



CONNECTION ASSESSMENT & APPROVAL PROCESS

PRELIMINARY ASSESSMENT REPORT

***For the Proposed 625MVA Development near Leamington
by AES Endeavor Inc.***

Final Version

Long Term Forecasts & Assessments Department

Date: 26th September 2000

Preliminary Assessment Report

*For the proposed 625MVA Development near Leamington
by AES Endeavor Inc.*

Acknowledgement

The IMO wishes to acknowledge the assistance of Hydro One in completing some of the studies for this assessment.

Disclaimers

IMO

The contents of these materials are for discussion and information purposes and are provided ‘as is’ without representation or warranty of any kind, including without limitation, accuracy, completeness or fitness for any particular purpose. The Independent Electricity Market Operator (IMO) assumes no responsibility to you or any third party for the consequences of any errors or omissions. The IMO may revise these materials at any time in its sole discretion without notice to you. Although every effort will be made by the IMO to update these materials to incorporate any such revisions it is up to you to ensure you are using the most recent version.

Hydro One

Special Notes and Limitations of Study Results

The results reported in this preliminary feasibility study are based on the information available to Hydro One, at the time of the study, suitable for a preliminary assessment of a new generation or load connection proposal.

The short circuit and thermal loading levels have been computed based on the information provided by the connection proponent at the time of the study. These levels may be higher or lower if the connection information changes as a result of, but not limited to, subsequent design modifications or when more accurate test measurement data is available.

This study does not assess the short circuit or thermal loading impact of the proposed connection on facilities owned by other load and generation (including OPGI) customers.

In this preliminary feasibility study, short circuit adequacy is assessed only for Hydro One breakers and does not include other Hydro One facilities. The short circuit results are only for the purpose of assessing the capabilities of existing Hydro One breakers and identifying upgrades required to incorporate the proposed connection. These results should not be used in the design and engineering of new facilities for the proposed connection. The necessary data will be provided by Hydro One and discussed with the connection proponent upon request.

The ampacity rating of Hydro One facilities are established based on assumptions used in Hydro One for power system planning studies. The actual ampacity ratings during operations may be determined in real-time and are based on actual system conditions, including ambient temperature, wind speed and facility loading, and may be higher or lower than those stated in this study.

The additional facilities or upgrades which are required to incorporate the proposed connection have been identified to the extent permitted by a preliminary assessment. Additional facility studies may be necessary to confirm constructability and the time required for construction. System impact or further studies at more advanced stages of the project development may identify additional facilities that need to be provided or that require upgrading.

PRELIMINARY ASSESSMENT REPORT

***For the Proposed 625MVA Development near Leamington
by AES Endeavor Inc.***

Executive Summary

This Preliminary Assessment has examined the impact on the local system of the proposed **AES** development, in isolation of any other proposed developments.

Incorporation into the 230kV System between Windsor and Chatham

AES is proposing to construct a new 625MVA generating facility, approximately 12km south of the existing Windsor-Chatham 230kV right-of-way. A new 230kV double-circuit line is to be constructed from the new generating facility to tap on to the 230kV circuits C23Z & C24Z, between Lauzon TS and Chatham TS, at a point approximately 55km from Chatham TS.

AES is proposing to install two in-line 230kV breakers at their facility, together with a bus-section breaker. At the tapping point on to circuits C23Z & C24Z, line disconnects are to be installed by AES.

AES has also indicated their interest in having a 230/115kV connection established between their new generating facility and Kingsville TS. This would enable some of the output from the AES development to be used directly to supply the load at Kingsville together with other loads on the 115kV system, thereby reducing the transfer into the 230kV system.

While the additional 12km of line will increase the exposure of circuits C23Z & C24Z to line faults, the provision of line disconnects at the tapping point will facilitate rapid removal of the faulted section should a permanent fault occur. In addition, should a connection with Kingsville TS be established, it would significantly enhance the supply reliability of that part of the 115kV system. The impact of the proposed termination arrangement on the supply reliability in the area is therefore expected to range between 'neutral' and 'beneficial' (in the event that a connection with Kingsville TS is established).

If all of the output from the AES development is injected into the 230kV system, then under contingency conditions that result in the loss of one of the auto-transformers at Lauzon TS, the companion unit could be overloaded. To address these situations, either generation rejection would need to be initiated or the scope of the existing Windsor Area Overload Scheme, which automatically opens up the 115kV system between Lauzon TS and Keith TS, would need to be expanded.

Impact on Fault Levels

The studies have indicated that the increased fault levels resulting from the incorporation of the AES Project will remain within the fault interrupting capability of the existing breakers. Consequently no remedial action will be necessary to accommodate the additional generating capacity into the system.

Impact on the Transfer Capability of the Ontario-Michigan Interface

The ATCO Project has been determined to have the following impact on the maximum transfers that can be maintained across the Ontario-Michigan Interconnections:

- Under IMPORT conditions, there would be no impact on the transfer capability.
- Under EXPORT conditions, the transfer capability would be reduced by approximately 30MW to 2380MW

While the Report identifies measures that (theoretically) would need to be undertaken to restore the transfer capability of the Interface to its present level under EXPORT conditions, no attempt has been made to assess the feasibility or practicality of these measures.

AES Development Proposal near Leamington

1. Introduction

AES Endeavor Inc. is proposing to construct a 3-unit combined-cycle, 625MVA generating facility in the Leamington area, approximately 12km south of the existing 230kV right-of-way. It is proposed to incorporate the new facility into the system via a double-circuit line, approximately 12km in length, connected to circuits C23Z and C24Z, between Chatham TS and Lauzon TS.

The proposed in-service date for the project is late-2003.

Diagram 1 shows the geographic location of the proposed facility, while Diagram 2 shows the configuration of the 230kV circuits in the area where it is proposed to connect to the system.

2. Comments on the Proposed Incorporation Arrangement

On the right-of-way to which the AES Project is to be connected, there are two double-circuit 230kV lines. Circuits C23Z & C21J are located on the northern-most line, while circuits C24Z & C22J are located on the line on the south-side of the right-of-way.

As shown in Diagram 2, circuits C23Z & C21J are equipped with 1192.5kcmil conductors, while circuits C24Z & C22J are equipped with 795kcmil conductors. At Sandwich Junction, various cross-overs take place, so that circuits C21J & C22J continue on the Keith TS as a double-circuit line equipped with 795kcmil conductors, while circuits C23Z & C24Z continue on the Lauzon TS as a double-circuit line equipped with 1192.5kcmil conductors.

With a choice of four 230kV circuits available on the right-of-way it had been decided to connect the proposed AES Project to circuits C23Z and C24Z, even though these circuits have dissimilar ratings, primarily in order to avoid any possible conflict with transfers eastwards from Keith TS on circuits C21J & C22J.

Diagram 3 shows the proposed arrangement of the generating facilities at the Leamington site as well as the connection arrangement at the right-of-way. At their generating station, AES is proposing to install an in-line breaker in each of the incorporation circuits, together with a bus-section breaker.

The inclusion of the bus-section breaker would facilitate splitting of the 230kV busbar at the AES generating station to take account of the dissimilar rating of the two circuits to which it is proposed to connect the Project. In this regard, the location of the bus-section breaker is important, since with it open, the steam turbine/gas turbine combination would be associated with circuit C23Z; the circuit with the larger conductors, and hence the higher rating. The bus-section breaker would also provide the added benefit of minimising the amount of generating capacity that would be lost in the event of a busbar fault or a fault involving either of the step-up transformers associated with the gas turbine units.

Diagram 3 also shows an alternative arrangement for the switchgear at the AES generating station.

AES has indicated that, should there be limitations on the amount of their output that can be accepted into the 230kV system (particularly under light-load conditions at Lauzon TS), they would be interested in having a 230kV connection established between their GS and Kingsville TS. Since there is a significant load at Kingsville TS (currently with a peak of 120MW, although the minimum load can be as low as 50MW), a connection to Kingsville TS would reduce the power transfer into the 230kV system. It would also enhance the supply to Kingsville TS.

In recognition of the possibility of a 230kV connection being established between the AES generating station and Kingsville TS, it is recommended that AES make allowance in their breaker layout design for possible modification to the alternative arrangement.

AES is proposing to install disconnects in each incorporation circuit at the right-of-way to allow ready isolation of their circuits for either maintenance or in the event that they are subject to a permanent fault.

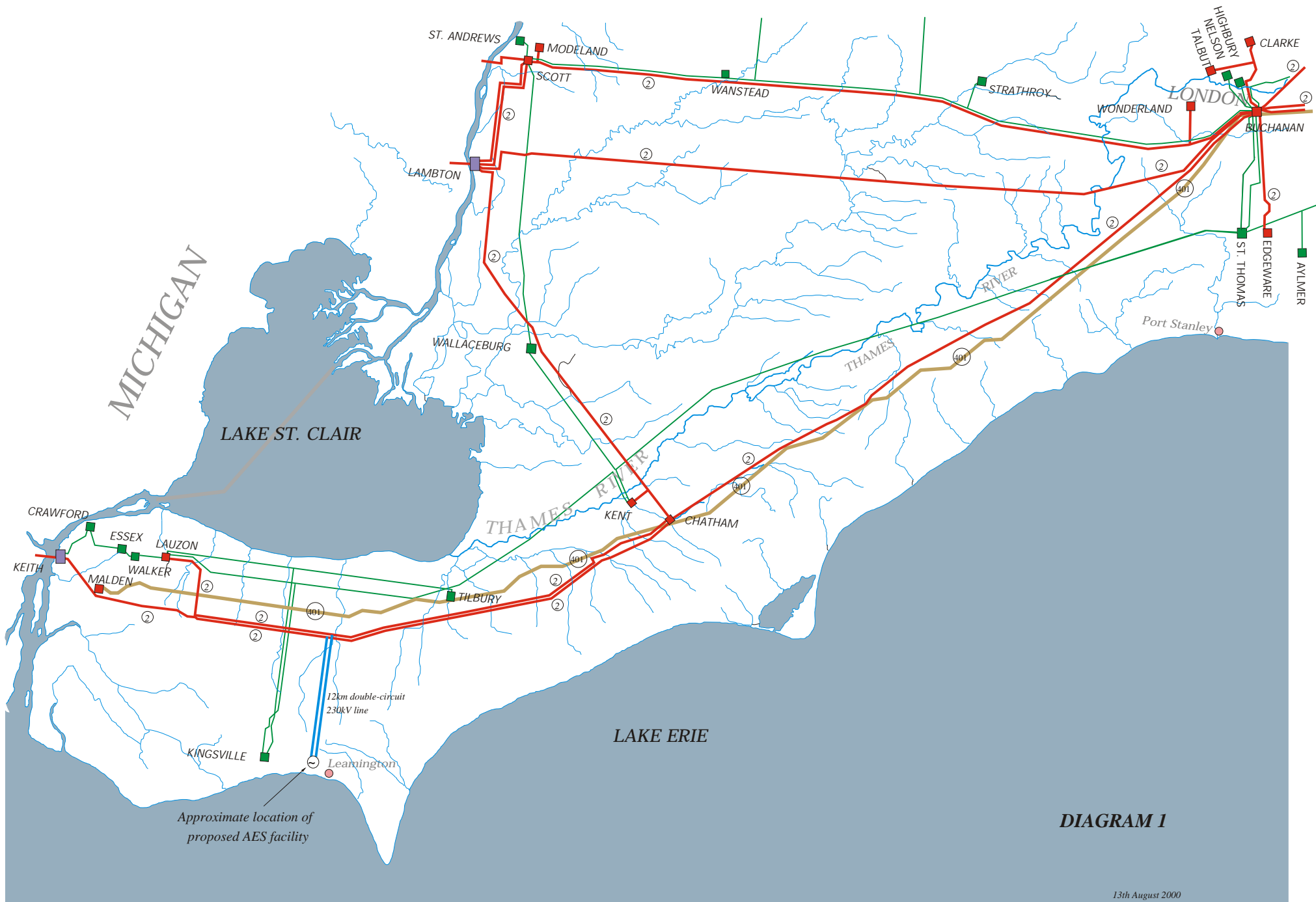
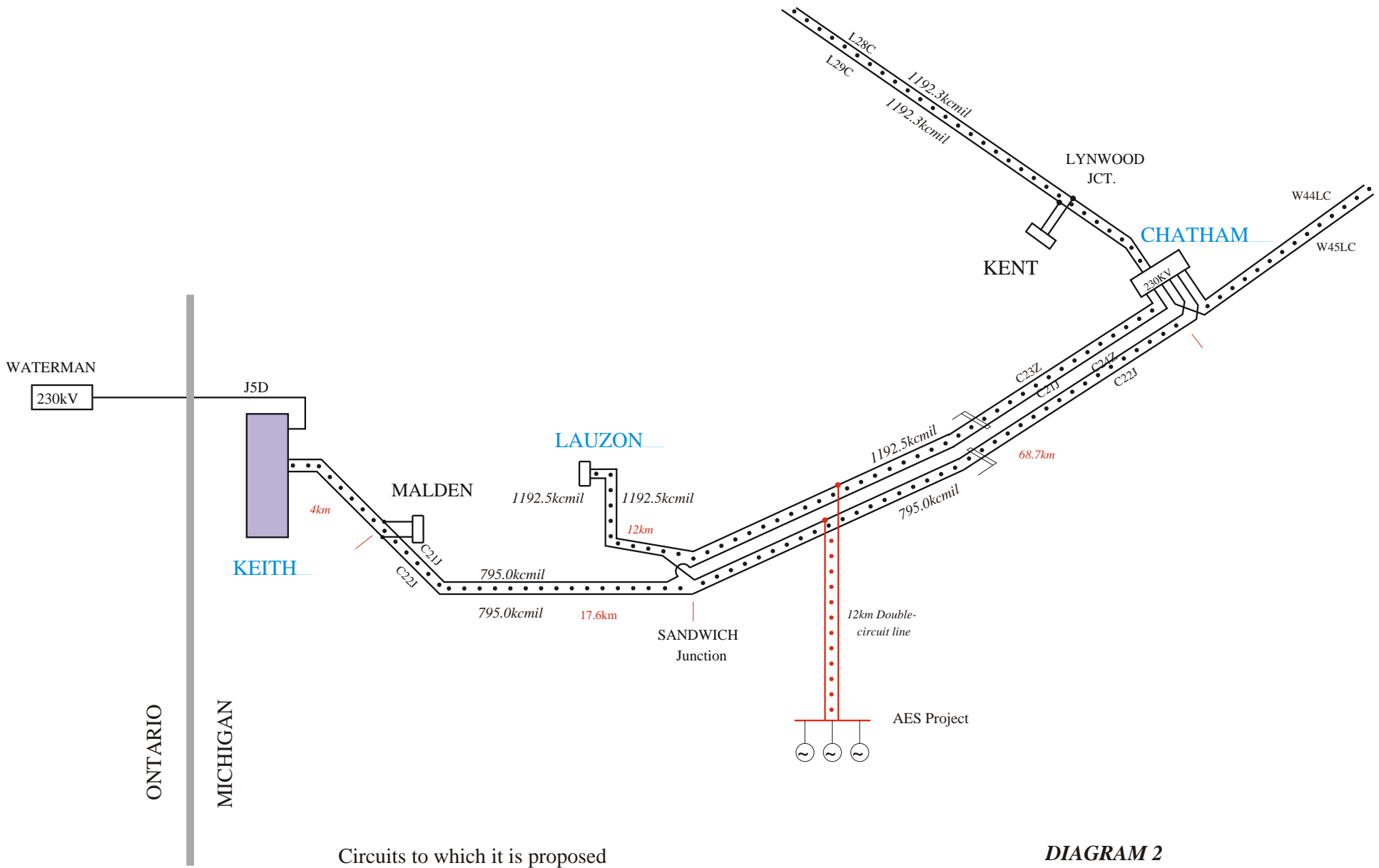
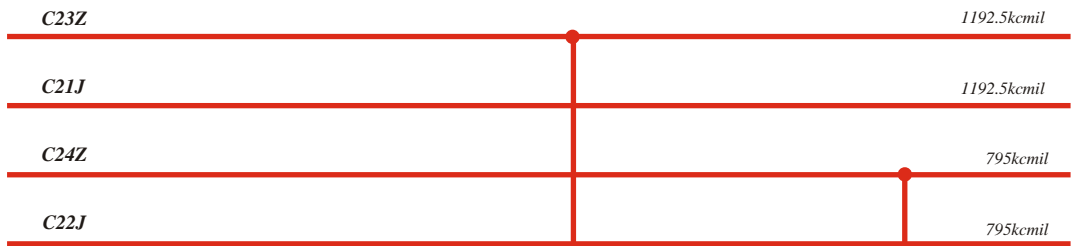


DIAGRAM 1

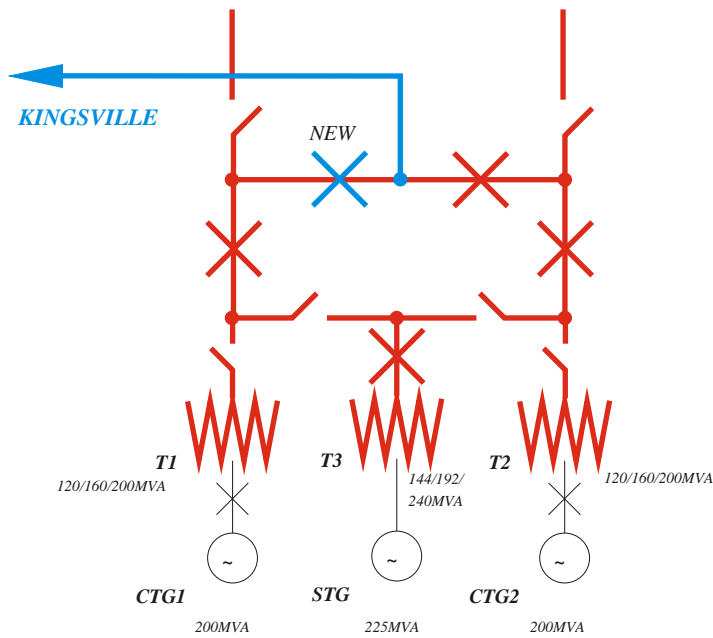


Circuits to which it is proposed
to connect the AES Project

DIAGRAM 2



Alternative Arrangement



C23Z

~12km
1272kcmil

C24Z

**AES - LEAMINGTON
PROJECT**

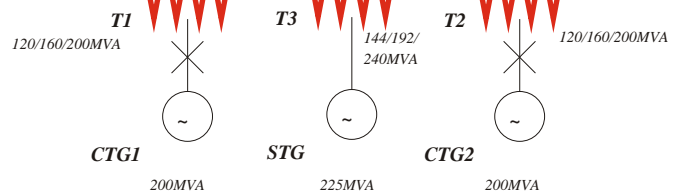


DIAGRAM 3

2.1 Impact on Reliability

The cross-over of the circuits that has been introduced at Sandwich Junction is intended to limit the exposure of the connections to Keith TS and Lauzon TS to double-circuit contingencies. However, for the supply to Lauzon, this still leaves approximately 12km of exposure due to the double-circuit line construction between Sandwich Junction and Lauzon TS. Adding a further 12km of double-circuit line construction for the incorporation of the AES Project will effectively double the exposure. It is therefore recommended that AES give consideration to employing single-circuit line construction for incorporating their Project, if not precluded by constraints on the available right-of-way.

3. Fault Level Analysis

Fault level studies were performed to determine the impact of the AES development (in isolation) on the existing transmission facilities.

The following system conditions were assumed when conducting the studies:

- All existing transmission facilities, together with those facilities that have been 'committed' are assumed to be in-service.
- The three Interconnections with Michigan reflect their final arrangement following the installation of the new phase-shifters.
- The generators at the Bruce 'A' and Pickering 'A' stations are out-of-service
- The two 500/230kV auto-transformers at Lennox TS, together with units G1 to G4 at Lennox GS are in-service.
- The 230kV busbars at Richview TS are operated 'split', while Cherrywood TS is operated with a separate North & South switchyard.
- The two 200MVA gas-turbine generators and the single 225MVA steam-turbine generator that comprise the AES project are incorporated via a 12km double-circuit 230kV line, connected directly to circuits C23Z & C24Z at a tapping point 55km from Chatham TS. The 230kV busbar at the AES project is also assumed to be operated 'solid'.

The full, quoted fault interrupting capability of the circuit breakers on the 230kV and 115kV systems was used when assessing the adequacy of the equipment for the projected fault interrupting duty that is likely to be imposed on it. The 5% margin that has traditionally been applied to the ratings of the 230kV (and 500kV) breakers has been eliminated

3.1 Fault Level Results

3.1.1. Fault levels at Lambton TGS

The results for Lambton TGS, the only critical location (as confirmed by the results of the fault level studies), have been summarised on the following Diagrams:

Diagram 4 For a 3-phase Fault on the 230kV busbar at Lambton TGS

Diagram 5 For a Line-to-Ground Fault on the 230kV busbar at Lambton TGS

The maximum fault levels are also summarised in the Table below: (with no reduction, where appropriate, for specific infeeds to reflect the duties that would be imposed on individual breakers):

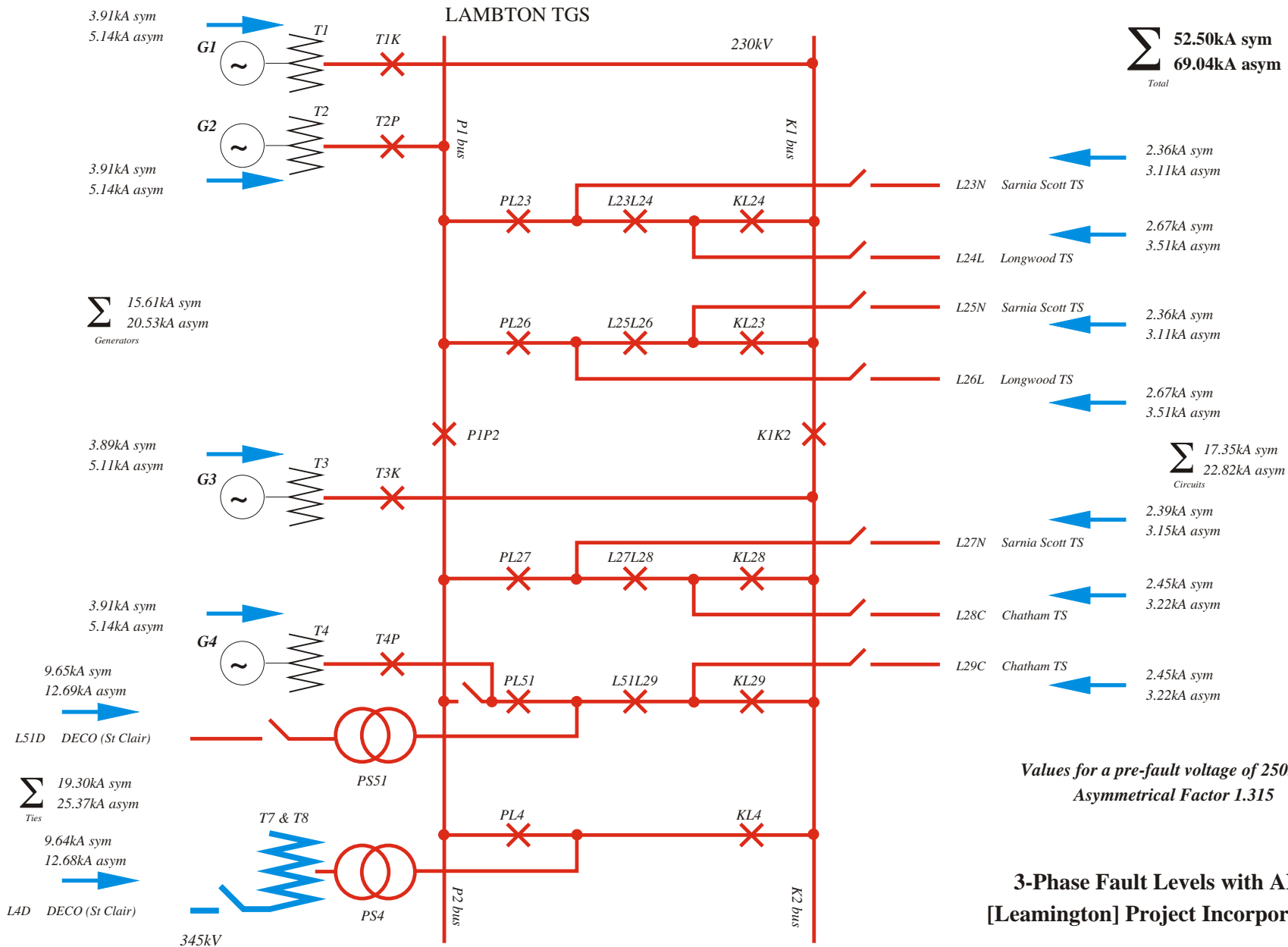


DIAGRAM 4

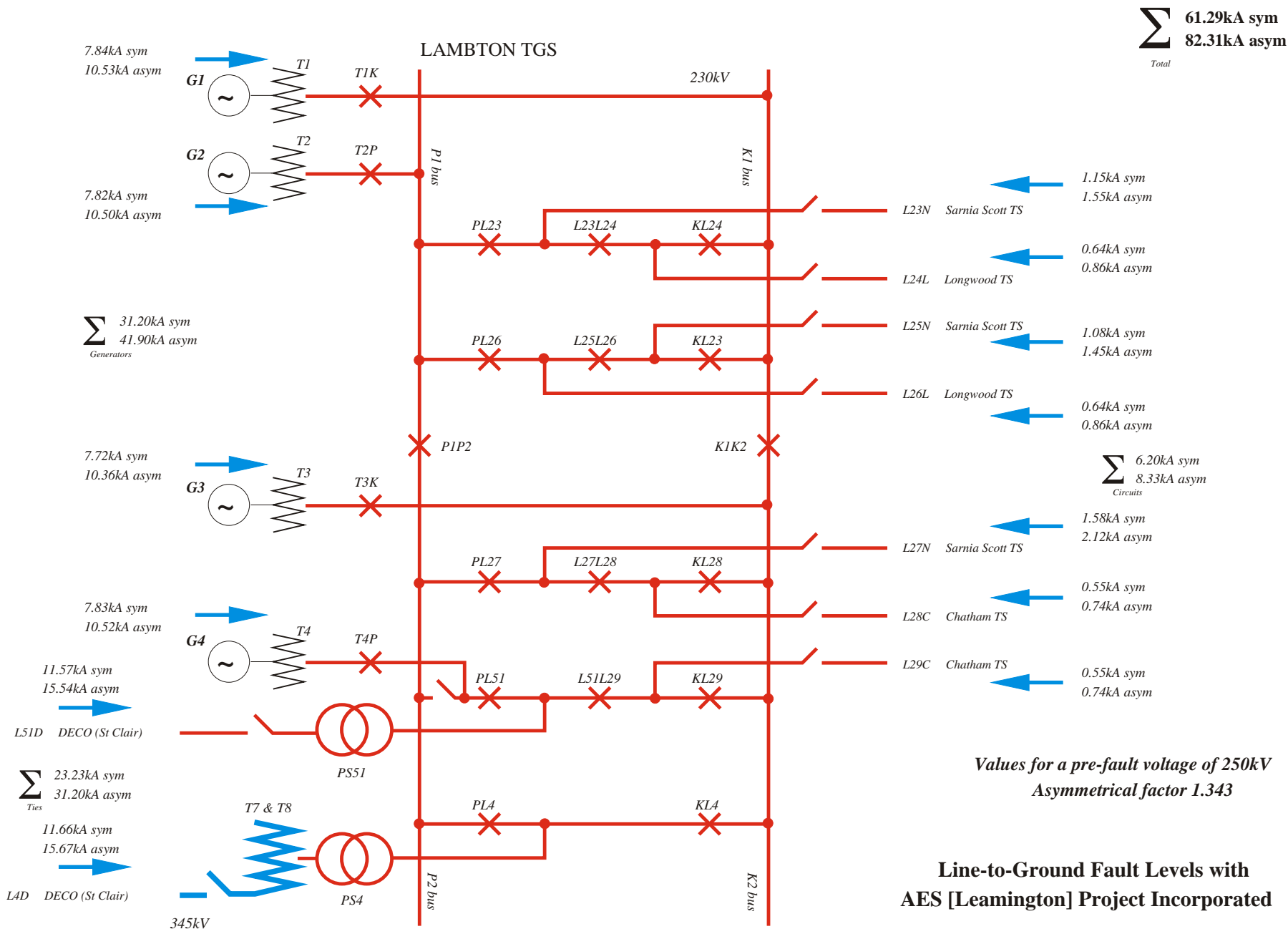


DIAGRAM 5

<i>Fault levels on the 230kV busbar at Lambton TGS for a Pre-fault Voltage of 250kV</i>								
	Symmetrical Fault		Asymmetrical Fault		Breaker Capability			
	3-phase	L-G	3-phase	L-G	Symmetrical		Asymmetrical	
Existing	52.1kA	60.9kA	68.5kA	82.48kA	A B	65.0kA 70.0kA	A B	78.0kA 92.0kA
With the AES Development Incorporated	52.50kA	61.29kA	69.04kA	82.31kA	A B	65.0kA 70.0kA	A B	78.0kA 92.0kA

Note: The 'A' ratings are for breakers PL4 & KL4, while the 'B' ratings are for the remaining breakers at Lambton TGS

From the table above, it is apparent that it is only the **total** fault level for an asymmetrical fault condition that exceeds the rating of the two, lower-rated breakers at Lambton TGS. The ratings for all the other breakers are adequate for the **total** fault levels, even before making allowance for specific fault infeeds in order to reflect the actual interrupting duty imposed on individual breakers.

The table below shows the results for the asymmetrical line-to-ground fault condition once allowance has been made for the respective fault infeeds that breakers KL4 and PL4 are not required to interrupt.

<i>Asymmetrical fault duties imposed on breakers KL4 & PL4 for a line-to-ground fault</i>			
	<i>Critical breaker</i>	Asymmetrical Fault Line-to-Ground	Breaker Capability Asymmetrical
Existing System	KL4 (less the G3 contribution)	71.96kA	78.0kA
	PL4 (less the G4 contribution)	71.80kA	
With the AES Development Incorporated	KL4 (less the G3 contribution)	71.95kA	78.0kA
	PL4 (less the G4 contribution)	71.79kA	

Existing Facilities

For the existing system configuration, after making allowance for specific infeeds in order to reflect the actual interrupting duty imposed on individual breakers, the projected fault levels are within the rating of the existing equipment.

With the AES Project Incorporated

Similarly, with the AES Project incorporated, after allowing for the non-contributing fault infeeds, the actual fault interrupting duty imposed on each critical breaker would remain within its rating.

Since the fault levels at Lambton TGS are within the rating of the two most-critical breakers, it follows that none of the breakers at this station would need to be replaced to cater for the enhanced fault level on the 230kV busbar resulting from the incorporation of the AES project.

3.1.2 Fault Levels at those TSs in Close Proximity to the Incorporation Point for the AES Project

The computed fault levels on the 230kV busbars of adjacent TSs are also summarised in the Table below: (with no reduction, where appropriate, for specific infeeds to reflect the duties that will be imposed on individual breakers):

<i>Fault levels at the 230kV busbars of Adjacent TSs for a Pre-fault Voltage of 250kV</i>						
<i>With the AES Project Incorporated</i>	Symmetrical Fault		Asymmetrical Fault		Breaker Capability	
	3-phase	L-G	3-phase	L-G	Symmetrical	Asymmetrical
<i>Location</i>						
BUCHANAN TS	28.60kA	24.67kA	31.92kA	27.97kA	39.0kA 41.5kA 41.8kA 48.6kA 66.3kA 74.0kA	39.0kA 41.5kA 41.8kA 48.6kA 66.3kA 74.0kA
CHATHAM TS	21.63kA	12.95kA	23.73kA	13.04kA	36.4kA 48.6kA	36.4kA 48.6kA
KEITH TS	13.98kA	13.72kA	17.10kA	16.08kA	48.6kA	48.6kA
LAUZON TS: C23Z	8.64kA	8.51kA	10.28kA	9.98kA	No 230kV Breakers	
LAUZON TS: C24Z	8.59kA	8.48kA	10.33kA	9.94kA		

In all instances, the projected fault level is within the rating of the breakers, even before making allowance for the specific fault infeeds that the breakers are not required to interrupt.

3.2 230kV Generator Breakers at Lambton TGS

Discussions are currently underway with Ontario Power Generation regarding the fault interrupting capability of their 230kV breakers T1K, T2P, T3K & T4P at Lambton TGS. In the absence of any LV breakers, these HV breakers are used for both fault isolation duty and for synchronising of the individual generators to the system.

We have been informed that breakers T2P & T3K have already been replaced with higher-rated units, while breakers T1K & T4P are scheduled for replacement.

From the information that is currently available, it appears that the rating of the remaining two original breakers is not adequate for the projected fault levels for the existing system configuration. However, we have been informed that in order to address this situation, modifications have been made to the relay protection to ensure that, in the event of a fault, operation of these breakers is delayed until after the main busbar has been isolated.

We propose to pursue this issue in more detail within the System Impact Assessment.

3.3 Summary of Fault Level Analysis

The fault level analysis has shown that incorporating the proposed AES Development into the 230kV system does not increase the fault levels in the Sarnia-Windsor-London area sufficiently to require any of the existing breakers to be replaced.

It should however be stressed that no account has been taken in any of the analysis of possible plans by the Detroit Edison Company to incorporate additional generating capacity into their system. Depending on the proximity of these developments to the Interconnections, they could have a significant impact on the fault levels at Lambton TGS, Scott TS and Keith TS.

4. Assessment of the Impact on Transfer Capabilities

Following the reinforcement of the Interconnections between Ontario and Michigan, the transfer capability of the Ontario-Michigan Interface has increased to approximately 1500MW and 2400 MW, for import and export conditions, respectively. These transfer limits are the direct result of thermal limitations on the interconnections under contingency conditions involving either the companion interconnections or facilities at the terminal stations.

Diagram 6 shows the incremental changes in the flow distribution in the Sarnia – London area that are expected to result from the incorporation of the AES Project into the 230kV system via circuits C23Z & C24Z.

As shown in this Diagram, approximately 90MW or 16% of the assumed maximum output of 560MW) from the GS will flow towards Lauzon TS. This will have the effect of increasing the loading on the two auto-transformers, which have a continuous rating of 250MVA and a limited-time-rating of 350MVA. At the Keith TS end of the 115kV system, this incremental change in the flows will have the effect of decreasing the normal transfers from the 230kV system to the 115kV system via the two 115MVA auto-transformers at that location.

Since the J5D Interconnection with Michigan is being regulated to maintain a transfer of 350MW under export conditions, the 90MW transfer into Keith TS circulates back to Chatham TS, via circuits C21J & C22J. The entire output from the AES Project therefore effectively ends up being injected into Chatham TS.

The PTI Linear Analysis Program, TLTG, was used to assess the impact of contingency conditions on the local 115kV facilities. This showed that a double-circuit contingency involving either of the double-circuit lines between Chatham TS and Sandwich Junction would result in overloading of the remaining auto-transformer at Lauzon TS.

- A double-circuit contingency involving circuits C23Z & C21J, would result in the loss of auto-transformer T1 at Lauzon TS, as well as the two transformers, T5 & T8, at the Lauzon DESN. This would result in the loading on the companion auto-transformer, T2 at Lauzon TS increasing to 363MW, which is 104% of its limited-time-rating.
- Similarly, a double-circuit contingency involving circuits C24Z & C22J, would result in the loss of auto-transformer T2 at Lauzon TS, as well as the two transformers, T6 & T7, at the Lauzon DESN. The post-contingency loading on the companion auto-transformer, T1 at Lauzon TS would be equivalent to 103% of its limited-time-rating.

Generation rejection, while not favoured for use under *import* conditions, could be used to address this situation by automatically reducing the output from the AES facility for each of these contingency conditions. Rejecting one or more generating units would result in an increased transfer over the Interconnections. Since this would include an increased transfer over the J5D Interconnection from Waterman Station to Keith TS, the net effect would be to reduce the flow through the remaining auto-transformer at Lauzon TS.

Alternatively, the transfer to the 230kV system from the AES facility could be reduced by using some of it to supply the load at Kingsville TS. This would be the preferred solution.

4.1 Performance of a 230kV connection to Kingsville TS

Preliminary analysis was performed to examine the impact of installing a 230kV connection into Kingsville TS. For the purpose of this analysis, a single-circuit 230kV line, connected to a 250MVA 230/115kV auto-transformer, was assumed.

Case 1

With an ‘extreme’ load of 177MW at Kingsville TS, the flow from the AES busbar was 212MW, resulting in a transfer through the 115kV system to Tilbury TS/Lauzon TS was 35MW.

Case 2

With no load at Kingsville TS, the flow from the AES busbar was 95MW, resulting in a 95MW transfer through the 115kV system towards Tilbury TS and the loads in the Lauzon area.

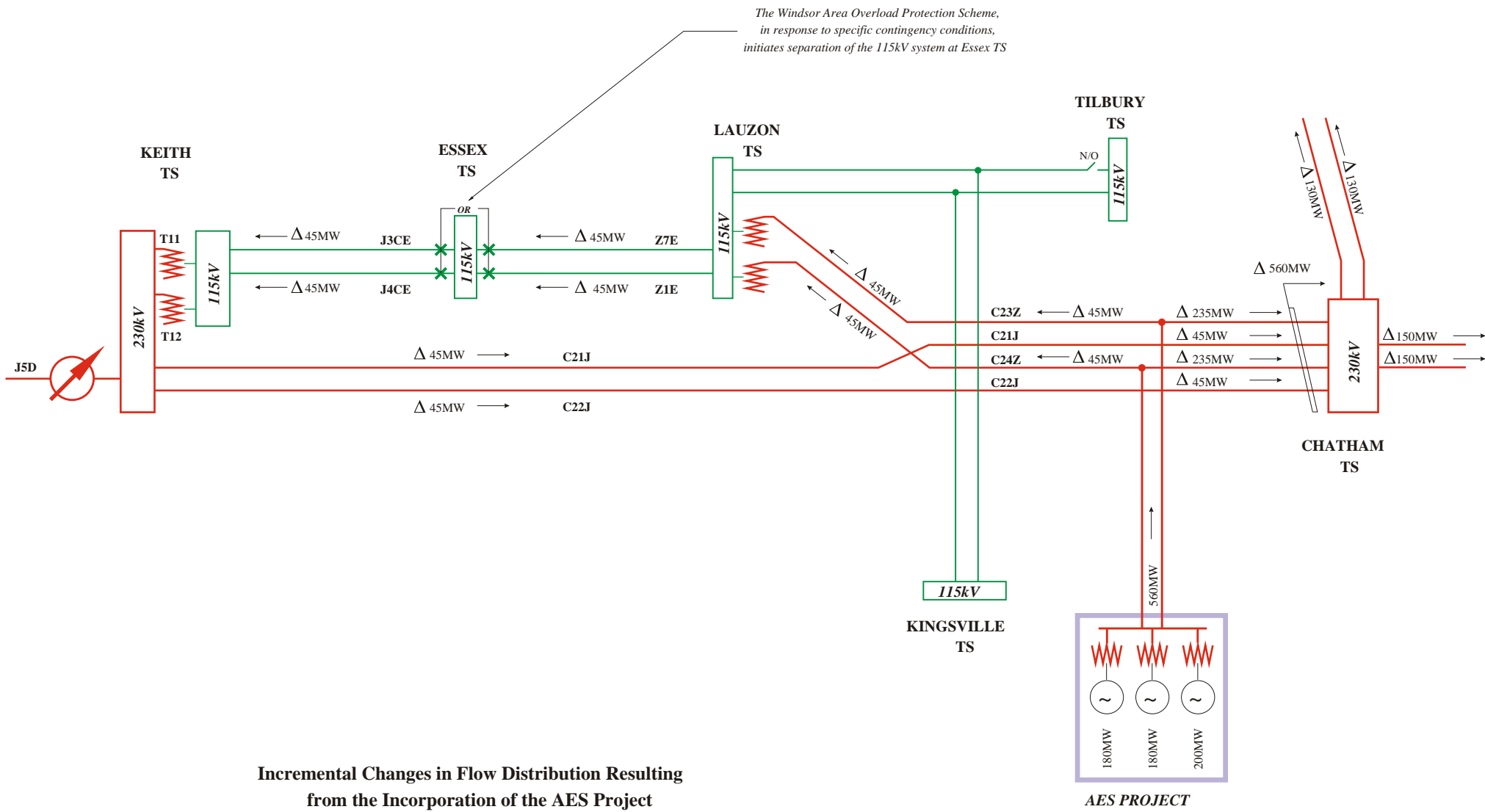


DIAGRAM 6

11th August 2000

Case 3

In response to the loss of one of the 230kV incorporation circuits for the AES project, the transfer through the connection to Kingsville TS increased, but the resulting transfers through the 115kV system remained within the thermal rating of the various circuits.

Case 4

In response to the loss of the 230kV connection between the AES Project and Kingsville TS, a voltage decline of approximately 15% would be experienced. However, this could be reduced to approximately 8% by installing a reactor with a rating of approximately 40MVAR to the tertiary of the auto-transformer. This would allow the existing capacitor banks at Kingsville TS to be placed in-service pre-contingency.

Although very preliminary, it would appear from these studies that a 230kV connection between the AES Project and Kingsville TS would be viable.

4.2 Impact on Transfer Capabilities

In order to assess the potential impact of the AES Development on the existing transfer capability, the PTI Linear Analysis Program, TLTG was used to rank the limiting conditions for both the reference condition, based on the existing system configuration, and for the situation with the AES Project incorporated. The respective results have then been compared.

The following conditions were assumed as a basis for the analysis:

For Export Conditions:

- A maximum Lake Erie Circulation of 800MW counter-clockwise
- A maximum transfer of 350MW on the J5D Interconnection from Keith TS (Windsor) to the Waterman station in Detroit, Michigan

For Import Conditions:

- A maximum Lake Erie Circulation of 200MW counter-clockwise
- A maximum transfer of 220MW on the J5D Interconnection into Keith TS from the Waterman station in Detroit, Michigan.

For both Import & Export Conditions:

- The tap-changers on the phase-shifters on the L4D, L51D & B3N Interconnections were set on the neutral tap position.
- The phase shifter on the J5D Interconnection was set to regulate the maximum transfers on that Interconnection to the values detailed above.
- No attempt was made to optimise the relative tap positions in order to reduce any import or export restrictions.
- The ratings for the Ontario-Michigan Interconnections were based on an ambient temperature of 35°C and a wind speed of 4km/hr.
- The ratings for all the other circuits were based on an ambient temperature of 30°C and a wind speed of 4km/hr.
- The 15-minute limited-time-ratings were based on a pre-loading of 75% of the continuous rating.
- Flows in Amps were converted to MVA at voltages of 250kV and 127kV.

In all of the analysis, Lambton TGS was assumed to be operating at full output, with all four 500 MW units in-service. In addition, the existing generating units at West Windsor Power, TransAlta, and the Dow Chemical Complex were assumed to be operating at their maximum contracted power output.

A select number of Load Flow Studies were performed to confirm the results from the Linear (TLTG) Analysis.

4.3 Results of the TLTG Analysis

Diagram 7 shows the principal interfaces that were used in this analysis, and Tables 1 & 2 summarise the results.

4.4 Discussion of the Results

The analysis only addressed limitations on the Interconnections between Michigan and Ontario, and on that portion of the system between the International Border and London, as shown in Diagram 7. It did not address limitations imposed on the level of imports and exports that could be maintained between Ontario and Michigan as a result of transfers on the other Interconnections with Ontario.

4.4.1 For the IMPORT Condition

Reference Condition I1, for the existing system configuration.

The transfer capability of the Ontario-Michigan Interface is currently limited to approximately 1500 MW.

Since a PL51 breaker-failure condition will result in the simultaneous loss of the L51D Interconnection and the G4 generating unit at Lambton TGS, it will result in an increased level of transfers on the remaining Interconnections. In order that the elevated, post-contingency flow appearing on the companion L4D Interconnection does not exceed its limited-time-rating of 1170MW, transfers on the Ontario-Michigan Interface have to be restricted to approximately 1500MW.

Condition I2

If it were possible to increase the limited-time-rating of the L51D Interconnection by at least 100MVA, then the next limiting condition would correspond to an Interface flow of approximately 1600MW. At transfers above this level, the post-contingency flow on circuit L28C, for a contingency involving the companion circuit L29C, would exceed its limited-time-rating of 652MVA.

[It is worth noting that while circuits L28C & L29C are equipped with identical conductors, the maximum operating temperature for the conductors of circuit L28C is 119°C, while for L29C it is 135°C. Consequently a contingency involving circuit L29C is the more critical one.]

Conditions with the AES Development Incorporated

Condition I3

For the same contingency condition that determined the 'reference level' for transfers across the Ontario-Michigan Interface (namely a PL51 breaker failure condition at Lambton TGS), transfers would need to be limited to 1509MW, with the AES Project incorporated, in order to respect the limited-time-rating of 1170MW for the companion Interconnection, L4D.

Since this 'limiting' transfer exceeds the 'reference transfer level' of 1505MW, this means that there would be no adverse impact on transfers across the Ontario-Michigan Interface, under Import Conditions, resulting from the incorporation of the AES Project into the system.

4.4.2 For the EXPORT Condition

It should be noted that during periods when exports are being made to Michigan that operation of the middle breaker in any of the diameters at Lambton TGS will normally initiate automatic rejection of one of the Lambton generating units.

Reference Condition E1 for the existing system configuration

Transfers from Ontario across the Ontario-Michigan Interface are currently limited to approximately 2410 MW.

As a result of a breaker-failure condition involving breaker L51L29 at Lambton TGS, the L51D Interconnection will become open-ended, resulting in increased transfers on the remaining Interconnections. In order to ensure that the post-contingency flow on the B3N Interconnection, even after automatically rejecting one of the Lambton generating units, does not exceed its limited-time-rating of 482MVA, the pre-contingency transfer on the Ontario-Michigan Interface will need to be restricted to 2410MW.

Condition E2

If the limited-time-rating of the B3N Interconnection were to be increased, then the continuous rating of the L51D Interconnection would impose the next limiting condition, allowing a marginal improvement in the maximum transfer across the Interface to 2414 MW from 2409 MW.

Conditions with the AES Development Incorporated

Condition E3

At transfer levels above 2381MW, the continuous rating of 845MVA for the L51D Interconnection would be exceeded. This would represent a 'penalty' of approximately 30MW on the 'reference' transfer level of 2410MW.

Condition E4

The next limiting transfer level of 2443MW corresponds to the same contingency condition that determined the 'reference condition' for maximum transfers for exports to Michigan (an L51L29 breaker-failure). Transfers above this level would result in the limited-time-rating of 482MVA for the B3N Interconnection being exceeded.

However, since this transfer level exceeds the 'reference level' for the Interface, then this condition would not be limiting.

4.5 Conclusions

The following conclusions can be drawn from the results of the TLTG Analysis:

Under IMPORT Conditions

- Incorporating the AES Project into the system would have no adverse impact on the maximum transfer level that could be maintained across the Ontario-Michigan Interface.

Under EXPORT Conditions

- Incorporating the AES Project into the system would reduce the maximum exports to Michigan by only 30MW (from 2410MW to 2380MW).
- In order to eliminate this 'penalty' it would be necessary to upgrade the B3N Interconnection so that its limited-time-rating was no longer restrictive.

Table 1
Imports from Michigan

<i>Limiting Transfers Across The Principal Interfaces</i>					
<i>ID</i>		Ontario-Michigan Interface	Sarnia-London Interface	London Import Interface	Limiting Condition
	<i>Continuous Rating of each Interface</i>	2581MW	3263MW	3466MW	
<i>I1</i>	For the existing conditions	1505MW	2684MW	1875MW	<i>PL51 Breaker Failure at Lambton TGS.</i> Interface transfers are restricted by the limited-time-rating of the L4D Interconnection (1170MVA)
<i>I2</i>		1593MW	2773MW	1964MW	<i>Contingency involving circuit L29C: Lambton to Chatham</i> Interface transfers are restricted by the limited-time-rating of the companion circuit L28C (652MVA)
<i>With the AES Project Incorporated</i>					
<i>I3</i>	With the AES Project Incorporated	1509MW	2689MW	2448MW	<i>PL51 Breaker Failure at Lambton TGS.</i> Interface transfers are restricted by the limited-time-rating of the L4D Interconnection (1170MVA)

Note: Shaded area denotes that the limiting transfer, with the AES Project Incorporated, would exceed the *existing* 'reference transfer capability' for this Interface.

Table 2
Exports to Michigan

<i>Limiting Transfers Across The Principal Interfaces</i>					
ID	<i>Continuous Rating of each Interface</i>	Ontario-Michigan Interface	Sarnia-London Interface	London Import Interface	Limiting Condition
			2581MW	3263MW	
E1	For the existing conditions	2409MW	-641MW	-2136MW	<i>L51L29 Breaker Failure at Lambton TGS (with rejection of one Lambton unit). Interface transfers are restricted by the limited-time-rating of the B3N Interconnection (482MVA)</i>
E2		2414MW	-647MW	-2142MW	<i>Base Case – Flow on the L51D Interconnection Interface transfers are restricted by the continuous rating of the L51D Interconnection (845MVA)</i>
<i>With the AES Project Incorporated</i>					
E3	With the AES Project Incorporated	2381MW	-623MW	-1516MW	<i>Base Case – Flow on the L51D Interconnection The Pre-contingency flow exceeds the continuous rating of the Interconnection (845MVA)</i>
E4		2443MW	-685MW	-1578MW	<i>L51L29 Breaker Failure at Lambton TGS (with rejection of one Lambton unit) Interface transfers are restricted by the limited-time-rating of the B3N Interconnection (482MVA)</i>

Note: Shaded area denotes that the limiting transfer, with the AES Project Incorporated, would exceed the *existing* 'reference transfer capability' for this Interface.