



Pre-analysis plan: Group A Energy billing guideline research

Policy problem

Across the energy market consumers experience confusion reading and understanding their energy bills. The current rules for what is required in energy bills are almost a decade old, and fail to reflect the changes to the market that have occurred during this period. This means that consumers often receive bills that are unnecessarily complex and struggle to comprehend the information. This creates problems for consumers trying to pay their bills and understand their energy use, as well as for retailers who have increasing costs from customer complaints.

Trial aim

We are aiming to inform the development of new rules for energy bills designed to improve customer understanding.

This research will involve three randomised controlled trials, run sequentially on the same sample via an online survey.

Trial 1 will test for Information overload in full energy bills. Specifically, we will investigate how the length of the bill impacts comprehension. We will use bills of varying lengths and layouts to determine if providing additional information detracts from comprehension of the most important information in the bill.

Trial 2 will test the inclusion of the 'reference price' on the bill, to see whether consumers are sensitive to different reference price levels, and whether they would value the information on the bill.

Trial 3 will test alternative presentations of the detailed charges table to see which most improves comprehension and is preferred by customers as easy to understand.

Interventions

Below, we provide a summary of the interventions in each treatment arm of the three trials. See Interim report for images of each treatment arm.

Trial 1 (Information overload)

This will be a four arm trial with the following groups:

- Control (C) = Comprehensive bill

- This bill contains all the elements considered in this research, and puts it in a two page design, typical of many billers
- Treatment 1 (T1) = Structured bill
 - The structured bill contains identical content to the comprehensive bill (control), but it is structured by how you might use it to find the information you need. It is spread out over 3 pages.
- Treatment 2 (T2) = Simple email bill with link to additional information
 - This bill is an email (not a pdf), which only contains the information you need to pay (page 1 & 2 of the structured bill). If you click on the link below the email you can go to see additional “off-bill” information about energy consumption and generation (page 3 of the structured bill).
- Treatment 3 (T3) = Basic bill with limited content
 - This bill is a typical paper bill/pdf, but just contains the minimal information you need to pay, critical phone numbers and the detailed charges table (excludes energy consumption and generation charts, definitions, plan summary, and ways to save).

Trial 2 (Reference price)

This will be a four arm trial with the following groups:

- Treatment 0 (T0) = Plan is “equal to the reference price”
 - This treatment shows page 1 of the ‘Structured bill’ (above), contains additional information about the ‘Simple saver plan’, which in this case is “Equal to” the reference price
- Treatment 1 (T1) = Plan is “11% less than the reference price”
 - This treatment shows page 1 of the ‘Structured bill’ (above), contains additional information about the ‘Simple saver plan’, which in this case is “11% less” than the reference price
- Treatment 2 (T2) = Plan is “22% less than the reference price”
 - This treatment shows page 1 of the ‘Structured bill’ (above), contains additional information about the ‘Simple saver plan’, which in this case is “22% less” than the reference price
- Treatment 3 (T3) = Plan is “5% more than the reference price”
 - This treatment shows page 1 of the ‘Structured bill’ (above), contains additional information about the ‘Simple saver plan’, which in this case is “5% more” than the reference price

Trial 3 (Detailed charges table)

This will be a four arm trial with the following groups:

- Control (C) = Traditional table
 - The control shows a traditional table showing usage and how the bill was calculated.
- Treatment 1 (T1) = Two tables
 - This treatment shows the usage and meter data in a table on the left and a summary table of the key line items on the right.
- Treatment 1 (T2) = Coloured infographic and two tables
 - This treatment shows a colourful infographic showing usage, meter data in a table on the left and a summary table of the key line items on the right.
- Treatment 1 (T3) = Black & white infographic and two tables
 - This treatment shows treatment 2 presented in black and white

Outcome measures

For all questions in the survey we will allow people to skip answering. A skipped response will be coded as 0 (see 'Trial Threats' for more discussion). The following table summarises how the trial outcomes are built from the relevant survey question. The full survey questions these outcomes are based on are available in Appendix A.

Box 1: Outcome measures for Trial 1 (Information overload)

Primary outcomes

- Bill comprehension - Aggregate of; able to pay, able to find key details, able to understand how your bill was calculated (each scored 0-3). Number of correct answers (0-9).
- Comprehension - Able to understand your energy consumption & generation. Number of correct answers (0-3).

Secondary outcomes

- Time taken - Able to pay.
- Time taken - Able to find key details.
- Time taken - Able to understand how your bill was calculated.
- Time taken - Able to understand your energy consumption & generation.
- Comprehension - Able to pay. Number of correct answers (0-3).
- Comprehension - Able to find key details. Number of correct answers (0-3).
- Comprehension - Able to understand how your bill was calculated. Number of correct answers (0-3).

- Intention - Free text 'cost saving advice'- focuses on 1. Energy saving; 2. Switching/comparing plans; 3. Using solar more efficiently. Free text coded to each of these binary outcomes.
- Confidence to find a strategy to reduce energy costs. Binary (Very confident or confident = 1, all other responses = 0).
- Bill is easy to understand. Binary (very or fairly easy = 1, all other responses = 0).
- Easy to find information. Binary (very or fairly easy = 1, all other responses = 0).
- What I liked about this bill (Free text).
- What I disliked about this bill (Free text).

Box 2: Outcome measures for Trial 2 (Reference price)

Primary outcomes

- Would 'shop around for a better deal'

Secondary outcome

- Would value having this comparison on my bill (7 point Likert scale). Binary (Any level of agree = 1, all other responses = 0).

Box 3: Outcome measures for Trial 3 (Detailed charges)

Primary outcomes

- Comprehension – Can correctly identify supply charge
- Detailed charges table was easy to comprehend (5 point Likert scale). Binary (very or fairly easy = 1, all other responses = 0)

Population and sample selection

Our population of interest is adults (18 and over) residing in areas covered by the National Electricity Market who are also covered by the National Energy Consumer Framework. This excludes people residing in WA, NT, and VIC. We will use an online survey panel provider to recruit participants from this target population.

While the survey panel provider will be able to restrict invites to members who meet our requirements, due to lags in updating profiles there is still a chance that we could recruit participants who live in WA, NT, or VIC. To avoid this we will also screen out any responses to our demographics questions who indicate they currently live in any of these states.

The overall sample will be 6,000 individuals who meet the above requirements. These will be split by state using the proportions below, with some states

oversampled to facilitate subgroup analysis. We will also use quotas for gender to ensure the sample is broadly representative of the Australian population.

Table 1: State quotas

State	Percentage of sample
NSW	25%
QLD	25%
SA	20%
ACT	15%
TAS	15%
Total	100%

We will allow flexibility of $\pm 5\%$ for the target samples for each state.

Hypotheses

Trial 1 (Information overload)

H1: **Simplified or structured bills will result in higher bill comprehension**

Any bill (T1, T2, T3, not pooled) will result in higher bill comprehension than the control condition (C)

T1>C

T2>C

T3>C

This hypothesis will be assessed with a series of 3 one-tailed tests. We will not correct for the comparison of multiple arms against the shared control due to the correlation between comparisons. If we reject the null for multiple treatment arms, we will assess the overall best performing group based on effect size without a corresponding statistical test. We expect such differences to be small and a formal test will lack power. There is little risk in a false positive when selecting the best performing group given that superiority over control has been demonstrated.

H2a: **A separate home energy report will result in higher comprehension of energy consumption and generation**

The bill with a separate home energy report (T1) will result in higher comprehension of energy consumption and generation than the bill containing this information as part of the main bill (C)

T1 > C

H2b: **Including the home energy report as an attachment instead of in the bill will diminish its impact on the comprehension of energy consumption and generation.**

T1>T2

Both H2a and H2b will be assessed with a one-tailed hypothesis test. We will correct for the two multiple comparisons that comprise this family of tests.

Trial 2 (Reference price)

H1: **Plans that do not compare favourably to the reference price will result in people being more inclined to ‘shop around for a better deal’**

Switching will be more likely the higher the plan price is relative to the reference price. (T3 (+5%) >T0 (=0%) >T1 (-11%) >T2 (-22%))

T3>T0

T0>T1

T1>T2

This hypothesis will be assessed with a series of 3 one-tailed tests. We will not correct for the comparison of multiple arms given each sequential comparison contains shared variance from the previous comparison.

Trial 3 (Detailed charges table)

H1a: **Behaviourally designed detailed charges tables will improve comprehension**

Treatments (T1, T2, T3, not pooled) will result in higher comprehension than the control condition (C).

T1>C

T2>C

T3>C

H1b: **Behaviourally designed detailed charges tables will be rated as easier to understand**

Treatments (T1, T2, T3, not pooled) will be rated as easier to understand than the Control condition (C).

T1>C

T2>C

T3>C

Both of these hypotheses will be assessed with a one-tailed hypothesis test. We will correct for the two multiple comparisons that comprise this family of tests, however, we will not correct for the comparison of multiple arms against the shared control.

Randomisation

Randomisation will be completed within the Qualtrics survey platform. After demographics are collected, all respondents are individually assigned a random number from 0 to 4 for each trial indicating treatment arm (with an 0.25 probability of assignment). Sample size may not be perfectly balanced between groups.

All participants will begin with consent and demographics. Half the respondents will be randomised to answer survey questions first, and half to do the series of three trials first. All trials are undertaken in this order (Trial 1, Trial 2, Trial 3).

Randomisation of the order of the survey and the block of three trials will be implemented using “Randomly present elements” (in which each element is a branch containing all the trials or the survey questions), specifying that they must evenly present two of two elements.

Sample size and power calculations

We performed power calculations using a standard alpha of 5%, and a standard power of 80% for a one tail test.

Approximate sample size will be 1500 participants per arm. We estimate that for continuous outcomes we will be able to detect a standardised effect of approximately 0.1 SD unit.

For our hypotheses that compare proportions we present a minimum detectable effect based on a conservative assumption of a 50% baseline. With a sample size of 1500 we will be powered to detect 4.55pp increase over the baseline.

Method of analysis

The principal analysis of the effect of the interventions will be intent-to-treat and will consist of a covariate-adjusted comparison of our primary outcomes¹. This estimate, confidence intervals and p-values will be derived from an ordinary least squares

¹ Note that this analysis will not be a pure ITT, as some data cleaning occurs before we download the data, namely the panel provider excludes respondents who are classed as: speeding, inattentive, flatlining, duplicates, IP address not in Australia, giving conflicting answers, and providing nonsensical responses to open ended questions. We do not think this adds any bias, and we think it is preferable to drop them rather than adding this extra noise in our sample.

regression model using robust (HC2) standard errors and with the following specification:

$$Y_i = \beta_0 + \beta_1 Z_i + \beta_2 X_i + \beta_3 Z_i X_i + \epsilon_i$$

Where i is an index for each individual in the trial, Y is the primary outcome in question, β_0 is the intercept, Z is a vector of three treatment assignment indicators, β_1 is a vector of coefficients representing the average treatment effect, X is a mean centred indicator where 1 indicates that the trials were conducted before the survey, and ZX is the interaction of the treatment indicator vector with the mean centred trial order indicator vector² and ϵ is the error term.

We will treat all analysis of secondary outcomes as exploratory.

Trial threats

Attrition related to treatment status is plausible in this trial. Some interventions presented will be harder to comprehend than others. If difficulty understanding a given intervention results in attrition (i.e., if people leave the survey because it is too difficult) then this could lead to bias in our estimates.

We will include a 'don't know' option for participants to use when they are not confident in the answer. We will include anybody who was randomised into a trial in the analysis and record any unanswered questions as zero.

We will assess attrition, questions skips and 'don't know' responses to see if there is suggestive evidence that these are related to assignment. We will take the results of this robustness check into account when interpreting and reporting our findings.

Interpretation of results

Although we will use p-values to test our hypotheses, we will consider the outcome of our hypothesis tests with prior evidence, effect size, outcome variability and design limitations in order to assess the strength of a finding and our recommendations. Where primary outcomes are inconclusive, we will look at effect sizes, secondary outcomes and subgroup analyses to determine whether there are grounds for recommending any particular treatments, either because they can be comprehended more quickly, perform better for vulnerable groups (older Australians, lower education levels, experiencing financial hardship) or are more likely to be valued, preferred or rated as 'easy to understand' in comparison to alternatives.

Pre-analysis plan commitments

'No analysis has been undertaken prior to the completion of this pre-analysis plan.'

² Lin, Winston. "Agnostic notes on regression adjustments to experimental data: Reexamining Freedman's critique." *Annals of Applied Statistics* 7, no. 1 (2013): 295-318.

‘We will be transparent about, and provide justification for, any deviations (additions or omissions) from this plan.’

Appendix A- Outcome measures

Trial 1 (Information overload)

Primary outcomes

Bill comprehension

Aggregate of; able to pay, able to find key details, able to understand how your bill was calculated (each scored 0-3). Number of correct answers (0-9)

Able to pay

1. "I need to pay..."
 - a. \$110.49
 - b. \$81.92
 - c. \$95.41**
 - d. It doesn't say
 - e. Not sure
2. "Payment is due by..."
 - a. 27 April 2021**
 - b. 1 April 2021
 - c. 31 March 2021
 - d. It doesn't say
 - e. Not sure
3. "To pay using BPAY online, the biller code is..."
 - a. 3456
 - b. 333**
 - c. 19808
 - d. It doesn't say
 - e. Not sure

Able to find key details

4. "Was a discount applied to the bill?"
 - a. Yes**
 - b. No
 - c. It doesn't say

- d. Not sure
- 5. "The number to call if a power line is down is..."
 - a. 13 74 90**
 - b. 131 131
 - c. 13 66 27
 - d. It doesn't say
 - e. Not sure
- 6. "The NMI or meter number is..."
 - a. 351932
 - b. 2043789159**
 - c. 4087226386
 - d. It doesn't say
 - e. Not sure

Able to understand how your bill was calculated

- 7. "How much electricity did I use this bill?"
 - a. 466 kWh**
 - b. 589 kWh
 - c. 381 kWh
 - d. It doesn't say
 - e. Not sure
- 8. "I get a 15% discount, so it costs less than \$1 a day to stay connected to the grid, right? (Like when I'm travelling and using no electricity)"
 - a. Yes
 - b. No**
 - c. It doesn't say
 - d. Not sure
- 9. "How much does it cost me to use electricity at 8pm?"
 - a. 29 cents per kilowatt-hour**
 - b. 13 cents per kilowatt-hour
 - c. 9 cents per kilowatt-hour

- d. It doesn't say
- e. Not sure

Comprehension - Able to understand your energy consumption & generation

Number of correct answers (0-3)

1. "Did I sell more energy than I had to buy in March 2021?"
 - a. Yes**
 - b. No
 - c. It doesn't say
 - d. Not sure
2. "Do I use less energy than similar households?"
 - a. Yes
 - b. No**
 - c. It doesn't say
 - d. Not sure
3. "Is my electricity usage down from this time last year?"
 - a. Yes, it's down
 - b. No, it's up
 - c. About the same**
 - d. It doesn't say
 - e. Not sure

Secondary outcomes

Time taken - Able to pay

Continuous (time stamp)

Time taken - Able to find key details

Continuous (time stamp)

Time taken - Able to understand how your bill was calculated

Continuous (time stamp)

Time taken - Able to understand your energy consumption & generation

Continuous (time stamp)

Comprehension - Able to pay

Number of correct answers (0-3)

As listed above, but looking at comprehension of different types

Comprehension - Able to find key details

Number of correct answers (0-3)

As listed above, but looking at comprehension of different types

Comprehension - Able to understand how your bill was calculated

Number of correct answers (0-3)

As listed above, but looking at comprehension of different types

Intention - Advises to use solar more efficiently

Free text coded as 1 if it mentions using solar more efficiently, broadly defined, such as by shifting more energy usage to daytime or storing solar in a battery, other answer or no answer coded as 0.

Intention - Advises to switch plans or compare plans

Free text coded as 1 if it mentions switching or comparing plans, other answer or no answer coded as 0.

Intention - Advises to save energy

Free text coded as 1 if it mentions saving energy or ways of saving energy, other answer or no answer coded as 0.

Alice would like to know how she can reduce her energy costs when she returns home next month. What do you suggest?

- a. I suggest... <Free text entry>
- b. I wouldn't know what to do

Confidence to find a strategy to reduce energy costs

Binary

"How confident do you feel about this advice?"

- a. Very confident =1
- b. Confident =1
- c. Not very confident =0
- d. Not at all confident =0

Bill is easy to understand

Binary

To understand Alice's bill was...

- a. Very easy =1
- b. Fairly easy =1
- c. Okay =0
- d. A bit difficult =0
- e. Very difficult =0

Easy to find information

Binary

To find the information I needed on Alice's bill was...

- a. Very easy =1
- b. Fairly easy =1
- c. Okay =0
- d. A bit difficult =0
- e. Very difficult =0

What I liked (Free text)

NVIVO analysis to identify most common themes

Something I liked about this bill was...

What I disliked (Free text)

NVIVO analysis to identify most common themes

Something I didn't like about this bill was...

Trial 3 (Reference price)

Primary outcome

Would 'shop around for a better deal'

Binary

Each group will see the version of the question below that corresponds to the information they saw as per their treatment group.

T0: If I saw on my bill that the plan was equal to the reference price, I would...

T1: If I saw on my bill that the plan was 11% less than the reference price, I would...

T2: If I saw on my bill that the plan was 22% less than the reference price, I would...

T3: If I saw on my bill that the plan was 5% more than the reference price, I would...

- a. Shop around for a better deal
- b. Stay on my current deal
- c. Feel unsure

Secondary outcome

Would value having this comparison on their bill

Binary

I would value having this comparison to the reference price on my bill.

- a. Strongly agree =1
- b. Moderately agree =1
- c. Slightly agree =1

- d. Neutral =0
- e. Slightly disagree =0
- f. Moderately disagree =0
- g. Strongly disagree =0

Trial 3 (Detailed charges table)

Primary outcomes

Comprehension – can correctly identify supply charge

Binary

How much was the supply charge per day?

- a. \$30.60 per day
- b. \$1.02 per day**
- c. \$0.33 per day
- d. It doesn't say
- e. Not sure

Detailed charges table is easy to understand

Binary

To understand this information was...

- a. Very easy =1
- b. Fairly easy =1
- c. Okay =0
- d. A bit difficult =0
- e. Very difficult =0