Recommendation 1 and 4.

I agree with the recommendation but recommend the following, supported by the level of electrical risk.

1. Solar PV modules designed for and intended to be connected to other PV modules to have a combined peak voltage exceeding extra low voltage.
2. Battery cells, when connected to other cells for the purpose of storing and releasing power of a combined voltage of greater than extra low voltage; or
3. Battery cells, when connected to other cells for the purpose of storing and releasing power where the peak incident energy in the event of a fault exceeds 1.2cal/cm². (This may need to be specified in a way that takes into account system voltage, short circuit current and enclosure).

See example incident energy calculation for 48Vdc ELV battery –

- 48Vdc battery
- 10 kA short circuit current
- Short near battery prior to fuse. Disconnection time taken as reaction time for person to move away from fault (2 seconds) as the arc will not disconnect.
- Working distance 46 cm.

First calculate system resistance (R_{sys}) from System voltage (V_{sys}) and short circuit current (I_{sc}):

$$R_{sys} = \frac{V_{sys}}{I_{sc}} = \frac{48}{10{,}000} = 0.0048\Omega$$

Then arcing current $(I_{arc})_{is}$ equal to:

$$I_{arc} = \frac{V_{sys}}{2\ x\ R_{sys}} = \frac{48}{2\ x\ .0048} = 5000A$$

In this case arcing time T_{arc} = 2s: Incident energy at maximum power (E_m) can now be calculated:

$E_m = 0.02\ x\ R_{sys}\ x\ I_{arc}^2\ \left(\frac{T_{arc}}{D^2}\right)$ = 0.02 x 0.0048 x 5000² x $\left(\frac{2}{30^2}\right)$ = 2.26 cal/cm²

In this case the incident energy at maximum power is greater than 2.26 *cal/cm²*.

The incident energy as calculated is where the energy is dissipated in all directions. Where the arc is contained within an enclosure such as a battery enclosure preventing dissipation in all directions, the result is multiplied by 3. In this case the result would be $2.26\ x\ 3 = 6.78\frac{cal}{cm^2}$

Recommendation 10:

230V smoke alarms require the use of a tool to open or remove the alarm. Once opened or removed IP2X protection is afforded by design. I do not believe that this is likely to pose a substantial electrical risk and as a homeowner would not like stickers on smoke alarms.

Recommendation 15:

Testing of electrical equipment may equally be work on energised electrical equipment or work on deenergised electrical equipment.

e.g. Testing of energised electrical equipment would include voltage measurements as part of a process to deenergise electrical equipment, voltage measurements for the purpose of fault finding, an energised EFLI test, current testing.

e.g. Testing of deenergised electrical equipment may be completing earth continuity and insulation testing on a circuit during commissioning or after the circuit has been disconnected and tested using energised testing.

Recommendation 20:

(b) I don't believe that the proposed definition addresses the issue raised (if the area normally has a hazardous atmosphere, but the atmosphere is not present at the time work is performed). To address the issue, I believe section 14(1)(c) should be amended with words to the effect of "is located in an area which has or is intended to have an atmosphere presents a risk to health and safety from fire or explosion"

Recommendation 31, 32 and 33

I suggest that the only way to ensure confidence in the competence of licensee examinations is for the licensing examinations to be fully administered by the Electrical Safety Office. This would ensure that RTO's provide the scope of training required and cannot "train to pass the exam". There is a perceived conflict of interest where the RTO provides both training and examination for reward. The approved RTOs would have a conflict of interest examining students from another RTO as there is financial reward for the RTO conducting the testing achieve higher pass rate.

Recommendation 34:

CPD needs to be flexible enough that it is of benefit to the person undertaking CPD. The electrical industry covers a wide range of work, much of which has specific requirements. As an example, an electrical worker in the mining or equipment manufacturing/repair industries would receive no relevant advantage from CPD relating to the MEN system.

Due to the spread of workers in Queensland, all CPD related training needs to be able to be delivered remotely or it will just be another tax on persons living in regional and remote areas. It would be unreasonable for every worker outside of Brisbane to spend thousands of dollars to achieve CPD because they do not live in southeast Queensland.

An example is that I hold multiple licenses, if I want to renew my ESV A grade licence it would cost over $2000 for travel and accommodation in Melbourne to sit in on the CPD required. This is a tax on licence holders who don't reside in the Melbourne CBD and being familiar with the CPD content I would have no improvement in knowledge as a result of the CPD.

Recommendation 35:

I agree that the current licence renewal questions are more of an exercise in reading than technical knowledge. I think the question bank could be improved to include more technical and practically aligned questions to assess a worker understanding of fundamental principles. There is a need to ensure relevance as electrical workers may work in many areas. All testing must be developed on a computer-based training model to enable remote regional workers to complete the requirements without unfair penalty.

Recommendation 39:

This recommendation appears counter productive and a step backwards in regard to mutual recognition and national licensing.

Recommendation 46

I am opposed to the removal of the exception for remote rural electrical installation work; however further clarification is recommended.

The properties where this applies are not near an electrical grid. They often need to travel considerable distance to get to the nearest formed road. When it rains, they can be cut off for substantial periods with the only access by air. They are hundreds of kilometres from the nearest electrical contractor. I am not aware of any incident ever occurring at the properties genuinely covered by this exception. I believe that the intent is only for large rural stations.

There are many who try to claim this exemption, which I do not believe fulfil the intent of this section. Most off grid rural installations do not fulfill all the remote rural requirements. Some people believe that they are exempt just because they have an off-grid supply, which is not the case. Clarification should be added. I believe that there are only a very small number of properties, possibly no more than 10 or 20 in the state. Maybe they could be registered as remote rural or specific areas for clarification.

Recommendation 59:

I am strongly opposed to any form of inspector being appointed by any organisation who may have a conflict of interest. Inspectors should only be appointed by gazette. Inspectors must comply with the Public Service Act, exercise integrity and impartiality—being honest, fair and respectful, and ensuring decisions are unprejudiced, unbiased and just. promoting the public good. Having an inspector of any kind appointed from or by a stakeholder creates a conflict of interest and undermines public accountability and confidence.

Recommendation 60:

I am strongly opposed to a stakeholder appointing members to carry out any enforcement type activity. I can see a definite conflict of interest here and the likelihood of abuse of power would be

high. All electrical workers currently have the ability to make safe (subject to the PIC). Assistance from an ESO inspector can be obtained where required.

Recommendation 66:

I support the phasing in of safety switches to a level consistent with the requirements of AS/NZS 3000:2018, but not in all settings. However, I believe that introducing this as a direct requirement is unlikely to justify the cost in many situations.

Safety switches are most effective at reducing the harm caused by an electric shock. Handheld electrical equipment poses the most risk. The majority of domestic premises have safety switch protection on socket outlets, thus addressing this issue, as most handheld equipment is connected by a plug and socket. Most domestic properties where safety switches are not installed are timber or Queenslander style buildings. By design there are limited places where a person will be in an "earthed situation" as defined in AS/NZS 3000.

Safety switches are supplemental protection, generally as a last line of defence against direct contact caused by the failure of other measures or carelessness of users. Fundamental protection is achieved by the methods outlined in AS/NZS 3000 section 1.5 including fault protection in accordance with section 1.5.5.

It is practical to apply additional protection in all areas identified in AS/NZS 3000 clause 1.5.6.3.

There are circumstances where the installation of a safety switch would cause electrical risk and defeat the safety of other measures. E.g. a separated supply in accordance with AS/NZS 3000:2018 clause 7.4.

Generally, in domestic installations all electrical equipment can be protected by type I or II safety switches, with the exception of items in clause 2.6.3.2.1.

Generally, in commercial installations most electrical equipment including lighting and all socket outlets can be protected by type I or II safety switches, with the exception of items in clause 2.6.3.2.1. Some electrical equipment may not be suitable for protection by safety switches due to normal leakage currents. E.g. HVAC systems.

Fitment of safety switches to safety systems such as fire pumps, air handling systems, evacuation equipment etc would create a risk far greater than the risk posed by earth leakage currents.

Generally industrial installations will have safety switches installed on socket outlets, lighting, hand held electrical equipment and electrical equipment which represents an increased risk, by way of compliance with AS/NZS 3000 or socket outlets by way of compliance with ESR s.108.

A lot of industrial equipment is not suitable for connection to a type I or Type II safety switch. This equipment is in most cases hard wired and represents a lower risk by design. Often this equipment may include VSD's and will inherently have large earth leakage currents. Electrical risk can be effectively controlled using the fundamental safety principals outlined in section 1.5 of AS/NZS 3000.

Often where persons receive an electric shock from industrial electrical equipment, it is in the event of a fault situation resulting in an electric shock from indirect contact. Generally, a safety switch will have no bearing on a shock of this nature as short circuit protection operates far quicker than a safety switch to limit the time/touch voltage threshold.

Recommendation 67:

Current regulations relating to work on energised electrical are appropriate, however the legislation should be altered to reflect a logical order, as it did prior to harmonisation. The same requirements should apply when working within 500mm of exposed energised electrical equipment as for work on energised electrical equipment.

Often there is far greater risk involved in conducting the live work required to deenergise electrical equipment than, working on the energised electrical equipment would have posed in the first place. Proper management of the hazard should be undertaken. This can only be achieved by ensuring that the persons conducting the work have the appropriate knowledge and resources to implement the safest way to conduct the work. (An example of where the process of deenergising may be greater is accessing a service pillar to deenergise supply to domestic switchboard).

a) The ESV document is very limited in workable information. Selection of PPE should be the last consideration, not the first. Every site is different, but hierarchy of control should prevail.
b) I am not sure how you calibrate PPE? Ensuring PPE is suitable, tested and in good working order is already covered under ESR s.22(1).

I suggest the implementation of an informative Code of Practice to assist with effective management of fault currents and work on or near energised electrical equipment.

Recommendation 68:

I see the potential for this proposed regulation to increase the risk to persons and property by mandating an action without understanding the particular circumstances. In a ceiling space with compliant wiring and timber battens the electrical installation generally poses no risk, whereas shutting down the lighting in the ceiling space will considerably increase the risk posed by spiders, snakes and safe movement. Additional PPE may create heat exhaustion and loss of dexterity increasing the risk of physical injury. When working in a ceiling space, risks are constantly assessed and controls varied constantly. Writing this down would be a distraction from controlling the risks and create an additional risk.

Recommendation 69 & 70:

The requirement for an electrical inspection at the point of sale of a property has merit. Also, where long term rental properties change tenants, as this would detect damage and/or unlicensed work performed by the previous tenant.

As far as requiring an inspection on a home every 5 years, there is no evidence to support that this would be of any benefit and is purely a nanny state proposal and would place an unjustified financial burden on the public.

(a) Asbestos switchboards are electrically safe, thus requiring their replacement outside of the normal conditions of equipment upgrades is not within the scope of the electrical safety legislation. Unnecessary work on asbestos switchboards only leads to a risk of exposure. If they are in good condition and not disturbed, they pose a minimal risk.