

Woodstove Retrofit Open Challenge

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Puget Sound Clean Air
Agency

Woodstove Design
Workshop, Brookhaven
National Lab

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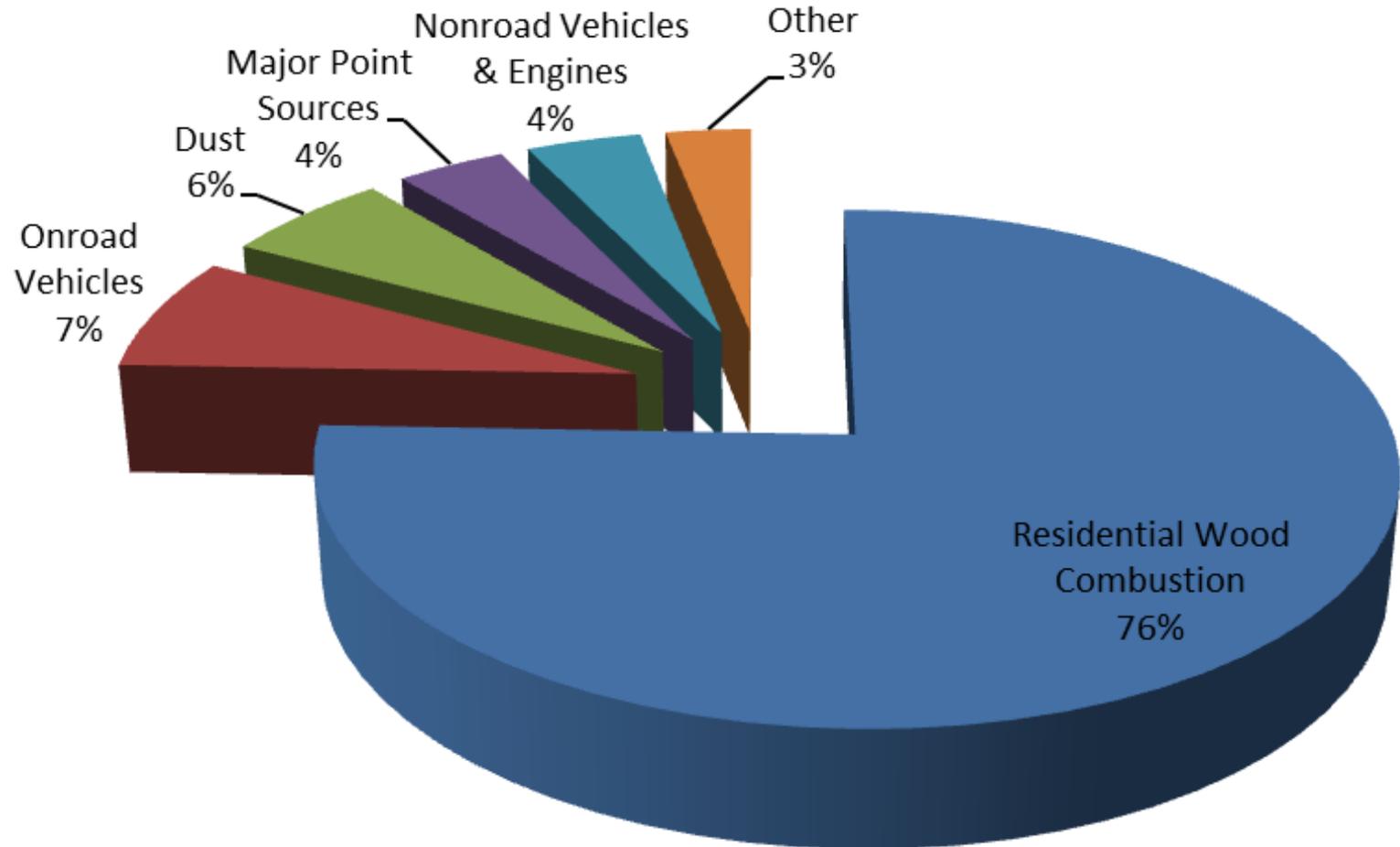


Why retrofits?

- Tacoma PM_{2.5} Nonattainment area Emissions Inventory is ~ 75% woodsmoke (w.s.)
- > 50% (of w.s.) is uncertified stoves, ~ 20,000 devices
- \$\$ is big driver: many people don't want to switch fuel, few can afford new device
- replacement is ~ \$4k (w options & installation)
- we can offer only \$1500 incentive, or full (capped) cost for income qualified, but funds are limited
- ~ \$80-100M to replace all
- enforcement is expensive and doesn't bring lasting emission reduction

Tacoma NAA Emissions Inventory

RWC as largest PM2.5 source



Why a challenge, what is it?

- **like the Decathlon...**
- **aka crowdsourcing, contest-driven innovation, advertised to a broad audience, compete for a prize**
- **idea is to draw on all similar knowledge, including from previously disparate sources**
- **e.g. Exxon had problem with vacuuming spilled oil that was cold because the oil congealed and wouldn't pump**
- **A chemical engineer who had once poured concrete recalled that vibration was used to help it flow and proposed to use similar approach.**
- **proposal was success and helped Exxon clean up spill much more rapidly**

InnoCentive leading host/ facilitator of open challenges

- 250,000 + registered solvers in 200+ countries
- more than 1200 challenges and 900 prizes
- awarded \$7M
- online info and submissions

The screenshot shows the InnoCentive website interface. At the top, there's a navigation bar with 'My IC', 'Products/Services', 'For Solvers', 'Challenge Center', 'Resources', and 'About Us'. Below this is a search bar and a 'Challenge Search' button. The main content area is titled 'InnoCentive Challenges' and features a 'Filters' sidebar on the left. The sidebar includes sections for 'All Challenge Sources' (Premium, Grand Challenge), 'All Challenge Disciplines' (Business & Entrepreneurship, Chemistry, Computer/Info. Technology, Engineering/Design, Food/Agriculture, Life Sciences, Math/Statistics, Physical Sciences, Requests for Partners, Social Innovation), and 'All Pavilions' (CTTSO, DARPA, AstraZeneca, Cleveland Clinic, HIF WASH, Lumina, NASA, Nature, Scientific American, Tec*Edge (Air Force), The Economist, UnitedHealth Group, Clean Tech, Developing Countries).

The main challenge list is titled 'InnoCentive Challenges' and includes a 'Save Settings' button, a 'Show' dropdown (set to 10), and a 'Next' button. The list is filtered to show 'All' challenge types. The challenges are displayed in a table with columns for 'Type', 'Posted', 'Deadline', 'Award', and 'Solvers'. The first challenge, 'Retrofit Residential Wood Burning Stoves for Pollution Reduction', is circled in red. It is a 'Premium Challenge' with a deadline of 11/21/14 and 1 solver. The other challenges listed are 'Autonomous Vehicle Sensor Technology' (9/25/14, 11/09/14, \$10,000 USD, 68 solvers), 'Real Time Monitoring of Steroid Metabolites and Metabolic Flux' (9/24/14, 10/24/14, \$10,000 USD, 57 solvers), and 'Seeking Bicyclic Fused Imidazoles' (9/22/14, 11/22/14, varies, 34 solvers).

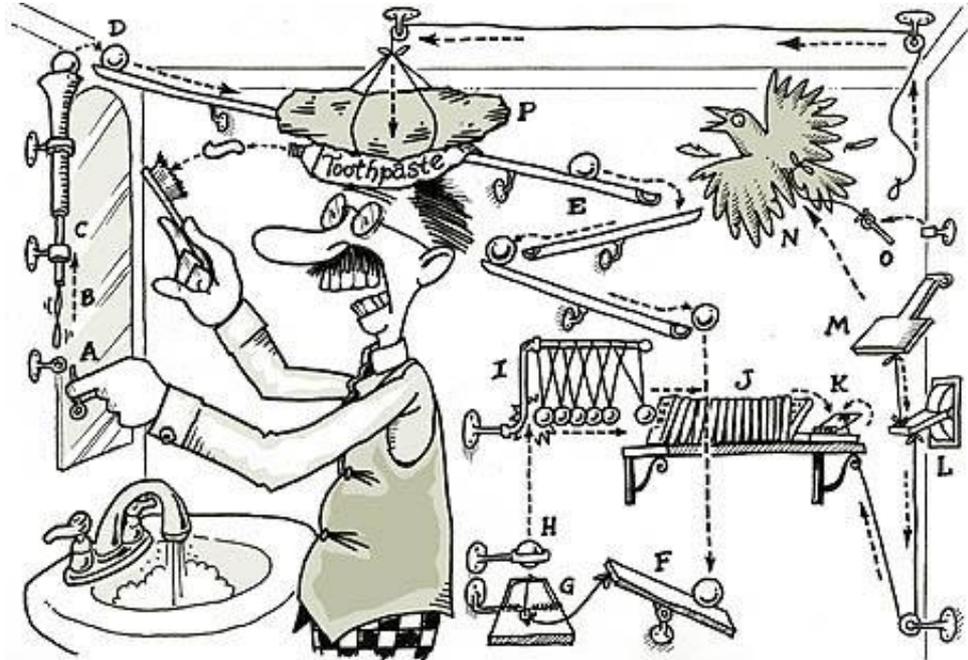
The Retrofit Challenge

- **National Estuary Program (NEP) grant to fund search for retrofits to reduce PAHs (and fine PM)**
- **A Technical Advisory Committee reviews, comments, rates, and make final recommendations on winners**
- **Will fund testing for up to three finalists**
- **Are significant challenges in maintaining motivation and protecting intellectual property**
- **Want to find, test, and highlight devices that perform well, but don't want to enable anti-competitive speculation**

The Technical Challenge of our Challenge

- Our current understanding of retrofit devices is that they have one or more of the following limitations (but we'd love to be proven wrong!) :

- too expensive and complicated
- require significant care and maintenance



- have significant technical limitations that render them ineffective, unreliable, or hazardous.

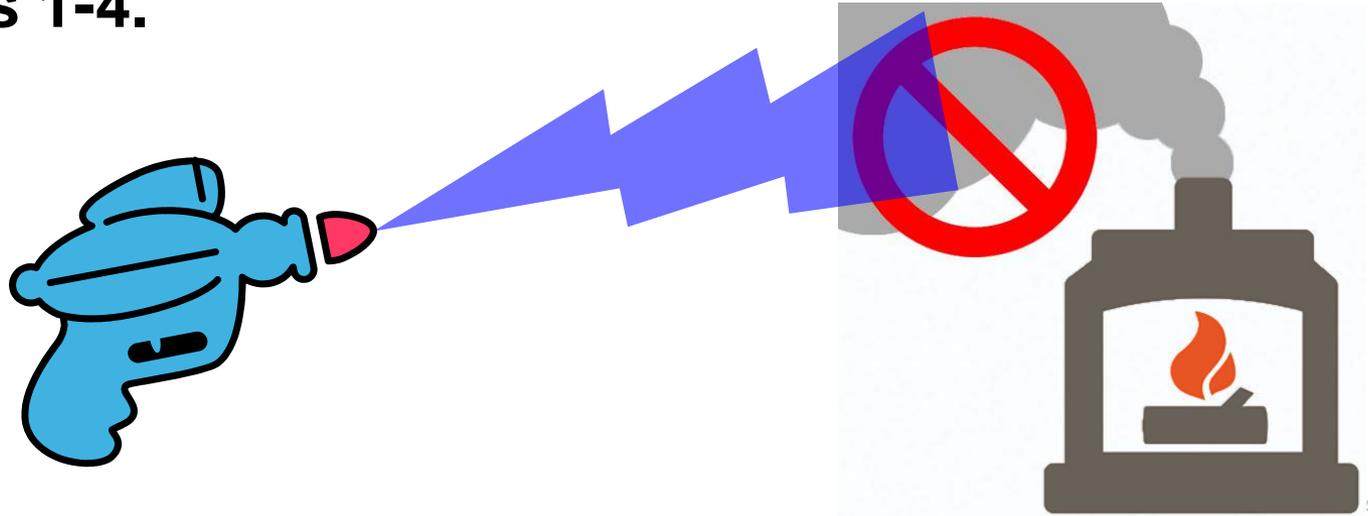
General approaches and our current understanding of the limitations... we hope we are wrong!

Disclaimer: None of this is directed at any device or approach here, this is just our general observation:

- 1. Mechanical filtration: low filtration performance, not robust to exhaust gas temperatures, water, rapid/high particulate loading, may restrict exhaust flow**
- 2. Catalyst in the burn chamber: insufficient pollution reductions, not robust to rapid/high loading, may restrict exhaust flow**
- 3. Electrostatic precipitators: too expensive, not proven to be durable, insufficient pollution reduction, requires ongoing maintenance**
- 4. Reburning outside the primary chamber: requires heat/energy input, may restrict exhaust flow**

... and the solution will be....

- ?... we've heard many promising approaches and prototypes...
- We are willing to consider any existing approach (1-4 above) that has robustly overcome all of the limitations.
- We are also open to novel methods that do not fit into categories 1-4.



Intellectual Property discussion

- **Our highest priority is to help protect innovators, inventors, and entrepreneurs**
- **We worked with local IP attorney to develop concept and terms**
- **Submissions must agree to conditional nonexclusive royalty-free license to the public, in the event of lack of commercialization within 4-years**
- **But, developer/inventor retains IP ownership**

Testing

- After close of challenge, up to three best devices may be selected for testing
- will be tested under varying conditions with 3 devices
- use High/Low burn rate and wood moisture combinations

ID of			Stove		
Parameter Pair	Burn Rate	Wood Moisture	1	2	3
A	HIGH	lower	Y	-	Y
B	LOW	higher	Y	Y	Y
C	HIGH	higher	-	Y	Y
D	LOW	lower	Y	Y	-

Challenge is OPEN!

- Sept 29 – Nov 21
- submission requires detailed description of method and device, and test data
- Evaluated on
 - ▲ efficacy
 - ▲ safety
 - ▲ cost



Retrofit Residential Wood Burning Stoves for Pollution Reduction

TAGS: Requests for Partners and Suppliers, Engineering/Design, Physical Sciences, Clean Tech, eRFP

AWARD: varies | DEADLINE: 11/21/14 | ACTIVE SOLVERS: 144 | POSTED: 9/29/14

The Seeker, the Puget Sound Clean Air Agency, is seeking new, emerging, or recent technologies for reducing emissions from older, uncertified residential wood burning stoves.

Solvers



Discussion and feedback:

- **What challenges or opportunities do you see might occur for**
 - **retrofits as a general approach?**
 - **testing of retrofits?**
 - **spurring commercial interest?**
 - **spurring regulatory revisions?**

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- For more information go to:
- <https://www.innocentive.com/ar/challenge/9933616>

or

- <http://bit.ly/1oqGKFO>

Or contact me

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