Regional Testing and Knowledge Centers: from Lab to Field

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ETHOS 2025

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Challenge: People need wood burning stoves that are developed locally

Cost and function based on demand from local market

Regional Testing and Knowledge Centers provide rigorous testing services and access to local markets

Cooking
Malawi
$0

Clean Cooking
Malawi
$30

Heating
USA
$850

Clean Heating
USA
$3,329

Lab is used to create potential solutions

- Advanced tools are used for precise measurements (WBT Thermal efficiency, emissions rates and emissions factors based on energy delivered, durability)
  - $20k to $100k to $1 million lab
- Time is taken for study of concepts - basic function of the lab
- Users are engaged in limited capacity
  - Bring them to the lab for precise observations (CCT, focus groups), but their actions are influenced by the measurements
- Lab measurements do not accurately predict field performance

LEMS Emissions equipment at ARC - 60 LEMS world wide

Regional Testing and Knowledge Centers currently provide these services

Field testing is needed for implementation

- Understanding of user needs and desires
- Accurate measure of real performance in households, ultimate measure of success
  - Surveys
  - Interviews
  - Focused measurements of small number of stoves with advanced instruments (PM2.5 personal exposure from filter, partial capture emissions rates)
  - Distributed measurements with simple instruments of many stoves (PM2.5 light scattering in household, partial capture emissions factor, usage sensors)

Regional Testing and Knowledge Centers are available to work with households in your region

Three case studies moving between lab and field

1. Institutional stove design and baseline study at CSIR test center, Ghana
2. Water boiling tests informed stove design with feedback from local users and manufacturing stakeholders at Ener-G-Africa (EGA) medium size manufacturer, South Africa
3. Development of cordwood heating stove using advanced measurements and data analysis at Aprovecho, USA

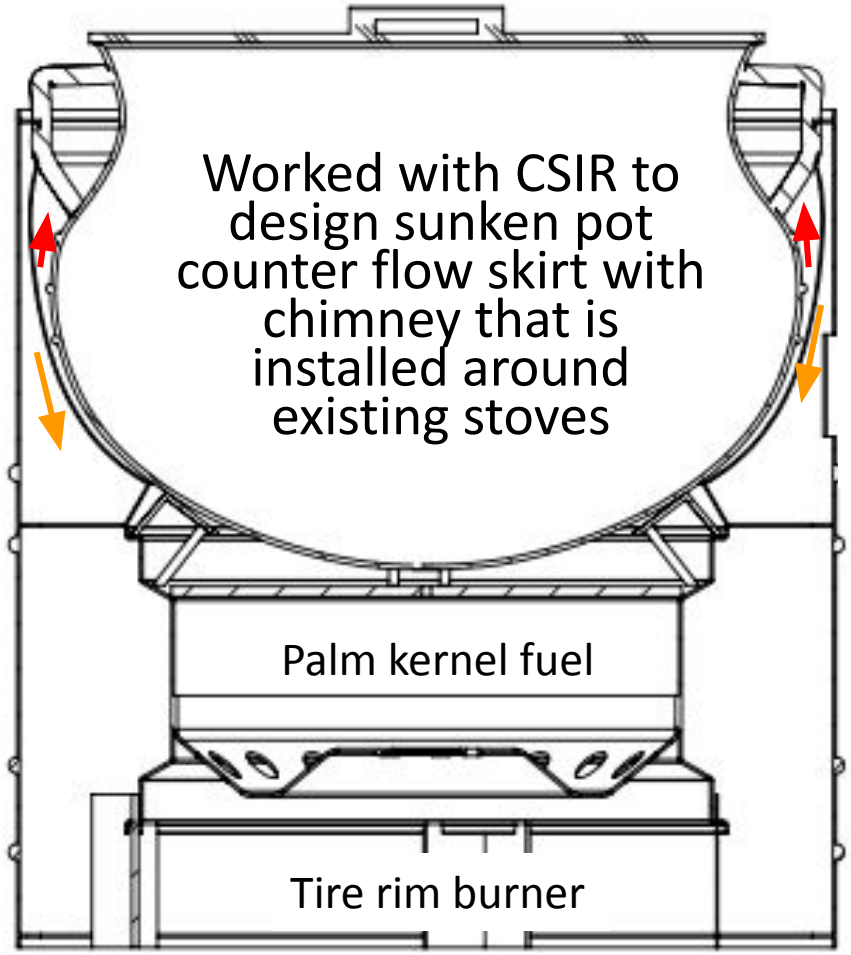
All started in lab and included user feedback

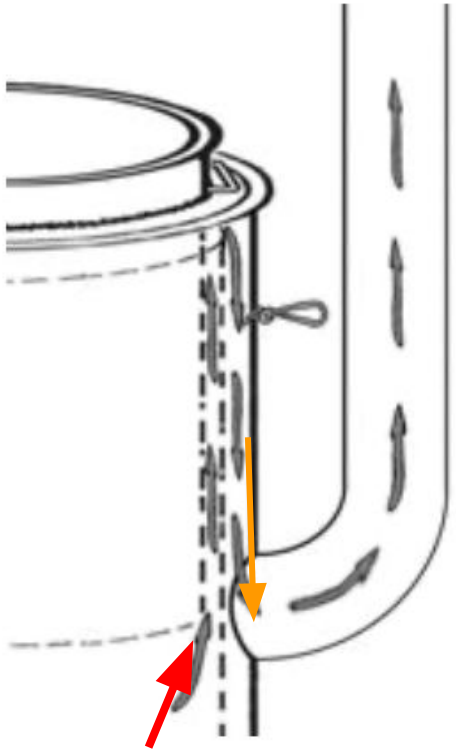
Case Study: Sunken Pot Institutional Stove CSIR Ghana

Design that is well known to western engineers is not well known to all stakeholders. Uptake is limited by messaging and coordination of stakeholders.

- Get repeatable test results in lab
- Create and communicate design
- Get access to users in field
- Monitor users in field
- Build prototype
- *Get feedback from users in lab*
- *Test prototype in field*

Inform stakeholders of existing solutions





Heat is forced to flow against the sides of the pot before passing down the outer channel and out the chimney.

Colored arrows indicate direction and temperature of gas flow. Red is hotter than orange. Cooking with less fuel: Breathing less smoke (Aprovecho 2008)

Sunken pot rockets in use at nearby school

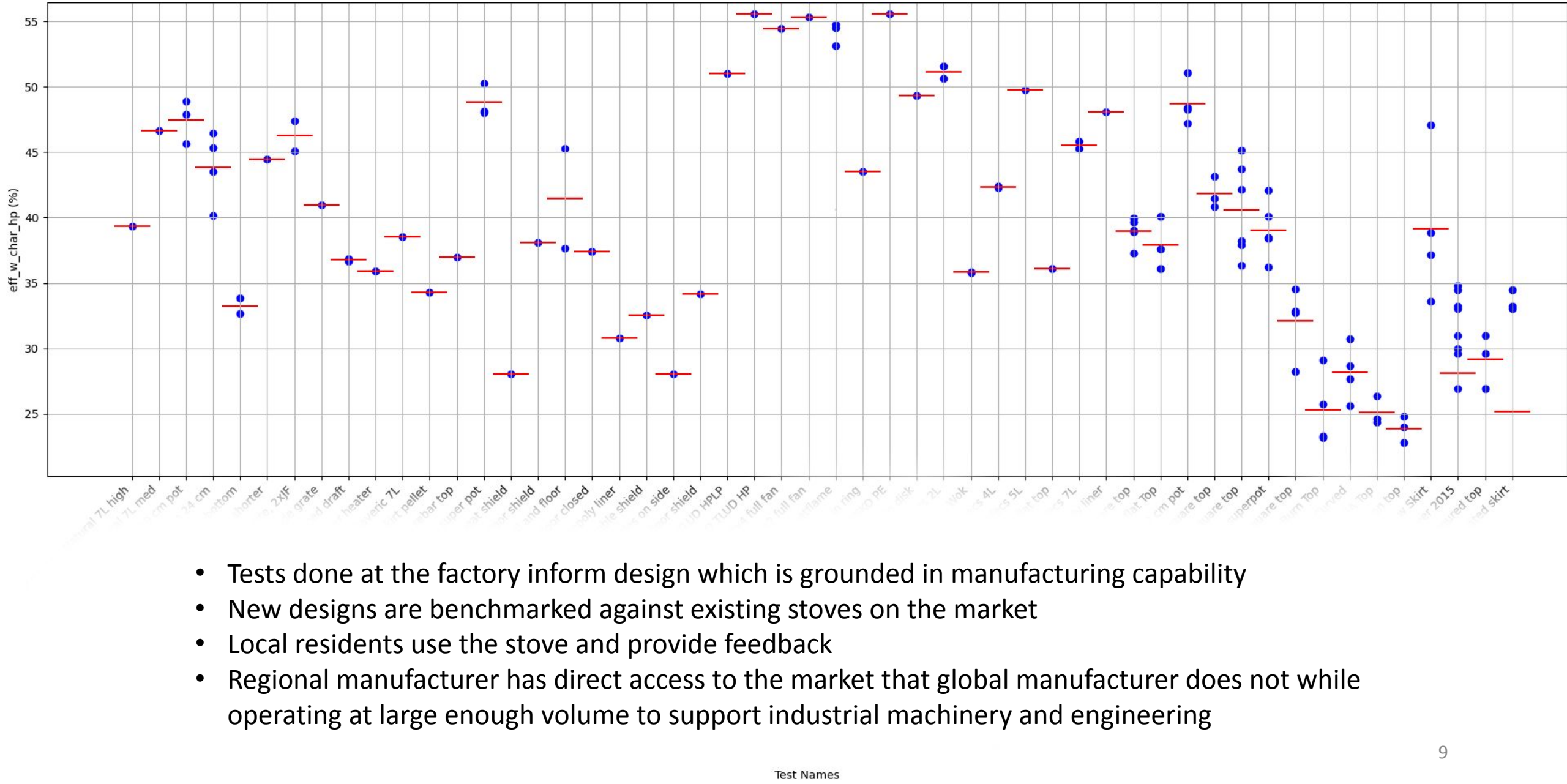
Case Study: Regional manufacturing at Ener-G-Africa South Africa

Designs must be manufacturable.

- Communicate design
- Generate repeatable test results
- Iterate design based on manufacturing capabilities (based on scale of distribution)
- Get user feedback
- Create tooling (welding, jigs, rolling, cutting, stamping)
- Distribute

Basic lab tools for thermal efficiency and PM

Business decisions based on iterative design against benchmarks

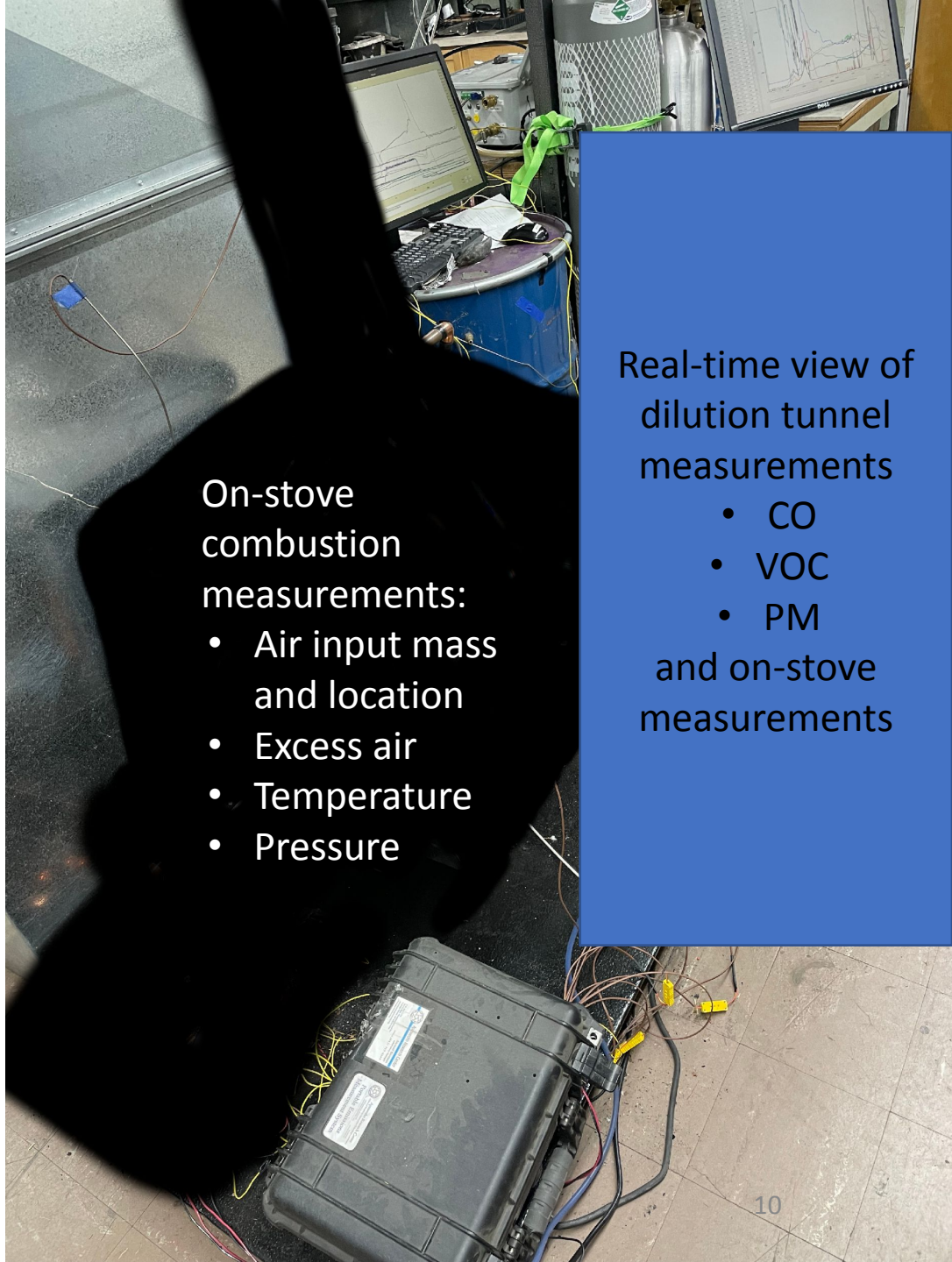


- Tests done at the factory inform design which is grounded in manufacturing capability
- New designs are benchmarked against existing stoves on the market
- Local residents use the stove and provide feedback
- Regional manufacturer has direct access to the market that global manufacturer does not while operating at large enough volume to support industrial machinery and engineering

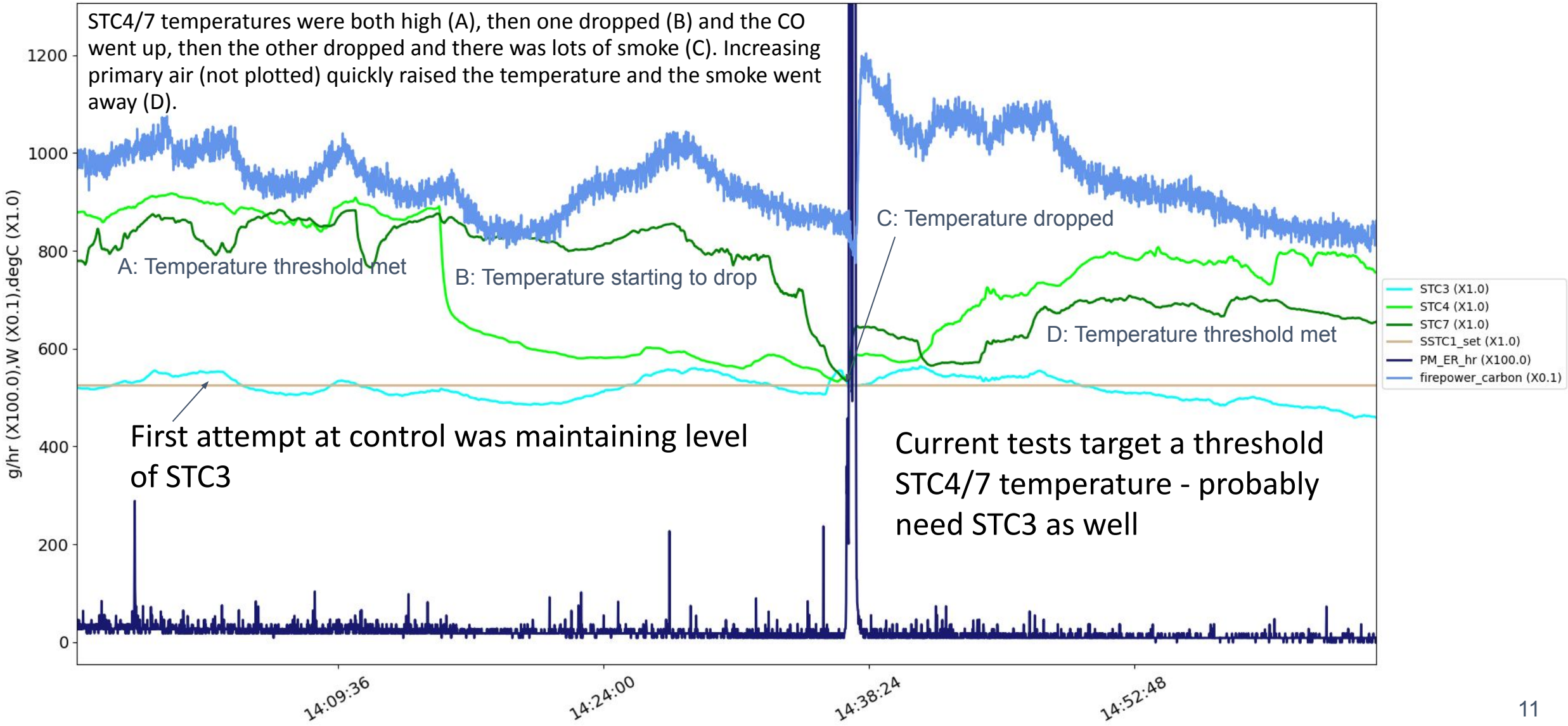
Case Study: Understanding heating stoves at Aprovecho

New design insights from advanced measurements and data analytics

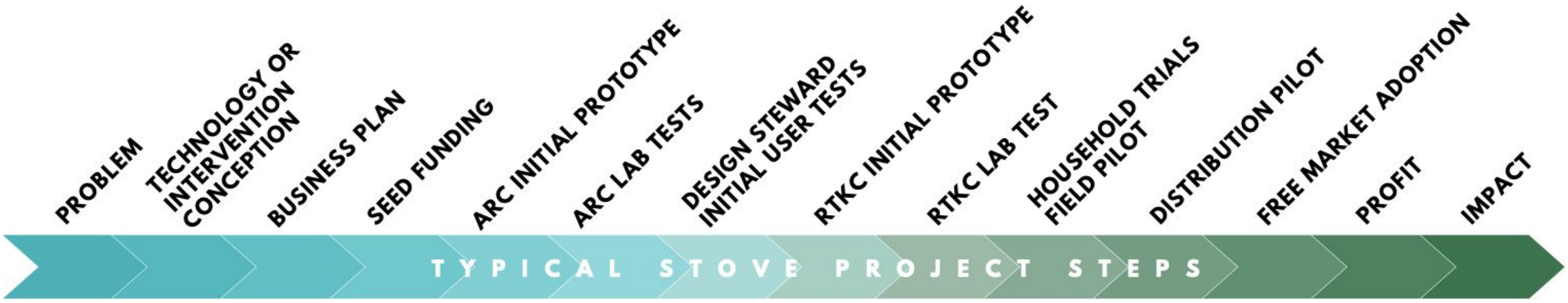
- Conceptualize design based on past experience
- Build and test prototype
- Monitor users to determine design targets
- Iterate prototype until design targets are met
- *Test prototype with users*



Controlling a Heating Stove with real-time measurements



The journey to success is slow



Call your local Regional Testing and Knowledge Center to get you there faster

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