Access, Interoperability and Regulation of DSP services
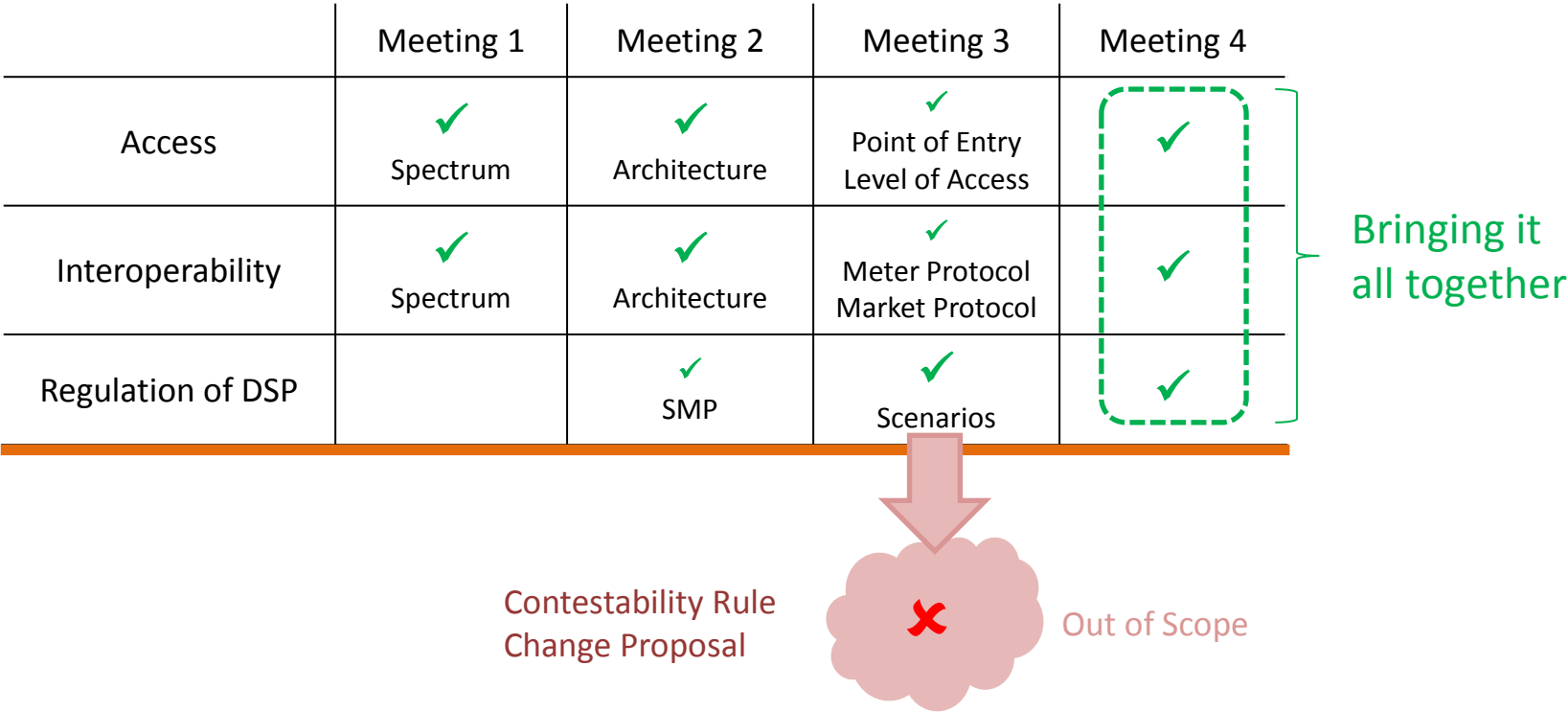
Meeting 4

Peter Egger and Dr Martin Gill

5th December 2013

Phacelift

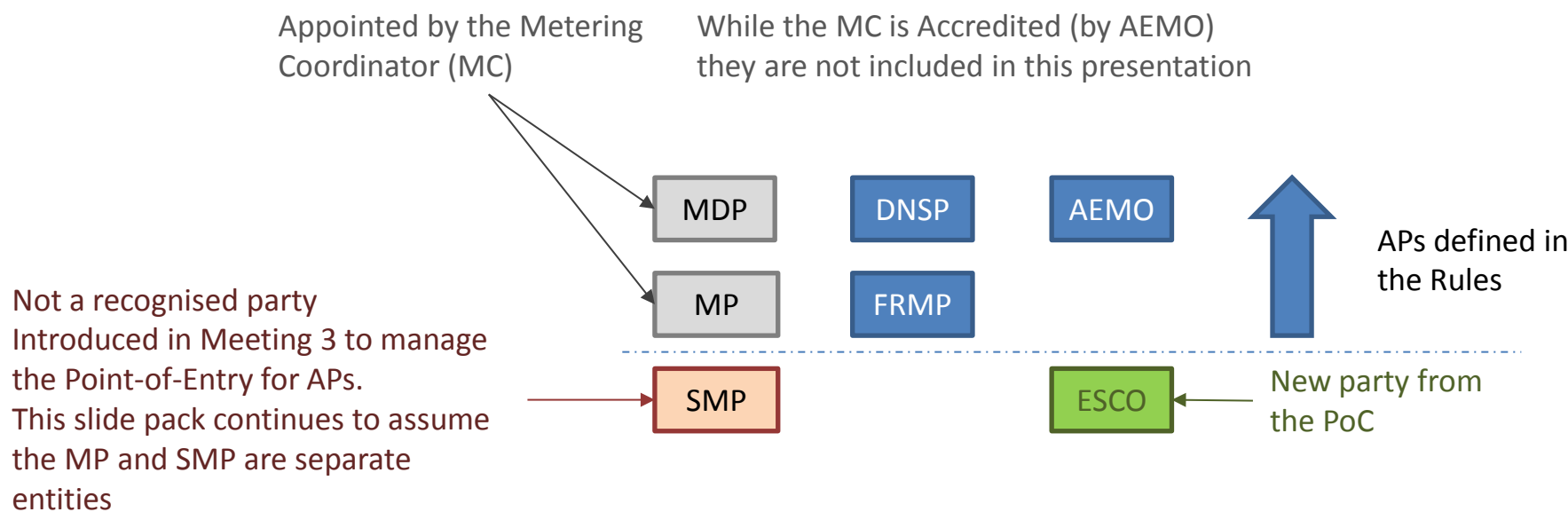# Bringing it all together

Framework supporting Open Access and Common Communication Standards

	Meeting 1	Meeting 2	Meeting 3	Meeting 4
Access	✓ Spectrum	✓ Architecture	✓ Point of Entry Level of Access	✓
Interoperability	✓ Spectrum	✓ Architecture	✓ Meter Protocol Market Protocol	✓
Regulation of DSP		✓ SMP	✓ Scenarios	✓

Bringing it all together

Contestability Rule Change Proposal

✗ Out of Scope

Phacelift

Agenda

- Introduction
  - ➢ The Accredited Parties
  - ➢ Discuss SMP and MP
  - ➢ Information Exchange
- Suitability of architectures described in the Rules to support Smart Meters
  - ➢ Point of Entry at the Meter
  - ➢ Market Point of Entry
    - → With Protocol Translation
    - → Without Protocol Translation
    - → Choice of two protocols
  - ➢ Two Points of Entry
  - ➢ Excluded Protocols
- Developing a protocol
- Conclusion
- Appendices
  - ➢ Describing duties assigned to the SMP
  - ➢ New Zealand
  - ➢ Point of Entry at the meter
  - ➢ Market Point of Entry

Phacelift

The Accredited Parties

Appointed by the Metering Coordinator (MC)

While the MC is Accredited (by AEMO) they are not included in this presentation

MDP   DNSP   AEMO

MP   FRMP

APs defined in the Rules

Not a recognised party
Introduced in Meeting 3 to manage the Point-of-Entry for APs.
This slide pack continues to assume the MP and SMP are separate entities

SMP   ESCO

New party from the PoC

Accredited Party (AP), being any one or all of the following:

AP

- MDP – Meter Data Provider
- MP – Metering Provider
- SMP – Smart Meter Provider (manages the PoE)
- DNSP – Distribution Network Service Provider
- FRMP – Financially Responsible Market Participant (Retailer)
- AEMO – Australian Energy Market Operator
- ESCO – Energy Services Company

PoE – Point-of-Entry
PoC – Power of Choice

Phacelift

The role of the SMP and MP

The deployment of Smart Meters with multi-party access places increased importance on the management of access, security, congestion and message validation when compared to "metrology (only) meters".

Currently the MP has not been assigned duties associated with this increased emphasis.

There are several options available including:

➢ Recognise the increased emphasis in the role of the MP

➢ Assign the duties to another role that is engaged by the Metering Coordinator

The use of the term SMP in these presentations has allowed the new duties to be clearly identified without forming a view of which option should be exercised.

Phacelift

Comparing the duties of the SMP and MP

The SMP's duties identified in the access and interoperability architecture includes:

➢ Provide and manage the Point of Entry used by APs to reach the meter for ALL functionality
  → Level of Access
  → Security Arrangements
  → Congestion Management
  → Validating Messages (sent between Smart Meters and APs and vice-versa)
➢ The SMP incurs significant OPEX to provide software to manage the PoE and use of communications networks.
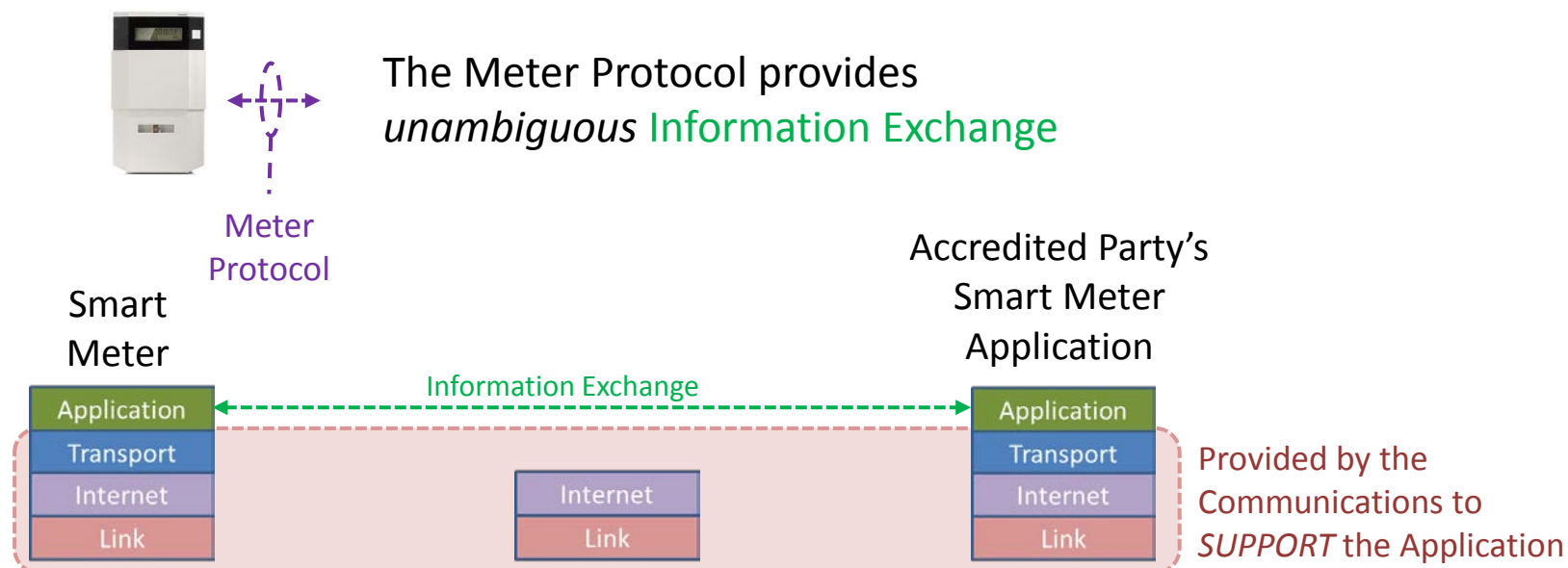
Currently the MP's duties include:

➢ Configure the meter for metrology
  → Metrology settings
  → Manage congestion (if required)
➢ The MP incurs significant CAPEX to cover the cost of installed meters, communications modems and if necessary, private communications networks

Phacelift

Protocols provide Information Exchange

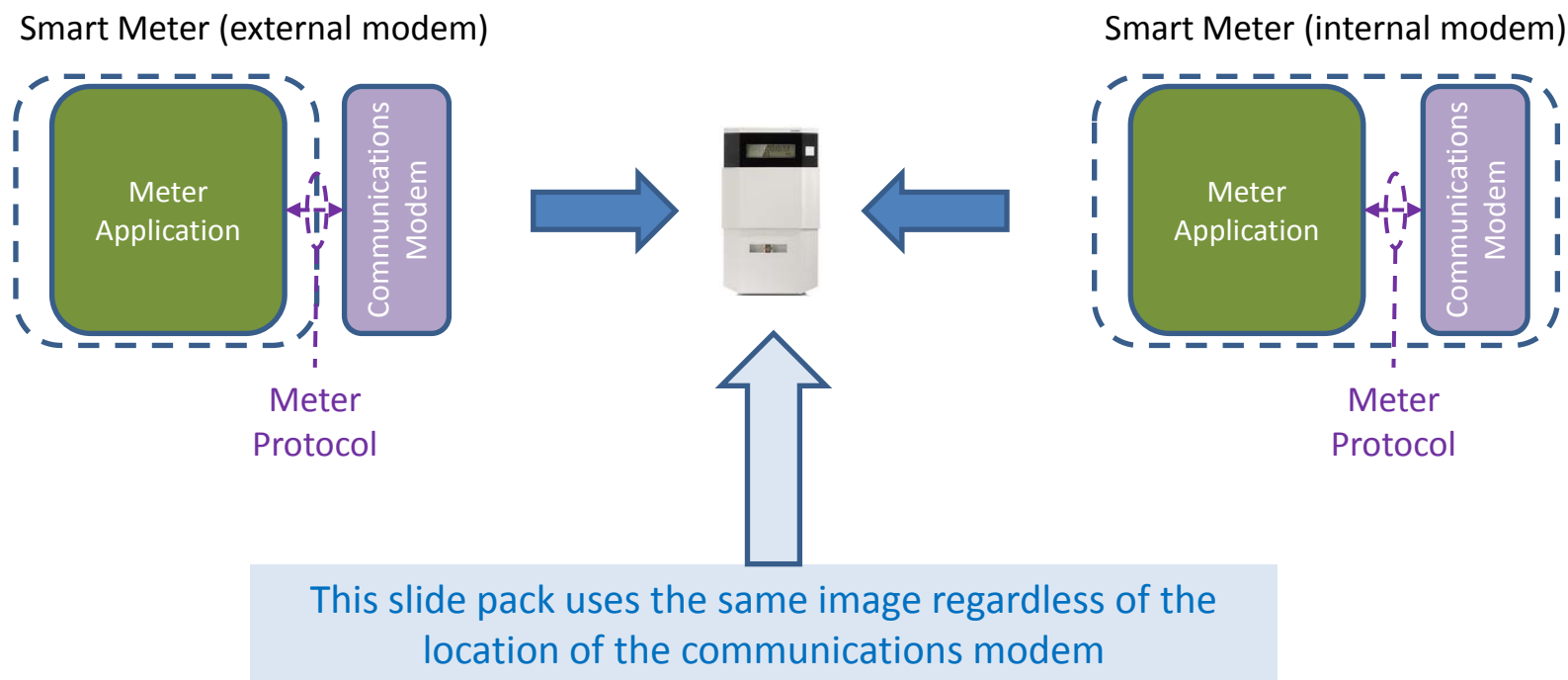The review of International Communication Standards revealed:

- Modern protocols separate the Application from the Communications Technology (using the Internet Layers)
- Separation of the Application from the Communications allows Smart Meter deployments to use a wide range of different communications technologies (provided they support required Internet Layers)
- An example of a modern meter protocol separating the Application from the Communications is DLMS/COSEM

The Meter Protocol provides
unambiguous Information Exchange

Meter
Protocol

Smart
Meter

Accredited Party's
Smart Meter
Application

Information Exchange

Application		Application
Transport		Transport
Internet	Internet	Internet
Link	Link	Link

Provided by the
Communications to
SUPPORT the Application

Phacelift

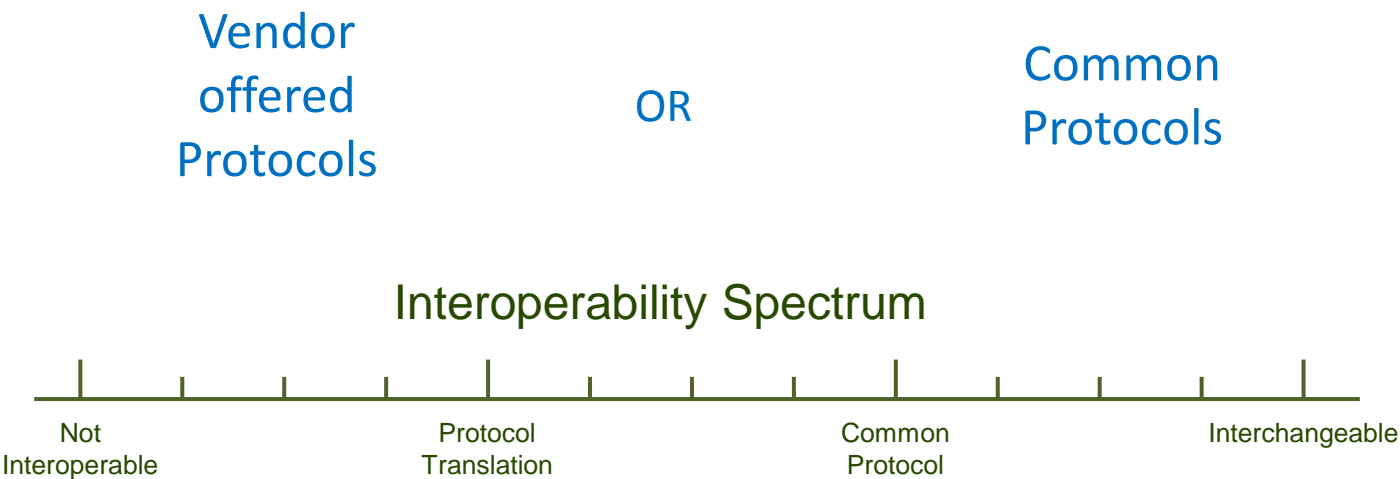# Smart Meter modem supports information exchange

From the perspective of a framework supporting access and interoperability for smart meters the location of the communications modem used by the Smart Meter is unimportant
The modem is dedicated to *supporting* information exchange

Smart Meter (external modem)

Smart Meter (internal modem)

Meter Application

Communications Modem

Meter Application

Communications Modem

Meter Protocol

Meter Protocol

This slide pack uses the same image regardless of the location of the communications modem

Interoperability Spectrum

Taking a high level view we have two alternatives:

Vendor
offered
Protocols   OR   Common
                                                   Protocols

Interoperability Spectrum

Not   Protocol   Common   Interchangeable
Interoperable   Translation   Protocol

APs must support   APs can use a single
multiple Smart Meter   Smart Meter
Applications to   Application to interact
interact with installed   with installed meters
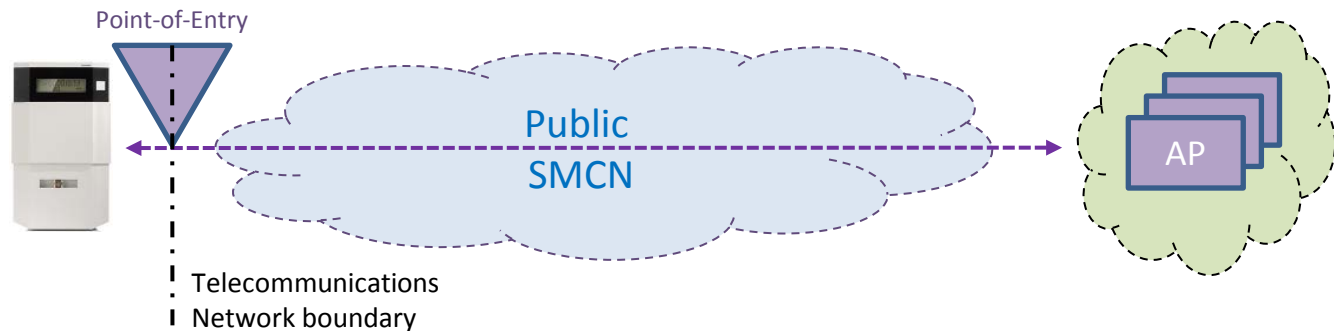meters

Phacelift

The Rules have two Foundation Architectures

Foundation architectures described in the Rules support
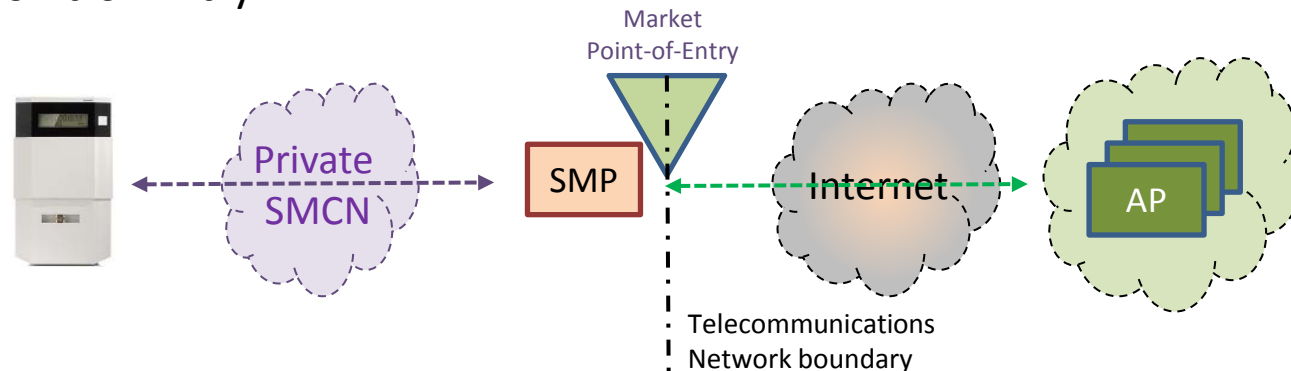two locations for the Telecommunications Boundary

Communications
Network

Telecommunications
Network boundary
(at the site boundary)

Telecommunications
Network boundary
(remote from the
site boundary)

MDP

MP

SMP

DNSP

FRMP

ESCO

Accredited Party's
Smart Meter
Application

Smart Meter

Both architectures support
Information Exchange

| Application |
| Transport |
| Internet |
| Link |

| Internet |
| Link |

| Application |
| Transport |
| Internet |
| Link |

Provided by the
Communications
Network

Phacelift

Describing the two architectures in the Rules

We choose to describe the two foundation architectures as:
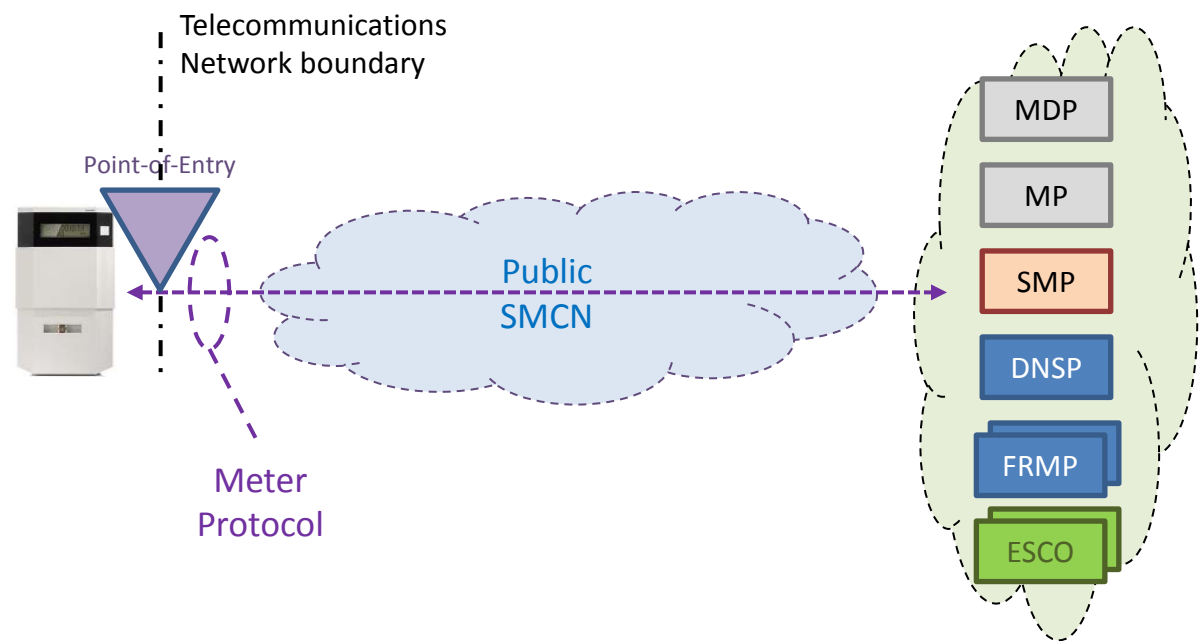
Point-of-Entry at the meter

Market Point-of-Entry

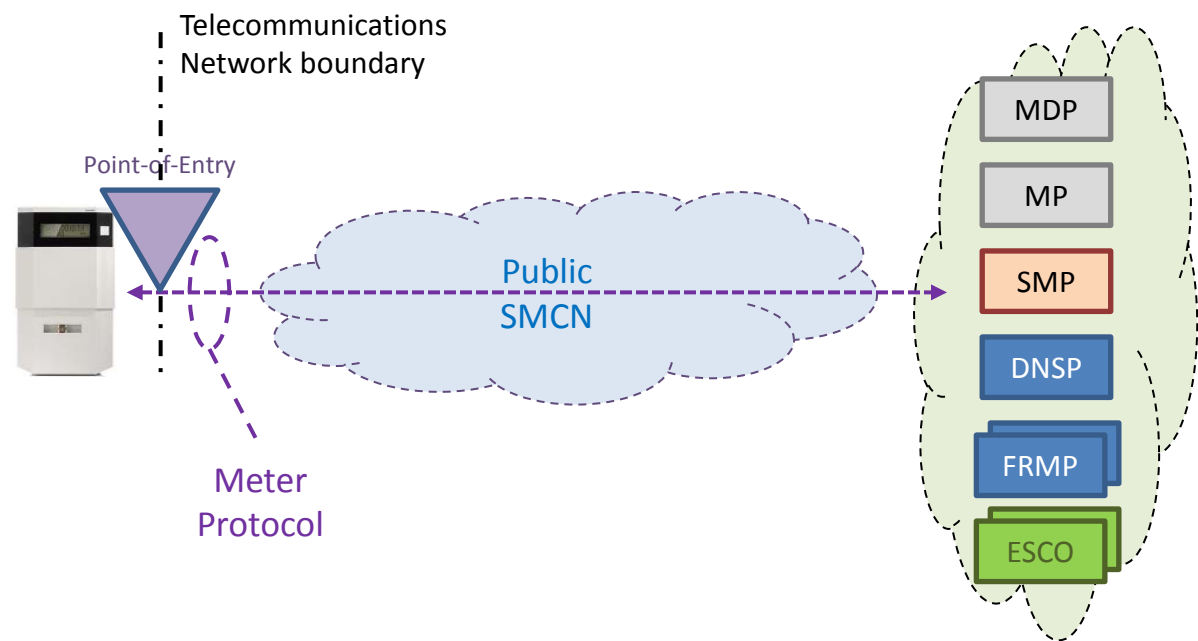The following slides propose protocols for these architectures

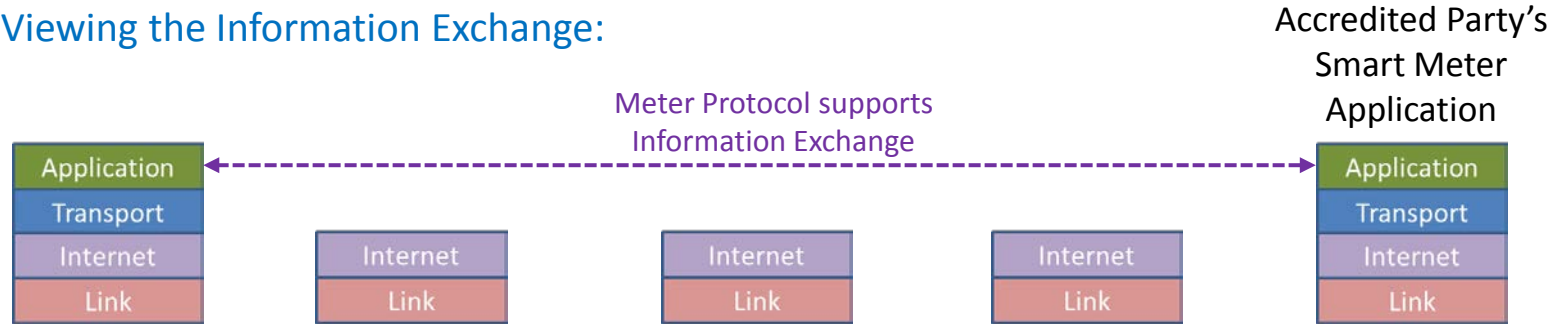Phacelift

Foundation Architecture: Point-of-Entry at the meter

Telecommunications
Network boundary

Point-of-Entry

Meter
Protocol

Public
SMCN

MDP

MP

SMP

DNSP

FRMP

ESCO

In this architecture the Telecommunications Network Boundary is located at the site boundary.
This architecture relies on the Smart Meter controlling access by Accredited Parties.

Appendix C also considers the PoE at the meter

Phacelift
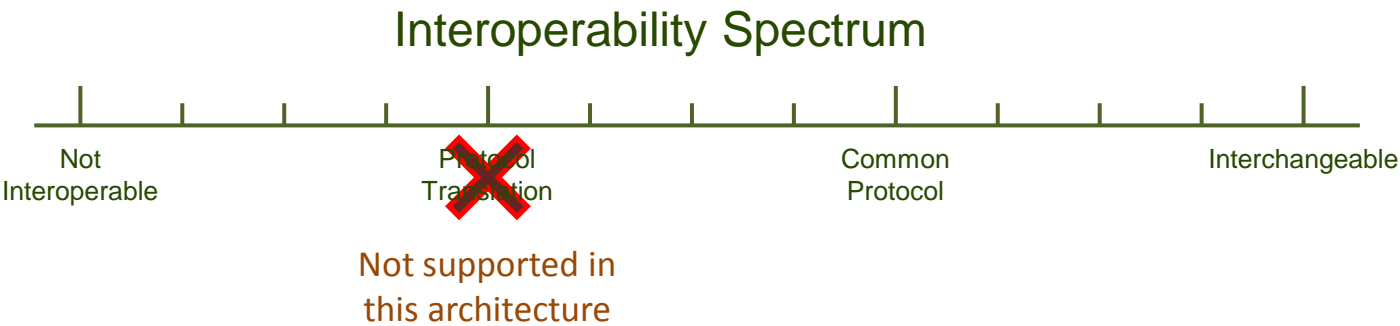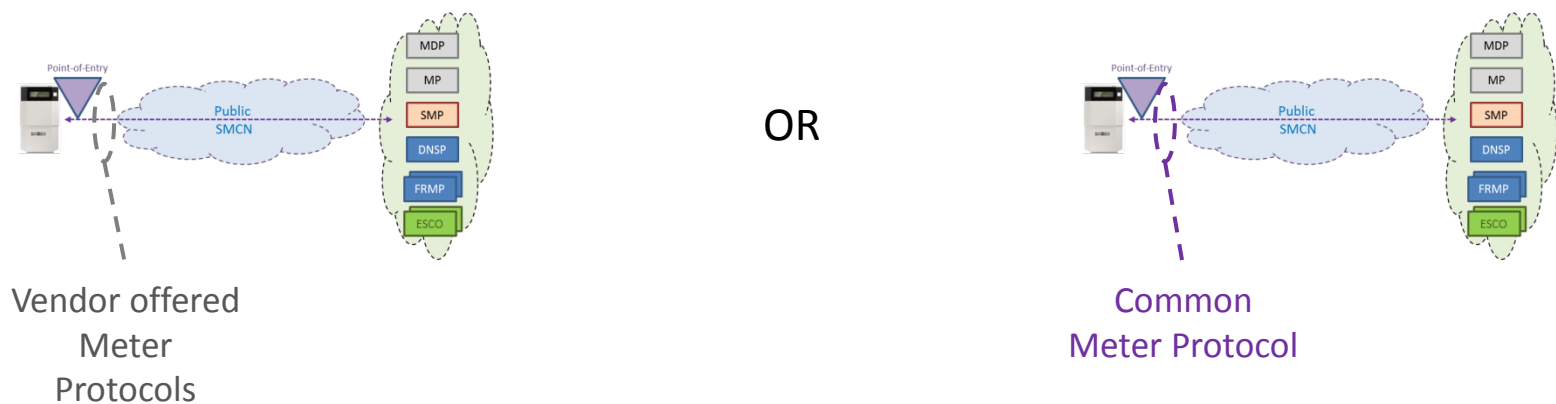
Information Exchange: PoE at the Meter

Telecommunications
Network boundary

Point-of-Entry

Public
SMCN

Meter
Protocol

MDP

MP

SMP

DNSP

FRMP

ESCO

Viewing the Information Exchange:

Meter Protocol supports
Information Exchange

Accredited Party's
Smart Meter
Application

| Application |
| Transport |
| Internet |
| Link |

| Internet |
| Link |

| Internet |
| Link |

| Internet |
| Link |

| Application |
| Transport |
| Internet |
| Link |

Requesting Feedback: PoE at the meter

> **Hypothesis**
> The efficient provision of services requires a common protocol at the meter

Vendor offered
Meter
Protocols

OR

Common
Meter Protocol

Interoperability Spectrum

Not
Interoperable

Protocol
Translation

Common
Protocol

Interchangeable

Not supported in
this architecture

We are seeking comments and views on the following point:

- Is a common meter protocol the most efficient option when using a Point of Entry at the meter?
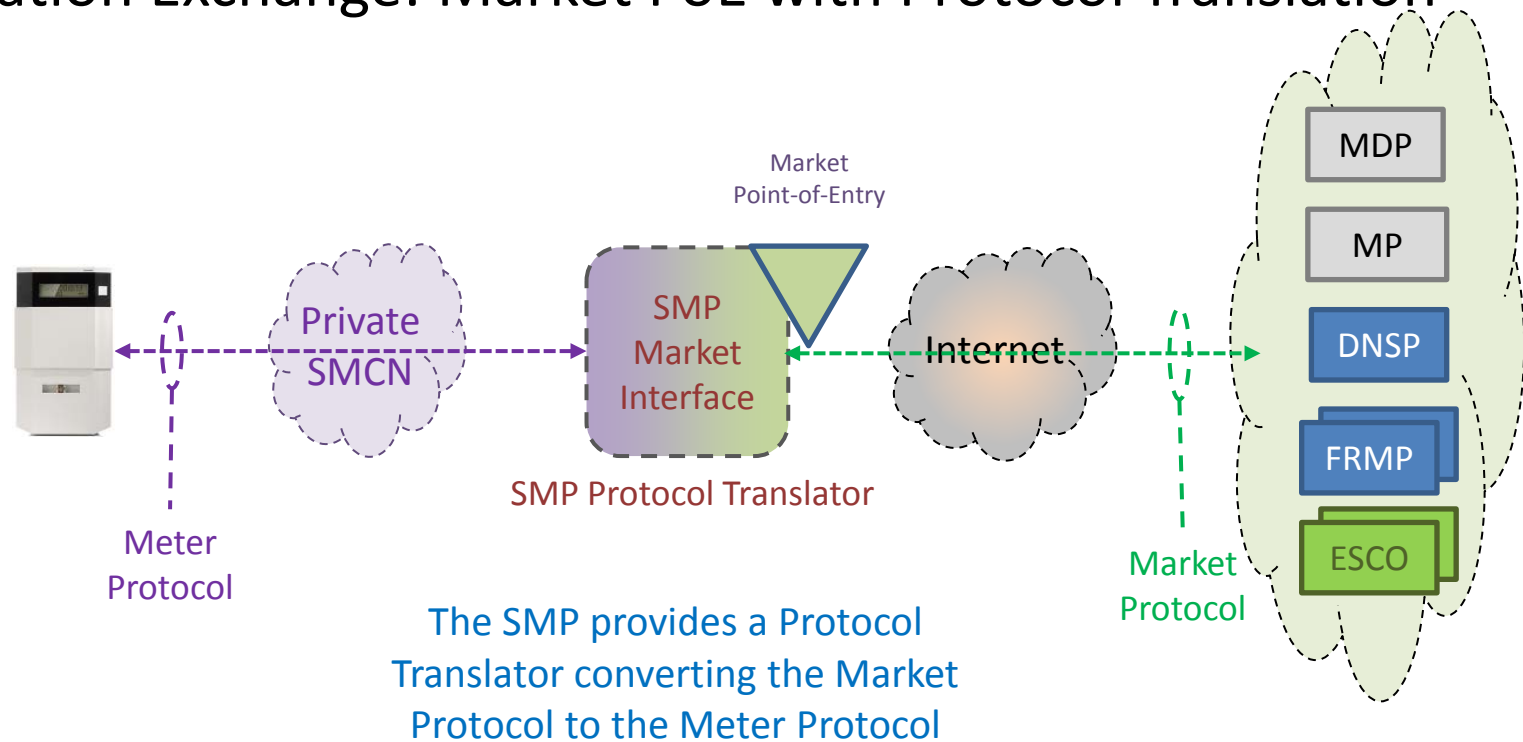
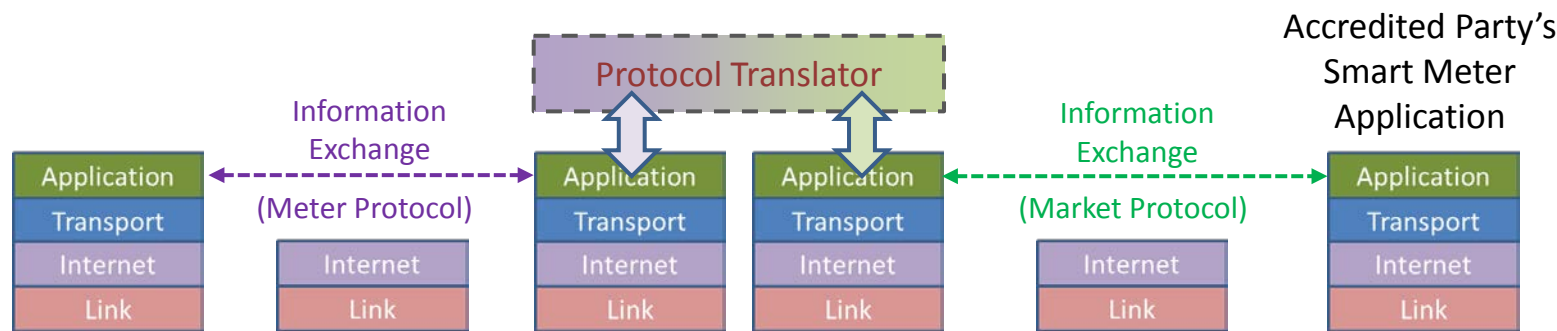# Foundation Architecture: Market Point-of-Entry

In this architecture the use of a Private SMCN shifts the Telecommunications Network Boundary to a position remote from the meter.

Appendix D also considers the Market PoE

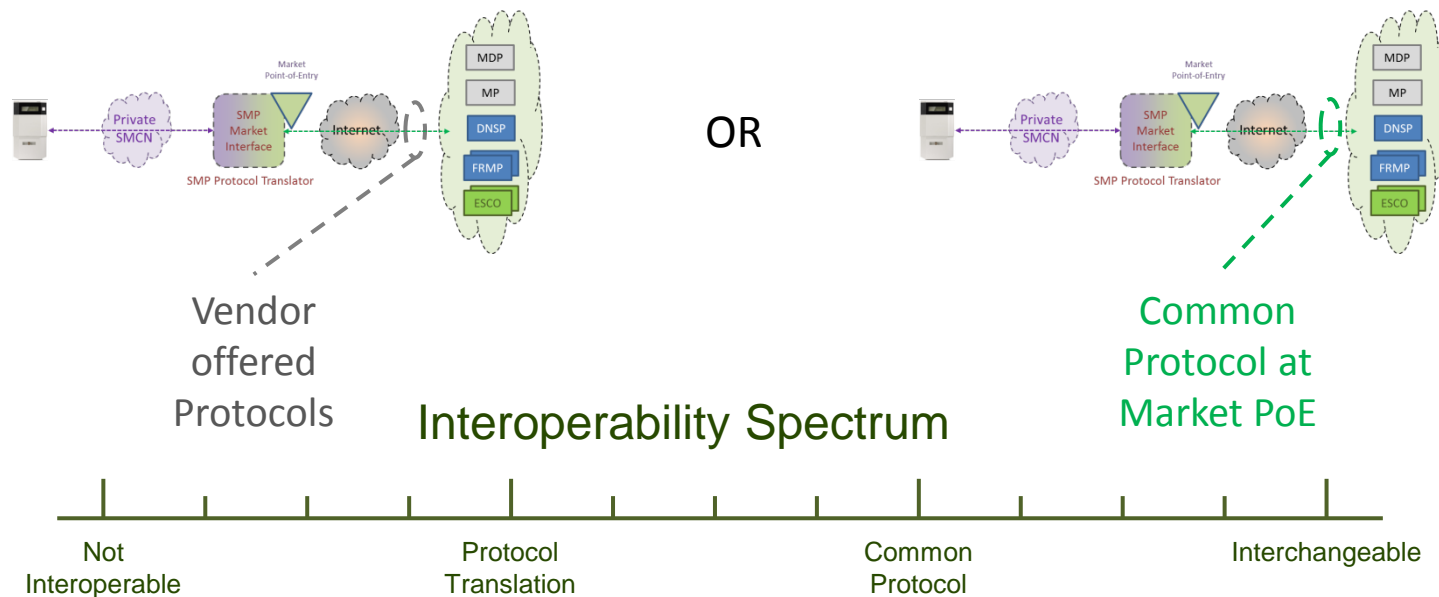# Information Exchange: Market PoE with Protocol Translation

Market
Point-of-Entry

Private
SMCN

SMP
Market
Interface

Internet

MDP

MP

DNSP

FRMP

ESCO

SMP Protocol Translator

Meter
Protocol

Market
Protocol

The SMP provides a Protocol
Translator converting the Market
Protocol to the Meter Protocol

Viewing the Information Exchange:

Protocol Translator

Accredited Party's
Smart Meter
Application

Information
Exchange

(Meter Protocol)

Information
Exchange

(Market Protocol)

Application		Application	Application		Application
Transport		Transport	Transport		Transport
Internet	Internet	Internet	Internet	Internet	Internet
Link	Link	Link	Link	Link	Link

Phacelift

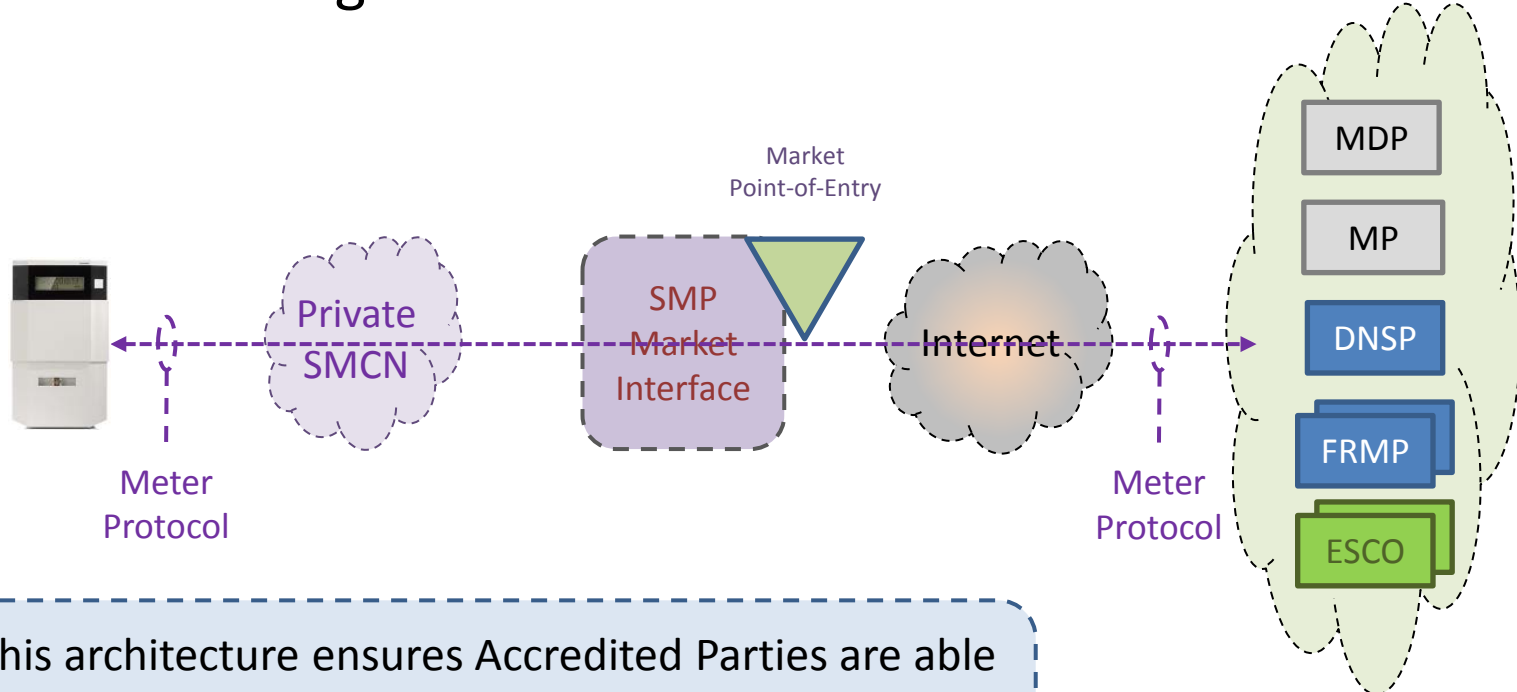# Requesting Feedback: Market PoE with Protocol Translation

Hypothesis

When the SMP offers access via a protocol translator the efficient provision of services requires a common protocol at the market point of entry

OR

Vendor offered Protocols

Common Protocol at Market PoE

Interoperability Spectrum

Not Interoperable | Protocol Translation | Common Protocol | Interchangeable

We are seeking comments and views on the following point:
- Is a common market protocol the most efficient option when the SMP offers access via a protocol translator?

Phacelift

Information Exchange: Market PoE without Protocol Translation

Market
Point-of-Entry

MDP

MP

Private
SMCN

SMP
Market
Interface

Internet

DNSP

FRMP

ESCO

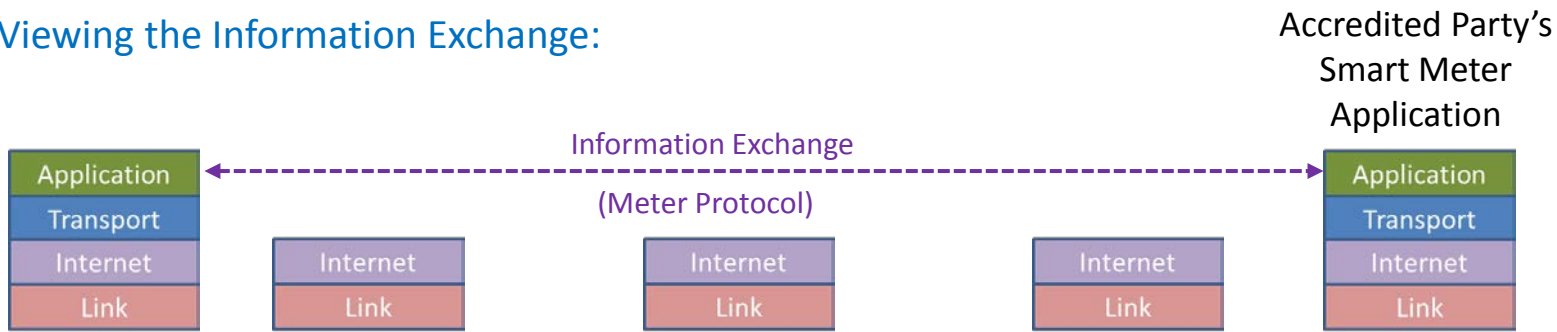Meter
Protocol

Meter
Protocol

New
Functions

Advanced
Functions

Basic
Functions

This architecture ensures Accredited Parties are able to access New Functionality and avoids delays in updating the SMP's Protocol Translator
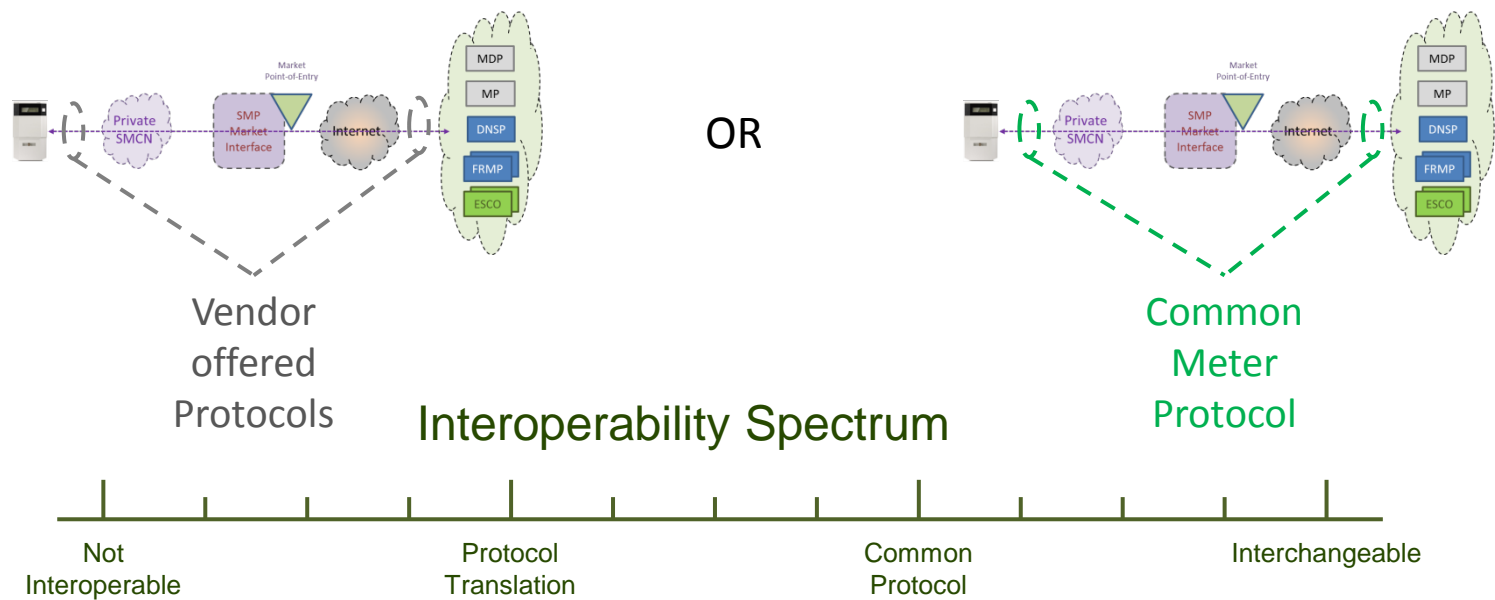
Viewing the Information Exchange:

Accredited Party's
Smart Meter
Application

| Application |
| Transport |
| Internet |
| Link |

Information Exchange

(Meter Protocol)

| Application |
| Transport |
| Internet |
| Link |

| Internet |
| Link |

| Internet |
| Link |

| Internet |
| Link |

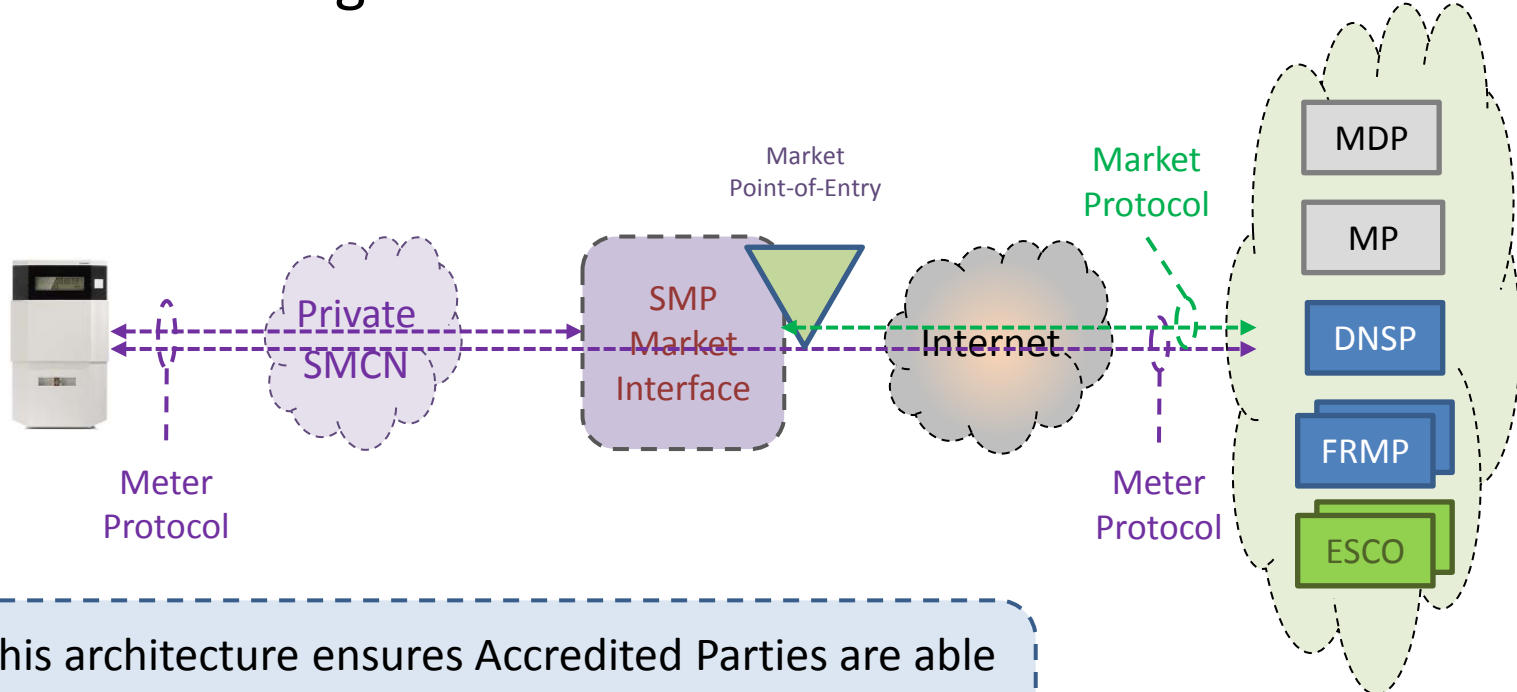# Requesting Feedback: Market PoE without Protocol Translation

Hypothesis

When the SMP offers access without a protocol translator the efficient provision of services requires a common meter protocol at the market point of entry

OR

Vendor offered Protocols

Common Meter Protocol

Interoperability Spectrum

| Not Interoperable | Protocol Translation | Common Protocol | Interchangeable |

We are seeking comments and views on the following point:

- Is a common meter protocol the most efficient option when the SMP offers access without a protocol translator?
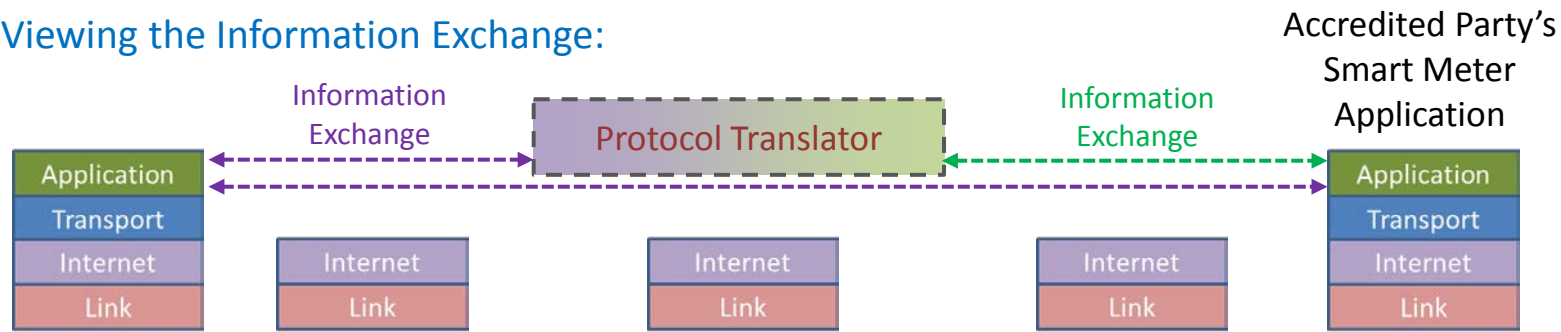
Phacelift

Information Exchange: Market PoE with a choice of Protocols

Market
Point-of-Entry

Market
Protocol

Private
SMCN

SMP
Market
Interface

Internet

Meter
Protocol

Meter
Protocol

MDP

MP

DNSP

FRMP

ESCO

New Functions

Advanced Functions

Basic Functions

This architecture ensures Accredited Parties are able to access New Functionality. Basic and Advanced functions are also supported by a Market protocol
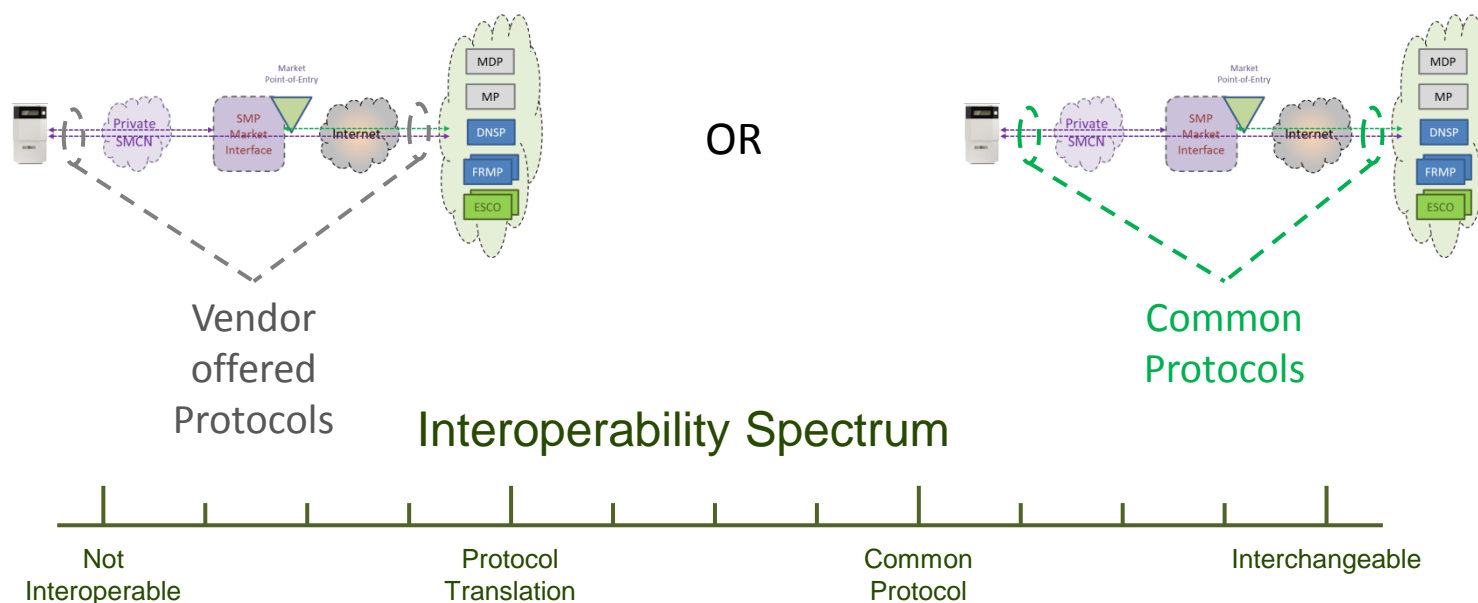
Viewing the Information Exchange:

Accredited Party's
Smart Meter
Application

Information
Exchange

Protocol Translator

Information
Exchange

Application
Transport
Internet
Link

Internet
Link

Internet
Link

Internet
Link

Application
Transport
Internet
Link

Phacelift

Requesting Feedback: Market PoE with a choice of Protocols

Hypothesis

When the Market PoE offers APs the choice of protocols the most efficient solution is to (heavily) base the market protocol on a common meter protocol
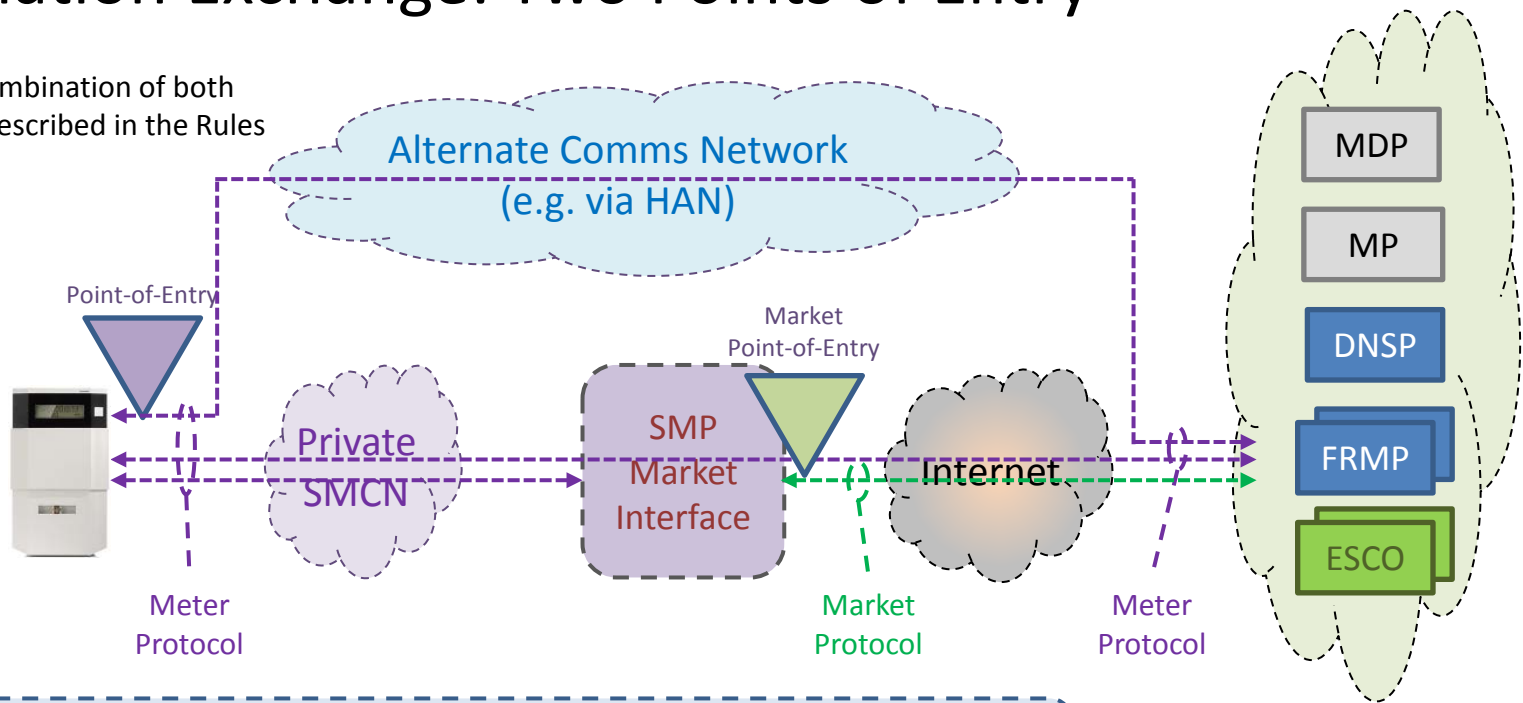

OR

Vendor offered Protocols

Common Protocols

Interoperability Spectrum

| Not Interoperable | Protocol Translation | Common Protocol | Interchangeable |

We are seeking comments and views on the following point:

- Is a common market protocol based on a common meter protocol the most efficient option when the SMP offers APs a choice of protocols?
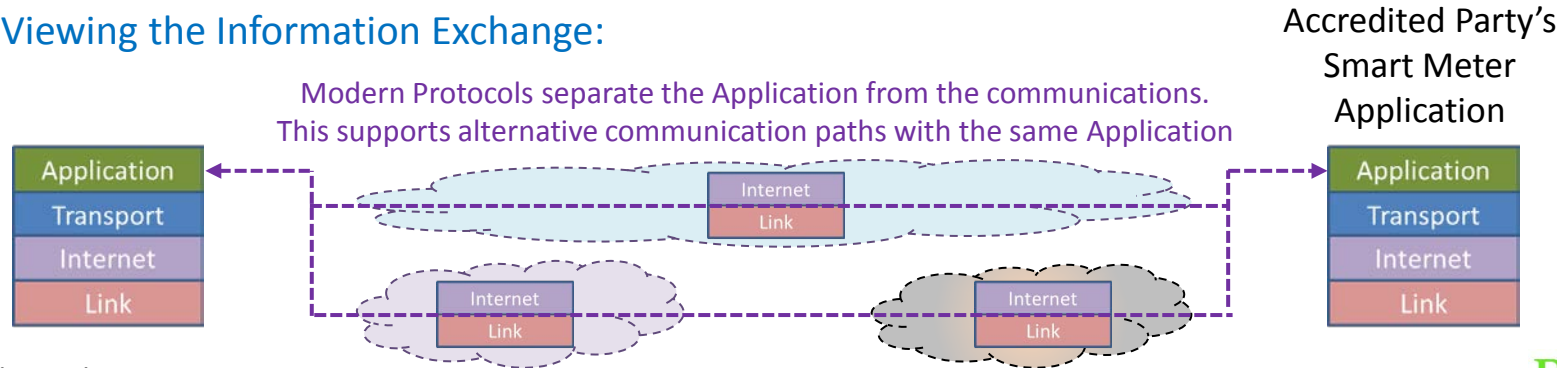
Phacelift

Information Exchange: Two Points of Entry

Essentially a combination of both architectures described in the Rules

Alternate Comms Network (e.g. via HAN)

MDP

MP

DNSP

Point-of-Entry

Market Point-of-Entry

SMP Market Interface

Private SMCN

Internet

FRMP
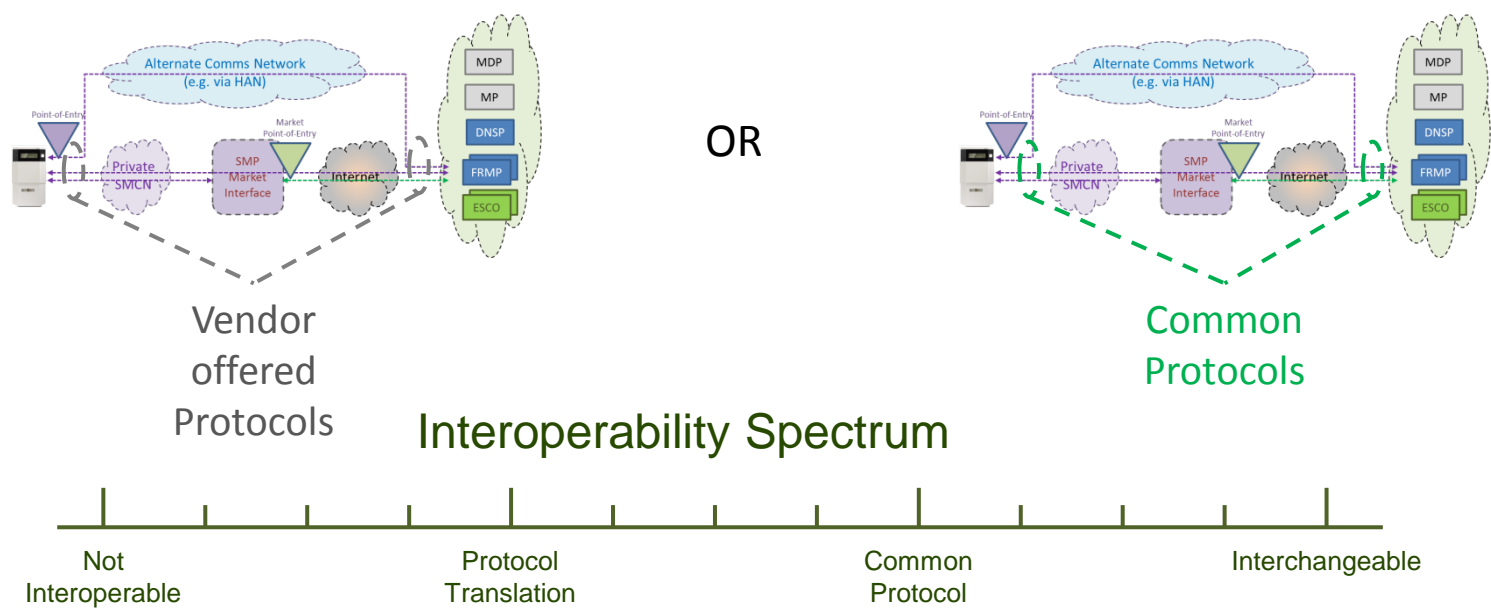
ESCO

Meter Protocol

Market Protocol

Meter Protocol

This architecture offers APs the ability to utilise alternative communications paths (e.g. offering higher performance levels)

Viewing the Information Exchange:

Accredited Party's Smart Meter Application

Modern Protocols separate the Application from the communications. This supports alternative communication paths with the same Application

Application
Transport
Internet
Link

Internet
Link

Internet
Link

Internet
Link

Application
Transport
Internet
Link

Phacelift

Requesting Feedback: Two PoE

> **Hypothesis**
> When SMPs offer APs a Market PoE and a PoE at the meter the most efficient solution is to (heavily) base the market protocol on a common meter protocol
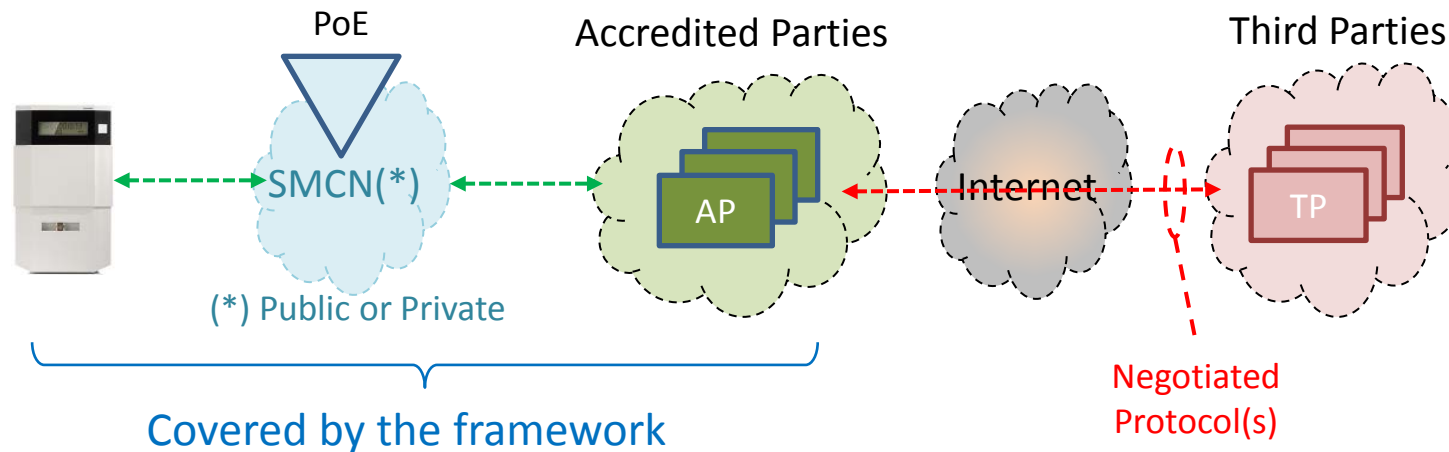

OR

Vendor offered Protocols

Common Protocols

Interoperability Spectrum

| Not Interoperable | Protocol Translation | Common Protocol | Interchangeable |

We are seeking comments and views on the following point:

- Is a common market protocol based on a common meter protocol the most efficient option when the SMP offers APs two points of entry?

Phacelift

Requesting Feedback: Excluded Protocols

Hypothesis
Other protocols may be offered. These are excluded from the proposed framework.
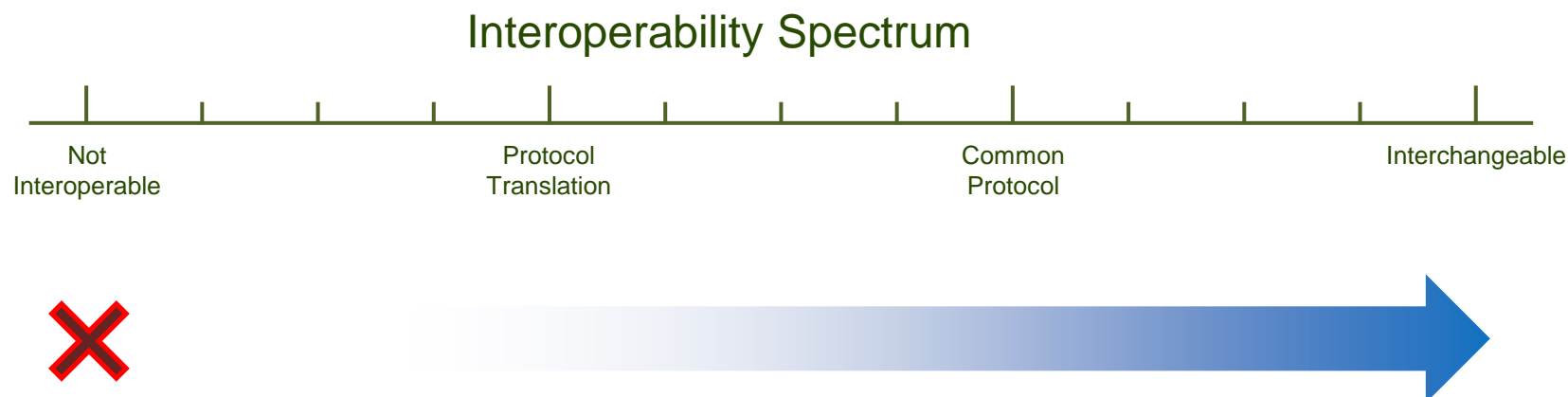

APs are able to offer smart meter functionality to third parties.
Protocols are contractually negotiated between the AP and third party
These protocols are excluded from the proposed framework
e.g. A protocol offered to Customers to control their HAN devices

We are seeking comments and views on the following point:
- Some protocols will be excluded from the proposed framework

Clarification

Interoperability Spectrum

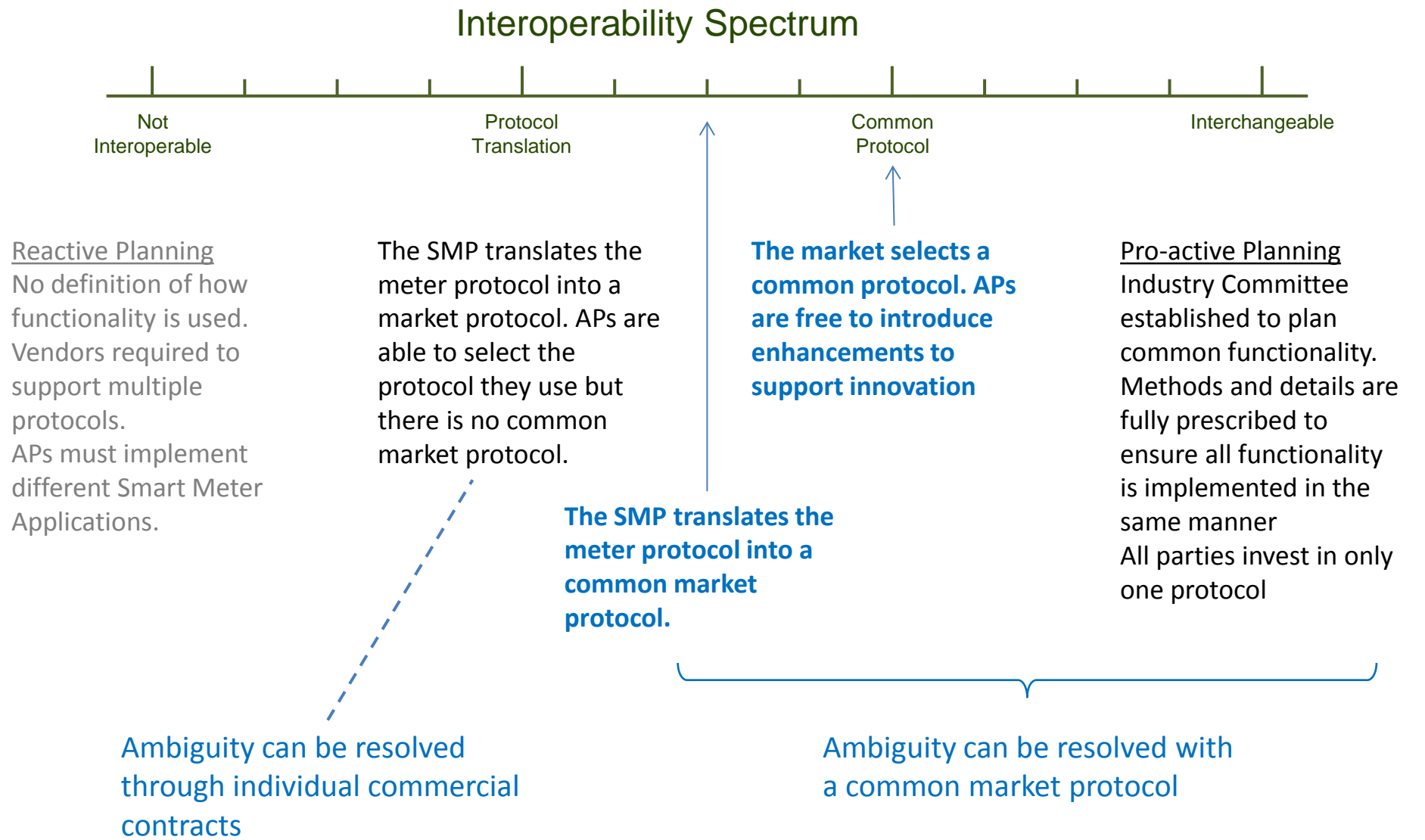| Not Interoperable | Protocol Translation | Common Protocol | Interchangeable |

The following slides ASSUME Accredited Parties wish to use:

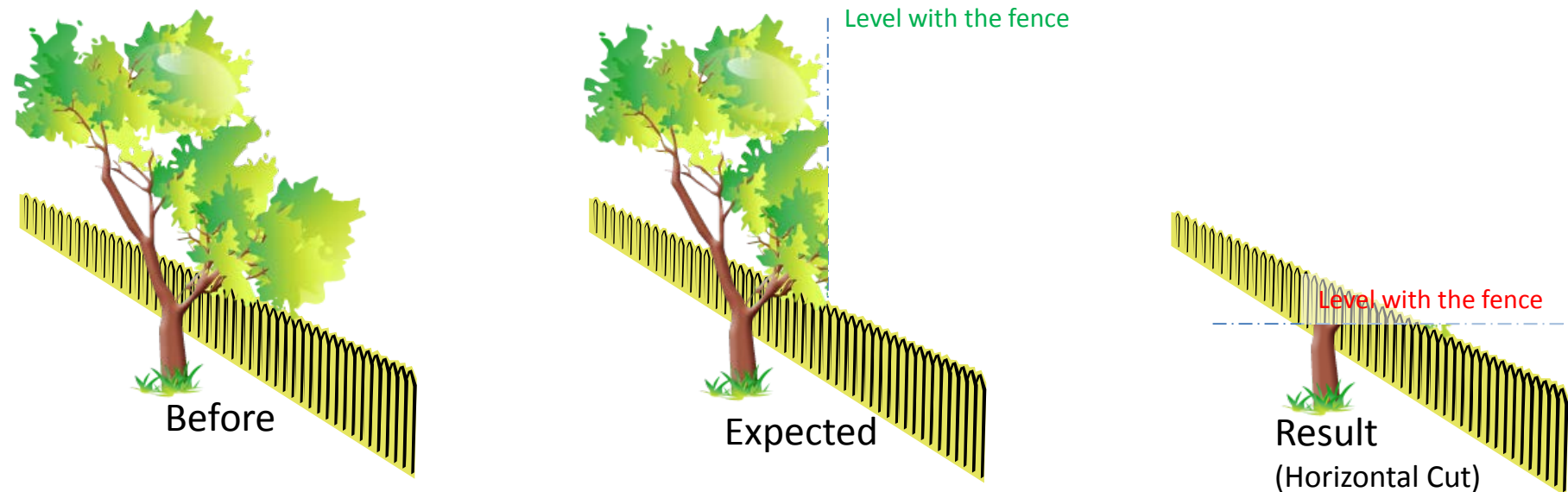- A Market Point of Entry
- A single Smart Meter Application

We therefore examine points on the Interoperability Spectrum using this assumption

Resource implications and ambiguity

Interoperability Spectrum

Not Interoperable   Protocol Translation   Common Protocol   Interchangeable

Reactive Planning
No definition of how functionality is used. Vendors required to support multiple protocols.
APs must implement different Smart Meter Applications.

The SMP translates the meter protocol into a market protocol. APs are able to select the protocol they use but there is no common market protocol.

The market selects a common protocol. APs are free to introduce enhancements to support innovation

Pro-active Planning
Industry Committee established to plan common functionality. Methods and details are fully prescribed to ensure all functionality is implemented in the same manner
All parties invest in only one protocol

The SMP translates the meter protocol into a common market protocol.

Ambiguity can be resolved through individual commercial contracts

Ambiguity can be resolved with a common market protocol

Phacelift

Importance of removing ambiguity

Ambiguity will have a **significant** influence on the outcome

"Trim the tree level with the fence"

Before

Expected

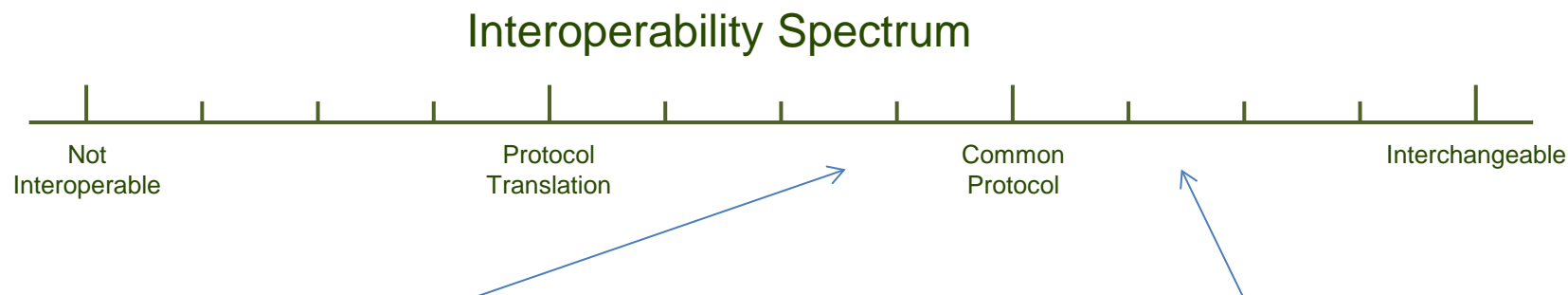Level with the fence

Result
(Horizontal Cut)

For the common market protocol to efficiently support interoperability it must **unambiguously** define all requirements for all Accredited Parties

When developing a common market protocol:
- Where do the protocols come from?
- How are messages unambiguously described (for use by all APs)?

Phacelift

Starting position for resolving ambiguity

The development of an unambiguous Common Market Protocol can start from two positions :

Interoperability Spectrum

| Not Interoperable | Protocol Translation | Common Protocol | Interchangeable |

All protocol translators convert the various vendor meter protocols into a common market protocol.

The common market protocol is based on a common meter protocol

Vendor Meter Protocols
All APs invest in the development of the common market protocol, but this may be complicated by access to proprietary vendor information.

SMPs must invest in the development of multiple protocol translators needed to support the various vendor protocols they select (costing $$$ and time).

Common Meter Protocol
All APs invest in the development of a common market protocol, using data fields detailed in the (internationally) defined metering standard.

Additional investment by the SMP (compared to other APs) is limited to checking that messages are correctly formatted.

Phacelift

Need for Regulation

Interoperability Spectrum

Not Interoperable   Protocol Translation   Common Protocol   Interchangeable

Information exchange achieved through commercial contracts.

Regulation may be required to ensure all parties are able to negotiate appropriate commercial contracts for functionality they require.

Regulation will be necessary to minimise barriers to entry.

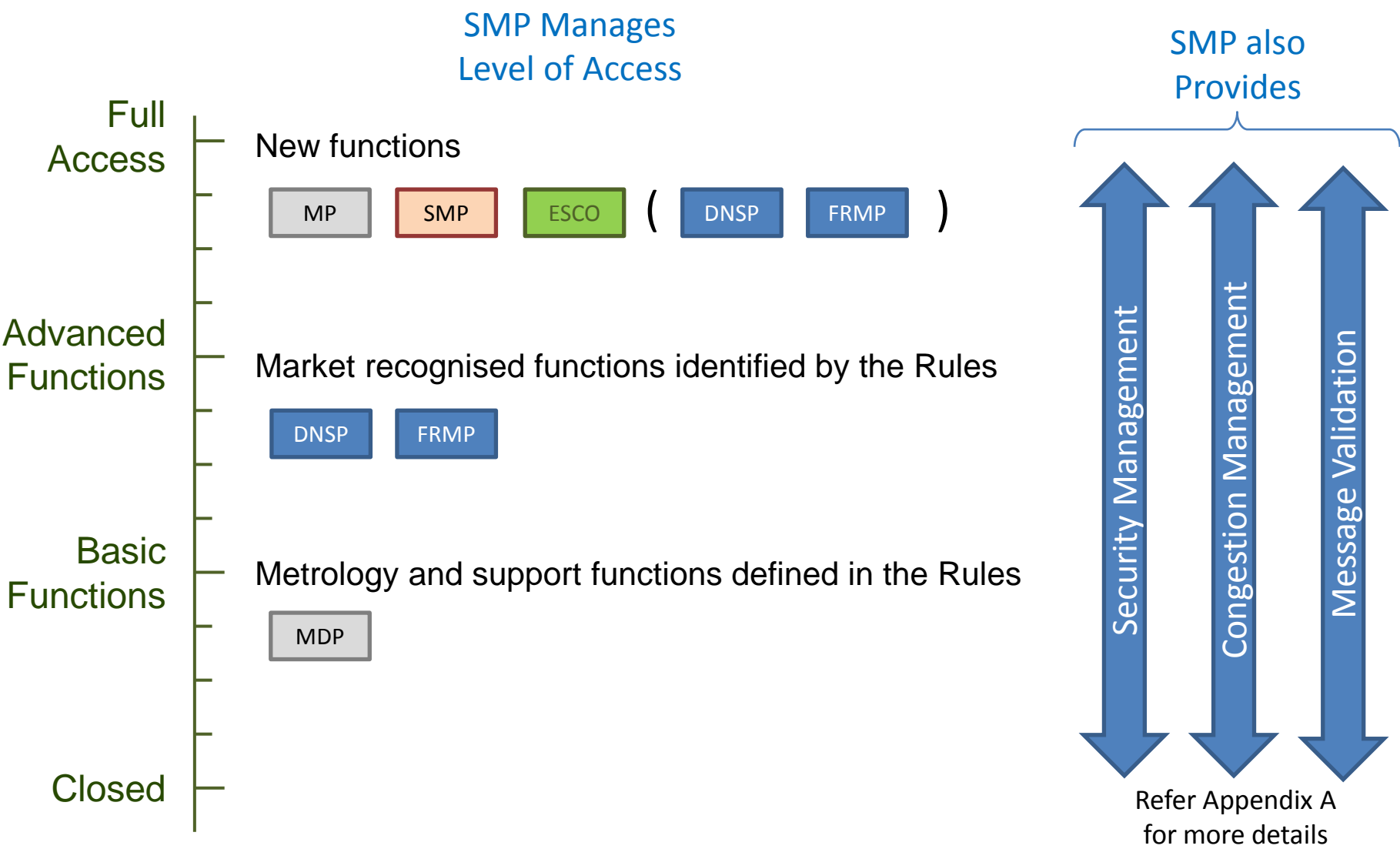**Protocol development and deployment costs will be distributed and opaque**

Information exchange achieved through agreement on a common market protocol.

Rules describe the development (and maintenance) of a common market protocol.

No regulation is required for the deployment of the common market protocol by APs.

Protocol development costs will be centralised and transparent. Minimal deployment costs
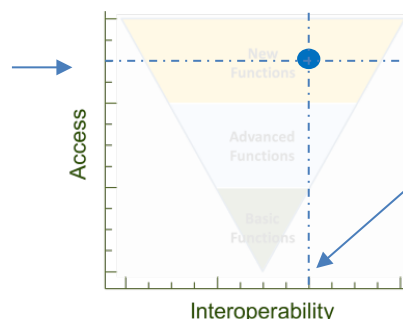
Phacelift

SMP manages the Level-of-Access and …

SMP Manages Level of Access

SMP also Provides

Full Access

New functions

| MP | SMP | ESCO | (| DNSP | FRMP |) |

Advanced Functions

Market recognised functions identified by the Rules

| DNSP | FRMP |

Basic Functions

Metrology and support functions defined in the Rules

| MDP |

Closed

Security Management

Congestion Management

Message Validation

Refer Appendix A for more details

Phacelift

Conclusion of Meetings 1 to 4

The efficient provision of DSP services requires

The ability for parties offering DSP services to be able to access required functionality

The ability for parties offering DSP services to be able to (efficiently) interact with the meter via the PoE

We are seeking comments and views on the following points:
- Should regulation of DSP services be designed around a point that provides a Common Protocol and (approaching) Full Access?
- Should DLMS/COSEM be adopted as the common meter protocol?
- Should DLMS/COSEM be adopted as the common market protocol?
- Should the National Measurement Institute be the custodian of the common meter protocol and the common market protocol if one or both are adopted?
- Should new duties of SMP be introduced to manage the Point of Entry?
- Should supported New Functionality be available to the NMI discovery process?
- Should the cost of protocol development and deployment be a factor in determining the efficient provision of DSP services?
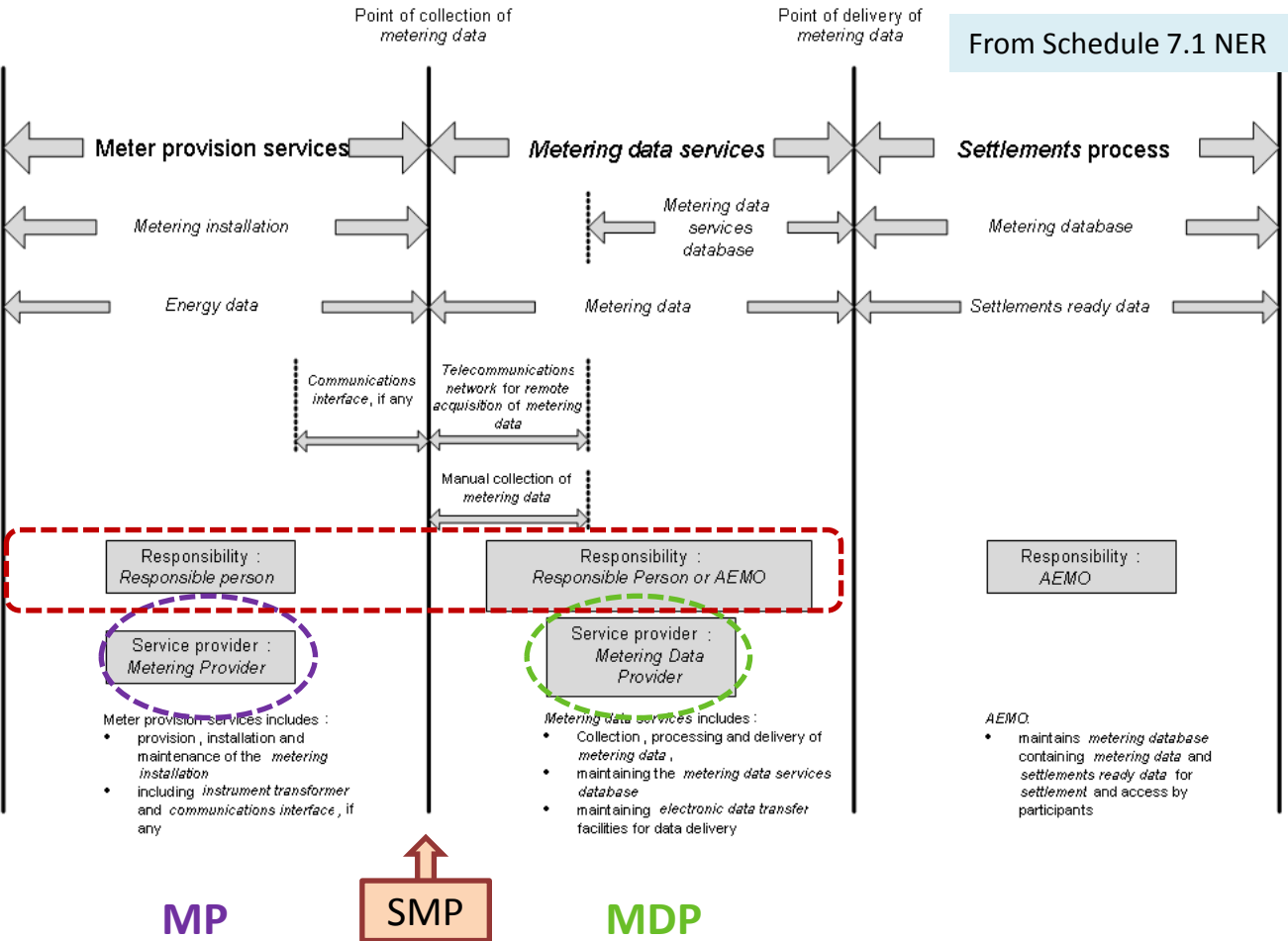
Phacelift

Questions

Phacelift

Describing duties assigned to the SMP

Appendix A

Phacelift

Where does the SMP fit in the NER?

From Schedule 7.1 NER

Metering Coordinator

SMP does not disturb MC integration role in the end-to-end metrology process
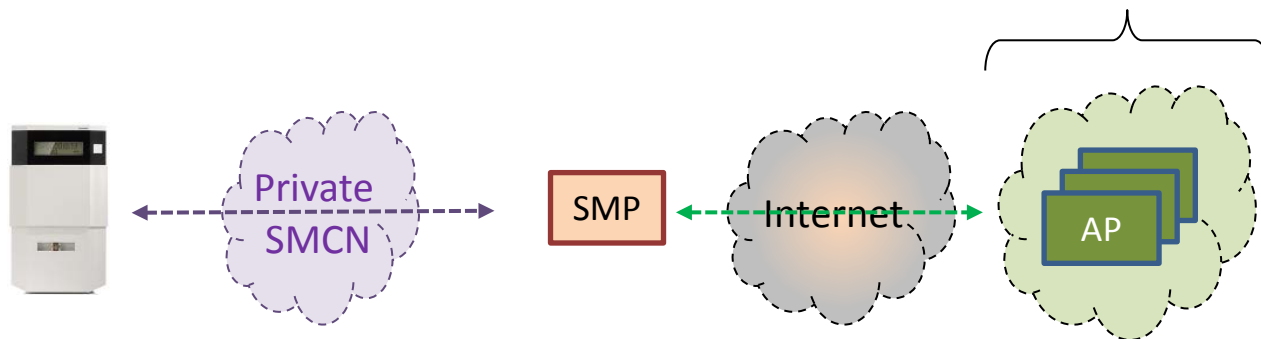
MP   SMP   **MDP**

SMP is either engaged by the MC as a new party, or MP duties are enhanced to incorporate 'SMP' responsibilities for management of level-of-access, security and congestion, and to provide message validation

Level of Security

These Meetings have focussed on how APs interact with meters once the communications path has been established

The first level of security is to ensure that only APs with a *relationship* with the customer are allowed to establish communications with the meter

The SMP must ensure that only APs with a relationship with the customer access the meter

Phacelift

Verifying the AP is allowed to access the meter

Market PoE – Example: Load Control message to meter

Using the Market Protocol the AP sends a Load Control message to the SMP
- The command must identify the customer

The SMP checks that the AP has a relationship with that customer
- The SMP must also ensure that the AP is entitled to send Load Control messages

The SMP queues the message and sends to the meter as per agreed Performance Levels

Message acknowledgement is sent to the AP once the SMP sends the message to the meter

The SMP checks access is allowed using MSATS database

Private SMCN

SMP

Internet

AP

MSATS

Existing AEMO MSATS Protocols

Seeking comments and views:
Does MSATS also store details of the functionality APs can access?
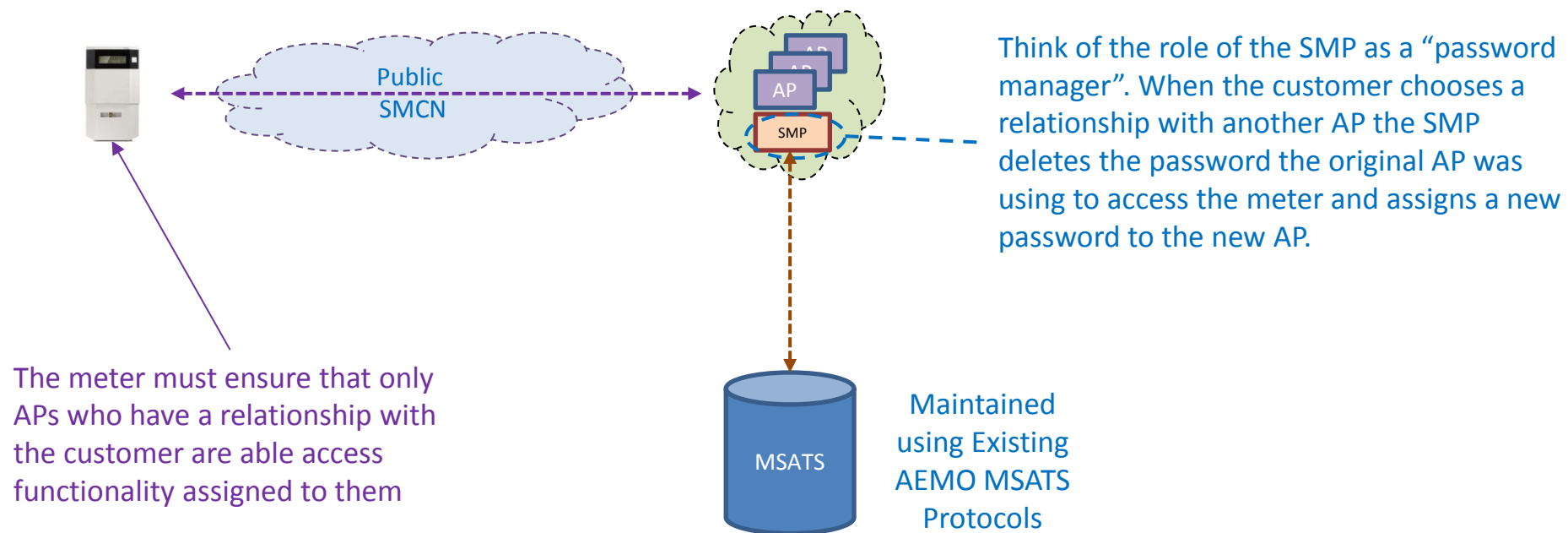
Phacelift

Access Control – Architecture PoE at the meter

The SMP is still required to manage security when there is a PoE at the meter

The use of a Public SMCN means any party can access the meter so access control must be implemented by the meter
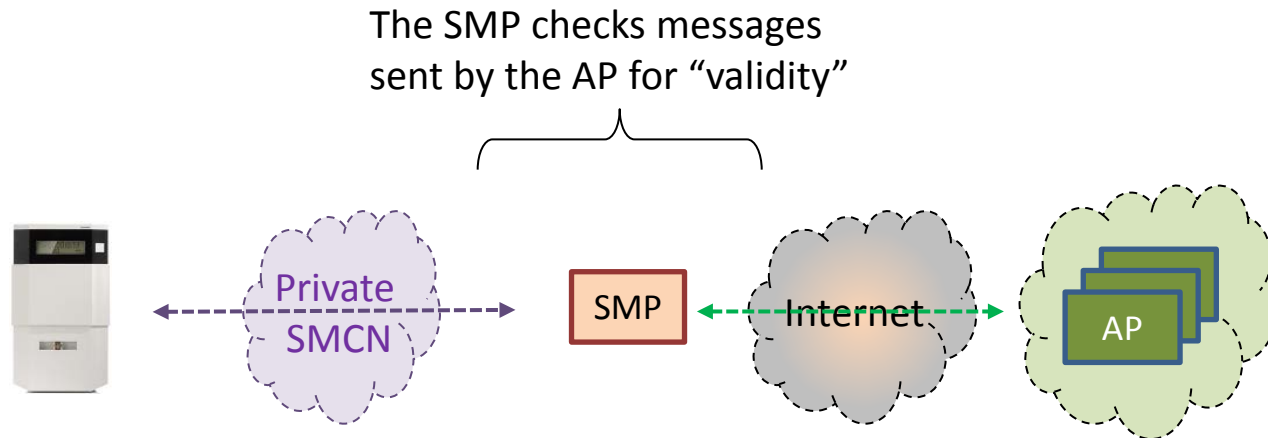
The SMP must configure the Smart Meter to ensure:

- Only APs with a relationship with the customer can access the meter
- The meter limits access to data and functionality assigned to that AP

Public SMCN

AP
AP
AP
SMP

Think of the role of the SMP as a "password manager". When the customer chooses a relationship with another AP the SMP deletes the password the original AP was using to access the meter and assigns a new password to the new AP.

The meter must ensure that only APs who have a relationship with the customer are able access functionality assigned to them

MSATS

Maintained using Existing AEMO MSATS Protocols

Phacelift

Message Validation

Another role of the SMP is to "validate" messages being sent from the APs to the meter. There are a number of possible validations that could be considered
- That the message is correctly formatted
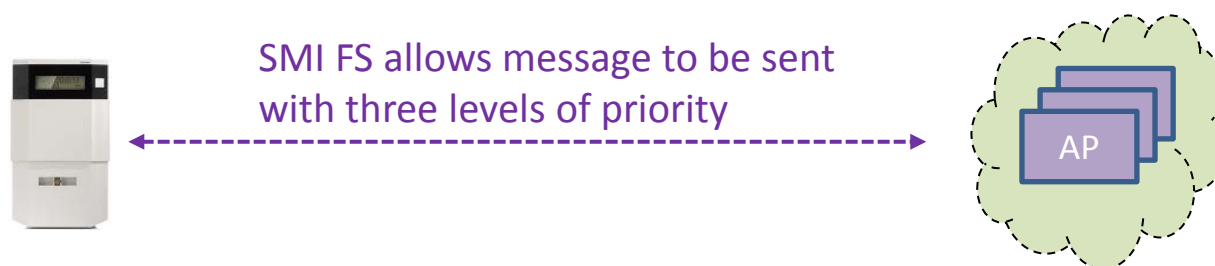- That the message will not adversely affect other APs using the meter

The SMP checks messages sent by the AP for "validity"

Private SMCN

SMP

Internet

AP

Seeking comments and views:
- Does the framework have to consider specific validations that should be performed?

Phacelift

Congestion Management

Congestion Management may be required when considering multi-party access to smart meters

The SMI FS allows for message prioritisation but misuse may limit an APs ability to send high priority messages to the customer.
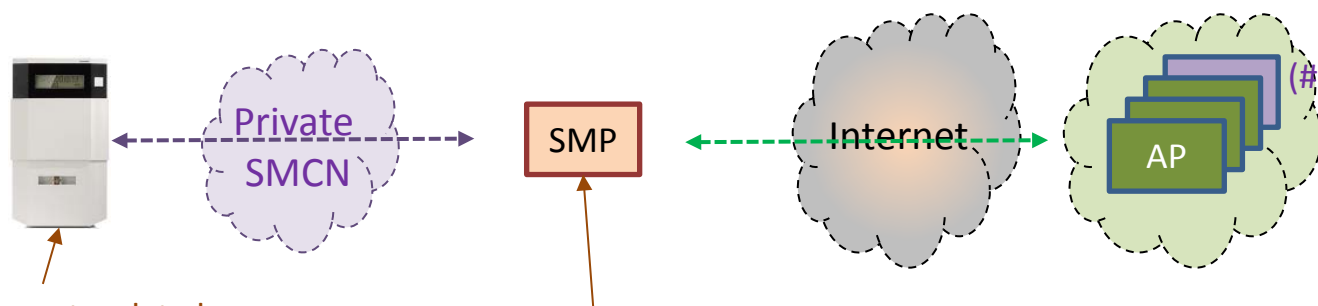
SMI FS allows message to be sent with three levels of priority

AP

Seeking comments and views on:
- Who sets message prioritisation?
- Should the SMP be allowed to change the priority of messages?

Phacelift

Privacy

In addition to regulatory requirements to ensure customer privacy, multi-party access to the same meter raise other privacy issues which may need to be addressed
For example: should another AP be able to see the tariffs being offered to the customer?

Should access to meter data be restricted to the AP with a relationship with the customer?

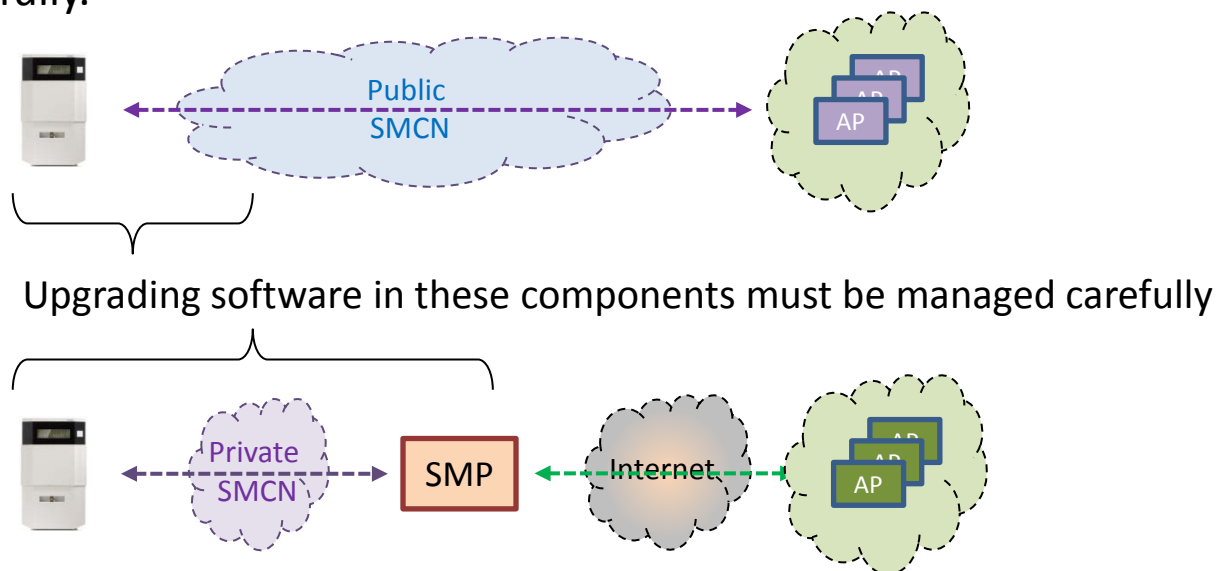Should interactions between APs and the meter be private?

How would the SMP validate messages if they are private?

Seeking comments and views on:
- What, if any, privacy issues need to be addressed?

Software Management

All smart metering systems rely on software in the end-to-end connection
When considering access to functionality the ability to upgrade software needs to be considered carefully.

Upgrading software in these components must be managed carefully
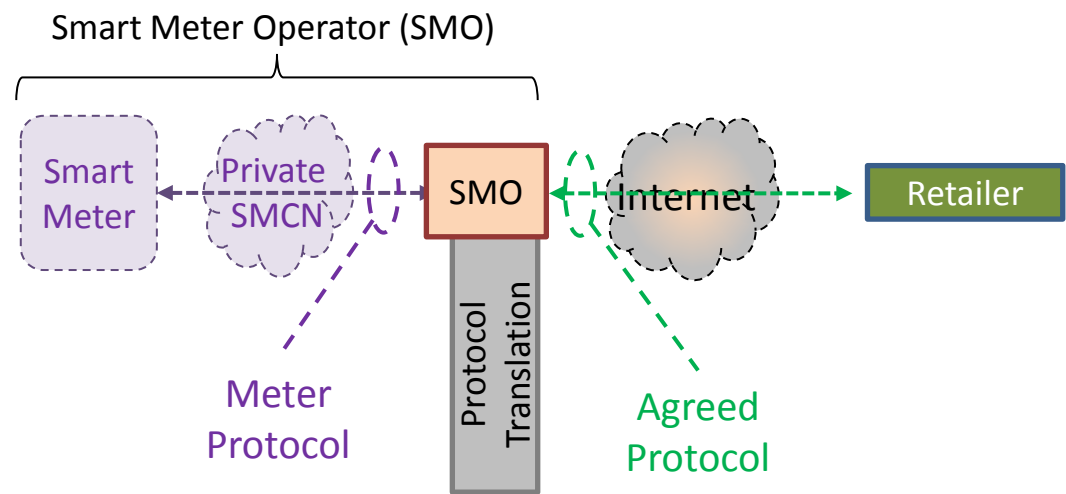
Seeking comments and views on:
- Should software upgrade of the meter and communications modem be restricted to one party?
- Should that party be the MP?
- Should the party be required to notify all APs before any software update?
- Given the critical role of software in smart meters is there a requirement to regulate this functionality or leave it to commercial arrangements?

New Zealand

Appendix B

Phacelift

Protocol Translation

Using the New Zealand model

Smart Meter Operator (SMO)

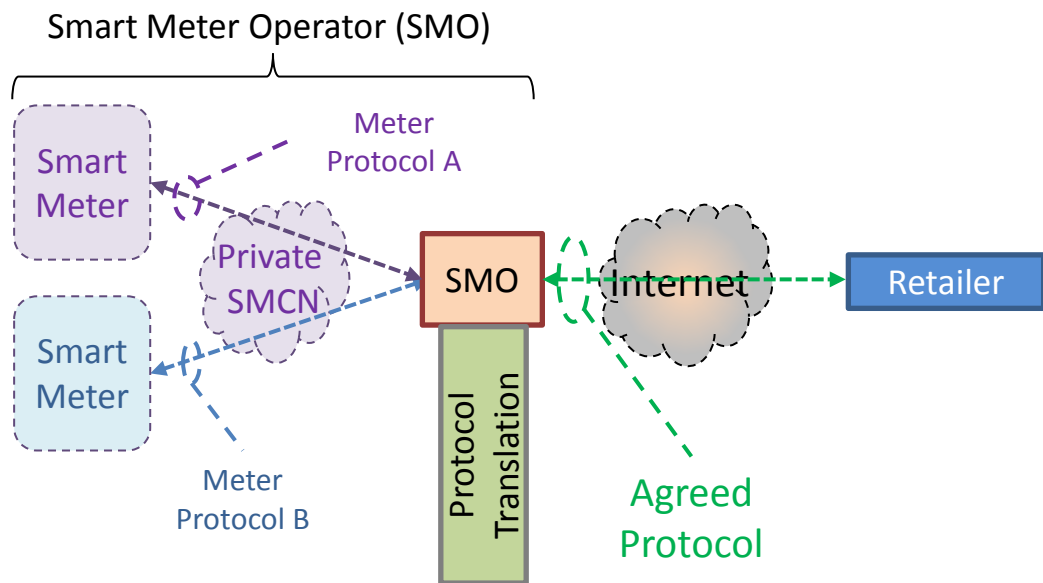| Smart Meter | Private SMCN | SMO | Internet | Retailer |

Meter Protocol

Protocol Translation

Agreed Protocol

In NZ the Retailer and their preferred Smart Meter Operator (SMO) negotiate the market protocol

As part of this contractual arrangement the SMO develops (and maintains) the Protocol Translator.

The SMO is free to pick any meter (running any meter protocol)

Phacelift

Protocol Translator Maintenance Costs

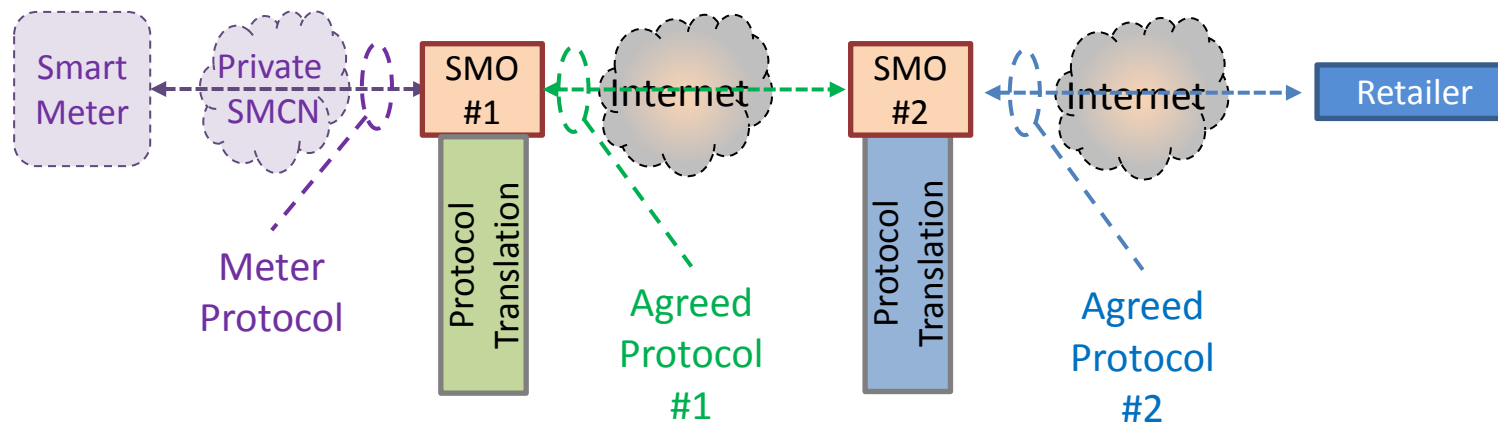In New Zealand the Smart Meter Operator must support all meters they offer

As noted the SMO is free to pick any meter running any meter protocol, but …

Proprietary meter protocols are free to change how they store data and meter settings.

The result is that when the SMO installs a new model of meter they must upgrade their Protocol Translator

This occurs each time a new model of meter is installed

The cost of continuously maintaining the Protocol Translator is included in the service fee negotiated with the retailer.

Phacelift

Avoiding Meter Replacement

New Zealand – Avoiding meter replacement on change of retailer

To avoid replacing the meter the SMO who owns the meter offers to provide data to the new SMO.
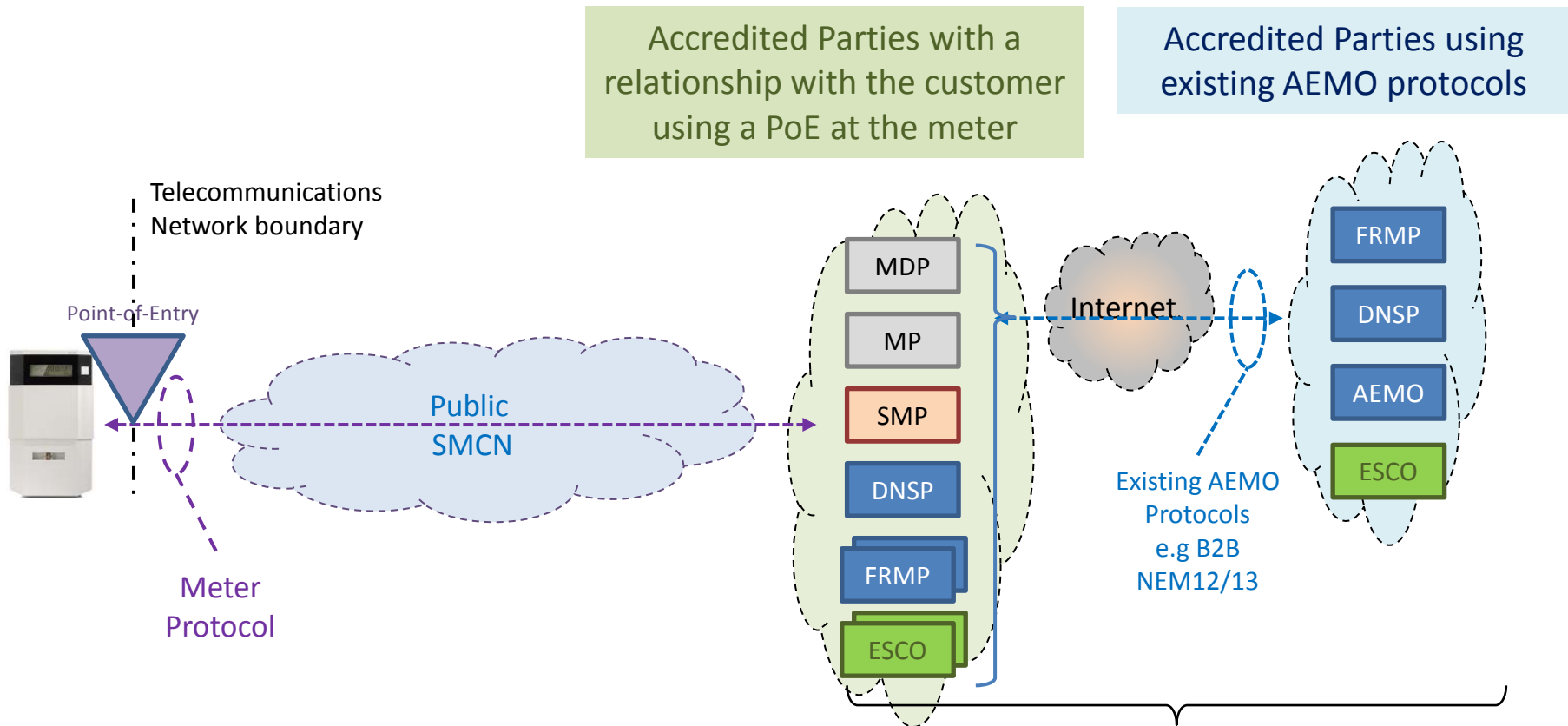As shown this now involves TWO Protocol Translators

NZ proves this solution is workable when using simple translations of meter data

Difficulties arise as the complexity of the Protocol Translator increases. For example the introduction of New Functionality by Accredited Parties.

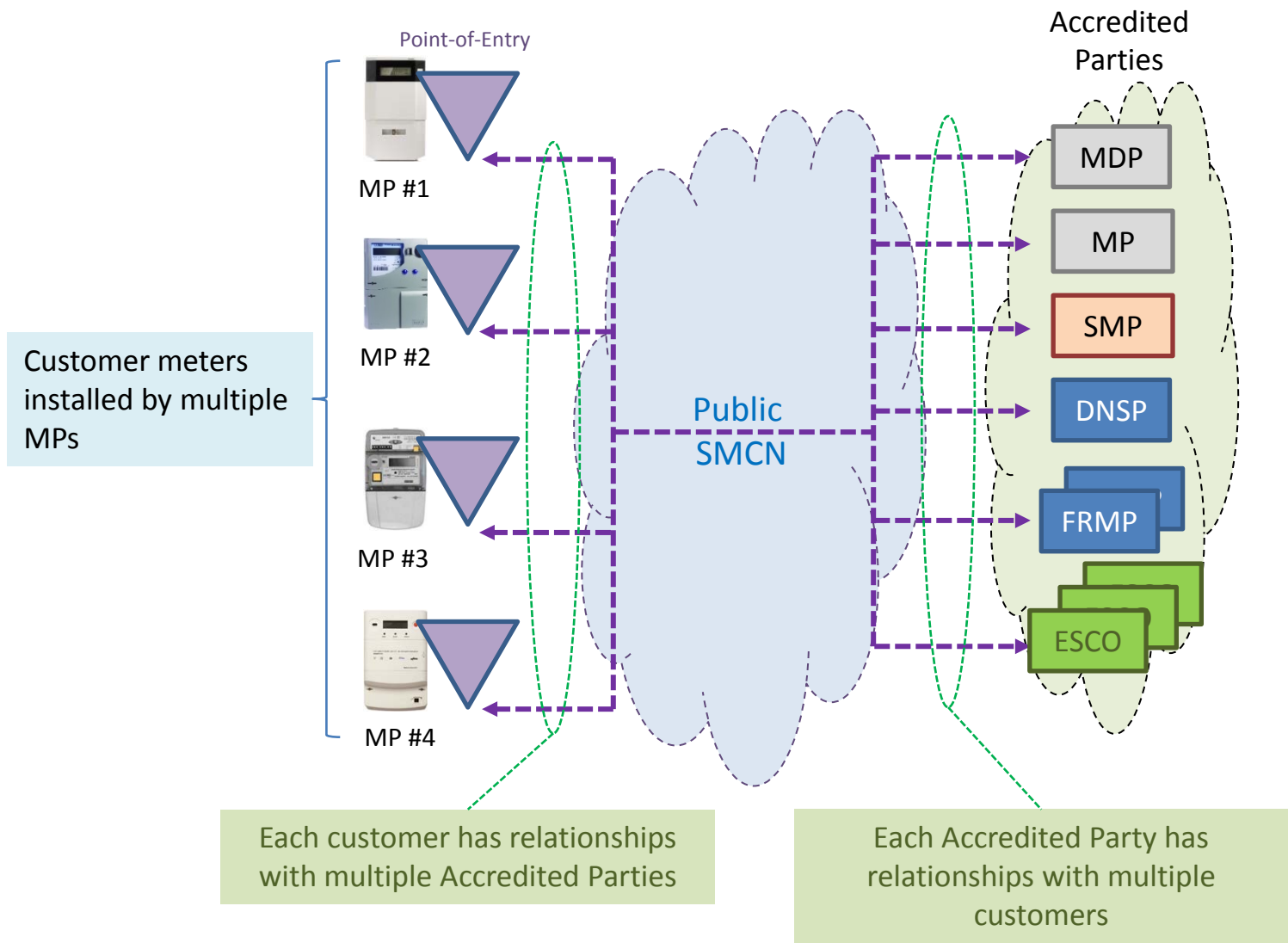Phacelift

Point of Entry at the Meter

Appendix C

Phacelift

Market context: PoE at the meter

Accredited Parties with a relationship with the customer using a PoE at the meter

Accredited Parties using existing AEMO protocols

Telecommunications Network boundary

Point-of-Entry

Meter Protocol

Public SMCN

MDP

MP

SMP

DNSP

FRMP

ESCO

Internet

Existing AEMO Protocols e.g B2B NEM12/13
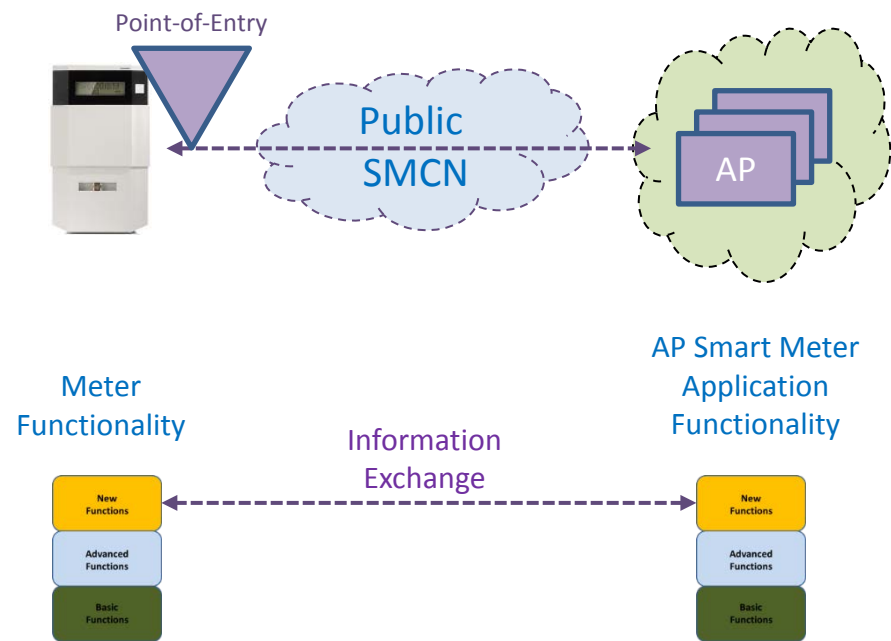
FRMP

DNSP

AEMO

ESCO

The SCER rule change proposal indicates that this relationship should not be disturbed.
(Note: This topic is out-of-scope of the proposed framework)

Reminder: We are showing the MP and SMP as separate entities.

Phacelift

"One to Many" relationship

Phacelift

Access to New Functionality

APs who upgrade their Smart Meter Application can access Meter Functionality

Phacelift

Market Point of Entry

Appendix D

Phacelift

Market Context: Market PoE

Accredited Parties with a relationship with the customer using a PoE at the meter

Accredited Parties using existing AEMO protocols

Telecommunications Network boundary

Market Point-of-Entry

Internet

Private SMCN

SMP

Internet

MDP

MP

DNSP

FRMP

ESCO

FRMP

DNSP

AEMO

ESCO

Meter Protocol

Market Protocol

Existing AEMO Protocols e.g B2B NEM12/13

The SCER rule change proposal indicates that this relationship should not be disturbed.
(Note: This topic is out-of-scope of the proposed framework)

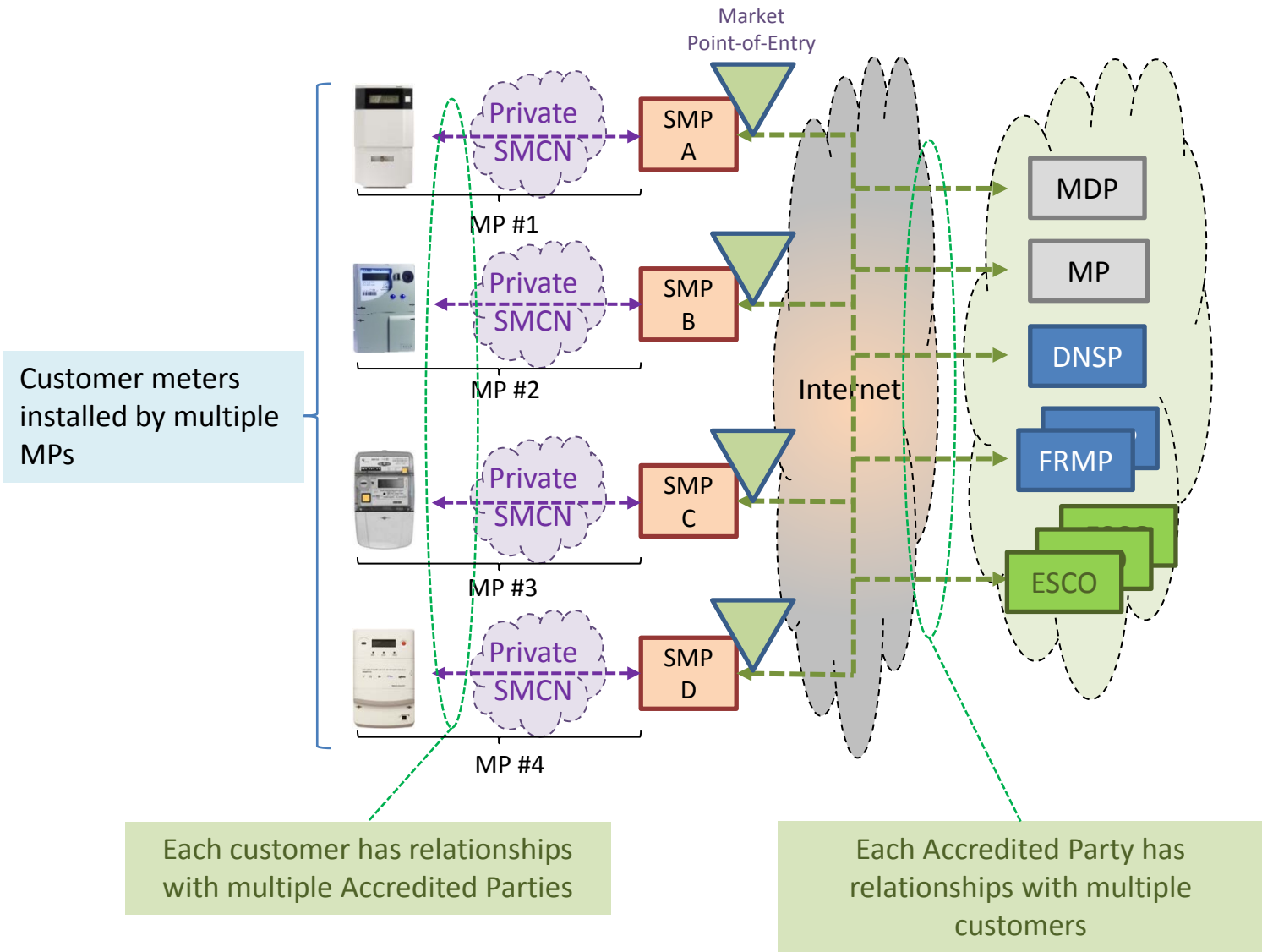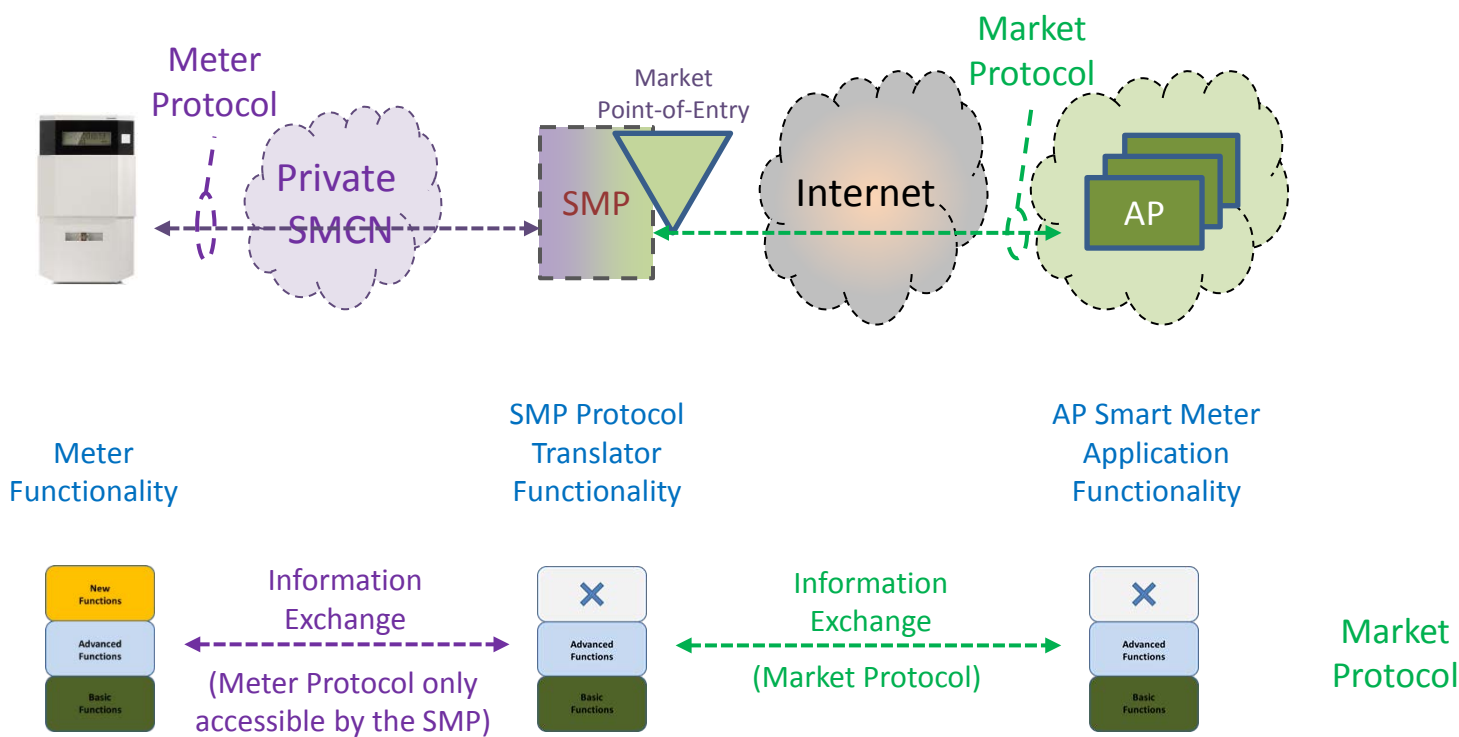Reminder: We are showing the MP and SMP as separate entities.
The MP is shown in a location enabling them to remotely change meter settings

"One to Many" relationship

Market Point-of-Entry

Private SMCN

SMP A

MP #1

Private SMCN

SMP B

MP #2

Customer meters installed by multiple MPs

Private SMCN

SMP C

MP #3

Private SMCN

SMP D

MP #4

Internet

MDP

MP

DNSP

FRMP

ESCO

Each customer has relationships with multiple Accredited Parties

Each Accredited Party has relationships with multiple customers
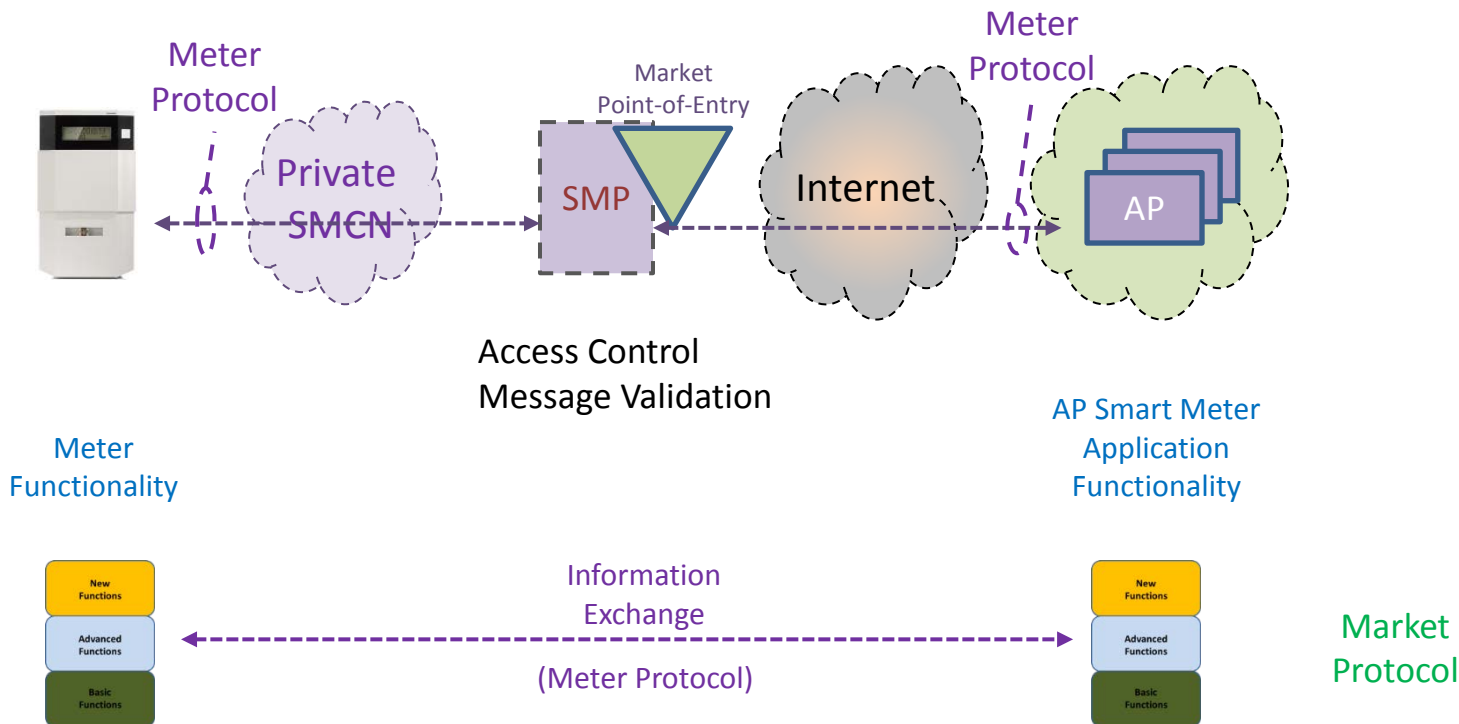
Phacelift

With Protocol Translation

APs are only able to access meter functionality supported by both the market protocol and the SMP's protocol translator

Even if an enhanced meter is installed APs cannot access Meter Functionality until
a) The Market Protocol describes the new functionality
b) The SMP's Protocol Translator is upgraded to support the new functionality

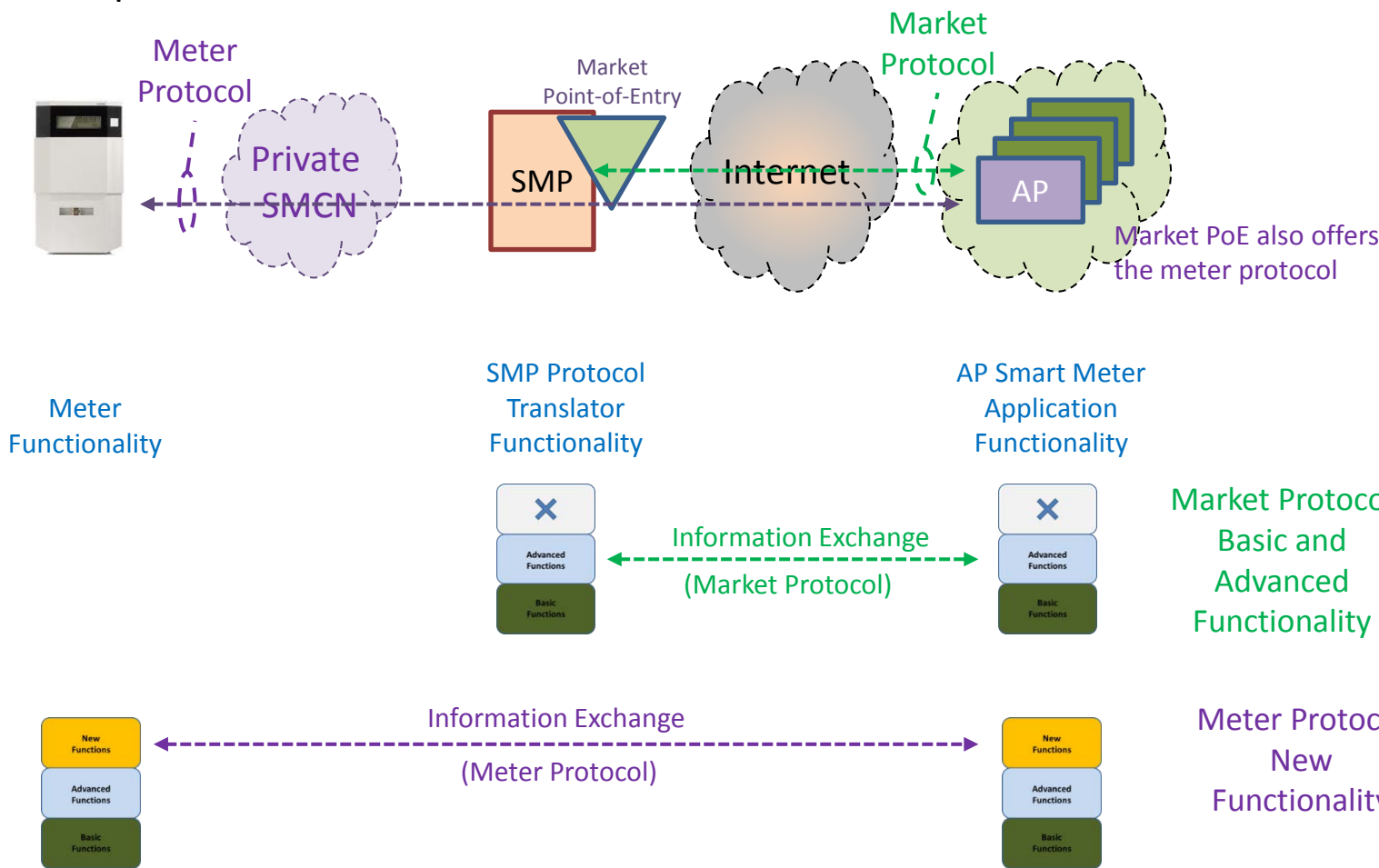Phacelift

Without Protocol Translation

APs able to access meter functionality using the meter protocol
The SMP still provides all required access control

Think of the SMP as a message router. As discussed in Meeting 2 the IP address of the meter will be private hence the SMP provides Network Address Translation and modifies the address fields of messages to ensure they arrive at the correct meter.

Choice of protocols

To ensure APs can offer functionality beyond what is described by the Market Protocol (and offered by the SMP's Protocol Translator) the SMP also allows APs to use the meter protocol.

Phacelift

Choice of protocols (cont)

The SMP already supports the meter protocol so this is straight forward for them. If the Market Protocol is based on a standard meter protocol (e.g. common data fields) then there is very little additional work required.

Basing the market protocol on a common meter protocol ensures this is relatively straight-forward.

Meter Functionality

SMP Protocol Translator Functionality

AP Smart Meter Application Functionality

Information Exchange (Market Protocol)

Market Protocol Basic and Advanced Functionality

Information Exchange (Meter Protocol)

Meter Protocol New Functionality

Phacelift