Task Status Report
Task 23
The Role of Customers in Delivering Effective Smart Grids

Operating Agent: Linda Hull
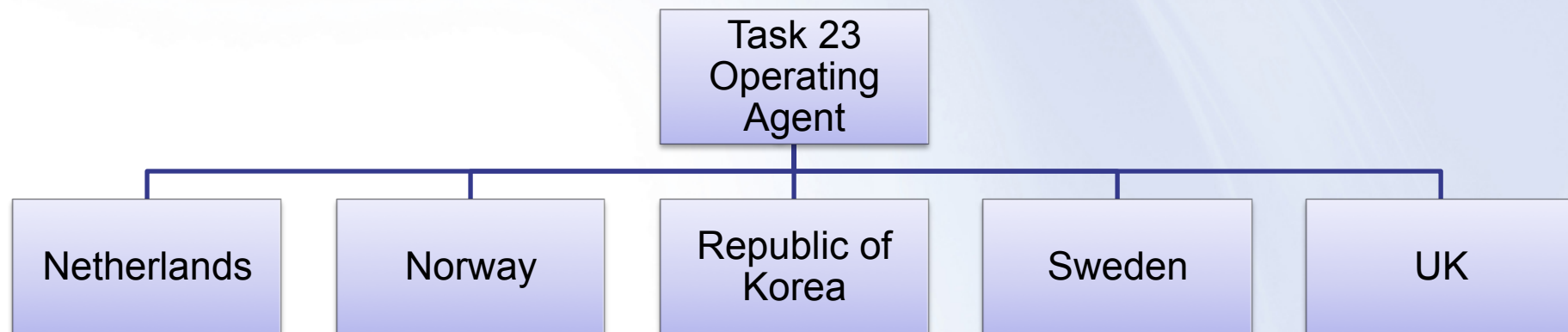
www.**ea**technology.com

Delivering Innovation in **Power Engineering**

Overview

- **Project overview**
- **Objectives for last six months**
  - Progress against objectives
- **Work plan for next six months**
- **Finance**
- **Matters for the ExCo**
  - Approval of task status report

Project Overview

Task 23 Participants

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        │   Task 23   │
        │  Operating  │
        │    Agent    │
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│Nether││Norway││Republic of││Sweden││  UK  │
│lands ││      ││   Korea  ││      ││      │
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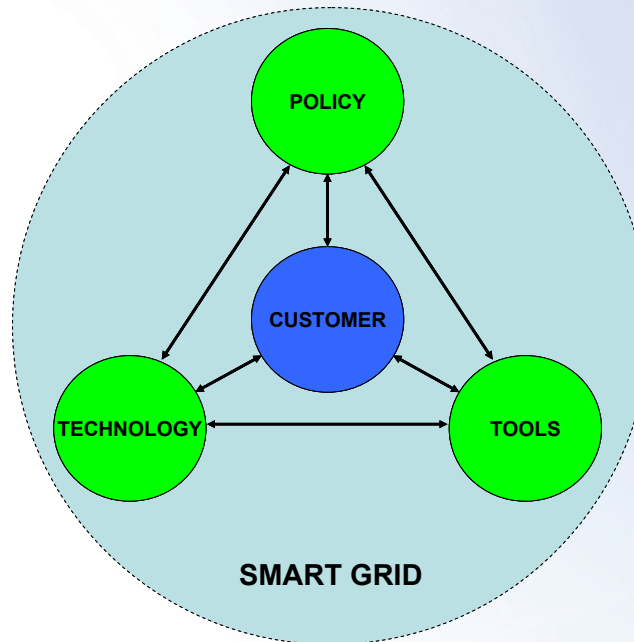Netherlands | Norway | Republic of Korea | Sweden | UK

Task 23:

Policy:
- Smart meter standards
- Smart appliance standards
- Mandate for Time of Use tariffs
- Market structure
- Settlement arrangements
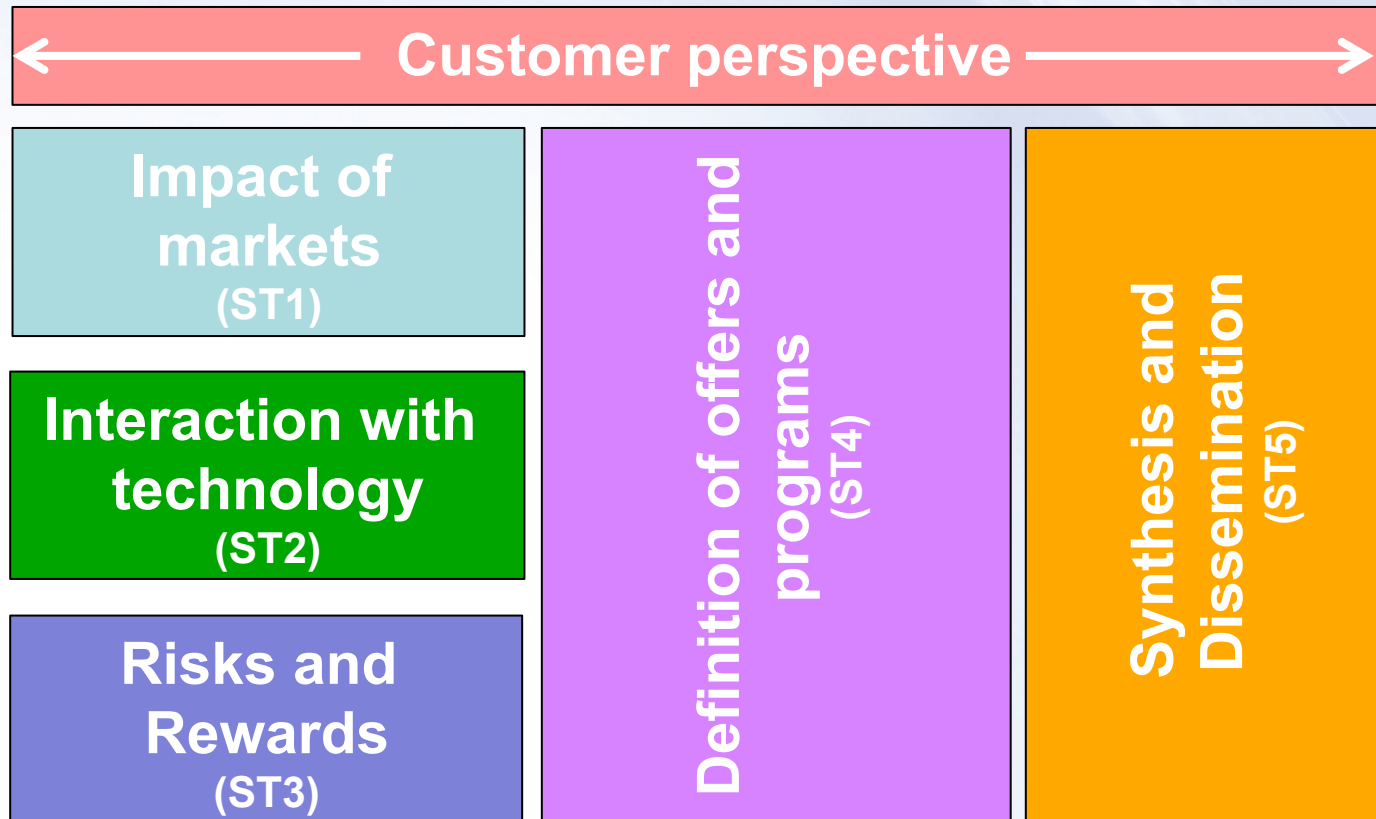- Billing arrangements

Technology:
- Smart meter
- In-home display
- Smart appliances

Tools:
- Time of Use Tariff
- Energy services
- Demand aggregation
- Energy advice

POLICY

CUSTOMER

TECHNOLOGY

TOOLS

SMART GRID

Task XXIII – overview of work programme

Customer perspective

Impact of markets
(ST1)

Interaction with technology
(ST2)

Risks and Rewards
(ST3)

Definition of offers and programs
(ST4)

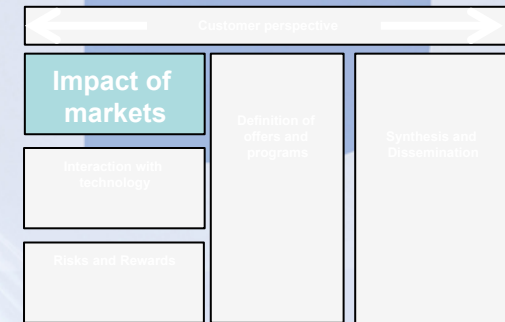Synthesis and Dissemination
(ST5)

Objectives and progress for last six months

Objectives for last six months

1. Complete Subtask 1 report

2. Complete Subtask 2

3. Commence Subtasks 3 and 4;
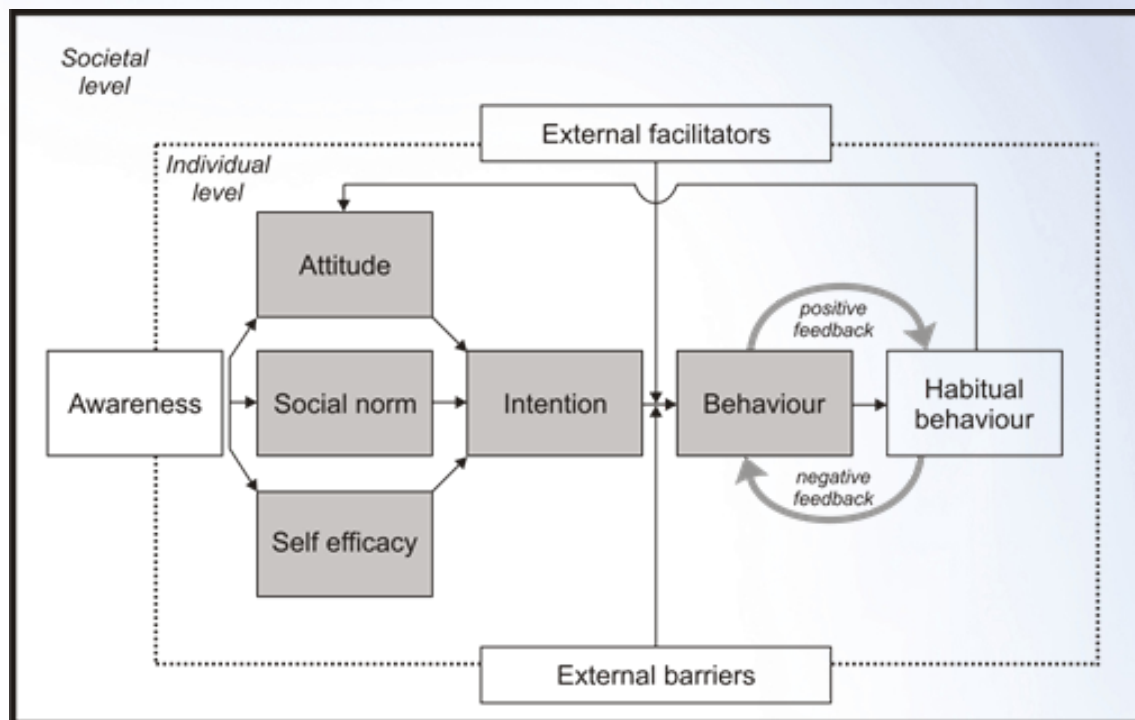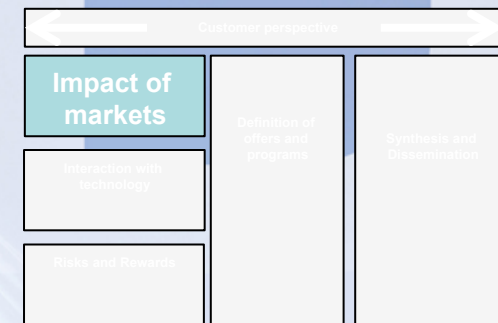
ST 1: Impacts of Markets

What we said we would do

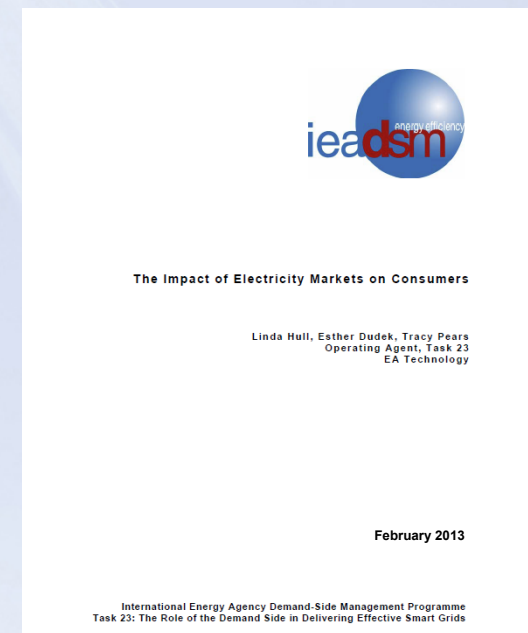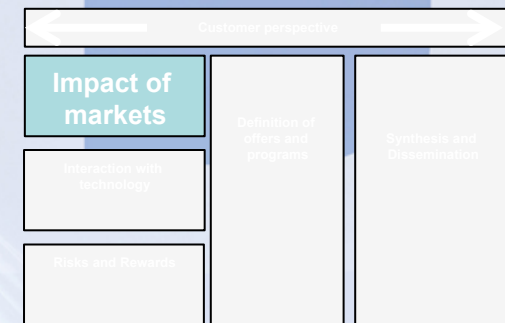| Activity		Status
Draw on existing work to define Smart Grids within the context of this study	Cost Share	Done
Prepare a template market map	Cost Share	Done
Completion of market maps for participating countries	Task Share	Done
Review and comparison of market maps	Cost Share	Done
Development of a matrix to highlight similarities / differences / benefits between market structures and impact on customers	Cost Share	Done

ST 1: Impact of markets

Approach

Societal level

Individual level

External facilitators

Attitude

Awareness

Social norm

Intention

Behaviour

positive feedback

negative feedback

Habitual behaviour

Self efficacy

External barriers

Theoretical model of energy behaviour

Who

Why

Where

5 W's

What

When

The 5 Ws Framework

Theoretical model of energy behaviour, Understanding Household Energy Use Investment Decisions, Even Bjørnstad, Enova SF Energy Efficiency and Behaviour Conference, Helsinki, 20 September 2012

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ST 1: Impact of Markets

- **Input from 5 participating countries on:**
  - **Drivers for Smart Grids**
  - **Market maps**
    - Role of stakeholders
  - **Tariff structures**
- **Final report completed**
  - **Highlights the importance of the electricity market structure on ability/willingness of customers to take an active role**

Impact of markets

The Impact of Electricity Markets on Consumers

Linda Hull, Esther Dudek, Tracy Pears
Operating Agent, Task 23
EA Technology

February 2013

International Energy Agency Demand-Side Management Programme
Task 23: The Role of the Demand Side in Delivering Effective Smart Grids

ST 1: Impact of markets

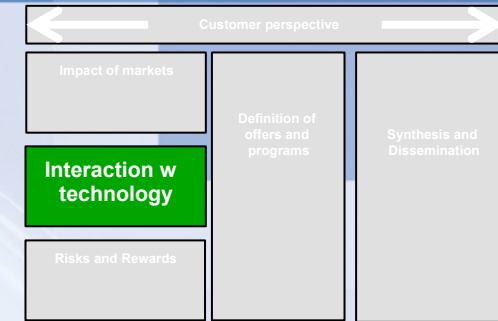|	NO	NL	SE	KR	UK	Positives (from who/what/why perspective)	Negative (from a who/what/why perspective)
Fully unbundled network activities	✓	✓	✓	✗	✓	**Who/What**: Potential for new entrants to enter the market, and offer innovative solutions and services	**What:** Broken value chain - benefits distributed amongst number of stakeholders. **Who/What:** Role of individual stakeholders may not be fully understood by consumers.
Significant competition in energy retail market	✓	✓	✓	✗	✓	**Who/What**: Additional choice for consumers **Who/What**: Competition between suppliers may lead to innovation as companies try to attract and retain consumers	**Who:** Too much choice for consumers - makes it difficult for consumers to compare offerings and select the one that is best for them (purchasing paralysis). **What:** Companies may be reluctant to offer something which may 'upset' consumers as they risk their consumers switching to another supplier (loss of business)
Mandated approach to way that energy information collected by Smart Meters is presented to consumers	✗	✗	✗	✗	✓	**What**: Ensures a minimum level of information is provided as 'standard' to all consumers to increase consumer awareness. **What**: Can ensure that 'best practice' is deployed.	**What:** Limits innovation by Metering providers, who may be well placed to understand needs of specific consumer groups, e.g. elderly or low-income households. **What:** Little is currently understood about the way that consumers react to information and the extent to which it drives behaviour change.
Mechanism in place to ensure consumer concerns over data access and privacy are addressed	✓	✓	✓	✗	✓	**What**: Reduces possibility of a 'consumer backlash', so that consumers are less likely to refuse to accept Smart Metering.	**Why/What:** Could restrict the use of Smart Meter data by the wider stakeholder group, which could limit innovation in products and services, which could be to the detriment of consumers in the long term.
Disaggregated tariff information provided to consumers	✓	✓	✓	✗	✓	**What/Why**: Consumers better able to understand impact of changes to their energy consumption habits on total electricity costs.	**What**: Added complexity could confuse consumers.
Time of use tariffs mandated	✗	✗	✗	✗	✗	**What**: Ensures that cost reflective tariffs are in place to drive behaviour change.	**What:** Limits the flexibility for Energy Suppliers to offer products and services that are most favoured by consumers. **What:** Little is understood to the way that consumers may react to these tariffs.
Smart Metering interval data for settlement	✗	✗	✗	✗	✗	**Why/What**: Ensures that the value of changing patterns of demand can be captured by consumers and by Energy Suppliers.	**What**: Could increase the financial burden on consumers for little benefit, if it does not lead to behaviour change.
Statutory consumer organisation	✗	✓	✗	✓	✓	**What**: Has statutory authority to ensure that consumer concerns can be effectively handled. **What**: Can represent needs of consumers in industry Consultations.	-

ST 2: Interaction with Technology

What we said we would do
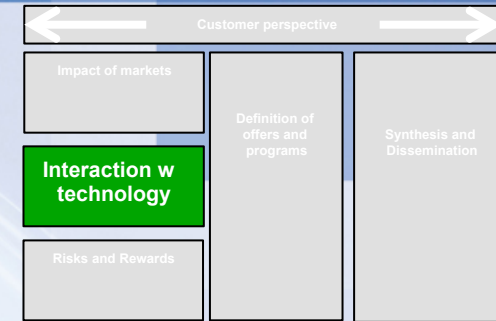
Activity	Funding	Status
Agree scope of technologies to be included	Cost Share and Task Share	Done
Background research on agreed technologies	Cost Share	Done
Country specific experiences from specific pilots and trials	Task Share	On-going
Assess TRLs and MRLs	Cost Share	On-going
Identify key factors impact on customers	Cost Share	On-going

Interaction with ~~Technology~~ Interventions

| Time of Use Tariff	(T)	A form of pricing that penalises consumers that use energy at certain times and/or rewards consumption at other times. This can include static Time of Use (ToU) tariffs, Critical Peak Pricing (CPP), Peak Time Rebates (PTR), Real Time Pricing (RTP).
Control	(C)	Controls to actively manage the pattern of consumption. This can include direct load control, automatic load controls, home energy management systems, thermostats for heating and air-conditioning and building energy management systems.
Feedback	(F)	Feedback of energy end use information based on the actual energy end use of the individual, i.e. relying on data collected from the smart meter. This can include in-home displays of real time and historic data, web based feedback and billing information. Alternative forms of feedback also exist, such as web-based feedback or the use of smart phones or other portable devices.
Advice	(A)	Advice on how consumers can deliver outcomes that support the effective delivering of Smart Grids. This can include advice targeted to an individual on processes/end uses that can be managed, or general advice distributed to groups.

Interaction with Technology

- **Approach**
  - **Case Study Template**
  - **Capture information on 'customer viewpoint'**
    - How were customers recruited
    - What did customers like / dislike
    - What were the main learning points

- **Progress**
  - **Case studies identified to date ~45**
    - For which:
      - results available for ~20
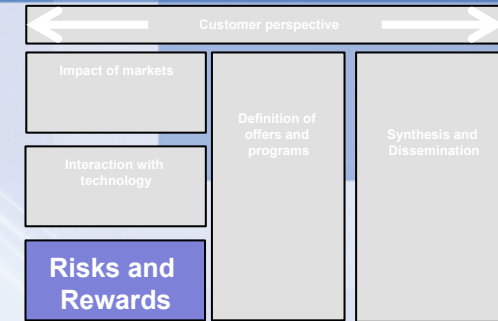   - Limited data/information on customer perspectives

- **Review of surveys of customer attitudes**
  - **~ 20 reviewed**
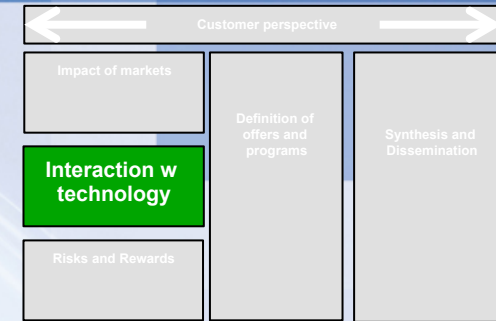
ST 3: Risks and Rewards

What we said we would do

| Activity		Status
Produce a matrix showing the interrelationship between industry stakeholder needs and customer needs	Cost Share	On-going
Identify specific case studies or example scenarios	Cost Share / Task Share	In parallel with ST2
Identify risks and rewards arising from case study / scenario analysis	Cost Share / Task Share	On-going
Develop a risk-reward calculator	Cost Share	-

ST 3: Risks and Rewards

What is risk?

- **The possibility of misfortune or loss and is generally defined as the combination of:**
  - The probability / likelihood of an undesirable event or outcome occurring; and
  - The resulting consequences / impacts if the undesirable event occurs
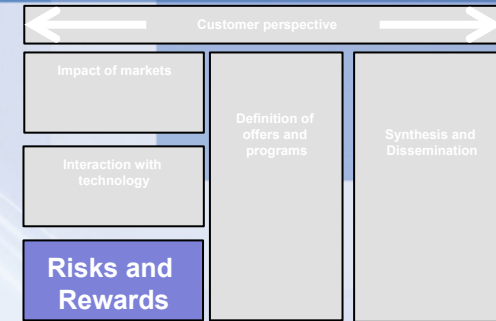
and what is reward?
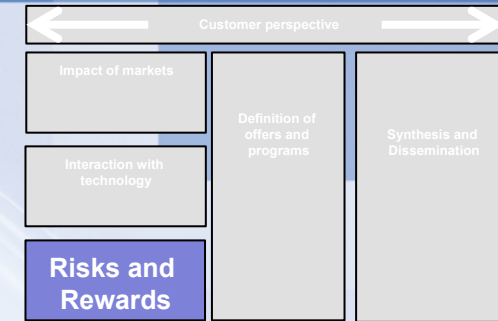
- **The possibility of fortune or gain and is generally defined as the combination of:**
  - **The probability / likelihood of a desirable event or outcome occurring; and**
  - **The resulting consequences / impacts if the desirable event occurs**

Undesirable/Desirable Outcomes?

	Undesirable ☹	Desirable ☺
Money / financial (£, $, €, loyalty points)	Spend more on electricity (ToU tariff & don't/can't shift demand)	Spend less on electricity (ToU tariff & do shift demand, or already have favourable energy profile)
	Receive a penalty for not delivering a demand reduction (Demand Response contract)	Receive payments for delivering demand reduction / energy efficiency (Demand Response contract)
Time / Inconvenience (minutes / hours)	Can't use appliances at times of peak demand	Time saved (through use of remote / automatic control of appliances?)
	Additional time taken to shop around (e.g. to choose a smart appliance)	

Undesirable/Desirable Outcomes?

	Undesirable ☹	Desirable ☺
Comfort (degC / year of over/under heating)	Colder house (if heating poorly controlled or interruption too long)	Improved comfort through avoided over/under-heating
	Hotter house (if air-condition poorly controlled or interruption too long)	
Environmental (kg CO2 / year)	Increased CO_2 emissions (operation of standby generators)	Reduced CO_2 emissions (avoided use of fossil fired central generation)
'Feel good' (units ??)	'Feel Bad' if can't do anything to change pattern of demand	'Feel Good' factor (e.g. feeling that 'doing your bit' to help reduce impact on the climate)
Network Security (CMLs, CIs)		Improved security of supply (reduced instances of black-outs/ brown outs)

Undesirable/Desirable Outcomes?

	Undesirable ☹	Desirable ☺
Others that lead to the consequences already identified:		
Safety	Fire arising from appliances running unattended while home is unoccupied • Impacts will be financial, time, loss of 'feel good'	Remote / Automated systems could provide warnings that appliances have been left on unattended, or that no electricity use may indicate that an elderly person needs assistance.
Privacy	Misuse of data (i.e. to plan a burglary) • Impacts will be financial, time, loss of 'feel good'	Data could be used to advantage of customers (to indicate when appliances are faulty)

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Which would you choose:

Customer perspective

Impact of markets

Interaction with technology

Definition of offers and programs

Synthesis and Dissemination

Risks and Rewards

a)   50% chance of winning £200

Or

b) 100% chance of winning £100
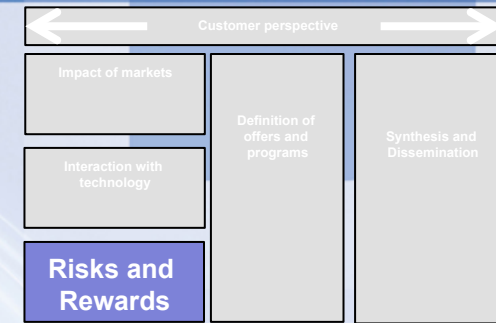
25% choose this

75% choose this

Maths for expected value:

a) 0.5*200 + 0.5*0 = 100

b) 1.0*100=100

Eldar Sharif 'Decisions Constructed Locally' in Kruglanski, A.W. and Higgins, E.T. (2007) Social Psychology: A Handbook of Basic Principles The Guilford Press: New York, London.
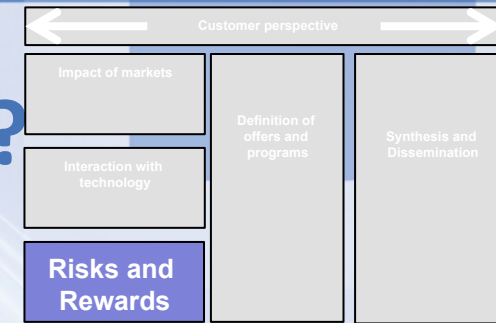
Which would you choose now?

Impact of markets

Interaction with technology

Definition of offers and programs

Synthesis and Dissemination

Risks and Rewards

a)   **50% chance of losing £200**

65% choose this

Or

b) 100% chance of losing £100

35% choose this

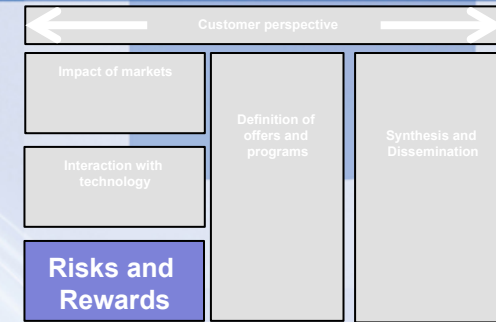**Maths for expected value:**

a) 0.5*200 + 0.5*0 = 100

b) 1.0*100 = 100

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Predictably Irrational

Dan Ariely

- **Purchasing paralysis:**
  - When customers offered an exhaustive variety of options, they are often paralysed by their inability to choose

- **Risk Aversion:**
  - Customers tend to think differently about benefits and disadvantages when considering alternatives

- **Framing:**
  - Draw inferences about a decision based on the way a question is framed
  - Options evaluated on relative terms (not absolute)

For many other social / cognitive biases see http://en.wikipedia.org/wiki/List_of_cognitive_biases)

Risks vs Rewards

- **The 'pleasure' of winning £100**

vs

- **The 'pain' of losing £100**
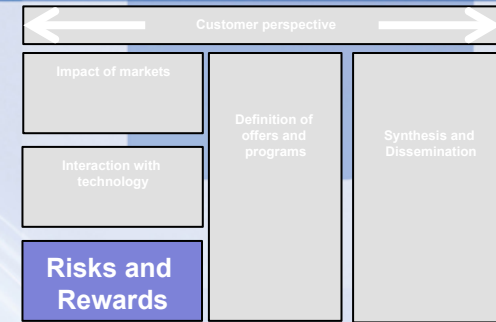
'pain' of losing £100 = 2+ x 'pleasure' of winning £100

An experiment – which would you choose?

- A new disease has been identified – it is expected to kill around 600 people

- Two options are available:

a) Option a) will save 200 lives

b) Option b) there is 1/3 probability that 600 people will be saved, but a 2/3 probability that no-one will be saved

What about now?

- **A new disease has been identified – it is expected to kill around 600 people**

- **What if you are given these two options:**

c) **Option c) 400 people will die**

d) **there is 1/3 probability that no-one will die, but a 2/3 probability that everyone will die**

Quantifying risks/rewards – an example

Loft Insulation - example

- **Rewards:-**
  - **~ £180/year reduced heating bill**
  - **~ 730kg/year reduced CO_2 emissions**

Loft Insulation

- **Risks** *(example numbers only!!!)*:-

Type	Consequence	Probability	Risk
Scratched paintwork	€30	0.33	€ 10
Damaged ceiling	€200	0.01	€ 2
Time (sorting)	8 hours	1	€ 80
Damage to wiring	€150	0.001	< € 1
Loss of valuable item	€1000	.0004	< € 1
Total			**€ 94**

ST 3: Risk and rewards

- **Customer's do not consider risks and rewards on an economically rational basis?**

- **Limited value in developing a 'risk – reward calculator'**

- **Alternative approach proposed**

  - Focus on learning from case studies using a qualitative approach

  - Use specific examples to highlight types of risks that are identified by consumers themselves

    - If appropriate, quantify risks and rewards in a selected number of examples

Finance

Finance

- **Budget**
  - **£279,220**
  - **Based on five countries each paying £55,844**
- **All invoices paid**
- **Expenditure in line with work programme**

- **Questions / Comments**

- **Approval of Task Status Report**