IND.T submission in response to AER draft determinations on EFD deployment

IND Technology Pty Ltd (IND.T) offers this submission to support the AER's economic assessment of proposals by Victoria's distribution network owners to deploy Early Fault Detection (EFD) systems, primarily on their Single Wire Earth Return (SWER) networks.

EFD exhibits characteristics of a mature technology across multiple dimensions relevant to regulatory decision-making. These include technical maturity, demonstrated by stable product design and reliable performance; commercial maturity, demonstrated by widespread and growing adoption by utilities operating under regulatory oversight; and regulatory maturity, demonstrated by repeated acceptance of EFD deployment by overseas regulators. Any remaining uncertainty does not relate to whether EFD performs its intended function, but to the magnitude and timing of benefits realised on specific network segments. This class of uncertainty is routinely managed under the National Electricity Rules through staged and risk-weighted deployment.

Over the last six years, EFD has been extensively deployed by electricity distribution and transmission businesses globally, usually with specific regulatory support and approval. Customers report in public statements and in regulatory filings, that their EFD systems deliver material benefits in affordability, reliability, and safety of electricity supply to their customers, sufficient to economically justify EFD deployment.

This submission sets out a range of evidence that underpins this assessment.

How this submission responds to the draft determination

This submission responds directly to matters raised in the AER's draft determination in relation to the proposed deployment of Early Fault Detection (EFD) systems on Victorian distribution networks. In particular:

- statements characterising EFD as an R&D-stage technology are addressed in Sections 5 and 6, which set out evidence of EFD's technical, commercial, and regulatory maturity;
- concerns regarding uncertainty of benefits are addressed in Sections 3, 6 and 7, which distinguish uncertainty regarding the existence of benefits from uncertainty regarding their magnitude in a Victorian context; and
- issues relating to scale, prudency, and risk exposure are addressed through the staged and risk-weighted deployment framework discussed in Section 8.

This structure is intended to assist the AER in assessing the relevance of the evidence presented to the matters raised in the draft determination.

1. The evidence shows EFD delivers multiple benefits

The AER in its regulatory decisions uses procedures set out in the National Electricity Rules to address the goal of Australia's National Electricity Objective (NEO). The core of the NEO is the affordability, reliability, and safety of electricity supply in the long-term interests of customers. In assessing network owner proposals, the AER must address the economic efficiency, certainty, and risks to outcomes of those proposals. This submission aims to support the AER in its assessment of these matters.

Available evidence demonstrates that EFD systems deployed by electricity network owners deliver benefits in each of the three NEO focus areas. Multiple trials of EFD in Victoria have demonstrated the technology is compatible with Victorian electricity networks and that it works as designed to detect and locate network asset defects before they fail and cause supply outages and fires. Uncertainty about these foundation aspects of EFD performance is very low. Uncertainty in EFD investment outcomes instead arises from uncertainty in the utility's information processing and decision-making workflow that EFD systems support and require.

Quantitative estimation of EFD benefits from Victoria's EFD trials is indicative rather than detailed since the trials were small compared to the total network size in Victoria. The EFD trials on Victoria's SWER networks covered four per cent of the total Victoria's total SWER network route length. Also, the utilities were required to follow trial procedures, not 'business as usual' operating procedures. These two sets of procedures differ markedly from each other. For example, the Victorian trials were conducted using trial-specific procedures rather than business-as-usual operating arrangements, which is typical of pilot deployments of new condition-monitoring technologies. As a result, the trials were not designed to reflect the way EFD is now operationalised in routine utility practice. Operationalisation does differ between utilities, reflecting differences in operating procedures, workforce practices, and systems integration; this does not affect EFD's core detection function. Since those trials, software tools to support large-scale deployment, automated triage, and integration into standard utility workflows have been developed and are now in operational use by utilities deploying EFD at scale. Accordingly, trial outcomes are most appropriately interpreted as confirmation of EFD's technical performance and network compatibility, rather than as a complete representation of the operational and economic outcomes achievable under current business-as-usual conditions.

Very limited deployments can constrain a network business's ability to integrate new technologies into business-as-usual processes and to generate sufficiently robust evidence on operational and economic outcomes. A larger, structured deployment across a representative set of higher-risk network segments allows uncertainties regarding benefit magnitude, workflow integration, and cost efficiency to be resolved more rapidly and at lower long-run cost than repeated small-scale trials.

Counterfactual asset management approach

In assessing the prudency of EFD deployment, it is relevant to consider not only the risks associated with investment, but also the risks associated with the alternative course of action. Rejection of EFD deployment implies reliance on existing asset management practices for SWER networks. It is therefore appropriate to consider whether those practices provide an effective mechanism for identifying end-of-life asset condition and emerging failure risk.

Historically, asset replacement rates on SWER networks have been low relative to asset age profiles, reflecting both the long service lives of these assets and the challenges of proactive replacement in remote areas. Current practice relies primarily on a combination of age-based replacement programs, periodic visual inspection, and reactive response following failure or public reporting. These approaches provide limited ability to identify asset-specific end-of-life condition, particularly for failure modes that develop internally or intermittently and are not visible during routine inspection.

In the absence of condition-based monitoring, there is no systematic mechanism to detect the onset of many critical SWER asset failure modes prior to failure. As such, a decision not to deploy EFD does not represent a neutral or risk-free outcome. Rather, it represents an implicit decision to continue operating ageing SWER assets without an enhanced mechanism for end-of-life condition monitoring.

Given the size, age, and operating conditions of Victorian SWER networks, addressing this gap solely through asset replacement would require materially higher replacement rates than those historically observed. In the absence of such a change, targeted deployment of condition-monitoring technologies represents one of the few available mechanisms to materially reduce latent failure risk on these networks.

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More extensive evidence of EFD benefits is available from much larger EFD deployments and 'business as usual' EFD operation overseas, especially in North America. Some EFD deployments there comprise thousands of EFD systems. Utilities there do not publish their internal business cases, nor their full EFD results. Nevertheless, considerable evidence of the materiality and consistency of EFD benefits can be inferred from their public statements, regulatory filings and decisions, industry recognition awards, etc.

Available evidence indicates that certain categories of EFD benefits are likely to be realised even under conservative assumptions. These include reductions in emergency maintenance costs, improved prioritisation of field inspections, and earlier identification of high-risk asset defects. Other benefits, such as quantified customer reliability benefits measured through VCR, are more sensitive to customer density and network topology and may therefore vary in magnitude. Variation in these benefits supports a targeted and risk-weighted deployment approach, rather than limiting deployment to very small areas where learning and benefit validation may be constrained.

Inferences drawn from overseas experience of EFD deployment are informative for assessment of likely outcomes in Australia. While differences exist between jurisdictions in climate, asset composition, and operating practices, the physical mechanisms of electrical asset degradation - including corrosion, insulation breakdown, partial discharge, and conductor failure - arise from well-understood processes that do not vary materially by geography. Evidence from large-scale overseas deployments is therefore relevant when assessing likely EFD performance and benefit delivery on Victorian networks, particularly where those networks share similar asset vintages, remoteness, and operating challenges.

The evidence indicates uncertainty of EFD benefit delivery is very low. It is the quantity of those benefits in a Victorian context that is evidenced with less certainly due to the trial limitations mentioned above. However, with strong familiarity of utility businesses, their network technologies, and EFD deployments both here and in North America, IND.T has found no evidence of any differences in technology or network operational practices that may cause realised benefits of EFD deployment here in Victoria to vary to any material degree from those in North America.

The key areas of EFD benefit and the mechanisms by which benefits are delivered are as follows. These are identical across both local and overseas EFD operations:

a. <u>EFD affordability benefits</u>

EFD systems deliver substantial financial benefits to utilities that deploy them. Over time, economic regulation ensures these, in part or whole, are passed on to customers as improved affordability of their electricity supply. EFD deployment creates substantial utility cost savings in the following ways:

i. Improved reliability of customer supply

EFD's improvement of supply reliability has two dimensions: reductions of the cost of supply outages to the utility and compliance with regulatory targets for supply reliability where these exist. The latter may not apply to the current AER determinations on distribution business revenue. In Australia, the AER administers the Service Target Performance Incentive Scheme (STPIS) for both electricity transmission and distribution networks. However, for low-customer-density networks such as SWER, the financial signal associated with distribution reliability incentive schemes is typically weak relative to the scale of investment required, and therefore contributes only marginally to the economic justification for EFD deployment.

EFD's predictive maintenance capability allows utilities to repair failing assets before failure and consequential customer supply outages. The reduction in frequency of supply outages improves affordability of supply. Supply outages impose costs on both utilities and their customers and reduction in their frequency of occurrence results in financial savings to both parties. Utility cost savings ultimately pass to customers as affordability improvement. Utility cost savings may be independent of the number of affected customers. It may depend more on the degree of challenge in field crew deployment for supply restoration.

Reduction in supply outages provides a financial benefit to electricity customers as reflected by industry standard measures such as the Value of Customer Reliability (VCR). In the current case where EFD deployment is proposed for SWER networks with very low customer numbers, this benefit may be comparatively small. Utilities measure supply reliability using Institution of Electrical and Electronic Engineers (IEEE) metrics commonly referred to as SAIFI, SAIDI, and MAIFI. Some North American regulators set targets for these measures and may introduce financial penalties if they are consistently breached. For example, after a series of supply outages affecting high-priority customers, one North American regulator imposed a regime under which any further supply outage in that area of the network would attract an automatic penalty of two million dollars. IND.T has not seen any similar regulatory action in Australia.

Victoria's Electricity Distribution Code of Practice (clause 14.5) sets penalties for breaches of defined Guaranteed Service Levels (GSLs) measured in customer-minutes off supply per year. The small number of customers supplied by individual SWER networks reduces any associated utility cost savings from improved supply reliability to levels that are marginal in the context of an EFD deployment business case.

The AER administers Victoria's F-factor scheme which establishes financial incentives to prevent powerline ignitions. A network asset failure that causes a fire almost always causes a supply outage, so the outcomes of this scheme can be viewed as an approximate surrogate for a supply reliability financial incentive. The amount of the incentive depends on fire location (estimated fire-loss consequence) and time of occurrence (fire-risk weather conditions). It can range up to more than a million dollars per ignition.

While powerline fires can cause billions of dollars in economic loss to Victoria, the financial cost to the network owner utility can be greatly mitigated by insurance. Under NER procedures, the cost saved by a fire-safety investment may be limited to the utility's insurance excess. This is a complex issue, but there is clear potential for some cost saving within the utility if EFD reduces the occurrence of powerline fires.

ii. More efficient asset management

EFD detects and locates corroded conductors, corroded or broken tie wires, leaky or cracked insulators, failing lightning arrestors, internal faults in transformers, and many other defects of electricity network assets. Many of these failure types are end-of-asset-life symptoms. EFD systems enable the utility to replace only those the assets that need replacement, rather than broader replacement of a set of assets selected using a blanket approach based on asset age or other factors.

The granularity of asset replacement investment enabled by EFD systems can dramatically reduce associated funding demand or alternatively, cover more of the failing network assets for the same funds. Either way, the extension of asset service life of assets EFD identifies as defect-free benefits the affordability of electricity supply. Real cases of spontaneous asset failure indicate asset lives vary from less than ten years to more than a century. In networks with large inventories of aging assets such as those in Victoria, the benefit of asset-by-asset replacement granularity can be large and potentially outweigh all other financial benefits of EFD deployment.

iii. Lower maintenance cost

Threats detected by EFD can be remedied as part of scheduled maintenance instead of expensive emergency supply-restoration activity. The cost ratio of a task performed in unplanned maintenance to the same task in planned maintenance is often quoted in the industry as lying between five and ten times. The net effect of predictive maintenance enabled by EFD is major cost savings. EFD enables predictive maintenance by detecting and accurately locating asset defects and compromise (such as by vegetation encroachment) well before asset failure. This benefit of EFD deployment alone has been sufficient to justify some large-scale EFD deployments in North America.

iv. Lower network operations cost (future incremental benefit)

Current EFD functionality and utility practices are already sufficient to justify EFD deployment. However, additional incremental EFD benefits are likely to be delivered over the course of the period covered by the AER determination. For example, the next major release of EFD functionality (planned for 2026 delivery over remote firmware update) will include fault location. When a supply outage occurs, local EFD system can often identify the precise location of the event that caused loss of supply. Fault location will enable utilities to send emergency crews direct to the site of the network fault rather than find it by patrol of a long section of powerline before repairs to restore supply can begin. The result will be faster supply restoration and lower cost of emergency repair work for a significant proportion of network faults, and not only asset failure faults. EFD fault location has been demonstrated in early North American trials, and its market release is eagerly awaited by IND.T customers there. Customers have advised INDT that this capability may be of very high business value to them, both in reducing costs, and reducing customer supply outage durations improve customer satisfaction.

Fault location is an example of an additional increment in EFD benefits. Such increments are not required to justify EFD deployment. It is already justified by current benefits outlined in this submission.

b. <u>EFD supply reliability benefits</u>

The second NEO dimension is reliability of electricity supply.

Reduced outage frequency delivered by EFD systems improves utility performance against reliability targets. In the case of SWER networks where low customer numbers can reduce the impact of any applicable regulatory financial incentive scheme, the incentive for improvement comes mainly in the form of customer satisfaction measures.

c. <u>EFD delivers safety benefits</u>

The third NEO dimension is safety of electricity supply. EFD systems can dramatically improve the safety of electricity supply for customers, work crews, and the public in the following ways.

i. Reduced wildfire ignitions

Many electrical infrastructure defects pose a wildfire ignition risk. Some of the deadliest bushfires in Australia's history have been caused by powerline failures that would have been detected, located, and remedied well in advance if an EFD system had been in place. EFD systems can make Single Wire Earth Return (SWER) powerlines safer, filling a gap in powerline fire-safety strategy left by other fire-safety remedies such as Rapid Earth Fault Current Limiters (REFCLs) that do not work on SWER powerlines. Damage estimates for single powerline fires can range up to tens of billions of dollars, with multiple deaths and destruction of critical economic infrastructure. Powerline fire-safety is the primary driver for adoption of EFD systems by several utilities in the USA and Canada. This is not universal. Other utilities are pursuing maintenance cost savings and supply reliability goals in their deployment of EFD systems.

ii. Reduced dangerous asset failures

Faulty network assets such as transformers, lightning arrestors, and cable terminations can fail explosively, scattering sharp-edged fragments and burning oil over the surrounding area. EFD detects and locates these emerging failures in time for the utility to act to prevent them.

iii. Reduced electrocutions

Failing network assets can leak high voltage electricity into the local environment and create an electrocution risk to people in the vicinity. If the current drawn by the contact with the ground is insufficient to trigger automatic disconnection, fallen wires can stay live on the ground for hours until reported by the public. This constitutes an electrocution risk to stock and people. EFD immediately alerts the utility to this dangerous situation so action can be taken to disconnect high-voltage supply to the fallen wire and remove public electrocution risk.

2. EFD benefits are real, not hypothetical

Observation of experience in North America EFD system deployments provide high-certainty evidence of the reality of EFD systems' benefits.

Customer investments in EFD deployments range from about one million US dollars for an initial pilot trial to multiple tens of millions of US dollars for a large rollout. These investments are supported by business cases within the utility's internal decision-making processes. IND.T is aware that in investor-owned utilities, EFD investments are commonly decided at executive and Board level. They are also carefully considered by regulators seeking confirmation that benefits to customers justify the cost passed on to customers. In each case, nominated senior utility managers accept accountability for realization of the benefits set out in the business case. Verification of the reality of the benefits against the estimates in the business case is normal good practice, in Australia no less than in North America.

The acid test of the reality of EFD system benefits is a utility's extension of EFD deployment beyond the initial scope. Continuing executive acceptance of the EFD deployment business case and demonstrated success in bringing EFD benefits to the utility's bottom line constitute objective proof that EFD benefits are real. The utility industry readily cancels programs that fail to deliver target benefits stated in the business case. The evidence shows IND.T customers often increase their planned deployment of EFD systems as they gain experience and confidence in the reality of the associated benefits. The expanded deployment of EFD systems on Victoria's SWER networks proposed by its two rural distribution businesses is an example of this. Trial results drive adoption and adoption results drive expansion.

An overseas example is Pennsylvania Power and Light (PPL) which has deployed nearly three thousand EFD systems in the last four years and continues to expand the deployment. PPL's target is now EFD system coverage of powerlines totaling a route length nearly half as much again as the total length of SWER powerlines in Victoria. PPL has won prestigious industry awards for its EFD rollout. In its 2025 public video, PPL revealed that, to the end of 2024, their EFD systems had already detected 288 asset defects that warranted repair, and a further 348 that warranted further investigation and monitoring. INDT understands PPL's EFD business case includes annual cost savings within the range of ten million US dollars.

Evidence from overseas deployments of EFD systems confirms the reality of EFD benefits and strongly supports the hypothesis that these benefits are sufficient to justify the investment.

3. Customers' public statements laud EFD

The Appendix lists (and provides hyperlinks to) a representative sample of numerous public statements by IND.T's utility customers about their EFD deployments. These include website articles and videos, documents such as Wildfire Mitigation Plans, and various samples of media coverage. The overwhelming common message of these public statements is that EFD works, it delivers real benefits, and is a valuable tool in cutting costs, and improving network reliability and fire-safety.

4. Regulatory decisions elsewhere support EFD

All overseas EFD deployments have involved regulatory oversight. In jurisdictions where EFD systems have been trialed, regulators are increasingly focused on EFD's benefits. Most examples are distribution networks on mainland USA and Canada. Regulatory practices in North America do not include publication of business cases for EFD deployment, but inferences can be drawn from Regulatory decisions. Justification of EFD deployment varies. On the West Coast, the key EFD benefit considered by utilities and regulators is wildfire mitigation. In the Mid-West, it tends to be network resilience against extreme weather events. East Coast utilities and regulators tend to focus on supply reliability. Other benefits such as network maintenance cost savings, affordability for customers are universal.

The following are some typical examples of regulatory involvement in decisions to deploy EFD systems in North America. More details can be found via the links in the Appendix.

California: Following a small successful trial of EFD (EPIC project 2.34) in 2019, the California Public Utilities Commission (CPUC) advised utilities that if a new technology showed positive fire-safety results in trials, the utility must justify to the CPUC any decision to not deploy it. In 2020, Southern California Edison (SCE) published high-level results of its EFD trial. In 2021, Pacific Gas and Electric (PG&E) publicly committed to EFD systems deployment across their network (600-800 distribution feeders over ten years). In 2022, SCE provided the CPUC with a detailed comparative analysis of value-for-dollar investment efficiency of available wildfire mitigation technologies. Its analysis rated EFD third after vegetation management and REFCLs as the most economically efficient. From 2023, EFD has been included in the wildfire mitigation plans of all major Californian utilities. In November 2023, the CPUC advised utilities to consider EFD for deployment on Electricity Transmission Powerlines as well as distribution. Trials of EFD on transmission lines are showing very positive results to date.

Alberta Canada: In 2022, Alberta approved Fortis Alberta's (FA's) proposal for EFD deployment in its rate case. The first year of rollout was approved without qualification, while later years were contingent on a report by FA of results from the first twelve months' deployment. Following submission of the report, the rollout was approved to proceed to completion in accordance with the initially proposed five-year plan. In 2025, Fortis Alberta received Electricity Canada Recognition for its five-year EFD rollout plan to enhance supply reliability and fire prevention.

Massachusetts: In 2023, the regulator approved National Grid's grid modernization plan for resilience and equity in Massachusetts. The plan included deployment of EFD systems in specific substantial areas of its total network.

Washington State: EFD deployment was included in the Cowlitz Public Utility District (CPUD) 2024 Wildfire Mitigation Plan. It proposes an EFD systems rollout following successful product testing.

Oregon: In 2020 Oregon strengthened wildfire mitigation obligations overseen by the Oregon Public Utility Commission (OPUC). Portland General Electric (PGE) has publicly described deploying EFD as part of its wildfire mitigation approach to identify emerging distribution faults and reduce wildfire ignition risk along with risk reduction benefit.

Pennsylvania: Pennsylvania Power and Light (PPL) was nominated for the Edison Award for grid modernization using EFD systems. In 2025, PPL worked with FERC regulators to identify the correct treatment of ‘Internet of Things’ technologies such as EFD. PPL is proceeding with deployment of EFD systems across its whole Pennsylvania distribution network.

5. EFD is a mature Australian technology

To IND.T’s knowledge, the AER does not define what characteristics distinguish an ‘R&D stage technology’ from a mature commercial product. IND.T regards technology maturity as a low rate of change of product design together with widespread and growing customer demand for the product. EFD products exhibit both characteristics.

EFD technology is an Australian product used globally (Refer Appendix 2). It was invented, developed and commercialized in Australia and is patented in most of the developed and developing world. It is an ‘Internet of Things’ technology that uses hi-tech hardware, software, and firmware produced in Richmond, Victoria, plus cloud data processing in Australian and USA data centres.

EFD technology has created many Australian hi-tech jobs. IND.T’s Richmond manufacturing and R&D facility employs fifty people and exports EFD systems worldwide. Most exports go to North America. IND.T offices in New York City NY, San Francisco CA, Portland OR, Vancouver BC, and Kuala Lumpur Malaysia, employ a further forty people in data analysis and customer support.

EFD technology is a mature toolset used globally by owners of major electrical infrastructure. Over the last five years, IND.T has grown at a compound annual rate greater than fifty per cent. This growth is projected to continue and to increase further. To date, 15,000 EFD systems have been ordered by customers, 12,300 delivered to customers, and 6,000 installed by customers, numbers that reflect a high rate of growth of market demand. IND.T customers listed in Appendix 2 include electricity utilities and industrial companies; twelve in Australia, seventeen in North America with another eight in contract negotiation, and four in countries outside North America: New Zealand, Greece, Portugal, and Malaysia, with utilities in four more countries in various stages of commercial engagement.

The effectiveness and benefits of EFD systems to utilities has attracted large investors. Three USA investors and one Australian investor have recently taken substantial equity positions in IND.T, providing capital to support further growth of the business to meet market demand, as well as R&D activity to exploit emerging AI technology capabilities.

EFD technology is technologically mature. Based on early experience, the current Gen4 EFD product was released some years ago as a stable hardware platform designed to support EFD functional development via software and firmware updates over the next ten years. This hardware design remains the basis of today’s EFD products with only occasional tweaks. The Gen4 product suits four-wire, three-wire, and two-wire powerlines and electric rail supplies. In 2021, a cut-down re-packaged version named FireSafe SWER EFD (EFD.Tap in the USA) was released for two-wire and one-wire (SWER) powerlines. This product variant was specifically designed to cut installation costs by more than seventy per cent and manufacturing costs more than fifty per cent. Its internals are unchanged from the Gen4 EFD product except for some minor changes identified in the 2021-2023 trials in Victoria. Software to operationalize large-scale EFD deployments (the EFD360 product) has been developed in collaboration with major customers. The final version was progressively released to all customers in 2025.

EFD’s R&D investments are defined by its forward technology roadmap which includes additional functions of major benefit to utilities, such as fault location (delivered as a firmware update over the Internet), and satellite data communications for infrastructure in locations with zero mobile broadband signal strength. Further R&D is aimed at design changes to cut the cost of EFD system manufacture. None of this R&D investment affects the core functions of EFD products, which have been stable for years.

All the above confirm that EFD technology is an established mature product-set sold to an increasing range of customers in a competitive market.

6. Uncertainty in EFD deployment business cases

If instead of a technology-focused definition, as outlined above, the AER's primary definition of maturity is the level of certainty of benefit delivery, IND.T would point to North American experience of EFD deployments. If the AER takes maturity to mean certainty of benefit quantification, IND.T would first draw attention the non-EFD factors that directly affect this quantification: the initial condition (proportion of defective assets) of the network, the utility's adoption of effective tools, procedures, and training for associated field work (site inspection, remedial repairs), communication coverage, rate of vandalism and theft, etc. IND.T experience is that the most important of these, and sometimes the most underdone, is utility practice in exploiting information delivered by the new EFD systems.

IND.T is not aware of any significant differences between Victoria and North America that would disturb this brief analysis of the potential causes of uncertainty in EFD deployment business cases. That said, IND.T recognizes benefit-quantification uncertainty as the most likely type to affect Victorian distributors' proposals, mainly because direct experience of larger scale Australian EFD deployments is not available.

The potential uncertainties in proposals for Australian deployments of EFD systems indicate that the most economically efficient approach is staged and risk-weighted deployment. In applying a risk framework, it is important to distinguish between the likelihood of hazardous outcomes and the consequences of those outcomes. EFD primarily reduces risk by improving measurement and management of likelihood, while utility modelling and related assessment methods are typically directed to estimating consequence. Efficient deployment should therefore be guided by both dimensions of risk. Consistent with good project management practice under uncertainty, staged deployment should be designed so that implementation is actively guided by results to date, with clear learning objectives and decision points that enable timely adjustment of scope and targeting within the regulatory period. On SWER networks, a relatively small proportion of route length can account for a disproportionate share of fire, safety, and supply-restoration consequences. In these circumstances, an economically efficient deployment may involve materially broader coverage than a small pilot, while remaining selective and targeted to higher-risk network segments.

7. Statements about EFD in AER's draft determination

The second goal of this submission is to respond to statements in the AER's draft determination, specifically statements characterising EFD as being at an R&D stage of development, and characterising the benefits of its proposed deployment as uncertain. The former are addressed in Section 5 above, while the latter are addressed in Section 6.

EFD deployment on Victoria's SWER networks is not a matter to be decided lightly. The striking examples of critical defects found by EFD on overseas networks are also present in Victoria. The very limited trials of EFD on SWER networks in Victoria to date (only four per cent of total network route length) have detected and located six critical defects (broken conductor strands, arcing low voltage service cable, detached conductor, candling fuses, transformer with an internal short circuit) requiring urgent repair. Statistical analysis indicate there may be of the order of another hundred such defects or more yet undetected in SWER network areas not covered by Victoria's EFD trials. EFD found many other defects of lesser urgency, such as corroded conductor and tie wires, that will become urgent if not addressed.

We respectfully suggest AER in its published final determination, review and clarify its assessment of EFD technology maturity and its statements about the uncertainty of benefits of EFD deployment. We stand ready to assist if further information on any of the matters in this response to the AER Draft Determination would assist the AER in its task.

Appendix 1: Customer public statements about EFD

2017–2019
Victorian Government, Powercor & AusNet – SWER Pilot - VIC, AU
First real-world pilot of EFD on SWER networks in rural Australia, validating hardware and methodology.
https://img1.wsimg.com/blobby/go/b578a722-35cf-4b12-b720-7d9489211e45/downloads/EFD%20SWER%20Trial%20Report.pdf?ver=1566771886263
2018–2020
PG&E EPIC 2.3.4 – Pilot Summary - CA, USA
Initial U.S. pilot with PG&E under EPIC to assess wildfire risk mitigation using early fault detection.
https://www.epicpartnership.org/resources/Kwientniak_PICG_Wildfire_Workstream_2.pdf
PG&E EPIC 2.34 – Full Report - CA, USA
Expanded PG&E pilot establishing roadmap for large-scale deployment with technical and performance analysis.
https://www.pge.com/pge_global/common/pdfs/about-pge/environment/what-we-are-doing/electric-program-investment-charge/PGE-EPIC-Project-2.34.pdf
PG&E & IND.T – T&D World Webinar - CA, USA
Knowledge-sharing webinar presenting pilot outcomes and utility collaboration insights.
https://www.tdworld.com/members/webinars/article/21151984/preventing-powerline-faults-and-fires

2020
EPRI & Ameren – Transmission Pilot - MO, USA
Transmission-level pilot in the U.S. assessing EFD on high-voltage lines and grid stability.
https://skipsolabs-epri.s3.amazonaws.com/uploads/content/95dbed02dbd45997509f4e273299cab70f08ea12.pdf
SCE – Media Release - CA, USA
Southern California Edison publicized their wildfire technology trials featuring EFD.
https://energized.edison.com/stories/new-technology-sounds-the-alarm-on-wildfire-hazards
SCE Webinar – T&D World - CA, USA
Webinar detailing SCE's use of incipient fault detection to reduce fire risk.
https://events.tdworld.com/tdworld2021/session/439518/webinar-implementing-asset-incipient-failure-detection-technology-to-mitigate-wildfires-at-southern-california-edison
Endeavour Energy – Innovation Recognition - NSW, AU
Recognition for innovation through early deployment and performance in Australian grid.
https://www.energynetworks.com.au/resources/reports/2021-reports-and-publications/network-innovation-report-2021/
2021
PG&E – Grid Sensor Scaling - CA, USA
PG&E publicly committed to EFD expansion across their network after pilot success.
https://www.pgecurrents.com/articles/3042-pg-e-scaling-deployment-grid-sensor-technologies-proactively-mitigate-wildfire-risk
2022
United Energy – Public Video Summary - VIC, AU
Utility published public video showing EFD technology detecting incipient faults.
https://www.youtube.com/watch?v=pxUOZADlCDM&t=6s
Metro Trains – Rail Sector Deployment - VIC, AU

EFD applied in the rail sector to monitor electrical infrastructure in Australia.
https://www.linkedin.com/posts/ind-technology-pty-ltd_10-innovations-in-10-weeks-series-activity-6958978876224020480-9Fah

Fortis Alberta – Regulatory Filing , AL, CA
Regulator acknowledged Fortis Alberta's pilot and factored it into rate structure plans - see attachment.
https://www.auc.ab.ca/

CPUC RSE Ranking – PG&E & SCE - CA, USA
CPUC ranked EFD among top 3 wildfire mitigation investments for PG&E and SCE.
https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/general-rate-cases/pge-proceedings/slides-july-15-2021-pge-2023-grc-workshop.pdf
https://www.sce.com/sites/default/files/AEM/Wildfire%20Mitigation%20Plan/2023-2025/2023-10-26_SCE_2023_WMP_R1.pdf

FireSafe SWER Report – EFD.Tap - VIC, AU
Report explored low-cost EFD.Tap sensors for remote and single-wire line coverage.
https://www.energy.vic.gov.au/__data/assets/pdf_file/0013/602320/Fire-safe-SWER-single-wire-earth-return-powerlines.pdf

2023 onwards.

Portland General Electric – Deployment Feature - OR, USA
PGE deployed EFD to reduce wildfire risks and shared results with industry press.
https://www.tdworld.com/wildfire/article/21262313/portland-general-electric-deploys-ai-advanced-tech-to-reduce-wildfire-risk

National Grid (MA) – Future Grid Plan (2023) - MA, USA
EFD included in grid modernization plan for resilience and equity in Massachusetts - approved by the Regulator.
https://www.nationalgridus.com/media/pdfs/our-company/massachusetts-grid-modernization/future-grid-full-plan-sept2023.pdf

WMP Integration – PG&E, SCE, SDG&E (old plans shown – EFD is also in all the new ones) - CA, USA
EFD featured prominently in wildfire mitigation planning across California's IOUs.
PG&E: https://www.pge.com/content/dam/pge/docs/outages-and-safety/outage-preparedness-and-support/pge-wmp-r3-092723.pdf
SCE: https://www.sce.com/sites/default/files/AEM/Wildfire%20Mitigation%20Plan/2023-2025/2023-10-26_SCE_2023_WMP_R1.pdf
SDG&E: https://www.sdge.com/sites/default/files/regulatory/2023-2025%20SDGE%20WMP%20with%20Attachments_Errata_10-23-23.pdf

PG&E – Wildfire Mitigation Media Release - Apr 25 - CA, USA
PG&E press release emphasized proven layers including EFD tech.
https://www.pge.com/en/newsroom/currents/safety/three-year-wildfire-mitigation-plan-builds-upon-proven-layers-of.html

SCE – Wildfire Strategy Announcement - Apr 25 - CA, USA
SCE highlighted innovations like EFD to protect communities.
https://newsroom.edison.com/releases/southern-california-edisons-wildfire-mitigation-plan-leverages-grid-innovations-to-advance-community-safety

CPUC – Corrective Action (Transmission) - Nov 23 - CA, USA
Based on positive results, CPUC advised EFD application on transmission networks.

Aurora Energy (NZ) – Asset Management Plan (2025) - NZ
New Zealand utility incorporated EFD in its long-term Asset Management Plan.
https://www.auroraenergy.co.nz/media/0i1pdesm/aurora-energy-2025-2035-asset-management-plan.pdf

Western Power – Pole Fire Mitigation (2025) - WA, AU

Western Power began rollout of EFD to mitigate pole-top fires in regional networks based on successful pilot.
https://www.westernpower.com.au/safety/pole-top-fires/#:~:text=We%20have%20also%20successfully%20trialled,pole%2Dtop%20fire%20can%20occur.

Endeavour Energy - Bushfire Preparedness Response (2024 onwards) - NSW, AU
See link on website also part of the business ESMS.
https://www.endeavourenergy.com.au/safety/bushfire-safety/our-approach/our-preparations-for-a-bushfire-season

PG&E – Field Crew Testimonial Video (2024) - CA, USA
PG&E published direct feedback from field teams highlighting system benefits.
https://players.brightcove.net/1691765962001/SkPAPXDi_default/index.html?videoId=6346028711112

Fortis Alberta – Media Coverage and Rate Case - FA, CA
Feature article and documentation supporting 5-year implementation plan.
https://www.tdworld.com/wildfire/article/21284861/a-360-degree-approach-to-wildfires-in-canada

PPL – EEI Edison Award Nomination (2024) - PA, USA
PPL nominated for Edison Award for grid modernization work using EFD.
https://www.eei.org/News/news/All/eei-announces-finalists-for-2024-edison-award

Fortis Alberta – Electricity Canada Recognition (2025) -AL, CA
EFD recognized nationally for enhancing reliability and fire prevention.
https://www.electricity.ca/news/electricity-canada-unveils-2024-centre-of-excellence-recipients/#:~:text=FortisAlberta's%20Early%20Fault%20Detection%20technology,within%20a%2010%2Dmetre%20range.
Recent company video.
https://www.linkedin.com/feed/update/urn:li:activity:7395533824585195520

PPL – SEPA Resilience Award (2025) - PA. USA
SEPA award acknowledged EFD's role in preventing 300+ faults and reducing fire risk.
https://sepapower.org/power-player-awards/2025-finalists-and-winners/
PPL Predictive Failure.mp4 - Google Drive

PPL- Corporate ESG (2024) - PA, USA
See page 27 with EFD system results and baseline reliability numbers.
https://www.pplweb.com/wp-content/uploads/2025/04/PPL_CSR-2024-Report_FINAL.pdf

Essential Energy (2025-December) - NSW, AU
Part of their Bushfire Mitigation Plan, see page 14.
https://www.essentialenergy.com.au/-/media/Project/EssentialEnergy/Website/Files/Our-Network/CEOP8022.pdf?rev=2a08135f5c5b421888b0489c6ec245ce

Cowlitz - Washington State (2025) - WA, USA
Part of their Wildfire Mitigation Plan
Microsoft Word - 20240930 CPUD WMP Final Version

Portland General Electric – Wildfire Mitigation Plan Update (2025)
https://downloads.ctfassets.net/416ywc1laqmd/4AVMbMHemvKMJeSztzvYU0/c2230643cc0f4eccfbcc58b5e8813bc2/2025_PGE_Wildfire_Mitigation_Plan_Update.pdf

Appendix 2: IND.T customers with EFD systems

Australia	**North America**	**Rest of World**
AusGrid	AEP TX	HEDNO Greece
AusNet Services	Ameren MO	KBE, Malaysia
ElectraNet	Baltimore Gas & Electric MA	Aurora Energy, New Zealand
Endeavour Energy	ATCO Electric (Alberta)	EDP, Portugal
Energy Queensland	CenterPoint TX	
Essential Energy	Cowlitz WA	
Metro Melbourne	First Energy NJ	
Metro tunnel (CYP)	Fortis (Alberta)	
Powercor	Henry County IN	
Rio Tinto	National Grid MA	
TransGrid	National Grid NH	
Western Power	Pacific Gas & Electric CA	
	PacifiCorp CA	
	Pennsylvania Power & Light PA	
	Portland General Electric OR	
	San Diego Gas & Electric CA	
	Southern California Edison CA	
	Southern Company GA	
None in Tasmania.	Eight utilities in negotiation in five new states and provinces.	Four countries in final negotiation.