TC 285 Working Group 2, Laboratory Testing

Convener: Richard Ebong, Uganda Bureau of Standards

Project Leader: Jim Jetter, U.S. Environmental Protection Agency

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Summary of WG 2 Scope

- Harmonize existing laboratory test protocols by adapting and updating them into a unified approach
- Develop a standard applicable to cookstoves used primarily for domestic and small-scale institutional cooking or water heating in the developing world, excluding cookstoves used primarily for space heating
- Specify methods in standard for laboratory evaluation of:
  - Air pollutant emissions
  - Energy efficiency
  - Safety
  - Durability
- Provide guidelines for reporting results from the laboratory measurement and evaluation methods

WG 2 Progress

- Established Working Group including 60 experts from 16 countries
- Included liaisons representing GACC, GERES, WHO
- Completed extensive review of existing related standards
- Worked with WG 1 to develop definitions/terminology
- Developed Working Draft based on:
  - Best practices from existing cookstove testing protocols
  - Experience of international cookstove testing centers
  - Standards and testing methodology in related sectors
- Held meeting of WG2 experts in Beijing in July 2015
- Completed two rounds of reviews of working draft
- Addressed remaining issues during Accra ISO meeting
- Next stage in ISO process – Committee Draft will be reviewed by TC-285 member countries

BEST PRACTICES from existing protocols

	HTP	CSI-Indo	China	India	WBT	IWA
3 cooking power levels	✓	✓				
1 cooking power level			✓	✓		
Thermal efficiency	✓	✓	✓	✓	✓	✓
PM (particulate matter), gravimetric (filter) method		✓	✓	✓	✓	✓
CO (carbon monoxide)	✓	✓	✓	✓	✓	✓
Emissions factors based on useful energy ($MJ_{delivered}$)	✓	✓	✓	✓	✓	✓
Emission rates (per time)					✓	✓

Key Decisions

- Balance of simplicity and adequate detail
- Protocols for determining emissions and efficiency
  - Standard Test Sequence for international comparability
  - Contextual Test Sequences for location- or demographic-specific comparability
- Methods for measuring emissions
  - Prescriptive method for particulate matter ($PM_{2.5}$)
  - Performance-based method for gaseous pollutants
- Inclusion of voluntary performance targets

Applicability of Lab Testing

- Useful for developing stove/fuel technology (along with other evaluations)
- Useful for screening stove/fuel technology for field studies (along with other evaluations)
- Useful for rating stove performance under controlled conditions
- Actual performance of a cookstove used in the field may vary if conditions are different:
  - Fuels
  - Cooking vessels (pots)
  - Foods
  - Operation
  - Environment

WG 2 Relevance for Stakeholders

- Greater alignment in laboratory methodology and metrics around the world
- Adaptation of methodology and metrics to the wide variety of cookstove fuels and cooking practices that exist in the developing world
- Stakeholders may:
  - Adopt the standard or portions of the standard
  - Adapt the standard to meet needs
  - Participate in further development of the standard

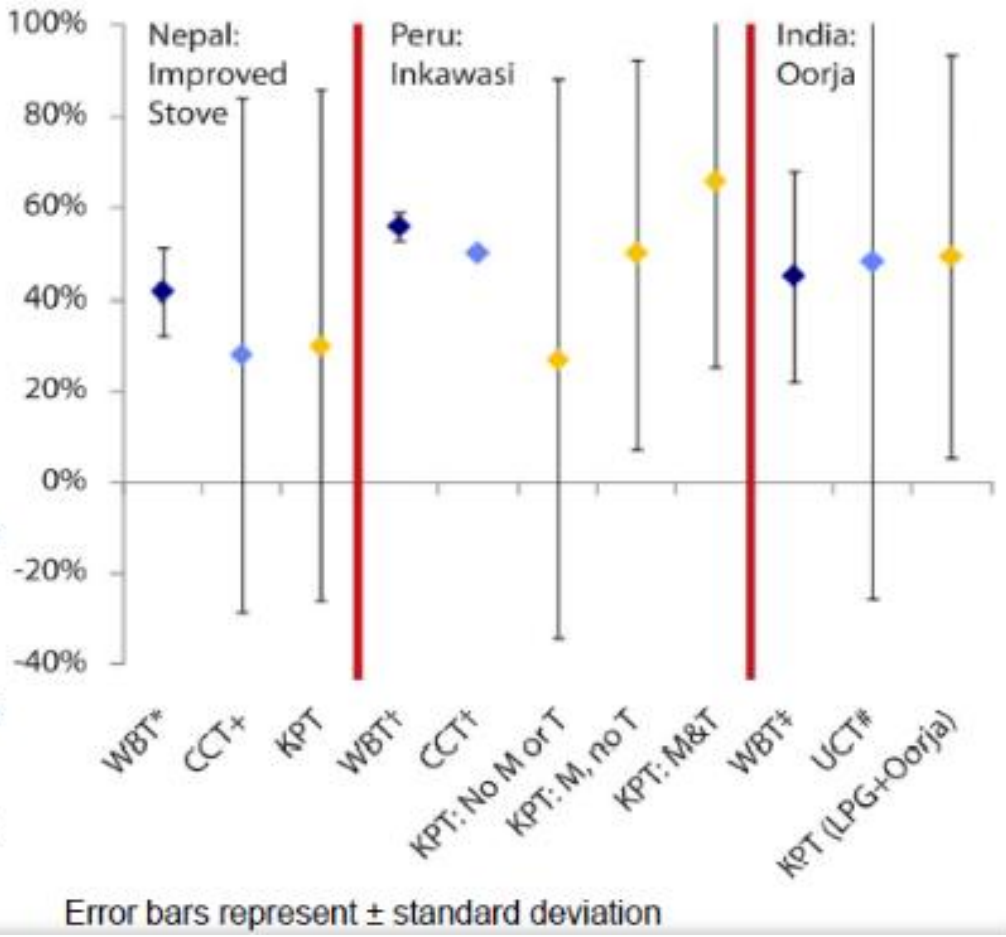
Coordination with other WGs and WHO

- Worked closely with WG 1 to develop definitions/terminology
- WG 1 stakeholder survey will inform further development of WG 2 standard
- Some metrics of performance can be harmonized between WG 2 and WG 3 guidelines (Field Testing)
- Contextual test sequences may include aspects of social impact assessment – WG 4
- TG 1 fuels standards review provides input to WG 2
- WG 2 determination of emission rates support WHO Guidelines for Indoor Air Quality

Thank you for your attention.

Comparison with WBTs and CCTs

- Percent fuel savings from controlled testing was generally similar to that found during KPTs.
- Promising for linking lab and field performance.
- Difficult to compare across all the Peru groups.
- Oorja group includes substantial LPG use so savings comparison is not direct.
- Need better understanding of why different testing approaches agree or do not agree.
- Far greater standard deviation in field testing than lab testing.



Reference: Berkeley Air Monitoring Group

http://www.pciaonline.org/files/PCIA_Aug11_Webinar_FieldTestResults_FINAL.pdf

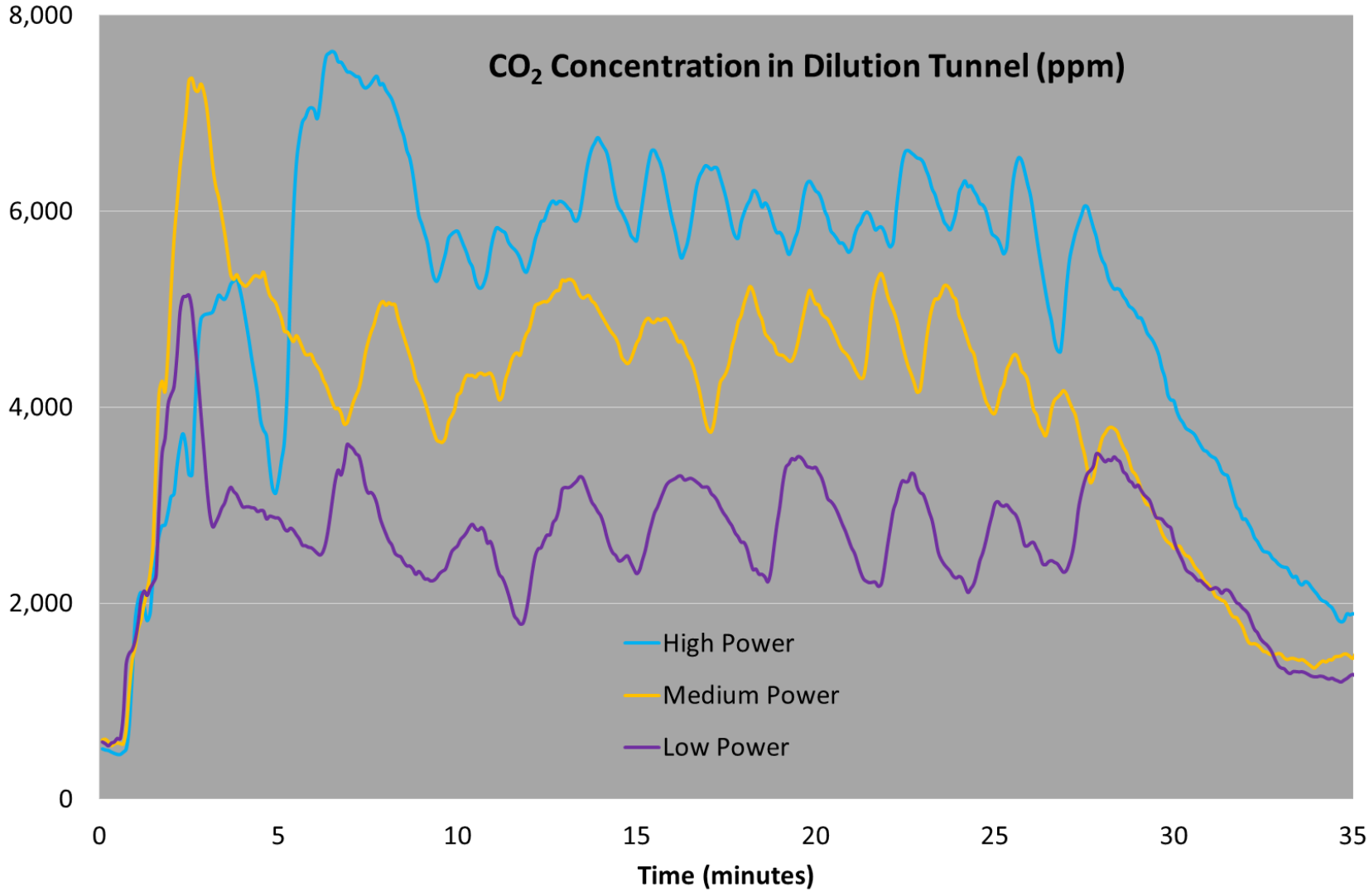
Johnson MA, et al, Impacts on household fuel consumption from biomass stove programs in India, Nepal, and Peru, *Energy for Sustainable Development* 2013. http://dx.doi.org/10.1016/j.esd.2013.04.004

Experimental Results Using Testing Protocol Under Development by ISO TC 285 Working Group 2

Power Level	High	Medium	Low
Cooking Power (W)	1690	1513	960
Thermal Efficiency w/o char (%)	37.7	40.4	41.9
Thermal Efficiency w/ char (%)	39.3	43.6	46.7
$PM_{2.5}$ per useful energy (mg/MJ)	*	47.2	56.5
CO per useful energy (g/MJ)	3.76	1.88	2.15
$PM_{2.5}$ emission rate (mg/h)	*	257	195
CO emission rate (g/h)	22.9	10.2	7.4

* Data rejected

Forced-Draft Stove – Test Data



Note: CO_2 concentration is an indicator of the fuel burning rate and fire power

Experimental Results – CO and $PM_{2.5}$ Data