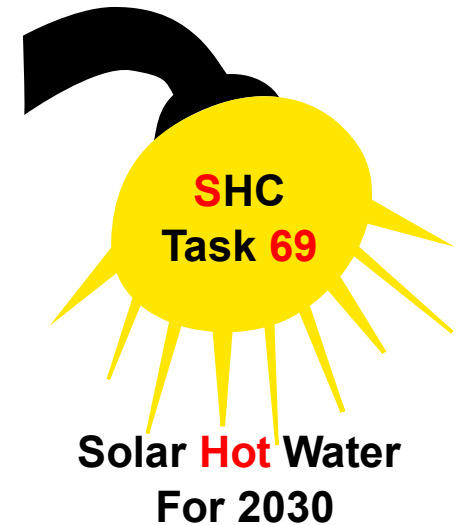




SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

Task 69: Solar Hot Water for 2030



Robert A Taylor, UNSW & He Tao, CBR: Joint TMs
Presented at: June 2023 SHC ExCo Meeting & National Day

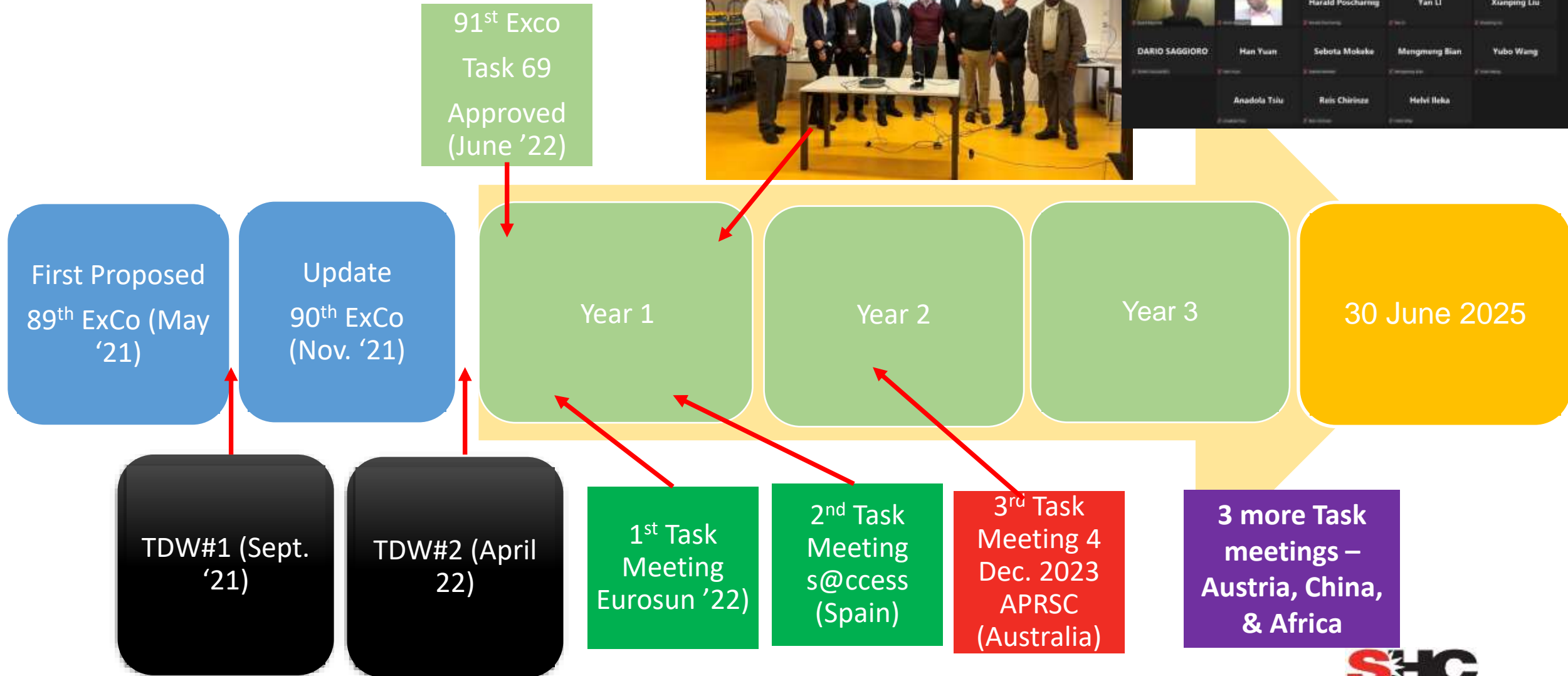
Scope

In this Task, we are focusing on **2** technologies:

- **Thermosyphons:** The most used solar heating system (~57% of domestic hot water systems in operation in 2019)
- **PV Hot Water:** Rapid PV growth! Can be simple (i.e., low cost) or advanced (i.e., soak up excess PV and power heat pumps).

Note: Both require very few moving parts, can be affordable and reliable, and provide opportunities for new products/components.

Timeline/Progression



Participating Countries / Sponsors

- **18** countries/regions represented
 - *Australia, Canada, China, UK, Austria, Denmark, Germany, Greece, Norway, Portugal, Switzerland, Italy, Zimbabwe, Botswana, Lesotho, Namibia, South Africa (and representatives from EACREE, SACREE)*
- **90** total experts registered
- ~**30-40** experts at Task Meetings #1-3 (8-12 in-person, 20-30 online)
- ~**30** 'active' experts
- ~**22** NLPs

4 x National (AT, DK, UK, CN) + AU project funding for Subtasks

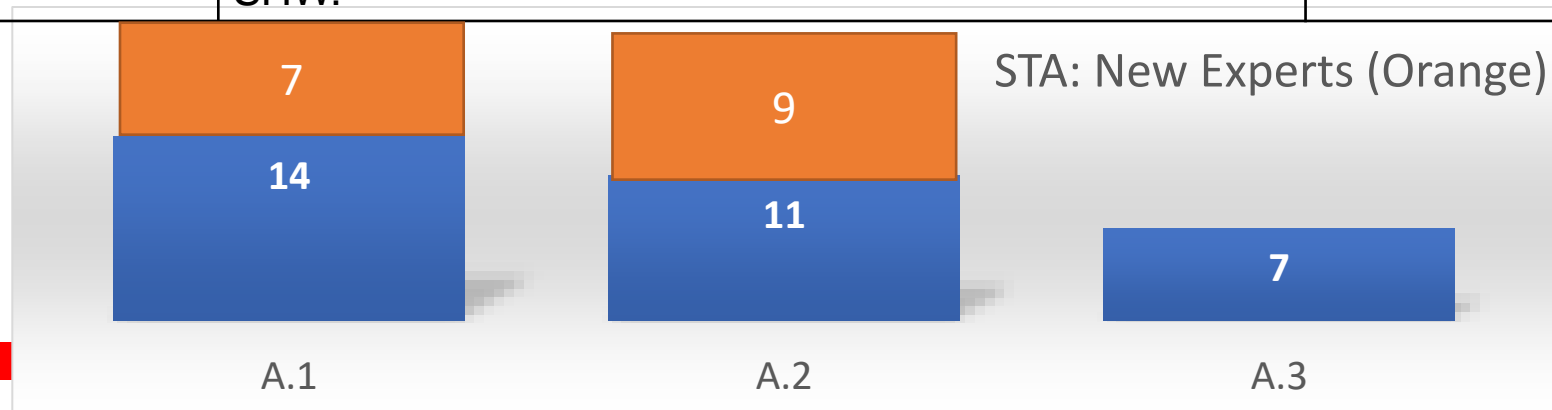
Subtask A: State-of-the-art & operating environments

Lead: Daniel Tschopp (AEE INTEC, Austria)

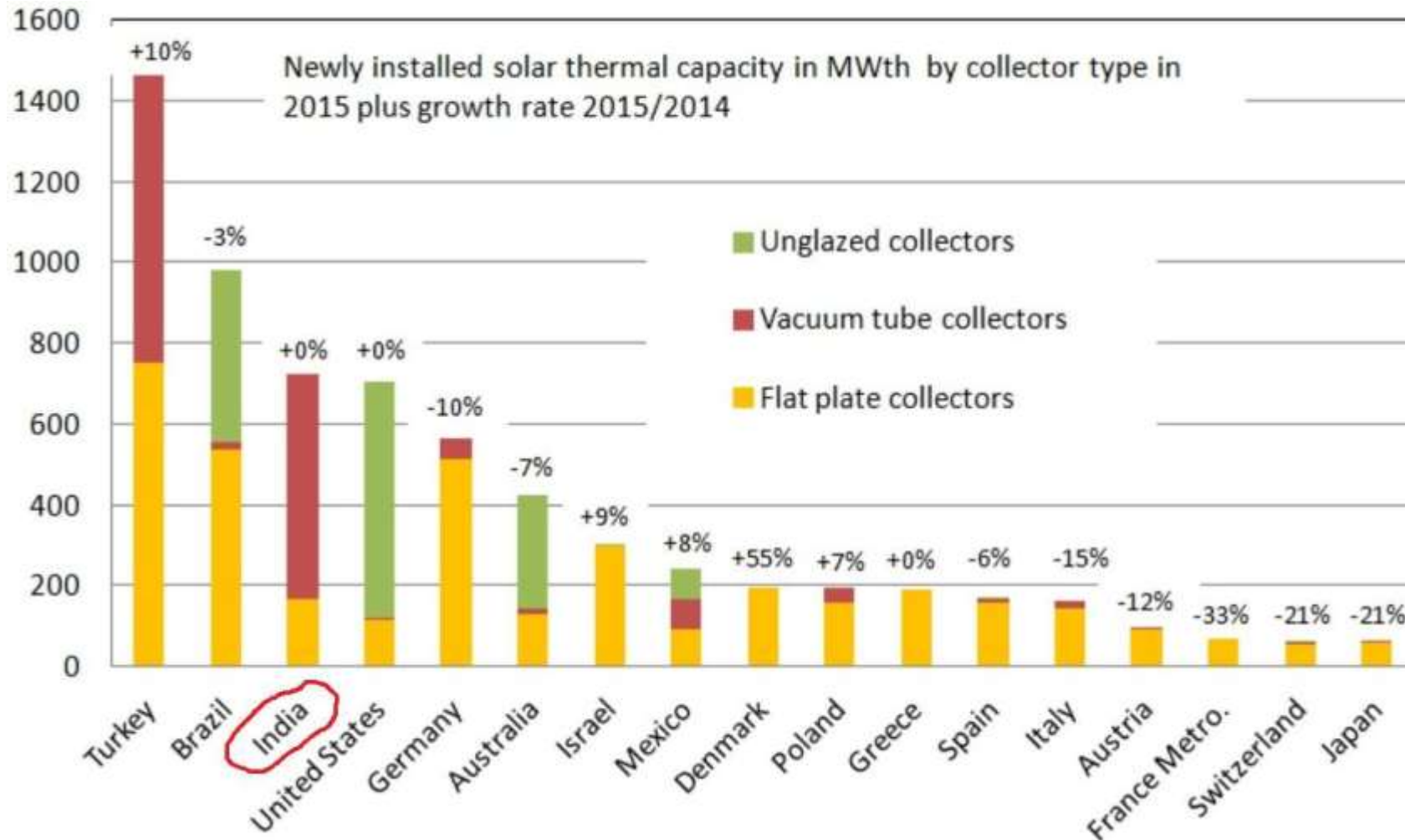
Aim: Analyze global solar hot water installation data, including the operating environment, trends, best practices, current regulations, and the major technical and non-technical barriers to adoption. Findings and results are brought into subtask B and C.

No.	Deliverable	Month
A.1	Report on most dominant solar water heating systems and state-of-the-art reviews for thermosyphon and PV hot water technologies, analysis of market regions and potential for solar water heating.	20
A.2	Documentation of success stories and market barriers in relevant regions.	30
A.3	Report on emerging products and research trends for SHW.	36

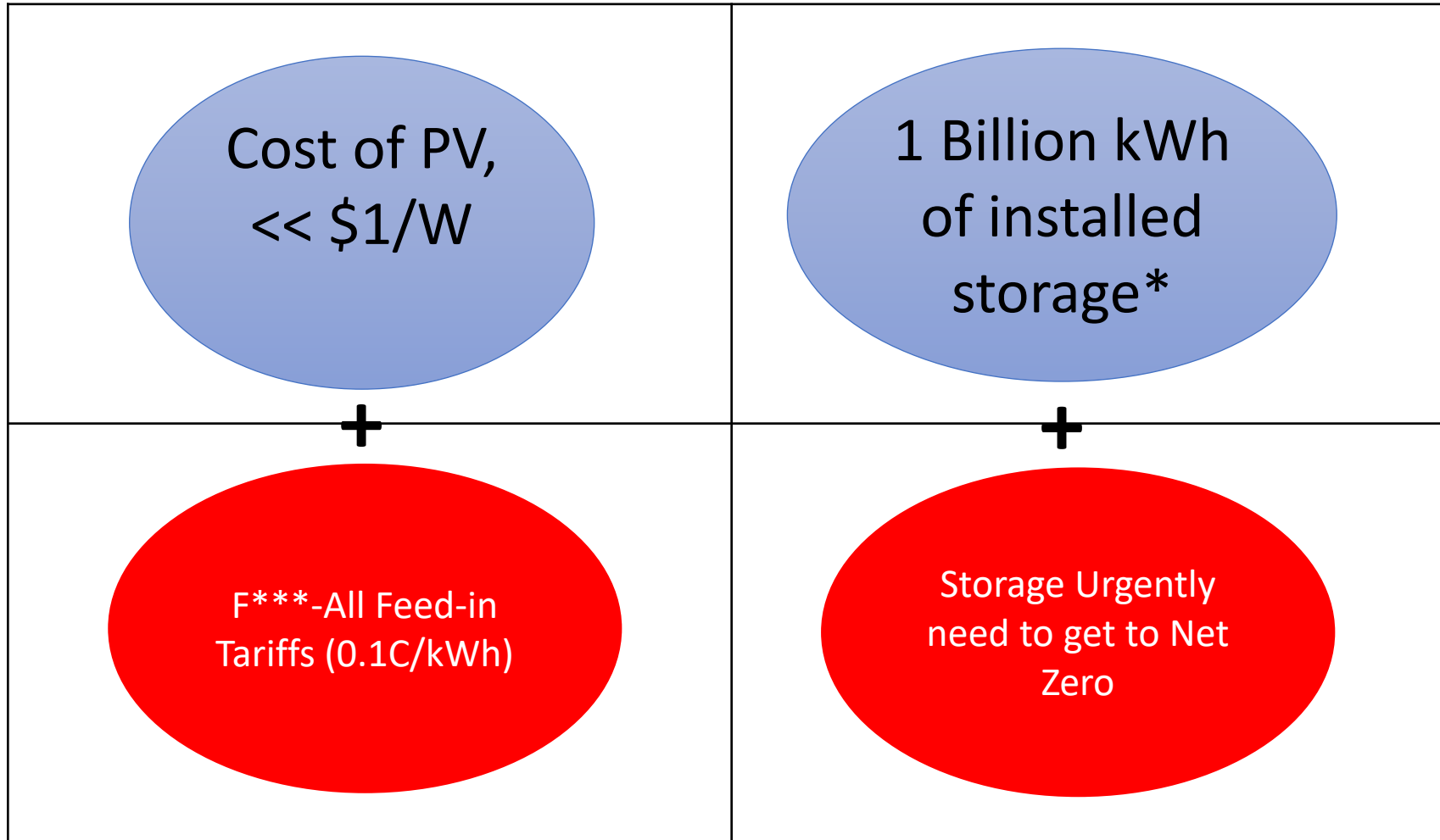
*Building upon
Solar Heat
Worldwide Data



Global trends (mostly downwards) for solar thermal



However...

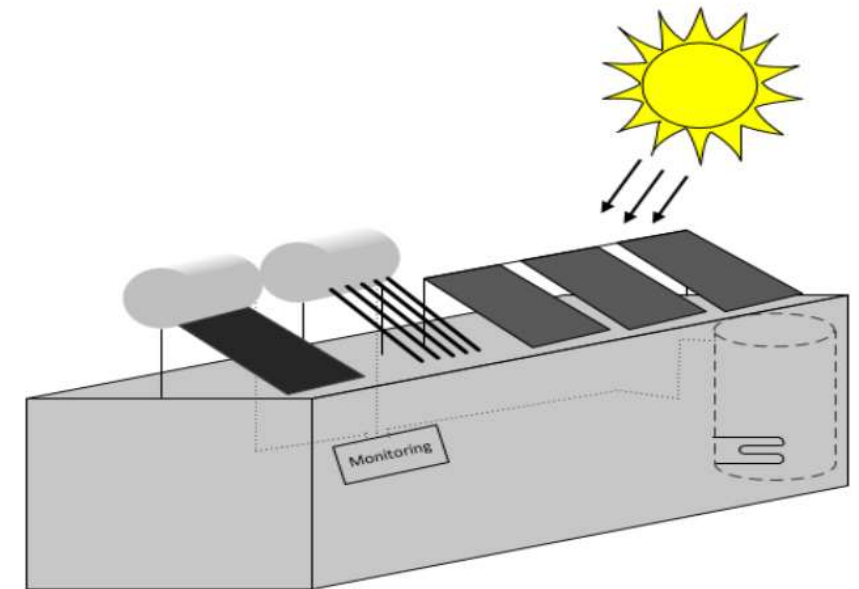


CONCLUSION:
We cannot
AFFORD to
forget about
hot water!

*10kWh/hot water tank x 1 Billion Households w/ tanks = 10 Billion kWh of storage

STA: SOLTRAIN+ Comparison Test Bed

- **Side-by-side comparison of solar hot water technologies**
 - Indirect thermosyphon system with a flat plate collector
 - Indirect thermosyphon system with evacuated heat pipe collector
 - PV-to-Heat (PV2Heat) system
- **Monitoring phase:** In 2024
- **Location:** Namibia University of Science and Technology
- **Data** of the comparison test bed together with insights from **SOLTRAIN project** (665 demo systems over 12 years) will be shared with the Task





Subtask B: Thermosyphon hot water systems

Lead: Li Bojia, China



Aim: To promote thermosyphon hot water systems by investigating design and management technologies for convenience and performance. Survey the failure modes and effects, provide durability and reliability improving suggestions. Energy-saving & GHG reductions.

No.	Deliverable	Month
B.1	Report of thermosyphon system potential	18
B.2	Survey of failure modes and effects and suggestions	18
B.3	Report on durability and reliability	18
B.4	Report on energy-saving & GHG reduction methods along with current and future trends	36

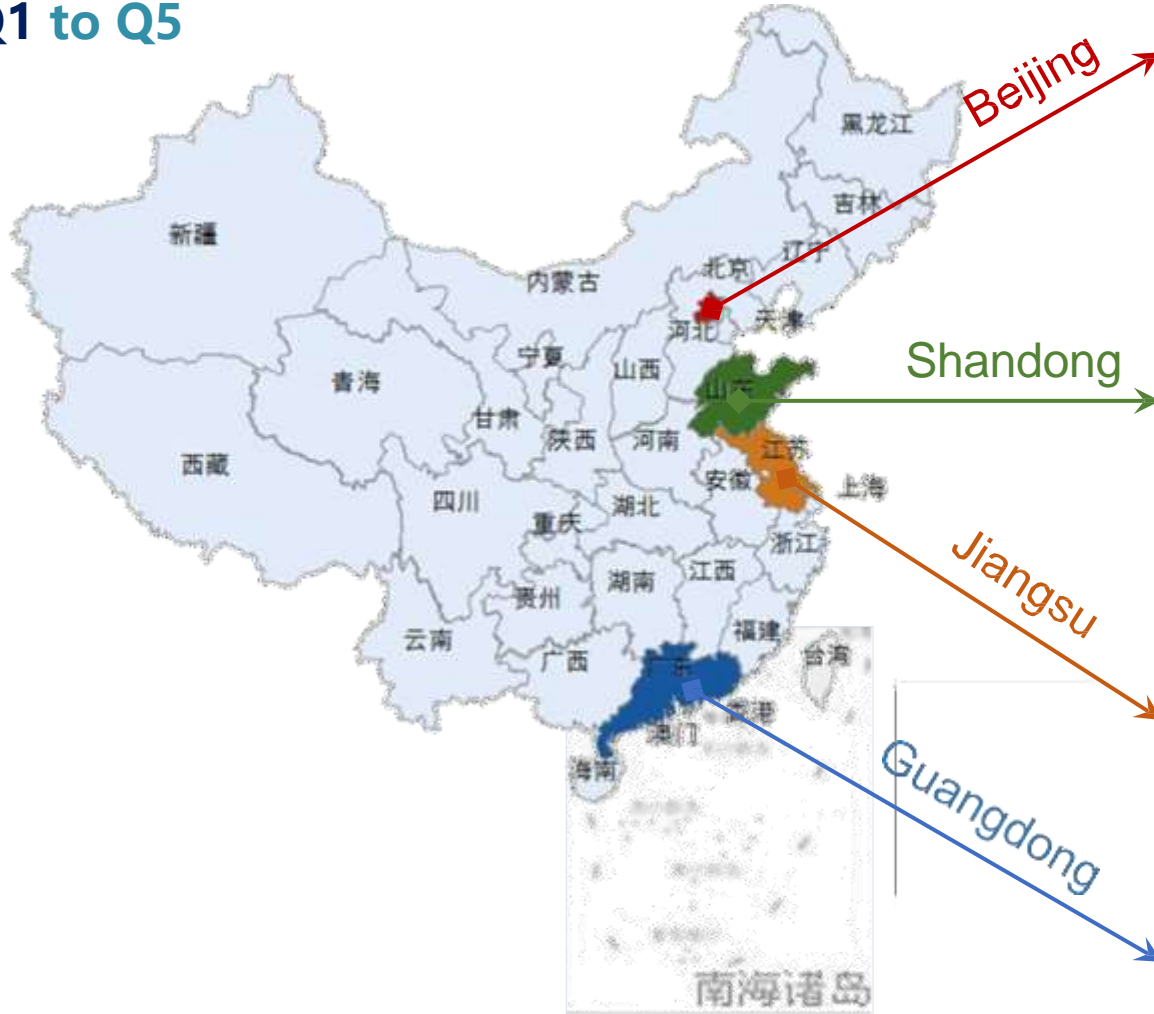


Part 1

Part 2

12 Manufacturers from 4 Provinces

Q1 to Q5



micoe 四季沐歌

天普新能源
TIANDU NEW ENERGY

清华阳光
TSINGHUA SOLAR

SUNPO 桑普

SANGLE 桑乐

JINHENG SOLAR

LINUO RITTER
— SINCE 1995 —

皇明 太阳能

Haier

Dr. SUN 阳光博士

SUNRAIN
太阳雨太阳能

5STAR
Expert of Solar Clean Energy

Production Data Q9-Q12



DIR-PLAT



DIR-ETC



IND-PLAT



IND-ETC

7	Heat pumps
6	PV hot water systems
5	Gas fired water heaters
4	Forced circulation SWH
4	Electric water heaters
0	Oil fired water heaters

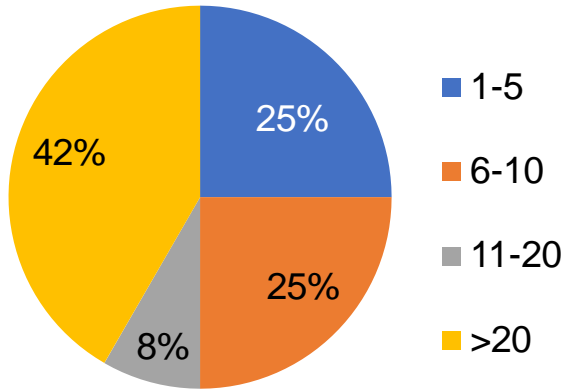
Production Data Q9-Q12



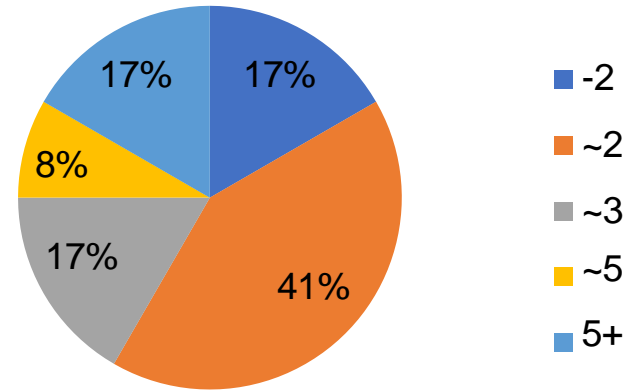
DIR-ETC



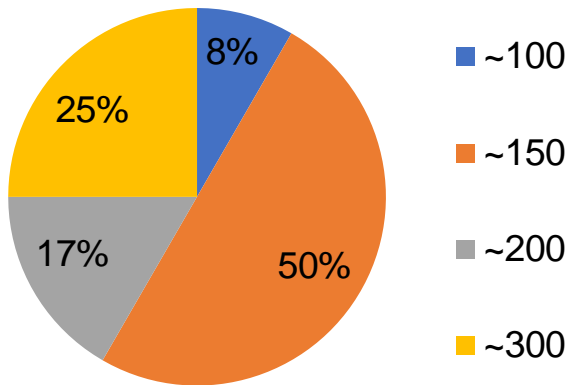
Number of Models



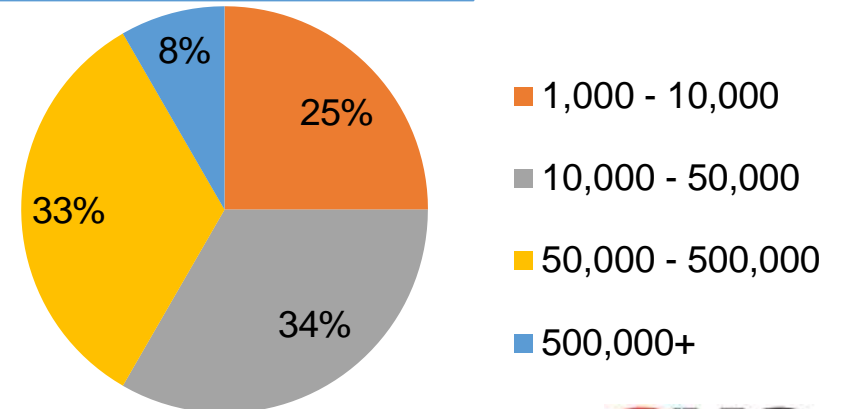
Gross Areas / m²



Tank Volume / L

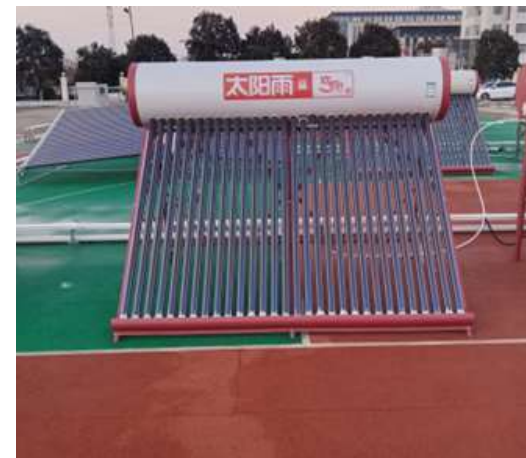


Yearly Production / m²



STB: GHG reduction testing in China

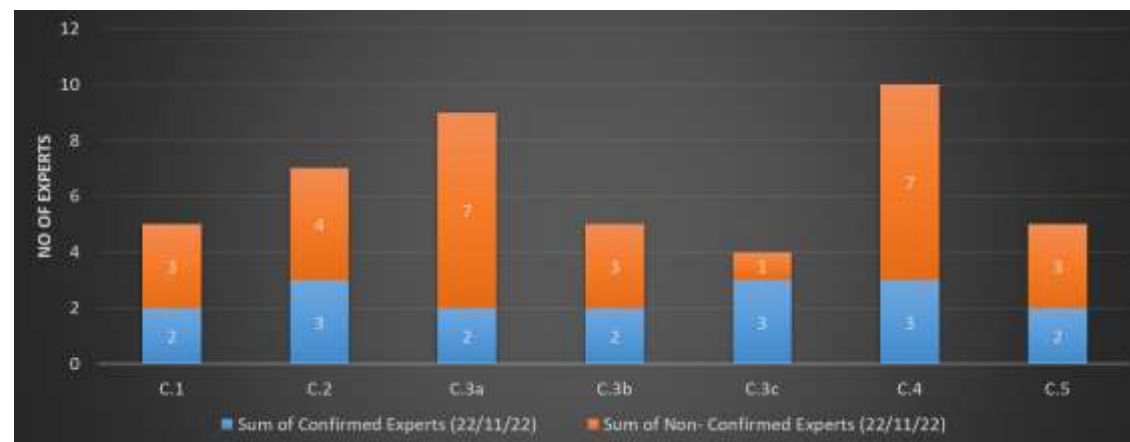
- A GHG reduction test bed for thermosyphon systems finished in China.
- GHG reduction performance analysis and testing of different hot water systems are conducting by CABR and Sunrain in China.



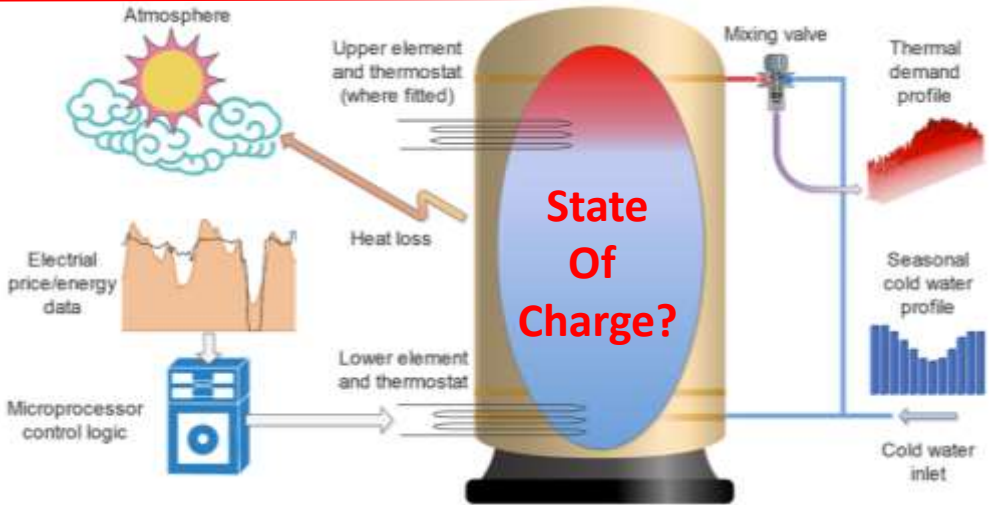
Subtask C: Solar Photovoltaic Hot Water

Joint Leads: Tony Day (UK) & Dean Clift (AU)

No.	Deliverables	1 July 2023 Proposed Deliverables	Month
C.1	Expert Network, Expert Questionnaire / Interviews and Case Studies	Unchanged	18
C.2	Systematic International Literature Review + Market Review	Unchanged	24
C.3	Technology / Policy Brief	IEA SHC Technology Brief	24
C.4	Reference Models + Solar Heat Worldwide Chapter	Academic Publications (2) on PV Hot Water System Modelling	24
C.5	Implementation of Solar PV Hot Water Technology Harmonisation Strategy	IEA SHC Report on Solar PV Hot Water Technology Configuration/Operation Optimisation	36



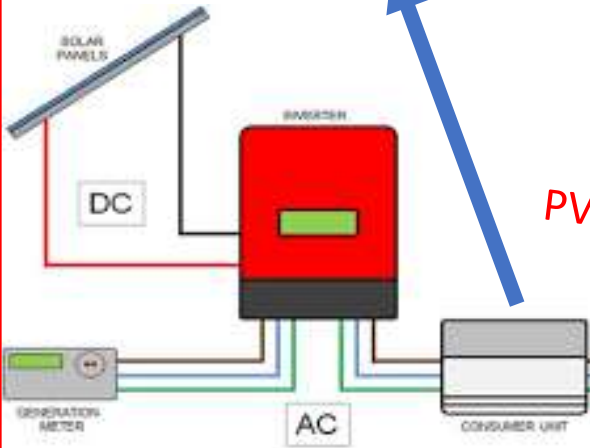
Subtask C: Covers a lot of technical ground



Dean Clift et. al, "Assessment of advanced demand response value streams for water heaters in renewable-rich electricity markets", Energy, Volume 267, 2023.

Indirect: Relatively trivial case (% electric water heaters)

Direct: PV to Heat (GN SEC)



PV Diversion

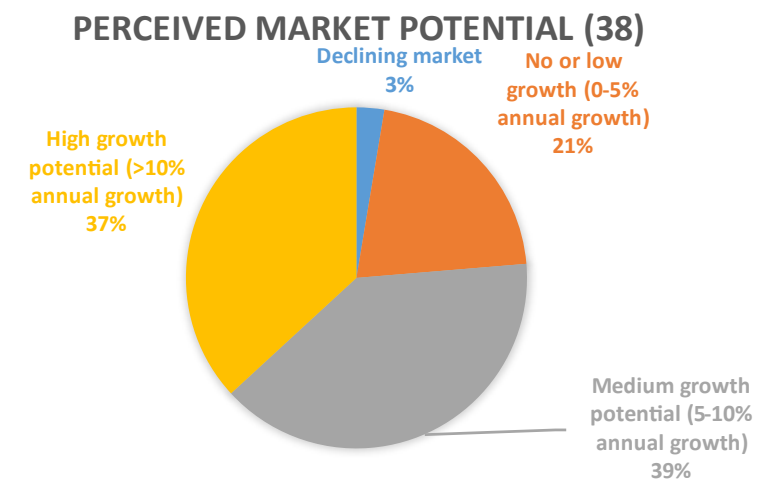
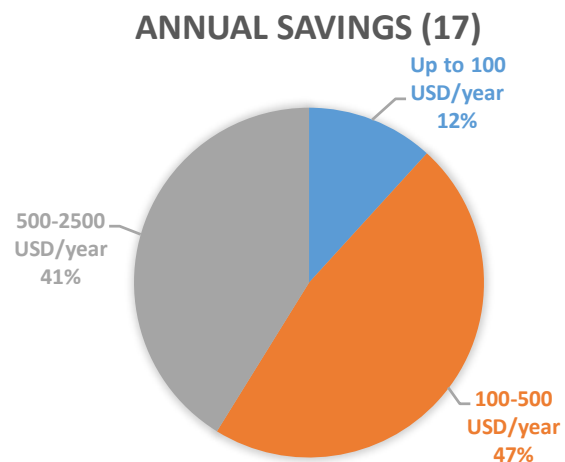
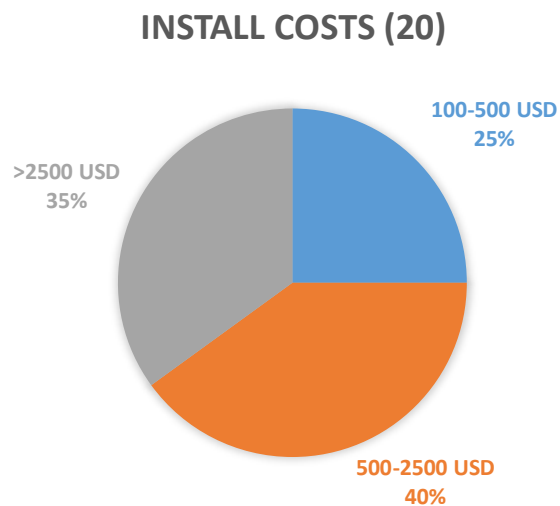
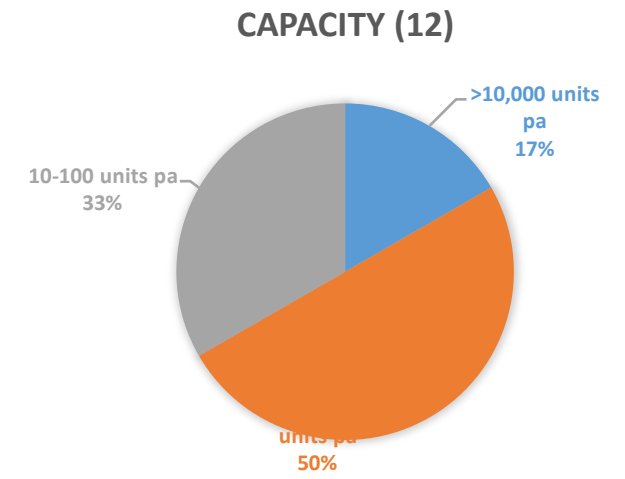
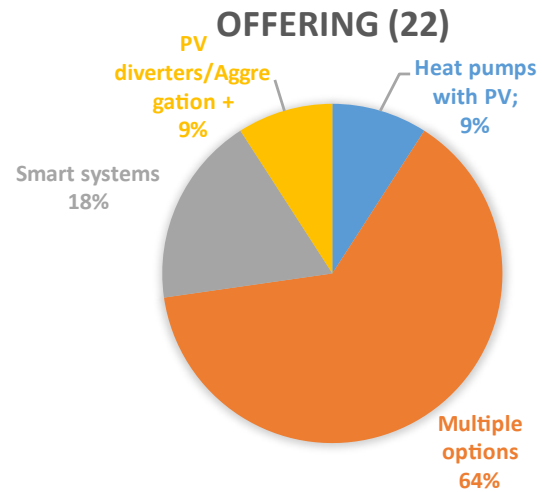
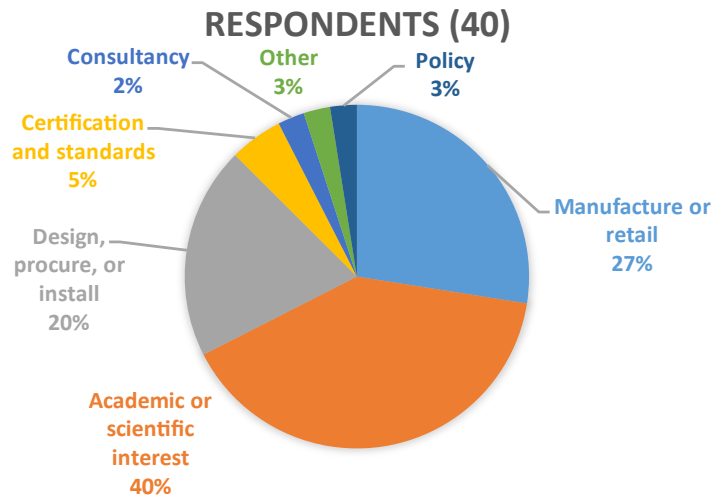


Heat Pump Water Heaters

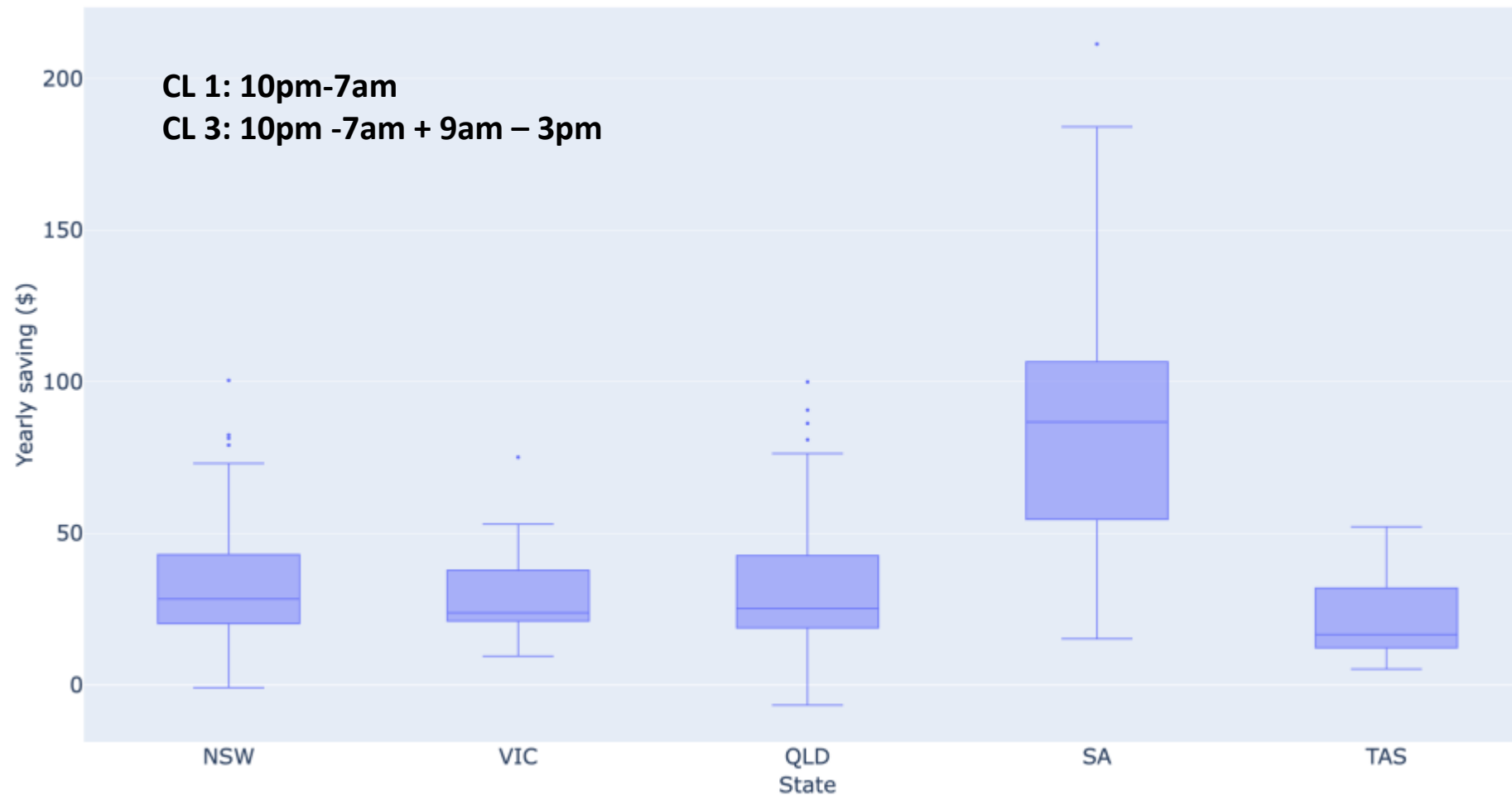
HP = Inductive load. Cannot use today's diverter products (i.e., Eddi)

Coupled (Excess PV and relatively low PV tariffs)

STC Survey – Preliminary Results (45 now)



From Baran (SolarShift): Distribution of Aggregator/ Retailer savings: Change from CL1 to CL3



According to Dean Clift STC Lead:

“To realise the potential of PV water heating, including demand response, we need:

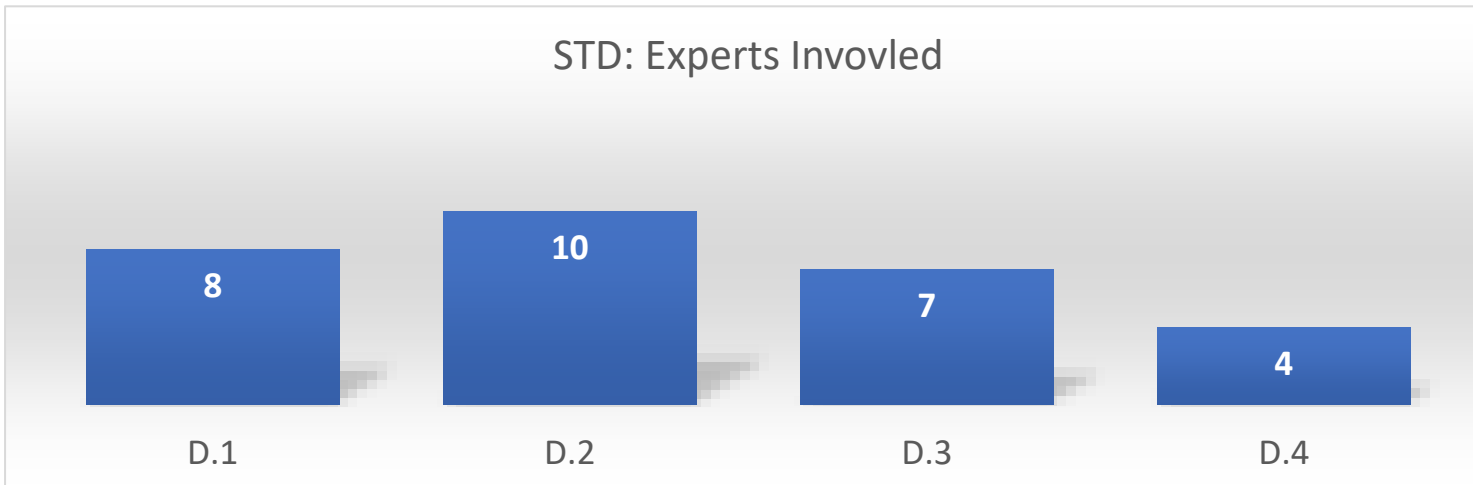
1. Regulatory support for emerging technology
2. New standards for product design and communication
3. Large participation rate
4. Aggregators

”

SubTask D: Deliverables and Timeline

Lead: Jianhua Fan (DK), Denmark

No.	Deliverable	Month
D.1	Report on needs for new Standards or Standards updates and the status of selected warranty and certification networks	18
D.2	Facilitate Training	15 & 30
D.3	Needs Assessment Report (Training for Solar Energy Practitioners)	24
D.4	Report on success stories	36



Future Task Meetings

- **Task Meeting #4:** April 2024, International Renewable Energy Conference (IREC) - Australia (online option)
- **Task Meeting #5:** November 2024, Beijing, China (w/ online option)
- **Task Meeting #6:** April 2025, GN SEC location, Namibia? (w/ online option)

How to get involved in Task 69?

- Join our Experts list (use QR code —>):
<https://forms.office.com/r/LbbGfLBAhq>
- Help us fill in the Thermosyphon survey: <https://forms.office.com/r/iLVfW2wq40>.
- Help us fill in the solar PV Hot Water Survey:
<https://forms.office.com/r/6f1SsNaq3P>



Questions?



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(group 4230381)