

# Reducing carbon emissions of households through monetary incentives and behavioral interventions: a meta-analysis

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## Supplementary Information

**Literature search:** Following the highest standards of systematic review, we searched a broad set of publication databases (Web of Science Expanded Collections, Scopus, JSTOR, MEDLINE, and Google Scholar) based on a comprehensive search string that followed the PICOS (population, intervention, comparator, outcome and study design) logic recommended by Campbell Collaboration<sup>1</sup>. We searched for articles that dealt with household energy (or electricity) consumption along with one or more of the interventions of interest. The complete search string used on Web of Science and Scopus databases is given in the SI.Table 1.

The Web of Science Core Collection Citation Indexes included in our search were: Science Citation Index Expanded (SCI-EXPANDED) --1900-present, Social Sciences Citation Index (SSCI) --1900-present, Arts & Humanities Citation Index (A&HCI) --1975-present, Conference Proceedings Citation Index- Science (CPCI-S) --1990-present, Conference Proceedings Citation Index- Social Science & Humanities (CPCI-SSH) --1990-present, Emerging Sources Citation Index (ESCI) --2015-present.

Since JSTOR and Publish or Perish do not allow for long search strings, a simplified query was run on these databases: *(information OR feedback OR price OR incentives) AND (household\* OR residential) AND ("electricity consumption" OR "energy consumption" or "energy conservation")*. Though not as comprehensive, this query also followed the PICOS logic.

**Inclusion/exclusion criteria:** We only tagged as relevant studies that dealt with energy consumption by households or student dormitories and contained a quantitative estimate for the energy saved through a relevant policy intervention. Studies that focused on price effects but only referenced load effects (changes in kW and not kWh) or those that only reported effects on peak consumption and not total consumption were also removed. The inclusion and exclusion criteria are available in the SI.Table 2.

**Article screening and eligibility criteria:** Article screening was done first at the title and abstract level, assisted by machine learning, and then manually on full text level (see methods section for details). A training database of relevant studies was derived from previous reviews and known studies. This database was used to develop a machine learning model that analyzed the abstracts of the studies to rank them in the order of predicted relevance. We conducted an iterative process where at each iteration, we 1) trained the algorithm with the already screened documents, 2) fitted this enhanced model on the unseen documents and 3) assigned the next set of documents for review by selecting the documents predicted to be most relevant. Each of these iterations of machine learning prioritized screening had decreasing proportions of relevant documents in the set of reviewed records. The first iteration of 713 documents contained 30% of relevant records, while the last iteration did not contain any relevant documents. We complemented this algorithm-based screening of studies with screening the studies referenced by existing

reviews (Srivastava et al.<sup>23</sup> on pricing interventions, Karlin et al.<sup>4</sup> on feedback, Abrahamse et al.<sup>5</sup> and Andor et al.<sup>6</sup> on social comparison, commitment devices, goal setting and labelling, Nisa et al.<sup>7</sup> on household behaviors, Delmas et al.<sup>8</sup> and Buckley<sup>9</sup> on energy conservation). In total we found 195 studies which studied the relevant interventions, which is more than twice the number of studies included in the existing reviews (SI.Table 3). Unlike other reviews, we further restricted our analysis to studies in which complete quantitative details, including an estimate for the variance of the estimates was also available. Our final set therefore consists of 122 studies. The complete list of studies included in the synthesis is available in SI.Table 4. The checklist for ROSES reporting standards is available in SI.Table 5.

**Evidence for publication bias:** A funnel plot displaying the relationship between estimate quality and effect size is given below. Each dot represents an effect from included studies (e.g. measuring the effect of a certain intervention), the y-axis represents study precision (standard error) and the x-axis shows the effect estimate. This scatterplot is used for the visual detection of systematic heterogeneity between studies. It assumes that studies with high precision will be plotted near the average, and studies with low precision will be spread evenly on both sides of the average, creating a roughly funnel-shaped distribution. Deviation from this shape suggests small-study bias, which is the case here, with lower precision studies reporting stronger effects. We also performed the Egger's test for funnel plot asymmetry which returned test statistic  $Z = 3.45$  ( $p\text{-value} = 0.0005$ ). Therefore, the regression test supports the earlier speculation about the asymmetry of the funnel plot. To account for possible publication bias, we used the Trim and Fill method using the *metafor* package<sup>10</sup>. With the filled in studies, the estimate of the effect size is now closer to zero, with the estimated average effect size using the REML estimator equal to 0.147 [95% CI = 0.12, 0.16]. However, note that the 95% confidence interval for the average effect size still does not include the value zero. Therefore, the estimate of average effect size is still significantly different from zero. This finding lends support to the robustness of the earlier conclusion, that interventions are effective in reducing household energy consumption.

63 Extended Tables and Figures for Supplementary Information

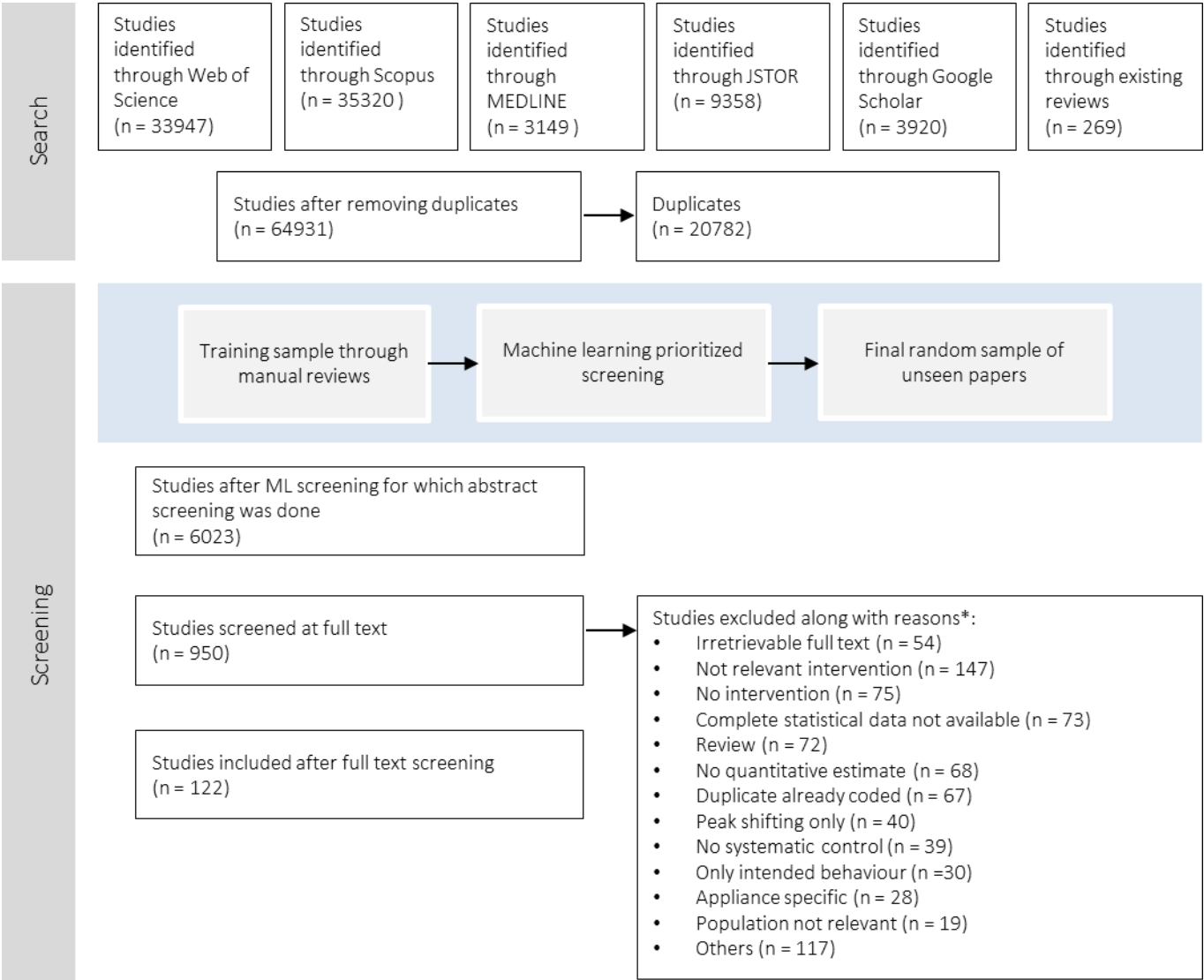
64 SI.Table 1: Search string used in Web of Science/Scopus/Medline advanced search

	Search Keywords
Population	((household* OR residential OR building OR dormitor* OR individual OR consumer* OR participant* OR customer* OR domestic OR homeowner*))
Intervention	(feedback OR pric* OR {time-of-use} OR {time-of-day} OR {real time} OR {peak} OR {dynamic pricing} OR "smart meter*" OR "smart grid*" OR (behavioral AND (economic* OR intervention* OR guideline*)) OR nudge* OR {choice architecture} OR norm OR norms or {normative} OR {social influence} OR {block leader} OR {public commitment} OR {social comparison} OR {social learning} OR {social modeling} OR {peer comparison} OR {peer information} OR salience OR "commitment device*" OR {Pre-commitment} OR {precommitment} OR pledge OR {behavioral contract} OR {commitment contract} OR "commitment approach*" OR {personal commitment} OR audit OR rebate OR reward OR incentives OR {goal setting} OR {home energy report} OR {in-home display} OR (information W/3 (campaign* OR provision OR strategies OR acquisition OR intervention* OR system*)) OR {foot-in-the-door} OR {minimal justification} OR "applied game*" OR "serious game*" OR gamif* OR {dissonance} OR tariff OR "time-varying pricing")
Comparator	-
Outcome	((energy OR electric* OR gas) W/15 (consumption OR conservation OR efficiency OR use OR demand OR usage)) OR "price responsiveness"))
Study type	-

65 SI.Table 2: Inclusion/Exclusion criteria used for classifying studies

	Population	Intervention	Comparator	Outcome	Study Type
Inclusion	Households globally (including residential dormitories)	Behavioural interventions to reduce energy consumption	Households without the intervention, before the intervention began	Energy consumption	Empirical quantitative studies
Exclusion	Industrial, Commercial building		Without comparator	Demand shifting	Simulation, modelling or predictive studies

67 SI.Figure 1: Flow diagram – adapted from the ROSES flow diagram for systematic reviews



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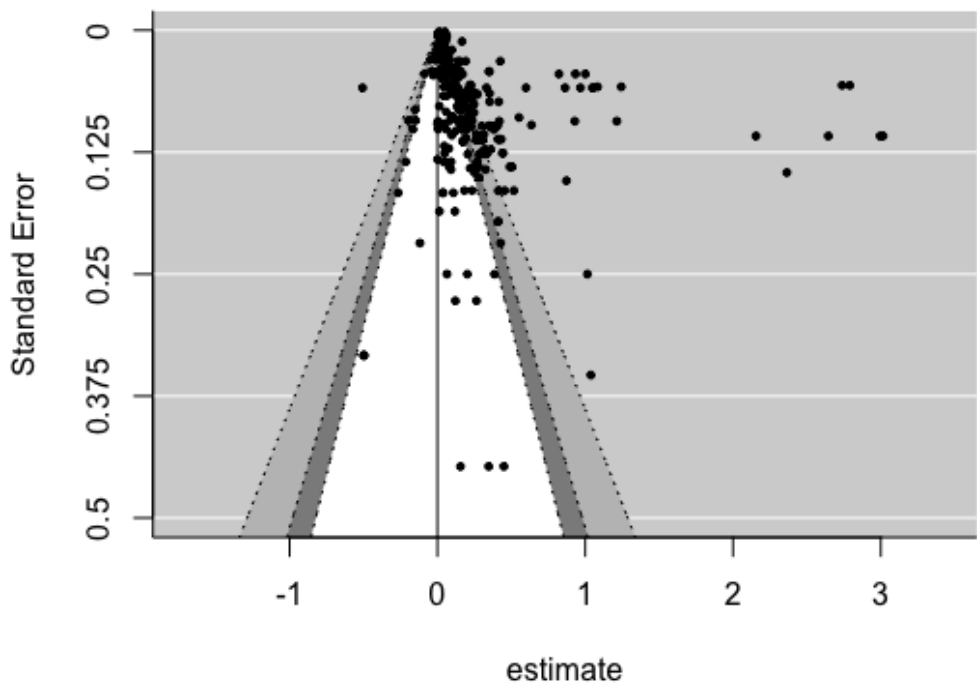
70 SI.Table 3: Number of studies included in previous meta-analyses and systematic reviews

Study	Search Strategy	Years	Databases	Number of relevant studies
Karlin Feedback Meta-analysis	– a keyword search in reference databases, a conference program search, a backward search, a forward search (127)  e-mails to study authors (31), and personal contacts (14).	1976-2010	PsychINFO, JSTOR, WoS, PubMed  Google Scholar Google Search Conference Proceedings: European Council for an Energy Efficient Economy, American Council for an Energy Efficient	42

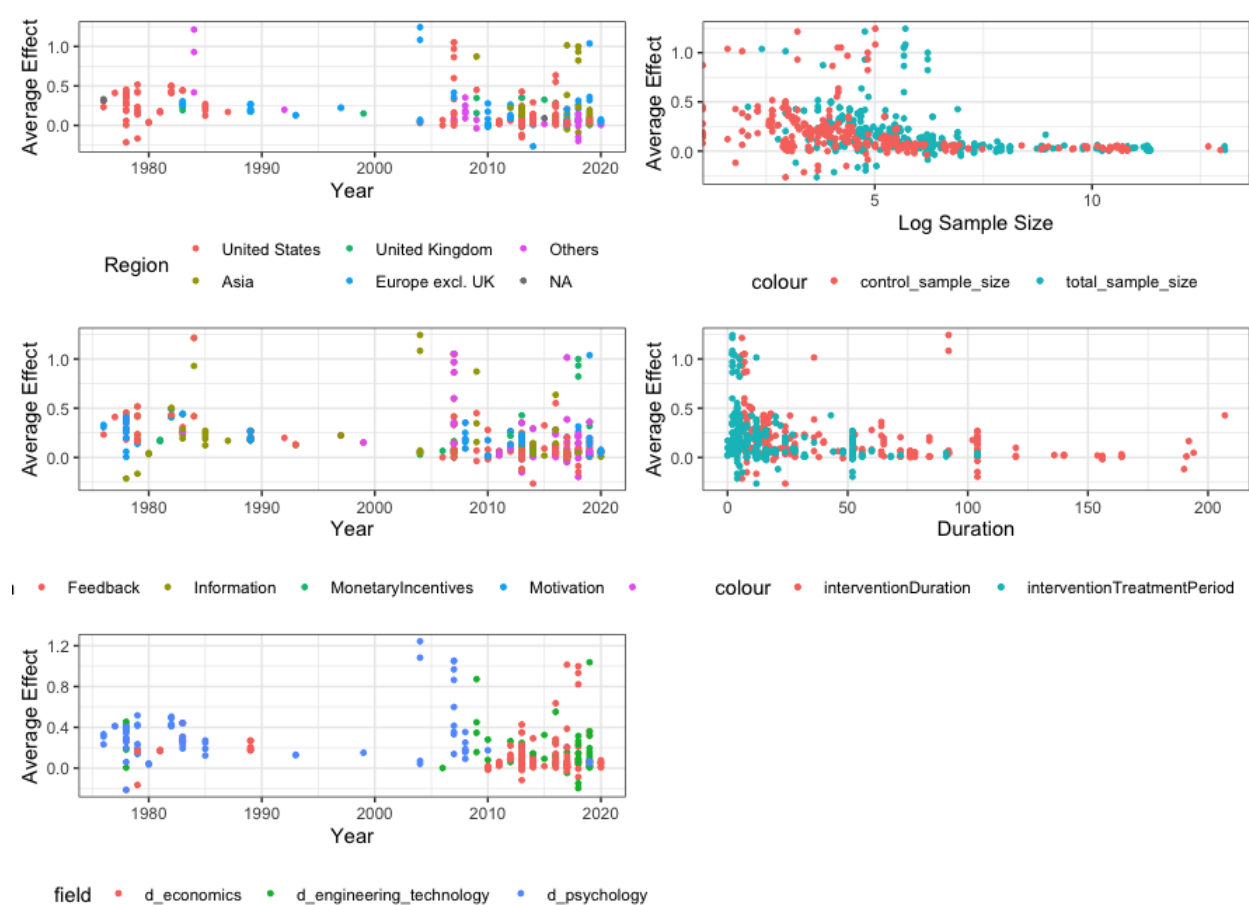
Study	Search Strategy	Years	Databases	Number of relevant studies
			Economy, Behavior Energy and Climate Change, Home Energy Display	
Delmas  Meta-analysis	Reviews backward search; backward search, and keyword search	1975-2012	PsychINFO, Academic Search Complete Business Source Complete JSTOR GreenFILE Environmental Sciences and Pollution Management Social Science Research Network (SSRN) GeoRef Ecology Abstracts NBER database	59
Andor  Non-price interventions *  Systematic Review  *includes water conservation, gas conservation	Keyword search (1,121); backward search on reviews (147)		EconLit Science Direct [Economics, Econometrics, Finance; Psychology; Social Sciences; Environment; Energy]	44
Abrahamse Steg Social Influence*  Meta-Analysis  *resource conservation includes recycling	Database search and specific journals, backward search	1976-2013	PsychInfo JSTOR Journals [J Environmental Psychology, Environment and Behavior, J Applied Social Psychology, Social Influence]	42
Srivastava Demand response Meta-Analysis  * Pricing (TOU, CPP, RTP)	“this paper drew upon articles from journal databases, and complemented this with studies from sources that covered analyses of DR initiatives, as well as with more general searches for other unpublished DR initiatives in an effort to address publication bias.”	2006-2017	NR	32

Study	Search Strategy	Years	Databases	Number of relevant studies
Nisa et al. Meta-analysis	Keyword search (13562)	1976-2017	EBSCO Business Source Complete, EconLit, PsycNET, JSTOR	47 (estimates)
Buckley Meta-analysis	Keyword search (2564)	2005-2019	CrossRef, EconLit, EconPapers, Repec, Google Scholar, NBER, ScienceDirect, SpringerLink, Web of Science, SSRN	52

71 SI.Figure 2: Funnel plot displaying the relationship between standard error and effect size



73 SI.Figure 3: Distribution of effect sizes across various metrics



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75 SI.Table 4: Complete list of studies included in the analysis

1	RLW Analytics,	2006	2006 Analysis at the Residential Time-at-Day and Energy Watch Pilot Programs Final Report. Submitted to the Idaho Public Utilities Commission, Case No. IPC-E-06-05
2	Lifson, D.P.; Miedema, A.K.	1981	A comparative analysis of time-of-use electricity rate effects: The Arizona experiment
3	Alahmad, MA; Wheeler, P G; Schwer, A; Eiden, J; Brumbaugh, A	2012	A Comparative Study of Three Feedback Devices for Residential Real-Time Energy Monitoring
4	KATZEV, RD; JOHNSON, TR	1983	A SOCIAL-PSYCHOLOGICAL ANALYSIS OF RESIDENTIAL ELECTRICITY CONSUMPTION - THE IMPACT OF MINIMAL JUSTIFICATION TECHNIQUES
5	Puckett, H	2004	Ameren UE Residential TOU Pilot Study—First Look Results. Prepared by RLW Analytics
6	Kim, ST; Lim, BI; Park, WK; Kim, MK; Son, SY	2016	An analysis on the effectiveness of a smart grid test-bed project: The Korean case
7	Nguyen, TTK; Shimada, K; Ochi, Y; Matsumoto, T; Matsugi, H; Awata, T	2016	An Experimental Study of the Impact of Dynamic Electricity Pricing on Consumer Behavior: An Analysis for a Remote Island in Japan

8	Casals, M; Gangoellis, M; Macarulla, M; Forcada, N; Fuertes, A; Jones, RV	2020	Assessing the effectiveness of gamification in reducing domestic energy consumption: Lessons learned from the EnerGAware project
9	Belenguer, E; Garcia, N; Sabater-Grande, G	2019	Assessment of energy efficiency improvement methods in the residential sector through the development of economic experiments
10	SELIGMAN, C; DARLEY, JM; BECKER, LJ	1978	BEHAVIORAL APPROACHES TO RESIDENTIAL ENERGY-CONSERVATION
11	Arvola,	1993	Billing feedback as a means to encourage household electricity conservation: A field experiment in Helsinki.
12	Kantola, S.J.; Syme, G.J.; Campbell, N.A.	1984	Cognitive dissonance and energy conservation
13	PALLAK, MS; CUMMINGS, W	1976	COMMITMENT AND VOLUNTARY ENERGY-CONSERVATION
14	Alberts, G; Gurguc, Z; Kouroupis, P; Martin, R; Muuls, M; Napp, T	2016	Competition and norms: A self-defeating combination?
15	Dobson, J	1992	Conservation effect of immediate electricity cost feedback on residential consumption behavior
16	SEEVER, WB; PATTERSON, AH	1976	DECREASING FUEL-OIL CONSUMPTION THROUGH FEEDBACK AND SOCIAL COMMENDATION
17	Pellerano, JA; Price, MK; Puller, SL; Sanchez, GE	2017	Do Extrinsic Incentives Undermine Social Norms? Evidence from a Field Experiment in Energy Conservation
18	Staats, H.; Harland, P.; Wilke, H.A.M.	2004	Effecting durable change: A team approach to improve environmental behavior in the household
19	Nilsson, A; Bergstad, CJ; Thuvander, L; Andersson, D; Andersson, K; Meiling, P	2014	Effects of continuous feedback on households' electricity consumption: Potentials and barriers
20	Nilsson, A	2014	Effects of continuous feedback on households' electricity consumption: potentials and barriers,
21	Schleich, J	2013	Effects of feedback on residential electricity demand-findings from a field trial in Austria
22	Schleich, J; Klobasa, M; Golz, S; Brunner, M	2013	Effects of feedback on residential electricity demand-Findings from a field trial in Austria
23	Ouyang, JL; Gao, LL; Yan, Y; Hokao, K; Ge, J	2009	Effects of Improved Consumer Behavior on Energy Conservation in the Urban Residential Sector of Hangzhou, China
24	WINETT, RA; KAGEL, JH; BATTALIO, RC; WINKLER, RC	1978	EFFECTS OF MONETARY REBATES, FEEDBACK, AND INFORMATION ON RESIDENTIAL ELECTRICITY CONSERVATION
25	WINETT, RA; NEALE, MS; GRIER, HC	1979	EFFECTS OF SELF-MONITORING AND FEEDBACK ON RESIDENTIAL ELECTRICITY CONSUMPTION
26	WINETT, RA; LECKLITER, IN; CHINN, DE; STAHL, B; LOVE, SQ	1985	EFFECTS OF TELEVISION MODELING ON RESIDENTIAL ENERGY-CONSERVATION
27	Costa, DL; Kahn, ME	2013	ENERGY CONSERVATION "NUDGES" AND ENVIRONMENTALIST IDEOLOGY: EVIDENCE FROM A RANDOMIZED RESIDENTIAL ELECTRICITY FIELD EXPERIMENT
28	Iwafune, Y; Mori, Y; Kawai, T; Yagita, Y	2017	Energy-saving effect of automatic home energy report utilizing home energy management system data in Japan
29	Fijnheer, J.D.L.; van Oosten dorp, H.; Veltkamp, R.C.	2019	Enhancing energy conservation by a household energy game



30	Mukai, T; Nishio, K; Komatsu, H; Uchida, T; Ishida, K	2016	Evaluating a behavioral demand response trial in Japan: evidence from the summer of 2013
31	Brown, MA; Macey, SM	1985	Evaluating the impact of two energy conservation programmes in a midwestern city
32	Becker, LJ; Rabinowitz, VC; Seligman, C	1980	Evaluating the impact of utility company billing plans on residential energy consumption
33	Egel, K.	1987	Evaluation of an Alternative Home Energy Audit Program
34	Summit Blue,	2007	Evaluation of the 2006 Energy-Smart Pricing Plan Final Report. Prepared for CNT Energy
35	Ayres, I; Raseman, S; Shih, A	2013	Evidence from Two Large Field Experiments that Peer Comparison Feedback Can Reduce Residential Energy Usage
36	Wemyss, D.; Castri, R.; Cellina, F.; De Luca, V.; Lobsiger-Kägi, E.; Carabias, V.	2018	Examining community-level collaborative vs. competitive approaches to enhance household electricity-saving behavior
37	Geelen, D; Keyson, D; Boess, S; ...	2012	Exploring the use of a game to stimulate energy saving in households
38	SELIGMAN, C; DARLEY, JM	1977	FEEDBACK AS A MEANS OF DECREASING RESIDENTIAL ENERGY-CONSUMPTION
39	Nishio, K.-I.; Mukai, T.; Komatsu, H.; Sasaki, M.; Odate, Y.; Maeki, W.	2020	Field experiment of smartphone-based energy efficiency services for households: Methodology and results of hourly electricity usage alert
40	Tiefenbeck, V	2013	For better or for worse? Empirical evidence of moral licensing in a behavioral energy conservation campaign
41	Harding, M; Hsiaw, A	2014	Goal setting and energy conservation
42	List, J.A.; Metcalfe, R.D.; Price, M.K.; Rundhammer, F.	2017	Harnessing Policy Complementarities to Conserve Energy: Evidence from a Natural Field Experiment
43	Harold, J; Lyons, S; Cullinan, J	2018	Heterogeneity and persistence in the effect of demand side management stimuli on residential gas consumption
44	van Dam, SS; Bakker, CA; van Hal, JDM	2010	Home energy monitors: impact over the medium-term
45	Lossin, F; Kozlovskiy, I; Sodenkamp, M; Staake, T	2016	INCENTIVES TO GO GREEN: AN EMPIRICAL INVESTIGATION OF MONETARY AND SYMBOLIC REWARDS TO MOTIVATE ENERGY SAVINGS
46	Stojanovski, O.; Leslie, G.W.; Wolak, F.A.; Huerta Wong, J.E.; Thurber, M.C.	2020	Increasing the energy cognizance of electricity consumers in Mexico: Results from a field experiment
47	Matsukawa, I.	2018	Information acquisition and residential electricity consumption: Evidence from a field experiment
48	Aydin, E; Brounen, D; Kok, N	2018	Information provision and energy consumption: Evidence from a field experiment
49	Martin, S.; Rivers, N.	2018	Information provision, market incentives, and household electricity consumption: Evidence from a large-scale field deployment
50	Chen, VL; Delmas, MA; Locke, SL; Singh, A	2017	Information strategies for energy conservation: A field experiment in India
51	Yun, TJ	2009	Investigating the impact of a minimalist in-home energy consumption display
52	Becker, LJ	1978	Joint effect of feedback and goal setting on performance: A field study of residential energy conservation.
53	Jessoe, K; Rapson, D	2014	Knowledge is (Less) Power: Experimental Evidence from Residential Energy Use

54	He, HZ; Kua, HW	2013	Lessons for integrated household energy conservation policy from Singapore's southwest Eco-living Program
55	Ma, GF; Lin, J; Li, N	2018	Longitudinal assessment of the behavior-changing effect of app-based eco-feedback in residential buildings
56	Bager, S; Mundaca, L	2017	Making 'Smart Meters' smarter? Insights from a behavioural economics pilot field experiment in Copenhagen, Denmark
57	Ro, M; Brauer, M; Kuntz, K; Shukla, R; Bensch, I	2017	Making Cool Choices for sustainability: Testing the effectiveness of a game-based approach to promoting pro-environmental behaviors
58	Erell, E; Portnov, BA; Assif, M	2018	Modifying behaviour to save energy at home is harder than we think ...
59	Loock, CM; Staake, T; Thiesse, F	2013	MOTIVATING ENERGY-EFFICIENT BEHAVIOR WITH GREEN IS: AN INVESTIGATION OF GOAL SETTING AND THE ROLE OF DEFAULTS
60	Dolan, P	2013	Neighbors, Knowledge, and Nuggets: Two Natural Field Experiments on the Role of Incentives on Energy Conservation (Economics Working Paper No. 2589269).
61	Sudarshan, A	2017	Nudges in the marketplace: The response of household electricity consumption to information and monetary incentives
62	Strapp, C	2007	Ontario Energy Board Smart Price Pilot Final Report. Prepared by IBM Global Business Services and eMeter Strategic Consulting for the Ontario Energy Board
63	Hammerstrom, D	2007	Pacific Northwest Grid Wide Test bed Demonstration Projects, Part 1. Olympic Peninsula Project. Pacific Northwest National Laboratory Report Number PNNL- 17167, prepared for US Department of Energy under contract DE-AC05-76L01830.
64	Schleich, J; Faure, C; Klobasa, M	2017	Persistence of the effects of providing feedback alongside smart metering devices on household electricity demand
65	Havas, L; Ballweg, J; Penna, C; Race, D	2015	Power to change: Analysis of household participation in a renewable energy and energy efficiency programme in Central Australia
66	Ghesla, C; Grieder, M; Schmitz, J; Stadelmann, M	2020	Pro-environmental incentives and loss aversion: A field experiment on electricity saving behavior
67	McClelland, Lou; Belsten, Laura	1979	PROMOTING ENERGY CONSERVATION IN UNIVERSITY DORMITORIES BY PHYSICAL, POLICY AND RESIDENT BEHAVIOR CHANGES.
68	Houde, S; Todd, A; Sudarshan, A; Flora, JA; Armel, KC	2013	Real-time Feedback and Electricity Consumption: A Field Experiment Assessing the Potential for Savings and Persistence
69	Carroll, J; Lyons, S; Denny, E	2014	Reducing household electricity demand through smart metering: The role of improved information about energy saving
70	Brandon, G; Lewis, A	1999	Reducing household energy consumption: A qualitative and quantitative field study
71	Gaskell, G; Pike, R	1983	Residential energy use: An investigation of consumers and conservation strategies
72	Battalio, R.; Kagel, J.; Winkler, R.; Winnett, R.	1979	Residential Electricity Demand: An Experimental Study
73	Eguiguren-Cosmelli, JM	2018	Responsiveness of low-income households to hybrid price/non-price policies in the presence of energy shortages: evidence from Colombia
74	Allcott, H	2011	Rethinking real-time electricity pricing

75	Suter, JF; Shammin, MR	2013	Returns to residential energy efficiency and conservation measures: A field experiment
76	Delmas, MA; Lessem, N	2014	Saving power to conserve your reputation? The effectiveness of private versus public information
77	Zhang, X.; Shen, J.; Yang, T.; Tang, L.; Wang, L.; Liu, Y.; Xu, P.	2019	Smart meter and in-home display for energy savings in residential buildings: a pilot investigation in Shanghai, China
78	Zhang, XX; Shen, JC; Yang, T; Tang, L; Wang, LY; Liu, Y Q; Xu, P	2019	Smart meter and in-home display for energy savings in residential buildings: a pilot investigation in Shanghai, China
79	Schleich, J; Klobasa, M; Brunner, M; Götz, S; Götz, K	2011	Smart metering in Germany and Austria: Results of providing feedback information in a field trial
80	Kažukauskas, A; Broberg, T; Jaraite, J	2017	Social comparisons in real time: A field experiment of residential electricity and water use
81	Allcott, H	2011	Social norms and energy conservation
82	Andor, M.; Gerster, A.; Peters, J.	2018	Social Norms and Energy Conservation Beyond the US
83	Taylor, NW; Jones, PH; Kipp, MJ	2014	Targeting utility customers to improve energy savings from conservation and efficiency programs
84	Byrne, DP; La Nauze, A; Martin, LA	2018	Tell Me Something I Don't Already Know: Informedness and the Impact of Information Programs
85	Henry, ML; Ferraro, PJ; Kontoleon, A	2019	The behavioural effect of electronic home energy reports: Evidence from a randomised field trial in the United States
86	Schultz, PW; Nolan, JM; Cialdini, RB; Goldstein, NJ; Griskevicius, V	2007	The constructive, destructive and reconstructive power of social norms
87	Asensio, OI; Delmas, MA	2016	The dynamics of behavior change: Evidence from energy conservation
88	Vollink, T; Meertens, R	2010	The Effect of a Prepayment Meter on Residential Gas Consumption
89	Haakana, M; Sillanpää, L; Talsi, M	1997	The effect of feedback and focused advice on household energy consumption
90	Gleerup, M; Larsen, A; Leth-Petersen, S; Tøgeby, M	2010	The Effect of Feedback by Text Message (SMS) and Email on Household Electricity Consumption: Experimental Evidence
91	VANHOUEWELINGEN, JH; VANRAAIJ, WF	1989	THE EFFECT OF GOAL-SETTING AND DAILY ELECTRONIC FEEDBACK ON IN-HOME ENERGY USE
92	Pon, S	2017	The Effect of Information on TOU Electricity Use: An Irish Residential Study
93	Abrahamse, W; Steg, L; Vlek, C; Rothengatter, T	2007	The effect of tailored information, goal setting, and tailored feedback on household energy use, energy-related behaviors, and behavioral antecedents
94	Considine, TJ; Sapci, O	2016	The effectiveness of home energy audits: A case study of Jackson, Wyoming
95	Herter, K; Wood, V; Blozis, S	2013	The effects of combining dynamic pricing, AC load control, and real-time energy feedback: SMUD'S 2011 Residential Summer Solutions Study
96	Ho, T.T.; Shinkuma, S.; Shimada, K.	2018	The effects of dynamic pricing of electric power on consumer behavior: A propensity score analysis for empirical study on Nushima Island, Japan

97	Winett, RA; Neale, MS; Williams, K; ...	1978	The effects of feedback on residential electricity consumption: Three replications
98	Allen, J	2006	The effects of household characteristics and energy use consciousness on the effectiveness of real-time energy use feedback: A pilot study
99	Faruqui, A; Arritt, K; Sergici, S	2017	The impact of advanced metering infrastructure on energy conservation: A case study of two utilities
100	Hassan, M.G.; Hirst, R.; Sieniuch, C.; Zobaa, A.	2009	The impact of energy awareness on energy efficiency
101	Loock, CM; Landwehr, JR; Staake, T; Fleisch, E; ...	2012	The influence of reference frame and population density on the effectiveness of social normative feedback on electricity consumption
102	Mizobuchi, K; Takeuchi, K	2013	The influences of financial and non-financial factors on energy-saving behaviour: A field experiment in Japan
103	Sipe, C	2009	The net impact of home energy feedback devices.
104	Gorgani, Hamid; Nouri, Aboulghassem; Molavi, Hossein	2008	The process of commitment, escalation, and incentive yields energy conservation.
105	Henn, L; Taube, O; Kaiser, FG	2019	The role of environmental attitude in the efficacy of smart-meter-based feedback interventions
106	Allcott, H; Rogers, T	2014	The Short-Run and Long-Run Effects of Behavioral Interventions: Experimental Evidence from Energy Conservation
107	Geelen, D; Mugge, R; Silvester, S; Bulters, A	2019	The use of apps to promote energy saving: a study of smart meter-related feedback in the Netherlands
108	Karp, A; McCauley, M; Byrne, J	2016	The value of adding ambient energy feedback to conservation tips and goal-setting in a dormitory
109	Jessoe, K; Rapson, D; Smith, JB	2014	Towards understanding the role of price in residential electricity choices: Evidence from a natural experiment
110	Pereira, L; Quintal, F; Barreto, M; Nunes, NJ	2013	Understanding the limitations of eco-feedback: a one-year long-term study
111	Harries, T; Rettie, R; Studley, M	2012	Using digital technologies to test the Social Norms Approach to reducing electricity consumption
112	Mizobuchi, K; Takeuchi, K	2012	Using economic incentives to reduce electricity consumption: A field experiment in Matsuyama, Japan
113	MIDDEN, CJH; METER, JE; WEENIG, MH; ZIEVERINK, HJA	1983	USING FEEDBACK, REINFORCEMENT AND INFORMATION TO REDUCE ENERGY-CONSUMPTION IN HOUSEHOLDS - A FIELD-EXPERIMENT
114	Mi, LY; Ding, CQ; Yang, J; Yu, XY; Cong, JQ; Zhu, HL; Liu, QY	2019	Using goal and contrast feedback to motivate Chinese urban families to save electricity actively - A randomized controlled field trial
115	Schultz, PW; Estrada, M; Schmitt, J; Sokoloski, R; ...	2015	Using in-home displays to provide smart meter feedback about household electricity consumption: A randomized control trial comparing kilowatts, cost, and social ...
116	Young, Robert M	2014	Variations on the normative feedback model for energy efficient behavior in the context of military family housing.
117	Stinson, J; Willis, A; Williamson, JB; Currie, J; Smith, RS	2015	Visualising energy use for smart homes and informed users
118	Hemmes, F.; Papyrakis, E.; van Beukering, P.	2012	Waste Not, Want Not

119	Kendel, A; Lazaric, N; Marechal, K	2017	What do people 'learn by looking' at direct feedback on their energy consumption? Results of a field study in Southern France
120	Bator, RJ; Phelps, K; Tabanico, J; Schultz, PW; Walton, ML	2019	When it is not about the money: Social comparison and energy conservation among residents who do not pay for electricity
121	Lynham, J; Nitta, K; Saijo, T ; Tarui, N	2016	Why does real-time information reduce energy consumption?
122	Lukas Meub, Petrik Runst, Kaja von der Leyen	2019	Can Appealing And More Informative Bills “Nudge” Individuals Into Conserving Electricity?

76 SI.Table 5: ROSES checklist for evidence synthesis reporting

Section/sub-section	Topic	Description	Further explanation	Checklist/meta-data	Author response	Comments
Title	Title	The title must indicate that it is a systematic review, and should indicate if it is an update/amendment: e.g. "...A systematic review update."	The title should normally be the same or very similar to the review question.	Meta-data	Yes	
Type of review	Type of review	Select one of the following types of review: systematic review, systematic review update, systematic review amendment, systematic review from a systematic map	See CEE Guidance on amendments and updates [1]	Meta-data	systematic review	
Authors' contacts	Authors' contacts	The full names, institutional addresses and email addresses for all authors must be provided.		Checklist	Yes	
Abstract	Structured summary	The abstract of the manuscript must not exceed 500 words and must be structured into separate sections: Background, the context and purpose of the review, including the review question; Methods, how the review was performed and statistical tests used (specifically mention search strategy, inclusion criteria, critical appraisal, data extraction and synthesis); Results, the main findings, including results of search and assessment of evidence base; Conclusions, brief summary and potential implications for policy/management and research.		Checklist	Yes	
Background	Background	Describe the rationale for the review in the context of what is already known. Reviews must indicate why this study was necessary and what it aims to contribute to the field.	A theory of change and/or conceptual model should be presented that links the intervention or exposure to the outcome.	Checklist	Yes	

Stakeholder engagement	Stakeholder engagement	The actual role of stakeholders throughout the review process (e.g. in the formulation of the question) must be described and explained (using a broad definition of 'stakeholder', including e.g. researchers, funders and other decision-makers; see [2])		Checklist	Yes	
Objective of the review	Objective	Describe the primary question and secondary questions (when applicable).	The primary question is the main question of the review. The secondary questions are usually linked to sources of heterogeneity (effect modifiers).	Checklist	Yes	
	Definition of the question components	Provide reference to the question key elements, e.g. population(s), intervention(s)/exposure(s), comparator(s), and outcome(s).	For other question types see [3,4]	Meta-data	Yes	SI
Methods	Protocol	Provide citation, DOI or open-access link to published protocol.	The protocol should be peer-reviewed and publicly available online (open access).	Meta-data	Yes	SI
	Deviations from protocol	Describe any ways in which the final methods of the review deviate from those set out in the protocol along with a justification.		Checklist	Yes	No deviations
Searches	Search strategy	Detail the search strategy used, including: database names accessed, dates of searching, institutional subscriptions (or date ranges subscribed for each database), search options (e.g. 'topic words' or 'full text' search facility), efforts to source grey literature, other sources of evidence (e.g. hand searching, calls for evidence/submission of evidence by stakeholders).		Checklist	Yes	
	Search string	Provide Boolean-style full search string and state the platform for which the string is formatted (e.g. Web of Science format)		Meta-data	Yes	
	Languages - bibliographic databases	List languages used in bibliographic database searches		Meta-data	Yes	
	Languages - grey literature	List languages used in organisational website searches and web-based search engines		Meta-data	Yes	

	Bibliographic databases	Provide the number of bibliographic databases searched		Meta-data	Yes	
	Web-based search engines	Provide the number of web-based search engines searched		Meta-data	Yes	
	Organisational websites	Provide the number of organisational websites searched		Meta-data	Yes	
	Estimating comprehensiveness of the search	Describe the process by which the comprehensiveness of the search strategy was assessed (i.e. list of benchmark articles)		Checklist	Yes	
	Search update	Describe any update to searches undertaken during the conduct of the review	Compulsory (if update performed). A search update is good practice if original searches were performed more than two years prior to review completion.	Checklist	Yes	An initial June 2019 Update July 2020
Article screening and study inclusion criteria	Screening strategy	Describe the methodology for screening articles/studies for relevance. Methods for consistency of screening decisions (at title, abstract, and full texts levels) checking must be described.		Checklist	Yes	
	Inclusion criteria	Describe the inclusion criteria used to assess relevance of identified articles/studies. These must be broken down into the question key elements (e.g. relevant subject(s), intervention(s)/exposure(s), comparator(s), outcome(s), study design(s)) and any other restrictions (e.g. date ranges or languages).		Checklist	Yes	
Critical appraisal	Critical appraisal strategy	Describe here the method used for critical appraisal of study validity (including assessment of individual studies and the evidence base as a whole). Describe how repeatability of critical appraisal of study validity was tested.		Checklist	Yes	
	Critical appraisal used in synthesis	Describe how the information from critical appraisal was used in synthesis.		Checklist	Yes	

Data extraction	Meta-data extraction and coding strategy	Describe the method for meta-data extraction and coding for studies, providing lists of variables that will be extracted as meta-data and those that will be coded. Describe how repeatability of meta-data/data extraction and coding was tested.	Optional, a map database can be included within a systematic review	Checklist	Yes	Code book included
	Data extraction strategy	Describe the method for extraction of qualitative and/or quantitative study findings. Describe how repeatability of data extraction was tested.		Checklist	Yes	
	Approaches to missing data	Describe any process for obtaining and confirming missing or unclear information or data from authors.		Checklist	No	
Potential effect modifiers /reasons for heterogeneity	Potential effect modifiers /reasons for heterogeneity	Provide a list of and justification for the effect modifiers/reasons for heterogeneity that will be considered in the review. Also provide details of how the list was compiled (including consultation of external experts).		Checklist	Yes	
Data synthesis and presentation	Type of synthesis	State the type of synthesis conducted as part of the systematic review (narrative only, narrative and quantitative, narrative and qualitative, narrative, qualitative and quantitative, narrative and mixed-methods)		Meta-data	Quantitative	
	Narrative synthesis strategy	Describe methods used for narratively synthesising the evidence base in the form of descriptive statistics, tables (including SM database) and figures. Study findings must only be narratively synthesised and vote-counting must be avoided.		Checklist	Yes	
	Quantitative synthesis strategy	If data are appropriate for quantitative synthesis, describe methods for calculating effect sizes, methods for handling complex data, statistical methods for combining data from individual studies, and any exploration of heterogeneity and publication bias. If all studies were not selected for synthesis explain criteria for selection (e.g. incomplete or missing information).	Compulsory (if quantitative synthesis performed)	Checklist	Yes	



	Qualitative synthesis strategy	Describe methods used for synthesising qualitative data and justify your methodological choices. Describe if and how you plan to analyse subgroups/subsets of data. If all studies were not selected for synthesis explain criteria for selection (e.g. incomplete or missing information).	Compulsory (if qualitative synthesis performed)	Checklist	n/a	
	Other synthesis strategies	Describe any other approaches used for synthesising data or combining qualitative and quantitative syntheses (e.g. mixed methods) and justify your choice of methodology.	Compulsory (if other synthesis performed)	Checklist	n/a	
	Assessment of risk of publication bias	Describe methods for examining the possible influence of publication bias on the synthesis.	This may be done for quantitative syntheses using diagnostic plots or statistical tests.	Checklist	Yes	
	Knowledge gap and cluster identification strategy	Describe the methods used to identify and/or prioritise key knowledge gaps (unrepresented or underrepresented subtopics that warrant further primary research) and knowledge clusters (well-represented subtopics that are amenable to full synthesis via systematic review).	Optional	Checklist	n/a	
	Demonstrating procedural independence	Describe the role of systematic reviewers (who have also authored articles to be considered within the review) in decisions regarding inclusion or critical appraisal of their own work.	Reviewers who have authored articles to be considered within the review should be prevented from unduly influencing inclusion decisions, for example by delegating tasks appropriately.	Checklist	Yes	
Results	Description of review process	Describe the review process including the volume of evidence identified from all sources and retained through each stage of the review. Must also display the number of articles/studies included at all stages of the review in a flow diagram, including the number of articles/studies excluded at each stage.		Checklist	Yes	
	Number of search results	Provide the number of search results from bibliographic databases (including updates if conducted) prior to duplicate removal.	This number should not include web-based search engine or organisational website searches: this will help assessment of the efficiency of the primary search string.	Meta-data	Yes	

	Number of search results after duplicate removal	Provide the total number of search results from bibliographic database searches following duplicate removal.	This number should not include web-based search engine or organisational website searches: this will help assessment of the efficiency of the primary search string.	Meta-data	Yes	
	Full text screening excludes	Additional file containing list of and reasons for full text exclusions.		Checklist	Yes	
	Title screening results	Provide the number of articles retained following title screening.	Optional if screening titles and abstracts together	Meta-data	n/a	
	Abstract screening results	Provide the number of articles retained following abstract screening.	Optional if screening titles and abstracts together	Meta-data	Yes	
	Title and abstract screening results	Provide the number of articles retained following title and abstract screening.	Optional if screening titles and abstracts separately	Meta-data	Yes	
	Retrieval results	Provide the number of articles retrieved at full text.		Meta-data	Yes	
	Unobtainable articles	Additional file containing list of unobtainable articles.		Checklist	Yes	
	Full text screening results	Provide the number of articles retained following full text screening.		Meta-data	Yes	
	Consistency checking: screening	Results of consistency checking at all stages (screening, data extraction, critical appraisal) must be provided. Provide the number of titles, abstracts and full texts screened and checked for consistency by two or more reviewers as a fraction of the total (e.g. Title: 2000/20000; Abstract: 500/5000; Full text: 10/100).		Checklist	Yes	
	Critical appraisal exclusions	If any studies are excluded due to low validity, provide the number of studies excluded from further synthesis during critical appraisal.	Compulsory for any studies not included in synthesis due to validity. Reviews authors may prefer to perform a sensitivity analysis (repeating analyses to examine the influence of validity) rather than excluding studies from synthesis.	Meta-data	Yes	

	Narrative synthesis	Describe the body of evidence identified using figures and tables, avoiding vote-counting (tallying of studies based on results; direction or significance). Each must be presented with descriptive information (meta-data) and extracted study findings. Describe the validity of individual studies and the evidence base as a whole.		Checklist	Yes	
	Extracted data	Additional file containing extracted quantitative or qualitative data (study findings) from included studies.		Checklist	Yes	
	Systematic map database	Additional file containing meta-data and coding for included studies.	Optional, a map database can be included within a systematic review	Checklist	n/a	
	Quantitative synthesis	Present results of quantitative synthesis of study findings (e.g. meta-analysis).	Compulsory (if quantitative synthesis performed)	Checklist	Yes	
	Qualitative synthesis	Present results of qualitative analysis of study findings (e.g. summaries of identified themes or categories). Also provide additional file with the identified themes or categories for each study.	Compulsory (if qualitative synthesis performed)	Checklist	n/a	
	Other synthesis	Present results of any other synthesis methods used.	Compulsory (if other synthesis performed)	Checklist	n/a	
	Risk of publication bias	Describe the results of assessments for the possible influence of publication bias on the synthesis.	For quantitative syntheses this may be done using diagnostic plots or statistical tests	Checklist	No	
Discussion	Discussion	Discuss the review results and suggest further enquiry or analysis (e.g. potential reasons for heterogeneity in outcome). Authors may draw attention to specific knowledge gaps.		Checklist	Yes	
	Limitations of the review	Discuss possible limitations in the methods used.		Checklist	Yes	
	Limitations of the evidence base	Discuss possible limitations in the evidence base.		Checklist	Yes	
Conclusions	Implications for policy/management	Summarise the state of the evidence base and discuss the way in which the identified evidence may inform policy/practice decision making in relation to the review question. Provide any measure of the uncertainty surrounding the outcome.	Reviews must not include practical environmental management recommendations or advocacy.	Checklist	Yes	

	Implications for research	Discuss the way in which the identified evidence may inform research including options for increasing the reliability of study design that could improve future research.	In this section some advocacy for future research on the reviewed topic is permissible provided it is clearly justified by the review outcome/critical appraisal of study validity.	Checklist	Yes	
Declarations	Competing interests	Describe of any financial or non-financial competing interests that the review authors may have.		Checklist	Yes	No deviations
References						
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[3] Collaboration for Environmental Evidence. 2018. Guidelines and Standards for Evidence synthesis in Environmental Management. Version 5.0. <a href="http://www.environmentalevidence.org/information-for-authors">www.environmentalevidence.org/information-for-authors</a> .						
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## 100 Supplementary Information - Code-book

### 101 Search Process

102 Meta analyses need three levels of information to be coded: search level, study level and the effect level  
103 information. We have done the first two by using the [apsis platform](#) which automatically records our search  
104 strategy and study level information from the documents that have been tagged as relevant. This document  
105 mostly relates to the manual coding at the effect level, also done on the aphis platform.

### 106 Ineligible documents

107 After going through the abstract and reading through the document, if you find it unacceptable to be  
108 included in the study because 1) it does not contain relevant effect sizes 2) effect size information is  
109 incomplete or irretrievable 3) document is not relevant or any other reason, please add the reason for  
110 excluding the document in the Notes box.

### 111 Acceptable documents

- 112 • For acceptable documents we collect effect level information in two forms, “Effects” and  
113 “Interventions”.
- 114 • Each study may report multiple estimates of the effect. This can be due to multiple iterations,  
115 multiple treatments/interventions, different populations, etc. You can add the multiple effects and  
116 corresponding information for each study. As such, please collect information on all the effect sizes  
117 estimated in the study along with the corresponding control variables.
- 118 • Once you have filled out and submitted the effect form once, you can also copy an effect form  
119 (some of the information will be similar across effects) by clicking on the yellow box next to “copy  
120 this”. This will create a copy of the completed form. Modify the form as required and click “submit”  
121 to save it as a different effect.

### 122 Effect Fields

123 In this section we will capture one estimation (e.g. one coefficient, one difference of means) and the  
124 characteristics of the model used in order to accurately calculate effect sizes comparable to others included  
125 in our meta-analysis.

126  
127 After the statistical information is captured it will be linked to an intervention in the next section. An effect  
128 size can be estimated for joint interventions (e.g. a TOU pricing scheme might be introduced alongside an  
129 in-home display device). The capture of the intervention section should describe the intervention linked to  
130 the estimate as accurately as possible.

131  
132  
133

Note: All boxes are set by default to -999 or information not available by default.

Field Name	Explanation	Choices or Examples
Page	<p>Capture page # for the specific effect – preferably page number that presents table of results.</p> <p>If you do not have access to the published paper please check the dropbox first. If you only have a version of the paper without page numbers use a normal page count to fill in the relevant page number.</p>	
Statistical technique	<p>Studies may employ different techniques to estimate effects.</p> <p>Note: Remove Difference in Difference from effect statistical_technique. Here we really just capture the type of regression and let Difference in Difference be the study type</p>	<p>Probit</p> <p>Logit</p> <p>Difference of means</p> <p>ANOVA</p> <p>one-step GMM</p> <p>Time/ Household or both</p> <p>Household Fixed effects</p> <p>Time Fixed effects</p> <p>Household and time fixed effects</p> <p>Random effects regression</p> <p>OLS regression, etc.</p>
Dependent variable	<p>Studies will utilize various measures to capture energy consumption. What variable/operationalization are they using here. We are ultimately interested in percentage change in energy consumption of the household given the intervention.</p> <p>Note: If a paper does the analysis using the dependent variable as “absolute energy consumption” and “change in energy consumption”, the figures for “change in energy consumption” should be recorded.</p>	<p>Household electricity consumption</p> <p>Household gas consumption</p> <p>HH energy consumption per square foot</p> <p>Log HH energy consumption per square foot</p> <p>Others</p>
Study design	Whether the study calculates a pre-test/ post-test effect size or a control-treatment effect size	<p>Pre-test/ post-test -</p> <p>No control used, same group measured twice</p> <p>Control-treatment- no baseline, two groups with starting</p>

Field Name	Explanation	Choices or Examples
		<p>observation started at the same time</p> <p>Difference in Difference - baseline for both control and treatment groups followed by treatment and measure of effect</p>
Effect size - statistical estimate	Capture both the value of the relevant regression coefficient and the direction of the effect of the intervention (decrease/increase).	
	<p>The variance is captured by the standard error of the coefficient (coefficient sd). Also capture the type of uncertainty measure provided (see right).</p> <p>If a standard error is not provided use code -999 and use 'not provided' as the type</p>	<p>(standard error, standard deviation, robust standard errors, pooled standard errors)</p> <p>-999; not provided</p>
	<p>Also capture the t-statistic and the degrees of freedom (n-k-1) of the t-statistic.</p> <p>If a study provides the coefficient and standard error, calculate the specific t-statistic (<math>\beta/se</math>) and use that to calculate a corresponding P-value.</p> <p>If a study only provides the level of significance (no standard error, no t-statistic, no specific p-value) then capture the level of significance in the p-value field and calculate the t-statistic using the level of significance and mark it as a lower bound (if significant) or higher bound (if not significant)</p>	
Effect size - difference of means	<p>Capture both the control and treatment group means where possible. Otherwise capture the difference along with the value of the relevant test statistic (t, Chi or F).</p> <p>Calculate pooled standard deviation using the formula in Ringquist if required.</p>	
Sample Size	Capture as much detail as possible (i.e. if all three options are given, record all). Given that a	

Field Name	Explanation	Choices or Examples
	<p>specification can include multiple treatments, the sum of treatment and control sample sizes will not necessarily add to the total.</p> <p>Studies may run analysis comparing treatment groups only to the control, or also to each other, capture elements</p> <p><b>Total</b> – Control and all treatments, full sample size (for pre-and post- treatment set-ups)</p> <p><b>Treatment</b> – Capture sample size for specific effect being captured (this should correspond to one treatment or combination of treatments)</p> <p><b>Control</b> – There is possibly only one control group for multiple treatments</p>	
Control Definition	<p>List the controls are being used to better isolate the effect of the intervention. Besides the variable of interest (intervention) which elements that affect energy consumption are included.</p> <p>Fixed effects and random effects for households or time effects should NOT be captured here. These should be captured in the statistical technique. Only include explicit weather or seasonal controls in the analysis.</p>	<p><b>Weather controls</b> (heating degree days or cooling degree days, etc.)</p> <p><b>Seasonal controls</b> (monthly dummies or quarterly/seasonal dummies, etc)</p> <p><b>Energy prices</b></p> <p><b>Residence controls</b> (physical nature of the house, size of house, appliance stock, etc.)</p> <p><b>Household controls</b> – demographic info (income, age, number of residents, education, etc.)</p> <p><b>Base energy consumption</b></p>
Geography and Aggregation Level	<p><b>Geographic scope</b> captures the area across which the intervention was carried out</p> <p>Note: Try and stick to the options mentioned</p> <p><b>Geographic location</b> should mention the country where the intervention took place. Use commas to separate levels of detail if given.</p> <p>Note: Try and stick to the format city, state, country</p>	<p>municipality, state, town, county</p> <p>city, state, country</p>



Field Name	Explanation	Choices or Examples
	<b>Aggregation</b> level at which the data is being analyzed or recorded. Most should be household.	
Baseline consumption	<p>Enter the average consumption per annum of the households in the total sample if provided or if can be calculated</p> <p>Rules for recording the baseline consumption:  <b>Which consumption?</b> If baseline data was collected and average consumption during that time is reported, record that. If baseline is not available, record the average consumption during the experiment.  <b>Whose consumption?</b> If average consumption of all households is mentioned, record that. If not, then the weighted average consumption of treatment and control group should be reported. If both the options are not possible, report the average consumption of the control group.  Preference order:</p> <ol style="list-style-type: none"> <li>1. Average consumption of all households (T+C) during baseline period</li> <li>2. Weighted average consumption of T and C during baseline period</li> <li>3. Average consumption of all households (T+C) during the treatment period</li> <li>4. Weighted average consumption of T and C during treatment period</li> <li>5. Consumption of the control group</li> </ol>	
Randomization Method	Capture the level at which randomization was done - not done	Household level, block level, district level
Opt-in vs. Opt-outs	<p>Were households first selected and then allowed to opt out of the intervention or were the households required to opt-in to the intervention or neither</p> <p>Note: Choose Opt out (2) only when households are given an option to drop out of the experiment explicitly. If they move away or discontinue without being given an option go for (0). Write (1) when households have the option of choosing to not be a part of the experiment anymore.</p>	

## 134 Intervention

135

Field Name	Explanation	Choices or Examples
Framing Unit	When participants are given information or feedback on their energy consumption, in what units/terms is this information given	Energy (kwh) savings (\$) Co2 other efficiency (R-value) other ecological
Timing/Frequency	What is the frequency at which the households are contacted to provide feedback/information? Normally not applicable for pricing interventions.	Continuous (on-demand) Monthly Bi-weekly One time only Monthly or quarterly
Medium	How was the household contacted? Could be relevant for all types of interventions.	
Duration	For how long did the intervention take place. If intervention happens only once (e.g. one-time energy audits, or one-time mail brochures on energy saving, enter duration as zero). Note: Data for duration should be in weeks where 1 month = 4 weeks and 1 year = 52 weeks	
Follow-up	If study explores boomerang or fading effects with a measure of the effect after some time, capture how many weeks after intervention discontinuation this measure is taken. If intervention is continued throughout the post study	

Field Name	Explanation	Choices or Examples
	period and no variable captures a fading of the effect then follow-up is 0.	
Intervention types and sub-types*	We look at five broad intervention types: Information, Feedback, Monetary Incentives, Social Comparison and Motivation	Information: home audits, tips, Feedback:historical, enhanced billing, in-home display Social comparison: peer comparison, HER Monetary Incentives: Rewards, ToU, Real-time Pricing, Dynamic Pricing, Peak Load Pricing Motivation: Gamification, commitments, goal setting

136 \* When describing the intervention associated with a treatment effect record the elements that are  
137 different from the control group. E.g. if the entire population has smart meters with an in-home display,  
138 and the treatment group is receiving an additional health framing feedback via sms, then capture only the  
139 health framing feedback, exclude the in-home display.