



DSOs' approach to EVs
ACER Workshop, 17 April 2023

Introducing EU DSO Entity

An EU association legally mandated
by EU Regulation 2019/943



“ Art. 52.1: Distribution system operators shall *cooperate at Union level through the EU DSO Entity*, in order to promote the *completion and functioning of the internal market for electricity*, and to promote optimal management and a coordinated operation of distribution and transmission systems. ”

A body of cooperation and neutral
expertise between all DSO in the EU

900+ DSOs
connecting
250 million
customers in
the EU

EU DSO Entity represent the voice of all EU DSOs and has a clear mandate alongside ACER and ENTSO-E for developing NC



Network Codes & Guidelines

Participates in drafting of Network Codes and Guidelines relevant for DSO grids

- Joint proposal with ENTSO-E on **Network Code (NC) Cybersecurity (14/1/22)**
- **Upcoming Network Code (NC) Demand-side Flexibility**
- **Review of existing network codes (NC)**



DSO/TSO cooperation

Promotes optimal and coordinated planning and operation of DSO/TSO networks

- **MoU** with ENTSO-E (DSO-TSO work plan)
- Cooperation on **Network Codes (NC)**
- Joint initiative on **Vision 2050**



Sharing best practice

Expert Groups and forum provide expertise and enable exchange of views

- **Various forms of knowledge sharing** with DSO Entity's members
- Via **project teams** (e.g. events, expert tables)
- **DSO radar reports**

EU DSO Entity welcomes the general approach outlined by ACER for amending current NCs RfG and DC

- **EU DSO Entity** welcomes the review of the current grid connection codes:
 - NC Requirements for generators (NC RfG).
 - NC Demand connection (NC DC).
- **DSOs' experts** have been actively involved in the preparatory work regarding the review of these NCs, namely in several Expert Groups under the European Stakeholder Committee Grid Connection (GC ESC).
- **EU DSO Entity's objective is to collaborate closely with ACER, ENTSO-E and DG ENER (EC's Directorate-General for Energy) on these amendments.**
- **EU DSO Entity** welcomes forthcoming active involvements with all EU Stakeholders in future amendments of other existing network codes and guidelines such as:
 - Guideline System Operation (SO GL) and in particular the KORRR methodology (on data exchanges)
 - Guideline Electricity Balancing (EB GL)

DSO Entity's approach to V2G EVs



- All other things being equal, V2G EVs are electrically the same as any other electricity storage device.
- Therefore V2G EVs could be treated exactly like electricity storage modules, ie the same as PPMs
- However, DSOs recognize that EVs are a specific societal change and that appropriate tailored approaches might be needed.
- As far as possible Regulations should be:
 - Technology neutral.
 - Identical across Europe.
 - Fair and transparent.
- Certification of the technical compliance of vehicles and their charging point should be done by the manufacturer and included in the sale of the vehicle.

DSOs' V2G needs



- DSOs support the rapid growth and increased use of EVs, and wish to apply network rules only to the minimum extent possible.
- DSOs need to manage the effect of EVs on the distribution network for the safety and security of all customers.
- DSOs also have a duty to ensure that EVs and their charging points are compliant with the relevant regulations.
- Each DSO, as with any new customer requirement, will have thresholds set within national rules beyond which EV owners will have to apply for a connexion, or to pre-notify the DSO before connexion.
- In general, this will only apply for larger V2G EVs, or 3* or more EVs at a single location.
- NC RfG should avoid directly affecting connexion agreements – the nature of these is defined in pre-existing national legislation.

* ACER proposal



Suggested NC RfG V2G implementation



- The NC RfG must make it clear that Equipment Certificates are mandatory for both EVs and charging equipment for EV1 and EV2.
- The boundary between EV1 and EV2 should be set by the DSO: it could be the same as the value as the capacity for which pre-notification or application is required by the DSO.
- EV1 and EV2 have identical technical requirements, so the boundary between them should not be an issue for manufacturers.
- Having fewer different thresholds will help both EV owners and DSOs.
- DSOs are aware that EV1 will probably not be allowed for electrical safety reasons in many member states.

Summary of DSO's proposals for NC RfG

	Individual V2G Vehicle or overall park size	
	< DSO* limit (EV1)	≥ DSO* limit < 42.0kW (EV2)
Single domestic property or single public charging point for 1 EV	No pre-notification/application process. Compliance relies on vehicle/charging point certification only	DSO defined pre-notification/application process. Compliance relies on installation Document submitted by property owner. Installation Document defined by DSO.
Single domestic property or single public charging point connecting more than 1 EV	No pre-notification/application process. Compliance relies on vehicle/charging point certification only	DSO defined pre-notification/application process. Compliance relies on installation Document submitted by property owner. Installation Document defined by DSO.
Public charging park	N/A	DSO defined pre-notification/application process. Compliance relies on installation Document submitted by property owner. Installation Document defined by DSO.

- At or above 42 kW the pre-notification/application process is the same but the owner would need to submit a Charging Point Installation Document.
- Above 1MW compliance would be required to be demonstrated with a Power Generation Module Document, ie the same approach as with Electricity Storage Modules and Power Generating Modules (typically Type B).

* The upper limit for connexion without pre-notification/application. Set by national rules.

NC DC - Power to Gas and Heat Pumps

- There is no definition of charging park, nor requirement for ≥ 3 EVs to follow the $>1\text{kV}$ notification process
- Unclear if all heating and cooling technologies are included: Art XX.5(f) implies it does apply to all. When does a heat pump become air conditioning, or a refrigerator?
- Art 24.3(c) would require a DSO to provide information for potentially millions of EVs and heat pumps to the TSO. It is suspected this is not the intent?

Appendix- detailed comments



DSO implementation of ACER's proposals – up to 42kW

	Individual V2G Vehicle or overall park size		
	<2.4kW (EV1)	≥2.4kW < DSO* limit (EV2)	≥ DSO* limit < 42.0kW (EV2)
Single domestic property or single public charging point for 1 EV	No pre-notification/application process. Compliance relies on vehicle certification only	No pre-notification/application process. Compliance relies on installation document submitted by property owner. Installation document defined by DSO.	DSO defined pre-notification/application process. Compliance relies on installation document submitted by property owner. Installation document defined by DSO.
Single domestic property or single public charging point connecting more than 1 EV	No pre-notification/application process. Compliance relies on vehicle certification only	No pre-notification/application process. Compliance relies on installation document submitted by property owner. Installation document defined by DSO.	DSO defined pre-notification/application process. Compliance relies on installation document submitted by property owner. Installation document defined by DSO.
Public charging park	N/A	N/A	DSO defined pre-notification/application process. Compliance relies on installation document submitted by property owner. Installation document defined by DSO.

* The upper limit for connexion without pre-notification/application. Set by national rules.

DSO suggested implementation – above 42kW

- Following ACER's current proposals:
 - We assume that any charging park in aggregate >1MW would be treated as above 1MW in Article 5
 - Application to the DSO is required.
 - Up to 1MW compliance would need to be demonstrated with a Charging Point Installation Document (CPID), defined by the DSO.
 - Above 1MW compliance would be required to be demonstrated with a Power Generation Module Document, ie the same approach as with Electricity Storage Modules and Power Generating Modules (typically Type B).
- Alternatively, the existing arrangements for Type A, B etc could be used

Issues with ACER's draft text



- Missing requirement for equipment certificates for EV1 &EV2?
- Need to be clear about when the requirements apply from, ie what is a “new” EV or EV charging point?
- Text doesn't recognize some V2G connexions might be single phase.
- Confusion over where the fault is for the fault ride through requirements.
- Lack of clarity on what pre and post fault operating points means.
- TSO cited in a number of cases where the Relevant System Operator would be more appropriate.

NC RfG Detailed issues - 1

Article/Reference	Comment
2	It is possible (according to slide 18 of the 03/04/23 set) for there to be multiple Charging Parks behind a single connexion point – do we need a definition of Charging Facility to sweep all these up? Possibly not if the notification and requirements are still per Charging Park.
2(67)	This definition includes all V2G EVs as storage modules, but EV1, 2 and 3 have their own requirements separate from storage modules. It would be good to EXCLUDE EV1, 2, 3 from the ESM definition.
2(69); 2(71); 2(73)	V1G is not used in the proposed legal text so there is no point in defining it. If reference is needed it would be appropriate to do it in the recitals, not in the definitions.
3(72)	Wiring is not mentioned for generation; there is no need to mention it for EVs.
3.1	The scope includes “new” EVs – but “new” is not defined. Probably needs something adding to Art 4 to define this.
13.5(f)	We assume this means Pmax, and not maximum consumption capacity – but it would be helpful to spell this out to avoid confusion where the two values are not identical.
13a.11	For EV1 and some EV2s we need to recognize that the connexions will be single phase – so this text needs to be reformulated for this.
13a.11	If pre and post fault ride through conditions are to be set by system operators, does this imply a single minimum fault level at LV and some MV voltages for the whole of Europe?
13a.3 and 13a.4	It is not clear why we should differentiate between normal reconnexion and following a fault. In fact, will the EV protection be able to distinguish between a system disturbance and a fault on the installation?
13a.5(e)	The grammar is odd, but why should there be any intentional delay anyway?

NC RfG Detailed issues - 2

Article/Reference	Comment
13a.6(a)	This specifies what happens for LFSM-U when the EV is absorbing active power – but it does not specify what happens when generating?
13a.8	This relaxation on active power output on falling frequency was intended to cater for gas turbines. As this is specific to EVs we could drop this completely.
14a.2(a)	Not clear whether “beyond these values” refers to the 400V to 110kV range, or the 0.9 to 1.1 pu range of the previous sentence.
14a.2(b)(i)	It is not clear why the missing tables need rated voltages.
14a.2(b)(i)	Tables XX.1 and XX.2 do not appear in the text.
14a.2(b)(iv) and (v)	It is not clear what the relevance of these paragraphs are, nor why voltage is important for V2G installations that by definition are <1MW for 400kV connexions.
14a.3(a)(ii)	FRT is for transmission faults, not local faults. This drafting risks confusing that point.
14a.3(a)(iii)	The text says TSO, but relevant SO in co-ordination with the RSO would be better.
14a.3(a)(iv)	The text says TSO, but relevant SO in co-ordination with the RSO would be better.
14a.3(a)(v)	This clause tries to specify pre and post fault operating points for V2G operation – is this appropriate? What does it mean in practice?
14a.3(a)(vi)	This drafting again seems confused about the location of the fault relevant for FRT.

NC RfG Detailed issues - 3

Article/Reference	Comment
14a.3(a)(vi)	Is this text about internal electrical faults trying to cover off the case (very unlikely) of a simultaneous internal and external fault?
14a.3(b)	Again -confusion over location of the fault – where is the asymmetric fault?
14a.5(d)(i)	Reference to SOGL (2017/1485) – is this appropriate given the emergence of the ND Demand Side Flexibility?
14a.5(d)(iii)	The requirement for fault recording goes beyond even what ENTSO-e are proposing – is this justified?
14a.6(c)	Again, is the reference to asymmetrical faults appropriate – how can this be translated into requirements at the connexion point?
30a	There is no compulsion in the drafting for EV1 to be certificated.
30a.1	It does not make sense to send one installation document for each EV2; send for each EV2 charging park within the overall installation.
30b.1	Typo – extraneous “or” at the end of the second line.
5.5(c)	Should probably be less than 1MW, not less than or equal to.
6.6	We need to check that applying the NC RfG equally to an EV that is injecting or withdrawing always make sense. I think it does – but it needs a careful check. Probably more of an issue for ESMs rather than EVs.
Figure 1x	Pref is set as Pmax or actual active power by the TSO for generation – is this difference intentional?

NC DC Detailed issues

Article/Reference	Comment
1.1(e)	This para is superfluous since all these issues are included in the definition of demand unit.
3.1(e)	So this applies retrospective to all EVs, heat pumps and power to gas? There is no distinction made between new and existing.
25.3(c)	As drafted this would require DSOs to provide a list of every EV and heat pump (and fridges?)
XX.1(b)	It might be better to phrase as "... in Article 13 if the connection point is at a voltage level..." It will avoid confusion between the connection of device to the installation and the connection of the installation to the grid.
XX.5(f)	Are devices that cool (air con, fridges) included in the definition of heat pump? Are all refrigerators in scope?