



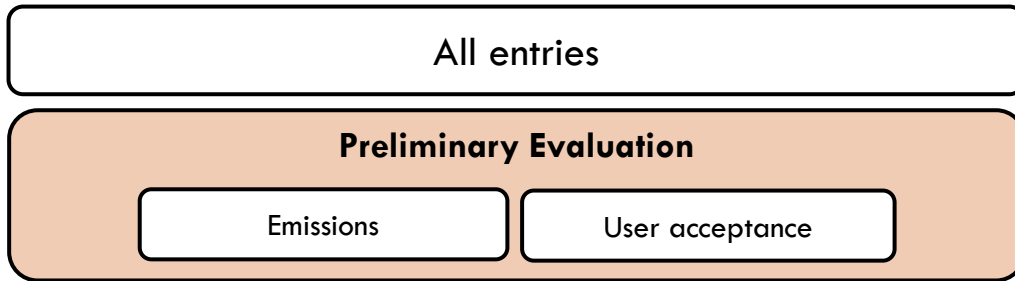
DRAFT: COOKSTOVE INNOVATION PRIZE + INCUBATION PLATFORM

December 5, 2016

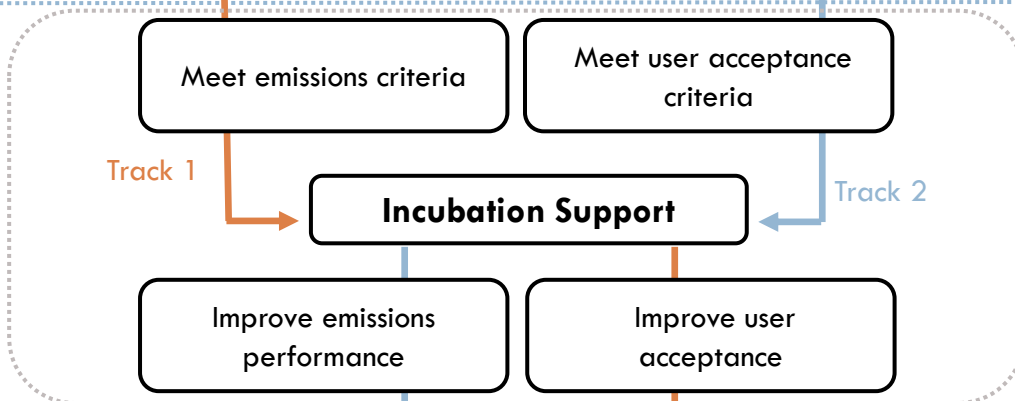
Competition Structure



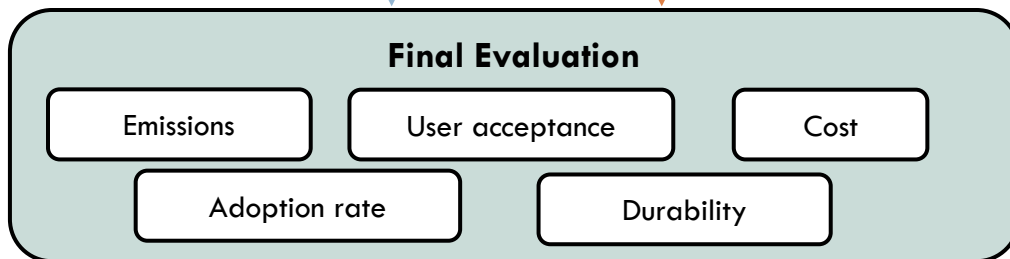
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- Teams submit their entries for preliminary evaluation
- Entries are shortlisted for the next phase based on meeting **either** emissions performance criteria (Tier 4 equivalent) **or** meet a minimum score for user acceptance criteria



- Selected teams may then then follow one of two incubation tracks – availing resources to refine their designs in one of two directions:
 - Improving user friendliness of the lowest emissions stoves
 - Improving the emissions performance of stoves users favour



- The ultimate prize winner(s) produce designs that can pass user acceptance + emissions tests + criteria for durability, cost, adoption rate



Roadmap Action: Incubator



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- Technology is challenging, can require many iterations, and significant expenditure on materials, tools
 - ▣ Estimates of the cost of the full product design process ranged from several lakh to several crore
 - ▣ Full process can take weeks to years, depending on whether design building on existing technology and extent of field testing
- Access to testing equipment can help speed up design process by reducing amount of “random experimentation” and reducing iterations required with testing labs (e.g. bomb calorimeter, thermal imaging camera, other diagnostic tools)
- Some expressed need for collaboration to avoid repeating mistakes; but important to do in a way that also addresses concerns about existing intellectual property
- Major emphasis on need to consider user-friendliness, not just technology and emissions performance

Action: Incubator



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- Tough product design challenge: combine technical design for emissions performance while meeting user requirements, preferences, and price points
- Right now have some companies who have gone a long way to meeting user preferences, but don't meet stringent emissions criteria; cleanest biomass stoves in the Indian have user acceptance challenges.
- Challenge of how to spark disruptive innovation in sector while addressing existing concerns raised by stakeholders from both supply and demand side:
 - ▣ Would require significant resources (both time and money) from enterprises
 - ▣ Importance of meeting quality, robustness, field performance, and other user criteria
- Develop sector-specific platform to convene financial and non-financial support, drawing on relevant expertise from other sectors and applying it to the clean cooking challenge
- Next Step: Design of technology incubator for next generation of cookstoves (and biomass fuels)

Objectives



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- Goal is to achieve a range of Tier 4 (emissions) biomass cooking solutions that are rigorously tested for user acceptability, with a preliminary evaluation to access incubation support.
 - ▣ Focus on blueprint for a Challenge Prize with carefully designed criteria + Incubation Support Platform
- Updated framework in this presentation includes insights from a recent workshop on user acceptance criteria and measurement
- Further stakeholder feedback is ongoing to finalise incubation support requirements and cutoff values for criteria.

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Preliminary Evaluation

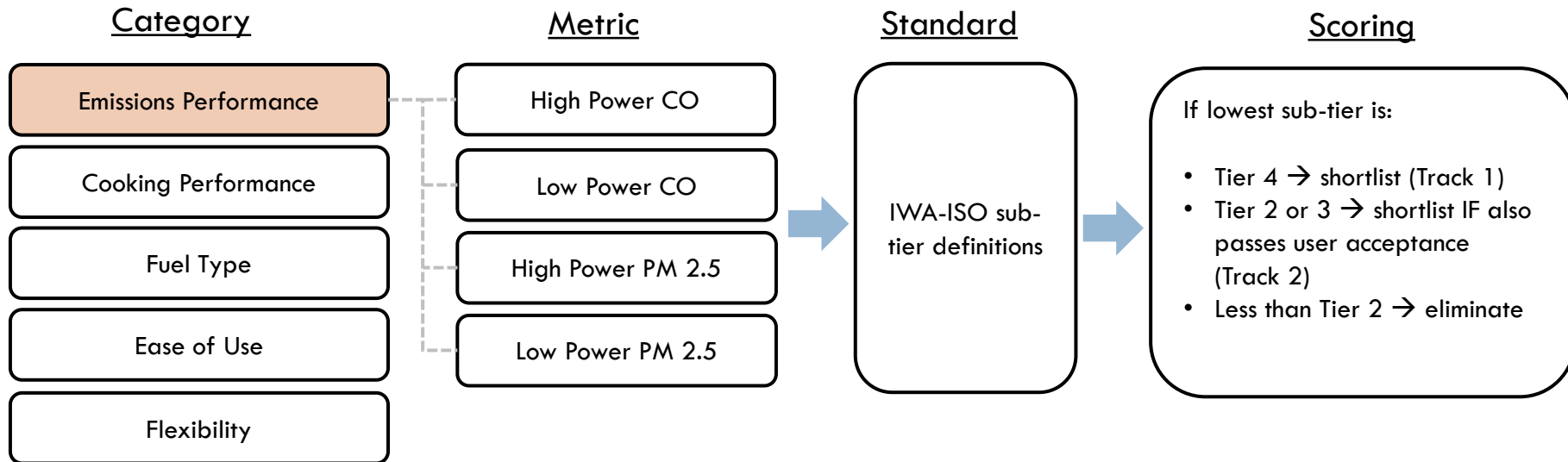
Emissions and User Acceptance Criteria

Date

Emissions Criteria



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Rationale:

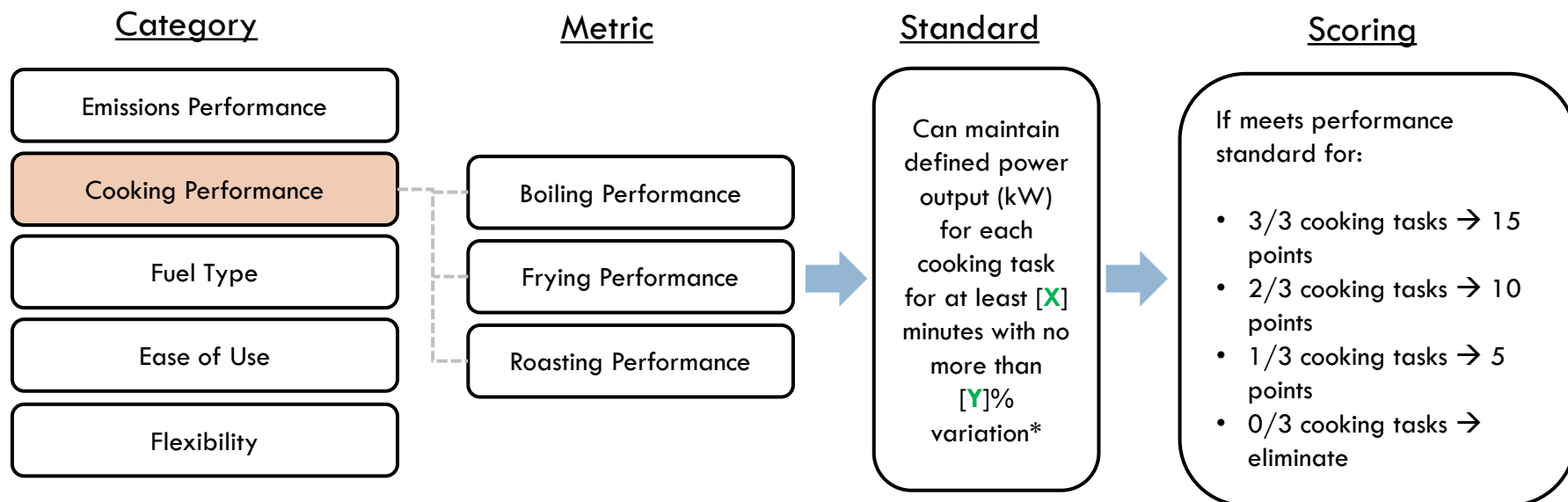
- All entries progressing to the incubation support phase need to meet at least some minimum emissions performance (Tier 2)
- Since one objective of prize is Tier 4 performance, those achieving Tier 4 in preliminary round move ahead automatically (user criteria may be measured to inform incubation phase work)
- However those with high rankings on user performance may be incubated to improve emissions performance

User Criteria: Cooking Performance



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Rationale:

- For entry, based on three most common cooking tasks in India. Importance of ability to maintain a given power output has been emphasized.
- Versatility is rewarded for stove systems that meet minimum performance in more than one cooking task
- If a stove system cannot meet minimum performance in any of these categories, it is automatically disqualified from Track 2 option

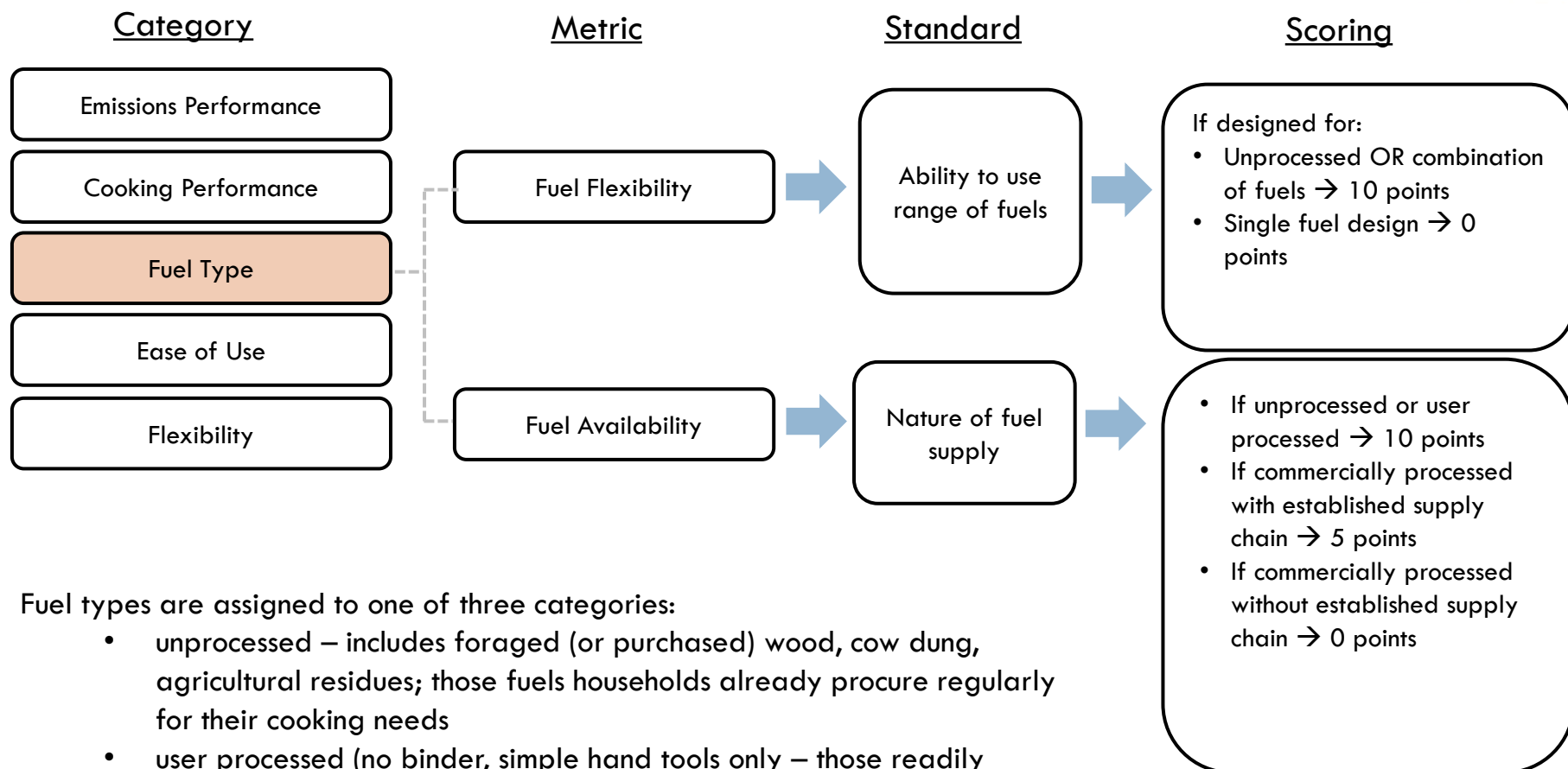
* Potential measurement challenges need to be explored

User Criteria: Fuel Type



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Fuel types are assigned to one of three categories:

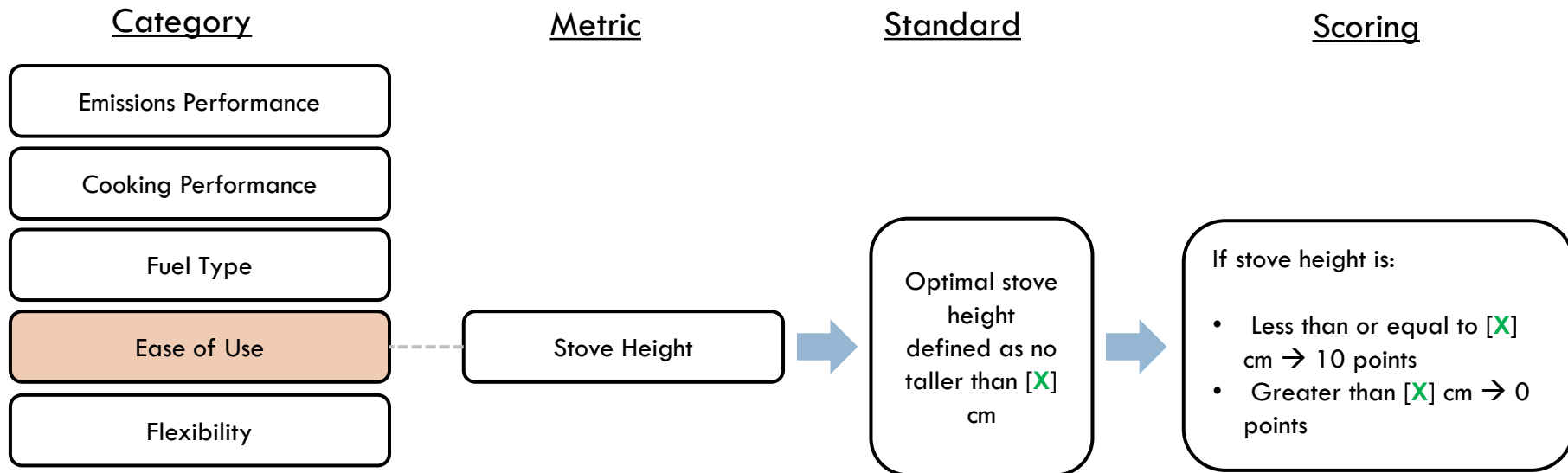
- unprocessed – includes foraged (or purchased) wood, cow dung, agricultural residues; those fuels households already procure regularly for their cooking needs
- user processed (no binder, simple hand tools only – those readily available in most households)
- bulk/commercially processed (equipment beyond simple hand tools)

User Criteria: Ease of Use



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Rationale:

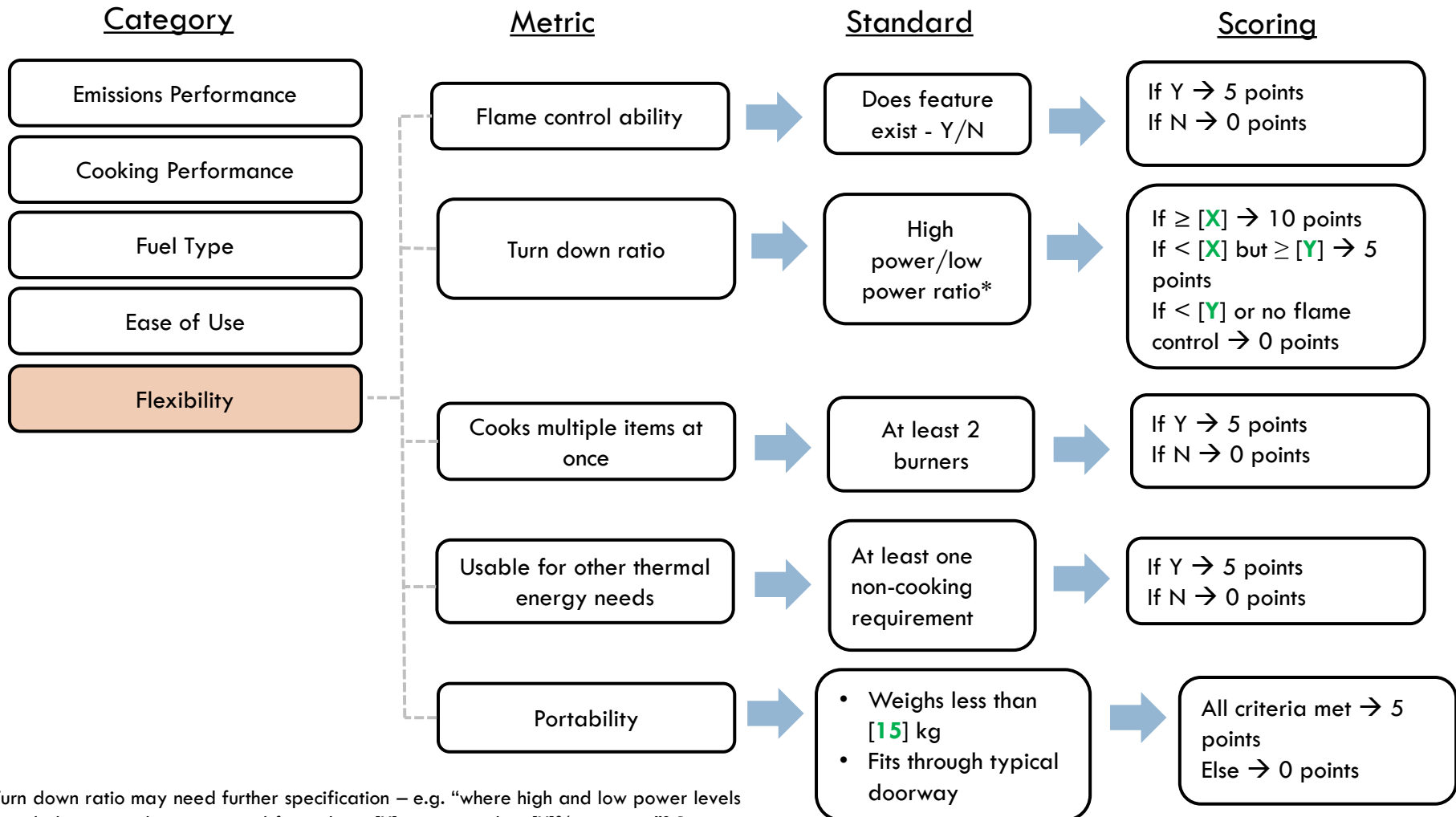
- Majority of cooking is done while seated in India, so the objective is to ensure stove systems work with the typical cooking posture.
- This requirement is often at odds with optimal stove design (for emissions performance) since taller stoves allow more complete combustion – so this criterion incentivizes balancing the typical user's need with the technical design

User Criteria: Flexibility



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*Turn down ratio may need further specification – e.g. “where high and low power levels for calculating can be maintained for at least [X] minutes with $< [X]\%$ variation”? But practical measurement challenges may need to be considered.

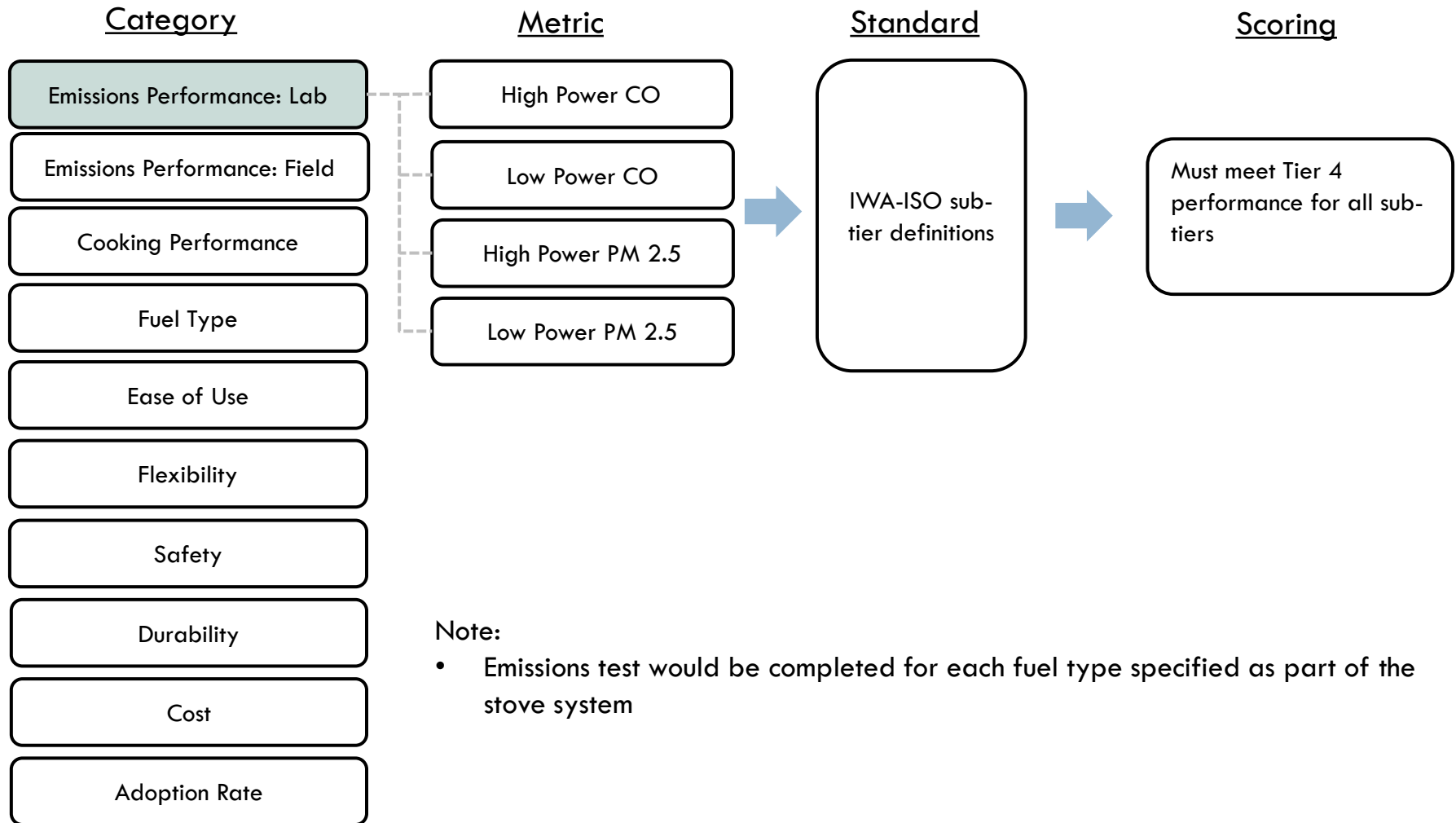
Final Evaluation

Lab + field emissions, user acceptance, durability, cost, and adoption rate criteria

Emissions Criteria: Lab



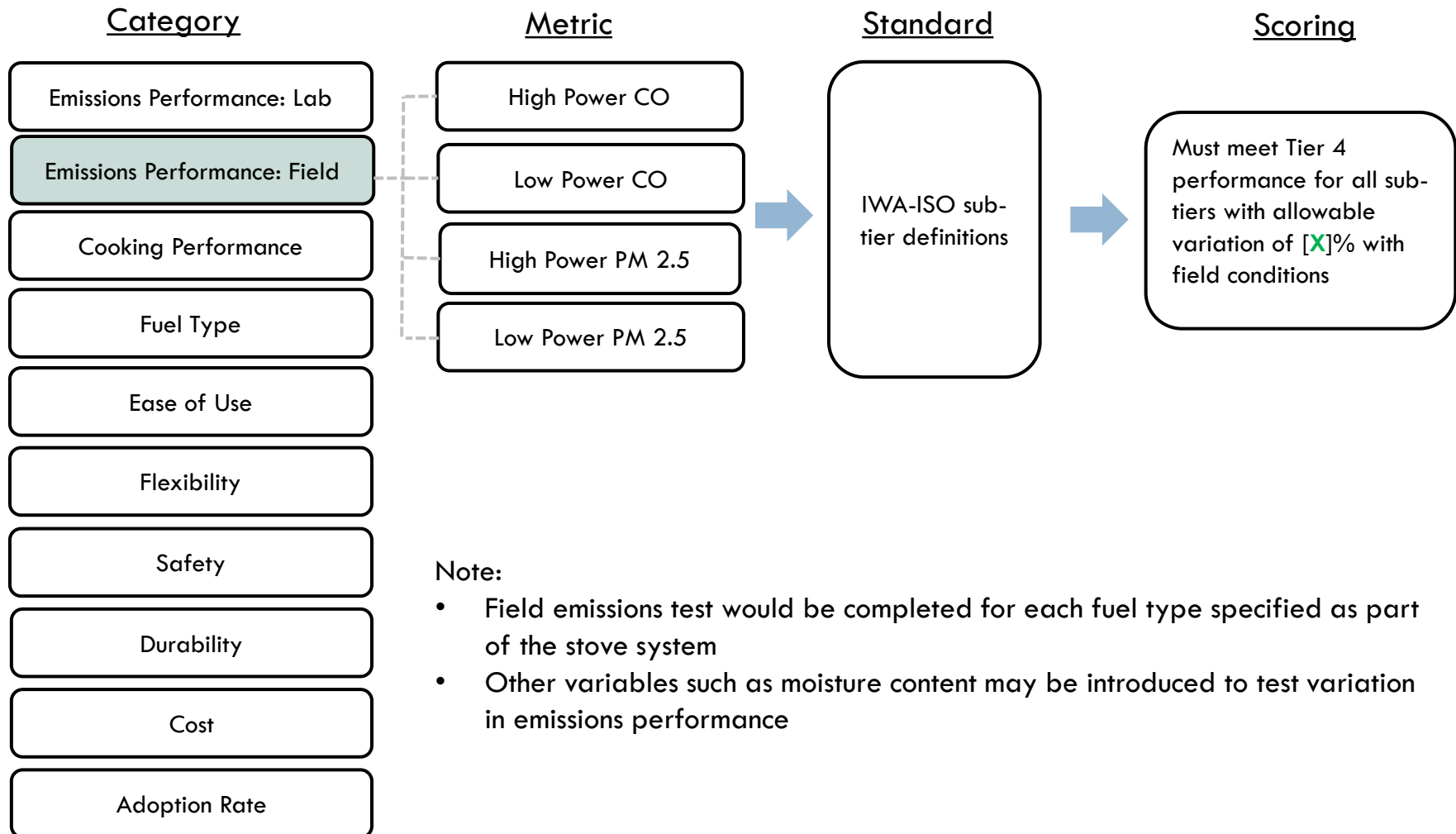
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Emissions Criteria: Field



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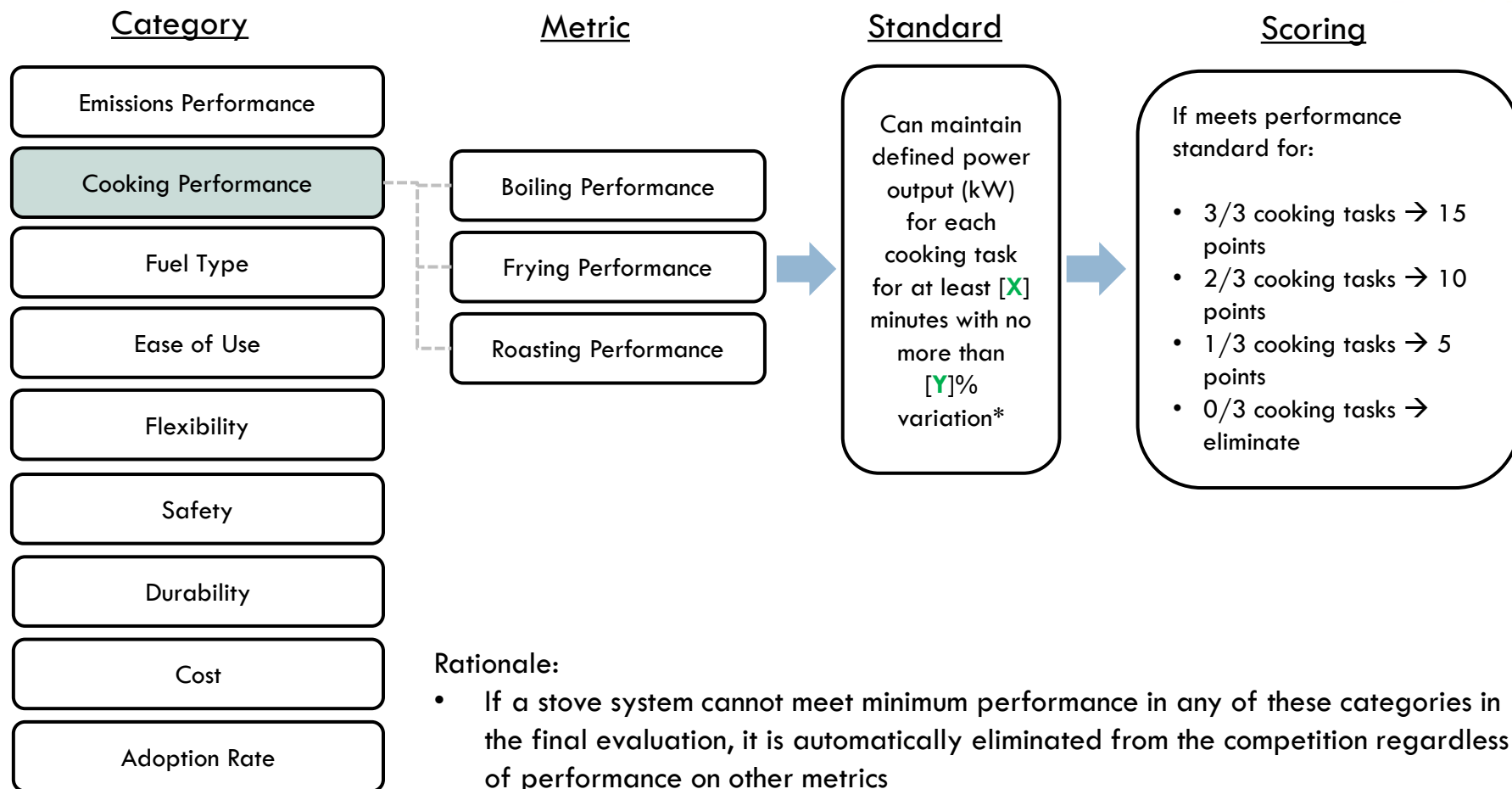


User Criteria: Cooking Performance



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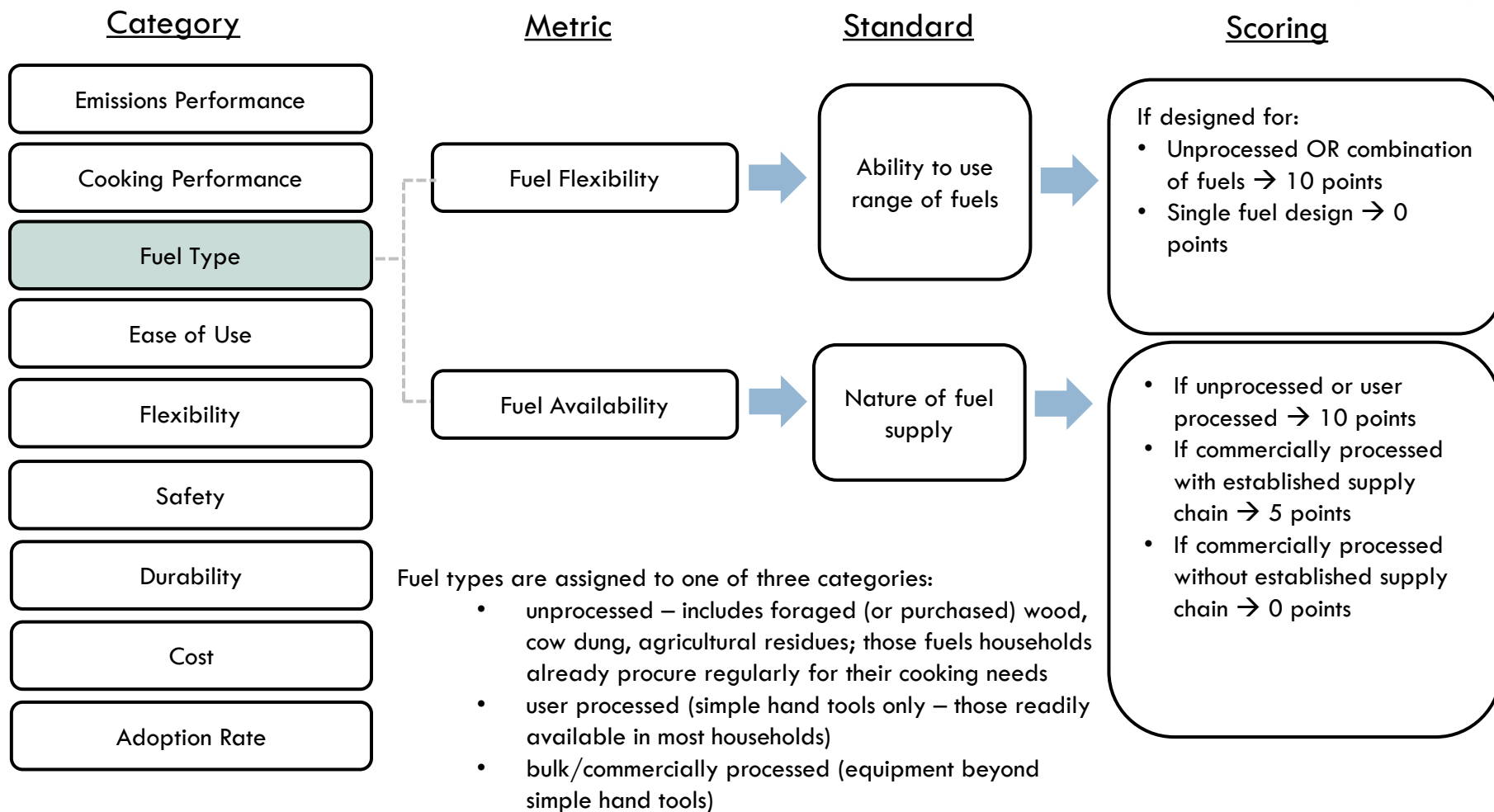
* Potential measurement challenges need to be explored

User Criteria: Fuel Type



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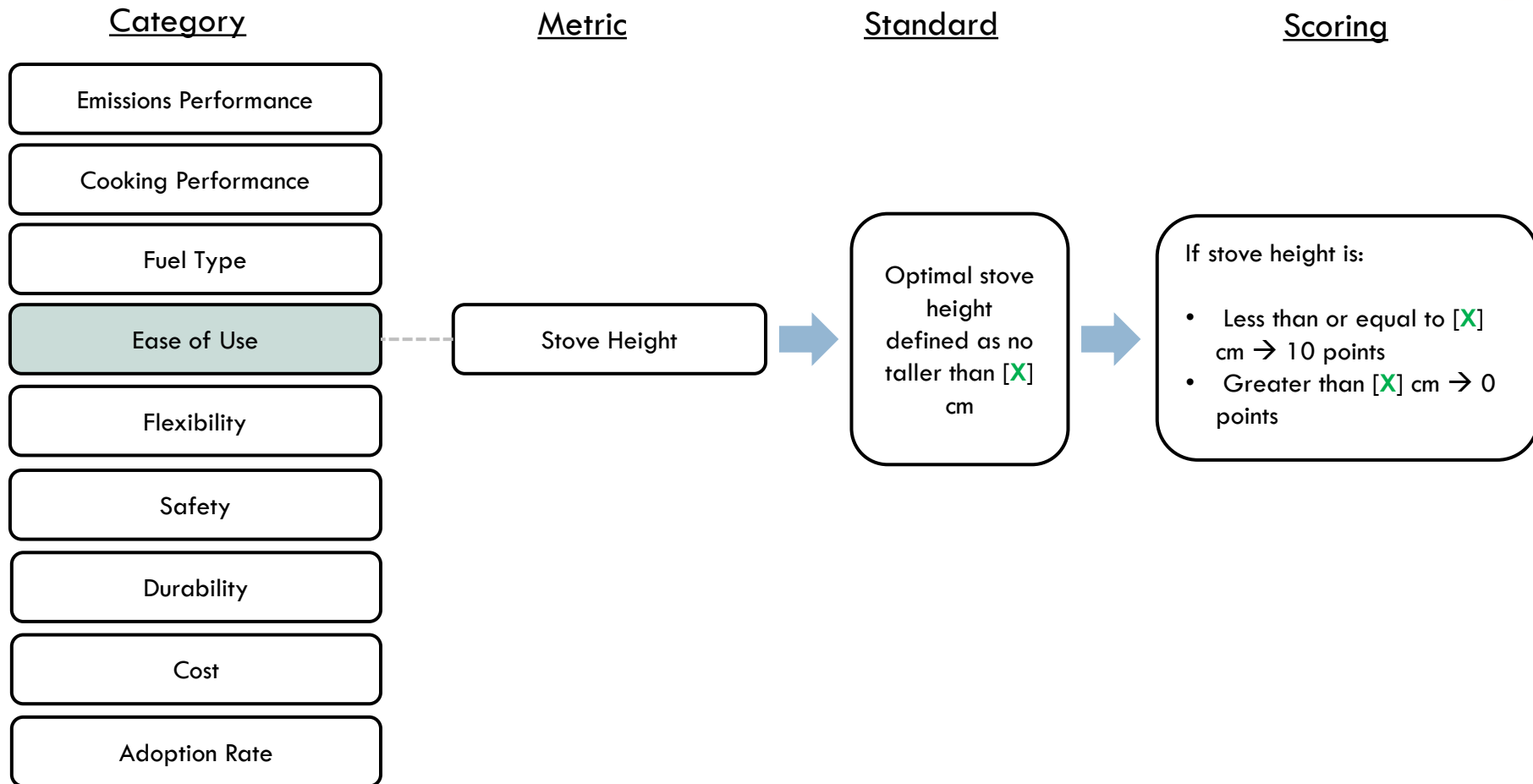


User Criteria: Ease of Use



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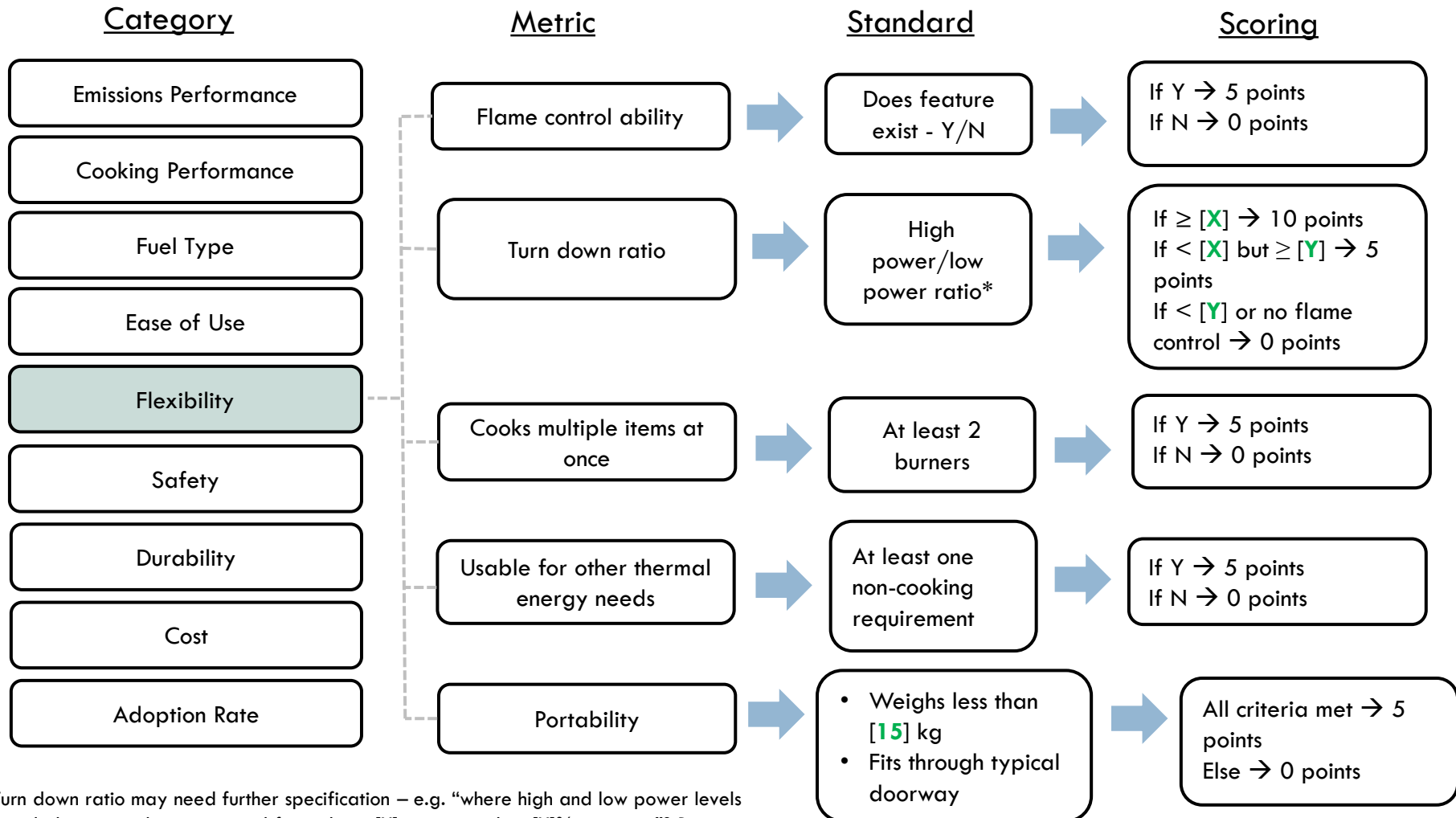


User Criteria: Flexibility



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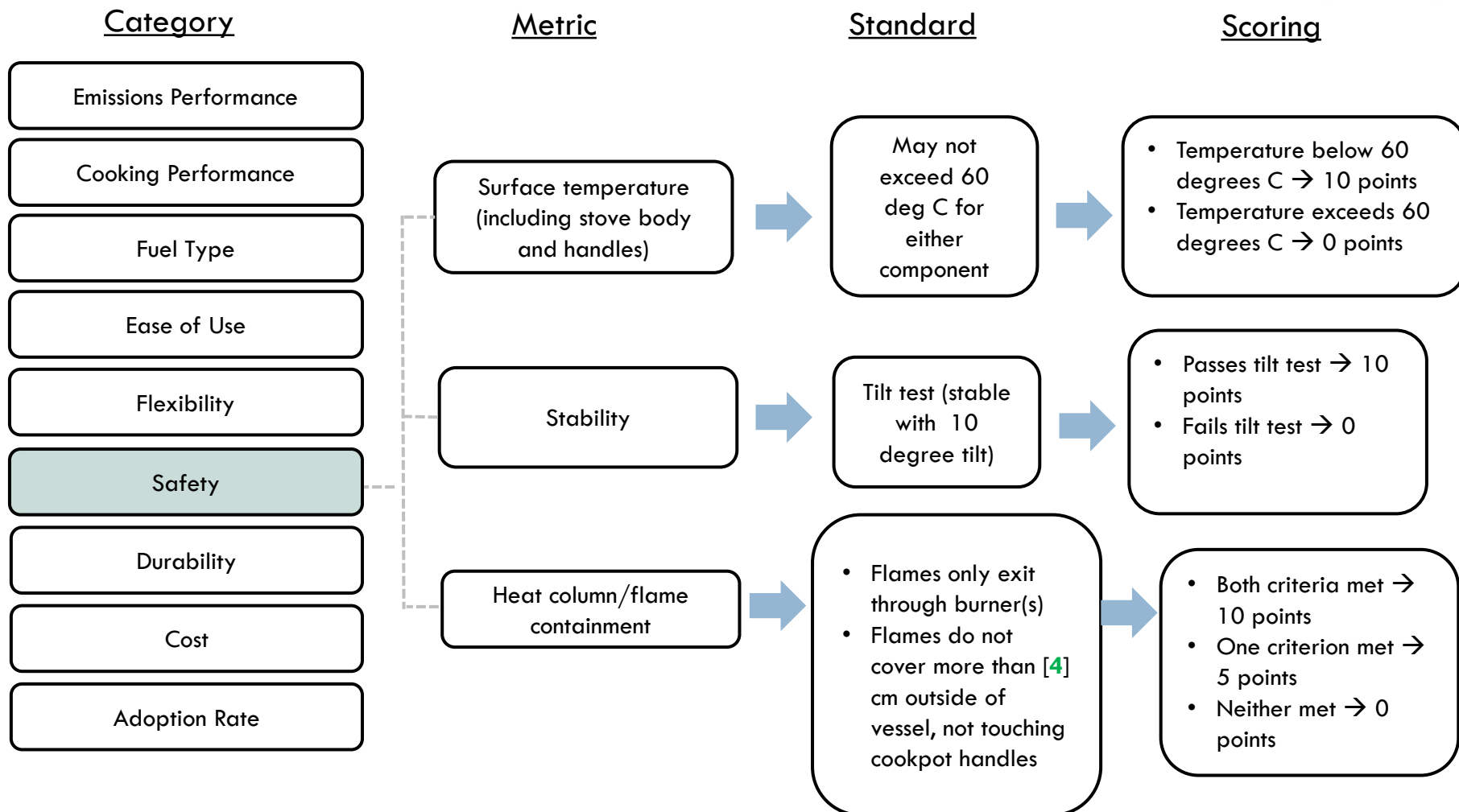
*Turn down ratio may need further specification – e.g. “where high and low power levels for calculating can be maintained for at least [X] minutes with $< [X]\%$ variation”? But practical measurement challenges may need to be considered.

User Criteria: Safety



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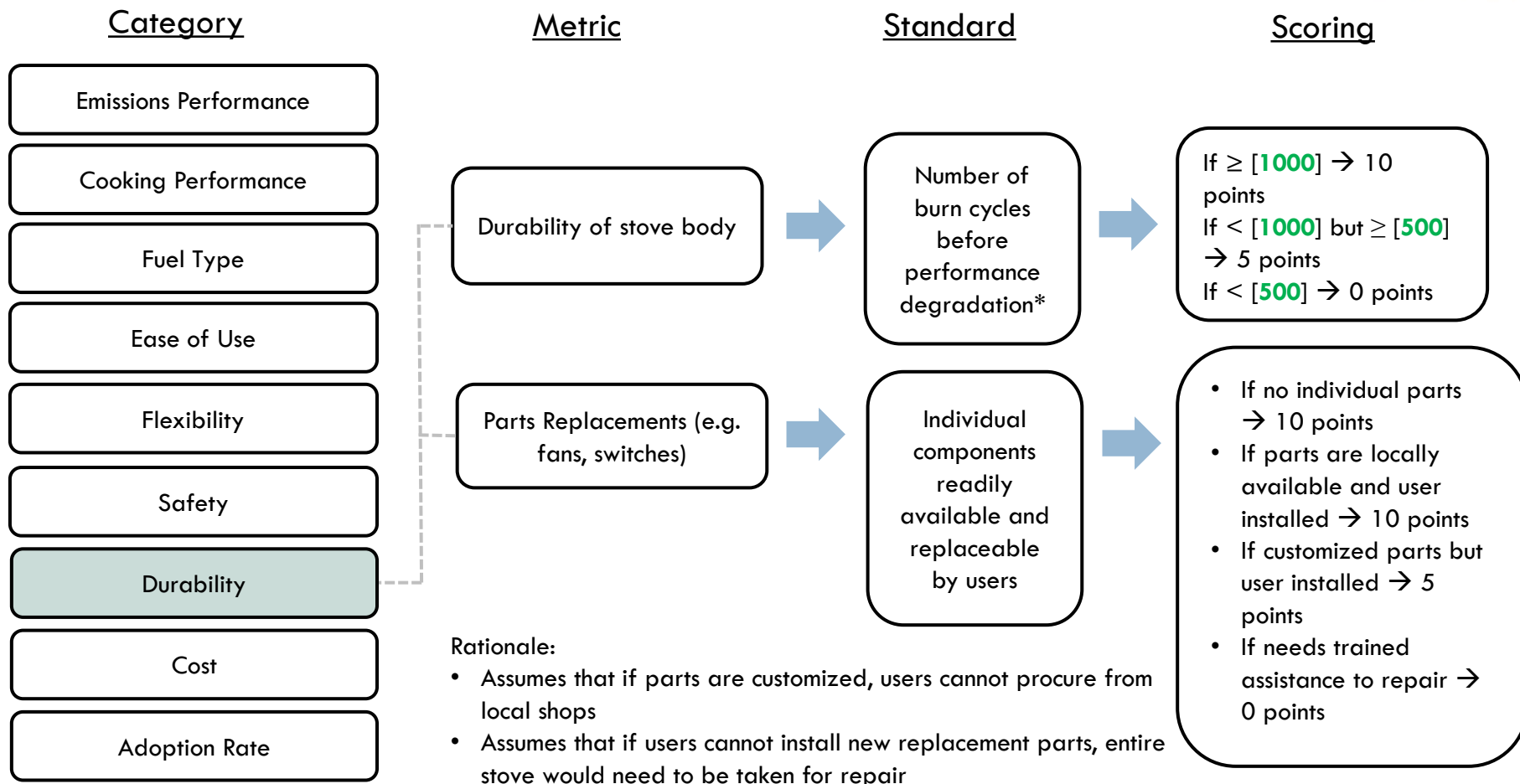


User Criteria: Durability



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* Testing for corrosion, material failure, damage to stove body (see full cookstove durability protocol from GACC)

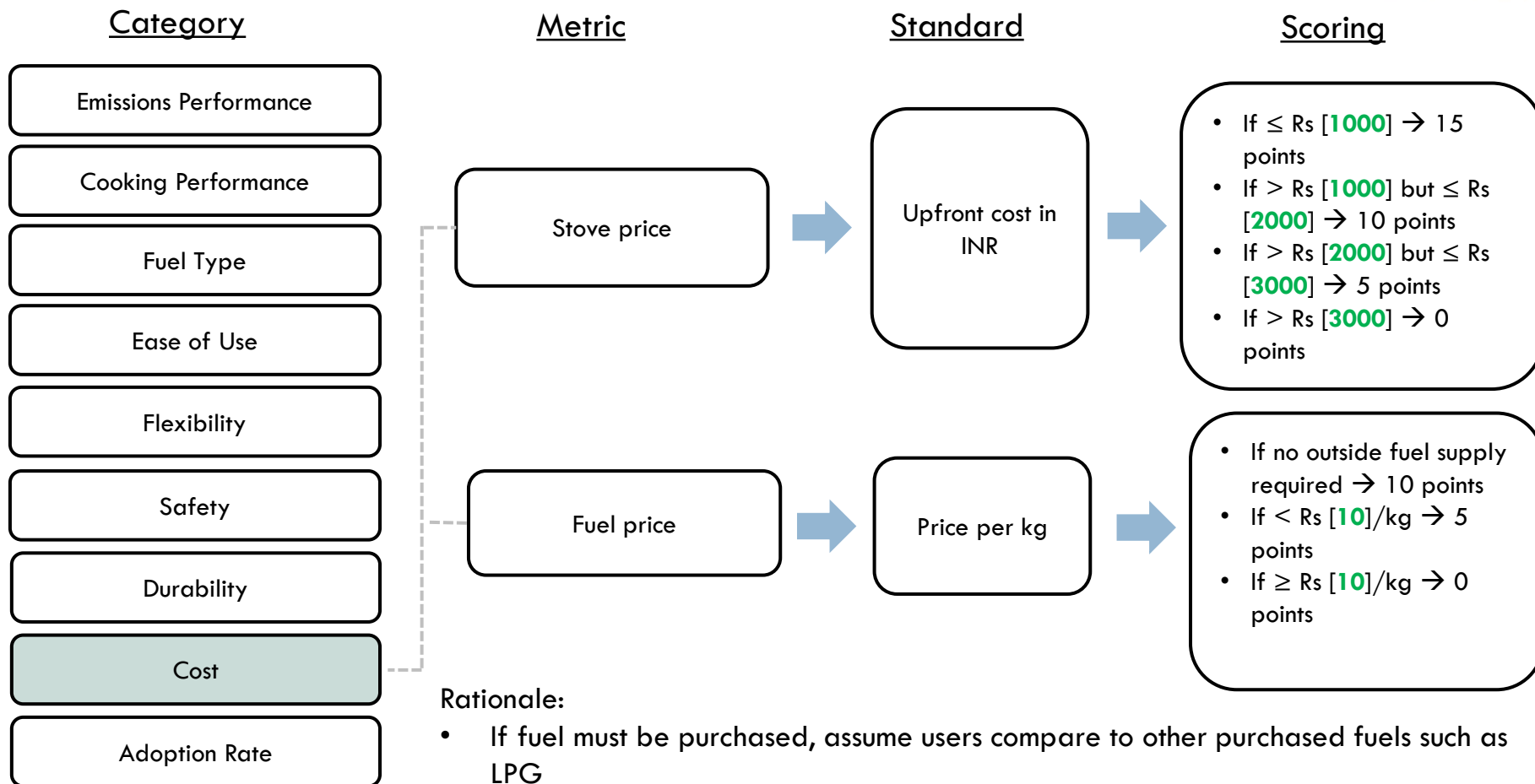
<https://cleancookstoves.org/binary-data/DOCUMENT/file/000/000/89-1.pdf>

User Criteria: Cost



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Rationale:

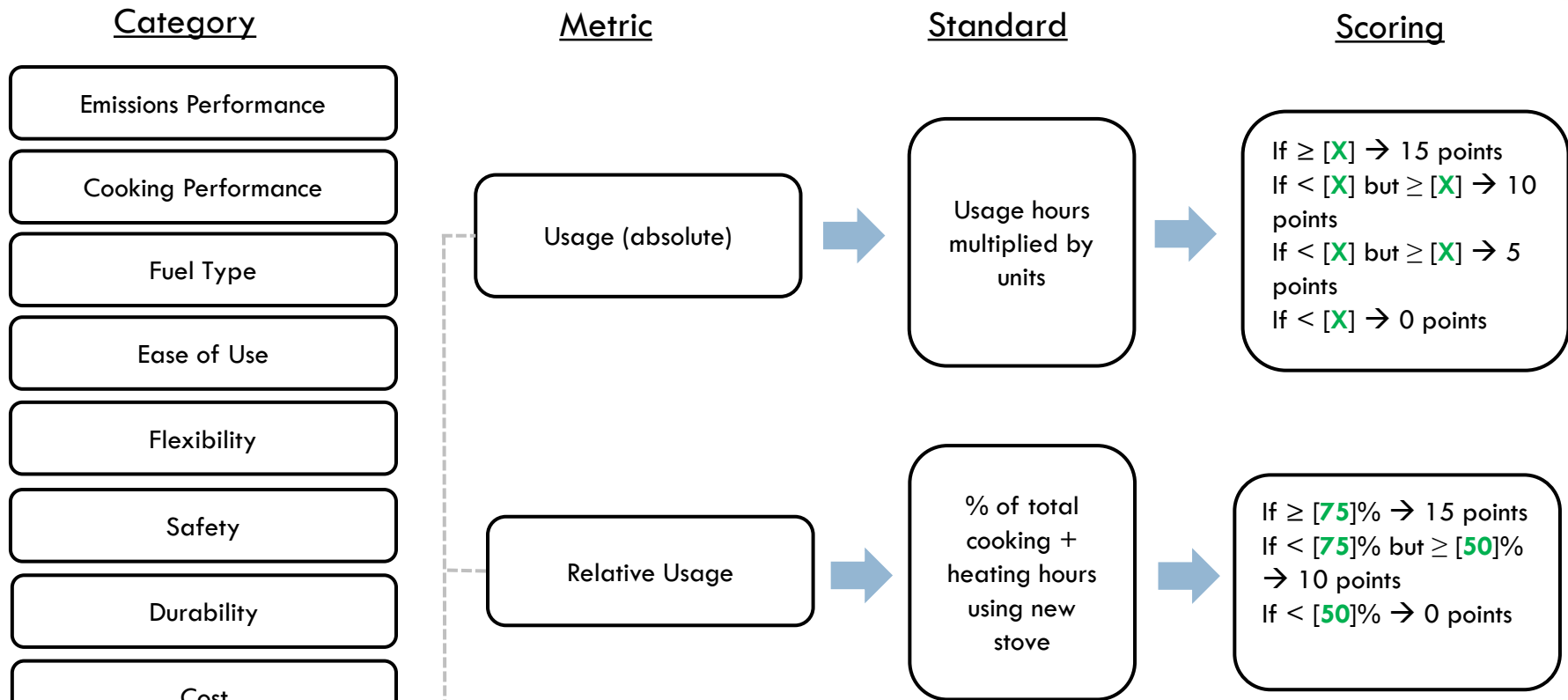
- If fuel must be purchased, assume users compare to other purchased fuels such as LPG
- Cost assumes scale of [50,000] units according specified advance market commitment

User Criteria: Adoption Rate



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Rationale:

- Can use temperature sensors for remotely tracking usage information for both new stove and traditional stove (as demonstrated by Nexleaf Analytics)
- Points are awarded for both total usage time over the trial period as well as for stoves whose usage surpasses that of the traditional stove
- Values would be averaged / aggregated across households supplied with stove

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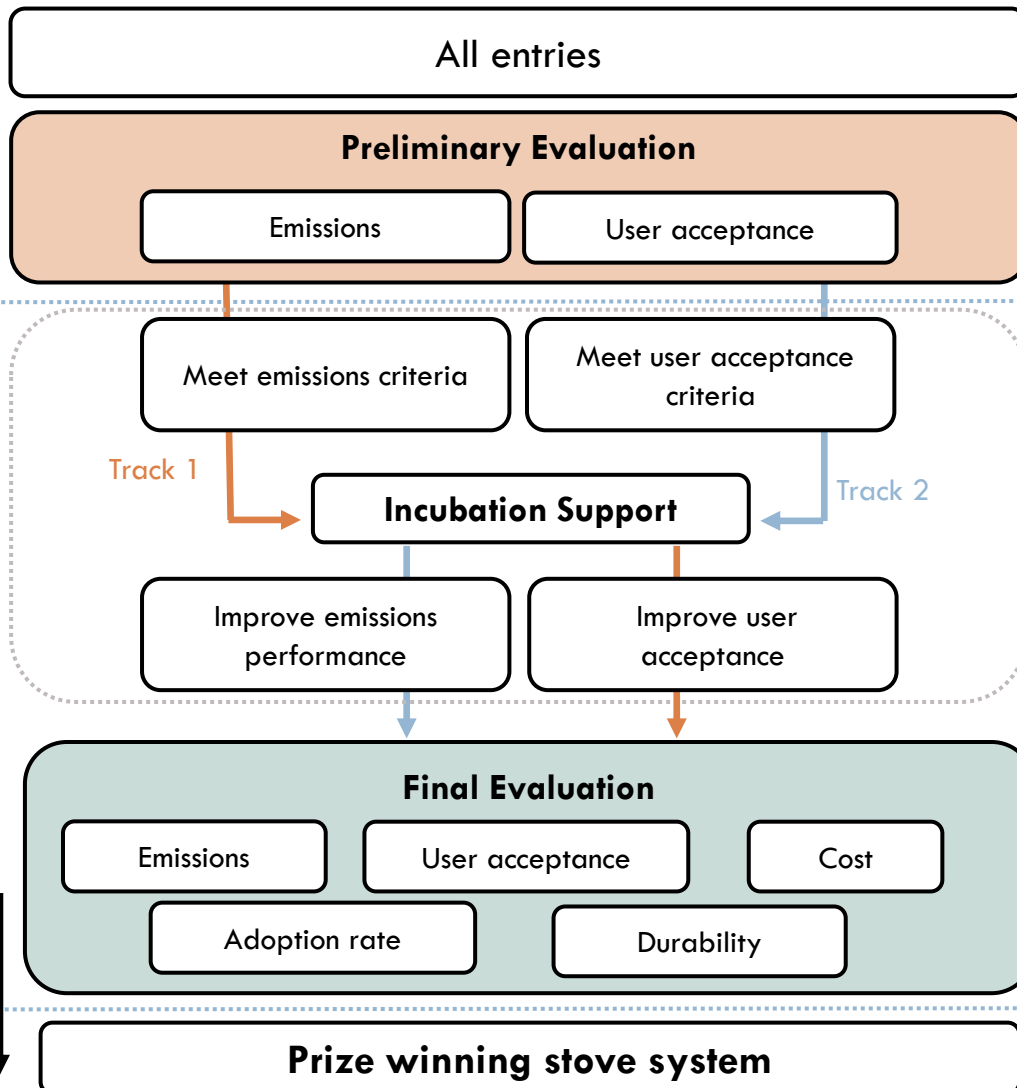
Incubation Network

Date

Incubation Phases



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- Track 1: User-centric Design Incubation
 - Consumer insights expertise & mentoring
 - Consumer testing – mobile kitchen
 - Testing facility
 - Technology tinkering facility
 - Manufacturing of parts /prototype
 - Financial Support
- Track 2: Technology Upgradation Incubation
 - Specialist technology expertise & mentoring
 - Technology testing facility
 - Technology tinkering facility
 - Manufacturing of parts /prototype
 - Financial Support

Types of Incubation Support



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Range of Incubation Support	
Support Type	Explanation
Building Technology & Prototyping	<ul style="list-style-type: none"> • Access to facility in which to create prototype including computer CAD programs and technologies required • Access to testing facility for quick testing and iteration • Access to expertise in technology upgradation in particular area of work
Consumer Acceptance & Consumer Centred Design	<ul style="list-style-type: none"> • Access to consumer behavior insight expertise and guidelines • Access to human centred design expertise • Access to consumers to help with testing • Access to testing facilities such as mobile kitchen • Access to facility to build/change technology
Lab Testing	<ul style="list-style-type: none"> • Labs for testing emissions and other criteria • Field labs (mobile kitchens) for testing criteria • Process and ready partners for testing stoves within households
Business and Market Readiness	<ul style="list-style-type: none"> • Mentoring and facility to refine prototype to market ready product • Support to create business plan, assess financial viability • Access to help assessing market opportunities • Access to support creating distribution & maintenance network
Manufacturing	<ul style="list-style-type: none"> • Access to manufacturer to build prototype and/or parts quickly • Access to manufacturer to build post-prototype product
Other	<ul style="list-style-type: none"> • Access to talent pool to fill gaps within team • Access to talent pool to bring on board short-term experts • Access to resources and guidelines on cookstoves, consumer centred design.

Resources in India



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- Most resources dedicated to the later stage – business models
- But those not currently dedicated to cookstove challenge exist
 - Scientific principles of stove design, and tools for simulations - IIT Delhi, IIT Bombay – experts identified
 - User centred design experts – orgs like Centre for Knowledge Societies (CKS)
 - Manufacturers with expertise in metal working, ceramics (auto ancillary parts manufacturers, stainless steel utensil industry)
 - NGOs working with womens SHGs as link to users such as Self Employed Women’s Association (SEWA), Grassroots Trading Network for Women (GTNFW), Swayam Shiksan Prayog (SSP)
 - Tools for use in rapid prototyping – diagnostic tools

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Operational Considerations

Date

User Testing Framework



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- To balance the resources necessary to test a range of user criteria at various points in the competition, the following framework was proposed:
 - For preliminary evaluation, most user criteria could be evaluated on the basis of a **questionnaire** + audit by observation of a submitted **prototype**. Cooking performance can be tested in a simulated kitchen or **mobile testing lab**.
 - During incubation, a similar **mobile testing lab** could be used to support iterative development of stoves with rapid user feedback
 - For the final evaluation, stove systems would be **given directly to users**. Usage patterns would be observed in the household environment alongside traditional stove usage over a period several weeks (to allow time for users to adapt to the stove and be able to incorporate it as desired in their daily cooking + heating needs)

Testing Resources Overview



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User Acceptance

Emissions Performance

Preliminary Evaluation

- Submission of questionnaire and prototype
- Simulated/mobile kitchen for testing cooking performance

- Submission of certificate from approved testing lab

Incubation Support

- Simulated/mobile kitchen for testing cooking performance and doing rapid iteration with field feedback

- Access to testing labs and equipment for iteration on emissions performance

Final Evaluation

- Testing lab for safety, durability, cooking performance
- Submit stoves to identified households for direct user test
- Preliminary period of 2 weeks for training in use of stove
- Usage monitored over subsequent period of [1-2] months

- Testing labs for final evaluation
- Field emissions testing equipment for final evaluation under typical household usage conditions

Feedback



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- Suggestions and feedback would be appreciated on the following:
 - Any measurement challenges with the specified criteria
 - Scoring framework for criteria – including suggestions for cutoff points (currently noted by [X] in the framework)
 - Operational plan for user testing

- In addition, we welcome suggestions on the nature of support required for entrants via the incubation platform to meet this set of criteria
 - Will be designed to cover both technical design improvements as well as extensive user engagement