# U.S. Consumer Product Safety Commission
# LOG OF MEETING

**SUBJECT: Meeting with PGMA**

**DATE OF MEETING: September 28, 2021**

**LOG ENTRY SOURCE: Janet Buyer, Engineering Sciences**

**DATE OF LOG ENTRY: September 29, 2021**

**LOCATION: teleconference via GoToMeeting**

**CPSC ATTENDEE(S):**

| Name | Affiliation |
|---|---|
| Mark Kumagai | CPSC-ES |
| Caroleene Paul | CPSC-ESMC |
| Janet Buyer | CPSC - ESFS |
| Matt Brookman | CPSC - LSM |
| Chuck Smith | CPSC - EC |
| Tim Smith | CPSC - ESHF |
| John Stabley | CPSC – HS |

**NON-CPSC ATTENDEE(S):**

| Name | Name |
|---|---|
| Joe Harding | PGMA |
| Tom Kim | Honda |
| Raymond Quon | Honda |
| Ken Stair | Briggs & Stratton |
| Dennis Lamberty | Champion |
| Andrew Miller | Duromax |
| Kazuaki Watanabe | Figaro Sensors |
| Greg Marchand | Firman |
| Brandon Schmidt | Generac |
| Kevin Cole | Generac |
| Ryan Galstad | Generac |
| T. McKechnie | Nemoto |
| M. Atta | Harbor Freight |
| Donald (D.J.) Murdock | Yamaha |
| Christine Wyman | Bracewell |
| Ed Krenik | Bracewell |
| Sean Oberle | Product Safety Letter |

**SUMMARY OF MEETING:**

- This meeting, which was requested by PGMA, was held so that CPSC staff could discuss their responses to a list of questions that PGMA forwarded to staff in advance of the meeting. See the attached for PGMA's questions. After discussing all the questions, the meeting adjourned.

# PGMA Questions for CPSC on Revisions to NIST TN 2048 Simulation Plan

| Section | Question |
|---|---|
| None | What version of CONTAM will be used for the simulations? CONTAM HT? Will the version used for this project model heat sources as well as contamination sources? |
| None | Will the simulations still use a one-second time step and report the CO concentrations in one-minute intervals? |
| None | What version of the COHb calculator will be used? In addition, please confirm that the COHb calculator only works on CO data with a one-minute time step? If so, what values of CO are actually used in the COHb calculator, i.e. how is the one minute value of CO determined given that the simulation calculates CO with a one second time step?<br><br>Will a tool for extracting the binary output files as csv files be created (COHbCalc3 or similar)?<br><br>The revised document introduces occupants that move throughout the house. COHbCalc3 cannot handle that situation. Will a COHb calculation tool be created that can do this?<br><br>In order to calculate the COHb% in the operator and collateral person, will an exposure profile be compiled by tracking the minute-by-minute location of the occupants, averaging zones for the operator where specified? Will this profile then be used to integrate the Coburn-Forster-Kane (CFK) equation to calculate COHb? If so, will a tool be created for this calculation? |
| None | What respiratory minute volume (RMV) will be used (6, 10, 12 L/min)? |
| None | What is the initial baseline level of COHb? Will the 0.00056 ml/ml value as previously stated in TN 1925 be used? |
| 3 | The revised document details changes that have been made to the house models, including the addition of exterior doors, addition of windows, and altering the layout of the DH-45 and DH-45(mod) models. Have these new models been created? |
| 3.2 | Please provide the dimensions of the garage bay doors as well as the model type and model parameters. |
| 3.2 | The revised document specifies the height and width of exterior doors. In the house models, exterior doors are modeled using “one-way flow using power law”. This model does not use door dimensions. Please specify the revised model parameters for the new door dimensions (leakage area per item, pressure drop, discharge coefficient, and flow exponent). |
| 3.2 | The revised document states that “Staff reduced the opening of interior doors from fully open to 10 cm”. Does this mean the initial condition for all interior doors in all models is that they are open 10 cm unless specified otherwise by a specific scenario? |

| Section | Question |
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| 3.2 | Is there an initial condition for all windows in the house models? |
| 3.2 | How will closed windows, interior doors, exterior doors, and garage doors be modelled? Will they have leakage rates? If so, please specify the models and parameters that will be used. Or will the closed doors and windows not be present in the model at all? Will they be elements that are only active in the models when they are open? |
| 4 | Section 4 of the revised document states that handheld generators will only be run with the MH-1(mod) and DH-8 models and that the Class 2 twin-cylinder generator will only be run with the GAR3 model. Will these three house models also be run with the class 1 and class 2 single-cylinder generators? |
| 4 | The revised document states that staff estimate that the number of simulations is now approximately 200,000. We estimated that the number of simulations was approximately 250,000. Please see the attached spreadsheet and confirm that our understanding of which simulations will be run is correct. |
| 4 | Does CPSC have any estimate for how long it will take to complete this project? (Including running all simulations, data analysis, fatality/injury calculations and final determination of effectiveness of PGMA G300 and UL 2201 in addressing the CO hazard.) |
| 4 | In all scenarios where the portable generator is moved outside and restarted, and where CO enters the home, what percentage of CO from the portable generator enters the home? Is there a difference depending on when the portable generator is located outside of the kitchen vs. outside of the garage? (This is covered in NIST TN 2048 Section 8 Simulation Methodology, but an exact percentage is not specified). |
| 5 | Section 5 states that staff has changed the orientation of all the houses. Will this change be done to the model files, or to the weather files? |
| 8 | Section 8 paragraph 1 of the original NIST TN 2048 states that “The simulations will use the CO emission rates in Table 11 with the rate increased by a factor of 3 times the CO emission rate at normal oxygen after 2 hours of operation, to reflect reduced O2 levels associated with operation in rooms without open windows or doors (as described in NIST TN 1925)”.<br><br>a. Is this still the plan?<br><br>b. Does this only apply if there are no open windows or doors in the source zone? Does that include interior windows and doors?<br><br>c. If the generator is restarted in the same location, would the 10 minute delay before restarting count as part of the 2 hours of operation or not? |
| 8 | The revised document says that all 40 models will be run for each simulation in Appendix A. Is that correct? That would mean running simulations that mention a basement with models that don’t have basements. |
| 8 | NIST TN 2048 states "Specifically, the CO concentration in the CONTAM zone with the generator will be divided by a factor based on the values reported in TN 2049 to account for the fact that the CO concentration was consistently lower |

| Section | Question |
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| | than the zone average at the elevation of a shutoff sensor located on the generator. Separate factors will be used for the instantaneous and 10-minute average shutoff criteria." There are two questions related to this.<br>• Is the "factor" mentioned here the same as the "shutoff ratio" described in NIST TN 2049?<br>• What "factors" will be used in the simulations?<br>• Will separate factors be used for the instantaneous and 10-minute average shutoff criteria? |
| 8 | The original version of NIST TN 2048 page 34 paragraph 1 states that if the exhaust is aimed into an adjacent room then no shutoff factor will be used. Is this correct? |
| 8 | How will the 10 minute rolling average shutoff criteria be handled during the first 10 minutes of operation? Will an average be calculated of just the available data during the first 10 minutes? Will the average only be calculated after ten minutes of data have been collected? |
| 8 | Will CPSC's publicly available report provide the results of PGMA G300 generators, UL 2201 generators as well as the baseline generator? |
| Appendix A Scenario Tables | In the revised document Table 1.a assigns the operator a weight of 75% and the collateral person a weight of 25%. How will these weights be used? Are they part of an effectiveness calculation? |
| Appendix A Scenario Tables | Table 1.c of the revised document requires that the “door between the generator zone and the rest of the house” be opened fully at 5 minutes after restart and open to 10 cm at 12 minutes after restart. This requires knowledge of which door will be designated as the “door between the generator zone and the rest of the house”.<br><br>a. For houses with a crawlspace, the house models have no doors designated for the crawlspace. Will the requirement for opening the door to the generator zone be waived for these simulations? If not, please specify the designated door for each house model with a crawlspace.<br><br>b. House models with basements with large open basements do not have doors on the basement level.<br><br>i. If the first floor has a single stair zone, will the door to that zone be considered the “door between the generator zone and the rest of the house” for the purposes of Table 1.c? For these models, please indicate the door that will be considered the “door between the generator zone and the rest of the house”: DH-52, DH60, DH-61, DH-61(mod).<br><br>ii. Multi-story houses such as DH63(mod1) have adjacent stair zones on the first floor, but the model does not indicate which stair zone services the basement. For these models, please designate which stair zone has the “door between the generator |

| Section | Question |
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| | zone and the rest of the house": DH45, DH- 63(mod1), DH-63(mod2) and DH-81.<br><br>c. Some house models have basements divided into multiple zones. The basement has a stair zone that connects to a stair zone on the first floor. Which door will be considered the "door between the generator zone and the rest of the house" for purposes of Table 1.c: the door to the zone with the generator, the door to the basement stair zone, or the door to the connecting stair zone on the first floor?<br><br>Please specify the door between the generator zone and the rest of the house for models AH-10, AH-34(mod), DH-10, DH-12, DH19(mod), DH-2, DH-2(mod), DH-27, DH-41, DH-44, DH-56 and DH-7.<br><br>d. Some house models have a two-room basement consisting of a basement room and a garage. These models have an interior door between the basement room and the garage. Will this door be considered the "door between the generator zone and the rest of the house"? Or will the door to the stair1 or stair2 zone on the first floor be used instead? Please specify the door to use for models AH-21, DH-45(mod) and DH-60(mod). |
| Appendix A Scenario Tables | Table 1.d Note 2 states that "At 12 min., any open windows will be closed". Does that mean any open windows in the entire house will be closed (including basement windows), or just the kitchen window?<br><br>a. For example, Table 2.b.i has an open window in the non-kitchen initial generator zone. Does this window get closed when the generator is restarted outside the kitchen? |
| Appendix A Scenario Tables | Table 1.e Note 2 states "Window Positions: All windows to the house will be closed".<br><br>a. This Note does not specify a time for the windows to close. Do these windows close at 12 minutes similar to Note 2 in Table 1.d?<br><br>b. Does this note also apply to the workshop windows? |
| Appendix A Scenario Tables | Table 2.a Scenario B1 (and others) say "Operator moves generator to outside of the kitchen where CO does not enter home" or "Restart after moving generator to outside of garage where CO does not enter garage". In these cases where the generator is moved outside but CO does not enter the home, does the operator movement and the opening and closing of the doors and windows described in Table 1.d and Table 1.e still happen? |
| Appendix A Scenario Tables | Many of the scenarios indicate that the generator will either be started or restarted in a room described as "other 1st floor room that has an isolating door". Please specify for each house model used in these scenarios exactly which room is designated as the "other 1st floor room that has an isolating door". This question applies to the house models used in the following scenarios: |

| Section | Question |
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| | a. Table 2.a Scenarios C1 and C2; Table 2.b.i, all scenarios; Table 2.b.ii, all scenarios<br><br>b. Table 3.a, Scenarios C1 and C2; Table 3.b.i, all scenarios; Table 3.b.ii, all scenarios<br><br>c. Table 9.a, Scenarios C1 and C2; Table 9.b.i, all scenarios; Table 9.b.ii, all scenarios<br><br>d. Table 10.a, Scenarios C1 and C2; Table 10.b.i, all scenarios; Table 10.b.ii, all scenarios |
| Appendix A Scenario Tables | Table 4.b, Table 6.b, Table 11.b, and Table 13.b all have the initial condition "Basement stairway door is open 10 cm."<br><br>a. As noted above, some house models have adjacent stair zones on the first floor.<br><br>Please indicate which of these stair zones leads to the basement for these scenarios.<br><br>b. As noted above, some house models have basements subdivided into multiple zones with stair zones in the basement and connecting stair zones on the first floor. For these models, which of the zones has the door referred to in the initial conditions? Is there a separate initial condition for the door of the zone containing the generator? |
| Appendix A Scenario Tables | Table 5.a: What is the initial state of the garage bay door in these scenarios? |
| Appendix A Scenario Tables | Many of the scenario tables indicate in the table title that the "Exhaust Plume Pushes Some of Exhaust into House" or "Exhaust Plume Pushes Some of Exhaust into Workshop". How will this be modeled? This question applies to the following tables:<br><br>Table 5.b.ii, Table 6.c.ii, Table 8.b.ii, Table 12.b.ii, Table 13.c.ii. |
| Appendix A Scenario Tables | Many of the scenario tables indicate "Exhaust Plume Oriented Out of Door to House Interior". How will this be modeled? This question applies to the following tables:<br><br>Table 2.b.ii, Table 3.b.ii, Table 9.b.ii, Table 10.b.ii. |
| Appendix A Scenario Tables | Many of the individual scenarios indicate that "Exhaust plume pushes some of exhaust into house" or "Exhaust plume pushes some of exhaust into workshop room". How will this be modeled? This question applies to: |

| Section | Question |
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| | a. Table 5.a Scenarios C3, C4, C7, C8<br>b. Table 8.a Scenarios C3, C4, C7, C8<br>c. Table 12.a Scenarios C3, C4, C7, C8<br>d. Table 13.a Scenarios C3, C4, C7, C8<br>e. Table 15.a Scenarios C3, C4, C7, C8 |
| Appendix A Scenario Tables | Table 6.a: What is the initial state of the garage bay door in these scenarios? |
| Appendix A Scenario Tables | Many of the scenarios indicate that the generator will either be started or restarted in the basement. Some of the house models have basements subdivided into multiple rooms.<br><br>For these models, please indicate the basement zone into which the generator will be placed: AH-10, AH-34(mod), DH-10, DH-12, DH19(mod), DH-2, DH-2(mod), DH-27, DH-41, DH-44, DH-56 and DH-7. |
| Appendix A Scenario Tables | Tables 2.c, 3.d, 4.c, 5.c, 6.d, 9.c, 10.d, 11.c, 12.3, and 13.d: "Actual Deaths for specific house model" is stated under the Scenario Weight. Please specify scenario weights and final scenario weights, or specify the procedure for how these weights will be calculated. |
| Appendix A Scenario Tables | Tables 3.a, 3.b.i, 3.b.ii, 3.c, 10.a, 10.b.i, 10.b.ii, and 10.c : Please explain the comment "The only exposure in the crawlspace is of operator entering the crawlspace to move the generator and/or restart the generator". |
| Appendix A Scenario Tables | Many of the table titles and/or individual scenario descriptions deal with exhaust gas aiming. The descriptions are not identical in wording. How will exhaust gas aiming be modeled? Will a fixed percentage of the exhaust gas be pushed into the adjoining room? If so, what percentage will be used?<br><br>If a version of CONTAM will be used that allows modeling of heat sources, will a fixed percentage of the heat generated be pushed into the adjoining room? If so, what percentage will be used? |
| Appendix A Scenario Tables | The scenario tables do not list the initial positions of the operator and collateral person. Is the intent to calculate exposure profiles for these occupants assuming they start in every zone of the house model? Will this be just for living spaces, or also including hallways, stairs, bathrooms, crawlspaces, etc.? Please specify which initial zones the operator and collateral person will occupy for each house model and each scenario table. |
| A.3 | The third rule on page 6 of the revised document states: "If the first restart is in a different location than the initial start, and either or both the operator and the collateral person are in this area, they will relocate to another room." The same page states that the collateral person moves instantaneously to the new zone, but it does not specify the timing of the move. |

| Section | Question |
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| | a. Assume that the generator cuts off at time t1. The operator moves and restarts the generator between t1 and t1 + 10 minutes. The operator then waits for two minutes while the generator runs before moving to his or her original zone.<br><br>b. Does the collateral person change zones at time t1 when generator cuts off, or at t1 + 10 minutes when the generator restarts, or at t1 + 12 minutes when the operator leaves the zone? |
| A.3 | Page 6 of the revised document states that when the operator restarts the generator in place, the exposure during the 10 minutes between the cutoff and the restart is assumed to be the average of the operator's starting zone and the generator zone. If the generator is restarted in a different location, the operator exposure is assumed to be the average of the operator's initial location, the generator initial zone, and the generator final zone. How is the average calculated? Do you calculate the average of each zone during the 10-minute period and then average the averages? |
| | After the operator restarts the generator, he or she waits an extra two minutes.<br><br>a. Does the operator then move instantaneously to the next zone (no averaging takes place)?<br><br>b. The third rule on page 6 of the revised document states that "If the first restart is in a different location than the initial start, and either or both the operator and the collateral person are in this area, they will relocate to another room". Table 1.d on page 8 states that after restarting a generator outside the home the operator waits outside for two minutes and then returns to "original location". Assume that the operator starts off in a bedroom. The generator starts in the kitchen and is then restarted in the bedroom, forcing the operator to move to the living room. Where does the operator return to after the second restart outside, the bedroom or the living room?<br><br>c. What happens if the generator cuts off a second time during the two-minute waiting period? Does the operator immediately begin the 10-minute averaging period while moving the generator outside, or does the operator finish waiting the full two minutes before moving the generator outside? |
| A.3 | Can CPSC confirm that the Staff effectiveness estimates, as described in NIST TN 2048 section A.3.6, will be unchanged, including that the operator or collateral person's location in the structure is assumed to have equal probability of occurring in any living space room, except as described in A.3 of the Revisions to the Plan Documented in NIST Technical Note 2048? |
| A.3 | NIST TN 2048 Table A.3.3.2 "Houses Grouped by Similar Structural Features", third row (basement but no crawlspace or garage) lists DH-61 twice. Is one of those entries DH- 61(mod)? |

| Section | Question |
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| A.3.6 | Section A.3.6 of the original NIST TN 2048 document details plans for calculating effectiveness, where the victim's location was assumed to have equal probability occurring in any living space zone. Will this calculation still be performed, or will it be replaced by the operator/collateral person analysis? |
| A.3.6 | Will effectiveness be calculated for the exposure profiles of the operator and collateral person? |
| A.3.6 | Which spaces will be considered "living spaces" for the purposes of the effectiveness calculations? |
| None | After the simulation and analysis plan is completed, what criteria will CPSC use to make a determination on whether PGMA G300 or UL 2201 sufficiently addresses the CO hazard associated with portable generators? In other words, what level of avoidance of fatality and/or injury will be necessary for either voluntary standard to be considered sufficient? |