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**“Sherlock Holmes and the
Theft of electricity and gas.”**

Theft of electricity and gas

Sherlock Holmes:

“When you have eliminated the impossible, whatever remains, however improbable, must be the truth.”

Theft of electricity & gas - CONTEXT:

Total Insured Theft Claims paid in
2000: £740m (ABI,ISSN 13540734).

- Ofgem assumes “*Electricity stolen between £44m & £132m, with Gas stolen as £37m.*”
- UKRPA considers “*Electricity stolen range is between £220m and £330m.*”

Theft of electricity & gas - CONSEQUENCE:

National Loss & Global Warming:

“Theft losses are a waste of resources, which results in cost incurred with no real gain to society. Avoidance allows these resources to be constructively used, rather than for global warming!”

Theft of electricity & gas - ATTITUDINAL CAUSE 1:

“TV Licensing” Survey 07 June 04

“It is the professional middle classes and high-earners who commit most of these offences [car tax, TV licence dodging, etc] & are mostly involved in morally dubious practices.”

Theft of electricity & gas - ATTITUDINAL CAUSE 2:

“Staff From Hell” ITV 9pm, 10 June 04

- Martin Holles said: ***“25% of staff are totally honest. 25% are dishonest; and 50% can be swayed either way.”***
- ***SUM UP: A majority will be swayed by the certainty of being caught!***

Theft of electricity & gas - CRIME MICRO-ECONOMICS:

Gresham's Law: "The bad drives out the good".

- If there's a low cost "barrier to entry";
- If there's a low cost of being caught, e.g. if there's "uncertainty of detection";
- Then theft will thrive, due to perceived "easy profits", or "cash savings".

Theft of electricity & gas - SYSTEM CAUSE:

Non Detection & Market Process?

“Due to many causes, including the 24 month period for a meter visit, compared with the 14 month period for data into settlement .”

Theft of electricity & gas - COLLECTION of DATA:

Root cause of inappropriate Data set?

- *Suppliers are responsible – through agents - for the collection of metered data.*
- *But theft occurs from the ‘wires’ business.*
- *Also, Distributors have to accept that data from the Suppliers. Q: How to challenge?*

Theft of electricity & gas - Ofgem's Ambiguous Objective, 1

Quotation from 85/04 page7, para 2.21

“The purpose of this review is to ensure that there are incentives and arrangements in place, regulatory or otherwise, so that *[unfortunately the extent desired by Ofgem is not clarified here]* cases of theft are identified, accurately recorded and effectively dealt with quickly by the appropriate parties.”

Theft of electricity & gas - Ofgem's Ambiguous Objective, 2

Ofgem's Objective might mean 1 of 3 things:

- If only **some** 'cases of theft are' to be identified, then honest customers pay for **most** of the theft.
- If only **most** 'cases of theft are' to be identified, then honest customers pay for **some** of the theft.
- If **ALL** 'cases of theft are' to be identified, then honest customers pay for **none** of the theft(s).

*BoxTen's opinion: Ofgem's Duties should mean **ALL!***

Summary of Proposed Solution:

- Reputational Risk Management issues.
- Theft 25 years ago: Price Commission & HC132.
- Patent GB2309086 'Utility Metering Arrangement' solves the 'Unbilled Units' problem.
- Theft today: Customers' SPAM and GSPGCF.
- Q: Isn't there a systematic bias with the Assumed LLF figures, which presumably includes Theft?
- Again Patent GB2309086 & Date Britain can help
- Because an Independent Annual Finite Element Oversight approach can focus R. P. teamwork!

Reputational Risk Management:

- **Theft is an issue of Corporate and Social Responsibility.**
- Perceived incompetence may result in a loss of **shareholder value**. (The FSA will test all UK listed Companies' systems and Internal Controls details.)
- Reputational Risk **affects the Regulator(s) also.**
- Q: Are you pro-active re your Reputational Risk?
- Q: Are you encouraging risk in your estimates?
- Q: Do you check, check and check again?
- Q: If not, how can you eliminate the 'impossible', & hence find true (i.e. un-biased) theft estimate?

Emperor's New Clothes?

1. Hans Christian Andersen wrote an interesting tale.
2. Currently a new novel is W-I-P, copyright © Don Stickland 2004, with a working subtitle:
3. “No Unplanned Distribution Events?”
4. Please note the acronym, also the novel’s title:
5. “**N U D E?**”
6. However, this novel will not be marketed soon!

BoxTen’s opinion: this novel might be of interest to customers who may be surprised at Ofgem’s work, compared with its aim “to promote ... value for all customers”, and the Theft of Electricity and Gas ...

Hypothetical Scenario 1?

1. Due to recklessness & desired low costs, our “villains” decided to illegally abstract electricity without authority:
2. This was used to grow certain plants:
3. And was also used to process their products:
4. Not only that, the products were transported by electric scooters, or by electric vans:
5. Which neither had to pay the Capital City’s Congestion Charge(s),
6. Nor any Parking bay fee(s) – because they’re electric vehicles. NB: the electricity was “free”!

Hypothetical Scenario 2?

1. Due to recklessness & desired low costs, a 'Regulator' decided to "not require detailed monitoring as a matter of course":
2. This decision had encouraged our "villains" to illegally abstract electricity without authority:
3. Because they believed detection was unlikely:
4. In view of the above, it was asserted in their hypothetical defence that the 'Regulator' was "a person who dishonestly causes to be wasted or diverted, any electricity", contrary to Section 13 of the Theft Act 1968:
5. (Q: Did the 'Regulator' go to Jail, in the novel?)

Why “NFA” is NG, ‘3rd Option’ (1)

- Uncertainty about how to “see” and to audit the reported estimates, and their calculation(s);
- Variability associated with estimates of theft and electrical losses;
- Uncertainty about the basis of estimates;
- Uncertainty about the design and logistics;
- Uncertainty about the objectives and priorities;
- Uncertainty about the fundamental relationships between the key parties.

BoxTen’s opinion: these become more fundamentally important to the project performance of the annual estimates of theft & losses, as we go down the list!

Why “NFA” is NG, ‘3rd Option’ (2)

1. Uncertainty about how to “see” and to audit the reported estimates, and their calculation(s); ***because little seems to be openly published, and when you have secrecy you inevitably may have an abuse of power risk.***
2. Variability associated with estimates of theft and losses; ***because losses (inc theft) seem to vary with time of day, and with season. [More later].***
3. Uncertainty about the basis of estimates; ***because theft detection responsibility currently seems to be down to the Data Collector’s (DC) Data Retriever (DR), but the DR can’t always access!***

Why “NFA” is NG, ‘3rd Option’ (3)

3. [Uncertainty about the basis of estimates] ***So if the DR can't get access, then theft detection can't currently happen! And DR doesn't seem to be paid any 'bounty'! Also, the LLFs seem to me to have assumed values chosen by Network Operator, & it's unclear how they're updated!***
4. Uncertainty about the design & logistics; ***because Ofgem Document 85/04 implies that the GSP Group Correction Factor only corrects for LLF failure for NHH (p 25, para 5.4, footnote 16).***
5. Uncertainty about the objectives and priorities; ***e.g. because Ofgem 85/04 implies that the 'R P Code of Practice' needs updating (p 40, 7.22).***

Why “NFA” is NG, ‘3rd Option’ (4)

6. Uncertainty about the fundamental relationships between the key parties. ***Because Ofgem 85/04 indicates that:***
- ***If the Distributor (D) finds evidence of theft, then D has to tell the Supplier (S); and if the S finds evidence of theft, then S has to tell D.***
 - ***D has to publish a ‘how to’ scheme to recover stolen DUoS etc money, BUT no such scheme seems to have been published (p 48, para 1.3)! So no DNO is currently permitted to recover any stolen DUoS etc money re “his” network!***
- QUESTION: Doesn’t that reflect a key uncertainty?***

Theft 25 years ago: System Losses (1)

TABLE 3.6 Percentage of electricity purchased by the ABs which is not re-sold, 1976-77 to 1978-79

<i>Year ended</i> <i>31 March</i>	<i>1977</i> <i>%</i>	<i>1978</i> <i>%</i>	<i>1979</i> <i>%</i>	<i>Percentage</i> <i>Increase/(decrease)</i> <i>1977 - 79</i>
LEB	10.05	11.15	10.90	8.5
SEEB	6.58	6.56	6.37	(3.2)
SEB	6.40	6.40	6.40	–
SWEB	7.19	7.07	6.93	(3.6)
EEB	7.50	7.70	7.60	1.3
EMEB	5.79	5.86	5.70	(1.6)
MEB	6.50	6.04	5.79	(10.9)
SWaEB	5.95	7.20	6.43	8.1
MANWEB	6.89	7.65	8.00	16.1
YEB	4.47	4.43	4.65	4.0
NEEB	4.94	4.85	4.84	(2.0)
NORWEB	6.40	6.70	6.90	7.8

Source: Price Commission study.

Ref: HC 132, 4th July 1979, "Area Electricity Boards - Electricity Prices and Certain Allied Charges".

- “A large part of these losses arises from the energy – a ‘pumping charge’ – required to drive electricity through the the distribution system to the consumer.”
- ABs said “not possible to estimate proportion of losses” due to pumping charge.

Theft 25 years ago: System Losses (2)

TABLE 3.6 Percentage of electricity purchased by the ABs which is not re-sold, 1976-77 to 1978-79

<i>Year ended</i> <i>31 March</i>	<i>1977</i> <i>%</i>	<i>1978</i> <i>%</i>	<i>1979</i> <i>%</i>	<i>Percentage</i> <i>Increase/(decrease)</i> <i>1977 - 79</i>
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Ref: HC 132, 4th July 1979, "Area Electricity Boards - Electricity Prices and Certain Allied Charges".

- “The other contributors to the losses are even more difficult to quantify, but one of increasing concern (particularly in metropoltn. areas) is the theft of electricity.”
- Some ABs indicated “such [theft] losses were unlikely to exceed 1% of sales”.

Theft 25 years ago: System Losses (3)

Part TABLE Percentage of electricity purchased by the ABs which is not re-sold, 1976-77 to 1978-79

<i>Year ended</i>	<i>1977</i>	<i>1978</i>	<i>1979</i>	<i>Percentage</i>
<i>31 March</i>	<i>%</i>	<i>%</i>	<i>%</i>	<i>Increase/(decrease)</i>
				<i>1977 - 79</i>
LEB (DNO = 12)	10.05	11.15	10.90	8.5
<u>MEMO ABs:</u>				
HIGH	10.05	11.15	10.90	16.1
LOW	4.47	4.43	4.65	(10.9)

- “From Table 3.6 it is clear that LEB has the highest loss of all the ABs.”
- “LEB has told us that its particular distribution system (which supplies a very high proportion of low voltage consumers) and its deliberate policy to operate equipment at high load levels” – *i.e. to sweat those assets* – “contribute to this, but it is also aware that it has a particular problem with theft of electricity, and is giving a high priority to combatting it.”

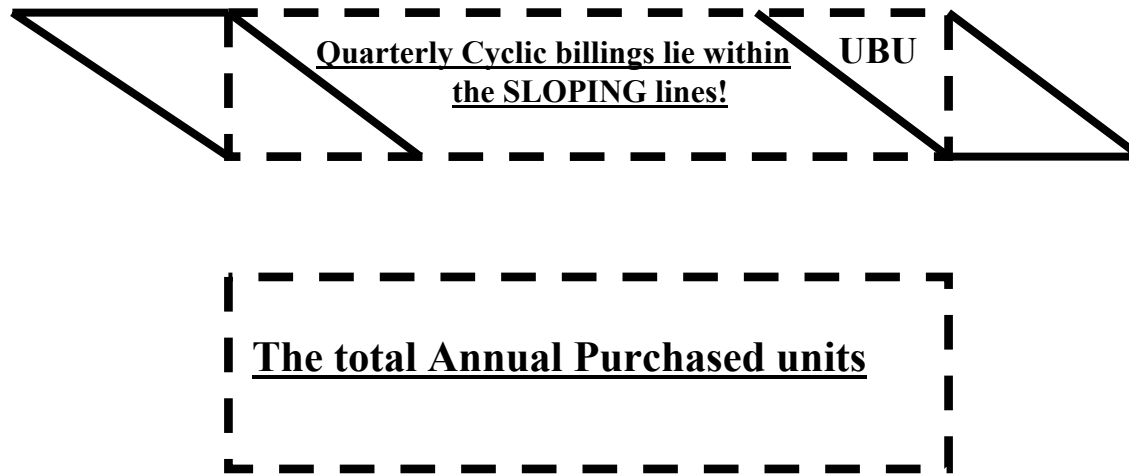
Theft 25 years ago: System Losses (4)

Part TABLE Percentage of electricity purchased by the ABs which is not re-sold, 1976-77 to 1978-79

<i>Year ended</i>	<i>1977</i>	<i>1978</i>	<i>1979</i>	<i>Percentage</i>
<i>31 March</i>	<i>%</i>	<i>%</i>	<i>%</i>	<i>Increase/(decrease)</i>
				<i>1977 - 79</i>
SEB	6.40	6.40	6.40	–
(DNO = 20)				
<u>MEMO ABs:</u>				
HIGH	10.05	11.15	10.90	<i>16.1</i>
LOW	4.47	4.43	4.65	<i>(10.9)</i>

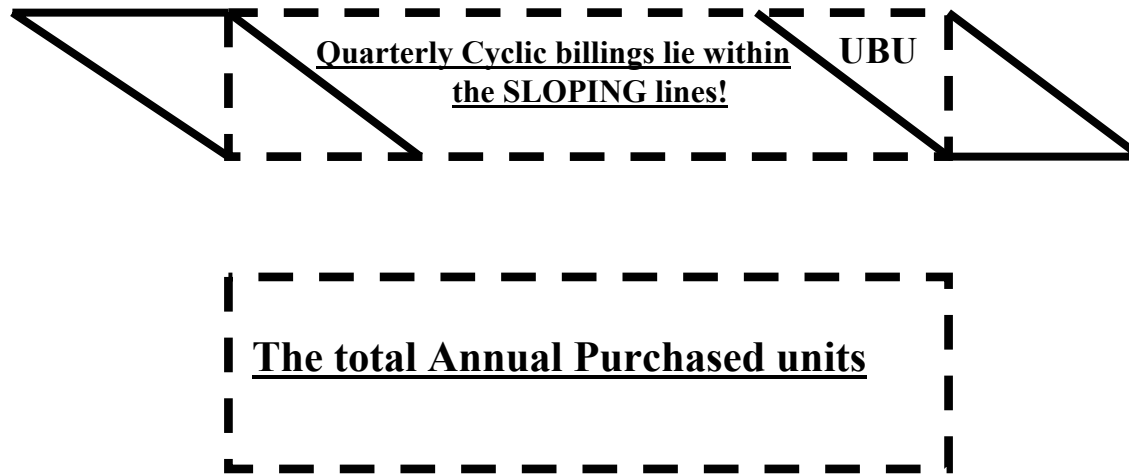
- From Table 3.6 it's also clear that SEB – *uniquely* – has the system loss figures which do not vary at all, unlike all the other Area Boards (ABs)!
- This feature was not addressed by the 1979 Price Commission Report.
- One credible explanation is that the loss figures were **assumed** to be constant, in the same way as Line Loss Factors (LLFs) are **assumed** to be constant now!
- However, it would appear that any error in this losses assumption was “pushed” onto the calculation of the “unbilled units”, which was published in the Annual Reports. Subsequently, it would seem that the error in the unbilled units caused this assumption to be re-reviewed. **There is no such mechanism for LLFs!**

Theft 25 years ago: Unbilled Units (5)



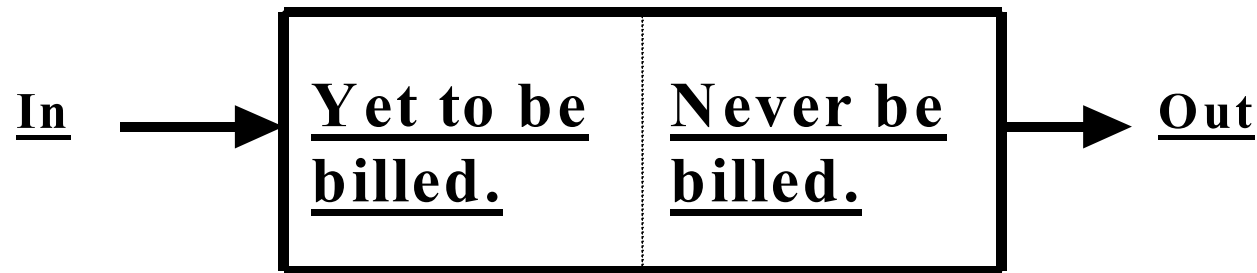
- SEB was faced with two basic “unknowns” (a) system losses – *including theft of electricity* – and also (b) the “unbilled units” [UBU], which is the correction which should be applied to the Annual “Billed” Units, in order to derive the Annual “Sold” units.
- The Annual “Sold” units were compared with the total Annual Purchased units by the Price Commission, for System Losses.
- The above diagrams show the Annual “Sold” units as the smaller rectangle with dashed lines, and the total Annual Purchased units as the larger rectangle with dashed lines. The difference = system losses.

Patent GB2309086



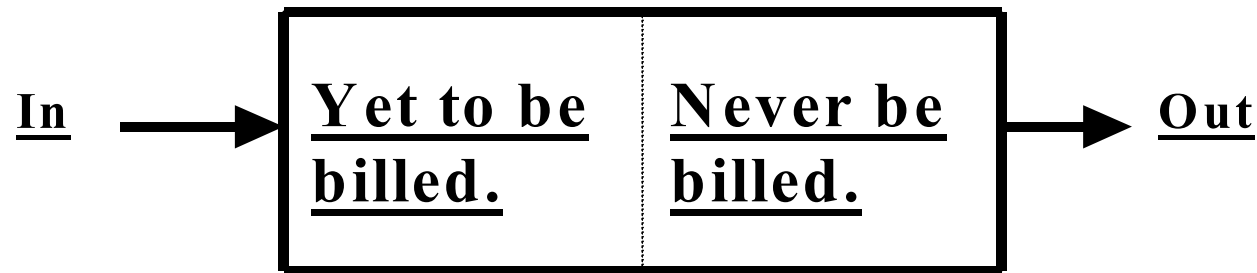
- Patent GB2309086 ‘Utility Metering Arrangement’ essentially allows a meter reading to be “frozen” at the end date of an Accounting Period, by transferring the recording of the energy used from one register to another, for cyclically read meters.
- This means that the area of the previously alleged “unbilled units” – the triangular area marked [UBU] – can be determined precisely.
- Consequently, the “other unknown”, the system losses – *including theft of electricity*, can be determined precisely. From Sherlock Holmes, if the pumping charge is accurately “eliminated”, the theft element is the rest!

Variability associated with estimates of theft and losses [more detail ref Why “NFA” is NG] (1):



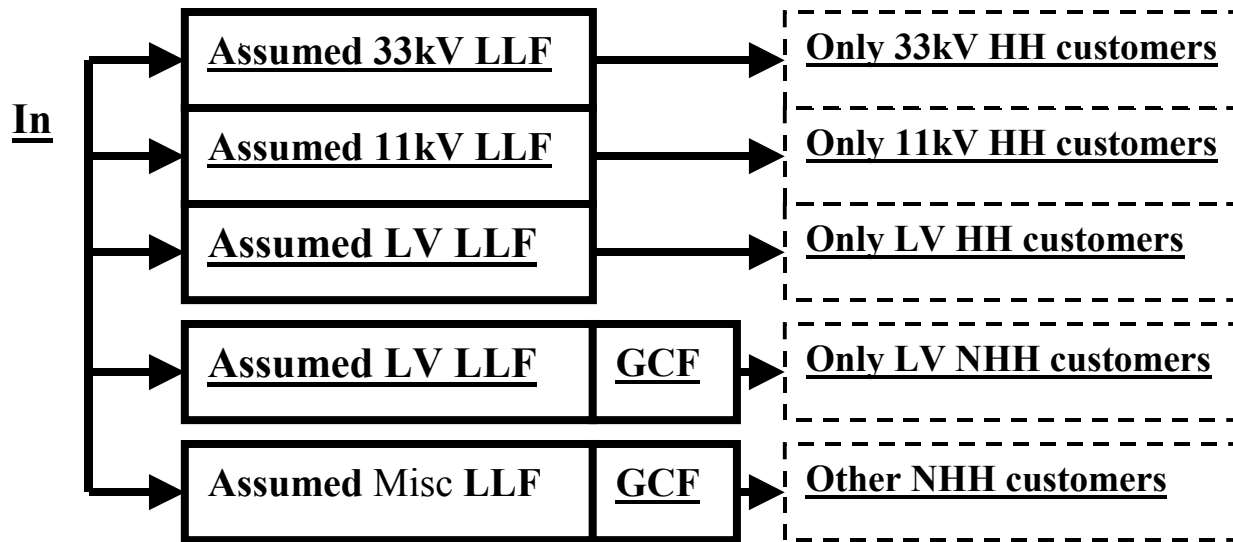
- Actual Unbilled.
- Detected theft.
- Detected meter (& reading) errors.
- Detected extra connections, and to IDNOs.
- Technical losses.
- Non detected theft.
- Non detected meter (& reading) errors.
- Non detected extra connections, and to IDNOs.

Variability associated with estimates of theft and losses [more detail ref Why “NFA” is NG] (2):



- Detectable UMS errors.
- Detectable mistakes e.g. wrong CT, or pressure reducer.
- Detected inter-connector errors.
- Non detected UMS errors.
- Non detected mistakes e.g. wrong CT, or gas pressure reducer.
- Non detected inter-connector errors.

Theft today: Customers' SPAM & GSPGCF



- The Customer based SPAM [Supplier Purchase Assumed Matrix] approach in my opinion uses Assumed LLF figures.
- If the Assumed LLF figures include Theft, won't any discrepancy due to Theft be further forgotten due to the false security of the Grid Supply Point Group Correction Factor [GSP GCF]?
- How can one justify the asymmetry using a GSP GCF on LV NHH, but not LV HH, if there were no NHH "profiling" error?

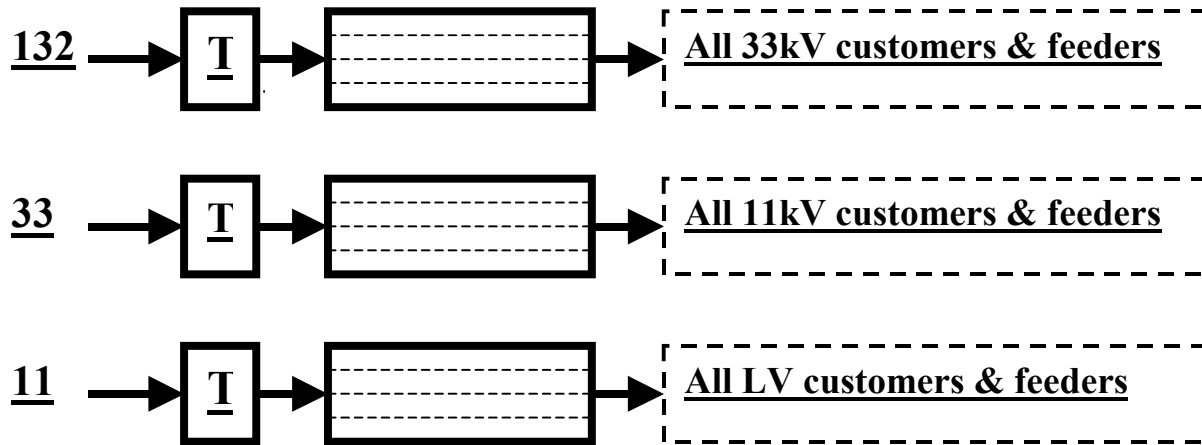
Theft today: Can HAZard OPerability help?

- The HAZOP approach is used to look at hazards (e.g. explosions, etc) in processes in the Chemical industries.
- It's based on the principle that a team approach will identify more problems than when individuals working separately combine results; the team consists of individuals with varying backgrounds and expertise.
- **After preparation, the team focuses on specific components in the process**, asking Qs:
 - The intention of the part examined?
 - The deviations from the declared intention?
 - The causes of the deviations?
 - The consequence of each deviation?

Theft today: Won't Data Collection Cross Check Calculations [**DC4**] help?

- The “Auditor” seems to be concerned with the quality of some of the data into settlement.
- BoxTen suggests that a overall data collection cross check calculation - to be done every one or two years - would highlight both Supply and Distribution market deficiencies, in manageable chunks.
- When compared with settlements done every half hour, this “**DC4**” oversight approach could offer an increase in precision of over **4** magnitudes in allowing the determination of some systematic errors. The next slide explains how to do it.

Independent Annual Finite Element Oversight approach



- Every year, etc, determine overall Losses for each element of each entire distribution voltage level, & not just for customers connected to that voltage level, for each separate GSP Group. For extra precision, use the Utility Metering Arrangement of Patent GB2309086.
- Make allowances for interconnectors, which would add and/or subtract equally, from each respective element.
- Focus the work of Revenue Protection Teams onto those feeders which show unexplained high losses; avoid the hit/miss approach of just DRs.

Independent Annual Finite Element Oversight example (1)

- Let us propose that a **Work Programme** is set up, and the annual analysis is done in a DNO, and that a League Table is drawn up, for each element of of a distribution voltage level, of the calculated overall Losses, with the following results for a comparable group of feeders:
 - 20 Feeders show 10% losses so code these GREEN
 - 20 Feeders show 15% losses so code these YELLOW
 - 20 Feeders show 25% losses so code these **RED** !!
- **ACTION: Ofgem should enable a framework to be set up so that there should be rewards on RED feeders for Data Retrievers, etc, for finding “good leads” for Revenue Protection staff to positively determine an illegal situation, or for metering staff to determine other anomalies.**

Independent Annual Finite Element Oversight example (2)

- Another key aspect of this Work Programme, with the annual analysis is done for a DNO, and a League Table of the calculated overall Losses, is that the results for a comparable group of feeders could show:
- 20 Feeders show 10% losses coded GREEN,
- **Here the degree of comparable low overall losses - on a GREEN classified feeder - would indicate that the risk of theft is unlikely!**
- ***This important prioritising feature could be used to screen out some of the inevitable false allegations of theft, against honest people!***
- **NB: It's vital that Justice is seen to be balanced.**

Summary

- Not all the “exceptions” would necessarily be due to theft. There may be alternatives, and active management will:

L I M M I T

Losses/Interconnectors/Mistakes/Mis-
Information/Theft

- Each source of variance must be examined.

Theft of electricity and gas

SUM-UP Sherlock Holmes:

“One should always look for a possible alternative and provide against it. It is the first rule of criminal investigation.”

Ofgem's Principle 3 - *Laissez Faire?*(1)

Theft DRAFT Principle 3 in 85/04 p44, para 8.3

- “**Principle 3:** The arrangements should not require detailed monitoring as a matter of course or require regular Ofgem intervention to ensure compliance and their overall effectiveness.”
- This proposed Principle seems contrary to Statute, as explained on the next 2 slides.

Ofgem's Principle 3 - *Laissez Faire?*(2)

Theft DRAFT Principle 3 in 85/04 p44, para 8.3

- Edmund Burke said: “**Evil thrives when good men do nothing**”, so the Ofgem assertion that “**The [theft] arrangements should not require detailed monitoring as a matter of course**” is very wrong, in Box Ten's opinion. Consequently
- Ofgem's proposed framework seems unfit for:
- Ofgem's Principle Duty of “**promoting effective competition**”, as explained by:
- **Gresham's Law**: “**The bad drives out the good**”.

Ofgem's Principle 3 - *Laissez Faire?*(3)

Theft DRAFT Principle 3 in 85/04 p44, para 8.3

- Furthermore ...
- Ofgem's proposed framework seems unfit for:
- Ofgem's Secondary Duty "to promote efficiency and economy ... to ... distribute or supply electricity and the efficient use of electricity conveyed by distribution systems;" and
- "to protect the public from dangers arising" from, but not restricted to, the theft of electricity.

But Theft requires “Certainty of detection”

So **RE-DRAFT** of Ofgem Principle 3:

- **Principle 3:** The arrangements should not - *apart from a “Sherlock Holmes styled Annual Finite Element oversight” to enable Distributors to make Data Collection Cross Check Calculations for which Ofgem should at least in part make funds available by raising the allowable regulated revenue of participating DNOs* - require detailed monitoring as a matter of course or require *other* regular Ofgem intervention to ensure compliance and their overall effectiveness.

As Theft needs “Certainty of detection”

Do this NOW, it's later than you think!

- *The reason why Ofgem must take action now is that a new feature is now being introduced into Distribution systems.*
- *Distributed Generation – encouraged by Government in order to reduce green house gas emissions – will radically alter the way in which electricity distribution networks perform, including their overall losses.*
- *Unless pro-active oversight measurement is in place, management will be difficult, & performance be diminished, with reduced stakeholder value!*

“Final Demand” *Re para 10.5 p46*

- Job creation and grey power, don't you just love it?
- [*Re Ofgem request for any international experience:*] The great man was intrigued to learn that one of BG Group's Indian subsidiaries uses a small army of 'senior citizens' and unemployed workers to monitor its pipeline network.
- **They've helped reduce damage and leakage.**
- Will anybody buying a local gas distribution network from Transco consider something similar? [***If not, why not?***]
- And how about the water industry, under pressure not to raise bills too much? Just a thought.
- [***And how about the electricity industry, too?***].

Disconnecter, UTILITY WEEK 14 MAY 2004, p 35.

“Last Slide” from **Don Stickland**

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- We have seen the need to design out theft by a limited pro-active regulatory oversight add-on framework, for the electricity and gas markets.
- We’ve seen some of the risks and uncertainties of theft becoming ‘ingrained’, and suggested a new ‘Internal Control’ method of measurement, which is needed now.
- The **BIGGEST** risk is the one you won’t expect.

**And to make this point, I now invite
your questions!**