Smart Metering

Response to Ofgem Prospectus

T-Systems Limited

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Dear Ms Coaster

Response to Ofgem's Smart Metering Prospectus and supporting documents (Part 1: 28th September deadline)

We are pleased to enclose T-Systems' response to the Ofgem consultation on smart meters for 28th September 2010. We shall provide further input in response to the questions posed for the 28th October 2010. This response provides proposals that will deliver four key benefits to the smart metering programme:

1. **Achieving the necessary behavioural change** by providing dynamic, relevant information to the consumer from day one.
2. **Quickly agreeing a secure future proof design** by restructuring the proposed workshops to focus on achieving a consistent end-to-end flow of data. We believe that accountability for data transfer between consumer and energy supplier needs to be defined at the outset to limit duplication, omission or conflict, and to deliver early consumer benefits.
3. **Delivering a faster roll out** by bringing forward the launch of the DCC and clarifying its role. This will allow Information and Communication Technology (ICT) suppliers to offer interim cloud/on-demand data services, enabling an early rollout without the need for heavy investment in ICT infrastructures. We believe this could potentially bring the entire rollout forward from Autumn to Spring 2013.
4. **Encouraging investment in Great Britain**. We support Ofgem's proposal for a 10-year licence which is invaluable in helping businesses see the long term potential of smart meters and grids and will actively encourage investment in Britain.

We believe that taking an end-to-end view, prior to deriving specific functional requirements, will be key to realising the above benefits. This process will ensure an unbroken data flow with clear accountability and a clear definition of the current and future role of the DCC.

T-Systems provides ICT solutions for multinational corporations and public sector organisations in the UK, Europe and around the world. We are part of the Deutsche Telekom group, one of the world's largest and most financially stable companies. Our knowledge base, derived from replacing the entire telecoms infrastructure of Eastern Germany, makes us one of the most experienced delivery organisations in the world. We believe that our expertise in data services, data security and communication technologies, combined with our experience of smart meters and their interoperability with end systems, can add significant value to Ofgem and the smart metering programme.

We very much look forward to participating in this programme further. Please do not hesitate to contact me if you have any queries regarding our response.

Yours sincerely,

[redacted]

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1 Executive Summary

T-Systems welcomes the publication of the Prospectus and its supporting documentation within the Smart Metering consultation process. Without question, Ofgem's vision of universal consumer smart metering is extremely exciting. It is also clear that realising that vision represents a significant challenge.

We look forward to actively participating in the consultation process and helping define a future proof programme that can be swiftly implemented. We trust that our contribution during these early stages demonstrates both our commitment to get involved and our ability to deliver value.

T-Systems provides Information and Communication Technology (ICT) systems for multinational corporations and public sector institutions in the UK, Europe and around the world. We are part of the Deutsche Telekom group, one of the world's largest and most financially stable telecoms companies. We are familiar with the challenges of maintaining consumer service systems of the scale and complexity envisioned in the Prospectus, having rolled out technology on a similar scale in the past. The organisational expertise we developed when, after reunification, the entire East German telecommunication infrastructure had to be replaced, uniquely positions T-Systems and Deutsche Telekom as one of the few companies worldwide with the experience of implementing nationwide infrastructure overhaul programmes.

Furthermore, our involvement in a wide variety of smart meter and grid trials in recent years has delivered valuable technological breakthroughs and achieved high degrees of interoperability (for details please see Appendices 6.1, 6.2 and 6.3).

It is this full range of experience and expertise that we have drawn on in answering the questions in the Smart Metering Prospectus. We hope very much that Ofgem recognises the value we can bring and allows T-Systems to become more actively involved in this programme.

Our response to the Prospectus focuses on those questions for which answers were requested by 28 September 2010 and, more specifically, where we feel we can add value. As you will see, our response focuses on the following themes:

- **Achieving behavioural change** through the exchange of fast, secure and tailored information;
- **Quickly agreeing a future proof design;**
- **Accelerating the rollout timetable;**
- **Encouraging investment** in Great Britain.

Achieving behavioural change

We fully concur with Ofgem that the most immediate objective for smart metering is to encourage consumers to play an active role in managing their energy consumption and assisting in Britain's transition to a low-carbon economy. We believe that potentially the most powerful means of interaction with the consumer is via in-home displays (IHD) capable of delivering information beyond basic energy usage.

T-Systems' smart metering trials have clearly demonstrated that tailoring different energy consumption messaging to consumers based on their changing circumstances is key to changing behaviour. We have also found that this necessitates more than the simple display of static information retrieved from a meter; it needs a dynamic interaction model. For this to be possible, it is of paramount importance that an end-to-end data flow model is deployed that enables fast high quality data exchange. As a result the consumer experience becomes

straightforward, tailored and rewarding. This will be essential in driving the desired change in behaviour.

Quickly agreeing a future proof design

Other countries have seen rapid launches of smart metering that, soon after commencement, have fallen victim to stagnation or capitulation. There are many reasons for this but there is little doubt that weak stakeholder communication or involvement is a common cause of failure.

Engaging Industry and the various stakeholder groups and expertise effectively in a workshop scenario is clearly fundamental to defining the right solution. But rather than structuring the workshops according to the physical location and ownership of devices, T-Systems proposes that design decisions may be arrived at more swiftly if the responsibilities of the workshops are refined to reflect the flow of data between the end points in the home and the suppliers.

'Figure 1' shows the relationship between physical and logical views. This highlights how the data flow is fractured by the current design focus.

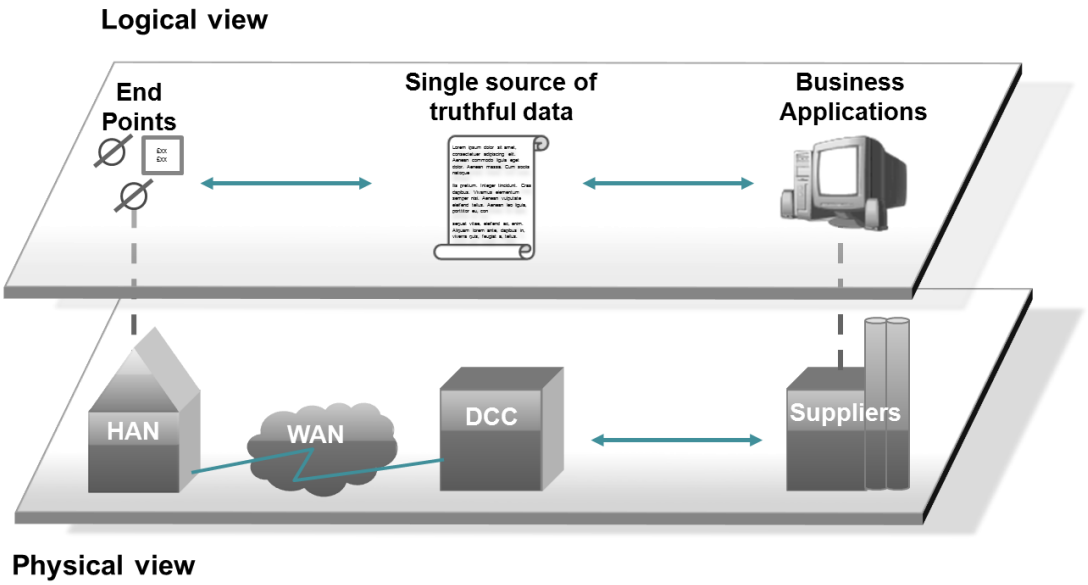

Figure 1: Design Perspectives

Operations, governance, processes and information systems must all be aligned, otherwise the resulting interrupted data flows invite errors and unnecessary complexity. To avoid this, T-Systems recommends that workshops be structured around the scenario in which data flows between the in-home end points and the single source of truthful data, and then between the single source of truthful data and the suppliers. The difference between the present and proposed workshop scope is displayed in 'Figure 2'. This structure would also place more emphasis on the services provided to suppliers, which could enable early agreement of a roadmap for long-term DCC services and promote low-cost, temporary solutions for suppliers.

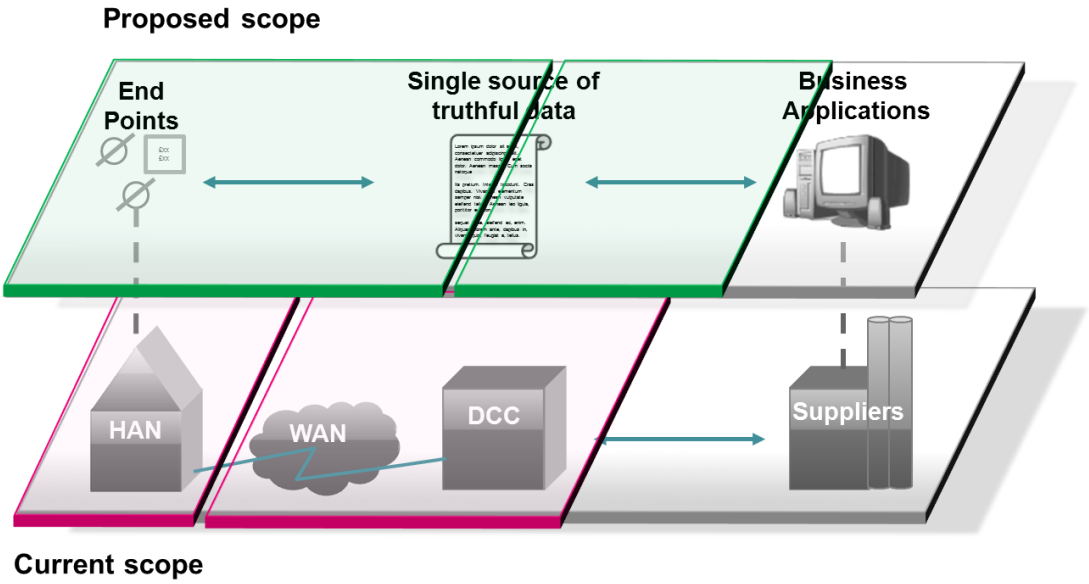

Figure 2: Expert workgroup scope

A faster rollout

We fully support the concept that the design specification and DCC workshops can be run in parallel so as to deliver an end-to-end design by mid 2011. We also consider that, by altering certain milestones, such as bringing forward the tendering process for the DCC, the go-live of the DCC could be brought forward to as early as Spring 2013.

In addition to the benefit of an earlier DCC launch, this change in approach may help reduce certain risks involved in the staged rollout approach. If independent ICT suppliers could provide temporary 'on-demand' data communication solutions from the point at which rollout is initiated, the benefits to all stakeholders would be significant. This could avoid costly investment for suppliers, prevent an imbalance in the market and, most importantly, reduce the risk of consumer confusion.

Encouraging investment in Great Britain's infrastructure

In addition to positively altering consumer behaviour, the investment in smart metering will provide general benefits for business, employment and the economy in Great Britain. Discussion too often focuses purely on the short-term costs to suppliers and their consumers, without considering the longer-term benefits that smart grid and other innovations will bring.

Ofgem's 10-year license concept and approach to mandating the rollout will be invaluable in helping businesses like T-Systems quantify business opportunities and make long-term investment plans for the UK and the smart metering and smart grid markets.

Conclusion

T-Systems' unique credentials include expertise in communication technologies, data services and data security, plus experience of smart meters and their interoperability with multiple systems. We believe these, together with our financial stability and multinational status, could add significant value to Ofgem and the British smart metering market now and in the future.

2 Response to Prospectus

The following section contains T-Systems' response to Ofgem's 'Prospectus' document, Questions 3, 6, 7, 17, 18, 19 & 20

Please note that, where the content of our answers may be either repeated or provided in more detail, we have provided cross-references to other answers.

2.1 Response to Prospectus Question 3

Question:	Do you have any comments on the proposed approach to ensuring customers have a positive experience of the smart meter rollout (including the required code of practice on installation and preventing unwelcome sales activity and upfront charging)?

We understand that Ofgem seeks to ensure that customers have a positive experience of the smart meter rollout by ensuring that suppliers fulfil the following obligations:

- Follow a code of practice when engaging consumers;
- Adopt a flexible approach to rolling out meters to consumers;
- Put in place a solution that enables them to start the rollout of smart meters prior to the DCC being established, and offers consumers a positive experience.

We believe that smart metering will only deliver a reduction in energy consumption if consumers actively engage with the smart meter concept. For this reason we fully endorse Ofgem's consumer focus and the importance that it attaches to ensuring a positive experience during smart meter rollout.

There appear to be two key areas of risk that could jeopardise this positive outcome, namely:

- Initiating rollout of smart meters without fully understanding the end-to-end requirements for all system components;
- Requiring suppliers to build intermediate solutions before the DCC becomes operational.

Our responses to Implementation Strategy Questions 3 and 4 describe our concerns about the proposed staged implementation. We fear that, as it stands, the plan may have unintended consequences on consumer engagement. It will be difficult to guarantee a consistent consumer experience if critical functionality has to be developed by suppliers in the period before the DCC becomes operational.

The opportunity to drive a change in behaviour may be lost if in-home displays (IHDs) are installed with limited functionality, since consumers will lose interest long before 'further services' become available. Our experience from German trials shows that consumer interest is highest during the first three weeks, meaning a valuable opportunity to engage and impress the consumer with opportunities to change their behaviour could be lost.

Furthermore, once the data services go-live, problems could arise if the switch to DCC becomes visible. For instance, it is possible that the required transfer of data between suppliers and data services within the DCC could cause discrepancies in the information displayed on

the IHD. This could generate confusion and, in doing so, negatively impact the consumer experience.

While Ofgem is not yet entirely clear about the future role of the DCC, it does suggest the DCC will provide further data services over time. T-Systems is concerned that this uncertainty could stifle any innovation of data services on the part of IT suppliers, leading to uncoordinated solutions that vary widely in their quality, capability and potential to remain future proof.

2.2 Response to Prospectus Question 6

Question:	Do you have any comments on the functional requirements for the smart metering system we have set out in the Functional Requirements Catalogue?

The process of determining comprehensive technical specifications is dependent upon agreeing functional requirements. However these functional requirements in turn need to be guided by an end-to-end architectural model that ensures all requirements link together. Without this model in place, there could be duplications, omissions or conflicts between the different requirements.

The end-to-end model displayed in the Prospectus is a physical view of the value chain. At T-Systems we believe that when designing functional requirements, the end-to-end model should be based on a logical view of the data flow. This reflects the fact that the data is correctly passed along a logical flow, though a series of “handshakes” that maintain security and privacy. We would like to propose to Ofgem that it consider such a design approach. Figure 3 below shows the relationship between physical and logical views and how these map onto the value chain. Separating the physical from the logical view enables preservation of the end-to-end data flow, even after assigning the functional requirements design to different working groups.

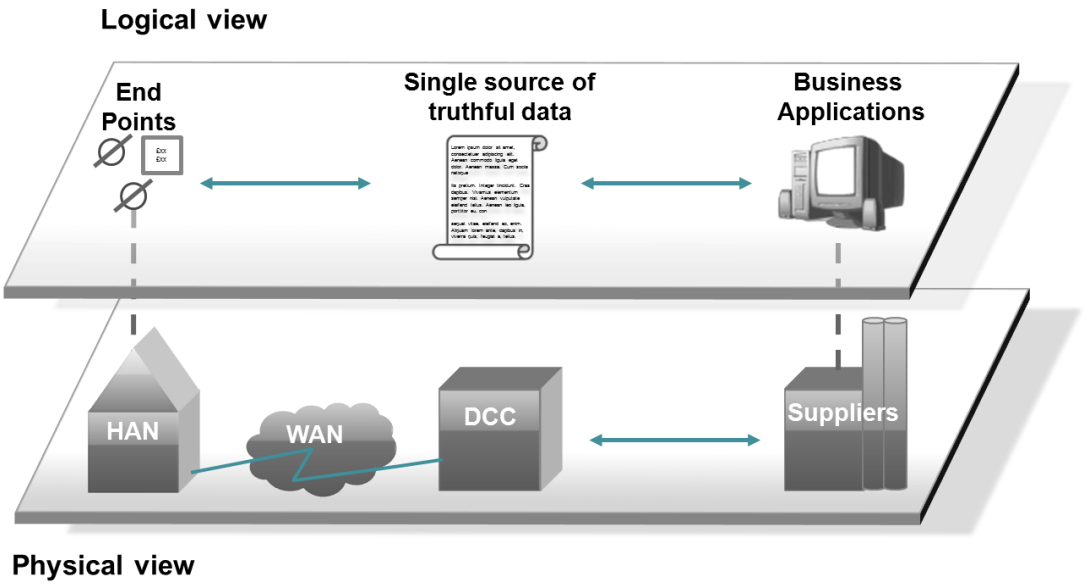

Figure 3: Design Perspectives

Without the logical view, and thus without a consistent end-to-end data flow, significant risks might be introduced unintentionally that could threaten consumer trust and engagement, increase costs and limit both the interoperability and the longevity of the smart metering system. The end-to-end data flow model on the other hand, delivers a number of benefits:

- Clear assignment of accountability;
- End-to-end security;
- High quality data services;
- Seamless opportunity for innovation.

Accountability: the need for clarity

We believe that accountability for data transfer between meter and energy supplier needs to be further defined. In order for the end-to-end processes to be successful, there must be an uninterrupted logical data flow with clear accountability throughout its course. Within the current Prospectus, however, there is an unclear separation of the physical view from the logical view, resulting in a Functional Requirements Catalogue that is detrimental to the preservation of data flow. As a result, working groups risk focusing too much on the in-home design, excluding data services and thereby failing to designate accountability sufficiently throughout the end-to-end chain.

Many years of experience delivering complex ICT solutions and highly sophisticated telecoms tariffing processes have taught us the importance of maintaining data integrity at all points within a data flow. In the case of smart metering, this means that data integrity between the meter and the energy supplier, and back to the consumer, should be viewed in the context of separate data flows, driven from one centrally accountable, single source of truthful data.

The current Ofgem approach does not clearly specify a single source of truthful data, or how it should provide a simple, effective connection between data flows. Rather than a simple, effective connection, the current design appears to allow a multitude of rigid connections to a multitude of end points, with varying degrees of control over data.

This is likely to make the role of the DCC, especially its role as a driver for future innovation, virtually impossible. Certain elements of the present approach may appear more attractive to industry, e.g. meter requirements and specifications might compel manufacturers to increase the smartness in their meters. But it will limit the ability of IT data service providers to propose high quality, end-to-end technical solutions and therefore the infrastructure necessary for the smart grid. As a result, the opportunity to deliver innovation and service improvement to consumers and the energy suppliers will be curtailed, as will the richness of communication between the energy suppliers and their consumers.

The definition of, and accountability for, the single source of truthful data is required, as well as for the connecting data flows, before further specifications are agreed.

The single source of truthful data

The single source of truth or truthful data is a term used to refer to the practice of structuring information models and associated schemata, such that every data element is stored once. In a network of computational entities or systems such as for smart metering, the sharing of data is inevitable. Changes to and transfer of data have to be carefully managed to prevent data corruption and inconsistencies. If in doubt, there has to be one point of reference that is guaranteed to be the 'true data'. The location of this true data is referred to as the 'single source of truthful data'.

We believe that not addressing accountability across the entire data flow will have a negative impact on the following parts of the Functional Requirements Catalogue:

- Operational requirements;
- Display and storage requirements;
- Interoperability requirements;
- Diagnostic requirements;
- Security and privacy requirements;
- WAN requirements.

Security: the importance of an end-to-end data flow perspective

When looking at the end-to-end data flow and its required interfaces, it becomes apparent how important the design of the WAN module is. This module has an important role to play in connecting the end points with the rest of the data flow. In T-Systems' view, the security of the data flow between the end points and the energy supplier cannot be guaranteed unless the security of the WAN module is designed with a full understanding of the processes of, and interfaces to, the single source of truth and data services.

Again, both consumers and energy suppliers stand to risk the integrity of their data unless a more complete end-to-end approach is taken. This further supports the adoption of the logical view as opposed to the physical view of the value chain.

We believe that not addressing security in light of the end-to-end data flow will impact the following sections of the Functional Requirements Catalogue:

- Display and storage requirements;
- Interoperability requirements;
- Prepayment and credit requirements;
- Electricity requirements;
- Gas requirements;
- Diagnostic requirements;
- Security and privacy requirements;
- HAN requirements;
- WAN requirements;
- IHD requirements.

Securing consumer confidence

T-Systems and Technische Werke Friedrichshafen commissioned independent market research in June 2009, 1.5 years into the trial of smart metering in Friedrichshafen, Germany. Some of the reported comments from consumers highlight the need to provide assurance of data privacy to consumers. An example of those concerns is listed below:

"My fear was that a hacker would have the ability to hack into the database and see when somebody was on Holiday and the House Empty."

A design approach based on the end-to-end data flow as well as clear communication about how this design secures private information can give consumer confidence in the protection of their data. At T-Systems we believe that instilling confidence is a key factor to getting approval from consumers and their buy in to smart metering in their homes.

Data services: a key to changing behaviour

T-Systems holds the view that the quality of information made available to consumers will have a significant effect, not only on the degree to which their behaviour changes, but also the permanence of that change. It is therefore important for consumers to have access to, for example, detailed tariff and cost information via the IHD. Yet without seamless access to data services, the information available to a consumer via the IHD will be limited to the data in the meter and may not be the same as that displayed in the final bill from the supplier. This reinforces the argument that the entire data flow model has to be agreed before functional requirements can be defined.

We fear that omitting the connection to the single source of truth will limit the energy supplier in their ability to communicate effectively with their customers. Access to consumer data in

addition to that held in the meter could offer many more opportunities to tailor data (communication) towards the consumer, enriching both the consumer experience and the supplier/consumer relationship.

Failure to address the definition (and associated quality) of information across the end-to-end data flow will impact the following sections of the Functional Requirements Catalogue:

- Operational requirements;
- Display and storage requirements;
- Interoperability requirements;
- HAN requirements;
- WAN requirements;
- IHD requirements.

The future: removing barriers to innovation

As mentioned above, the optimal aggregation, validation and analysis of data depends on the relationship between the end points, the WAN module and data services to and from suppliers and other third parties. Without a clear agreement of where the single source of truthful data is held and which data services are available, the in-home solution is likely to be locked-in and this will inhibit progress.

Future proofing the solution means deploying a flexible and easily upgradeable framework to allow for the largest possible amount of unknown future requirements. A well-designed, single source of truthful data will deliver this flexibility, providing both an easily extensible data interface and a single, clearly identifiable point of accountability.

Failure to address the requirements of the end-to-end data flow in the definition of the functional requirements will impact the following sections of the Functional Requirements Catalogue:

- Display and storage requirements;
- Interoperability requirements;
- Prepayment and credit requirements;
- Electricity requirements;
- Gas requirements;
- Diagnostic requirements;
- Security and privacy requirements;
- HAN requirements;
- IHD requirements.

Conclusion

Where currently the Catalogue focuses purely on the in-home design, we believe it should adopt a truly end-to-end focus on data flow. Only then can it provide a complete foundation for the creation of technical specifications. This, in turn, will enable the realisation of Ofgem's goals, including reducing the cost of change, maximising the effect on consumer behaviour and ensuring data security and privacy.

2.3 Response to Prospectus Question 7

Question:	Do you see any issues with the proposed approach to developing technical specifications for the smart metering system?

Please note: The content of this answer is the same as for Statement of Design Requirements Question 7, which also asks about the proposed approach to developing technical specifications.

In T-Systems' view, this question should be considered from both a technical point of view as well as from an organisational perspective. In both areas, we believe that the overall programme would benefit from further consideration.

The technical perspective
As outlined in the previous answer, Ofgem's proposed approach to developing specifications during the early stages will determine all future development. However, T-Systems believes that the current approach may result in a highly complex distributed system containing multiple rigid connections. The key technical characteristics of the proposed system and their associated risks are outlined in the following table:

Technical characteristic	Associated risk
An end-to-end system comprising several computational entities with independent smart functions.	Increased cost and complexity.
Multiple autonomous entities that communicate with each other but are not controlled by one overarching entity.	Threat to data quality and security caused by multiple points of failure.
Lack of accountability for failure and recovery in an individual computational entity.	Delays and ineffective failure management.
Lack of clearly defined system structure, e.g. network topology.	Increased cost and complexity.
Design of computational entities with only a limited and incomplete view of the full system.	Sub-optimal specifications.

Given these characteristics, we recommend that the architecture of the smart metering system be developed based on up front decisions about the control and distribution of smartness across the end-to-end process, setting clear parameters for the functional specifications of the involved entities.

This proposal is supported by evidence from successful trials we have conducted on controlling the volume of data transferred in a smart grid environment. Where most trials in this field focus on the remote reading of several million of meters, T-Systems' tests have concentrated on the distribution of smartness and control between the end points and the data services.

Our experience developing the German road charging solution further supports the need for upfront decisions about the data flow, control and distribution of smartness across the architecture. In 2005, from the moment the solution first went live, T-Systems was capturing data from traffic volumes on over 12,500km of road and charging 1.5m users. Charges varied depending on the types of road and distance traveled, and there were different payment methods, including Internet, credit card or cash, pre-paid or invoiced. The management of data

flow for road charging and payment, similar to that required for smart metering, requires early agreement on the distribution of smartness across the architecture. Only then is it possible to ensure the integrity of the end-to-end data flow, and that the system is flexible enough to accommodate ongoing improvements, new requirements and continuous data traffic increases. With the smart grid volumes anticipated in the future, the establishment of a controlling entity for smart communication becomes essential.

The organisational perspective
The development of such a complex system will require collaboration between all stakeholders involved in the end-to-end architecture. This is because the system processes, business case and technical elements are all interdependent. We therefore strongly recommend a carefully considered organisational approach to developing design specifications.

Ofgem has identified all key stakeholders and established 10 working groups, including two expert groups. It is highly recommended that, before any of these working groups decide on the detailed functional specifications, it is decided how smartness and security are distributed across the end-to-end process.

Once this decision has been made, Ofgem's proposed working groups format can be executed. In the proposed organisation, two expert groups are defined: the 'Smart Metering Design Group' and 'Data and Communications Group'. These are seen as vital to the development of the technical specifications and will have a direct impact on the overall success of the programme.

T-Systems proposes that Ofgem considers adjusting the focus of these two groups in line with the logical (not physical) view of the value chain, i.e. in light of the data flows. The multidisciplinary nature of the resulting groups would ensure that interoperability is optimised in a truly end-to-end manner across the entire smart metering system and that security aspects are fully considered.

The scope of the two expert groups could be expanded as follows:

- The Smart Metering Design Group works on specifications covering the equipment installed in the home (HAN and WAN), as well as the specification of functionalities provided by DCC over the WAN. Together this determines the data between the home and one single source of truthful data;

- The Data and Communications Group works on the specification of data services provided by the DCC to suppliers, network operators and third parties.

Both groups must consider all relevant data privacy and security requirements and the specifications must then ensure that these can be fulfilled.

While the two groups will work closely to ensure the interoperability of the entire end-to-end smart metering system, the overall process design and separation by data flow will enable them to make informed decisions without the risk of conflicting, missing or duplicate design decisions.

This is further explored in our answer to Prospectus Question 20.

Conclusion
We believe our proposed technical concept for the smart metering system will enable interoperability, deliver a future proof solution and reduce implementation costs. We are also confident that our recommendations to the organisational setup will support not only the interrelationships between stakeholders but also the completeness of their output.

2.4 Response to Prospectus Question 17

Question:	Do you have any comments on our implementation strategy? In particular, do you have any comments on the staged approach, with rollout starting before DCC services are available?

T-Systems appreciates the benefits of a rapid approach to implementation using a staged approach. Having analysed the implementation plan, however, we are concerned that the risks Ofgem has already identified with this approach, coupled with substantial additional risks we will highlight, threaten the success of the programme.

Our main concerns focus on the late start of DCC data services and the implications that this has on both suppliers and consumers. Our proposal to alleviate these concerns involves clarifying the role of the DCC and bringing forward its launch. In doing so, we believe we can also bring forward the rollout schedule.

Staged approach: additional risks
In addition to the risks noted by Ofgem in the Prospectus, T-Systems has identified the following potential risks of a staged implementation. Firstly, relating to suppliers:

- Supplier reluctance to invest heavily in complex, non-standard data communication systems to manage communication with meters, when their lifetime will probably be less than one year;
- Supplier uncertainty about the future role of the DCC and how it will impact the provision of data services, thus limiting scope for early strategic planning and investment;
- Unfair disadvantage to smaller suppliers of having no centrally available services. The required up front investment may be prohibitive, giving larger suppliers a competitive advantage and potentially distorting the market.

And more broadly, relating to consumers and future innovation:

- Leaving fundamental data services in the hands of suppliers may not best serve the evolution of the smart grid, data integrity, privacy and security or consumer protection, and could drive the need for further codes of practice and monitoring bodies;
- In light of the risks highlighted here, overall consumer experience will very likely be impacted. Specifically, confusion could be caused among consumers during the switch from suppliers to the DCC if, as is likely, the switch causes discrepancies in the display of information via the IHD;
- Lack of clarity relating to the future role of the DCC will only make the realisation of smart grid and related innovations more difficult, from both a WAN module and a data processing perspective.

T-Systems believes that the following changes to the current approach will enable Ofgem to reduce these risks and speed up the implementation process, potentially still enabling a staged rollout.

Clarifying the DCC's role
The remit of the DCC should be clearly laid out in parallel with the completion of the technical specifications (Phase 1). Consideration also needs to be taken regarding how, if necessary, the requirements could be adjusted during the tender phase. This will increase the level of certainty for suppliers and organisations applying as potential DCC candidates.

Once the DCC scope is clear the provision of interim data services would be possible. 'On-demand' services could be requested from ICT suppliers, providing they meet the technical specifications laid out for the core functionalities. On-demand services would enable suppliers to conduct early rollout without the need for investment in expensive ICT infrastructures. They

would also minimise market distortion by ensuring both small and large suppliers are able to take advantage of those temporary services.

It should be noted that, whilst we have provided ideas on how to best offer interim services, temporary solutions can always introduce risk. These potential risks should be balanced against the benefits of reduced cost to the market.

Bring forward the launch of the DCC

T-Systems proposes that tendering for the DCC commences as soon as the completed technical specifications are available, and ends shortly after implementation of the regulatory changes required for DCC.

This could potentially bring forward DCC Go-Live from Autumn 2013 to Spring 2013, shortening the period in which DCC services are unavailable, while also providing more time for the tendering process, as shown in Figures 4 & 5:

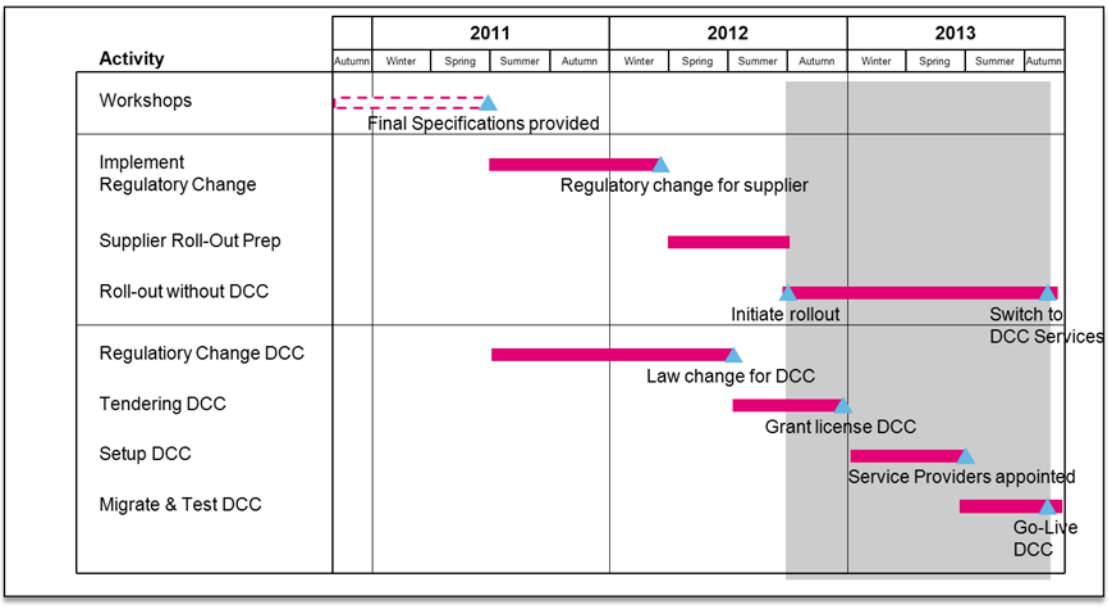

Figure 4: DCC unavailable time, current approach

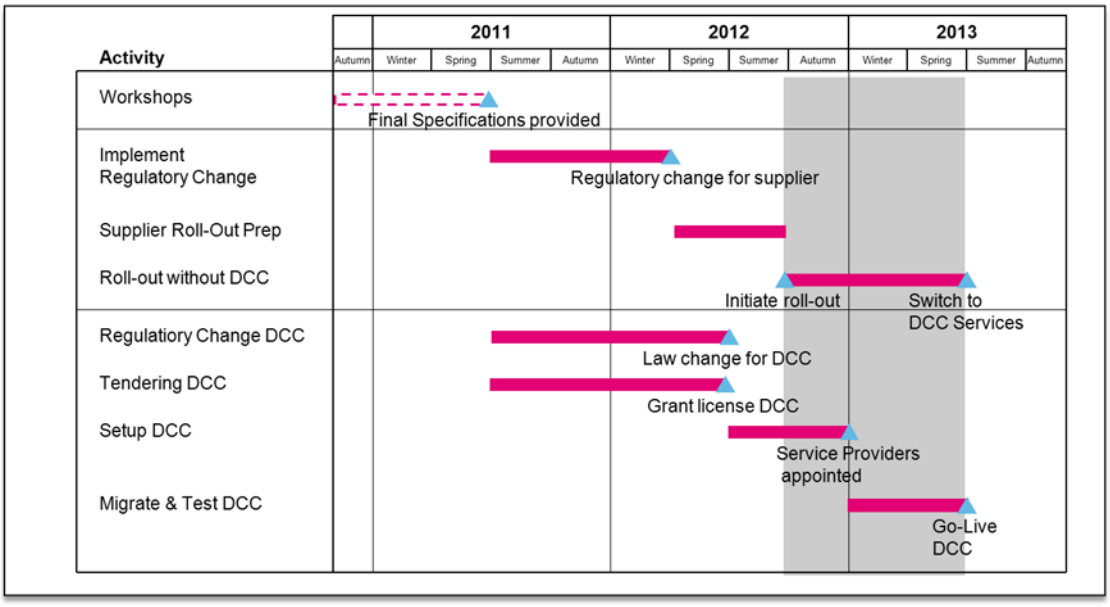

Figure 5: T-Systems proposal to reduce DCC unavailable time

Conclusion
T-Systems agrees with Ofgem's desire to roll out smart meters as quickly as possible and can appreciate how this has led to a staged approach. Yet we feel that, in addition to the risks that Ofgem has outlined, a significant financial burden could be placed on suppliers if they are to comply with the approach set out in the Prospectus. We fear that smaller suppliers in particular will be penalised by the current approach.

Likewise, we believe consumers stand to lose out if substantial supplier investment is made based on unstructured requirements prior to DCC availability. The overall consumer experience risks being inconsistent and, at worst, negative – a highly undesirable outcome given that the programme's main goal is dependent on a positive consumer perception of smart metering.

We believe our proposed alterations could strengthen the implementation approach and bring forward the availability of data services. The revised DCC Go-Live date may also be sufficiently early to avoid the need for temporary solutions and their associated risks.

2.5 Response to Prospectus Question 18

Question:	Do you have any other suggestions on how the rollout could be brought forward? If so, do you have any evidence on how such measures would impact on the time, cost and risk associated with the programme?

As detailed in our answer to Prospectus Question 17, which outlines possible changes to the overall Implementation Strategy, T-Systems is confident the overall timeline can be reduced and that the DCC could go-live by Spring 2013 instead of Autumn.

As shown in Figure 6 below, if tendering for the DCC commences as soon as technical specifications are available and ends shortly after implementation of regulatory changes required for DCC, a significant portion of time will be saved.

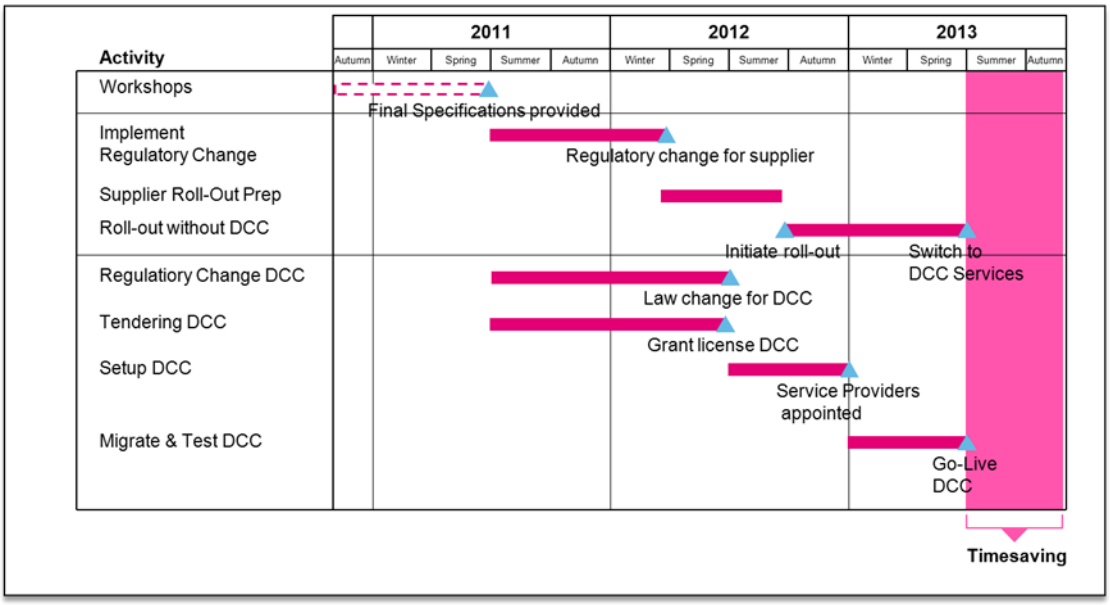

Figure 6: T-Systems proposed alternative, shorter implementation approach

In addition to this, in our answer to Prospectus Question 20, we make recommendations relating to the decision making process for the functional requirements and specification. We believe these might further reduce the time and enable an even earlier DCC launch.

2.6 Response to Prospectus Question 19

Question:	The proposed timeline set out for agreement of the technical specifications is very dependent on industry expertise. Do you think that the technical specifications can be agreed more quickly than the plan currently assumes and, if so, how?

Please note: The content of this answer is the same as for Statement of Design Requirements question 10.

At T-Systems, we share Ofgem's desire to speed up the agreement of technical specifications and appreciate the dependence on industry expertise. Much time will need to be spent in order to fully understand the many different technical options and evaluate their respective advantages and disadvantages before decisions can be made. This will be particularly difficult given the different industry and technical experts and their differing views, concerns, priorities and motives. Reviewing and rationalising such a significant volume of input will inevitably be the most time consuming activity in this phase.

The presentation approach
In the interest of simplifying the process, we suggest incorporating a presentation approach into the Ofgem specification design process, as illustrated in Figure 7 below.

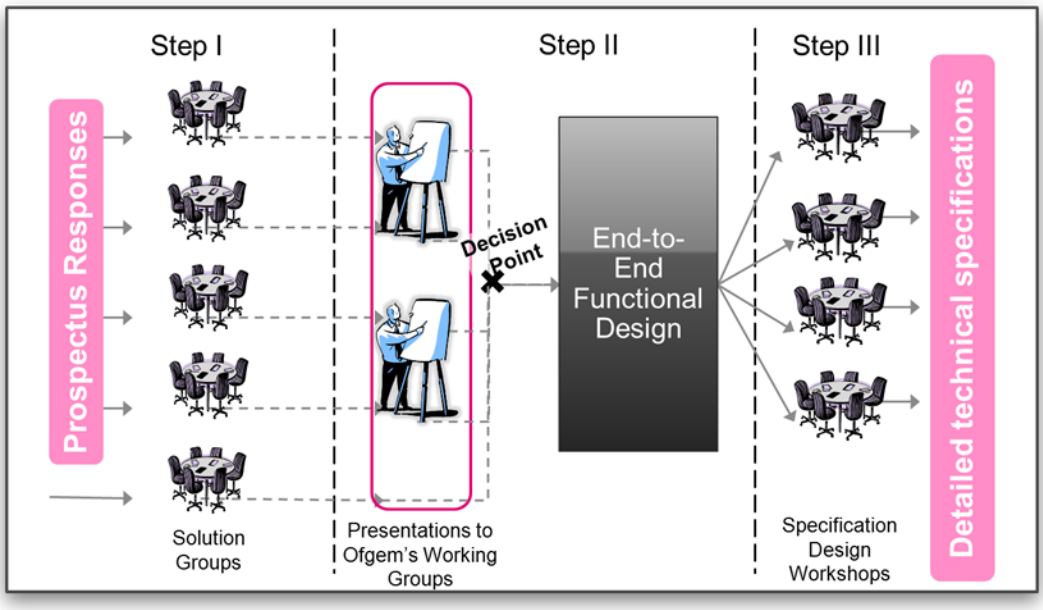

Figure 7: Proposed specification design process

In T-Systems' view, there are a small number of significantly different solution options, each varying in the distribution and degree of smartness along the value chain. Ofgem could use the Prospectus responses to identify experts with a full understanding of the different data flows within the smart metering system, invite these individuals to lead 'solution groups' and task them with developing detailed presentations on each of the different solution options. There

would also be the opportunity for other parties to form alternative solution groups to investigate additional models.

Subsequently, within a month, each solution group would be invited to present their findings to a panel of experts, chaired by Ofgem. Clearly defined scoring mechanisms with predefined criteria would then be applied, leading to the selection of a single optimal solution.

Once this is done, the third step would be the agreement of a technical specification. Given the now shared understanding of the overall solution, this could take place in parallel work streams without any conflicting design agenda, and without jeopardising the end-to-end integrity of the architecture.

We believe that adopting this approach could deliver agreed, documented technical specifications as early as Spring 2011.

T-Systems has extensive experience in advising large organisations on the evaluation of different ICT solutions, including working with the German government on projects to define new protocols and standards for online processes. We have found that open workshops and discussions with large numbers of stakeholders and advisors take longer than a structured presentation approach, in which different experts or expert groups are given the opportunity to explain their preferred approaches and then invite discussion.

We would welcome the opportunity to discuss this approach (and potentially other methods of accelerating the design specification process) with Ofgem. We believe Ofgem has already undertaken several specification activities and we would also like to better understand its preferred decision making process, in order that we might make additional suggestions. Irrespective of the manner in which the decision making process is structured, we emphasise the importance of rapidly establishing an escalation process and clear accountability for decisions made.

2.7 Response to Prospectus Question 20

Question:	Do you have any comments on our proposed governance and management principles or on how they can best be delivered in the context of this programme?

Please note: The content of this answer is the same as for Implementation Strategy Question 1, which also asks about Ofgem's proposed governance and management principles.

T-Systems has reviewed the Implementation Strategy document and we understand the concepts and high-level proposal made by Ofgem relating to governance and management principles. In addition, we would welcome further guidance from Ofgem in the following areas:

- The attendee selection process for workshops (ensuring the required balance of expertise in the design groups);
- The guidelines and end-to-end design framework that would enable functional specifications to be agreed;
- The process for decision making within, and following, the workshops;
- The distribution of accountability in the decision making process.

We feel these areas are of critical importance to the programme and, in the absence of further information, we propose changes to two areas within Ofgem's approach. The first is an

adjustment to the scope of the planned workshops to allow all main solution options to be identified, understood and assessed. The second is to establish and communicate a transparent decision making process that allows for one solution option to be selected with sufficient time remaining to arrive at a full specification.

Adjustment to workshop scope

If the workshops and expert groups are to enable the rapid agreement of the most suitable technical design and specification, then agreeing the correct scope is essential. We fear that the present approach of focusing on the technical specification and the DCC may not result in the best end-to-end design for optimal data quality and security. On the contrary, even with the potential oversight of the Implementation Co-ordination Group, we believe the current scope could lead to a flawed solution design in which home and DCC functions are considered separately too soon.

We feel the scope of the Smart Metering Design Group and the Data and Communications Group should be adjusted to safeguard the effective interoperability of the entire end-to-end smart metering system. Specifically, we believe the focus should be on the two activities most critical to arriving at a correct design of an end-to-end solution:

- The capture of information from the household into a logical, single source of truthful data;
- The secure and authorised delivery of data in the most appropriate format from the single point of truthful data to and from the energy suppliers.

Figure 8 shows the physical and the logical separation of the home and the DCC. Using the logical data flow view, we illustrate that a slight shift in the focus of the groups' design efforts will have a large effect on the preservation of the data flow integrity.

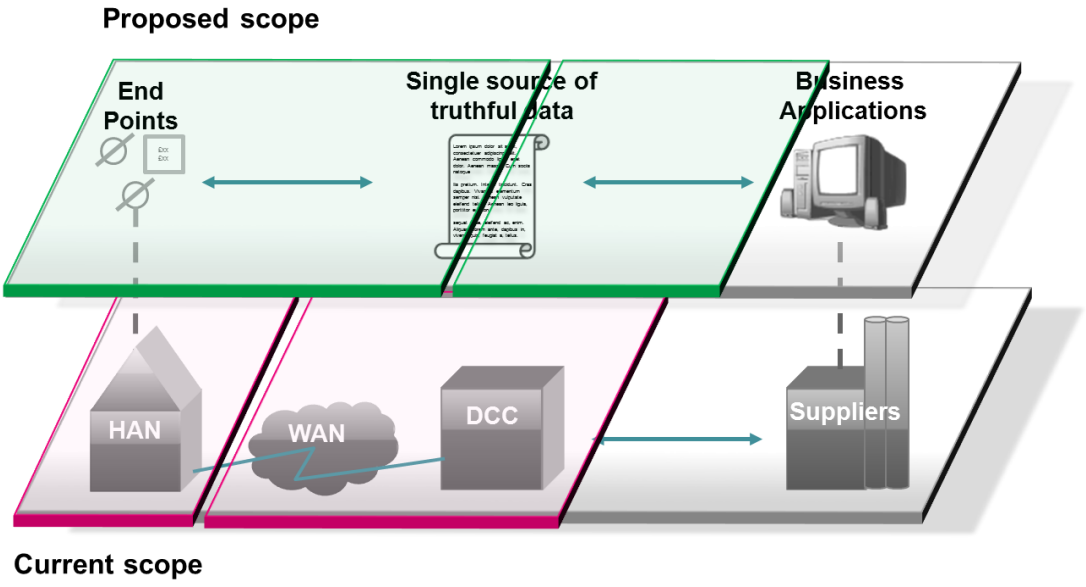

Figure 8: Expert workgroup scope

In the proposed approach, we recommend that the Smart Metering Design Group should focus on specifications covering the equipment installed in the home (HAN and WAN) through to the single source of truthful data in the DCC. The focus of the Data and Communications Group should lie in the specification of data services provided by the DCC to suppliers, network operators and third parties. These services, though potentially wide-ranging and varied, will nevertheless all be based on data supplied by the single source of truthful data.

T-Systems strongly believes that this adjustment to the scope of the workshops will refocus the decision making process on ensuring an uninterrupted flow of data across the entire system. This will in turn enable the security and quality of data services necessary to achieve Ofgem's objectives for the overall programme.

Design Decision Process

We are concerned that the framework for reaching decisions within the Smart Metering Design and Data and Communications Groups is not sufficiently clear. Specifically, we feel that agreement on the preferred solution will be difficult to reach in such a large group, leading to delayed or, worse still, flawed specifications.

In our experience, large working groups often fail to agree a solution if a decision-making framework is not clearly in place. We therefore propose a three-step approach, detailed in our answer to Prospectus Question 19, which will help provide this framework. We believe this will help considerably and accelerate the delivery of an agreed, documented functional design and technical specifications as early as Spring 2011.

Conclusion

Ofgem has clearly outlined its thoughts on high-level governance and management principles for the programme. T-Systems believes that these principles could be refined even further so as to more quickly arrive at a satisfactory conclusion.

We also feel the scope of the workshops could be altered to better enable the agreement of an end-to-end architecture and avoid flaws that could risk security and the long-term effectiveness of the chosen solution.

3 Response to Statement of Design Requirements

The following section contains T-Systems' response to Ofgem's 'Statement of Design Requirements' document, Questions 1, 2, 3, 4, 7, 8, 9 and 10.

3.1 Response to Statement of Design Requirements Question 1

Question:	Should the HAN hardware be exchangeable without the need to exchange the meter?

It is T-Systems view that the home area network (HAN) hardware should remain exchangeable, independent of the meter itself.

The HAN will initially be used for communication between the meters, the IHD and the WAN module, and later for interaction between other sensors and actuators within future smart home or smart grid applications. It is highly likely that both devices, meter and WAN module, will therefore require electronic circuits that connect to the existing infrastructure in the home or business premises. For the purposes of this response, we will call this means of connection the 'HAN connector'.

A multitude of options
The technical and physical prerequisites for installing any HAN technology will vary from one home to another. Different technologies dictate different requirements, just as different homes and business premises will vary in their characteristics. Clearly, HAN connectors must accommodate these potential variations.

Wired HANs are based on existing wiring in the home (e.g. power cabling) or on newly installed wiring (coax or 'phone' wiring). Occasions inevitably arise when it is necessary for both types of wiring to be used, for instance in situations where the opportunity to install new wiring is limited.

Nationwide rollout will necessarily require a large variety of HANs to address different physical and technical demands and, consequently, a corresponding variety of different HAN connectors will be needed. Smart meters cannot incorporate all these potential variations in advance, mainly due to high production costs and unforeseen demands on upward compatibility.

A universal solution
Our experience shows that, in order to obtain a high degree of flexibility and scalability within the smart metering system, the HAN connector should remain independently exchangeable. This means it can be fitted or replaced easily without the need to swap out the meter or, for that matter, the WAN module. To achieve this, the interconnection between the meter and the HAN connector would likely use the Recommended Standard 232 (RS232) or USB docking ports. Both these are common examples of interfaces that define the electrical characteristics and timing of signals, the meaning of signals, and the physical size and pin-out.

Conclusion
When looking at smart metering, it could easily be argued that current HAN technology represents a weakness. There are no clear favourites that deliver against both current requirements and the anticipated demands of the future.

As a result, T-Systems recommends that any design of smart metering specifications accommodate the option to replace HAN technology elements with minimal cost or risk to the overall solution. In other words, HAN technology should remain independent of that in the meter(s) and the WAN module.

We also propose that a proportion of the investment in City Trials be used to further explore new HAN technologies, their security requirements and options for in-home automation.

3.2 Response to Statement of Design Requirements Question 2

Question:	Are suitable HAN technologies available that meet the functional requirements?

There are certainly technologies readily available for HAN applications and T-Systems suggests that a thorough investigation of their suitability, both now and for the future could represent one element of the planned City Trials.

When considering potentially suitable HAN technologies, one should distinguish between the different media (wired or wireless) and the possible suite of high-level communication protocols involved.

MBUS (Meter-Bus), which may be either wired or wireless, is a European Standard low-cost Bus system to power and enable remote reading of meters. High-level protocols then add further functionality, such as extended range by mesh networking, additional security through access control, and data integrity by transport error correction. Some of these protocol suites may run on top of an included adaptation layer on both wired and wireless media.

Several alliances have already specified home automation protocols that already meet, or will be extended to meet, the requirements of smart metering. Most popular in terms of number of installations worldwide are:

- ZigBee, targeted at radio-frequency (RF) applications that require a low data rate, long battery life, and secure networking;
- KNX, 'twisted pair' wiring, power line, radio (KNX-RF) or Ethernet; a KNX Device, e.g. based on an 8-bit microcontroller, might monitor smart meters as well as providing output for the In-Home Display (IHD).

In a recently launched initiative, the German Government is supporting EEBus to become an open standard within the metering, Green IT and E-Mobility sectors. EEBus incorporates established standards such as those mentioned above and is intended for use by in-home devices (including HANs) and small to medium sized enterprises.

T-Systems also proposes that Ofgem encourage standardisation bodies and industry alliances to strengthen collaboration between the metering, home automation and communication industries for the benefit of future smart grid applications.

3.3 Response to Statement of Design Requirements Question 3

Question:	How can the costs of switching between different mobile networks be minimised particularly in relation to the use of SIM cards and avoiding the need change out SIMs?

In order to avoid the complexity associated with switching between mobile networks, T-Systems proposes that Ofgem consider structuring the DCC in the manner of a Mobile Virtual Network Operator (MVNO).

MVNOs are organisations that provide mobile phone services but have neither their own licensed frequency allocation within the radio spectrum, nor the physical infrastructure necessary to provide mobile telephone service. They have their own customers, roughly equivalent to the 'switchless resellers' of the traditional landline telephone market. Crucially, this means they issue their own SIM cards, regardless of the Mobile Network Operators (MNOs) with whom they under contract. MVNOs may or may not choose to outsource authentication, authorisation and billing procedures to a third party service company.

Structuring the DCC in the manner of a MVNO will enable it to take advantage of SIM cards and their capabilities for authentication, authorisation and accounting whilst avoiding the need to change out SIMs. It is anticipated that this may also have a positive impact on cost reduction.

T-Systems has many years of international experience in projects involving telecommunication and MVNO implementation and operation. We have successfully completed MVNO related projects for international customers including Cingular Wireless, TT&T (Thai Telecom), Moconta/Bertelsmann and T-Mobile. We would welcome the opportunity to support the implementation programme with our extensive expertise.

Consideration of alternative WAN communication options

The national prevalence of GSM suggests that this will be one of the key technological contenders for the first wave of the Smart Metering and smart grid programme. There is, however, a range of alternative technologies that have been widely trailed for use with Smart Meters.

T-Systems has attached, as Appendix 6.5 to this response, a high level comparison of the technologies that may be used in this programme and would be happy to provide further details on request.

3.4 Response to Statement of Design Requirements Question 4

Question:	Do you believe that the Catalogue is complete and at the required level of detail to develop the technical specification?

Functional requirements have been described thoroughly in the Catalogue. However, in T-Systems' view, key questions critical to the development of a robust technical specification remain unanswered.

The Catalogue is based to a large extent on requirements expressed by future consumers, and from that perspective it can be considered complete. There is also enough detail present,

relating to consumer-oriented functionality, for potential suppliers to have a sufficient level of detail on which to build technical specifications.

However, in our opinion, it is highly unlikely that a substantial and sustained impact on future consumer behaviour will be achieved simply by delivering accumulated energy consumption data. At T-Systems we have formed this opinion as a result of 140 months of cumulative experience from 19 smart meter and smart grid pilot trials (more detail can be found in the Appendices 6.1 and 6.2). Our largest trial, in Friedrichshafen, Germany, has been ongoing since 2008 and has not only provided us with technology breakthroughs but also generated useful independent market research data. These data suggest that in a price-transparent energy market, the consumer will invariably look for the cheapest energy provider, rather than explore means of using less energy. Against this background, we are certain that the availability of tariffing information, and the ability to interpret consumption data, have a direct influence on changing consumer behaviour.

We believe that only by providing significantly enriched data relating to energy usage and consumption will it be possible to drive such a sustained change in behaviour. So, while Ofgem's current Catalogue may be deemed "complete" from a consumer perspective, it is our view that, from a truly end-to-end system perspective, it requires further development.

Driving behavioural change

T-Systems and Technische Werke Friedrichshafen commissioned independent market research in June 2009, 1.5 years into the trial of smart metering in Friedrichshafen, Germany. Some of the reported comments from consumers highlight their appreciation of tailored information, confirming how important this is to achieve a change in their behaviour:

"With the 24 hour summary I could finally show my son: Look… that's what happens when you leave your computer on at night ... it consumes that much power."

"As a result of tracking our usage we have installed a switchable socket. The TV, VCR, etc are no longer on standby when not in use."

"These are all costs that were not transparent for us, they were simply a number that came through at year end as a bill."

"I now have the opportunity to analyse and evaluate."

"an alarm that sounds when one reaches a defined limit would be good."

Finding the right 'smart balance'

There is a strong link between home management (consumer decisions relating to appliance purchase, water and heat usage, etc.) and smart metering. Consequently we feel that this should be more strongly reflected in the Catalogue. This should include requirements for the HAN modules, meters, IHDs and the WAN modules, along with their computational power or that of the processors driving them.

The Catalogue focuses on in-home design. T-Systems believes that there should be sufficient flexibility as to where functionality and intelligence lies. Ideally, the Catalogue should emphasise the importance of the distribution of smartness among devices, their interfaces and requirements on data exchange protocols, not least when thinking ahead to smart grid applications.

Clarifying roles within a distributed system

At T-Systems we believe that the Catalogue could also give more consideration to the transition to the smart grid. This would help avoid potentially costly and difficult-to-manage hardware upgrades in millions of homes, and technically duplicated or inefficiently operated communication methods. T-Systems' experience has shown that the management of a complex nationwide infrastructure requires highly detailed preparation.

If Ofgem maintains the current approach of split ownership (and therefore responsibility) of the overall smart metering system, then further definition of the respective roles is recommended.

In particular, the interoperation of the different parts and their respective responsibilities requires deeper inspection, whilst keeping in mind that suppliers obligations within the system could conflict with their business interests. Care must also be taken in ensuring satisfactory levels of privacy are afforded to competing suppliers to ensure that commercially sensitive information remains confidential.

Without this further analysis, it is difficult to say whether future innovations will be easily achieved or severely hindered – and in our opinion, such unknowns are undesirable.

We would suggest that a more detailed architectural description and data model, from which necessary roles and possible security tasks can be derived, is produced before work on the technical specification can be started.

The role of the DCC should also be analysed in greater detail, in terms of organisational and technical factors and operational responsibilities. More thought is needed with regards to what data is acquired, how it is securely stored and processed and what information will be made available to suppliers. Only then can Ofgem be confident that in-home architecture is complete and that the expensive and cumbersome process of swapping out hastily designed, now-redundant meter equipment is avoided.

Conclusion
In order to develop the technical specification for a system consisting of multiple interacting parties, the operational responsibilities of each party must be known in advance.
Without this knowledge, the resulting technical specification will inevitably lead to a design that makes it inherently difficult for those parties to fulfil their respective duties. It will hinder the DCC's efforts to evolve the smart grid, and lead to consumer dissatisfaction.

3.5 Response to Statement of Design Requirements Question 7

Question:	Do you agree that the proposed approach to developing technical specifications will deliver the necessary technical certainty and interoperability?

Please note: The content of this answer is the same as for Prospectus Question 7, which also asks about the proposed approach to developing technical specifications.

In T-Systems' view, this question should be considered from both a technical point of view as well as from an organisational perspective. In both areas, we believe that the overall programme would benefit from further consideration.

The technical perspective
As outlined in the previous answer, Ofgem's proposed approach to developing specifications during the early stages will determine all future development. However, T-Systems believes that the current approach may result in a highly complex distributed system containing multiple rigid connections. The key technical characteristics of the proposed system and their associated risks are outlined in the following table:

Technical characteristic	Associated risk
An end-to-end system comprising several computational entities with independent smart functions.	Increased cost and complexity.
Multiple autonomous entities that communicate with each other but are not controlled by one overarching entity.	Threat to data quality and security caused by multiple points of failure.
Lack of accountability for failure and recovery in an individual computational entity.	Delays and ineffective failure management.
Lack of clearly defined system structure, e.g. network topology.	Increased cost and complexity.
Design of computational entities with only a limited and incomplete view of the full system.	Sub-optimal specifications.

Given these characteristics, we recommend that the architecture of the smart metering system be developed based on up front decisions about the control and distribution of smartness across the end-to-end process, setting clear parameters for the functional specifications of the involved entities.

This proposal is supported by evidence from successful trials we have conducted on controlling the volume of data transferred in a smart grid environment. Where most trials in this field focus on the remote reading of several million of meters, T-Systems' tests have concentrated on the distribution of smartness and control between the end points and the data services.

Our experience developing the German road charging solution further supports the need for upfront decisions about the data flow, control and distribution of smartness across the architecture. In 2005, from the moment the solution first went live, T-Systems was capturing data from traffic volumes on over 12,500km of road and charging 1.5m users. Charges varied depending on the types of road and distance traveled, and there were different payment methods, including Internet, credit card or cash, pre-paid or invoiced. The management of data flow for road charging and payment, similar to that required for smart metering, requires early agreement on the distribution of smartness across the architecture. Only then is it possible to ensure the integrity of the end-to-end data flow, and that the system is flexible enough to accommodate ongoing improvements, new requirements and continuous data traffic increases. With the smart grid volumes anticipated in the future, the establishment of a controlling entity for smart communication becomes essential.

The organisational perspective

The development of such a complex system will require collaboration between all stakeholders involved in the end-to-end architecture. This is because the system processes, business case and technical elements are all interdependent. We therefore strongly recommend a carefully considered organisational approach to developing design specifications.

Ofgem has identified all key stakeholders and established ten working groups, including two expert groups. It is highly recommended that, before any of these working groups decide on the detailed functional specifications, it is decided how smartness and security are distributed across the end-to-end process.

Once this decision has been made, Ofgem's proposed working groups format can be executed. In the proposed organisation, two expert groups are defined: the 'Smart Metering Design Group' and 'Data and Communications Group'. These are seen as vital to the development of

the technical specifications and will have a direct impact on the overall success of the programme.

T-Systems proposes that Ofgem considers adjusting the focus of these two groups in line with the logical (not physical) view of the value chain, i.e. in light of the data flows. The multidisciplinary nature of the resulting groups would ensure that interoperability is optimised in a truly end-to-end manner across the entire smart metering system and that security aspects are fully considered.

The scope of the two expert groups could be expanded as follows:

- The Smart Metering Design Group works on specifications covering the equipment installed in the home (HAN and WAN), as well as the specification of functionalities provided by DCC over the WAN. Together this determines the data between the home and one single source of truthful data;

- The Data and Communications Group works on the specification of data services provided by the DCC to suppliers, network operators and third parties.

Both groups must consider all relevant data privacy and security requirements and the specifications must then ensure that these can be fulfilled.

While the two groups will work closely to ensure the interoperability of the entire end-to-end smart metering system, the overall process design and separation by data flow will enable them to make informed decisions without the risk of conflicting, missing or duplicate design decisions.

This is further explored in our answer to Prospectus Question 20.

Conclusion
We believe our proposed technical concept for the smart metering system will enable interoperability, deliver a future proof solution and reduce implementation costs. We are also confident that our recommendations to the organisational setup will support not only the interrelationships between stakeholders but also the completeness of their output.

3.6 Response to Statement of Design Requirements Question 8

Question:	Do you agree it is necessary for the programme to facilitate and provide leadership through the specification development process? Is there a need for an obligation on suppliers to co-operate with this process?

T-Systems agrees that it is very important for the programme to have clear leadership and facilitation through the specification development process. As outlined in Statement of Design Requirements Question 10, there is a risk that with many stakeholders there will be many different views, expertise and motives. Without a process by which the relevant expertise can be presented and evaluated in a simple manner, the specification development process could become unwieldy and chaotic, potentially leading to disillusionment of suppliers and their withdrawal.

So far as an obligation on suppliers is concerned, we feel this will be unnecessary. As key stakeholders in the market, suppliers have an inherent motive for participation in the

specification process. This will certainly hold true if suppliers feel that the process is effectively managed and solutions are evaluated in light of their needs. For instance, it will be particularly important to agree the criteria for selecting the preferred end-to-end smart metering process, prior to drilling down into design specifications.

Ultimately T-Systems believes that, with the right solution design, Ofgem's vision will offer energy suppliers a hugely improved, cost-efficient method of engaging with their consumers. However, the path to realising that vision will not be easy.

Suppliers will not only be concerned about the costs associated with meter replacement and installation but also the increased cost of managing their business applications and processes due to the increase in data volume. Data services provided by the DCC may potentially reduce this pressure but Ofgem will nevertheless need to take a guiding and supporting role throughout the programme.

T-Systems recognises that decisions made must reflect the long-term goals of the solution, i.e. the smart grid. The aspiration for smart grid compatible solutions may not be as strong for suppliers if they don't also have a network distribution business. Nevertheless, interoperability between devices connected to the national grid, to local grids and even to home grids (HAN) is essential for overall automation and coordination united by a superior data model and corresponding protocols. Again those considerations should be explained, discussed and agreed early in the specification design process. Effective facilitation and leadership will be key to the success of the programme.

No ICT supplier or advisor can take over this responsibility, however we at T-Systems are happy to offer our expertise and experience to Ofgem and would welcome the opportunity to discuss how we may do this with you.

3.7 Response to Statement of Design Requirements Question 9

Question:	Are there any particular technical issues (e.g. associated with the HAN) that could add delay to the timescales?

As mentioned in Statement of Design Requirement Question 1, the HAN technology currently available is a weakness within the smart metering process and design, as it will evolve rapidly over the next years. However, we do not consider that this needs to add any delay to the proposed timescales, so long as changes and improvements over time can easily be integrated into the chosen solution.

We believe that a smart WAN module could become the central device for the home, acting as a mediator between different HAN devices, and effectively becoming a 'Smart Hub'. Classical architectures and networking standards relating to home and building automation are destined to become outdated and be replaced by such developments. Within the home, our tests have all confirmed that the HAN is best organised as a star network with the Smart Hub at the centre. Functionality such as data brokerage, data aggregation, resource management and abstraction from specific sensors and actuators will be needed on top of physical devices (smart or otherwise), hence the need for a clever coordinating and controlling device.

T-Systems' smart metering trials use this Smart Hub technology, which can be remotely upgraded and operated securely as the control unit for HAN communication, connecting the meters, the IHD and, potentially, other appliances. Full interoperability with 57 meters from 21 manufacturers has been achieved in trials to date (see Appendix 6.3).

T-Systems' research labs are working on modern HAN technologies and solutions for in-home automation. We have found the most cost efficient and effective approach has been a Smart Hub in the home, like the smart WAN module, with open source programming and standards. This enables new and previously unknown technologies to be incorporated into existing designs.

Clearly, new HAN hardware may be required over time as technology evolves but, as detailed in our answer to Question 1, a plug-in and replace option for the hardware connection within the WAN module should keep the hardware exchange simple and costs to a minimum.

3.8 Response to Statement of Design Requirements Question 10

Question:	Are there steps that could be taken which would enable the functional requirements and technical specifications to be agreed more quickly than the plan currently assumes?

Please note: The content of this answer is the same as for Prospectus Question 19, which also asks about speeding up the agreement of technical specifications.

At T-Systems, we share Ofgem's desire to speed up the agreement of technical specifications and appreciate the dependence on industry expertise. Much time will need to be spent in order to fully understand the many different technical options and evaluate their respective advantages and disadvantages before decisions can be made. This will be particularly difficult given the different industry and technical experts and their differing views, concerns, priorities

and motives. Reviewing and rationalising such a significant volume of input will inevitably be the most time consuming activity in this phase.

The presentation approach

In the interest of simplifying the process, we suggest incorporating a presentation approach into the Ofgem specification design process, as illustrated in Figure 9 below.

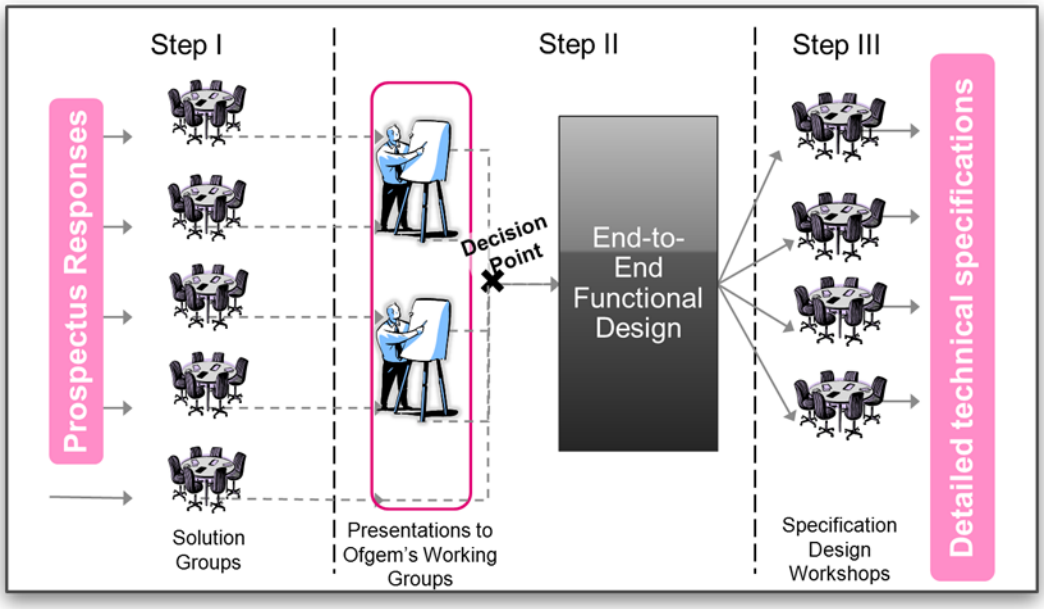

Figure 9: Proposed specification design process

In T-Systems' view, there are a small number of significantly different solution options, each varying in the distribution and degree of smartness along the value chain. Ofgem could use the Prospectus responses to identify experts with a full understanding of the different data flows within the smart metering system, invite these individuals to lead 'solution groups' and task them with developing detailed presentations on each of the different solution options. There would also be the opportunity for other parties to form alternative solution groups to investigate additional models.

Subsequently, within a month, each solution group would be invited to present their findings to a panel of experts, chaired by Ofgem. Clearly defined scoring mechanisms with predefined criteria would then be applied, leading to the selection of a single optimal solution.

Once this is done, the third step would be the agreement of a technical specification. Given the now shared understanding of the overall solution, this could take place in parallel work streams without any conflicting design agenda, and without jeopardising the end-to-end integrity of the architecture.

We believe that adopting this approach could deliver agreed, documented technical specifications as early as Spring 2011.

T-Systems has extensive experience in advising large organisations on the evaluation of different ICT solutions, including working with the German government on projects to define new protocols and standards for online processes. We have found that open workshops and discussions with large numbers of stakeholders and advisors take longer than a structured presentation approach, in which different experts or expert groups are given the opportunity to explain their preferred approaches and then invite discussion.

We would welcome the opportunity to discuss this approach (and potentially other methods of accelerating the design specification process) with Ofgem. We believe Ofgem has already undertaken several specification activities and we would also like to better understand its preferred decision making process, in order that we might make additional suggestions. Irrespective of the manner in which the decision making process is structured, we emphasise the importance of rapidly establishing an escalation process and clear accountability for decisions made.

4 Response to Implementation Strategy

The following section contains T-Systems' response to Ofgem's 'Implementation Strategy' document, Questions 1, 2, 3, 4, 5, 7 and 8.

4.1 Response to Implementation Strategy Question 1

Question:	Do you have any comments on our proposed governance and management principles or on how they can best be delivered in the context of this programme?

Please note: The content of this answer is the same as for Prospectus Question 20, which also asks about Ofgem's proposed governance and management principles.

T-Systems has reviewed the Implementation Strategy document and we understand the concepts and high-level proposal made by Ofgem relating to governance and management principles. In addition, we would welcome further guidance from Ofgem in the following areas:

- The attendee selection process for workshops (ensuring the required balance of expertise in the design groups);
- The guidelines and end-to-end design framework that would enable functional specifications to be agreed;
- The process for decision making within, and following, the workshops;
- The distribution of accountability in the decision making process.

We feel these areas are of critical importance to the programme and, in the absence of further information, we propose changes to two areas within Ofgem's approach. The first is an adjustment to the scope of the planned workshops to allow all main solution options to be identified, understood and assessed. The second is to establish and communicate a transparent decision making process that allows for one solution option to be selected with sufficient time remaining to arrive at a full specification.

Adjustment to workshop scope
If the workshops and expert groups are to enable the rapid agreement of the most suitable technical design and specification, then agreeing the correct scope is essential. We fear that the present approach of focusing on the technical specification and the DCC may not result in the best end-to-end design for optimal data quality and security. On the contrary, even with the potential oversight of the Implementation Co-ordination Group, we believe the current scope could lead to a flawed solution design in which home and DCC functions are considered separately too soon.

We feel the scope of the Smart Metering Design Group and the Data and Communications Group should be adjusted to safeguard the effective interoperability of the entire end-to-end smart metering system. Specifically, we believe the focus should be on the two activities most critical to arriving at a correct design of an end-to-end solution:

- The capture of information from the household into a logical, single source of truthful data;
- The secure and authorised delivery of data in the most appropriate format from the single point of truthful data to and from the energy suppliers.

Figure 10 shows the physical and the logical separation of the home and the DCC. Using the logical data flow view, we illustrate that a slight shift in the focus of the groups' design efforts will have a large effect on the preservation of the data flow integrity.

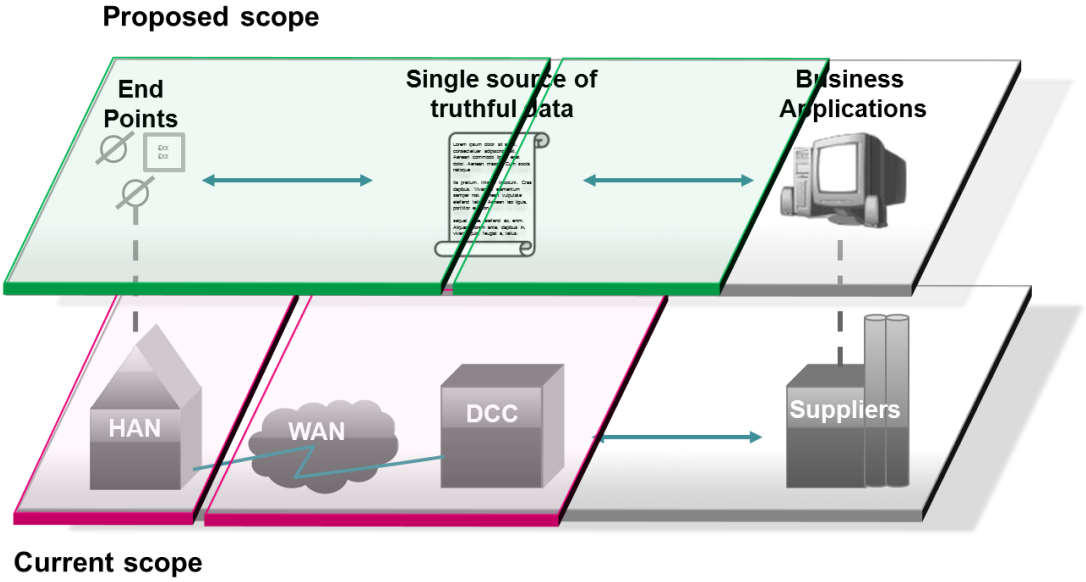

Figure 10: Expert workgroup scope

In the proposed approach, we recommend that the Smart Metering Design Group should focus on specifications covering the equipment installed in the home (HAN and WAN) through to the single source of truthful data in the DCC. The focus of the Data and Communications Group should lie in the specification of data services provided by the DCC to suppliers, network operators and third parties. These services, though potentially wide-ranging and varied, will nevertheless all be based on data supplied by the single source of truthful data.

T-Systems strongly believes that this adjustment to the scope of the workshops will refocus the decision making process on ensuring an uninterrupted flow of data across the entire system. This will in turn enable the security and quality of data services necessary to achieve Ofgem's objectives for the overall programme.

Design Decision Process

We are concerned that the framework for reaching decisions within the Smart Metering Design and Data and Communications Groups is not sufficiently clear. Specifically, we feel that agreement on the preferred solution will be difficult to reach in such a large group, leading to delayed or, worse still, flawed specifications.

In our experience, large working groups often fail to agree a solution if a decision-making framework is not clearly in place. We therefore propose a three-step approach, detailed in our answer to Prospectus Question 19, which will help provide this framework. We believe this will help considerably and accelerate the delivery of an agreed, documented functional design and technical specifications as early as Spring 2011.

Conclusion

Ofgem has clearly outlined its thoughts on high-level governance and management principles for the programme. T-Systems believes that these principles could be refined even further so as to more quickly arrive at a satisfactory conclusion.

We also feel the scope of the workshops could be altered to better enable the agreement of an end-to-end architecture and avoid flaws that could risk security and the long-term effectiveness of the chosen solution.

4.2 Response to Implementation Strategy Question 2

Question:	Are there other cross-cutting activities that the programme should undertake and, if so, why?

Ofgem identifies a number of cross-cutting activities including, among others, promoting consumer engagement, consumer protection and risk management. Assuming that cross-cutting activities are activities or themes that should be considered throughout all elements of the programme, T-Systems has identified three other potential areas for consideration. These are the end-to-end process, data quality and accountability.

End-to-end process
The definition of the overarching meter to energy supplier process, plus a high level framework of future services such as those required for the smart grid, needs to be identified and addressed during the upcoming phases of the programme.

T-Systems is certain that a clear view of the end-to-end process will provide a valuable guideline to all stakeholders involved in the Implementation Co-ordination, Smart Metering Design and Data and Communications groups. It will also help reduce risks, e.g. lack of interoperability or data privacy, which could jeopardise the achievement of programme objectives.

Data quality
All current and future processes and services associated with smart energy, smart grid, or that interact with the smart metering system (directly or indirectly), are dependent on the quality (integrity and completeness) of processed data. Any inconsistency in data records or data interpretation could not only have a major economic impact (e.g. incorrect smart grid information) but could also threaten consumer acceptance (e.g. wrong billing information).

In order to mitigate such risks to the end-to-end data flow, it must be ensured that data objects are fully interoperable throughout all involved parties, services and devices. In addition, in order to enable unhindered interaction between multiple parties, it is essential that each entity (e.g. a meter) has a single truthful point of reference (e.g. a unique ID) and that the interpretation of defined data sets is identical among all participants.

Given the fact that the smart metering value chain contains multiple data interfaces between various entities and given the fact that all interfaces need to be interoperable, a high degree of formal data organisation is required. T-Systems therefore recommends a cross-cutting coordination of data objects to ensure consistency and interoperability of data throughout the entire system.

Accountability
As we have already said, the end-to-end process requires the interaction of multiple parties and stakeholders. From the moment a meter reading is taken through to the point at which that data is ultimately used, there will be multiple steps of data processing and data handover. While each of these steps represents a potential point of failure, the probability of failure identification will be highest at the final point of data usage (e.g. the bill).

T-Systems' experience shows that, within complex distributed systems, such interdependence and numerous data handover points will cause problems in determining accountability for errors. Since errors often occur between interfaces, the allocation of responsibility is not always possible. However, the costly and difficult processes of identifying responsible parties and fixing errors can be avoided. We recommend that accountability be clearly defined for all parts of the end-to-end data flow. And since this impacts all interfaces and data processing activities, it represents a cross-cutting activity throughout the entire system.

Conclusion
These three activities, in our view, are vital to ensuring the desired interoperability throughout the end-to-end system, and are fundamental to achieving the timeline. They should also guide any future design activities once the DCC is in place and has taken ownership of the smart energy code.

4.3 Response to Implementation Strategy Question 3

Question:	Do you agree with our proposal for a staged approach to implementation, with the mandated rollout of smart meters starting before the mandated use of DCC for the domestic sector?

For all the reasons given by Ofgem, T-Systems appreciates the benefits of a rapid approach to implementation using a staged approach. However, we strongly advise extending the focus of Phases 1, 2 and 3 (Policy Design, Establish Framework and Implement Framework) in order to address the challenges created by rolling out the Smart Metering System and the DCC at different times.

These challenges include:

- Lack of interoperability, data privacy and security;
- Inefficient procurement processes;
- Technical as well as legal implications upon required transition to DCC's services;
- Distortion of market competitiveness;
- Unnecessary costs caused by developing ICT systems during early rollout;
- Poor consumer experience.

Please also refer to T-Systems' response to Implementation Strategy Question 4 for more details on these challenges. Our November 28th response to the questions raised in the Communications Business Model will also provide further detail on this subject.

Our concern is that, without some modification to the Implementation Strategy, the challenges mentioned above outweigh the benefits of the staged approach proposed by Ofgem, and could threaten a successful implementation.

4.4 Response to Implementation Strategy Question 4

Question:	Do you have any comments on the risks we have identified for staged implementation and our proposals on how these could best be managed?

In the Prospectus and supporting documents, Ofgem highlights a number of risks associated with the staged approach to implementation. These include:

- Smart meters rolled out ahead of the establishment of the DCC are not sufficiently interoperable;
- Suppliers cannot or do not procure communications services of sufficient quality and flexibility, or in an efficient and economical manner;
- Implementation of the DCC is hindered by existing supplier contracts with communication service providers.

In our opinion, these risks are entirely valid and there are others that we feel should also be carefully considered. Firstly, relating to suppliers:

- Supplier reluctance to invest heavily in complex, non-standard and risk-prone data communication systems to manage communication with meters, when they will be temporary and their lifetime will probably be less than one year;
- Supplier uncertainty about the future role of the DCC and how it will impact the provision of data services, thus limiting scope for early strategic planning and investment;
- For those smaller suppliers less capable of investing in costly systems, the disadvantage of having no centrally available services. The required up front investment may be prohibitive, giving larger suppliers a competitive advantage and thereby distorting the market.

And more broadly, relating to consumers and future innovation:

- Leaving fundamental data services in the hands of suppliers may not best serve the evolution of the smart grid, data integrity, privacy and security or consumer protection, and could drive the need for further codes of practice and monitoring bodies;
- In light of the risks highlighted here, overall consumer experience will very likely be threatened. Specifically, confusion could be caused among consumers during the switch from suppliers to the DCC if, as is likely, the switch causes discrepancies in the display of information via the IHD.
- Lack of clarity relating to the future role of the DCC will only make the realisation of smart grid and related innovations more difficult, from both a WAN module and a data processing perspective.

It is T-Systems' belief that changes to the currently proposed staged approach will enable Ofgem to reduce these risks and speed up the implementation process. Details of our proposed changes are provided in our answer to Implementation Strategy Question 7.

4.5 Response to Implementation Strategy Question 5

Question:	Do you have any other suggestions as to how the rollout could be brought forward, including the work to define technical specifications, which relies on industry input?

With regard to speeding up the rollout, please see our answer to Implementation Strategy Question 7. Our answers to Statement of Design Requirements Question 10 and Prospectus Question 19 detail our approach to bringing forward the definition of technical specifications.

4.6 Response to Implementation Strategy Question 7

Question:	Do you have any comments on the activities, assumptions, timings and dependencies presented in the high-level implementation plan?

Our comments relate mainly to concerns about what we perceive to be the late start of DCC data services and the implications that this has on both suppliers and consumers.

Our proposal to alleviate these concerns, as previously detailed in our answer to Prospectus Question 17, involves clarifying the role of the DCC and bringing forward its launch. In doing so, we believe we can also bring forward the rollout schedule.

T-Systems believes that the following changes to the current approach will enable Ofgem to reduce the risks and speed up the implementation process, potentially still enabling a staged rollout.

Clarifying the DCC's role
The remit of the DCC should be clearly laid out in parallel with the completion of the technical specifications (Phase 1). This will increase the level of certainty for suppliers and organisations applying as potential DCC candidates.

Once the DCC scope is clear the provision of interim data services would be possible. 'On-demand' services could be requested from ICT suppliers, providing they meet the technical specifications laid out for the core functionalities. On-demand services would enable suppliers to conduct early rollout without the need for investment in expensive ICT infrastructures. They would also minimise market distortion by ensuring both small and large suppliers are able to take advantage of central services.

It should be noted that, whilst we have provided ideas on how to best offer interim services, temporary solutions can always introduce risk. These potential risks should be balanced against the benefits of reduced cost to the market.

Bring forward the launch of the DCC
T-Systems proposes that tendering for the DCC commences as soon as the completed technical specifications are available, and ends shortly after implementation of the regulatory changes required for DCC.

This could potentially bring forward DCC Go-Live from Autumn 2013 to Spring 2013, shortening the period in which DCC services are unavailable, while also providing more time for the tendering process, as shown in Figures 11 & 12 below.

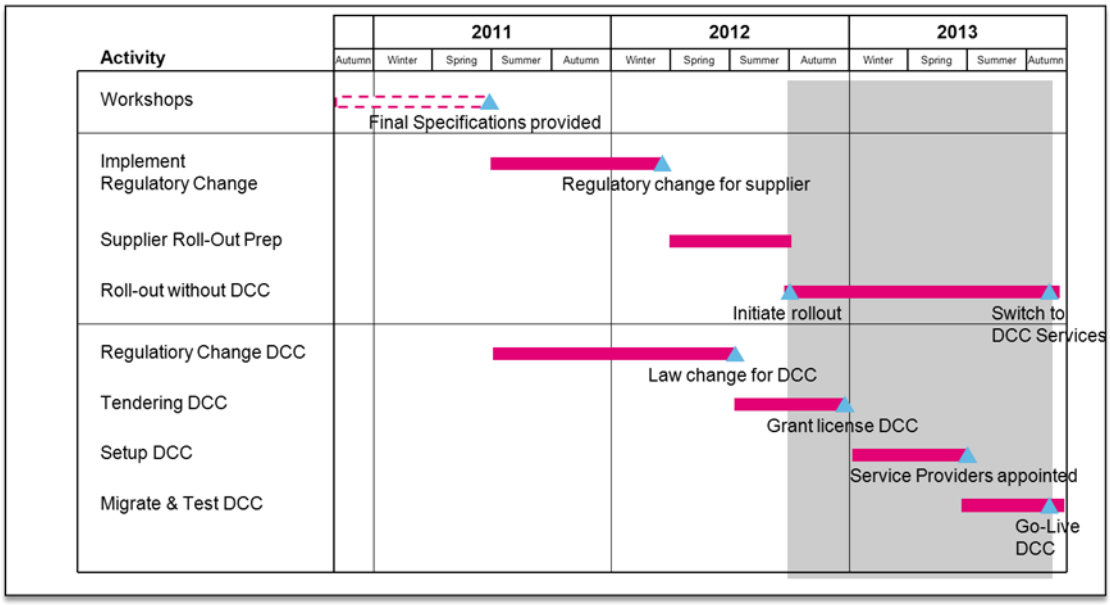

Figure 11: DCC unavailable time, current approach

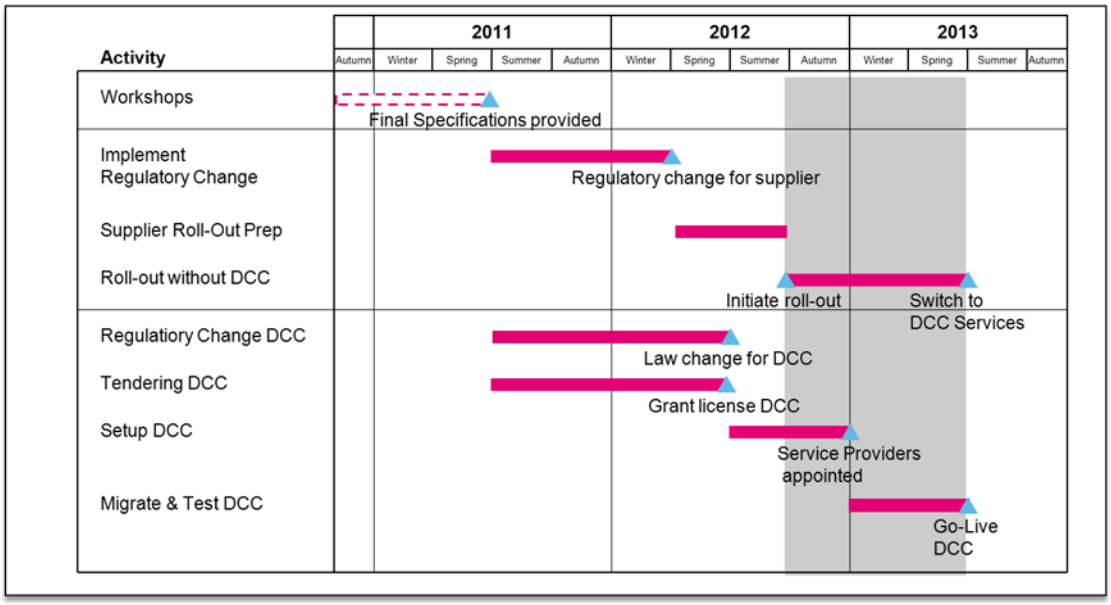

Figure 12: T-Systems proposal to reduce DCC unavailable time

Conclusion

T-Systems agrees with Ofgem's desire to roll out smart meters as quickly as possible and can appreciate how this has led to a staged approach. Yet we feel that, in addition to the risks that Ofgem has outlined, a significant financial burden could be placed on suppliers if they are to comply with the approach set out in the Prospectus. We fear that smaller suppliers in particular will be penalised by the current approach.

Likewise, we believe consumers stand to lose out if substantial supplier investment is made based on unstructured requirements prior to DCC availability. The overall consumer experience risks being inconsistent and, at worst, negative – a highly undesirable outcome given that the programme's main goal is dependent on a positive consumer perception of smart metering.

We believe our proposed alterations could strengthen the implementation approach and bring forward the availability of data services. The revised DCC Go-Live date may also be sufficiently early to avoid the need for temporary solutions and their associated risks altogether. In

addition, bringing forward the availability of data services would reduce the overall timeline from Autumn to Spring 2013, as outlined in our response to Prospectus Question 18.

4.7 Response to Implementation Strategy Question 8

Question:	Do you have any comments on the outputs identified for each of the phases of the programme?

Ofgem has proposed a staged approach for the programme with high-level outputs for each phase. In our analysis of the Ofgem Prospectus, we have identified several challenges and risks as outlined in our response to Implementation Strategy Questions 3 and 4. In our response to Question 7, we recommend some adjustments in order to reduce these risks. This answer summarises the impact on outputs as a result of our proposed adjustments.

Phase 1 outputs

Workshop Scope
In Implementation Strategy question 1, we argue for an adjustment to the scope of the planned workshops.

Issue: Even with the potential oversight of the Implementation Co-ordination Group, we fear that the current workshop scope could lead to a fundamentally flawed solution design in which home and DCC functions are considered separately too soon.

Proposal: We recommend refocusing the design process for technical specification on ensuring an uninterrupted flow of data across the entire system. This would be achieved as follows:

- The Smart Metering Design Group should focus on the capture of information from the household into a logical, single source of 'truthful data' at the DCC;
- The Data and Communications Group should focus on the secure and authorised delivery of data in the most appropriate format from the single point of truthful data to the utilities;
- Revisit and refine the national business case for smart metering. We believe there is a compelling argument to periodically review and refine the national business case for smart metering to assure consumers and the wider stakeholder community that the business benefits of the programme will be fully realised within the anticipated timeframe.

The National Business Case
The national business case is compelling and will grow stronger driven by factors such as:

- *Access to customer premises is becoming increasingly difficult. Consumers (particularly vulnerable consumers) are becoming less willing to allow people into their homes unnecessarily.*
- *As 'Digital Britain' is further rolled out, consumers will need to have a greater understanding of the effect of their new digital devices. Smart Metering and the IHD will encourage appliance and equipment manufacturers to make more energy efficient products for the home*
- *Smart Meters will assist in developing the market for home based renewables.*

Implemented properly, this programme will enable remote accurate meter reading, help consumers to understand and control their energy consumption, simplify industry processes and lay the foundation for smart grids and the fundamental change in the way that we use and distribute our energy. It will also make Britain a leading place in the world for people and companies to invest in innovative technologies that will help Britain to deliver on its carbon reduction targets and create new knowledge economy jobs.

Decision Making Process
In Prospectus Question 19 and Implementation Strategy Question 1, we argue that a sound decision making process needs to be established.

Issue: We believe that there is a number of fundamentally different solution options that need to be analysed during the workshops, before selecting one for full technical specification. In order to identify, understand and decide on the best option, a decision process is needed that allows for one solution option to be selected with sufficient time remaining to arrive at full specifications.

Proposal: We propose a three-step process, as follows:

- Based on the responses to the Prospectus, groups are selected and tasked with presenting different solution options;
- Presentations are made to a panel of experts, chaired by Ofgem, followed by agreement on the best solution option;
- Agreement on full technical specifications achieved in parallel work streams, given that a full understanding of the chosen solution is now present.

Phase 2 output

Technical specifications
We believe that including the DCC specifications within the full technical specifications will address two issues.

Issue 1: In Prospectus Question 6, we argue that the current scope of the Catalogue does not sufficiently address data services or the processes within the DCC. The absence of an end-to-end view of data flows may result in flawed functional specifications, resulting in unforeseen risks that may ultimately jeopardise consumer trust and engagement.

Issue 2: In Implementation Strategy Question 7, we argue that unless go-live of the DCC is accelerated there are inherent risks to both suppliers and consumers. Suppliers will be burdened with the cost of building interim solutions. Consumers are likely to suffer the effects of an inconsistent smart metering experience caused by the varying supplier interim solutions.

Proposal: We propose that the full specifications of the DCC services are included in the technical specifications. This will ensure that the technical design is sound as well as allowing the tendering, set up and go-live of the DCC to be brought forward.

Phase 3 output

Interim services
Provision of market based interim services during the period when the DCC is unavailable.

Issue: We argue in Implementation Strategy Question 7 that, even with the shortened period of DCC unavailability, the complete lack of DCC for six months may make heavy investment necessary on the supplier side, as well as distorting the market for the smaller suppliers who can't afford the cost of interim solutions.

Proposal: We propose that independent ICT suppliers should be encouraged to develop temporary, on-demand services, for the benefit of smaller suppliers and those larger suppliers who prefer not to invest in their own interim solutions.

5 Response to Rollout Strategy

The following section contains T-Systems' response to Ofgem's "Rollout Strategy" document, Questions 1, 2 and 3.

5.1 Response to Rollout Strategy Question 1

Question:	Do you believe that the proposed approach provides the right balance between supplier certainty and flexibility to ensure the successful rollout of smart meters? If not, how should this balance be addressed?

Ofgem proposes that suppliers be responsible for the installation of smart metering equipment at the consumer premises. While this approach has many benefits, Ofgem recognises a number of potential dangers. At T-Systems we argue that the current approach may cause significant market distortions in favour of the larger players.

Ofgem refers to the balance between supplier certainty and flexibility. For clarity, we would like to confirm our interpretation of these terms. We take 'flexibility' to mean the flexibility suppliers have in rolling out smart meter equipment. And we understand 'certainty' to refer to both short-term certainty (or uncertainty) about meter operability, as well as medium-term certainty (or uncertainty) about the required interim data services.

In its proposed approach, Ofgem recognises the following shortcomings:

- The meter installation visit could be used as an unwelcome sales call and a code of practice is needed to avoid any problems;
- Smart meters deployed in the early rollout phase may not be sufficiently interoperable;
- Upfront charging by utilities may disadvantage consumers;
- Smaller suppliers will find it more challenging to roll out smart meters.

T-Systems has identified the following additional risks:

- Before the DCC is fully available with data services, suppliers will not be able to engage in smart metering without investing heavily in data services;
- All suppliers will be forced to invest into temporary solutions;
- The upfront investment may be prohibitive for smaller suppliers, giving larger suppliers competitive advantage and thereby distorting the market;
- Temporary solutions may lead to an inconsistent (negative) consumer experience across different suppliers;
- Due to human resource and logistical limitations within the installation process, smaller suppliers will be geographically limited during the rollout;
- Suppliers could adopt a strategy where they proactively target consumers with smart meters already installed, in order to avoid installation costs themselves; this will especially be the case with those suppliers that do not own distribution networks and are unlikely to be interested in investing in consumer premises hardware;
- If meter registration becomes a DCC service at some point, as indicated by Ofgem, it stands to reason that this transition will cause additional, potentially disruptive administrative complexity.

T-Systems would like to offer two potential solutions to address these issues:

Firstly, we propose that market driven interim solutions should be encouraged to lower the barrier to market entry for suppliers prior to the DCC going live. Suppliers should be able to use these services during the early rollout in order to avoid heavy investments.

Secondly, we propose that Ofgem should consider a centralised coordination programme for meter installation. This would ensure a consistent and cost-effective delivery of smart meters, potentially enable a fast street-by-street rollout, and provide a “level playing field” in the market.

T-Systems believes these recommendations will help address the risks associated with Ofgem’s proposed approach. They will help encourage positive engagement from the energy suppliers, contribute to a positive consumer experience, and support the timely implementation of the programme.

5.2 Response to Rollout Strategy Question 2

Question:	Would the same approach be appropriate for the non-domestic sector as for the domestic sector?

Ofgem states that the programme should take the business requirements of non-domestic customers into account, although non-domestic customers are not mandated to use the new domestic metering process.

Many non-domestic customers already use smart metering and there is a risk that their design specifications will not match those to be agreed and mandated for domestic smart meters next year. T-Systems has experience of similar issues with both domestic and non-domestic smart meters from our trials in Germany. This experience shows that interoperability and retro-fitting of existing smart meters becomes easier when design specifications require no unique features in the meter, and instead rely on the smartness within the WAN module to address compliance with standards and protocols.

Given a smart WAN module, existing meters in use by non-domestic customers can also be adapted more easily to fit future HAN solutions. This can be achieved by remote software upgrades in the smart WAN module, thus ensuring interoperability with non-domestic meters.

At T-Systems we believe that the ease of converting non-domestic customers will determine the uptake of the DCC services. We feel that incorporating as much of the non-domestic sector as possible in the overall smart metering process will be advantageous when looking ahead to the operation of a smart grid.

On this basis, T-Systems recommends that the technical specifications should give particular consideration to interoperability scenarios involving established solutions in the non-domestic sector.

This argument further supports our reasoning that the design scope of the HAN elements is orientated around data flow and that the WAN connector should act as the Smart Hub in the home.

5.3 Response to Rollout Strategy Question 3

Question:	Is there a case for special arrangements for smaller suppliers?

Ofgem has recognised that the smart meter rollout may be more challenging for smaller suppliers than for larger organisations. In our answer to Rollout Strategy Question 1, we have argued a number of disadvantages in the currently proposed rollout strategy. Several of these apply specifically to smaller suppliers, as listed below:

- Before the DCC is fully available with data services, suppliers will not be able to engage in smart metering without investing heavily in data services. This is likely to give larger suppliers competitive advantage and thereby distort the market;
- Suppliers could adopt a strategy where they proactively target consumers with smart meters already installed, in order to avoid installation costs themselves. This will especially be the case with those suppliers which do not own distribution networks and are unlikely to be interested in investing in consumer premises hardware;
- If meter registration becomes a DCC service at some point, as indicated by Ofgem, it stands to reason that this transition will cause additional, potentially disruptive administrative complexity.

In order to address issues that may be caused by the early rollout, we have suggested two potential solutions in our answer to Rollout Strategy Question 1.

Firstly, we recommend that Ofgem considers encouraging the provision of interim solutions by ICT companies, which would lower the burden particularly for smaller suppliers. And secondly, we propose that Ofgem consider a centralised coordination programme for meter installation in order to level the playing field and reduce the disadvantage to smaller providers.

6 Appendices

The following section contains supporting information for T-Systems' response.

6.1 Corporate Overview

T-Systems has years of relevant experience
T-Systems is part of Deutsche Telekom, one of the world's leading ICT companies, serving over 150 million customers globally. Our culture thrives on innovation, transformation and technology, enabling us to understand our customers and to offer attractive bundled services and individually tailored tariff options. When our customers move house, travel abroad or switch local network providers, they still want to receive real-time information about their costs. Our technical platform and operational processes enable this.

Within the Deutsche Telekom group, T-Systems is dedicated to providing resilient and cost effective solutions to help Multinational Corporations and Public Sector Institutions meet their ever-changing information and communication needs. The flexibility and scalability of our solutions, our security features and quality are key ingredients to our customers' success and our own growth.

We see smart metering evolving in a similar way to that of telecommunications. Just as we pioneered competitive telecoms solutions, we have already invested in and developed a solution that offers a stable technical foundation for a competitive smart metering marketplace, independent of the chosen communication method ((DSL, GPRS, Long Range Radio Frequency, Power Line Communication (PLC) / Broadband over Power Line (BPL) etc.)). We believe we are well positioned to deliver secure, future proof smart metering solutions and establish ourselves as a trusted and valued partner in the world's leading energy markets.

Our organisational expertise, honed on projects including the replacement of the entire East German telecommunication infrastructure following reunification, uniquely positions T-Systems and Deutsche Telekom as one of the few global organisations with experience of implementing nationwide infrastructure overhaul programmes. We are keen to prove the value of this expertise to Ofgem through our involvement in the smart metering programme and its nationwide rollout.

T-Systems smart metering services in use in 19 trials
Drawing on our experience from the telecommunications industry, we have already designed, built and proven new technology platforms for a large number of European smart metering trials. The first of these began in 2008 in Friedrichshafen, Germany. Since then we have been involved in 18 other trials which enabled us to further develop our technology and understanding of smart metering and smart grid solutions. With a total of 140 months experience to date and established working relationships with energy network operators, suppliers and consumers, we are continuing to develop a range of flexible smart solutions. This experience has also enabled us to generate and share a unique wealth of knowledge and expertise.

Whilst Friedrichshafen was not the first European city to implement smart metering, it is one of the largest test environments where an established smart metering infrastructure is used to

achieve technical interoperability and develop a smart grid. T-Systems' meter data services have so far been fully integrated and tested with 57 different meters from 21 different meter manufacturers.

The interoperable and scalable architecture of our solutions is especially designed to cater not only for today's smart metering, but also for tomorrow's smart grid requirements. Security and privacy is assured, as are the flexibility and performance necessary to address the varying needs of different energy suppliers and other third parties.

In a sector where technology is evolving at such a pace, future proofing solutions to maintain affordability and scalability is key. T-Systems' solutions are designed to accommodate software updates without the need for meter replacement, reducing supplier costs and avoiding unnecessary impact on the consumer.

All available IP-based telecoms connectivity or augmentative communication methods can be deployed for data transmission with our technology, ensuring flexibility and interoperability. Furthermore, we can deliver our smart metering solution as a service, which provides an attractively competitive costing model, especially if costs are to be passed from energy suppliers to the consumer.

The solution in Friedrichshafen comprises approximately 2000 households with more than 2500 smart meters for power, gas and water consumption. ABB and Deutsche Telekom are using this established infrastructure to balance the increasing share of renewables.

Managing future power networks requires detailed information on utilisation and demand, so power networks and data networks will merge into a smart grid. ABB is a leader in power and automation technologies that enable utility and industry customers to improve performance while lowering environmental impact. ABB will provide the technology for managing power networks and home automation whilst T-Systems will continue to develop and provide the necessary data services. We believe that together we can create compelling smart grid solutions, in particular focusing on four key areas:

- Virtual power plants;
- Distribution automation;
- Demand side management and e-mobility; and
- Home automation enabled demand response.

T-Systems is already a trusted partner in the UK

T-Systems' credentials combine ICT knowledge and experience with proven our smart meter and smart grid solutions. We hope to provide support to Ofgem and DECC during the planned workshops, city trials and in ultimately delivering smart metering solutions and related services in the future.

We operate in the UK market as T-Systems Limited and have already established a strong presence and credibility. We have grown rapidly in recent years, with organisations such as Shell and BP putting their faith in our expertise by choosing to outsource their IT and communications infrastructure to T-Systems.

We appreciate that no single supplier can meet all the requirements for the transition to smart metering and smart grids in Britain. As previously mentioned we are already partnering with organisations such as ABB to develop smart grid services. And we frequently evaluate other partnership opportunities, both in the UK and globally, in our ongoing commitment to further strengthening the overall value of our proposition.

6.2 T-Systems smart meter trials

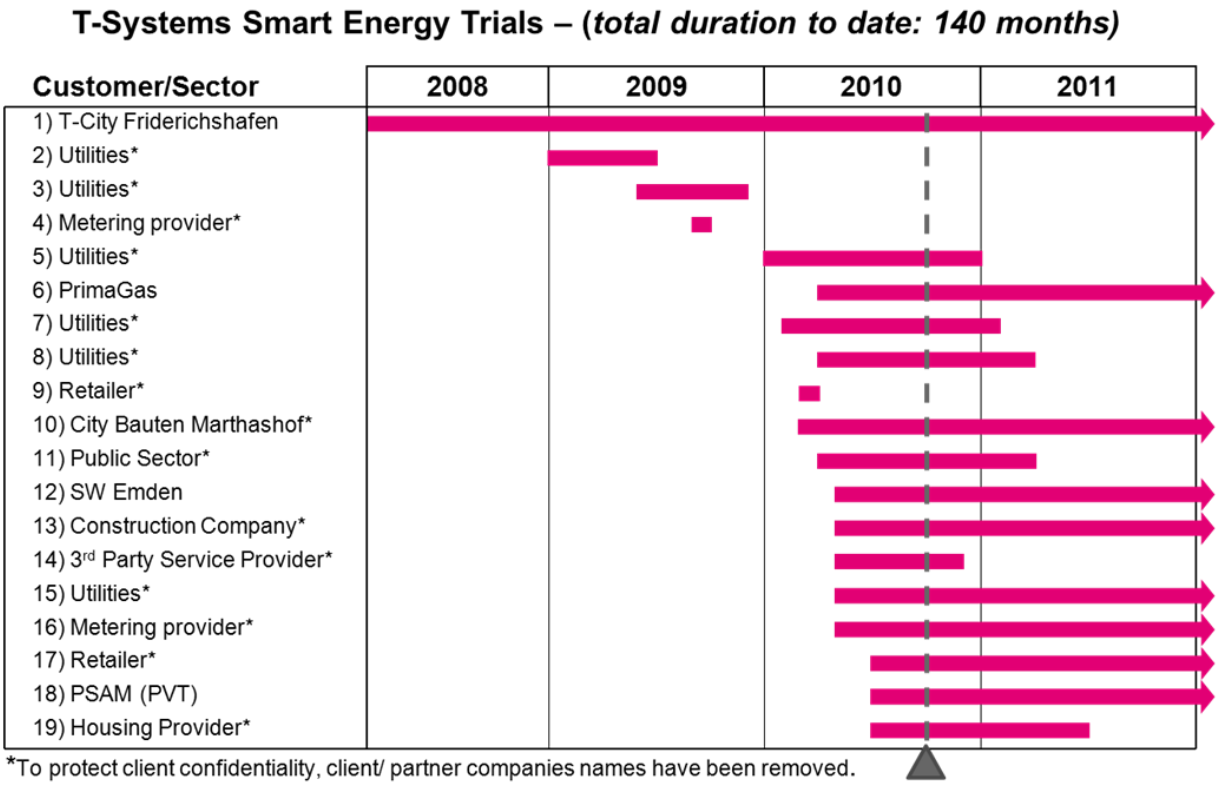

Figure 13: T-Systems smart meter trials

6.3 Meters tested by T-Systems

T-Systems has tested and proved interoperability with a number of meters. The list of those that have successfully passed through this process are shown in the table below.

Manufacturer	Model	Type
ACTARIS Itron	CF-ECHO II	Heat
ACTARIS Itron	Cyble M-BUS	Water
ACTARIS Itron	RF1	Gas
aquametro	CALEC® ST	Heat
Contor Caracioni GmbH	Solaris	Water
EasyMeter GmbH	Q3D (Wireless-MBUS)	Electricity
Elster GmbH	A1350 (Alpha)	Electricity
Elster GmbH	A1440	Electricity
Elster GmbH	A1500	Electricity
Elster GmbH	A220	Electricity
Elster GmbH	AS1440	Electricity
Elster GmbH	F90M	Heat
Elster GmbH	ICM F96	Heat
Elster GmbH	TMP-A (M140)	Water
Elster GmbH	Falcon Communication module (PR6/7)	Water
Elster Instromet	BK (Wireless MBUS)	Gas
Elster Instromet	Absolut-ENCODER Z6	Gas
Elster Instromet	BK (Wired MBUS)	Gas
EMH	LZQJ-XC	Electricity
EMH	eHZ V1.03	Electricity
EMH	MIZ	Electricity
EMH	DIZ	Electricity
EMH	ITZ	Electricity
EMH	LZQJ	Electricity
EMS-PATVAG AG	EGZ	Gas
Flonidan DC A/S	G4S	Gas
Flonidan DC A/S	G4S	Gas
Flonidan DC A/S	UNIFLO G4	Gas
Gossen Metrawatt	GMC-U	Electricity
GWF	GWFcoder-Encoder	Water
GWF	Meistream/Meistream Plus	Water
GWF	MTKcoder® Mehrstrahlzähler	Water
Hydrometer GmbH	HYDRUS BAUREIHE 171 (Wireless MBUS)	Water
Hydrometer GmbH	HYDRUS BAUREIHE 171 (Wired MBUS)	Water
Hydrometer GmbH	Flypper	Water
Hydrometer GmbH	Sharky	Heat
Hydrometer GmbH	IZAR RADIO EXTERN SCR	Konfigurierbar
Iskra	MT173	Electricity
Iskra	MT372	Electricity
ista	sensonic II mbus	Heat
Kamstrup A/S	382BCDE	Electricity
Kamstrup A/S	382Jx3 (Wireless MBUS)	Electricity
Kamstrup A/S	Multical 401	Heat
Landis+Gyr	E350	Electricity
NZR	DHZ	Electricity
NZR	WZ-HY	Heat
NZR	WZ-M	Water
QUNDIS	G21	Heat
QUNDIS	WHE460/467	Heat
RELAY GmbH	PadPuls M2/M2C	Various
Sensus	PolluTherm	Heat
Sensus	C420	Water
Sensus	MeiStream/MeiStream Plus	Water
Sensus	Residia Jet	Water
Sensus	C620/MS8100	Water
Sensus	HRI-Data Unit	Water
Wehrle GmbH	MOD-M	Water

6.4 Corporate Responsibility and Sustainability

Smart metering and smart grid services are by no means a new “green theme” for T-Systems. Our keenness to invest in solution development and participate in trials builds on an established portfolio of Green ICT initiatives and reflects our strong internal commitment to corporate responsibility.

T-Systems approach to corporate responsibility is guided by the overarching Deutsche Telekom strategy, which defines three fields of activity:

Connected life and work: Linking private life with the world of work
We want to be a major driving force for sustainable life and work. We want to help shape the change toward increasingly digitised life, work in a positive way, and improve quality of life for people.

Connect the unconnected: Access to the information and knowledge society
We aim to enable as many people as possible to participate in the connected society. We want to achieve CR market leadership by setting an example in the integration of people in the information society, among other things. We want to enable as many people as possible to have access to ICT – regardless of where they live, their age, level of media competency or disabilities.

Low carbon society: **Ways to create a climate-friendly society**
We want to be leaders on the road to a low carbon society. Reducing global warming by cutting CO_2 emissions is an important CR goal for T-Systems and Deutsche Telekom. We also want to enable our customers to make their own contribution to climate protection.

For many years, Deutsche Telekom has offered its sustainability performance for external assessment, and has repeatedly achieved top ratings. Sustainable Asset Management (SAM) has listed Deutsche Telekom in the Dow Jones Sustainability Index (DJSI World) without interruption since its inception in 1999. The agency analyses more than 2,000 companies worldwide from a social, ecological and economic viewpoint. Only the top 10 percent from any given year are included in the index. Deutsche Telekom’s good rating also led to its inclusion in the DJSI Stoxx Index, which lists only the best European companies.

6.5 Consideration of alternative communication technologies

Further to our answer to Statement of Design Requirements Question 3, Figure 14 below provides a high level comparison of the technologies that may be used in the British smart metering programme.

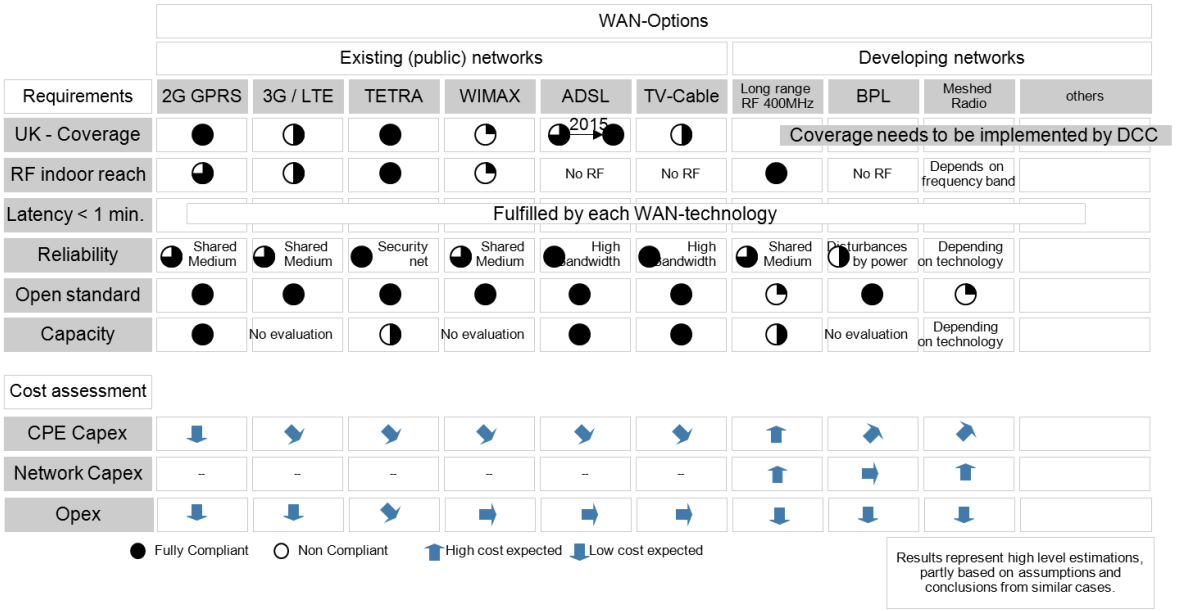

Figure 14: Comparison of possible UK WAN technologies

7 Glossary of terms

The following list contains words and terms we have used in our answers that may not be immediately familiar to all readers of this submission. We have avoided repeating any of the terms from Ofgem's Prospectus and supporting documents.

Term	Definition
EEBus	EEBus describes the use of existing communication standards, norms and products in order to increase energy efficiency by facilitating the exchange between applications and services.
End points	The final destination/s within an end-to-end process or system
End-to-end	The description given to a process or system that extends fully between end points.
Locked in	The state in which a device or technology may be limited in its ability to interact or interoperate with other devices or technologies.
Pin-out	The arrangement of the connecting pins in an electrical connector.
Single source of truth	The single source of truth or truthful data refers to the one location or point of reference that guarantees to be the source 'true data'.
Smart Hub	The Smart Hub is a device in the home that acts as mediator or communications hub, controlling the data flow between external entities (e.g. energy suppliers, third parties) and other devices within the home (e.g. utility meters, smart appliances).