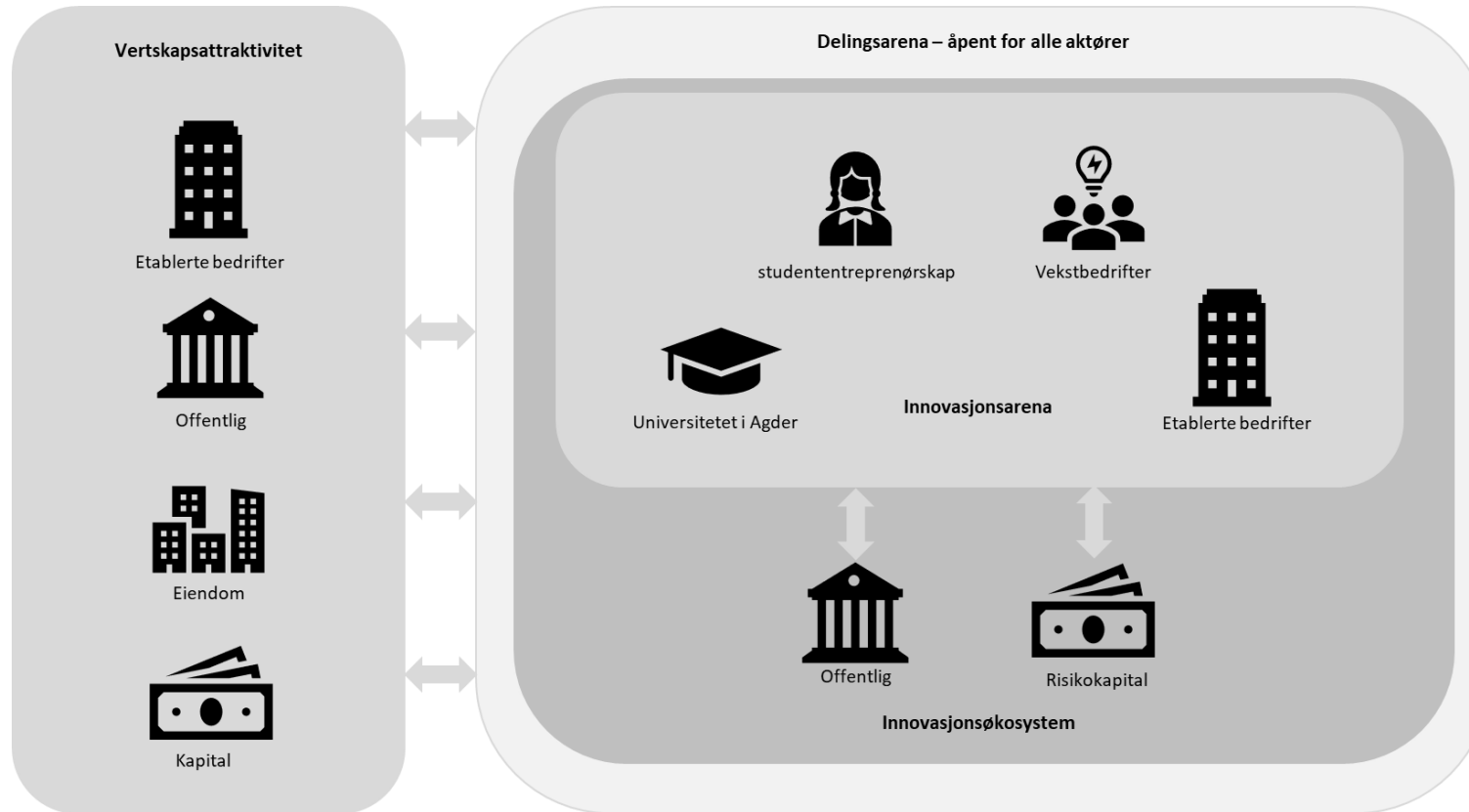
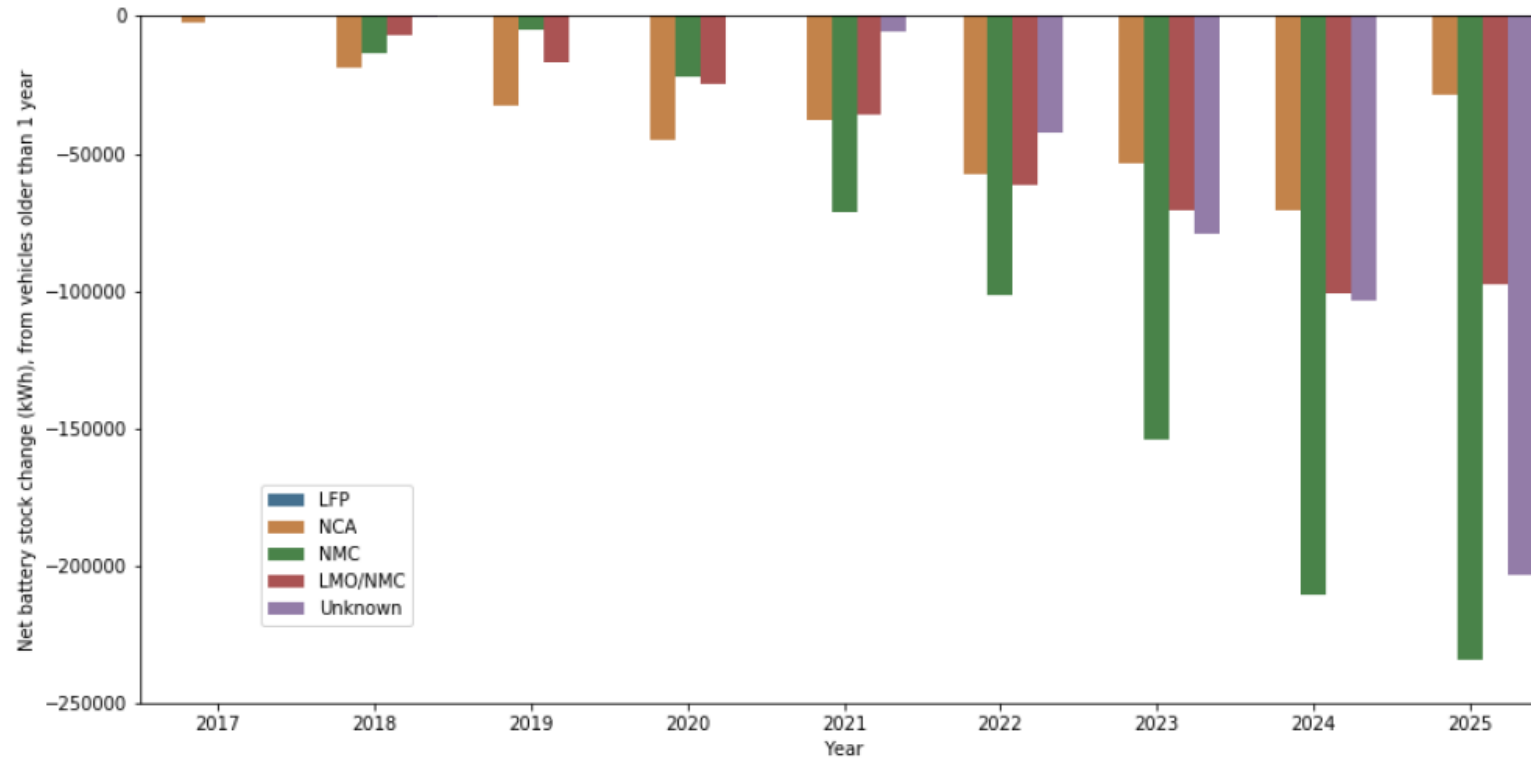




# Agder Batteri – Innovation Arena



# Agder Batteri – Innovation Arena



End-of-life electric vehicle lithium-ion battery output (modelled)

2021 – 150 MWh

2025 – 550 MWh

2030 – 2.2 GWh

# Agder Batteri – Innovation Arena



Energy storage

# UiA

second use: synergies and opportunities  
Bernhard Fäßler



# Second Use Battery Workshop at the University of Agder


Agder Batteri Project  
November 2020



# Welcome

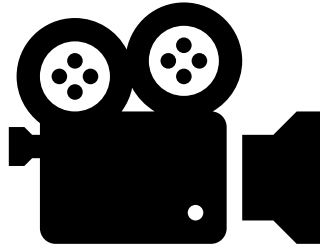
good morning everyone

# Program

| Time   | Speaker                | Company             | Topic   |
|--|------------------------|---------------------|---|
|  09:30-09:40 | Bernhard Fäßler        | University of Agder | Second use: Synergies and opportunities                       |
| 09:40-09:50  | Radu Achihai           | RePack              | Innovative approach to second use                             |
| 09:50-10:00  | Geir Landmo            | Alternativ Energi   | Building battery storage systems based on spent batteries     |
| <b>Break</b>   |                        |                     |   |
| 10:05-10:15  | Charly Berthod         | Greenstat Energy    | Greenstat and the future of energy systems                    |
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| 11:10-11:30  | All                    | All                 | Panel discussion  |



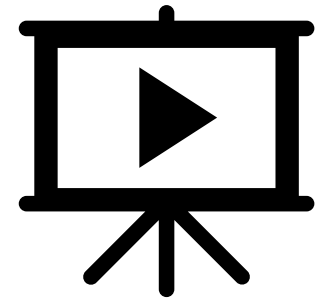
## Rules/Remarks



Workshop  
is recorded



Questions  
via Q/A tool

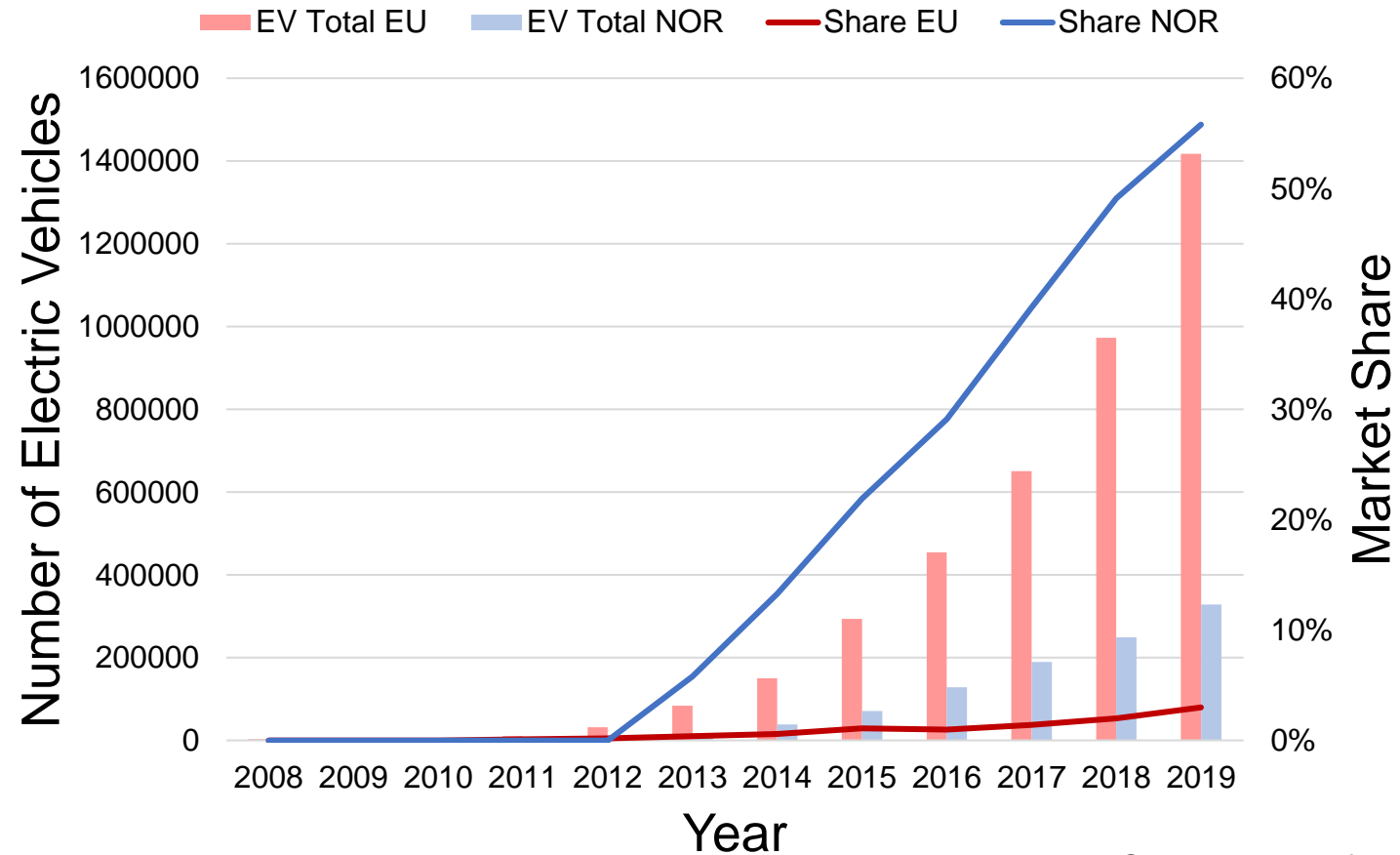


Presentations  
will be shared

# Second Use

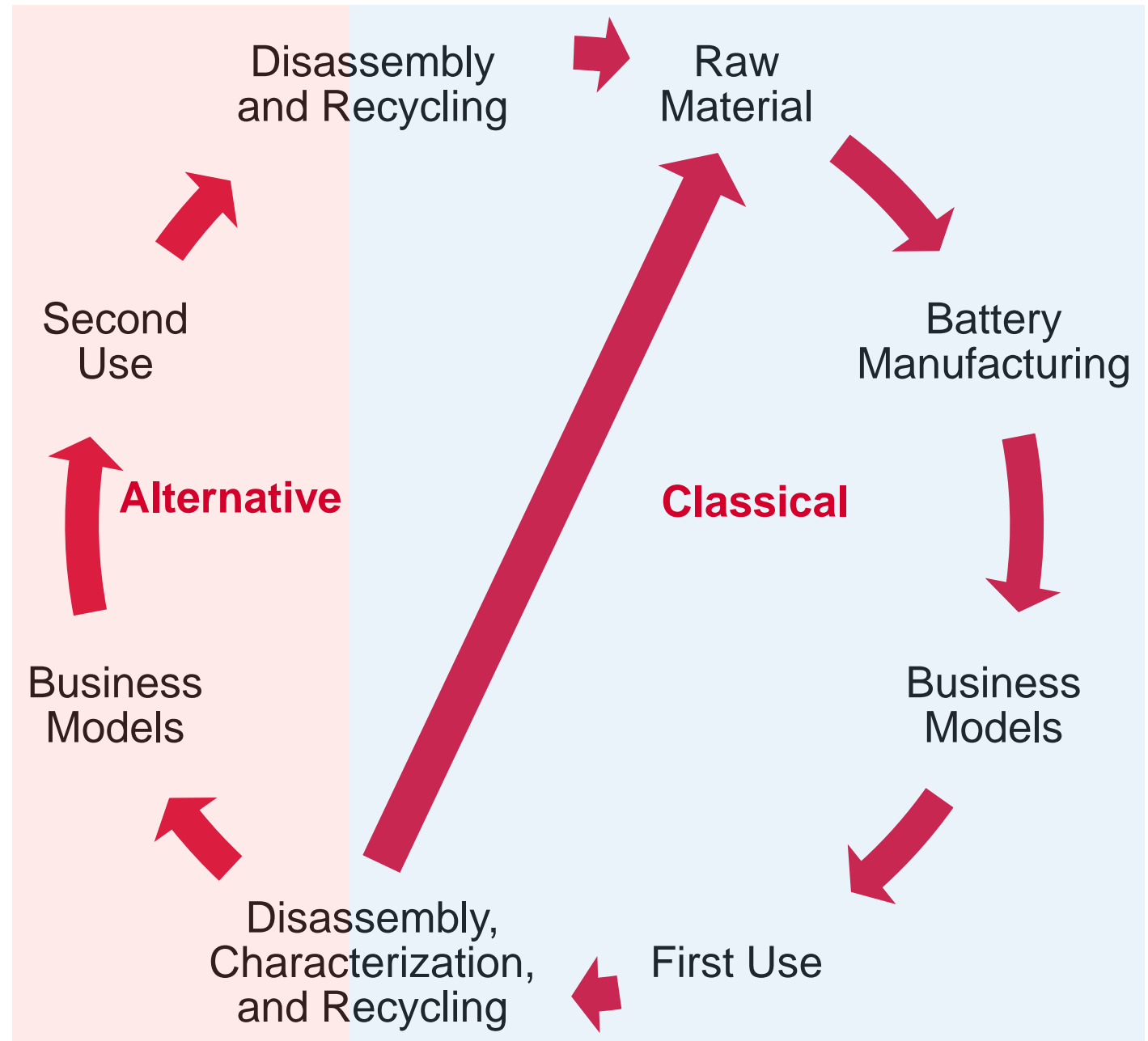
of batteries and its components

# Electric Vehicles: Europe vs Norway



Source: [www.eafo.eu](http://www.eafo.eu)

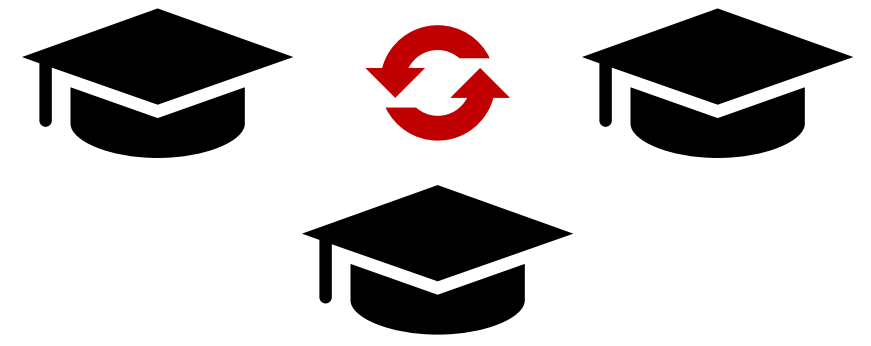
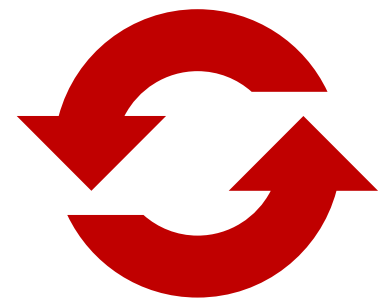
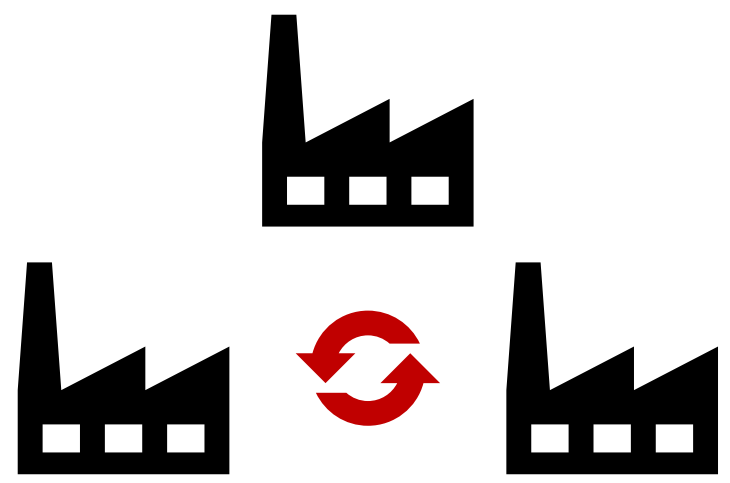
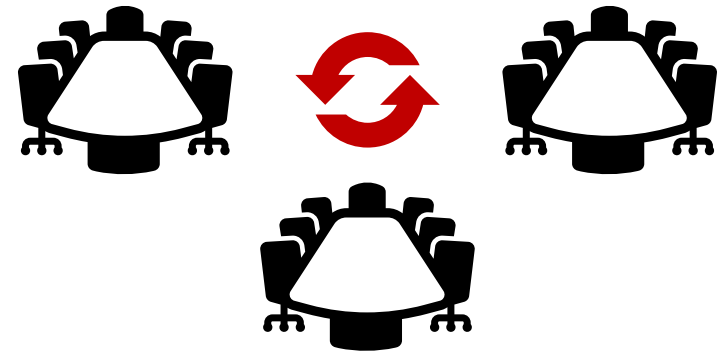
# Battery Value Chain



# Synergies

creation of value

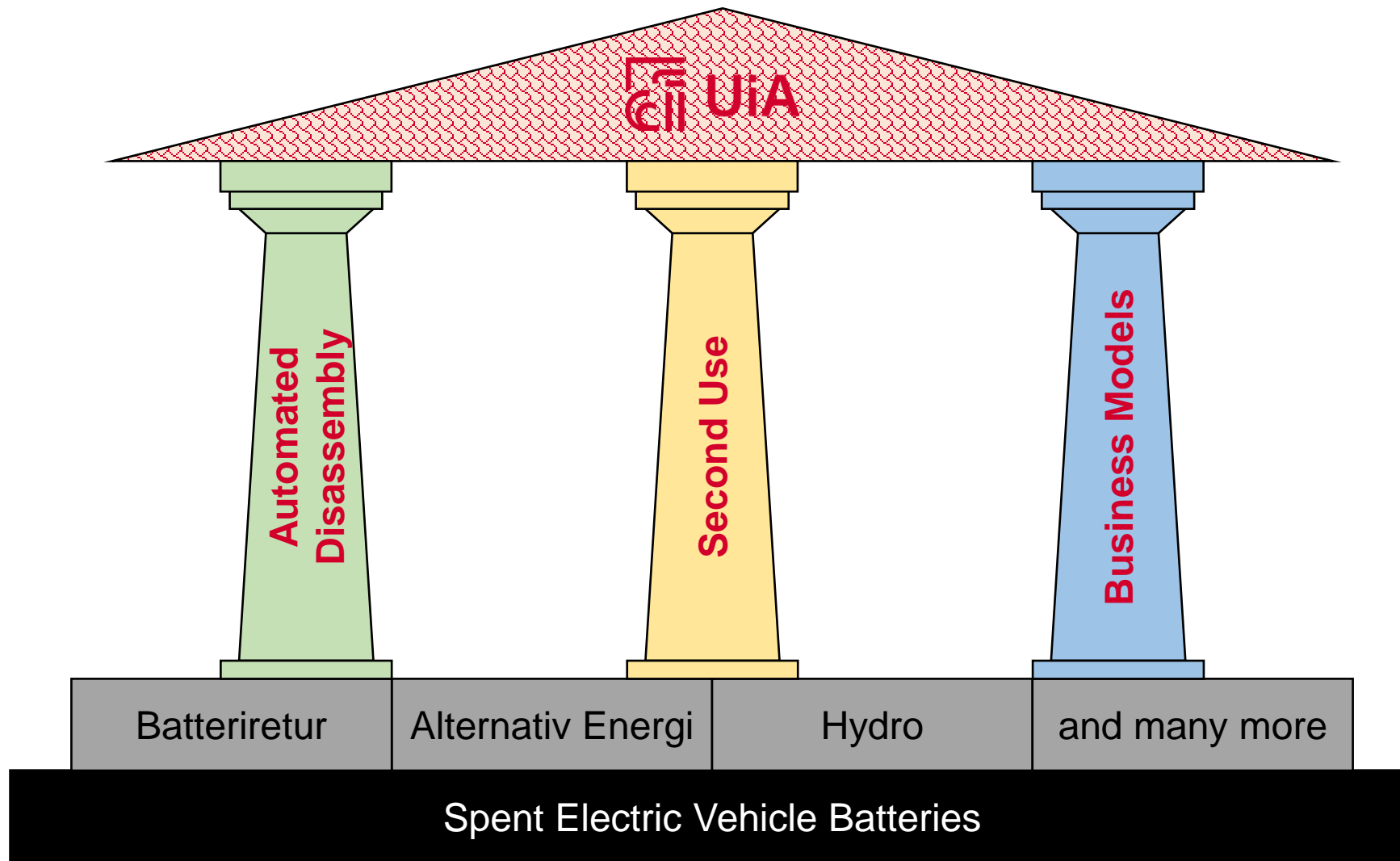
# Synergies



# Battery Activities

at the University of Agder

[battery.uia.no](http://battery.uia.no)

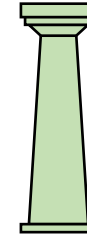




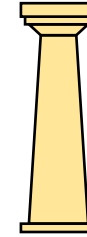
# Collaboration?

interesting and fruitful opportunities

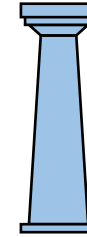
**Martin Marie Hubert Choux**  
**Automated Disassembly**  
Email: martin.choux@uia.no



**Bernhard Fäßler**  
**Second Use**  
Email: bernhard.faessler@uia.no



**Benedikte Wrålsen**  
**Business Models**  
Email: benedikte.wralsen@uia.no



**Reyn O'Born**  
**LCA/Battery Value Chain**  
Email: reyn.oborn@uia.no

**University of Agder**  
Jon Lilletuns vei 9  
4879 Grimstad, Norway  
Web: [battery.uia.no](http://battery.uia.no)

# RePack

innovative approach to second use  
Radu Achihai



# RePack

Enabling the reused battery revolution

Agder Batteri Innovasjonsarena  
Nov 18<sup>th</sup>, 2020

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# Team



# RePack



**Jørgen Erdal**  
CEO

- Ex-BCG consultant specialized in RES
- MSc in Electrical Energy Engineering w/ Master's Thesis in Battery System optimization



**Radu Achihai**  
COO

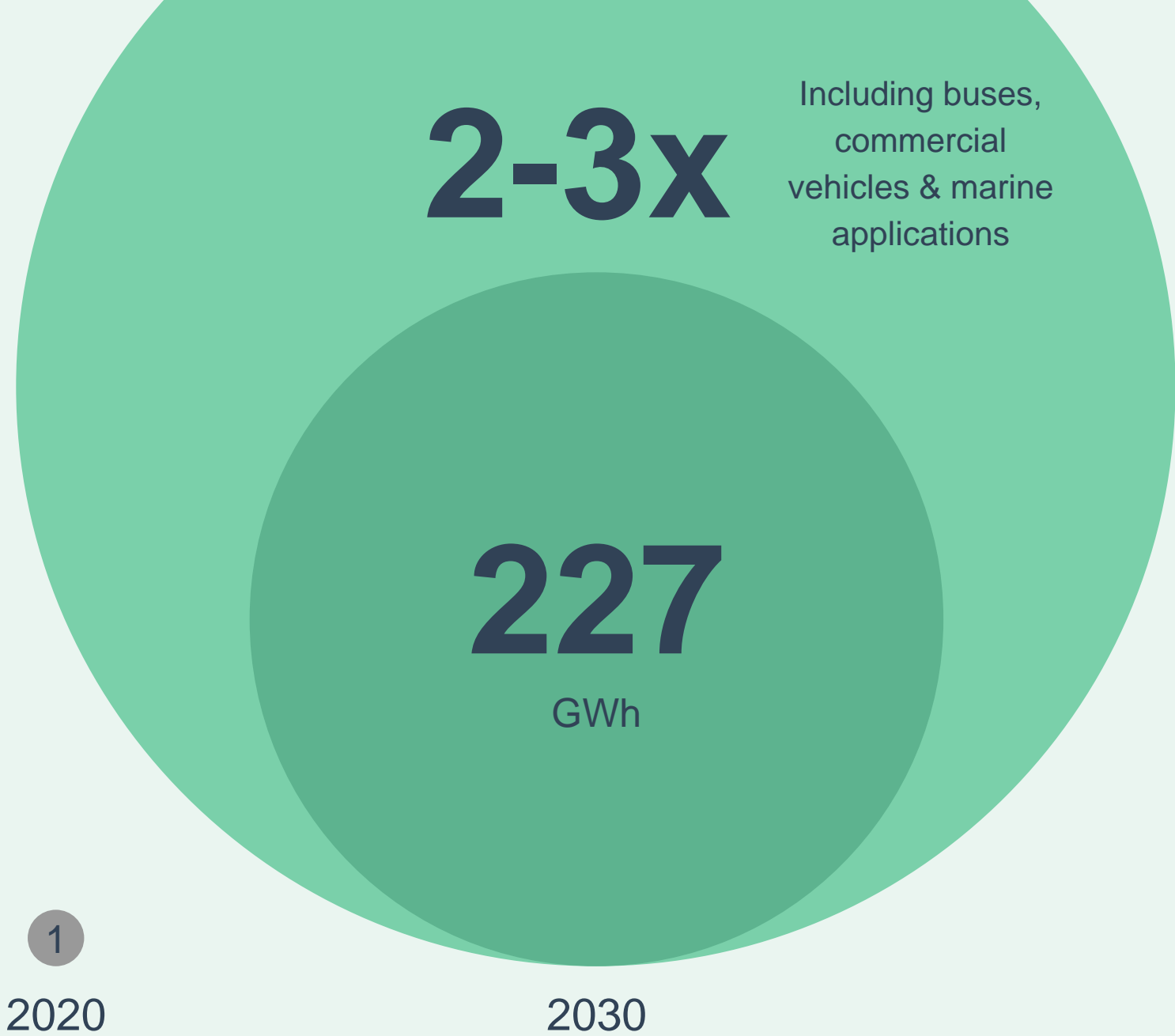
- Ex-Operations manager for Visuray
- Ex-Schlumberger Field Engineer
- MSc in Computer Science & Executive MBA



**TBC**  
CTO

- MSc/PhD in Engineering
- Proven project execution capabilities
- Curious, driven and efficient

Scrapped EV  
battery volumes  
can increase  
**>200x until  
2030**



Source: McKinsey 2019, IDTechEx

# Norway has 10x the concentration of EVs vs leading US state



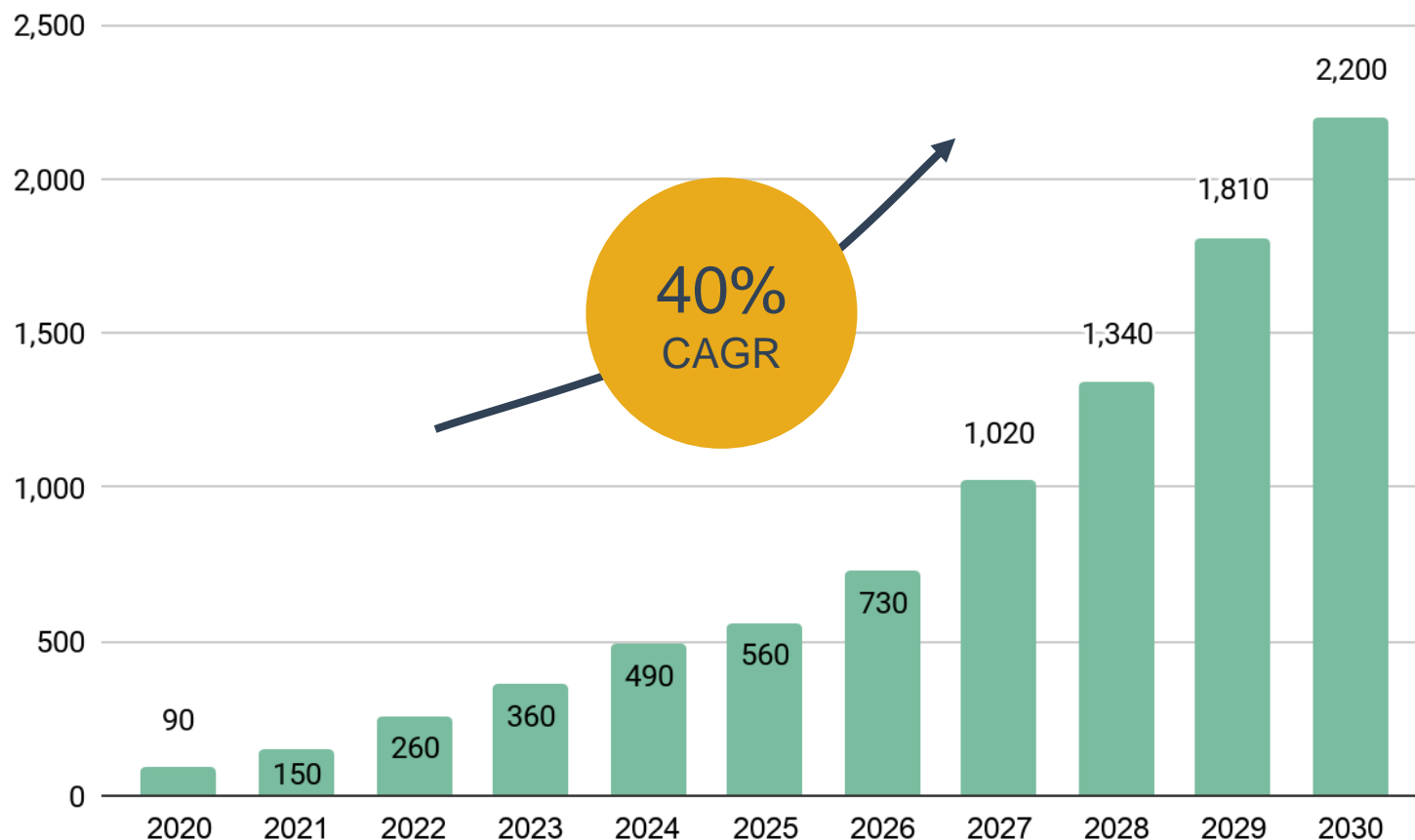
1  
%

California



10%

MWh used EV batteries being scrapped p.a.



Norwegian  
second life battery  
volumes  
believed to  
increase at 40%  
CAGR<sup>1</sup>

1. Compounded Annual Growth Rate

Source: TØI - Norwegian Centre for Transport Research, 2020



Today most EV batteries are **shredded, burnt or trashed...**



1 out of 3 with  
**70-  
80%**  
remaining capacity

...although they can bring **substantial value** in **second life** applications

## Real Estate



“ Battery storage systems can become highly valuable to our portfolio



Norwegian Real estate developer

## Construction



“ Battery systems are one of the needed solutions in order to cut pollution and get cleaner air



Oslo Municipality

## Grid

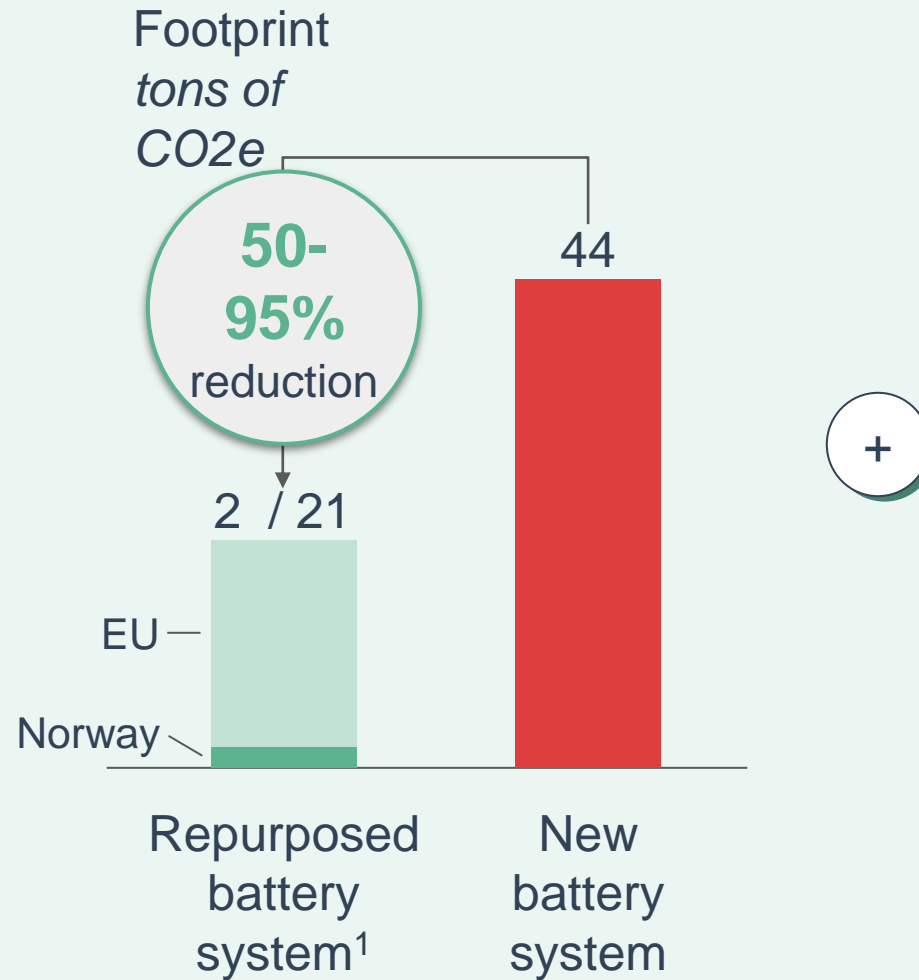


“ We believe battery storage will become a major part of the future grid



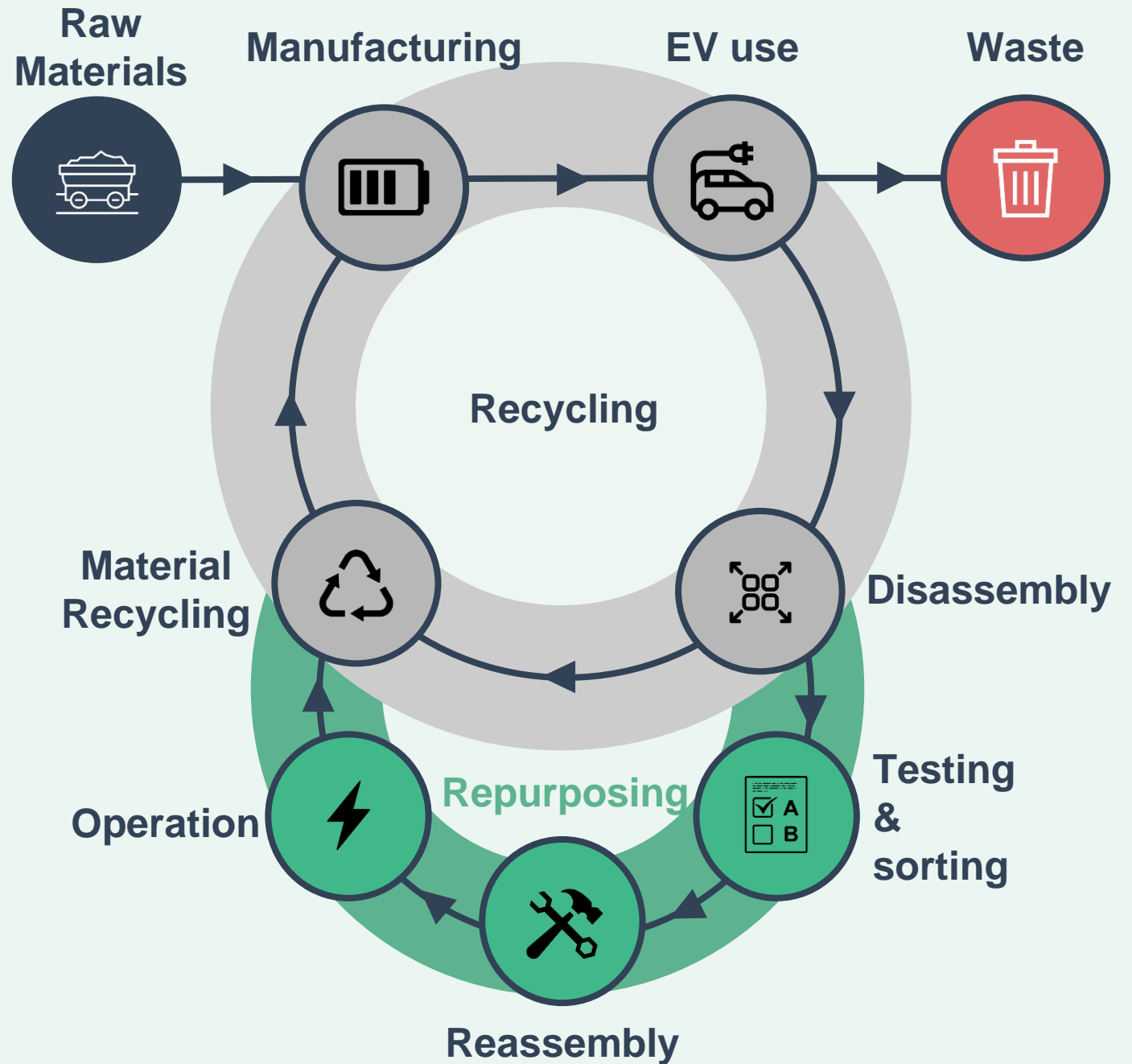
Norwegian utility

Repurposed batteries can reduce storage systems' carbon footprint by **up to 95%**



1. Includes comparative losses due to energy efficiency. CO<sub>2</sub>e impact variation due to electricity generation footprint differences between Norway and EU average  
 Source: *GHG Emissions from the Production of Lithium-Ion Batteries for Electric Vehicles in China* (2017), RePack analysis

Repurposing brings **additional value** to the EV Battery **recycling value chain**



# Many solutions are **non-scalable** and **unprofitable** due to **manual work** and **custom designs**



Testing & sorting



Manual operations



Reassembly



One-off designs



Operation

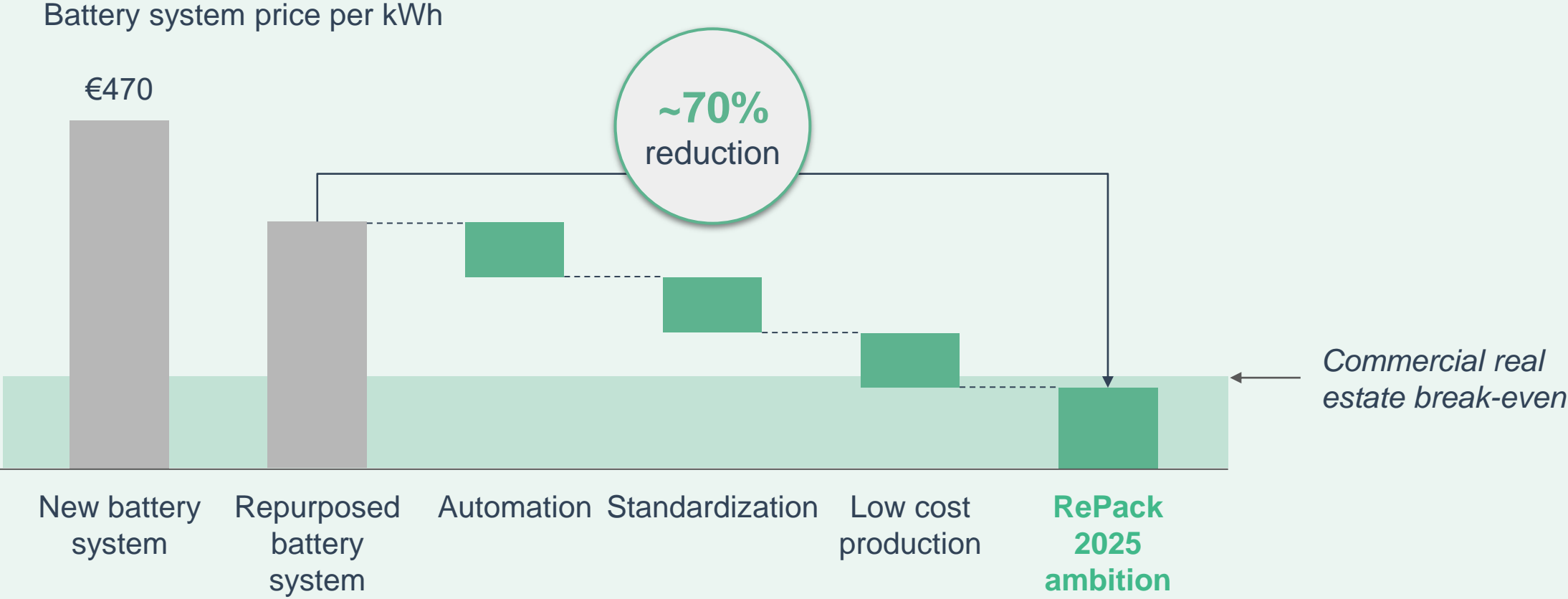


Lack of scale



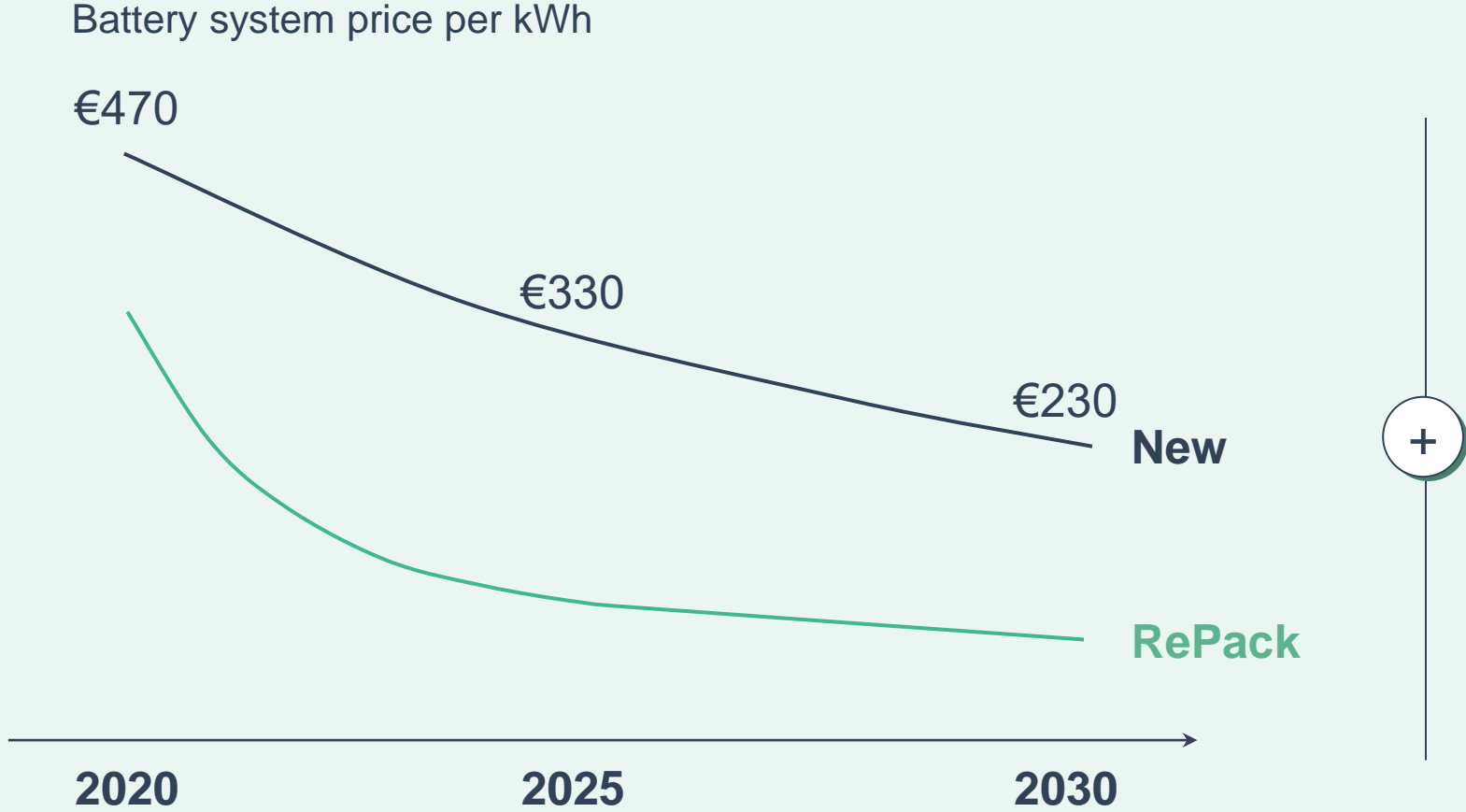
Limited  
operational  
guarantee

# RePack ambition to reduce battery system costs by ~70%



Source: Expert interviews, RePack analysis

# RePack will have a **sustained cost advantage** compared to new systems, supported by upcoming Battery Directive

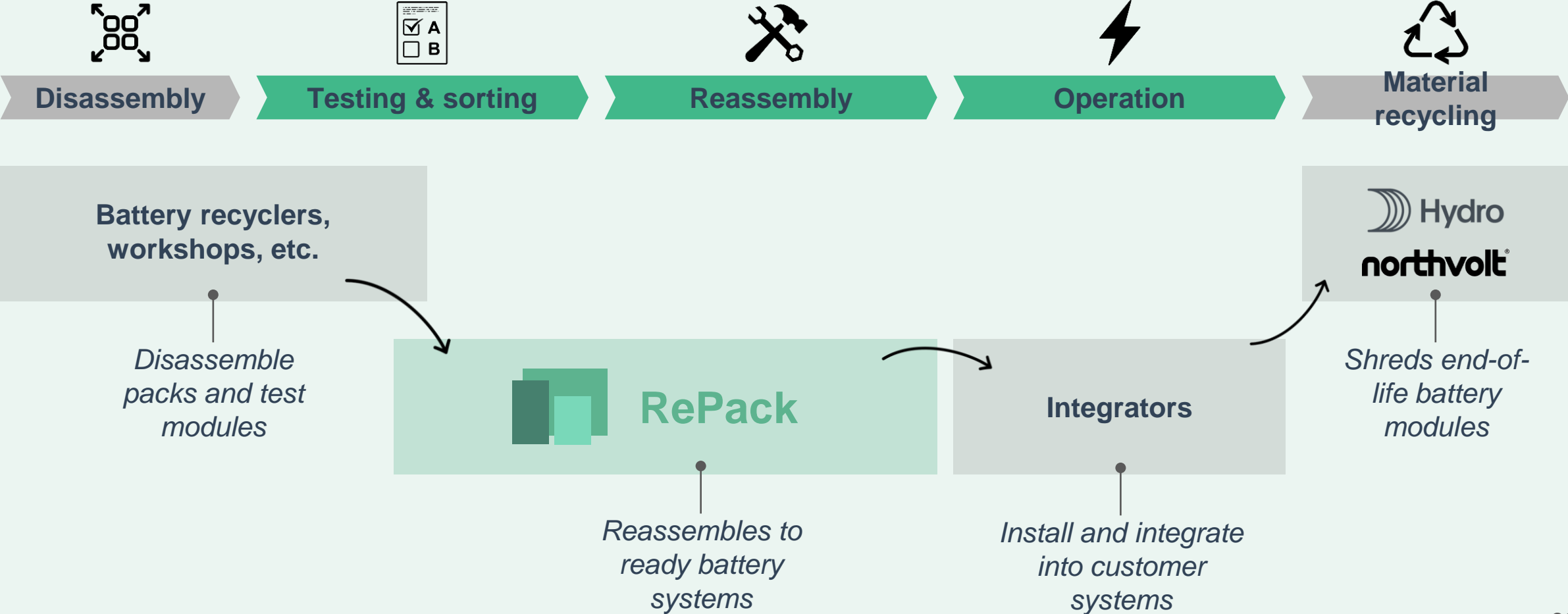


“  
*Upcoming Battery Directive will likely require repurposing of usable batteries*”

Industry experts

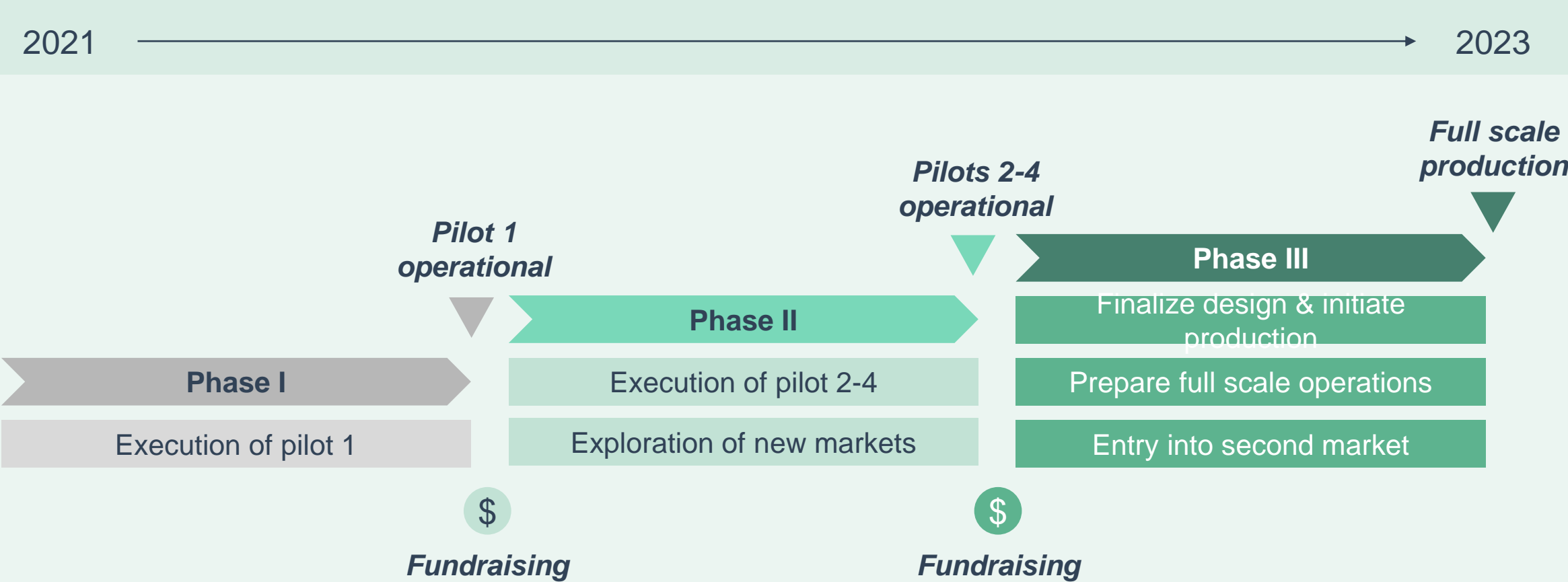
Note: Assuming 7% yearly reduction in new system costs, in line with expert interviews  
Source: Expert interviews, RePack analysis

# RePack plan to work together with recyclers & integrators on each side of the value chain





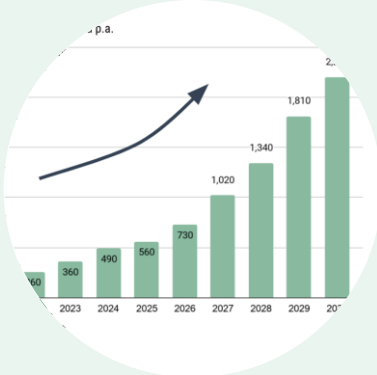
# We plan to follow a **three step approach** towards full scale production in 2023



# Four key reasons why we believe in the repurposing market



**Norway & now are the right place & time** - we have a window of opportunity to act



**Large & fast growing market** reaching >€3B in 2030



**Regulatory support** will positively impact the industry



Significant **carbon footprint reduction** will boost demand

# Thank you!

Do you know our next CTO?  
Please reach out!



# Alternativ Energi

building second use energy storage systems  
Geir Ingvald Landmo



# Alternativ Energi AS

2nd use Battery Workshop

18.11.20

Geir Ingvald Landmo

# About us

- Established in 2000 by Svein Teistedal (CEO)
- Located in Grimstad
- 3 employees
- Turnover in 2019 20,7 Mnok



# Business areas

- Complete off-grid power-systems
  - Re-use batteries from electric cars
  - Solar panel
  - Inverter
- Wheel-loaders
  - Diesel
  - Electric





# Off-grid systems

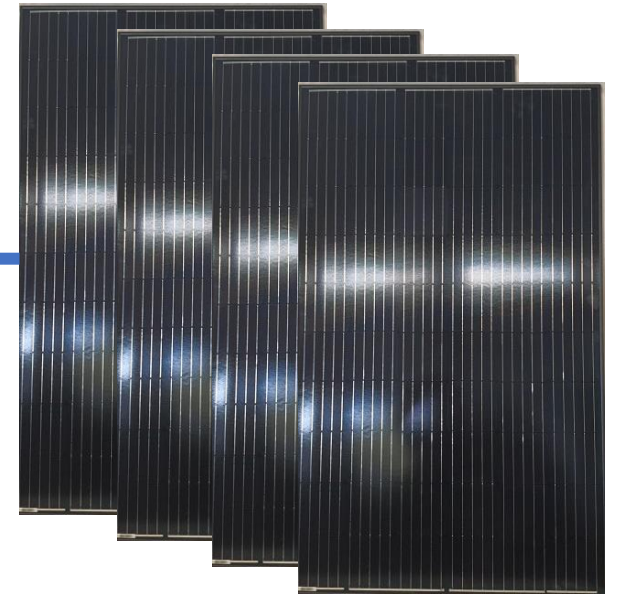
Lithium Battery



Meter



Regulator



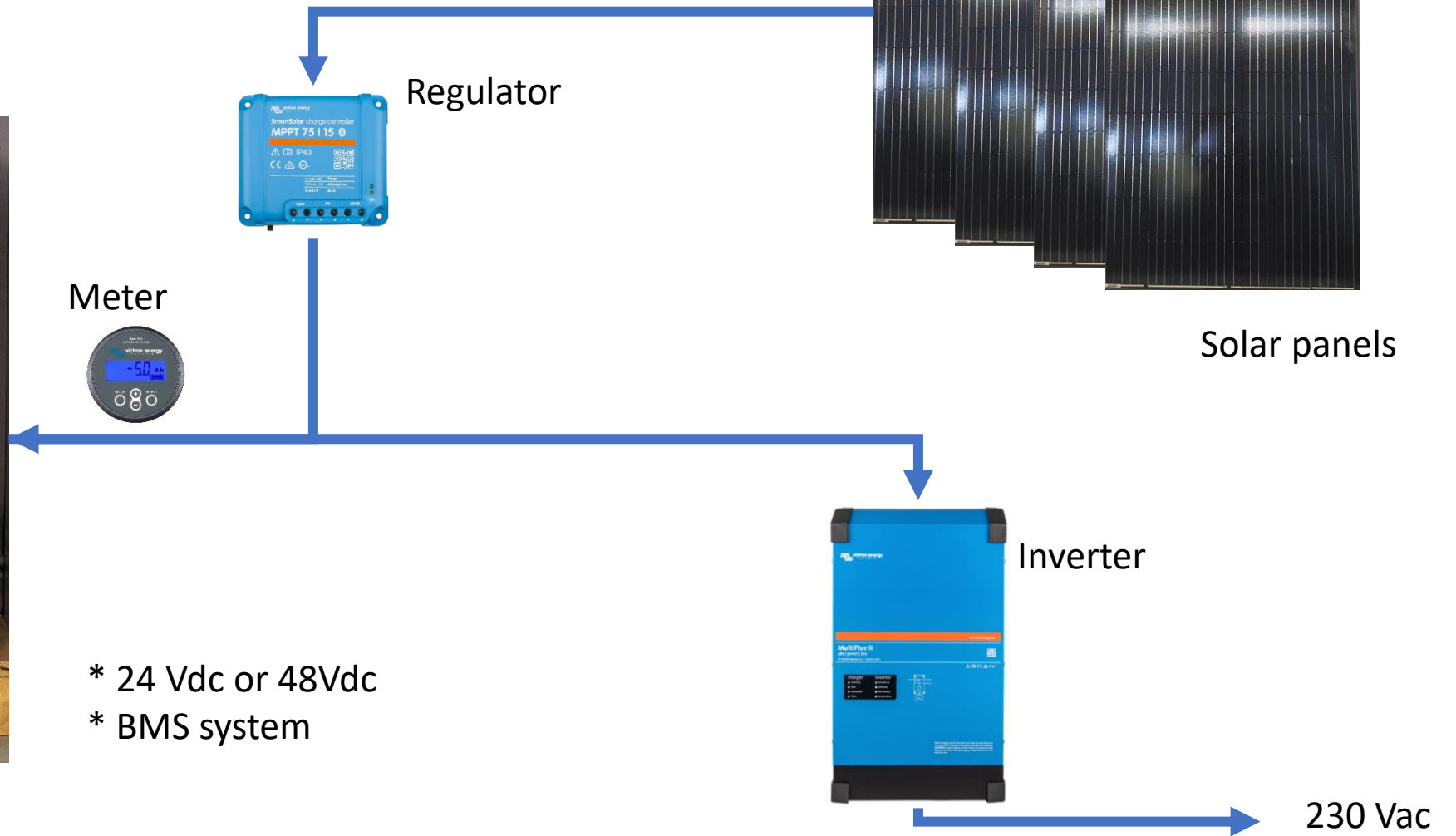
Solar panels

Inverter



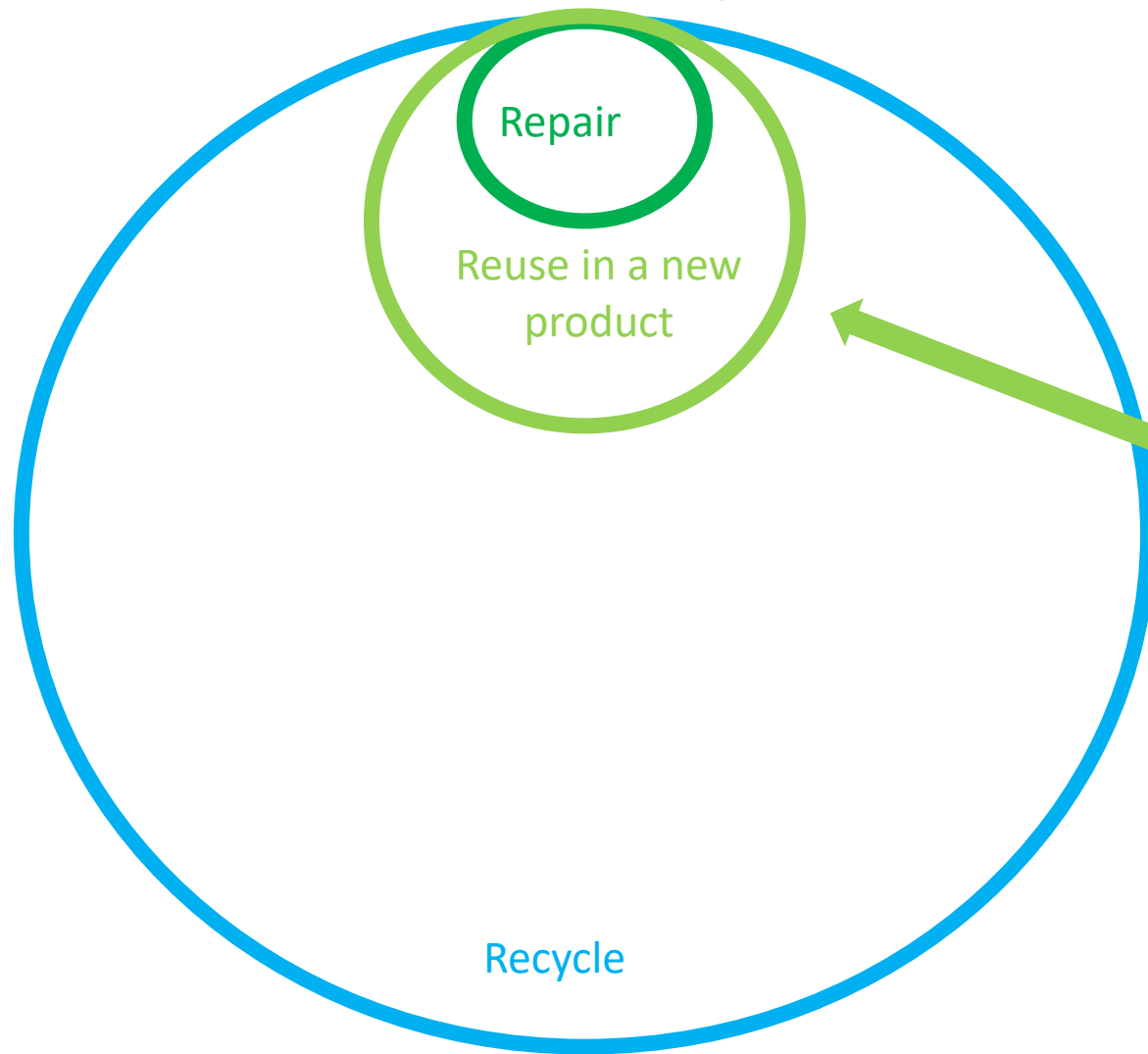
230 Vac

- \* 24 Vdc or 48Vdc
- \* BMS system





# Circular economy

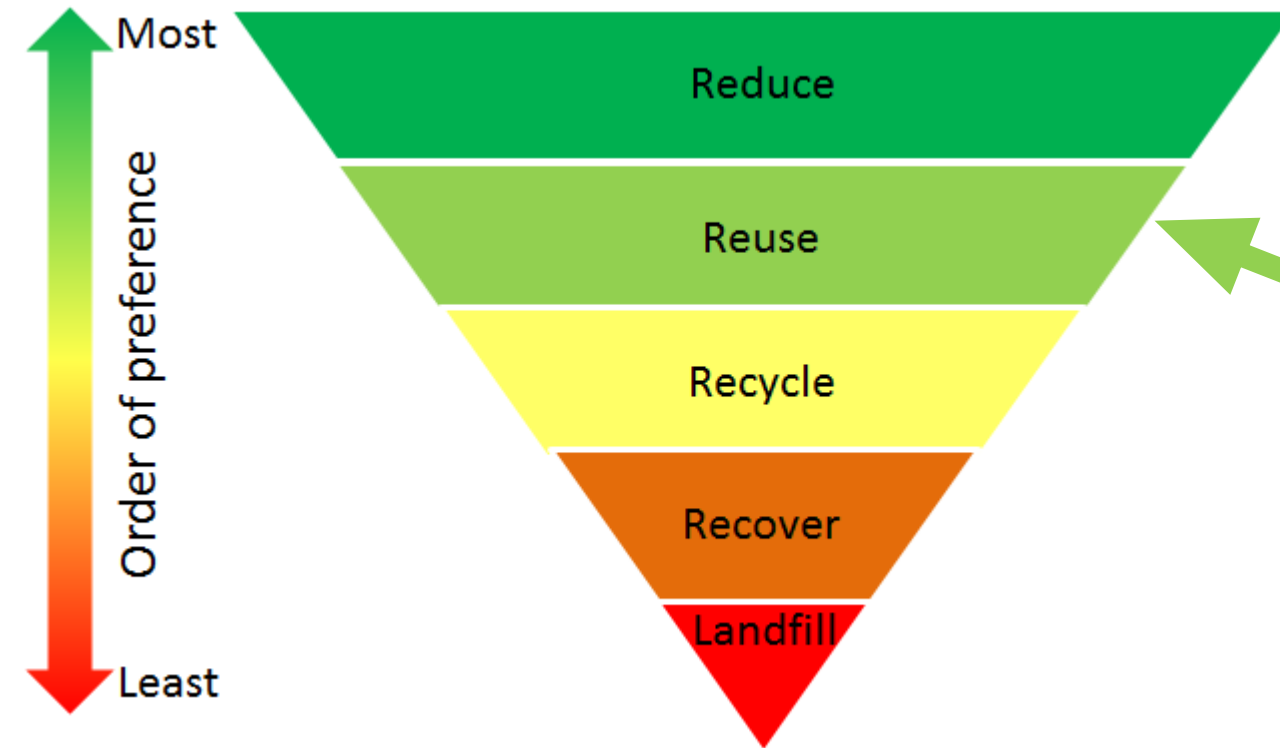


Reuse of lithium batteries



Alternativ Energi AS

# Waste Pyramid



Reuse of lithium batteries




Alternativ Energi AS

# Challenges

- **Off-grid systems:** Limited access to lithium battery cells
  - Some car-producers do not allow cells to be reused, only recycled
  - Cells are sold on the open private market, less cells available for professional use
  - Battery/car producers do not think reuse when designing the battery systems for the electric cars
- **Wheel loaders:** Change market from diesel to electric loaders.
  - Need drivers. VAT reduction?



## Short Break

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