Application of KB savings, baselines and correction factors in the Toolbox and PSMCs

Internal Note

Project Coordinator: AEA

Work Package 4 Leader organization: ECN.TNO

April 2019

Authors

Piet Boonekamp

Paul van den Oosterkamp

Manuscript completed in April 2019.

This document is available on: www.epatee.eu

Document title	Application of KB savings, baselines and correction factors in the Toolbox and specific guides
Work Package	WP4
Document Type	Internal Note
Date	18 April 2019
Document Status	Version 1.0

Acknowledgments & Disclaimer

Application of KB savings, baselines and correction factors in the Toolbox and PSMCs (Specific guides)

For the calculation of savings the following 16 quantities, baselines and factors are mentioned in the Knowledge Base (KB).

Saving quantities in KB:
1. Gross savings
2. Net savings

Baselines in KB:
3. Before / after
4. Control group
5. Trend
6. Minimum performance standards

Normalization factors in KB:
7. Performance gaps (differences in operating conditions or defects from installation)
8. Pre-bound
9. Direct rebound
10. Other (weather conditions, occupancy level, production volume etc...)

Adjustments of savings in KB
11. Free rider
12. Spill-over/multiplier
13. Additionality
14. Indirect rebound
15. Non-compliance
16. Double counting

Gross and net savings are connected to the baselines and factors 7 – 16; therefore these quantities are dealt with separately. Normalization factor 10 is split into weather (10a) and changes for energy using activities such as occupancy of buildings, production volume in industry or driven km by car for transport (10b). For the baselines the extra option "With/without" has been incorporated in the analysis.

The applicability of the baselines and factors has been analysed for the 30 selected PSMCs (see Annex). For PSMCs on buildings a distinction has been made for existing (a) and new (b) buildings. The results are shown in the table as 1 (applicable), 0 (not applicable) and 0 (unclear/to be done).

Baseline options in the analysis

Before/after
Analysis of changes in energy consumption before/after the saving action, where "before" acts as the baseline for "after". This option can be applied for replacement of existing energy using systems. The results can be corrected for other influencing factors than savings (see Normalization factors) providing Gross energy savings. By applying adjustment factors (e.g. free-rider effect), the "before/after" comparison can take into account what share of the savings can be attributed to the policy measure, the Net energy savings.

With/without

Analysis of changes in energy consumption with/without the saving action, where the "without" situation acts as the baseline for the "with" situation. This option is for example suited for new efficient systems where no "before" situation is available. Results can be corrected for adjustment factors, providing Net savings. The With/without baseline can also be applied more generally for evaluation of policy measures, especially to evaluate energy savings additional to a predefined scenario (e.g., business-as-usual scenario or a scenario including other policy measures). In this case, this predefined scenario will be used to specify the "without" situation.

Comparing with trend

Analysis of the difference between actual development of energy consumption over time and development without the influence of new policy; e.g. consumer behaviour, autonomous technical progress, "business as usual" scenario. The "trend analysis" option is a sub-category of the "with/without" option, where the "without" situation is defined from the trend analysis.

Target/control group

Analysis of differences in energy consumption for the target group (or participants) of the policy measure and a control group not subject to it (or a comparison group of non-participants). The influence of other factors than the policy measure is assumed to be directly taken into account by the comparison. The "target/control group" comparison thus directly gives net energy savings (see Calculating Gross and Net energy savings). The "target/control group" option is a sub-category of the "with/without" option, where the "without" situation is defined as the changes observed in the control (or comparison) group.

Minimum efficiency standards

If a standard is in place, e.g. for appliances or cars, this baseline can be chosen so that only the above-standard savings count. The standard acts as a baseline for attributing savings due to other policy measures. Therefore, this baseline can be combined with the other baselines. The "minimum efficiency standards" option is a sub-category of the "with/without" option, where the "without" situation is defined as performance level required by the standards.

Compared to the Knowledge base the option With/without has been added to the options in this analysis

Table 1: Applicability of baselines and factors for 30 PSMCs

PSMC	Baseline	Baselines KB				Normalization factors KB					Adjustment of savings KB		
PSMC		3	4	5	6	7	8	9	10a	10b	11	12	1
PSMC	With/ without	Before / after	Control group	Trend	Min.eff. Standard	Perform. gap	Pre-bound	Direct rebound	Weather	Prod./ oc-cupancy	Free rider	Spill-over	Add na
	0 < ?=1 or 0												
1a (as AM)	0	1	1	0	0	0	1	1	1	1	0	0	
1b new	1	0	0	0	0	0	0	1	1	1	0	0	
2a exist	1	0	0	0	0	1	1	1	0	1	0	0	
2b new	1	0	0	0	0	1	1	1	0	0	0	0	
3a exist	1	1	0	0	0	1	0	0	0	0	0	0	
3b new	1	0	0	0	0	1	0	0	0	0	0	0	
4	1	0	0	0	0	0	0	1	0	0	0	0	
5 (+CM3)	1	0	0	0	1	0	0	1	0	0	1	1	
6 (update)	0	1	0	0	1	0	0	0	1	1	0	0	
7 (as AM)	0	1	0	0	1	0	0	1	1	1	0	0	
8a (as AM)	0	1	1	0	1	0	1	1	1	1	1	1	
8b new	1	0	1	0	1	0	0	0	0	1	1	1	
9a exist	1	0	0	0	1	1	1	1	0	1	1	1	
9b new	1	0	0	0	1	1	0	1	0	0	1	1	
10 (+CM3)	1	0	0	0	1	0	1	1	0	0	1	1	
11 (+CM3)	1	0	0	1	1	1	1	1	0	1	1	1	
12	0	1	0	0	0	0	0	0	1	1	0	0	
13	1	0	0	0	1	1	0	0	0	1	1	1	
14	1	0	0	0	1	0	1	1	0	0	1	1	
15	0	1	1	0	1	0	1	1	1	1	1	0	
16	1	1	0	0	0	0	0	0	0	1	1	0	
17	0	1	1	0	0	0	0	0	0	1	1	0	
18	0	1	0	0	0	0	0	0	0	1	0	0	
19	1	1	0	0	0	0	0	0	0	1	1	0	
20 (+CM3)	1	0	0	0	1	0	0	1	0	0	1	1	
21	0	0	0	0	0	0	0	0	1	0	0	0	
22	1	0	0	0	0	0	0	0	1	0	0	0	
23(as AM)	0	0	1	0	1	0	0	1	1	0	1	0	
24	0	1	1	0	0	0	0	0	1	1	1	0	
25	1	0	1	0	0	0	0	0	0	1	0	0	
26	1	0	0	0	1	0	0	1	0	0	1	0	
27	0	1	0	0	0	0	0	0	0	1	0	0	
28	1	0	0	0	1	1	1	1	0	1	0	0	
29	0	1	0	1	0	0	0	0	1	1	0	0	
30	1	1	0	0	0	0	0	0	0	1	0	0	
Total(<35)	22	15	8	2	16	9	10	18	12	22	17	10	

Analysis of results on baselines and factors

This analysis does not concern all possible evaluation cases (PSMCs). It intends to give a first view on the (possible) application of baselines and factors when evaluating energy savings using the Tool-box. The results will help to formulate the guiding per PSMC.

 Additionality was only globally analysed in relation to the with/without baseline approach. The Indirect rebound effect will always be present given that savings lead to lower energy costs. But this effect has not been taken into account here because the relevance per PSMC cannot be estimated. Double counting is not analysed because the effect can only be determined when the presence of other policy measures is known.

Occurrence per baseline/factor in all PSMCs

The bottom line in the table shows this occurrence for the set of 35 (split) PSMCs. The most frequent occurrence is for Production/occupancy (normalization), where in 22 cases a correction may be needed for different activity levels before and after the saving action. Other high occurrences concern Direct

rebound (normalization), Min. efficiency standard (baseline), Free rider (Adjustment) and Before/after (baseline).

The lowest occurrence is for Trend (baseline) where it only concerns PSMC 11 (Subsidies - Buildings/residential - Diffusion indicator) and PSMC 29 (EEOB - Building/residential – Econometric/regression). The reason is that mainly before/after observations can show a trend break, either visible from measurement or from regression analysis, before and after the introduction of the policy measure.

Additional to the quantities in the Knowledge Base the baseline option with/without has also been analysed, which occurs 21 times.

Occurrence of all baselines/factors per PSMC

This occurrence is shown at the right side of the table. The scores concern the 15 possible baselines/factors specified in the KB (including split of factor 10).

The largest sets are found for PSMC 8a (Subsidies - Buildings/residential – Measurement) and PSMC 11 (Subsidies - Buildings/residential - Diffusion indicator). The first is an additional method, used to check other methods such as deemed savings. Almost the same high scores are found for and PSMC 15 (Subsidies – Buildings/residential – Billing analysis) and PSMC 9a. All cases with highest scores concern subsidies for saving actions in residential buildings.

The lowest scores are for PSMC 21 (Energy-tax – All sectors – Econometric/regression), PSMC 22 (Energy-tax – All sectors – Econometric/elasticity) which both concern energy taxes. Low scores also concern PSMC 3 (Standards - Buildings/non-residential – Engineering estimate) and PSMC 4 (Standards – HH/Other (appliances – Deemed savings). For PSMCs on dwellings the score for new dwellings is always lower than for existing dwellings because there are less baselines (no before/after or control group) and no pre-bound effect.

Occurrence of baselines/factors per Policy measure

For the 15 PSMCs with grants/subsidies (GS) the highest scores are for the factors Production/occurrence (normalization), Free riders (adjustment) and Min. efficiency standards (baselines). The overall score (about 56%) for all factors is also the highest.

For the 8 PSMCs on standards (LN) the highest score (6) is for Direct rebound (normalization) and the overall score is about 36%.

For the 3 PSMCs on EE Obligations (MB) a 100% is scored for the factor Production/occurrence (normalization); the overall score is 44%.

The lowest score is for the 2 PSMCs on energy taxes (FT) that score only on With/without (baseline) and Weather (normalization).

PSMCs on Standards and Subsidies do also score fairly well on the extra baseline With/without, mainly due to new dwellings or buildings.

Occurrence of all factors per Method

The method Billing (5 PSMCs) show the highest overall scores (about 55%) on all factors.

For Measurement (4 PSMCs) and Deemed savings (9 PSMCs) the overall score is about 45%.

The Diffusion indicator (1 PSMC) has a very high overall score, but that is due to the complementary method deemed savings.

The engineering estimate (5 PSMCs) has a low overall score; the highest score is on Production/occupancy (normalization).

For Stock modeling, including deemed savings, the overall score is medium.

Occurrence of specific factors per Method

The method Measurement scores high on normalization factors Direct rebound, Weather and Production/occupancy.

Billing analysis scores high on Production/occupancy (normalization), Control group (baseline) and Free riders (adjustment).

Deemed savings, present in 9 PSMCs, shows a very high score for the factor Direct rebound (8 out of 9).

The elasticity method (1 PSMC) and regression analysis (1 PSMC) score only on the factor Weather (normalization).

The engineering estimate (used in 5 PSMCs) is the only method that scores high on the extra baseline With/without, because engineering estimates are fitted to this baseline.

Stock modeling, including deemed savings, scores in all 3 PSMCs on Min. eff. standard (baseline), Direct rebound (normalization) and Free riders (adjustment).

Conclusions on factors to be taken into account in the Toolbox

Given these results the following factors should at least be taken into account when formulating the PSMCs:
- Baselines: Before/after, With/without and Min. efficiency standard (and possibly Control group)
- Normalization factors: Direct rebound, Production/occupancy/car usage and Weather
- Adjustment factors: Free riders (and possibly Non-compliance)

The factor Weather does not score very high on all cases but is indispensable for cases where energy consumption is observed (methods Measurement or Billing analysis). The applicability of Double counting depends on the presence of more policy measures focusing on the same saving actions. Minimum efficiency standards as baseline can be relevant for many policy measures other than standards, but again the actual importance is dependent on the presence of the combination.

In some cases there is a connection between the chosen baseline and the factors to be taken into account. For instance, with the baseline Target versus Control group a correction for Free riders and Weather may not be needed because the difference in energy consumption covers already the effect of these factors.

Other factors not mentioned above could be of importance for specific PSMCs. Therefore all other factors should be checked when formulating the PSMC.

Finally it must be remarked that all adjustment factors in the Knowledge base concern so-called bottom-up calculations (KB-methods 1 to 6). In case of top-down calculations, such as

energy consumption indicators (KB-method 8), adjustment factors can concern autonomous savings (or technological progress) and price-induced energy efficiency progress. These adjustment factors have not been taken into account here.

Analysis for gross and net savings in the PSMCs

For all PSMCs the calculation of gross and net savings has been analysed (see Annex) as to the following:
- Calculation of unitary savings
- Calculation of total savings as product of unitary savings and number of actions
- Calculation of total savings from unitary savings in another way

Due to PSMCs been split for existing and new buildings the total set analysed concerns 35 cases.

Results unitary and total savings:
- For 8 cases no unitary savings can be calculated; the PSMCs use methods that only provide total savings, such as Subsector energy intensity and Regression analysis.
- For 24 cases the total savings can be calculated as the product of unitary savings and number of actions (or new dwellings, subsidies, advice, etc.).
- In the 11 other cases total savings constitute the sum of savings per action (participant, industrial process, etc.) or are calculated from the change in a stock of appliances, cars or dwellings.

Results gross/net savings:
- In 7 cases the calculated gross and net savings are (almost) the same; this regards PSMCs with the (top-down) methods Subsector energy-intensity, Regression analysis and Elasticity analysis.
- For the calculation of gross savings the baselines Before/after (existing system) and With/without (new system) can be applied. For gross savings the normalization factors Weather and Production/occupancy/car usage should be taken into account.
- For the calculation of Net savings the baseline With/without can be applied. The baseline Target/Control group provides in almost all cases the net savings. For net savings adjustment factors, such as Free riders and Double counting should be taken into account.
- As to the factor Direct rebound it is not obvious whether it should be accounted for in the calculation of gross savings or net savings.

Conclusion:

All in all it can be concluded that gross and net (total) savings can be calculated for the 30 PSMCs, using the set of baselines and factors.

ANNEX: Analysis of applicability of baselines, factors and gross/net savings for 30 PSMCs

PSMC-1: Standards (LN) - Buildings/residential – Measurement (PDF 55)
1a. Minimum eff. standards for insulation/boiler in retrofitted dwellings > additional method

3.	Before / after:	Y existing > measurement before/after
4.	Control group:	Y measurement for control group without renovation
5.	Trend	? amount of renovation after introduction standard
6.	<u>Min. performance standards</u>	X standard vs standard > only above-standard savings
7.	Performance gaps:	X included in measured savings, not to be corrected
8.	Pre-bound	Y/**X** correction for underscoring before > on measurement before [Y], not on control group [X]
9.	Direct rebound	Y correction measurement after
10.	a. Weather conditions	Y correction energy consumption before/after
11.	<u>b. Occupancy/prod. volume</u>	Y correction energy consumption for occupancy
12.	Free rider	X (not for standards, only for government expenditure policies
13.	Spill-over/multiplier	X not for standards
14.	Additionality	?
15.	Indirect rebound	?
16.	Non-compliance	Y included in measurement > to be corrected?
17.	Double counting	? other PM?

Actual unitary savings = Old vs retrofitted-with-standard, actual total savings = unitary x retrofitted dwellings

1. Gross unitary = Before/after measurement + Weather before/after, gross total = gross unitary x retrofitted dwellings
2. Net unitary = Gross + Direct rebound after + Occupancy before/after (+Pre-bound before + non-compliance after). Net total = unitary x retrofitted.

1b. Minimum efficiency standards for <u>new </u>dwellings (EPC) > add. method to check standard

3.	Before / after:	X no before > other with/without
4.	Control group:	X no control group without standard
5.	Trend	X no trend break due to new
6.	<u>Min. performance standards</u>	X standard vs standard > only check
7.	Performance gaps:	X included in measurement, not to be corrected
8.	Pre-bound	X no before
9.	Direct rebound	Y check of standard > correction
10.	a. Weather conditions	Y check of standard > corrected for non-standard weather
	<u>b. Occupancy/prod. volume</u>	Y check of standard > corrected for non-standard occupancy
11.	Free rider	X not for standards, only for government expenditure policies
12.	Spill-over/multiplier	X not for standards
13.	Additionality	?
14.	Indirect rebound	?
15.	Non-compliance	? included in measurement, check standard = non-compliance
16.	Double counting	? other PM?

Actual unitary savings = Earlier standard/new vs measured/new, actual total savings = unitary x new dwellings

1. Gross unitary = With/without strengthening (ex-ante) + Weather (ex-post) , gross total savings = unitary x new dwellings
2. Net unitary = Gross + Direct rebound after + Occupancy after (+ non-compliance after), net total savings = unitary x new dwellings.

PSMC-2: Standards (LN) - Buildings/residential – Deemed savings (PDF 97)

2a. Minimum efficiency standards for insulation/boiler in <u>retrofitted</u> dwellings

3.	Before / after: with/without standard	X deemed > no measurement > no before/after > deemed =
4.	Control group:	X deemed > no control/target group
5.	Trend	X no measurement/billing > no trend
6.	<u>Min. performance standards</u>	X standard vs standard > only above-standard savings
7.	Performance gaps:	**Y** (to be included in deemed
8.	Pre-bound	**Y** correction for underscoring before > correction on deemed
9.	Direct rebound	**Y** correction on deemed
10.	a.Weather conditions	X no measurement > no correction for weather
	b. Occupancy/prod.volume	**Y** correction deemed for occupancy before/after
11.	Free rider	X not for standards, only for government expenditure policies
12.	Spill-over/multiplier	X not for standards
13.	Additionality	X with/without > additional savings, no correction
14.	Indirect rebound	?
15.	Non-compliance	**Y** below standard actions > separate correction
16.	Double counting	? other PM?

Actual unitary savings = Old vs retrofitted-with-standard, actual total savings = unitary x retrofitted dwellings

1. Gross unitary = Deemed (ex-ante), gross total savings = unitary x retrofitted dwellings
2. Net unitary = Gross + Rebound after + Occupancy before/after (+Pre-bound before + non-compl. after), net total savings = unitary x retrofitted dwellings.

2b.Minimum efficiency standards for <u>new</u> dwellings (EPC)

3.	Before / after:	X no before, deemed > other with/without standard
4.	Control group:	X no control group without EPC
5.	Trend	X no trend break due to new dwellings
6.	<u>Min. performance standards</u>	X standard vs standard > only above-standard savings
7.	Performance gaps:	**Y** correction to be included in deemed
8.	Pre-bound	**Y** correction for underscoring before > correction on deemed
9.	Direct rebound	**Y** correction on deemed
10.	a. Weather conditions	X no before/after, deemed not influenced by weather
	b. Occupancy/prod.volume	X deemed new not influenced by occupancy
11.	Free rider	X not for standards, only for government expenditure policies
12.	Spill-over/multiplier	X not for standards
13.	Additionality	?
14.	Indirect rebound	?
15.	Non-compliance	**Y** EPC not met > separate correction
16.	Double counting	? other PM?

Actual unitary savings = Earlier standard/new vs current standard/new, actual total savings = unitary x new dwellings

1. Gross unitary = With/without strengthening standard (ex-ante), gross total savings = unitary x new dwellings
2. Net unitary = Gross + Direct rebound after + Occupancy after (+ non-compliance after), net total savings = unitary x new dwellings.

PSMC-3: Standards (LN) - Buildings/non-residential – Engineering estimate

3a.Minimum efficiency standards for insulation/systems in renovated buildings

3. Before / after: Y simulation before/after(indiv.building) or simulation with/without (same building)
4. Control group: X only for measurement/billing, buildings too different?
5. Trend   X amount of renovation after standards?, data?
6. <u>Min. performance standards</u>   X standards vs standards
7. Performance gaps: **Y** correction to be included in estimate
8. Pre-bound   X not for non-residential buildings
9. Direct rebound   X not for non-residential buildings
10. a. Weather conditions   X estimate with standard weather
    <u>b. Occupancy/prod.volume</u>   X estimate with standard occupancy
11. Free rider   X not for standards, only for government expenditure policies
12. Spill-over/multiplier   X not for standards
13. Additionality   X with/without > additional savings, no correction
14. Indirect rebound   ?
15. Non-compliance   **Y** below standard actions > separate correction
16. Double counting   ? other PM?

Actual unitary savings = Old vs retrofitted-with-standard, actual total savings = unitary x retrofitted dwellings

1. 1.Gross unitary = Engineering estimate with/without saving actions/standard, gross total savings = unitary x retrofitted dwellings
2. 2.Net unitary = Gross + Occupancy before/after (+ non-compliance after), net total savings = unitary x retrofitted dwellings.

3b.Minimum efficiency standards (EPC) for new buildings

3. Before / after: X no before > with/without estimates
4. Control group: X only for measurement or billing
5. Trend   X no trend break due to new buildings
6. <u>Min.performance standards</u>   X standard vs standard > only above-standard savings
7. Performance gaps: **Y** correction to be included in estimate
8. Pre-bound   X not for buildings
9. Direct rebound   X not for buildings
10. a. Weather conditions   X estimate with standard weather
    <u>b. Occupancy/prod.volume</u>   X estimate with standard occupancy
11. Free rider   X not for standards, only for government expenditure policies
12. Spill-over/multiplier   X not for standards
13. Additionality   ?
14. Indirect rebound   ?

15. Non-compliance   **Y** EPC not met > separate correction
16. Double counting   ? other PM?

Actual unitary savings = Earlier standard/new vs current standard/new, actual total savings = unitary x new dwellings

1. Gross unitary = With/without strengthening standard (ex-ante), gross total savings = unitary x new dwellings
2. Net unitary = Gross + Occupancy after (+ non-compliance after), net total savings = unitary x new dwellings.

PSMC-4: Standards(LN) – HH/Other (appliances – Deemed savings (PDF 16/38)
Minimum efficiency standard per type of appliance

3.	Before / after:	X unitary: deemed > no measurement before/after > deemed = with/without
4.	Control group:	X no control group without standard
5.	Trend	X no measurement > no trend
6.	<u>Min.performance standards</u>	X standard vs standard > only above-standard savings
7.	Performance gaps:	? malfunctioning, to be included in deemed?
8.	Pre-bound	X small effect per appliance, no correction
9.	Direct rebound	**Y** correction on deemed
10.	a. Weather conditions	X no before/after or no with/without measurement
11.	<u>b. Occupancy/prod.volume</u>	? deemed corrected for usage ?
12.	Free rider	X not for standards, only for government expenditure policies
13.	Spill-over/multiplier	X not for standards
14.	Additionality	X with/without > additional savings, no correction
15.	Indirect rebound	?
16.	Non-compliance	**Y** appliances below standard sold > separate correction
17.	Double counting	? other PM?

Actual unitary)savings = Old appliance vs new-with-standard, actual total savings = unitary x purchased appliances

1. Gross unitary = Deemed (ex-ante), gross total savings = unitary x purchases appliances
2. Net unitary = Gross + Direct rebound after (+ Intensity-of-use before/after + non-compliance after), net total savings = unitary x purchased appliances

PSMC-5: Standards (LN) - HH/Other (appliances) – Stock modeling
Minimum efficiency standard for appliances > number of action via stock + complementary method on deemed savings

3.	Before / after:	X Unitary > deemed > no measurement before/after > deemed = with/without
4.	Control group:	X unitary > deemed > no measurement > no control group
5.	Trend	X no measurement > no trend
6.	<u>Min. performance standards</u>	Y standards vs standards > above-standard savings
7.	Performance gaps:	? malfunctioning > correction deemed?
8.	Pre-bound	X no under-scoring for appliances
9.	Direct rebound	Y unitary > correction on deemed for more appliance use
10.	a. Weather conditions	X no before/after measurement
	<u>b. Occupancy/prod/usage</u>	X deemed not influenced by usage intensity
11.	Free rider	**X** number of actions > no government expenditure > no free riders

12. Spill-over/multiplier   X standards for all appliances > no non-participants
13. Additionality   X with/without > additional savings, no correction
14. Indirect rebound   ?
15. Non-compliance   Y not meeting standard > correction deemed
16. 16.Double counting   ? other PM?

Actual unitary = old vs new appliance-with-standard, actual total savings = Old stock appliance vs new stock-with partly-unitary savings

1. Gross unitary = Deemed (ex-ante), gross total = Old stock appliances vs new stock-with partly-deemed savings = unitary x stock change
2. Net unitary = Gross + Direct rebound after (+ Intensity-of-use before/after + non-compliance after), Net total savings = unitary x stock change.

PSMC-6: Mandatory labeling (LI) - Buildings/residential – Billing analysis (PDF xx)
Mandatory efficiency labels per type of dwelling

3. Before / after: Y billing before/after putting label on individual dwelling
4. Control group: X no control group without labels present
5. Trend   X too small/gradual effect in bill > no trend break
6. Min. performance standards   Y label for above-standard savings
7. Performance gaps: X included in billing after, not to be corrected
8. Pre-bound   X small effect of labeling, no correction
9. Direct rebound   X small effect of labeling, no rebound
10. a. Weather conditions   Y billing to corrected before and after
      b. Occupancy/prod/usage   Y not influenced by labeling
11. Free rider   X not for labels, only for government expenditure policies
12. Spill-over/multiplier   X not for labels
13. Additionality   ?
14. Indirect rebound   ?
15. Non-compliance   Y no control on labels present?
16. Double counting   ? other PM?

Actual unitary savings = Old appliance vs new-with-label, actual total savings = unitary x purchased appliances-with-label

1. Gross unitary = Deemed (ex-ante), gross total = unitary x purchased appliance-with-label
2. Net unitary = Gross + Direct rebound after (+ Intensity-of-use before/after + non-compliance after), Net total = unitary x purchased appliance-with-label.

PSMC-7: Mandatory labeling (LI) – HH/Other (appliances) - Measurement (PDF 58)
Efficiency labels per type of appliance > add. method to check deemed savings of labels

3. Before / after: Y only check deemed savings with measurement
4. Control group: X no control group without labels
5. Trend   ? uptake labels visible as trend break?
6. Min.performance standards   Y label for above-standard savings
7. Performance gaps: X malfunctioning included in measurement > check deemed
8. Pre-bound   X small effect per appliance, no correction
9. Direct rebound   Y dependent on chosen label
10. a. Weather conditions   Y correction measurement before/after introduction labels
      b. Occupancy/prod/usage   Y correction measurement for usage changes
11. .Free rider   X not for labels, only for government expenditure (subsidies)

12. Spill-over/multiplier	X not for labels
13. Additionality	?
14. Indirect rebound	?
15. Non-compliance	Y no control on labels > included in measurement
16. Double counting	? other PM?

Actual unitary savings = Old appliance vs new-with-label/measurement, actual total savings = unitary x purchased appliances-with-label

1. Gross unitary = Before/after measurement + Weather before/after, gross total savings = unitary x purchased appliances-with-label
2. Net unitary = Gross + Direct rebound after (+ Intensity before/after + non-compl. after), Net total savings = unitary x purchased appliance-with-label.

PSMC-8: Subsidies/Financial (GS/FT) - Buildings/residential – Billing analysis (PDF xx)
8a.Subsidized insulation actions for existing dwellings > additional method only incidentally

3. Before / after:	Y billing before/after
4. Control group:	Y billing for target group and control group without subsidy
5. Trend	X trend break on at individual level, not for gradual change in stock
6. <u>Min.performance standards</u>	Y only above-standard savings
7. Performance gaps:	X included in billing after, not to be corrected
8. Pre-bound on control group	Y/X correction for underscoring before > on billing before [Y], not
9. Direct rebound	Y correction billing after
10. a. Weather conditions	Y correction billing before/after
b. Occupancy/prod.volume	Y correction billing for occupancy
11. Free rider	Y correction number of actions > valid for subsidies
12. Spill-over/multiplier	Y correction number of actions > valid for subsidies
13. Additionality	?
14. Indirect rebound	?
15. Non-compliance	Y subsidy but incomplete actions > included in billing
16. Double counting	? other PM?

Actual unitary savings = Old vs retrofitted dwelling/billing, actual total savings = actual unitary x subsidized retrofits

1. Gross unitary = Before/after billing + Weather before/after. Gross total = gross unitary x subsidized retrofits
2. Net unitary = Gross + Direct rebound after + Occupancy before/after (+Pre-bound before + non-compliance after), net total savings = unitary x (subsidized retrofits + Free rider)

8b.Subsidized actions for above standard new dwellings (EPC)

3. Before / after:	X no billing before > with(=actual)/without(=standard) can be applied
4. Control group:	Y billing target and control group without subsidy
5. Trend	X trend break at individual level, not for gradual change in stock
6. <u>Min. performance standards</u>	Y standard vs standard, only above-standard savings
7. Performance gaps:	X included in billing after, not to be corrected
8. Pre-bound	x not for new dwellings
9. Direct rebound	X no rebound for very efficient dwelling

10. a. Weather conditions	X after only, control group > no correction
b. Occupancy/prod/usage	Y after only, correction for occupancy
11. Free rider	Y correction number of actions > valid for subsidies
12. Spill-over/multiplier	Y correction number of actions > valid for subsidies
13. Additionality	X with/without > additional savings, no correction
14. Indirect rebound	?
15. Non-compliance	Y subsidy but incomplete actions, included in measurement
16. Double counting	? other PM?

Actual unitary savings = Earlier standard/new dwelling vs measured/new dwelling, actual total savings = unitary x subsidized new dwellings

1. Gross unitary = With/without strengthening (ex-ante) + Weather (ex-post), gross total savings = gross unitary x subsidized new dwellings
2. Net unitary = Gross + Direct rebound after + Occupancy after (+ non-compl. after), net total savings = unitary x (subsidized new dwellings + Free riders).

PSMC-9: Subsidies/Financial (GS/FT) - Buildings/residential – Deemed savings (PDF 52/102/109)
9a.Subsidized insulation actions for existing dwellings

3. Before / after:	X no measurement/billing before/after > deemed = with/without
4. Control group:	X deemed > no measurement control group without subsidy
5. Trend	X no measurement > no trend break
6. <u>Min. performance standards</u>	**Y** only above-standard savings > correction on deemed
7. Performance gaps:	**Y** correction for deemed savings
8. Pre-bound	**Y** correction for underscoring before > correction on deemed
9. Direct rebound	**Y** correction on deemed
10. a.Weather conditions	X deemed savings, no measurement > no weather correction
11. <u>b. Occupancy/prod.volume</u>	**Y** correction deemed for occupancy before/after
12. Free rider	Y number of actions > valid for subsidies
13. Spill-over/multiplier	**Y** valid for subsidies
14. Additionality	X with/without > additional savings, no correction
15. Indirect rebound	?
16. Non-compliance	**Y** subsidy but incomplete actions > separate correction?
17. Double counting	? other PM?

Actual unitary savings = Old vs retrofitted-with-subsidized saving actions, actual total savings = unitary x subsidized retrofits

1. Gross unitary = Deemed (above-standard, ex-ante) , gross total savings = gross unitary x subsidized retrofits
2. Net unitary = Gross + Direct rebound after + Occupancy before/after (+ Perform-gap + Pre-bound before + non-compliance after), Net total savings = net unitary x (subsidized retrofits + Free riders).

9b.Subsidized actions for above standard new dwellings (EPC)

3. Before / after:	X no before > deemed = with/without
4. Control group:	X deemed > no measurement control group without subsidy
5. Trend	X no measurement > no trend break
6. <u>Min.performance standards</u>	**Y** standard vs standard > only above-standard savings
7. Performance gaps:	**Y** correction deemed savings
8. Pre-bound	X no before > no correction on deemed

9. Direct rebound   **Y** correction deemed savings
10. a. Weather conditions   X deemed, no measurement > no corrections for weather
     <u>b. Occupancy/prod.volume</u>   X correction deemed for non-standard occupancy
11. Free rider   **Y** number of actions > valid for subsidies
12. Spill-over/multiplier   **Y** valid for subsidies
13. Additionality   X with/without > additional savings, no correction
14. Indirect rebound   ?
15. Non-compliance   **Y** subsidy but incomplete actions > separate correction?
16. Double counting   ? other PM?

Actual unitary savings = Current standard/new vs new dwelling with extra saving actions. Actual total savings = unitary x subsidized new dwellings

1. Gross unitary = Deemed savings (above-standard, ex-ante), gross total savings = gross unitary x subsidized new dwellings
2. Net unitary = Gross + D-rebound after + Occupancy after (+ Perf.-gap + Non-compl.), Net total savings = unitary x (subsidized new dwellings + Free rider).

PSMC-10: Subsidies (GS) - Buildings/residential - Stock modeling (PDF 23)
Tool does concern number of actions + complementary method deemed savings

3. Before / after: X Unitary > deemed > no measurement before/after > deemed = with/without
4. Control group: X unitary > deemed > no measurement > no control group
5. Trend   X no measurement > no trend
6. <u>Min.performance standards</u>   Y unitary > above-standard savings
7. Performance gaps: ? malfunctioning > correction deemed?
8. Pre-bound   Y unitary > under-scoring heating before > correction deemed
9. Direct rebound   Y unitary > correction on deemed-after for higher temp.settting
10. a. Weather conditions   X deemed > no before/after measurement > no weather effect
     <u>b. Occupancy/prod/usage</u>   X deemed not influenced by usage intensity
11. Free rider   Y number of action > correction stock
12. Spill-over/multiplier   Y number of action > non-GS actions > correction stock
13. Additionality   X with/without > additional savings, no correction
14. Indirect rebound   ?
15. Non-compliance   Y subsidized saving actions less efficient > correction deemed
16. Double counting   ? other PM?

Actual unitary = Old vs new-with-subsidized saving actions, actual total savings = unitary x stock change (part with subsidized saving actions)

1. Gross unitary = Deemed (ex-ante), gross total savings = unitary x stock change
2. Net unitary = Gross + Rebound after (+ Pre-bound + non-compliance after), Net total savings = unitary x (stock change + Free rider).

PSMC-11: Subsidies (GS) - Buildings/residential - Diffusion indicator (PDF 22/136)
Concerns number of actions (insulation or boiler) + complementary method deemed savings.

3. Before / after: X unitary > no measurement/billing before/after > with/without = deemed
4. Control group: X deemed > no measurement for control group without subsidy
5. Trend   **Y** number of actions > trend break after subsidy
6. <u>Min. performance standards</u>   Y unitary > only above-standard savings > correction on deemed

7. Performance gaps: Y unitary > correction on deemed
8. Pre-bound   Y unitary > correction for underscoring before > correction on
    deemed
9. Direct rebound   Y unitary > correction on deemed
10. a. Weather conditions   X deemed savings, no measurement > no weather correction
    b. Occupancy/prod.volume Y correction deemed for occupancy before/after
11. Free rider   **Y** valid for subsidies, incorporated in indicator > correction
12. Spill-over/multiplier   **Y** valid for subsidies, incorporated in indicator
13. Additionality   X with/without > additional savings, no correction
14. Indirect rebound   ?
15. Non-compliance   Y subsidy but incomplete actions > correction deemed?
16. Double counting   ? other PM?

Actual unitary savings = Old system vs system-with-subsidized saving actions, actual total savings = unitary x (change diffusion indicator x total dwellings)

1. Gross unitary = Deemed (ex-ante), gross total savings = unitary x (change diffusion indicator x total dwellings)
2. Net unitary = Gross + Rebound after + Occupancy after (+ Pre-bound + non-compliance after), Net total savings = unitary x (change indicator + Free rider).

PSMC-12: Subsidies (**GS) – Buildings/non-residential –Energy indicator/subsector intensity** (PDF 53)
Does not concern unitary savings or number of actions, e.g. average gas consumption per m2 of buildings due to insulation/systems.

3. Before / after: **Y** total savings > indicator (billing) subsector before/after
4. Control group: X total savings > no control group for subsector
5. Trend   **?** total savings > indicator > trend break not visible with gradual actions?
6. Min. performance standards X no unitary savings > no effect standards
7. Performance gaps: X no unitary savings > no correction
8. Pre-bound   X no unitary savings, not for non-residential
9. Direct rebound   X unitary > not for non-residential
10. a. Weather conditions   **Y** total savings > indicator before and after corrected for weather
    b. Occupancy/prod.volume **Y** total savings > indicator corrected for occupancy before/after
11. Free rider   X no number of actions > no correction for free riders
12. Spill-over/multiplier   ? no unitary savings or number of actions > no correction?
13. Additionality   ?
14. Indirect rebound   ?
15. Non-compliance   **Y** incomplete actions > included in indicator after deemed
16. Double counting   ? other PM?

Actual total savings = Old building vs building-with-subsidized saving actions, actual total savings = unitary x subsidized retrofits

1. Gross total savings = sector-intensity before/after x energy consumption + Weather before/after
2. Net total savings = Gross total savings + Occupancy before/after (+ non-compliance after).

PSMC-13: Subsidies (**GS) – Services-ex-buildings (devices) – Deemed savings**
Subsidized actions per type of device

3. Before / after: X no measurement/billing before/after > with/without = deemed
4. Control group: X deemed > no measurement control group without subsidy

5. Trend   X no measurement > no trend break
6. Min. performance standards **Y** only above-standard savings > correction on deemed
7. Performance gaps: **Y** correction for deemed savings
8. Pre-bound   X not for Services
9. Direct rebound   X not for Services
10. a. Weather conditions   X deemed savings, no measurement > no weather correction
    b. Occupancy/prod.volume   **Y** correction deemed for occupancy before/after
11. Free rider   **Y** number of actions > valid for subsidies
12. Spill-over/multiplier   **Y** valid for subsidies
13. Additionality   X with/without > additional savings, no correction
14. Indirect rebound   ?
15. Non-compliance   **Y** subsidy but incomplete actions > separate correction?
16. Double counting   ? other PM?

Actual unitary savings = Old devices vs more efficient subsidized devices, actual total savings = unitary x subsidized devices

1. Gross unitary = Deemed (ex-ante), gross total savings = unitary x subsidized devices
2. Net unitary = Gross + Intensity-of-use after (+ non-compliance after), Net total savings = unitary x (subsidized devices + Free riders).

PSMC-14: Subsidies/Financial (**GS/FT**)- HH/Other (appliances) – Deemed savings (PDF 38/175)
Subsidized more efficient appliances

3. Before / after: X deemed > no measurement before/after > deemed = with/without
4. Control group: X deemed > no measurement > no control group
5. Trend   X no measurement > no trend
6. Min. performance standards **Y** label for above-standard savings
7. Performance gaps: ? malfunctioning > correction deemed?
8. Pre-bound   **Y** correction for underscoring before > correction on deemed
9. Direct rebound   **Y** correction on deemed
10. a.Weather conditions   X no before/after measurement
11. b. Occupancy/prod/usage   X deemed not influenced by usage intensity
12. Free rider   **Y** correction on deemed
13. Spill-over/multiplier   **Y** correction (on deemed?)
14. Additionality   X with/without > additional savings, no correction
15. Indirect rebound   ?
16. Non-compliance   **Y** subsidized appliances less efficient > correction deemed
17. Double counting   ? other PM?

Actual unitary savings = Old appliances vs more efficient subsidized appliances, actual total savings = unitary x subsidized appliances

1. Gross unitary = Deemed (ex-ante), gross total savings = unitary x subsidized appliances
2. Net unitary = Gross + Direct rebound after (+ Pre-bound + non-compliance after), Net total savings = net unitary x (subsidized appliances + Free riders).

PSMC-15: Subsidies (**GS**) – Buildings/residential – Billing analysis (PDF 116/135)
Subsidized insulation measures and boilers

3. Before / after: Y group with subsidy > billing before/after

4. Control group: Y group with and without subsidy (billing after start subsidy scheme)
5. Trend ? trend break from billing for partly/gradual change?
6. <u>Min.performance standards</u> Y only above-standard savings
7. Performance gaps: X included in billing results after, not to be corrected
8. Pre-bound Y/X correction for underscoring in billed consumption before [Y}, not for control group [X]
9. Direct rebound Y correction total consumption after
10. a. Weather conditions Y correction total consumption before/after
    b. Occupancy/prod.volume Y correction (part of) consumption for occupancy
11. Free rider Y valid for subsidies, number of actions > correction savings
12. Spill-over/multiplier ? valid for subsidies, correction savings?
13. Additionality ?
14. Indirect rebound ?
15. Non-compliance Y subsidy but incomplete actions > included in billing
16. Double counting ? other PM?

Actual unitary savings = Old dwelling vs dwelling with subsidized saving actions, actual total savings = unitary x subsidized saving actions

1. Gross unitary = before/after billing + Weather before/after, gross total savings = number of subsidies x gross unitary savings
2. Net unitary = Gross + D-rebound after + Occupancy before/after (+Pre-bound + non-compl), Net total savings = unitary x [subsidized actions + Free rider).

PSMC-16: Subsidies/Voluntary agreement (GS/VA) – Industry/specific – Engineering estimate (PDF 118)
Subsidized energy efficiency actions for energy-intensive processes > individual cases

3. Before / after: **Y** simulation before/after (spec. building) or simulation with/without (same building)
4. Control group: X processes > no control group
5. Trend X engineering > no measurement > no trend
6. <u>Min. performance standards</u> X no standards for processes
7. Performance gaps: ? malfunctioning > correction after via engineering?
8. Pre-bound X not for industry
9. Direct rebound X not for industry
10. a.Weather conditions X processes> no weather influences
11. <u>b. Occupancy/prod.volume</u> **Y** correction for production via engineering before/after
12. Free rider **Y** to be corrected per individual case
13. Spill-over/multiplier X too unique for spill-over
14. Additionality X with/without > additional savings, no correction
15. Indirect rebound ?
16. Non-compliance **Y** incomplete actions (not in ex-post estimate?) > to be corrected
17. Double counting ? other PM?

Actual unitary savings = Old vs new process-with-subsidized saving actions, actual total savings = sum unitary savings over subsidized processes

1. Gross unitary = Engineering estimate before/after or with/without, gross total savings = sum unitary over subsidized processes

2. Net unitary = Gross + Production before/after (+ Perform-gap + non-compliance), Net total savings = sum unitary over [subsidized processes + Free riders)

PSMC–17: Subsidies (**GS) – Industry/general – Unit consumption** (PDF 56)
Subsidized actions (possibly also Voluntary Agreement) – energy-intensity at company/organization level

3.	Before / after:	**Y** company level savings > intensity at company level before/after, also control group
4.	Control group:	Y company level savings > control group = companies without subsidies
5.	Trend	X at company level same as before/after
6.	<u>Min.performance standards</u>	X no standards for all energy uses
7.	Performance gaps:	X company level savings > no correction (only at system level)
8.	Pre-bound	X not for industry
9.	Direct rebound	X not for industry
10.	a. Weather conditions	X hardly influence of weather for industry
	<u>b. Occupancy/prod.volume</u> before/after	**Y** company level savings > intensity corrected for prod.volume
11.	Free rider	Y number of actions = companies > correction via survey?
12.	Spill-over/multiplier	? number of companies > effect on non-participants?
13.	Additionality	?
14.	Indirect rebound	?
15.	Non-compliance intensity after	**Y** incomplete actions > less savings per company > included in
16.	Double counting	? other PM?

Actual unitary savings = savings from subsidized saving actions per company, actual total savings = sum over all subsidized companies

1. Gross unitary = company intensity before/after x energy consumption + Weather before/after, gross total savings = sum over all companies
2. Net unitary = Gross unitary + Production before/after (+ non-compliance after), Net total savings = sum over all companies.

PSMC–18: Subsidies (**GS) – Agriculture) – Energy indicator/subsector intensity** (PDF 40)
Subsidized actions under a Voluntary Agreement scheme (see 17)

3.	Before / after:	**Y** total savings > intensity (consumption subsector) before/after
4.	Control group:	X total savings > no control group for subsector
5.	Trend	**?** total savings > intensity > trend break not visible with gradual actions?
6.	<u>Min. performance standards</u>	X no standards for all energy uses
7.	Performance gaps:	X no unitary savings > no correction
8.	Pre-bound	X not for industry
9.	Direct rebound	X not for industry
10.	a .Weather conditions	X hardly influence of weather for industry
	<u>b. Occupancy/prod.volume</u>	**Y** total savings > indicator corrected for occupancy before/after
11.	Free rider	? no number of actions > correction total savings via survey?
12.	Spill-over/multiplier	? no unitary savings or number of actions > no correction?
13.	Additionality	?
14.	Indirect rebound	?

15. Non-compliance   **Y** incomplete actions > included in indicator after deemed
16. Double counting   ? other PM?

Actual total savings = savings from subsidized saving actions, actual total savings = sum over all subsidized saving actions

1. Gross <u>total</u> savings = sector-intensity before/after x energy consumption + Weather before/after
2. Net <u>total</u> savings = Gross total savings + Production before/after (+ non-compliance after).

PSMC-19: Subsidies (**GS**) – Transport/freight – Engineering estimate
Subsidized energy efficiency actions on lorries and logistics > uniform

3.	Before / after:	**Y** simulation before/after or with/without
4.	Control group:	X engineering > no measurement > no control group
5.	Trend	X engineering > no measurement > no trend
6.	<u>Min. performance standards</u>	X no standards for freight savings
7.	Performance gaps:	? malfunctioning > correction after via engineering?
8.	Pre-bound	X not for freight transport
9.	Direct rebound	X not for freight transport
10.	a. Weather conditions	X freight transport no weather influences
	b. Occupancy/prod/load	**Y** correction for loading rate via engineering before/after
11.	Free rider	**Y** to be corrected
12.	Spill-over/multiplier	X to be corrected
13.	Additionality	X with/without > additional savings, no correction
14.	Indirect rebound	?
15.	Non-compliance	**Y** incomplete actions (not in ex-post estimate?) > to be corrected
16.	16.Double counting	? other PM?

Actual unitary savings = Old vs new system-with-subsidized saving actions, actual total savings = sum unitary savings over subsidized systems

1. Gross unitary = Engineering estimate before/after or with/without, gross total savings = sum unitary over subsidized systems
2. Net unitary = Gross + Production before/after (+ Perform-gap + non-compl), Net total savings = sum unitary over [subsidized systems + Free riders).

PSMC-20: Financial (**FT**) – Transport/persons – Stock modeling (PDF 147)
Tool does concern number of actions + complementary method deemed savings.

3.	Before / after:	X Unitary > deemed > no measurement before/after > deemed = with/without
4.	Control group:	X unitary > deemed > no measurement > no control group
5.	Trend	X no measurement > no trend
6.	<u>Min. performance standards</u>	Y unitary > above-standard savings
7.	Performance gaps:	? malfunctioning > correction deemed?
8.	Pre-bound	X no under-scoring for car use
9.	Direct rebound	Y unitary > correction on deemed for more car use
10.	a. Weather conditions	X no before/after measurement
	b. Occupancy/prod/usage	X deemed not influenced by usage intensity
11.	Free rider	**Y** number of action > correction stock
12.	Spill-over/multiplier	**Y** number of action > correction stock (non FT-cars)
13.	Additionality	X with/without > additional savings, no correction
14.	Indirect rebound	?

15. Non-compliance   Y subsidized cars less efficient > correction deemed
16. Double counting   ? other PM?

Actual unitary = Old vs new car-with-subsidized saving actions, actual total savings = unitary x stock change (part with subsidized saving actions)

1. Gross unitary = Deemed (ex-ante), gross total savings = unitary x stock change
2. Net unitary = Gross + Rebound after (+ non-compliance after), Net total savings = unitary x (stock change + Free rider).

PSMC-21: Financial (FT) (Energy tax) – All sectors – Econometric/regression.
Tool does concern total savings that cannot be specified > regression before/after tax

3. Before / after: Y total savings > time-dependent part of change in consumption
4. Control group: X total savings > regression before/after > no control group
5. Trend   ? total savings > short-term = trend break ?
6. Min. performance standards   X all standards for all energy uses not in regression
7. Performance gaps: X no unitary savings > no correction
8. Pre-bound   X not for all sectors
9. Direct rebound   X not for all sectors
10. a. Weather conditions   X hardly influence of weather for all sectors
     b. Occupancy/prod.volume   X various factors for all sectors not in regression
11. Free rider   X not from regression
12. Spill-over/multiplier   X not from regression
13. Additionality   ?
14. Indirect rebound   ?
15. Non-compliance   X incomplete actions > not in regression
16. Double counting   ? other PM?

Actual total savings = all saving actions due to tax, actual total savings = energy consumption before/after tax (corrected for all other influences)

1. Gross total savings = regression factor for tax introduction x total energy consumption (corrected for weather)
2. Net total savings = gross total savings (+ double counting).

PSMC-22: Financial (FT) (Energy tax) – All sectors – Econometric/elasticity (PDF 68)
Total savings due to (higher) energy taxes > tax vs price fraction x factor (literature) = fraction consumption

3. Before / after: X total savings > with/without tax (x factor) > no before needed
4. Control group: X total savings > no control group without tax
5. Trend   X total savings > no measurement > no trend break ?
6. Min. performance standards   X all standards for all energy uses > no correction fraction consumption
7. Performance gaps: X no unitary savings > no correction
8. Pre-bound   X no unitary savings > no correction possible
9. Direct rebound   X no unitary savings > no correction possible
10. a. Weather conditions   Y total savings = fraction consumption > correction for weather
     b. Occupancy/prod.volume   X fraction consumption > various factors > correction not possible
11. Free rider   X number of actions not known > no correction possible
12. Spill-over/multiplier   X fraction consumption > various factors > correction not possible
13. Additionality   ?

14. Indirect rebound   ?
15. Non-compliance   X incomplete actions >correction not possible
16. Double counting   ? other PM?

Actual total savings = all saving actions due to tax, actual total savings = energy consumption with/without tax (corrected for all other influences)

1. Gross <u>total</u> savings = tax/price fraction x elasticity value x total energy consumption
2. Net <u>total</u> savings = gross total savings (+ double counting).

PSMC-23: Info/Education (IE) – HH/Other (appliances) – Measurement (PDF 108)
Focused information (ex. labels) on more efficient appliances > additional method to check deemed savings of info (pick-up rate * savings better appliance)

3. Before / after: X buyers with/without info on appliances > no before/after
4. Control group: Y control group without information appliances
5. Trend   ? relation info and uptake? No trend-break visible?
6. <u>Min. performance standards</u>   Y only above-standard savings counted > correction
7. Performance gaps: X malfunctioning included in measurement
8. Pre-bound   X small effect per appliance, no correction
9. Direct rebound   Y more usage incorporated in measurement
10. a. Weather conditions   X no weather influence on appliances
     <u>b. Occupancy/prod/usage</u>   X covered in direct rebound
11. Free rider   Y number of actions > info receivers not buying > correction
12. Spill-over/multiplier   X not for information
13. Additionality   X with/without > additional savings, no correction
14. Indirect rebound   ?
15. Non-compliance   Y no use of information > included in measurement
16. Double counting   ? other PM?

Actual unitary savings = Old appliance vs new efficient-due to info, actual total savings = unitary x purchased more efficient appliances-due-to-info

1. Gross unitary = Before/after measurement + Weather before/after, gross total savings = unitary x advised more efficient appliances
2. Net unitary = Gross + Direct rebound after (+ non-compl. after), Net total savings = unitary x [advised + Free riders] (appliances-due-to-info).

PSMC-24: Info/Education (IE) – Services-ex-buildings – Billing analysis (PDF 25)
Info/audits on saving actions for activities of SME (not buildings) > savings of focused information = pick-up rate * savings better devices

3. Before / after: Y billing before/after info for SME (practical?)
4. Control group: **Y** control group without information on savings
5. Trend   X billing total consumption > no trend-break due to savings from info
6. <u>Min. performance standards</u>   X billing total consumption > standard no baseline for consumption
7. Performance gaps: X malfunctioning saving actions included in billing > no correction
8. Pre-bound   X small effect per appliance, not for services
9. Direct rebound   X no rebound for Services
10. a. Weather conditions   X no weather influence on energy using devices
     <u>b. Occupancy/prod/usage</u>   Y billing after to be corrected for different occupancy

11. Free rider   **Y** number of actions > info to receivers but not acting > correction
12. Spill-over/multiplier   X not for information
13. Additionality   ?
14. Indirect rebound   ?
15. Non-compliance   **Y** information not disseminated > included in billing before/after
16. Double counting   ? other PM?

Actual unitary savings = Old devices vs new efficient-due to audits, actual total savings = sum of unitary savings over all saving actions-due-to-audits

1. Gross unitary = With/without saving action from bill target/control group, gross total savings = unitary x saving actions-from-audits
2. Net unitary = Gross (+ non-compl. after), Net total savings = unitary x [actions from audits + Free riders] (pick-up of saving actions from audits).

PSMC-25: Info/Education (**IE**) **(audit) − Industry/general − Econometric/regression** (PDF 132 on voluntary audits)
Voluntary audits lead partly to saving actions, total saving effect follows from regression > based on consumption, production and other factors

3. Before / after: X regression for with/without > no before/after
4. Control group: **Y** total savings > regression with/without > control group
5. Trend   X regression with/without > no trend break
6. <u>Min. performance standards</u>   X no standards in industry, not in regression
7. Performance gaps: X no unitary savings > no correction
8. Pre-bound   X not for industrial sectors
9. Direct rebound   X not for industrial sectors
10. a. Weather conditions   X hardly influence of weather for industrial sectors
    <u>b. Occupancy/prod.volume</u>   **Y** relevant factors in regression
11. Free rider   X no government expenditures > no freeriders
12. Spill-over/multiplier   X no effect to non-participants
13. Additionality   X with/without > additional savings, no correction
14. Indirect rebound   ?
15. Non-compliance   Y audit measures not implemented > included in regression
16. Double counting   ? other PM?

Actual total savings = saving actions due to audit for company, actual total savings = saving actions due to audits over all companies with audit

1. Gross <u>total</u> savings = regression factor for audits x energy consumption (change consumption corrected for all other influences)
2. Net <u>total</u> savings = gross total savings (+ double counting).

PSMC-26: Info/Education (**IE**) **– Transport/persons – Deemed savings** (PDF 111)
More efficient new cars due to information (excluding mandatory labels)

3. Before / after: X deemed > no measurement before/after > deemed = with/without
4. Control group: X deemed > no measurement > no control group
5. Trend   X no measurement > no trend
6. <u>Min. performance standards</u>   **Y** information on above-standard savings
7. Performance gaps: ? malfunctioning car > correction deemed?
8. Pre-bound   X no under-scoring for car use

9.	Direct rebound	**Y** cost savings to more car usage > correction on deemed
10.	a. Weather conditions	X no before/after measurement
	b. Occupancy/prod/usage	X deemed not influenced by autonomous usage intensity
11.	Free rider	**Y** government cost for info > no action > correction on deemed
12.	Spill-over/multiplier	X no effect info car savings on non-participants > no corr. deemed
13.	Additionality	X with/without > additional savings, no correction
14.	Indirect rebound	?
15.	Non-compliance	**Y** savings advise not useful > less uptake > correction deemed
16.	Double counting	? other PM?

Actual unitary savings = Old car vs new more efficient car-due-to-info, actual total savings = unitary x number of efficient cars-due-to-advice

1. Gross unitary = Deemed (ex-ante), gross total savings = unitary x number of advices on efficient cars
2. Net unitary = Gross + Direct rebound after (+ non-compliance after), Net total savings = net unitary x [number of advices + Free riders].

PSMC-27: Voluntary Agreement (**VA**)**– Industry/general - Energy indicator / subsector intensity** (PDF 35)
Methodology concerns total savings which are not specified.

3.	Before / after:	**Y** total savings > intensity (consumption subsector) before/after
4.	Control group:	X total savings > no control group for subsector
5.	Trend	**?** total savings > intensity > trend break visible with gradual actions?
6.	Min.performance standards	X no standards for industry (only small part)
7.	Performance gaps:	X no unitary savings > no correction
8.	Pre-bound	X not for industry
9.	Direct rebound	X not for industry
10.	a. Weather conditions	X hardly influence of weather for industry
	b. Occupancy/prod.volume	**Y** total savings > indicator corrected for prod.changes before/after
11.	Free rider	X no government expenditures > no free riders
12.	Spill-over/multiplier	X VA covers whole sector > no effect on non-part. > no correction
13.	Additionality	?
14.	Indirect rebound	?
15.	Non-compliance	**Y** incomplete actions > included in indicator-after
16.	Double counting	? other PM?

Actual total savings = savings actions from VA plan, actual total savings = sum over all saving actions of VA participants

1. Gross total savings = sector-intensity before/after x energy consumption
2. Net total savings = Gross total savings + Production before/after (+ non-compliance after).

PSMC-28: Energy Efficiency Obligation (**MB**) **– Building/residential – Deemed savings** (PDF 70)
Actions on insulation types for existing dwellings under EEO scheme

3.	Before / after:	X no measurement/billing before/after > deemed = with/without
4.	Control group:	X deemed > no measurement control group without subsidy
5.	Trend	X no measurement > no trend break
6.	Min. performance standards	**Y** only above-standard savings > correction on deemed

7. Performance gaps: **Y** correction for deemed savings
8. Pre-bound **Y** underscoring before measures > correction on deemed
9. Direct rebound **Y** correction on deemed
10. a. Weather conditions X deemed savings, no measurement > no weather correction
    b. Occupancy/prod.volume **Y** correction deemed for occupancy before/after
11. Free rider ? number of actions > subsidies not from government
12. Spill-over/multiplier X EEO for all customers > no effect on non-part.> no correction
13. Additionality X with/without > additional savings, no correction
14. Indirect rebound ?
15. Non-compliance **Y** incomplete actions > separate correction?
16. Double counting ? other PM?

Actual unitary savings = Old dwelling vs retrofitted-via-EEO, actual total savings = unitary x retrofits due to EEO

1. Gross unitary = Deemed savings (EEO savings actions , gross total savings = gross unitary x retrofits due to EEO
2. Net unitary = Gross + Direct rebound after + Occupancy (+ Perform-gap + Pre-bound + non-compl.), Net total savings = net unitary x EEO retrofits.

PSMC-29: Energy Efficiency Obligation (**MB**) **- Building/residential – Econometric/regression** (PDF 51 cohort / logistic regression)
Actions on insulation types for existing dwellings under EEO scheme

3. Before / after: **Y** regression for before/after EEO > before/after
4. Control group: X total savings > regression before/after > no control group
5. Trend **Y** regression > explain change consumption > trend break
6. <u>Min. performance standards</u> ? standards in regression? > baseline effect ?
7. Performance gaps: X no unitary savings > no correction
8. Pre-bound ? correction for underscoring before on consumption in regression?
9. Direct rebound ? correction for more usage after savings in regression?
10. a. Weather conditions **Y** weather corrected consumption data in regression > corrected
    b. Occupancy/prod.volume **Y** occupancy data in regression analysis > corrected
11. Free rider X no government expenditures > no free riders
12. Spill-over/multiplier X EEO covers all customers > no effect to non-participants
13. Additionality ?
14. Indirect rebound ?
15. Non-compliance Y incomplete actions > in consumption >included in regression
16. Double counting ? other PM?

Actual total savings = saving actions In dwellings due to EEO, actual total savings = sum saving actions due to EEO over all customers with actions

1. Gross <u>total</u> savings = regression factor for EEO saving actions x energy consumption (change corrected for all other influences)
2. Net <u>total</u> savings = gross total savings (+ non-compliance + double counting)..

PSMC-30: White Certificate System (**MB**) **- Industry/general - Engineering estimate** (PDF 83)
Energy efficiency actions/plan as part of EEO or WCS system

3. Before / after: **Y** simulation before/after or with/without
4. Control group: X EEO covers all customers > no control group

5. Trend   X engineering > no measurement > no trend
6. <u>Min. performance standards</u> X no standards for industry
7. Performance gaps: ? malfunctioning > correction-after via engineering?
8. Pre-bound   X not for industry
9. Direct rebound   X not for industry
10. a. Weather conditions   X hardly weather influences for industry
     <u>b. Occupancy/prod.volume</u>   **Y** correction for production via engineering before/after
11. Free rider   ? no government expenditure for EEO > no free riders
12. Spill-over/multiplier   X EEO covers all customers > no effect on non-participants
13. Additionality   X with/without > additional savings, no correction
14. Indirect rebound   ?
15. Non-compliance   **Y** incomplete actions (not in ex-post estimate?) > to be corrected
16. Double counting   ? other PM?

Actual unitary savings = saving actions In industry due to EEO, actual total savings = sum saving actions due to EEO over all customers with actions

1. Gross unitary = Engineering estimate before/after or with/without, gross total savings = sum unitary over all customers with actions
2. Net unitary = Gross + Production before/after (+ Perform-gap + non-compliance), Net total savings = sum unitary over all customers with actions.