2029] Peak MVA	[2030] Peak MVA	[2031] Peak MVA	[2032] Peak MVA	[2033] Peak MVA	[2034] Peak MVA	[2035] Peak MVA	[2036] Peak MVA	[2037] Peak MVA	[2038] Peak MVA	[2039] Peak MVA	[2040] Peak MVA	[2041] Peak MVA	[2042] Peak MVA	[2043] Peak MVA	[2044] Peak MVA	[2045] Peak MVA	[2046] Peak MVA	[2047] Peak MVA	[2048] Peak MVA
Meadowlark	89.1	S	62.7	66.6	67.9	69.4	70.9	72.7	74.5	76.3	78.1	79.6	80.7	83.4	86.2	89.1	92.2	95.3	98.5	101.6	104.7	107.7	110.8	113.5	116.2	118.8	121.4
	101.4	W	65.7	70.0	71.5	73.2	75.1	77.2	79.5	81.6	83.7	85.5	86.7	89.9	93.2	96.7	100.2	104.0	107.7	111.3	114.9	118.5	121.9	125.2	128.3	131.3	134.2

1. N-1 Firm Capacity

Table 15: Alternative III - 25 Year Load Forecast for Impacted PODs after Solution Implementation

25 YEAR FORECAST LOAD

SUB No	CAPACITY[1] MVA	W or S	[2024] Peak MVA	[2025] Peak MVA	[2026] Peak MVA	[2027] Peak MVA	[2028] Peak MVA	[2029] Peak MVA	[2030] Peak MVA	[2031] Peak MVA	[2032] Peak MVA	[2033] Peak MVA	[2034] Peak MVA	[2035] Peak MVA	[2036] Peak MVA	[2037] Peak MVA	[2038] Peak MVA	[2039] Peak MVA	[2040] Peak MVA	[2041] Peak MVA	[2042] Peak MVA	[2043] Peak MVA	[2044] Peak MVA	[2045] Peak MVA	[2046] Peak MVA	[2047] Peak MVA	[2048] Peak MVA
Meadowlark	77.5	S	62.7	66.6	67.9	69.4	70.9	72.7	74.5	76.3	57.7	58.4	59.5	62.2	65.0	67.9	71.0	74.1	77.3	80.4	83.5	86.5	89.6	92.3	95.0	97.6	100.2
	92.0	W	65.5	69.6	71.0	72.5	74.3	76.1	78.1	80.0	60.0	61.0	62.2	65.4	68.7	72.2	75.7	79.5	83.2	86.8	90.4	94.0	97.4	100.7	103.8	106.8	109.7
Jasper	148.6	S	115.0	117.2	117.3	117.4	117.5	117.7	118.0	118.3	139.0	140.2	140.7	141.1	141.6	142.0	142.6	143.1	143.5	144.0	144.4	144.7	145.1	145.3	145.6	145.8	146.0
	148.6	W	99.5	101.7	101.8	102.0	102.1	102.4	102.7	103.0	127.5	128.8	129.3	129.9	130.5	131.0	131.6	132.2	132.7	133.3	133.7	134.2	134.6	134.9	135.2	135.5	135.7

1. N-1 Firm Capacity

9.0 CONCLUSION

EDTI DFO has determined that resolving the deficiencies through distribution means only is not technically viable over the 25-year forecast period.

Pending the completion of transmission-related assessment and associated costs, EDTI DFO suggests Alternative II as the preferred alternative to address the identified deficiencies and considerations outlined in this document. EDTI DFO believes that Alternative II, and Alternative III are both technically viable and address the distribution and transmission deficiencies identified in section 5.0. However EDTI anticipates that Alternative III will have a higher total cost due to the length of feeder cable to be installed and the cost of a substation expansion. Alternative III also provides less value to the system and customers due to its inability to handle deviations in load growth or load connections from what is currently forecast. For example, Alternative III strands distribution cable capacity at Meadowlark POD (resulting from the POD transformer capacity constraint), and uses the last remaining spare position at Jasper POD significantly reducing the number of solutions available for localized distribution issues that might arise. Selecting Alternative III results in the addition of transmission investment that could have otherwise been deferred. Consequently, with the coordination of the TFOs lifecycle replacement plans, Alternative II is expected to be a low cost alternative that provides a flexible and optimal solution to addressing both foreseeable and unforeseeable developments within the Meadowlark POD service area.

EDTI will not be requesting a change to its DTS contract at Meadowlark POD at this time.

The requested in-services date (ISD) for the proposed development is to align with EPCOR TFO lifecycle replacement plans which have a planned completion dates of 2026 for T1, 2029 for T2, and 2030 for the final transformer replacement T3.