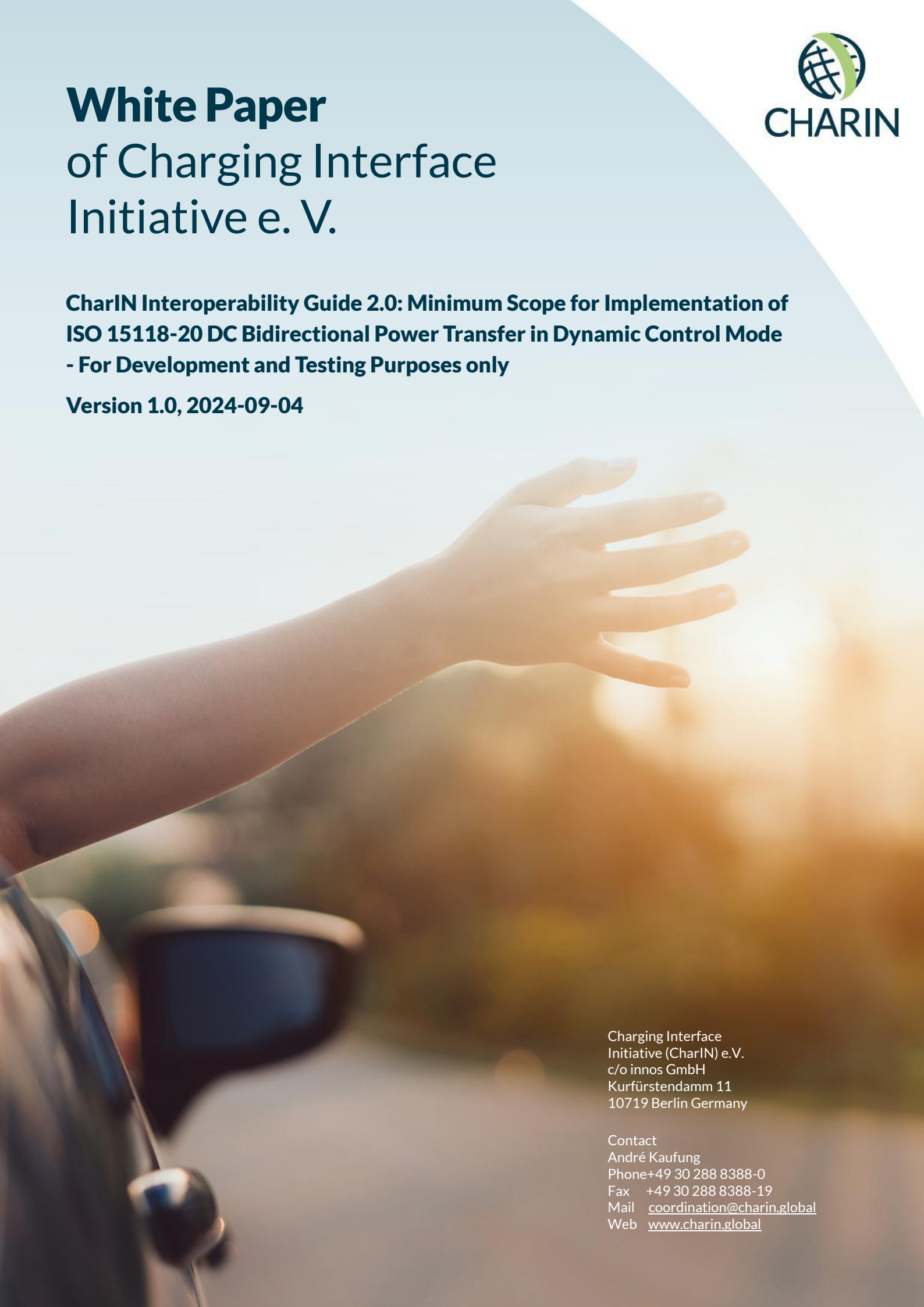


White Paper of Charging Interface Initiative e. V.

**CharIN Interoperability Guide 2.0: Minimum Scope for Implementation of
ISO 15118-20 DC Bidirectional Power Transfer in Dynamic Control Mode
- For Development and Testing Purposes only**

Version 1.0, 2024-09-04



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1. Introduction

CharIN is dedicated to developing and establishing the Combined Charging System (CCS) as the standard for charging Battery Electric Vehicles (BEVs) of all kinds.

This document presents a reduced area of applications for the implementation of the use case DC bidirectional power transfer in dynamic mode of the ISO 15118-20. The intention of this document is to provide a first simple and functional implementation version of the DC BPT (Bidirectional Power Transfer) in dynamic mode to start the interoperability testing of the system. This document covers only the communication aspect of DC BPT. This document by no means should be considered as a substitute for what is required by ISO 15118-20 and shall not be used as it is for series production of SECC/EVCC. For system safety aspects of DC BPT please refer to [CharIN guideline](#) in accordance with IEC 61851-23 (only accessible for CharIN members).

The users of this document are highly encouraged to provide feedback to CharIN coordination office on topics such as mistakes in the descriptions, topics which are overlooked but essential for implementations, etc. This document shall be considered a work in progress and will have further editions to include new features, improvements based on the feedback from the community through implementation and testing.

2. General Scope

The general scope of this document is DC BPT using dynamic control mode. The following features are not included in the scope of this document.

- Service renegotiation
- Schedule renegotiation
- Scheduled control mode
- Grid forming mode
- Multiplexed communication
- Pause and standby
- Plug and Charge
- Certificate revocation check for TLS (CLR, OCSP, Stapling)
- Set mobility needs by the SECC

Although some parameters are important for certain applications, none are essential for a first realization of bi-directional power transfer. This document may be further updated in the future to include features such as pause/standby and other optional parameters such as EVMaximumV2XEnergyRequest to support more use cases.

2.1 Physical Layer

Control Pilot Line communication layer is set up according to ISO 15118-3.

2.2 Supported Payload types

- 0x9000 : SDPRequestPayloadID
- 0x9001 : SDPResponsePayloadID
- 0x8002 : Part20MainstreamPayloadID
- 0x8004 : Part20DCMainstreamPayloadID

2.3 SDP

- SDPReq(SecurityProtocol = 0 (TLS), Transport Protocol = 0x00 (TCP))
- SDPRes(SecurityProtocol = 0 (TLS), Transport Protocol = 0x00 (TCP))

Related requirement from ISO 15118-20: [V2G20-623]

2.4 Transport Layer Security TLS

ISO 15118-20 requires TLS 1.3.

The following settings are considered in this document for TLS session.

Cipher suite: TLS_AES_256_GCM_SHA384

curve: secp521r1

Certificate revocation check for TLS may be skipped.

Note: Implementers should be cognizant of the security risks presented by skipping revocation checks.

2.5 Energy Level related Terms & Definitions

Minimum Energy Level

Minimum Energy Level is a boundary condition defined by the EV where below the level the EV will only charge.

Target Energy Level

Target Energy Level is the amount of energy expected to be in the EV at departure time. (related to target SoC)

Minimum V2X Energy Level

Minimum V2X energy level is the lower limit of the V2X operational range.

Note1: for operation using V2X parameters, please refer to the [CharIN Guide on Bi-directional Power Transfer related to IEC 61851-23 \(only accessible for CharIN members\)](#).

Maximum Energy Level

Maximum Energy Level is a boundary condition defined by the EV where above the level the EV will only discharge.

Present Energy Level

Present energy level is the amount of energy in the EV battery currently available.

Note1: Energy requests are defined in ISO 15118-20.

Note2: Minimum/Maximum/Target Energy Level is not exchanged in the communication protocol

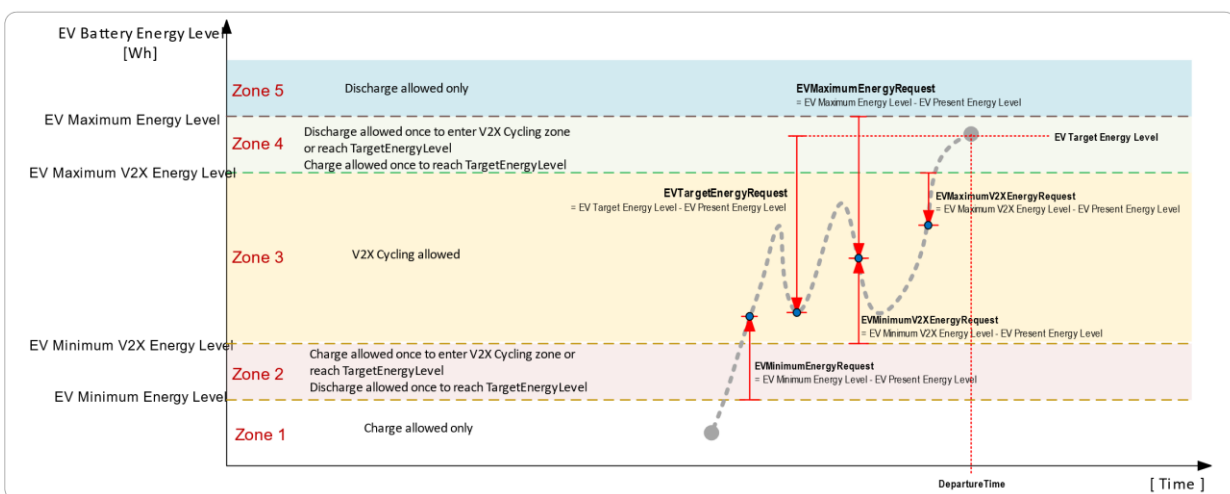
V2X operational range

The energy range for V2X cycling.

V2X cycling

Freely cycling between charging and discharging and vice versa.

Note: V2X related parameters are not used in this version of the guide. The inclusion of their definitions is for clarification purposes as a supplement to the ISO 15118-20 standard.



Note: The EVMaximumV2XEnergyRequest and EVMinimumV2XEnergyRequest are optional parameters provided by the EV. Although there is no specific requirement, if these parameters are provided, it is recommended that the EVSE attempts to follow the rules described in the previous definitions.

3. Message Sequence description

This chapter lists all the V2G messages needed for DC bi-directional power transfer in dynamic control mode. Under each message pair section there are three parts:

a) General, which describes values for some key parameters in the message pair;
b) Error handling, which describes how the system shall react when certain error occurs; and
c) Message example, which provides the implementation of the message pair with all mandatory fields and valid parameter values.

3.1 SupportedAppProtocolReq/Res

3.1.1. General

ProtocolNamespace= urn:iso:std:iso:15118:-20:DC
VersionNumberMajor =1 ,
VersionNumberMinor =0,
SchemaID= 0

Note: It is assumed that only one Schema with -20:DC namespace will be used for this guide. If more than one schema is offered, the -20:DC namespace shall have the highest priority for the DC BPT testing to continue.

Related requirements from ISO 15118-20 : [V2G20-2132].

3.1.2 Error Handling

[ChIN-BPT-001] If TLS 1.3 is established, the SECC shall send back the schemaID which corresponds to -20:DC namespace. If the EVCC does not offer -20:DC namespace, the SECC shall respond with response code Failed_NoNegotiation. If negotiation is not successful, the EVCC shall proceed to terminate the communication.

Note: this requirement is specific for DC BPT testing ONLY as this is a functionality supported only by ISO 15118-20. This requirement shall not apply for series products.

Related requirements from ISO 15118-20: [V2G20-172].

3.1.3 Message example

SupportedAppProtocolReq

```
<?xml version="1.0" encoding="UTF-8"?>
<ns0:supportedAppProtocolReq xmlns:ns0="urn:iso:15118:2:2010:AppProtocol">
  <AppProtocol>
    <ProtocolNamespace>urn:iso:std:iso:15118:-20:DC</ProtocolNamespace>
    <VersionNumberMajor>1</VersionNumberMajor>
    <VersionNumberMinor>0</VersionNumberMinor>
    <SchemaID>2</SchemaID>
    <Priority>1</Priority>
  </AppProtocol>
</ns0:supportedAppProtocolReq>
```

SupportedAppProtocolRes

```
<?xml version="1.0" encoding="UTF-8"?> <ns0:supportedAppProtocolRes
xmlns:ns0="urn:iso:15118:2:2010:AppProtocol">
  <ResponseCode>OK_SuccessfulNegotiation</ResponseCode>
  <SchemaID>2</SchemaID>
</ns0:supportedAppProtocolRes>
```

3.2. SessionSetupReq

3.2.1. General

SessionSetupReq:
SessionID = 0 (0x00000000) (see message example)
EVCCID = CHAV0123456789ABCDE3
SessionSetupRes:
SessionID EVSEID = ZZ000000 D != 0
ResponseCode = OK_NewSessionEstablished
EVSEID = ZZ000000

Note: The sessionID is an element of fixed size 8 hexBinary and it shall be zero if a new session is intended to be established (always in the context of this CharIN guide, since pause/standby is not supported).

[ChIN-BPT-002] EVSEID in SessionSetupRes shall be ZZ000000 for this guide. The EV shall accept this EVSEID.

[ChIN-BPT-003] EVCCID communicated over V2G message shall be identical to the vehicle certificate leaf (see Table B.13 in ISO 15118-20).

[ChIN-BPT-004] The following EVCCID and SECCID shall be used for this guide: EVCCID: cha-V-0123456789abcde-3 SECCID: AA-CHA-S-01234567890123456789012345678901-6

SECCID is only used in the SECC cert leaf (see Section B.4.1 Table B.5 in ISO 15118-20).

3.2.2 Error handling

[ChIN-BPT-005] If the SECC receives a SessionSetupReq including a SessionID value which is not equal to zero (0x00), it shall send a SessionID value in the SessionSetupRes message that is unequal to "0x00" and indicate the new V2G communication session with the ResponseCode set to "OK_NewSessionEstablished".

Note: As Session Pause and Resume is not considered in this guide, the SECC is not expected to store any previous sessionID, and therefore will always start a new session.

Related requirements from ISO 15118-20: [V2G20-2547].

3.2.3 Message example

SessionSetupReq

```
<?xml version="1.0" encoding="UTF-8"?>
<p0:SessionSetupReq xmlns:p0="urn:iso:std:iso:15118:-20:CommonMessages"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>0000000000000000</p1:SessionID>
    <p1:TimeStamp>1624366042</p1:TimeStamp>
  </p1:Header>
  <p0:EVCCID>CHAV0123456789ABCDE3</p0:EVCCID>
</p0:SessionSetupReq>
```

SessionSetupRes

```
<?xml version="1.0" encoding="UTF-8"?>
<p0:SessionSetupRes xmlns:p0="urn:iso:std:iso:15118:-20:CommonMessages"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
```

```

    <p1:TimeStamp>1624366043</p1:TimeStamp>
  </p1:Header>
  <p1:ResponseCode xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">OK_NewSessionEstablished</p1:ResponseCode>
  <p0:EVSEID>zz000000</p0:EVSEID>
</p0:SessionSetupRes>

```

3.3. AuthorizationSetupReq/Res

3.3.1. General

- AuthorizationSetupReq: empty
- AuthorizationSetupRes:
- AuthorizationServices: EIM
- CertificationInstallationService: False
- EIM_ASResAuthorizationMode: empty

Note: As only EIM is considered in this guide, PnC service is not offered.

3.3.2. Error handling

None.

3.3.3. Message example

AuthorizationSetupReq

```

<?xml version="1.0" encoding="UTF-8"?>
<ns0:AuthorizationSetupReq xmlns:ns0="urn:iso:std:iso:15118:-20:CommonMessages">
  <ns1:Header xmlns:ns1="urn:iso:std:iso:15118:-20:CommonTypes">
    <ns1:SessionID>3933323835363733 </ns1:SessionID>

    <ns1:TimeStamp>1620044866</ns1:TimeStamp>
  </ns1:Header>
</ns0:AuthorizationSetupReq>

```

AuthorizationSetupRes

```

<?xml version="1.0" encoding="UTF-8"?>
<p0:AuthorizationSetupRes xmlns:p0="urn:iso:std:iso:15118:-20:CommonMessages"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366043</p1:TimeStamp>

```

```

</p1:Header>
<p1:ResponseCode xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">OK</p1:ResponseCode>
<p0:AuthorizationServices>EIM</p0:AuthorizationServices>
<p0:CertificateInstallationService>false</p0:CertificateInstallationService>
<p0:EIM_ASResAuthorizationMode/>
</p0:AuthorizationSetupRes>

```

3.4. AuthorizationReq/Res

3.4.1. General

• AuthorizationReq:
• SelectedAuthorizationService: EIM
• EIM_AReqAuthorizationMode: empty
• AuthorizationRes:
• ResponseCode = OK
• EVSEProcessing = Ongoing / Finished when authorization is done

3.4.2. Error handling

[ChIN-BPT-006] If the SelectedAuthorizationService in AuthorizationReq is not EIM, the SECC shall send AuthorizationRes with ResponseCode = WARNING_AuthorizationSelectionInvalid.

[ChIN-BPT-007] The EVCC shall send an AuthorizationReq message with SelectedAuthorizationService = EIM after receiving an AuthorizationRes with ResponseCode = WARNING_AuthorizationSelectionInvalid.

[ChIN-BPT-008] The SECC shall wait for another AuthorizationReq message if the previous AuthorizationRes is with ResponseCode = WARNING_AuthorizationSelectionInvalid. After that the SECC shall respond with FAILED if the SelectedAuthorizationService in AuthorizationReq is still not EIM.

Related requirements in ISO 15118-20: [V2G20-1583], [V2G20-2209], [V2G20-2219].

3.4.3. Message example

AuthorizationReq

```
<?xml version="1.0" encoding="UTF-8"?>
```

```
<p0:AuthorizationReq xmlns:p0="urn:iso:std:iso:15118:-20:CommonMessages"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366043</p1:TimeStamp>
  </p1:Header>
  <p0:SelectedAuthorizationService>EIM</p0:SelectedAuthorizationService>
  <p0:EIM_AReqAuthorizationMode/>
</p0:AuthorizationReq>
```

AuthorizationRes

```
<?xml version="1.0" encoding="UTF-8"?>
<p0:AuthorizationRes xmlns:p0="urn:iso:std:iso:15118:-20:CommonMessages"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366043</p1:TimeStamp>
  </p1:Header>
  <p1:ResponseCode xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">OK</p1:ResponseCode>
  <p0:EVSEProcessing>Finished</p0:EVSEProcessing>
</p0:AuthorizationRes>
```

3.5. ServiceDiscoveryReq/Res

3.5.1. General

ServiceDiscoveryRes:
ServiceRenegotiationSupported = false
ServiceID = 6
FreeService = true/false
The serviceID in ServiceDiscoveryReq is optional.
[ChIN-BPT-009] Independent from the ServiceID in the ServiceDiscoveryReq, the SECC shall send ServiceID= 6 (DC_BPT) in ServiceDiscoveryRes.
The FreeService may be set to true or false.
[ChIN-BPT-010] The EVCC shall accept both true and false for FreeService.

3.5.2. Error handling

[ChIN-BPT-011] If the SECC does not send ServiceID = 6 in ServiceDiscoveryRes, the EVCC shall send SessionStopReq to stop the session with EVTerminationExplanation = WrongServiceID. This requirement is only for testing purposes of DC BPT; for series products, other ServiceIDs can be selected according to the use case

3.5.3. Message example

ServiceDiscoveryReq

```
<?xml version="1.0" encoding="UTF-8"?>
<p0:ServiceDiscoveryReq xmlns:p0="urn:iso:std:iso:15118:-20:CommonMessages"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366043</p1:TimeStamp>
  </p1:Header>
</p0:ServiceDiscoveryReq>
```

ServiceDiscoveryRes

```
<?xml version="1.0" encoding="UTF-8"?>
<p0:ServiceDiscoveryRes xmlns:p0="urn:iso:std:iso:15118:-20:CommonMessages"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366043</p1:TimeStamp>
  </p1:Header>
  <p1:ResponseCode xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">OK</p1:ResponseCode>
  <p0:ServiceRenegotiationSupported>false</p0:ServiceRenegotiationSupported>
  <p0:EnergyTransferServiceList>
    <p0:Service>
      <p0:ServiceID>6</p0:ServiceID>
      <p0:FreeService>false</p0:FreeService>
    </p0:Service>
  </p0:EnergyTransferServiceList>
</p0:ServiceDiscoveryRes>
```

3.6. ServiceDetailsReq/Res

3.6.1. General

ServiceDetailsReq:

ServiceID = 6

ServiceDetailsRes:

ServiceID = 6

ParameterSetID = 1:

Connector = 2	Extended
ControlMode=2	Dynamic
MobilityNeedsMode=1	Mobility needs provided by SECC not allowed
Pricing=0	No Pricing
BPTChannel=1	Unified
GeneratorMode=1	Grid Following

Note1: MobilityNeedsMode=2 leads to complexity in ScheduleExchange parameters (see requirement [V2G20-1648]/[V2G20-1649]. For this first version of the guide the MobilityNeedsMode is limited to 1.

Note2: In case of DC BPT and Control Mode = Dynamic, the EVSE may change from Grid Following to Grid Forming in GeneratorMode without doing a service renegotiation, i.e., information the EV. This is designed to prevent a blackout, as a service renegotiation would require to stop the power transfer.

3.6.2. Error handling

None.

3.6.3. Message example

ServiceDetailReq

```
<?xml version="1.0" encoding="UTF-8"?>
<ns0:ServiceDetailReq xmlns:ns0="urn:iso:std:iso:15118:-20:CommonMessages">
  <ns1:Header xmlns:ns1="urn:iso:std:iso:15118:-20:CommonTypes">
    <ns1:SessionID>3933323835363733</ns1:SessionID>
    <ns1:TimeStamp>1624366043</ns1:TimeStamp>
  </ns1:Header>
</ns0:ServiceDetailReq>
```



```
</ns1:Header>  
<ns0:ServiceID>6</ns0:ServiceID>  
</ns0:ServiceDetailReq>
```


ServiceDetailRes

```
<?xml version="1.0" encoding="UTF-8"?>
<p0:ServiceDetailRes xmlns:p0="urn:iso:std:iso:15118:-20:CommonMessages"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366043</p1:TimeStamp>
  </p1:Header>
  <p1:ResponseCode xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">OK</p1:ResponseCode>
  <p0:ServiceID>6</p0:ServiceID>
  <p0:ServiceParameterList>
    <p0:ParameterSet>
      <p0:ParameterSetID>1</p0:ParameterSetID>
      <p0:Parameter p0:Name="Connector">
        <p0:intValue>2</p0:intValue>
      </p0:Parameter>
      <p0:Parameter p0:Name="ControlMode">
        <p0:intValue>2</p0:intValue>
      </p0:Parameter>
      <p0:Parameter p0:Name="MobilityNeedsMode">
        <p0:intValue>1</p0:intValue>
      </p0:Parameter>
      <p0:Parameter p0:Name="Pricing">
        <p0:intValue>0</p0:intValue>
      </p0:Parameter>
      <p0:Parameter p0:Name="BPTChannel">
        <p0:intValue>1</p0:intValue>
      </p0:Parameter>
      <p0:Parameter p0:Name="GeneratorMode">
        <p0:intValue>1</p0:intValue>
      </p0:Parameter>
    </p0:ParameterSet>
  </p0:ServiceParameterList>
</p0:ServiceDetailRes>
```

3.7. ServiceSelectionReq /Res

3.7.1. General

ServiceSelectionReq: ServiceID = 6 ParameterSetID = 1

ServiceSelectionRes: ResponseCode = OK

3.7.2. Error handling

[ChIN-BPT-013] If in ServiceSelectionReq the ServiceID !=6 or ParameterSetID !=1, ServiceSelectionRes shall contain FAILED_ServiceSelectionInvalid in the ResponseCode.

Requirement from ISO 15118-20:[V2G20-433].

3.7.3. Message example

ServiceSelectionReq

```
<?xml version="1.0" encoding="UTF-8"?>
<p0:ServiceSelectionReq xmlns:p0="urn:iso:std:iso:15118:-20:CommonMessages"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366043</p1:TimeStamp>
  </p1:Header>
  <p0:SelectedEnergyTransferService>
    <p0:ServiceID>6</p0:ServiceID>
    <p0:ParameterSetID>1</p0:ParameterSetID>
  </p0:SelectedEnergyTransferService>
</p0:ServiceSelectionReq>
```

ServiceSelectionRes

```
<?xml version="1.0" encoding="UTF-8"?>
<p0:ServiceSelectionRes xmlns:p0="urn:iso:std:iso:15118:-20:CommonMessages"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366043</p1:TimeStamp>
  </p1:Header>
  <p1:ResponseCode xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">OK</p1:ResponseCode>
</p0:ServiceSelectionRes>
```

3.8. DC_ChargeParameterDiscoveryReq/Res

3.8.1. General

There is no preset parameter in this message pair for this guide as all parameters shall be dependent on the electrical aspects of the EV & EVSE.

Note1: in this guide all, optional parameters are not used, such as TargetSoC in DC_ChargeParameterDiscoveryReq.

[ChIN-BPT-014] Any optional parameters in DC_ChargeParameterDiscoveryReq/Res may not be considered in the charging session.

Note2: The parameters related to current, power and voltage provided in DC_ChargeParameterDiscovery message pair should be considered as physical limitations, meaning that they are related to the physical abilities of the system under rated operating conditions. The values can be changed later in the energy transfer process.

3.8.2. Error handling

[ChIN-BPT-015] The SECC shall validate the validity of the parameters exchanged in the DC_ChargeParameterDiscoveryReq message. If invalid parameters are exchanged or if BPT_DC_CPDReqEnergyTransferMode is not used, the DC_ChargeParameterDiscoveryRes shall contain ResponseCode = FAILED_WrongChargeParameter.

Related requirement in ISO 15118-20: [V2G20-2272].

3.8.3. Message Example

DC_ChargeParameterDiscoveryReq

```

<?xml version="1.0" encoding="UTF-8"?>
<p0:DC_ChargeParameterDiscoveryReq xmlns:p0="urn:iso:std:iso:15118:-
20:DC" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366044</p1:TimeStamp>
  </p1:Header>
  <p0:BPT_DC_CPDReqEnergyTransferMode>
    <p0:EVMaximumChargePower>
      <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">7</p1:Exponent>
      <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">1</p1:Value>
    </p0:EVMaximumChargePower>
    <p0:EVMinimumChargePower>
      <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">4</p1:Exponent>
      <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">5</p1:Value>
    </p0:EVMinimumChargePower>
    <p0:EVMaximumChargeCurrent>
      <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">4</p1:Exponent>
      <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">3</p1:Value>
    </p0:EVMaximumChargeCurrent>
    <p0:EVMinimumChargeCurrent>
      <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">2</p1:Exponent>
      <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">1</p1:Value>
    </p0:EVMinimumChargeCurrent>
    <p0:EVMaximumVoltage>
      <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">0</p1:Exponent>
      <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">360</p1:Value>
    </p0:EVMaximumVoltage>
    <p0:EVMinimumVoltage>
      <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">0</p1:Exponent>
      <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">310</p1:Value>
    </p0:EVMinimumVoltage>
    <p0:EVMaximumDischargePower>
      <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">5</p1:Exponent>
  </p0:BPT_DC_CPDReqEnergyTransferMode>
</p0:DC_ChargeParameterDiscoveryReq>
  
```

```

        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">-1</p1:Value>
    </p0:EVMaximumDischargePower>
    <p0:EVMinimumDischargePower>
        <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">5</p1:Exponent>
        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">-1</p1:Value>
    </p0:EVMinimumDischargePower>
    <p0:EVMaximumDischargeCurrent>
        <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">2</p1:Exponent>
        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">-4</p1:Value>
    </p0:EVMaximumDischargeCurrent>
    <p0:EVMinimumDischargeCurrent>
        <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">2</p1:Exponent>
        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">-3</p1:Value>
    </p0:EVMinimumDischargeCurrent>
    </p0:BPT_DC_CPDReqEnergyTransferMode>
</p0:DC_ChargeParameterDiscoveryReq>

```

DC_ChargeParameterDiscoveryRes

```

<p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366044</p1:TimeStamp>
</p1:Header>
<p1:ResponseCode xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">OK</p1:ResponseCode>
<p0:BPT_DC_CPDResEnergyTransferMode>
    <p0:EVSEMaximumChargePower>
        <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">3</p1:Exponent>
        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">11</p1:Value>
    </p0:EVSEMaximumChargePower>
    <p0:EVSEMinimumChargePower>
        <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">0</p1:Exponent>
        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">500</p1:Value>
    </p0:EVSEMinimumChargePower>
    <p0:EVSEMaximumChargeCurrent>
        <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">1</p1:Exponent>

```

```

        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">4</p1:Value>
    </p0:EVSEMaximumChargeCurrent>
    <p0:EVSEMinimumChargeCurrent>
        <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">1</p1:Exponent>
        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">3</p1:Value>
    </p0:EVSEMinimumChargeCurrent>
    <p0:EVSEMaximumVoltage>
        <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">2</p1:Exponent>
        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">4</p1:Value>
    </p0:EVSEMaximumVoltage>
    <p0:EVSEMinimumVoltage>
        <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">0</p1:Exponent>
        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">250</p1:Value>
    </p0:EVSEMinimumVoltage>
    <p0:EVSEMaximumDischargePower>
        <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">3</p1:Exponent>
        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">-11</p1:Value>
    </p0:EVSEMaximumDischargePower>
    <p0:EVSEMinimumDischargePower>
        <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">0</p1:Exponent>
        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">-500</p1:Value>
    </p0:EVSEMinimumDischargePower>
    <p0:EVSEMaximumDischargeCurrent>
        <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">1</p1:Exponent>
        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">-4</p1:Value>
    </p0:EVSEMaximumDischargeCurrent>
    <p0:EVSEMinimumDischargeCurrent>
        <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">1</p1:Exponent>
        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">-3</p1:Value>
    </p0:EVSEMinimumDischargeCurrent>
    </p0:BPT_DC_CPDResEnergyTransferMode>
</p0:DC_ChargeParameterDiscoveryRes>

```

3.9. ScheduleExchangeReq/Res

3.9.1. General

ScheduleExchangeReq/Res message set is also mandatory even though this guide covers only dynamic control mode.
ScheduleExchangeReq:
MaximumSupportingPoints = 12
Dynamic_SEReqControlMode

DepartureTime (s)	<p>> = 0</p> <p>The range of the departure time shall be within the range of 15 mins (900) to 24 hours (86400) for this guide.</p> <p>Note: if DepartureTime = 0, it means that the EV shall be charged as fast as possible.</p> <p>Note: this range limitation is for interoperability testing purposes only. Per ISO 15118-20 the range is limited by type definition of unsignedInt</p>
EVTargetEnergyRequest	The energy request of the EV it needs to fulfil the target SOC as specified by the owner.
EVMaximumEnergyRequest	Maximum acceptable energy level of the EV
EVMinimumEnergyRequest	The energy request of the EV it needs to fulfil the minimum SOC as specified by the owner. Note: Not a guaranteed minimal amount

ScheduleExchangeRes:

ResponseCode = OK

EVSEProcessing = Ongoing / Finished if Req is processed successfully

Note1: The parameters related to current, power and voltage provided in ScheduleExchange message pair should be considered as physical limitations, meaning that they are related to the physical abilities of the system under rated operating conditions. The values can be changed later in the energy transfer process.

Note2: Optional parameters are not considered in this guide.

3.9.2. Error handling

[ChIN-BPT-016] If the EVMinimumEnergyRequest is greater than EVMaximumEnergyRequest or EVTargetEnergyRequest, the SECC shall respond with ResponseCode = FAILED. The charging session will be terminated.

[ChIN-BPT-017] If multiple ScheduleExchangeReq messages with different parameter values are received, the value in the latest ScheduleExchangeReq shall be used.

3.9.3 Message Example

ScheduleExchangeReq

```

<?xml version="1.0" encoding="UTF-8"?>
<p0:ScheduleExchangeReq xmlns:p0="urn:iso:std:iso:15118:-20:CommonMessages"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366044</p1:TimeStamp>
  </p1:Header>
  <p0:MaximumSupportingPoints>12</p0:MaximumSupportingPoints>
  <p0:Dynamic_SEReqControlMode>
    <p0:DepartureTime>3600</p0:DepartureTime>
    <p0:EVTargetEnergyRequest>
      <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">3</p1:Exponent>
      <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">60</p1:Value>
    </p0:EVTargetEnergyRequest>
    <p0:EVMaximumEnergyRequest>
      <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">3</p1:Exponent>
      <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">67</p1:Value>
    </p0:EVMaximumEnergyRequest>
    <p0:EVMinimumEnergyRequest>
      <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">0</p1:Exponent>
      <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">10</p1:Value>
    </p0:EVMinimumEnergyRequest>
  </p0:Dynamic_SEReqControlMode>
</p0:ScheduleExchangeReq>

```


ScheduleExchangeRes

```
<?xml version="1.0" encoding="UTF-8"?>
<p0:ScheduleExchangeRes xmlns:p0="urn:iso:std:iso:15118:-20:CommonMessages"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366044</p1:TimeStamp>
  </p1:Header>
  <p1:ResponseCode xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">OK</p1:ResponseCode>
  <p0:EVSEProcessing>Finished</p0:EVSEProcessing>
  <p0:Dynamic_SEResControlMode></p0:Dynamic_SEResControlMode>
</p0:ScheduleExchangeRes>
```

3.10. DC_CableCheckReq/Res

3.10.1 General

DC_CableCheckReq : empty

DC_CableCheckRes:

ResponseCode = OK

EVSEProcessing = Ongoing. Setting to Finished when cable check is done.

3.10.2 Error handling

None.

3.10.3 Message example

DC_CableCheckReq

```
<?xml version="1.0" encoding="UTF-8"?>
<p0:DC_CableCheckReq xmlns:p0="urn:iso:std:iso:15118:-20:DC"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366044</p1:TimeStamp>
  </p1:Header>
</p0:DC_CableCheckReq>
```

DC_CableCheckRes

```
<?xml version="1.0" encoding="UTF-8"?>
<p0:DC_CableCheckRes xmlns:p0="urn:iso:std:iso:15118:-20:DC"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366044</p1:TimeStamp>
  </p1:Header>
  <p1:ResponseCode xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">OK</p1:ResponseCode>
  <p0:EVSEProcessing>Finished</p0:EVSEProcessing>
</p0:DC_CableCheckRes>
```

3.11. DC_PreChargeReq/Res

3.11.1 General

DC_PreChargeReq :

EVProcessing = Ongoing. Setting to Finished when the EV wants to move onto the next sequence

EVPresentVoltage = present voltage of the EV measured at the EV inlet

EVTARGETVoltage = Voltage the EVSE shall reach for the EV to end the Precharge phase

DC_PreChargeRes:

ResponseCode = OK

EVSEPresentVoltage = EVSE output voltage

Note1: The definition and usage of the EVPresentVoltage and EVTARGETVoltage shall be referred to the CharIN Implementation Guideline – Bi-directional Power Transfer DC electric vehicle supply equipment related to IEC 61851-23 System C.

Note2: The precision of the measurement in the EV is defined in ISO 5474 series. The EVSE shall take this standardized measurement precision into account if it is taking this measurement value as base for certain decisions.

3.11.2 Error Handling

None.

3.11.3 Message Example

DC_PreChargeReq

```
<?xml version="1.0" encoding="UTF-8"?>
<p0:DC_PreChargeReq xmlns:p0="urn:iso:std:iso:15118:-20:DC"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366044</p1:TimeStamp>
  </p1:Header>
  <p0:EVProcessing>Ongoing</p0:EVProcessing>
  <p0:EVPresentVoltage>
    <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">0</p1:Exponent>
    <p1:Value xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">0</p1:Value>
  </p0:EVPresentVoltage>
  <p0:EVTargetVoltage>
    <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">0</p1:Exponent>
    <p1:Value xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">330</p1:Value>
  </p0:EVTargetVoltage>
</p0:DC_PreChargeReq>
```

DC_PreChargeRes

```
<?xml version="1.0" encoding="UTF-8"?>
<p0:DC_PreChargeRes xmlns:p0="urn:iso:std:iso:15118:-20:DC"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366044</p1:TimeStamp>
  </p1:Header>
  <p1:ResponseCode xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">OK</p1:ResponseCode>
  <p0:EVSEPresentVoltage>
    <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">0</p1:Exponent>
    <p1:Value xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">330</p1:Value>
  </p0:EVSEPresentVoltage>
</p0:DC_PreChargeRes>
```

3.12. PowerDeliveryReq/Res

3.12.1 General

PowerDeliveryReq :

EVProcessing = Ongoing / Finished

ChargeProgress = Start to start charging / Stop to stop charging

Note1: Pause, Standby, and schedule renegotiation are not supported in this guide.

Note2: There is a contradiction in the ISO 15118-20 standard on EVPowerProfile for Dynamic Control Mode. According to table 46 the parameter is optional but according to requirement [V2G20-1546] this is mandatory when ChargeProgress is equal to "Start" and "Stop". This implementation guide considers the parameter to be optional as there is no requirement on how the EVSE shall process the EVPowerProfile in dynamic mode. Therefore, it is not used in this guide.

Note3: BPT_ChannelSelection is only used if power channel switching is required between Charging and Discharging. Therefore not used in this guide.

PowerDeliveryRes:

ResponseCode = OK

3.12.2 Error handling

[ChIN-BPT-018] If ChargeProgress = Pause or Standby or Schedule renegotiation is used in PowerDeliveryReq, the SECC may terminate the charging process as if ChargeProgress = Stop is received in this guide.

[ChIN-BPT-019] If the EVSE is not able to perform power transfer in both directions, the message PowerDeliveryRes shall contain ResponseCode = FAILED_PowerDeliveryNotApplied.

Related requirements in ISO 15118-20: [V2G20-1411].

3.12.3 Message example

PowerDeliveryReq

```
<?xml version="1.0" encoding="UTF-8"?>
<p0:PowerDeliveryReq xmlns:p0="urn:iso:std:iso:15118:-20:CommonMessages"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366045</p1:TimeStamp>
  </p1:Header>
  <p0:EVProcessing>Finished</p0:EVProcessing>
  <p0:ChargeProgress>Start</p0:ChargeProgress>
  <p0:EVPowerProfile>
</p0:PowerDeliveryReq>
```

PowerDeliveryRes

```
<?xml version="1.0" encoding="UTF-8"?>
<p0:PowerDeliveryRes xmlns:p0="urn:iso:std:iso:15118:-20:CommonMessages"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366045</p1:TimeStamp>
  </p1:Header>
  <p1:ResponseCode xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">OK</p1:ResponseCode>
</p0:PowerDeliveryRes>
```

3.13. DC_ChargeLoopReq /Res

3.13.1. General

DC_ChargeLoopReq:

MeterInfoRequested = False or True

EVPresentVoltage = present voltage of the EV measured at the EV inlet

BPT_Dynamic_DC_CLReqControlMode: only mandatory parameters are used.

Note1: The EVMaximumV2XEnergyRequest and EVMinimumV2XEnergyRequest are optional parameters provided by the EV. Although there is no specific requirement, if these parameters are provided, it is recommended that the EVSE attempts to follow the rules described in the previous definitions in section 2.5.

Note2: EV may send DepartureTime if its Mobility needs changes during charge loop, the EVSE shall update the DepartureTime value accordingly.

Note3: the EVMaximumEnergyRequest and EVMinimumEnergyRequest may be used to limit the bi-directional power transfer region.

DC_ChargeLoopRes:

ResponseCode = OK

EVSEPresentCurrent

EVSEPresentVoltage

EVSEPowerLimitAchieved: true when EVSE has reached its power limit

EVSECurrentLimitAchieved: true when EVSE has reached its current limit

EVSEVoltageLimitAchieved: true when EVSE has reached its voltage limit

BPT_Dynamic_DC_CLResControlMode: only mandatory parameters are used

[ChIN-BPT-020] The EVSE shall respect the limits of EVMaximumPower and EVMaximumCurrent, whichever is lower, during the charging session.

Note5: the EV may reduce the EVMaximumChargeCurrent/EVMaximumDischargeCurrent to 0A in ChargeLoopReq for an EV initiated shutdown, so that the EVSE will follow the limit and reduce the current to 0A before shutdown. The current rampdown rate should be $\leq 20\text{A/s}$ according to IEC 61851-23.

Note6: the EVSE should reduce the EVSEMaximumChargeCurrent/EVSEMaximumDischargeCurrent to 0A with a rampdown rate of $\leq 20\text{A/s}$ according to IEC 61851-23 before initiating a session stop.

Note7: For certain use-cases it might be advantageous for the EV to know what the status of the grid is during DC_ChargeLoop. For example, an EV user might want to have a different discharge SoC limit when connected to the grid vs. when the grid is unavailable, or they might only want to discharge the EV when the grid is unavailable. To instantaneously change the EV behavior without terminating the active communication session, which results in a loss of power to the home for several seconds, the following implementation can be considered:

- During DC_ChargeLoop the EV can set MeterInfoRequested to true in every DC_ChargeLoopReq message
- During DC_ChargeLoop the EVSE can set MeterStatus to the values below and send those in every DC_ChargeLoopRes:
- Grid outage: MeterStatus = 100
- Grid available: MeterStatus = 200
- The EV can monitor those signals and adjust EV behavior accordingly

This proposal was made because there was no dedicated signal that described the grid status in the present version of ISO15118-20:2022(E) at the time this document was published. There are currently discussions

ongoing to add a grid status signal in the ISO 15118-200 standard. Once the ISO 15118-200 standard is published and the standard includes a grid status signal this solution will be obsolete.

3.13.3. Error handling

[ChIN-BPT-021] If the EVSE sends MeterInfo in DC_ChargeLoopRes when the MeterInfoRequested in DC_ChargeLoopReq = false, the EV shall ignore the MeterInfo received.

[ChIN-BPT-022] If the limits communicated in the DC_chargeLoopReq are exceeded by the EVSE (for example, EVSEPresentCurrent > EVMaximumChargeCurrent), the EVSE may expect that the EV terminates the charging session.

[ChIN-BPT-023] If the EVMaximumEnergyLevel /EVMinimumEnergyLevel are not fulfilled at anytime during the charging session (except when the charging session is started outside of the range of EVMaximumEnergyLevel/EVMinimumEnergyLevel), the EVSE may expect that the EV terminates the charging session by PowerDeliveryReq with ChargeProgress = STOP, followed by SessionStopReq with ChargingSession = Terminate.

Note: Please refer to Section 2.5 for the definition of EVMaximumEnergyLevel and EVMinimumEnergyLevel.

[ChIN-BPT-024] If the EVMinimumEnergyLevel is reached during discharging, the EVSE shall trigger the termination of the V2G communication session.

Note: if pause/standby are supported, the EVSE may choose to enter pause or standby mode depending on the implementation strategy. As these features are not used in this guide, the session will be terminated.

DC_ChargeLoopReq

```
<?xml version="1.0" encoding="UTF-8"?>
<p0:DC_ChargeLoopReq xmlns:p0="urn:iso:std:iso:15118:-20:DC"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366045</p1:TimeStamp>
  </p1:Header>
  <p1:MeterInfoRequested xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">false</p1:MeterInfoRequested>
  <p0:EVPresentVoltage>
    <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">0</p1:Exponent>
    <p1:Value xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">330</p1:Value>
  </p0:EVPresentVoltage>
  <p0:BPT_Dynamic_DC_CLReqControlMode>
```

```

<p1:EVTargetEnergyRequest xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
  <p1:Exponent>6</p1:Exponent>
  <p1:Value>6</p1:Value>
</p1:EVTargetEnergyRequest>
<p1:EVMaximumEnergyRequest xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
  <p1:Exponent>4</p1:Exponent>
  <p1:Value>7</p1:Value>
</p1:EVMaximumEnergyRequest>
<p1:EVMinimumEnergyRequest xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
  <p1:Exponent>0</p1:Exponent>
  <p1:Value>0</p1:Value>
</p1:EVMinimumEnergyRequest>
<p0:EVMaximumChargePower>
  <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">7</p1:Exponent>
  <p1:Value xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">1</p1:Value>
</p0:EVMaximumChargePower>
<p0:EVMinimumChargePower>
  <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">4</p1:Exponent>
  <p1:Value xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">5</p1:Value>
</p0:EVMinimumChargePower>
<p0:EVMaximumChargeCurrent>
  <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">4</p1:Exponent>
  <p1:Value xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">3</p1:Value>
</p0:EVMaximumChargeCurrent>
<p0:EVMaximumVoltage>
  <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">0</p1:Exponent>
  <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">360</p1:Value>
</p0:EVMaximumVoltage>
<p0:EVMinimumVoltage>
  <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">0</p1:Exponent>
  <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">310</p1:Value>
</p0:EVMinimumVoltage>
<p0:EVMaximumDischargePower>
  <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">5</p1:Exponent>
  <p1:Value xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">-1</p1:Value>
</p0:EVMaximumDischargePower>
<p0:EVMinimumDischargePower>
  <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">5</p1:Exponent>
  <p1:Value xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">-1</p1:Value>
</p0:EVMinimumDischargePower>
<p0:EVMaximumDischargeCurrent>

```



```

        <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">2</p1:Exponent>
        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">-4</p1:Value>
    </p0:EVMaximumDischargeCurrent>
    </p0:BPT_Dynamic_DC_CLReqControlMode>
</p0:DC_ChargeLoopReq>

```

DC_ChargeLoopRes

```

<?xml version="1.0" encoding="UTF-8"?>
<p0:DC_ChargeLoopRes xmlns:p0="urn:iso:std:iso:15118:-20:DC"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
        <p1:SessionID>3933323835363733</p1:SessionID>
        <p1:TimeStamp>1624366045</p1:TimeStamp>
    </p1:Header>
    <p1:ResponseCode xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">OK</p1:ResponseCode>
    <p0:EVSEPresentCurrent>
        <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">4</p1:Exponent>
        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">3</p1:Value>
    </p0:EVSEPresentCurrent>
    <p0:EVSEPresentVoltage>
        <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">3</p1:Exponent>
        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">3</p1:Value>
    </p0:EVSEPresentVoltage>
    <p0:EVSEPowerLimitAchieved>false</p0:EVSEPowerLimitAchieved>
    <p0:EVSECurrentLimitAchieved>false</p0:EVSECurrentLimitAchieved>
    <p0:EVSEVoltageLimitAchieved>false</p0:EVSEVoltageLimitAchieved>
    <p0:BPT_Dynamic_DC_CLResControlMode>
        <p0:EVSEMaximumChargePower>
            <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">3</p1:Exponent>
            <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">11</p1:Value>
        </p0:EVSEMaximumChargePower>
        <p0:EVSEMinimumChargePower>
            <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">0</p1:Exponent>
            <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">500</p1:Value>
        </p0:EVSEMinimumChargePower>
        <p0:EVSEMaximumChargeCurrent>
            <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">1</p1:Exponent>

```

```

        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">20</p1:Value>
    </p0:EVSEMaximumChargeCurrent>
    <p0:EVSEMaximumVoltage>
        <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">2</p1:Exponent>
        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">4</p1:Value>
    </p0:EVSEMaximumVoltage>
    <p0:EVSEMaximumDischargePower>
        <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">3</p1:Exponent>
        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">-11</p1:Value>
    </p0:EVSEMaximumDischargePower>
    <p0:EVSEMinimumDischargePower>
        <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">0</p1:Exponent>
        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">-500</p1:Value>
    </p0:EVSEMinimumDischargePower>
    <p0:EVSEMaximumDischargeCurrent>
        <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">1</p1:Exponent>
        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">-20</p1:Value>
    </p0:EVSEMaximumDischargeCurrent>
    <p0:EVSEMinimumVoltage>
        <p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">0</p1:Exponent>
        <p1:Value xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">-250</p1:Value>
    </p0:EVSEMinimumVoltage>
    </p0:BPT_Dynamic_DC_CLResControlMode>
</p0:DC_ChargeLoopRes>

```

3.14. DC_WeldingDetectionReq/Res

3.14.1. General

DC_WeldingDetectionReq:

EVProcessing = Ongoing / Finished till welding detection is done

DC_WeldingDetectionRes:

ResponseCode = OK

EVSEPresentVoltage = Voltage measured at the EVSE outlet

3.14.2. Error handling

None.

3.14.3. Message Example

DC_WeldingDetectionReq

```
<?xml version="1.0" encoding="UTF-8"?>
<p0:DC_WeldingDetectionReq xmlns:p0="urn:iso:std:iso:15118:-20:DC"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366048</p1:TimeStamp>
  </p1:Header>
  <p0:EVProcessing>Ongoing</p0:EVProcessing>
</p0:DC_WeldingDetectionReq>
```

DC_WeldingDetectionRes

```
<?xml version="1.0" encoding="UTF-8"?>
<p0:DC_WeldingDetectionRes xmlns:p0="urn:iso:std:iso:15118:-20:DC"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366048</p1:TimeStamp>
  </p1:Header>
  <p1:ResponseCode xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">OK</p1:ResponseCode>
  <p0:EVSEPresentVoltage>
```

```
<p1:Exponent xmlns:p1="urn:iso:std:iso:15118:-  
20:CommonTypes">0</p1:Exponent>  
<p1:Value xmlns:p1="urn:iso:std:iso:15118:-  
20:CommonTypes">300</p1:Value>  
</p0:EVSEPresentVoltage>  
</p0:DC_WeldingDetectionRes>
```

3.15. SessionStopReq /Res

3.15.1. General

SessionStopReq :

ChargingSession = Terminate

SessionStopRes :

ResponseCode = OK

Note: Pause & ServiceRenegotiate are not supported in this guide.

3.15.2. Error handling

[ChIN-BPT-025] If ChargingSession = Pause or ServiceRenegotiate is sent in SessionStopReq by the EVCC, the SECC shall send corresponding SessionStopRes with ResponseCode = FAILED_PauseNotAllowed, or FAILED_NoServiceRenegotiationSupported respectively according to ISO 15118-20 and terminate the charging session. and terminate the charging session.

Related ISO 15118-20 requirements: [V2G20-1955], [V2G20-1195].

If the sessionStopReq is sent before WeldingDetection (pre-mature session termination), the usage of EVTerminationCode/Explanation is encouraged for debugging purposes.

Optional elements :

- EVTerminationCode : 80 string
- EVTerminationExplanation : 160 string

SessionStopReq

```
<?xml version="1.0" encoding="UTF-8"?>
<p0:SessionStopReq xmlns:p0="urn:iso:std:iso:15118:-20:CommonMessages"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366049</p1:TimeStamp>
  </p1:Header>
  <p0:ChargingSession>Terminate</p0:ChargingSession>
</p0:SessionStopReq>
```

SessionStopRes

```
<?xml version="1.0" encoding="UTF-8"?>
<p0:SessionStopRes xmlns:p0="urn:iso:std:iso:15118:-20:CommonMessages"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <p1:Header xmlns:p1="urn:iso:std:iso:15118:-20:CommonTypes">
    <p1:SessionID>3933323835363733</p1:SessionID>
    <p1:TimeStamp>1624366049</p1:TimeStamp>
  </p1:Header>
  <p1:ResponseCode xmlns:p1="urn:iso:std:iso:15118:-
20:CommonTypes">OK</p1:ResponseCode>
</p0:SessionStopRes>
```

4. General Error handling

[ChIN-BPT-026] The ResponseCode in the following table shall be used according to the requirements in ISO 15118-20. The table is based on Table 224 and Table 226 in ISO 15118-20 with V2G messages which are used in this guide.

[ChIN-BPT-027] ISO 15118-20 [V2G20-459] shall apply.

ResponseCode (Enumeration)	V2G application layer protocol handshake messages			V2G application layer messages					
	SessionSetupRes	ServiceDiscoveryRes	ServiceDetailRes	ServiceSelectionRes	AuthorizationSetupRes	AuthorizationRes	ScheduleExchangeRes	PowerDeliveryRes	SessionStopRes
OK	x	x	x	x	x	x	x	x	x
OK_NewSessionEstablished	x								
WARNING_AuthorizationSelectionInvalid						x			
WARNING_EIMAuthorizationFailure						x			
WARNING_StandbyNotAllowed								x	
FAILED	x	x	x	x	x	x	x	x	x
FAILED_SequenceError	x	x	x	x	x	x	x	x	x
FAILED_UnknownSession		x	x	x	x	x	x	x	x
FAILED_ServiceIDInvalid			x						
FAILED_ServiceSelectionInvalid				x					
FAILED_NoEnergyTransferServiceSelected				x					
FAILED_NoServiceRenegotiationSupported				x					x
FAILED_ContactorError								x	

ResponseCode (Enumeration)	V2G application layer protocol handshake messages			V2G application layer messages					
	SessionSetupRes	ServiceDiscoveryRes	ServiceDetailRes	ServiceSelectionRes	AuthorizationSetupRes	AuthorizationRes	ScheduleExchangeRes	PowerDeliveryRes	SessionStopRes
FAILED_PowerDeliveryNotApplied								X	
FAILED_PauseNotAllowed									X

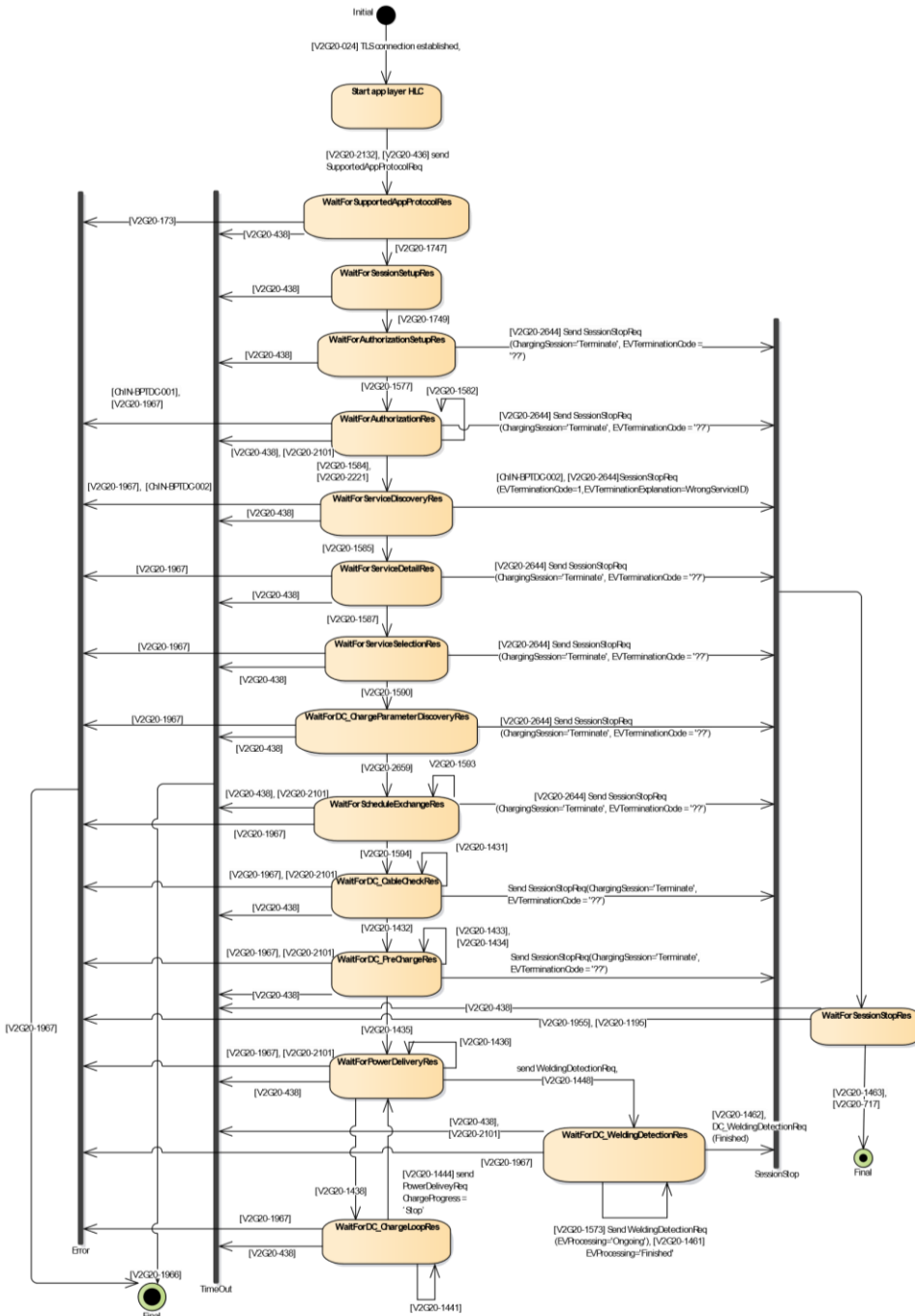
5.61851-1 CP State related requirements

[ChIN-BPT-028] ISO 15118-20 [V2G20-912], [V2G20-913], [V2G20-917], [V2G20-918], [V2G20-919], [V2G20-920], [V2G20-921], [V2G20-922] shall apply.

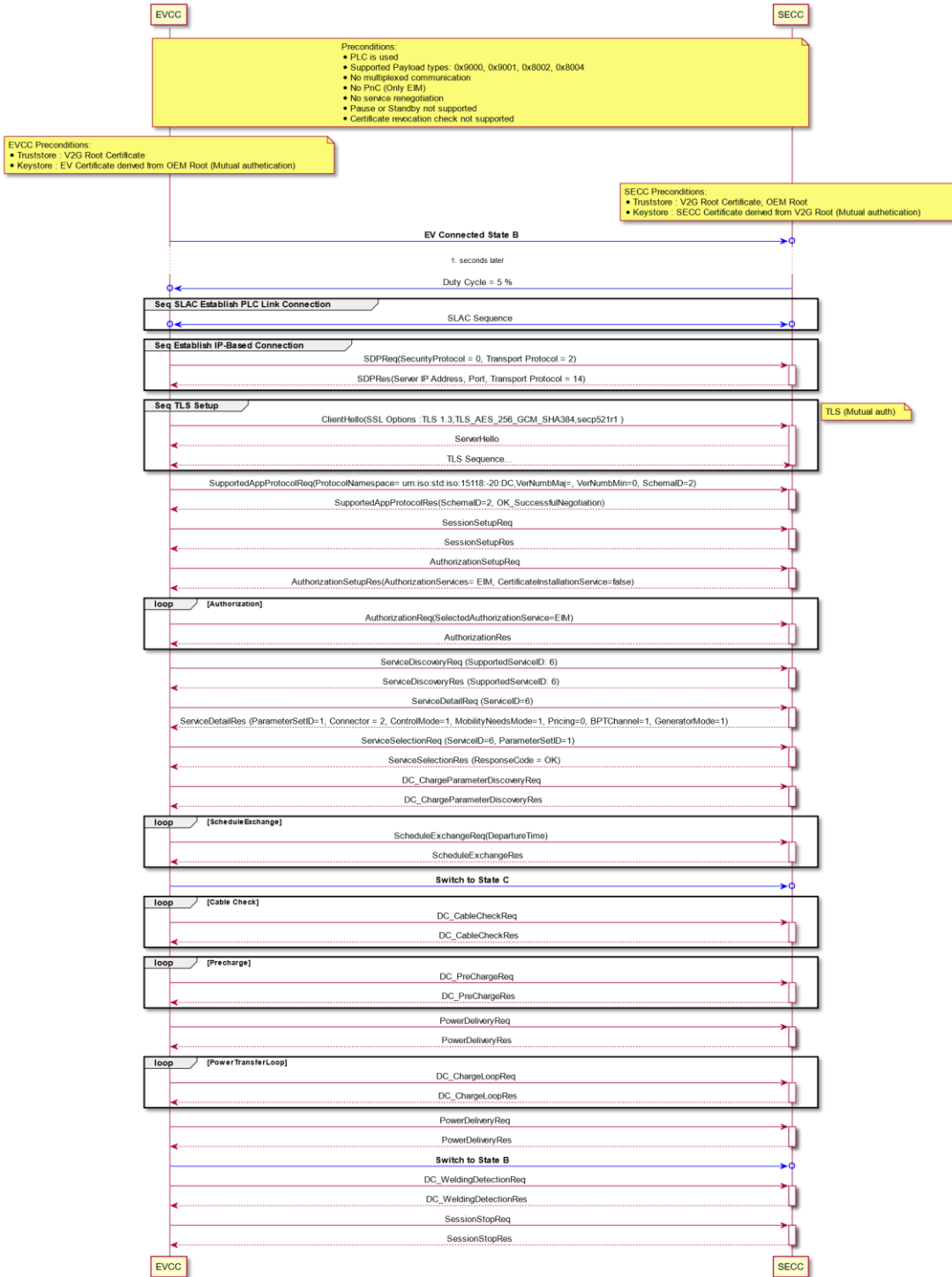
Note: the CP state change of B2 to C2 according to ISO 15118-20 happens after ScheduleExchange message instead of ChargeParameterDiscovery message in ISO 15118-2.

State Machine

EVCC State Machine



6. Communication Sequence





Note: the message timeouts, e.g. DC_ChargeLoopReq/Res for SECC and EVCC have been updated in ISO 15118-20 as compared to ISO 15118-2. Please refer to Table 214+215 and Table 217 (DC) for details.

7.61851-23 Safety related considerations

See [CharIN implementation Guideline](#) on Bi-directional Power Transfer related to IEC 61851-23 (only accessible for CharIN member).