ASTRA Webinar Survey Feedback Report

Audience feedback analysis from the “Help us shape ASTRA” questionnaire

Prepared for Martin Patel and Frédéric Bless

Prepared by Mostafa Babaei | 26 June 2026

1. Executive summary

The webinar survey produced a strong positive signal for ASTRA as an early-stage industrial heat pump decision-support platform. Out of 22 respondents, none rejected future use of ASTRA. The strongest demand is not only for working-fluid ranking, but for architecture comparison, techno-economic evaluation, retrofit screening, and scenario analysis under site-specific constraints.

Responses	Relevant or very relevant	Could use ASTRA	Follow-up interest
22	**18/21**	**15 Yes**	**19 Yes**
Approx. 40-44% response rate if 50-55 attended	86% of valid ratings	7 Maybe, 0 No	16 left an email

Key interpretation: the feedback supports positioning ASTRA as a transparent, scenario-based, early-stage decision-support platform for industrial heat pump integration, not only as an optimizer or refrigerant selector.

2. Survey scope and limitations

- The analysis is based on 22 completed questionnaire responses exported from Microsoft Forms.
- The attendee number was approximately 50 to 55, so the response rate is estimated at about 40 to 44%.
- Responses mainly came from consultants, heat pump/equipment manufacturers, and researchers. No direct industrial end-user selected that category.
- The temperature question allowed multiple selections. Therefore, the results are interpreted as relevant temperature ranges rather than a strict single maximum temperature.
- The results are encouraging but should be treated as early validation, since respondents were self-selected and probably more interested than the average attendee.

3. Respondent profile

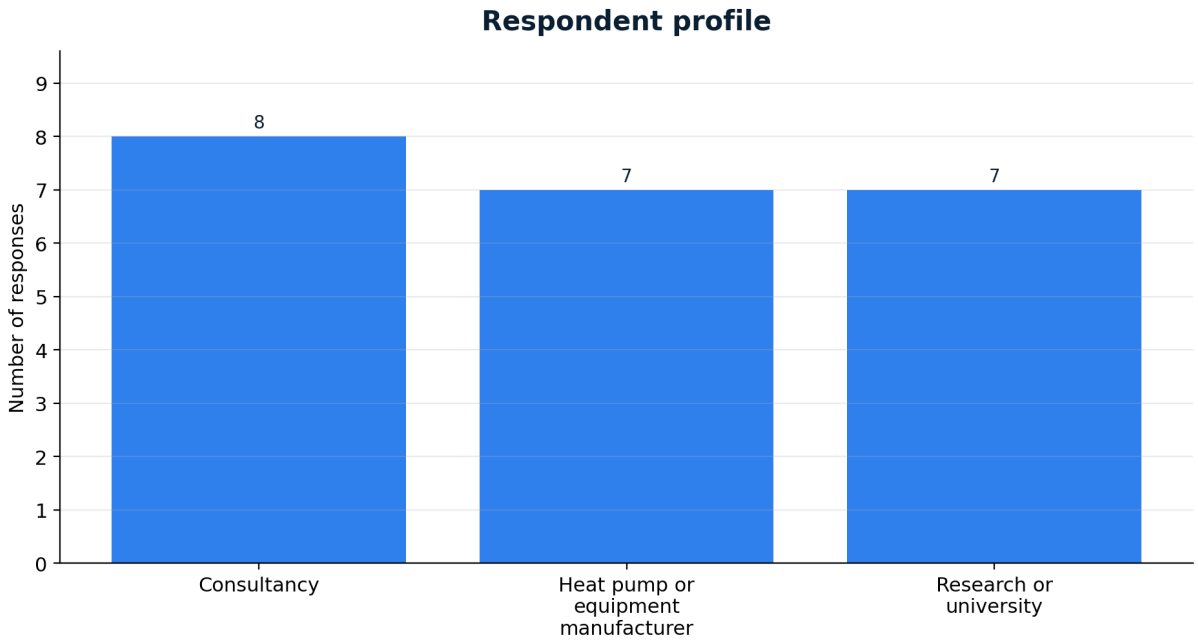

Figure 1. Organization categories of respondents.

Organization type	Responses	Share
Consultancy	8	36%
Heat pump or equipment manufacturer	7	32%
Research or university	7	32%

Interpretation: the strongest feedback came from actors who are close to early-stage design and technology development. Consultants appear to be immediate potential users, while equipment manufacturers are important validation and collaboration partners.

4. Relevance and adoption potential

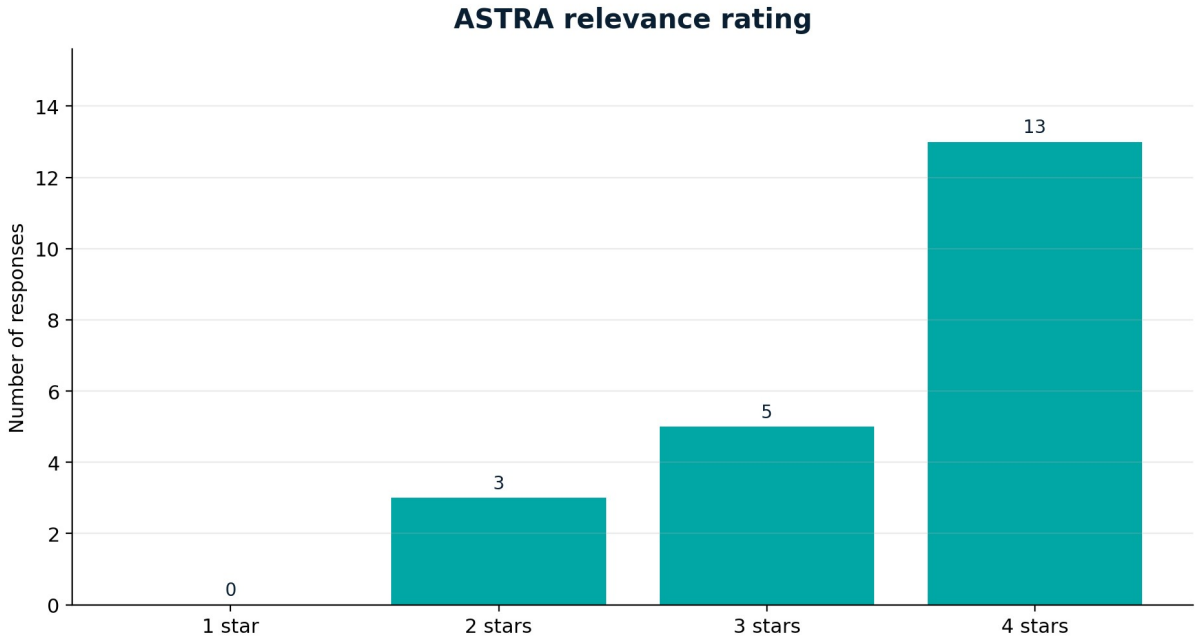

Figure 2. Distribution of ASTRA relevance ratings.

Metric	Result
Average relevance score	3.48 out of 4
Median relevance score	4 out of 4
Rated relevant or very relevant	18/21 (86%)
Rated very relevant	13/21 (62%)
Rated not relevant	0

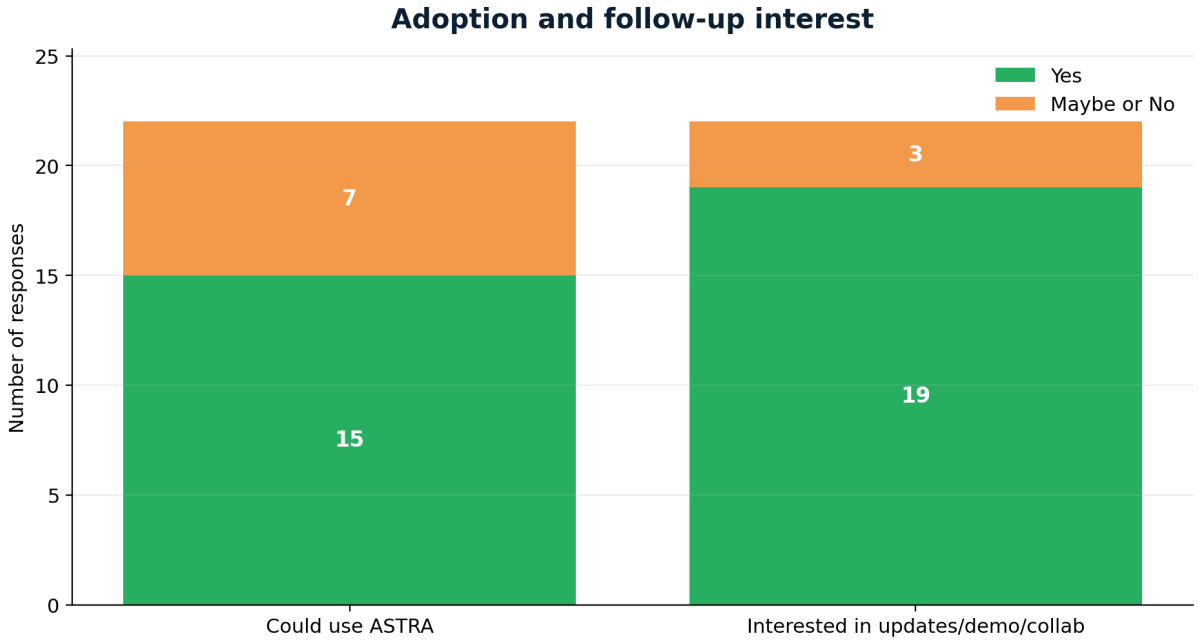

Figure 3. Self-reported adoption potential and follow-up interest.

Question	Yes	Maybe/No	Interpretation
Could imagine using ASTRA	15	7	No respondent answered No.
Interested in updates/demo/collaboration	19	3	High conversion to follow-up interest.

Segment insight: consultants were the most positive near-term user group. Manufacturers were more cautious in adoption, but still interested in updates and discussions. This is consistent with their need to protect vendor-specific design assumptions and product boundaries.

Segment	n	Average relevance	Use: Yes	Use: Maybe	Follow-up: Yes
Consultancy	8	3.86	7	1	7
Heat pump or equipment manufacturer	7	3.14	2	5	6
Research or university	7	3.43	6	1	6

5. Requested ASTRA capabilities

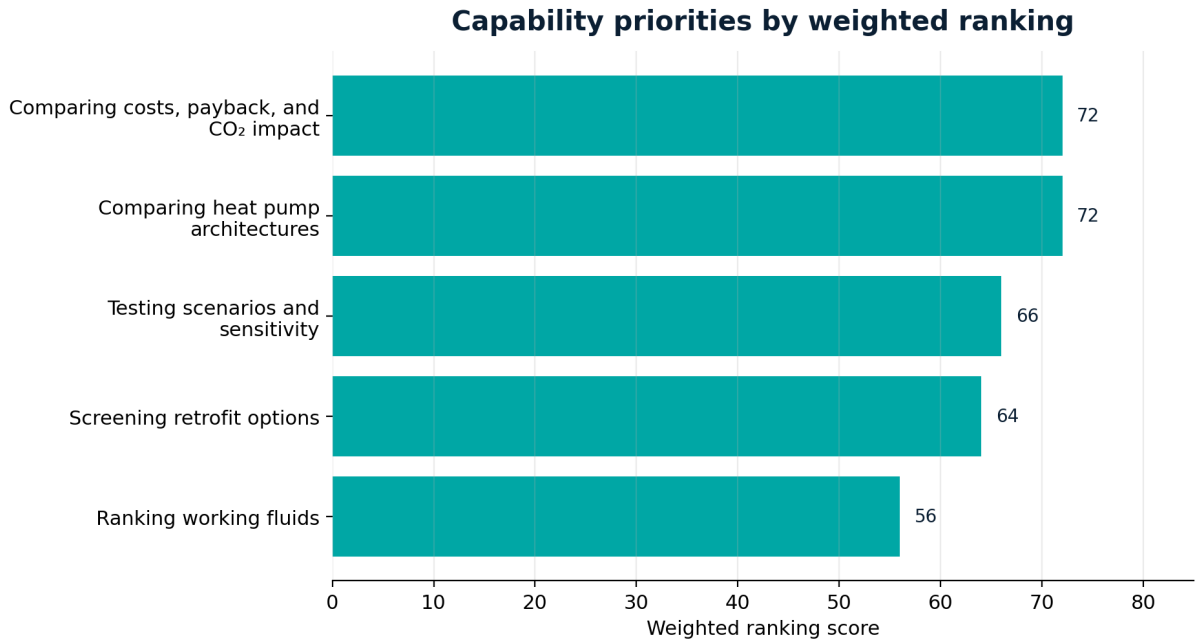

Figure 4. Weighted ranking of ASTRA capabilities. Higher score means higher overall priority.

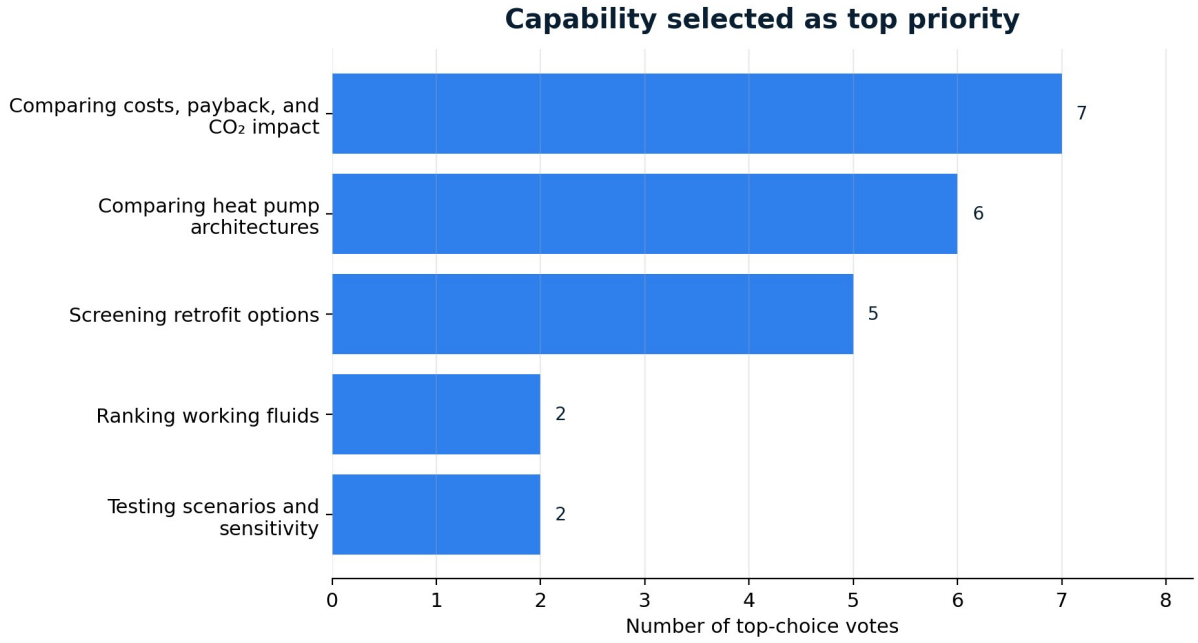

Figure 5. Capabilities selected as the top priority.

Capability	Top-choice votes	Weighted score	Average rank
Comparing heat pump architectures	6	72	2.73
Comparing costs, payback, and CO_2 impact	7	72	2.73
Testing scenarios and sensitivity	2	66	3.00
Screening retrofit options	5	64	3.09
Ranking working fluids	2	56	3.45

Interpretation: working-fluid ranking is useful, but it is not the central value proposition by itself. The stronger message is that ASTRA should compare architectures, economics, retrofit concepts, and scenario robustness together.

6. Barriers to high-temperature heat pump implementation

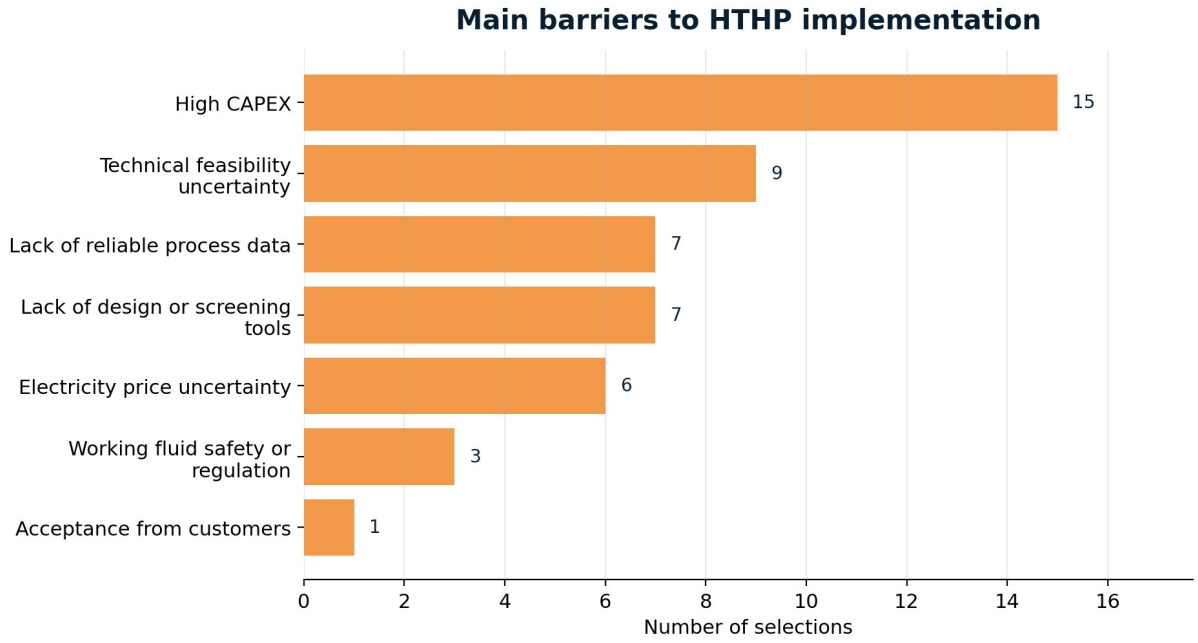

Figure 6. Main perceived barriers. Multiple selections were allowed.

Barrier	Selections	Share of respondents
High CAPEX	15	68%
Technical feasibility uncertainty	9	41%
Lack of design or screening tools	7	32%
Lack of reliable process data	7	32%
Electricity price uncertainty	6	27%
Working fluid safety or regulation	3	14%
Acceptance from customers	1	5%

Interpretation: CAPEX is the dominant barrier, followed by technical feasibility uncertainty. This means ASTRA should strongly emphasize CAPEX, OPEX, payback, TAC, scenario sensitivity, and transparent feasibility checks. Refrigerant safety matters, but was not the dominant concern in this survey.

7. Temperature ranges and access model

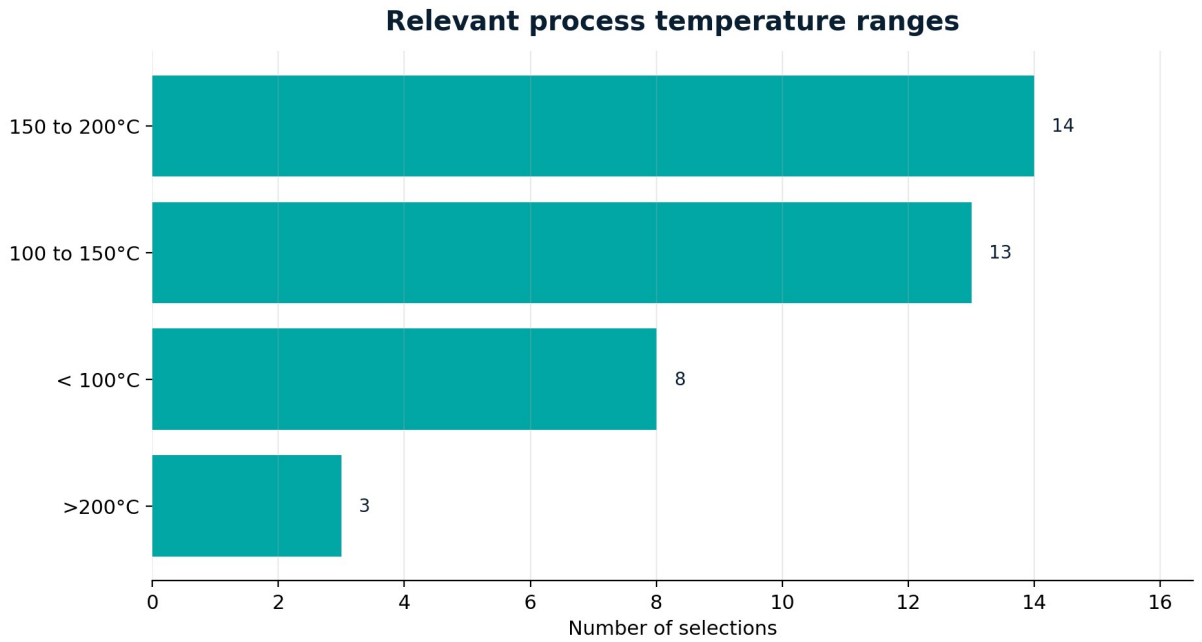

Figure 7. Relevant process temperature ranges. Multiple selections were allowed.

Temperature range	Selections	Highest selected range
< 100°C	8	2
100 to 150°C	13	6
150 to 200°C	14	11
>200°C	3	3

Interpretation: the strongest near-term focus should be 100 to 200°C industrial heat, with particular attention to 150 to 200°C. Above 200°C is interesting but less represented in this sample.

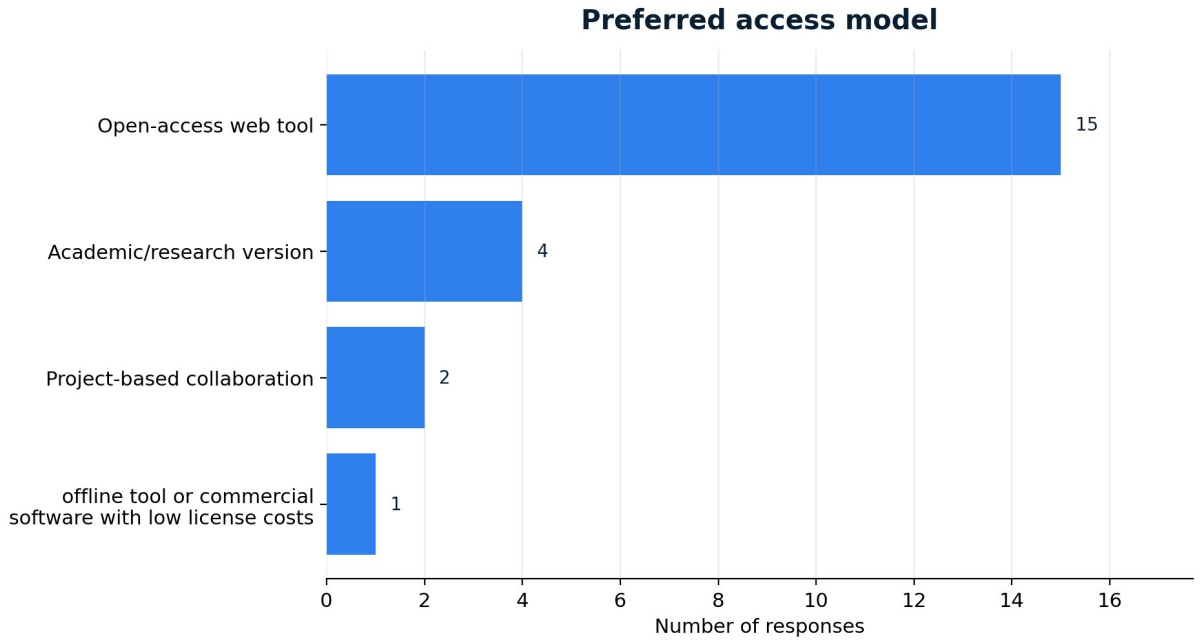

Figure 8. Preferred access model.

Access model	Responses	Share
Open-access web tool	15	68%
Academic/research version	4	18%
Project-based collaboration	2	9%

offline tool or commercial software with low license costs	1	5%

Interpretation: respondents clearly prefer low-friction access. This does not necessarily mean that the full ASTRA engine must be fully open. A sensible strategy would be an open web demo, a research/collaboration version, and later a controlled professional version for confidential industrial projects.

8. Qualitative feedback themes

Theme	Evidence from comments	ASTRA implication
Explainability and trust	Users want to understand why a selected option is optimal, not only receive a black-box result.	Add reasoning, rejected alternatives, binding constraints, and sensitivity explanations.
Boundary-condition-driven design	A respondent explicitly asked for best solutions under different boundary conditions.	Keep site-specific constraints and scenario inputs at the center of ASTRA.
Technology extensibility	Suggestions included ammonia/water mixtures, reverse Stirling, and other high-temperature technologies.	Design ASTRA so new technologies can be added later without overpromising now.
Measured data input	A respondent asked for measured data input.	Add data import, stream-profile construction, and data quality checks as future features.
Simple and expert modes	A manufacturer requested simple cycle analysis with as little effort as possible.	Offer a minimal-input screening mode and an advanced expert mode.
Modular product design	A manufacturer mentioned architectures that can work across many applications and be mass manufactured.	Explore ASTRA as a tool for identifying standardizable product modules.
Customizable outputs	A consultant asked for control over graph colors, units, currencies, languages, and customer-specific abbreviations.	This strongly supports the AI/LLM output-format layer.

9. Strategic recommendations

Recommended positioning

Position ASTRA as an early-stage industrial heat pump decision-support platform that screens and ranks feasible concepts using thermodynamic, economic, and practical constraints.

Development priorities

- Prioritize architecture comparison, economics, and scenario analysis over a narrow refrigerant-ranking message.
- Keep retrofit screening in the roadmap, but define it carefully as pre-feasibility screening for existing thermal systems, not full plant redesign.
- Build explainability into the output: why the option is selected, why others are rejected, and which assumptions drive the result.
- Develop a low-friction web demo while keeping advanced features available through research, collaboration, or controlled professional access.
- Add measured-data handling and customizable outputs as part of the industrial user layer.
- Treat manufacturers as validation partners for realistic constraints, compressor behavior, product envelopes, and modular architecture ideas.

Suggested immediate follow-up

- Thank respondents who left contact details and share the posters/papers where appropriate.
- Prioritize one-to-one discussions with consultants and equipment manufacturers who left detailed comments.
- Use the survey result in SWEET/DeCarbCH internal reporting as evidence of industrial interest.
- Prepare a short follow-up email stating that feedback will influence the ASTRA roadmap.

Appendix A. Detailed numerical summary

A1. Relevance distribution

Rating	Responses	Share of valid ratings
1 star	0	0%
2 star	3	14%
3 star	5	24%
4 star	13	62%
Missing	1	-

A2. Capability ranking

Capability	Top-choice votes	Weighted score	Average rank
Comparing heat pump architectures	6	72	2.73
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A3. Barriers

Barrier	Selections	Share of respondents
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A4. Temperature ranges

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100 to 150°C	13	59%	6
150 to 200°C	14	64%	11
>200°C	3	14%	3

Appendix B. Follow-up contacts and open comments

Note: contact details were voluntarily provided in the survey. Treat this appendix as internal and do not circulate externally without checking consent and relevance.

B1. Contacts left for follow-up

Organization category	Email
Heat pump or equipment manufacturer	Kamran.iranshahi@everllence.com
Research or university	vaishak@sdu.dk
Consultancy	jasper.daniels@swecobelgium.be
Research or university	Martin.patel@unige.ch
Consultancy	darko.weber@dmeag.ch
Heat pump or equipment manufacturer	kenneth.hoffmann@gea.com
Consultancy	sebastien.barnet@amstein-walthert.ch
Consultancy	Bertram.schedler@smartbridge.at
Research or university	alireza.mahmoudan@unige.ch

Research or university	mohamedali.hamada@polimi.it
Heat pump or equipment manufacturer	benedikt.woelke@atlascopco.com
Consultancy	andreas.santschi@eicher-pauli.ch
Heat pump or equipment manufacturer	john.brehm@carrier.com
Heat pump or equipment manufacturer	lorenzo.buldrini@andritz.com
Consultancy	elia.stieger@dmeag.ch
Consultancy	Robbiefoulkes8@gmail.com

B2. Open comments

Category	Email	Comment
Heat pump or equipment manufacturer	Kamran.iranshahi@everllence.com	Providing best solutions for different boundary conditions.
Research or university	Martin.patel@unige.ch	Transcritial
Heat pump or equipment manufacturer	kenneth.hoffmann@gea.com	For the heat pumps with temperature glide it would be good to include more technologies like ammonia/water mixture heatpumps: https://www.ago-energie.de/thermotechnik/ago-caldora-industriewaermepumpe/ Or reverse Stirling engine: https://www.hotgreensolutions.com/ https://olvondotech.no/
Consultancy	Bertram.schedler@smartbridge.at	Input for Measured Data / Thank you for this interessting Activity
Heat pump or equipment manufacturer	benedikt.woelke@atlascopco.com	The ability to analyze only simple heat pump cycles (1 or 2 sec with a recuperator)—with as little effort as possible.
Heat pump or equipment manufacturer	john.brehm@carrier.com	Potential of modules. E.g., finding architectures, that would work for many application (with no or small modifications) and can be mass manufactured instead of individual solutions.
Consultancy	elia.stieger@dmeag.ch	Regarding outputs, it would be helpful to choose / define: - colors of graphs, tables, etc. - language (English, German, Italian, 2 languages, ...) - units (joule vs. Wh, $ vs. Euro vs. CHF vs. ..., M$ or k$ or plain numbers for finances) - certain abbreviations (CapEx, OpEx, ...) Certain customers prefer their own abbreviations, units, colors, etc. and tailoring the output to a customer's needs / wishes helps in getting HTHPs installed.