Introduction to the Dutch National Growth fund ‘Materials Independence & Circular Batteries’

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Nov. 29th, PROMETIA 10th Scientific Seminar, Lisbon, Portugal

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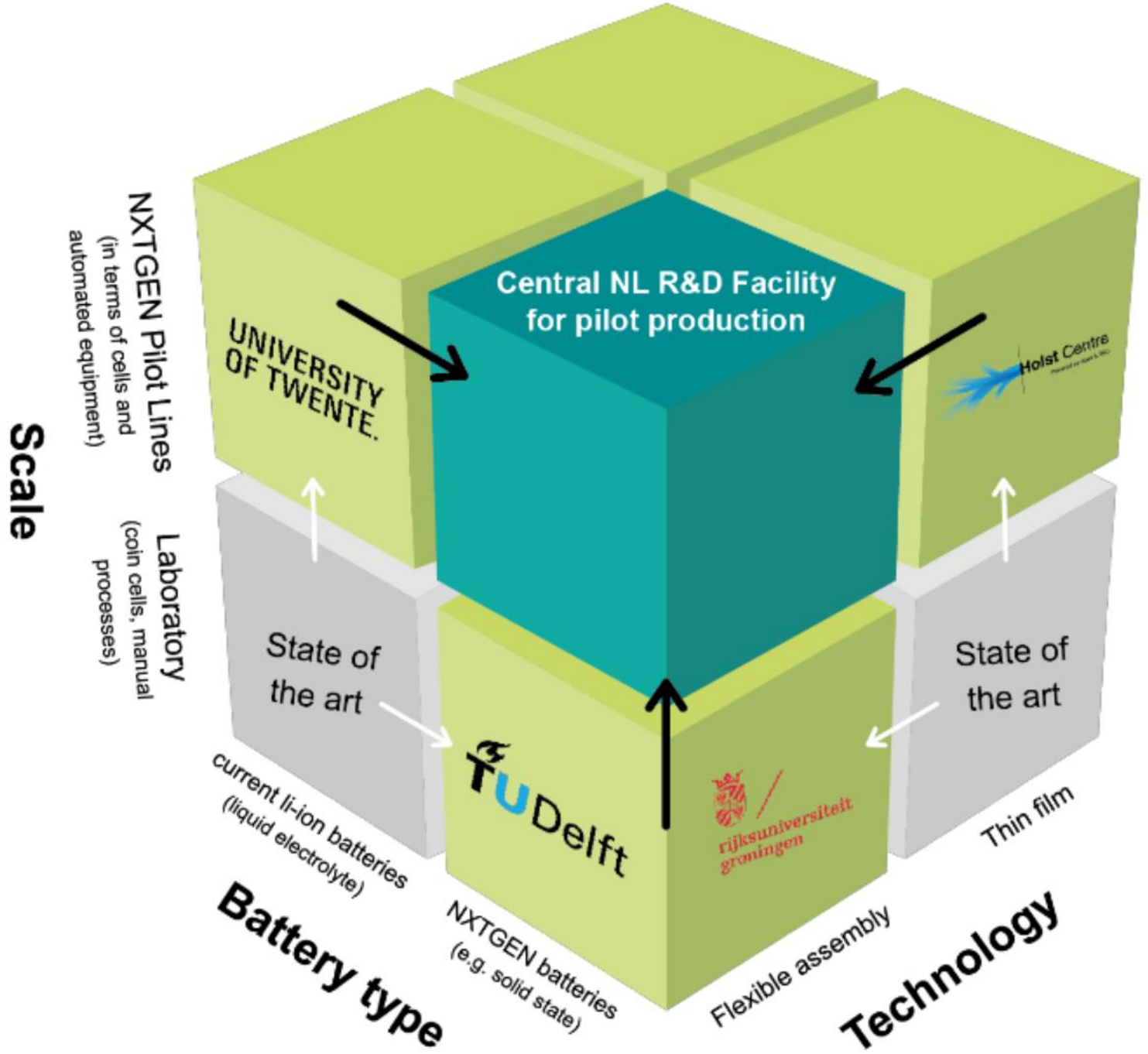

Content

- **Introduction –** Why?
- **NL growth fund Circular Batteries –** How & What!
- **Summary**

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Introduction
EUs' high ambitions

- Batteries play a central role in the energy transition, providing an efficient, smart & flexible way for energy storage and conversion.

- Demand for energy materials is on the rise and the battery market will grow enormously in just a few years

% metal required in 2050 for clean energy technologies vs. 2020 overall use (Global SDS ambitious climate scenario).** †			
Lithium	2,109%	Silicon	62%
Dysprosium	433%	Terbium	62%
Cobalt	403%	Copper	51%
Tellurium	277%	Aluminium	43%
Scandium	204%	Tin	28%
Nickel	168%	Germanium	24%
Praseodymium	110%	Molybdenum	22%
Gallium	77%	Lead	22%
Neodymium	66%	Indium	17%
Platinum	64%	Zinc	14%
Iridium	63%	Silver	10%

MADE IN EUROPE

Europe joins the 'white gold' rush for lithium and faces an energy transition challenge

Renewable energy + Add to myFT

EU digs for more lithium, cobalt and graphite in green energy push

Brussels plans to lower regulatory barriers to mining raw materials needed for wind farms and electric vehicles

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Introduction
The problem

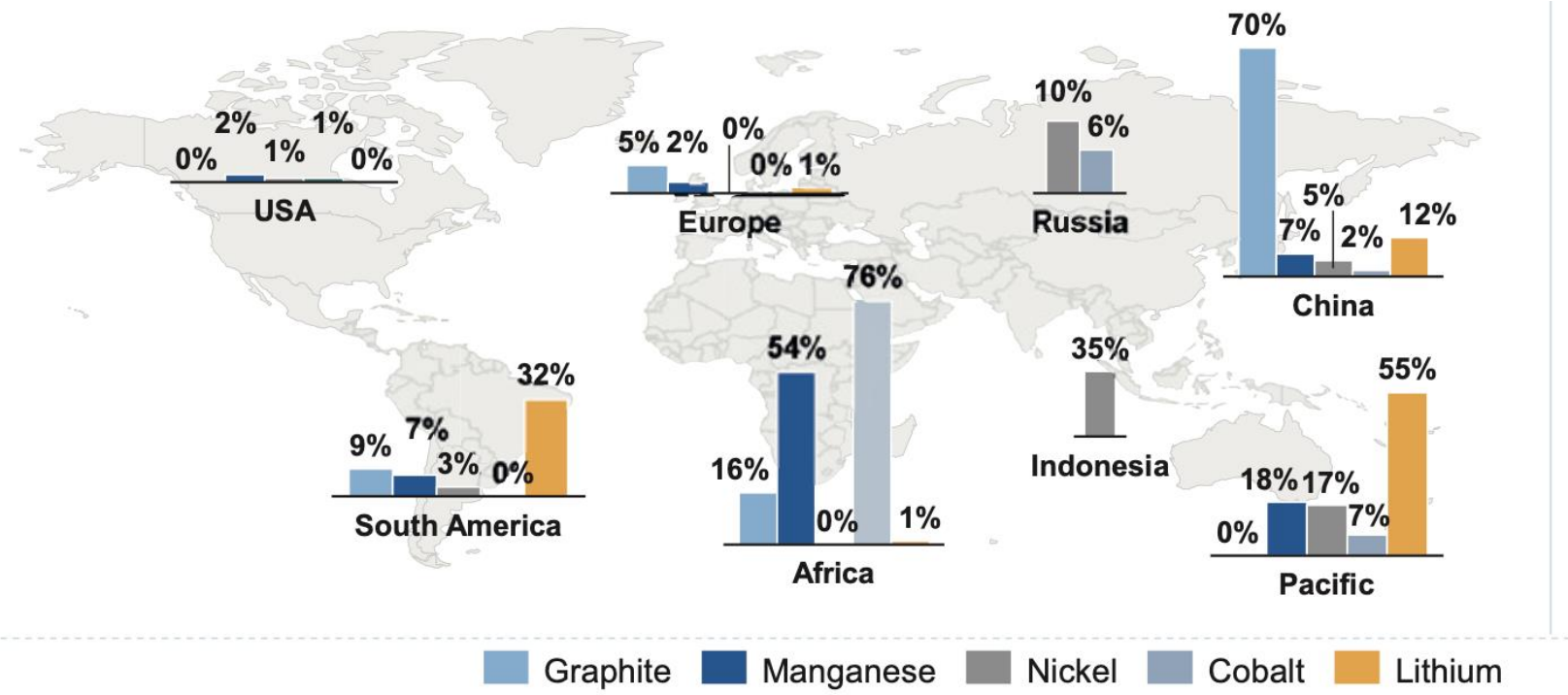
Business > Economy

By Doloresz Katanich with Reuters

Published on 20/10/2023 - 14:33 • Updated 15:06

Red alert for the EV market: China puts curb on graphite export

The EU not have enough materials, production & recycling capacity to realise it!



Supply chain risks: Resource allocation with major political risks
*Supply of new raw materials, 2020 [% share of world market]**

source: Battery Atlas, July 2022

Introduction
The solution

Press release | 16 March 2023 | Brussels

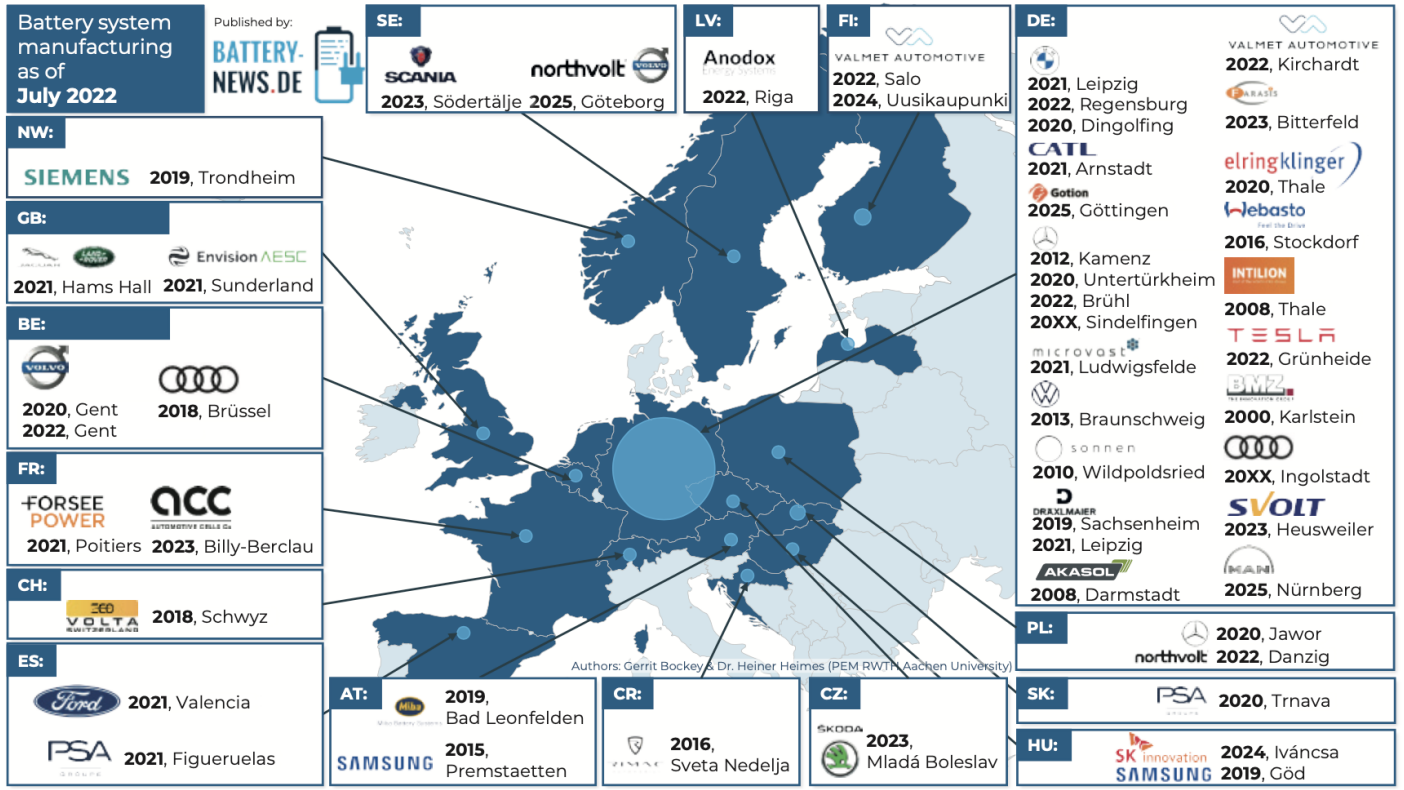
Critical Raw Materials: ensuring secure and sustainable supply chains for EU's green and digital future

⟺

Press release | 16 March 2023 | Brussels

Net-Zero Industry Act: Making the EU the home of clean technologies manufacturing and green jobs

- **EU policies:** EU CRMs act Act, EU Net-Zero industry Act, Battery legislation, etc.
- **Commercial investments**: European industry investing in 'gigafactories' of Li-ion battery cells production & recycling



source: Battery Atlas, July 2022

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Introduction

Li-ion battery value chain in NL

Source: Battery Atlas, July 2022

- Battery cell manufacturers
- Module and Pack Manufacturers
- Equipment Suppliers
- Active Material Suppliers
- Recycling Companies
- Battery Test Centers

No big OEMs in NL and volumes present on other countries like Germany and France

→ NL needs a National Battery Strategy and Action Plan

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Introduction

NL strengths

- Heavy duty mobility
- Chemical industry
- Thin-film technology
- High-tech equipment
- Materials Science
- Logistics, location (Rotterdam port)

- NextGen. and bulk batteries:
  - Silicon anodes
  - Solid state batteries
  - New battery materials
  - Bulk batteries (no/low CRMs)

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Introduction

Battery Competence Cluster - NL

NL agenda

1. Set up a national independent cluster organization = BCC-NL

   → Realized

2. Develop a Growth Fund program for multi-year innovation collaborations to grow the Dutch battery value chain

   → Approved in Sep. 2023 – 296 Million € subsidy

3. Develop a Human Capital agenda

   → ongoing

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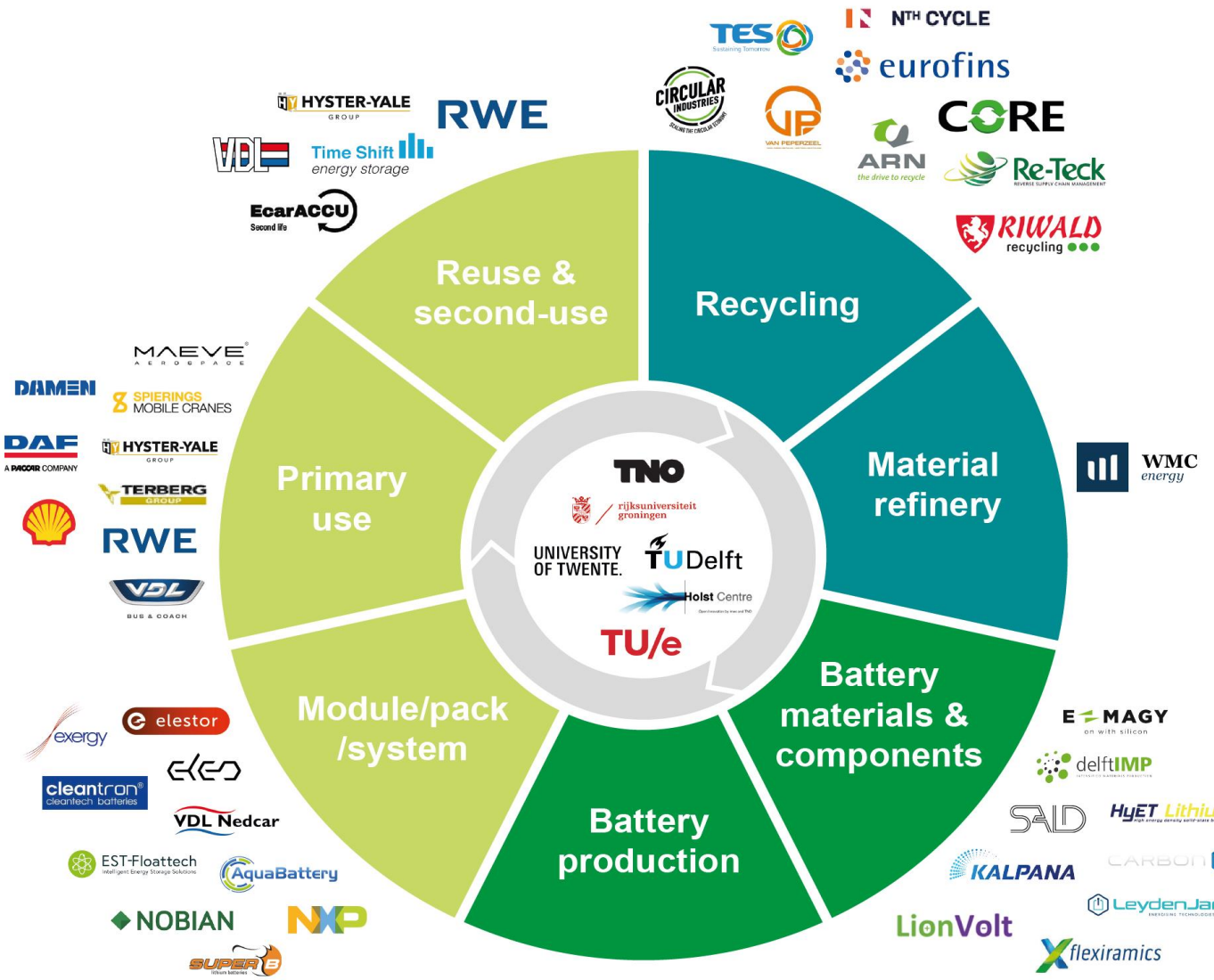
NL growth fund Circular Batteries

- Applicants: Min. Economic Affairs and BCC-NL
- 65 project partners
- Industry driven
- Total costs: € 750mln
- Subsidy: € 296mln
- Duration : 8 years – Q1 2024 – Q4 2031
- 3 program lines and 6 work packages



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NL growth fund Circular Batteries

Goals:

- Build a **recycling capacity** within the Netherlands

  → handling EoL batteries as close as possible to where they end at EOL, access to CRM

- Scale-up of Dutch companies in supply of **NexGen. Batteries**

  → component manufacturing pilot for development and scale up

- Focus on specialized markets: batteries for **heavy duty mobility** and (bulk) batteries for **grid stabilization**

  → niche market (20 vol.%) with high growth potential

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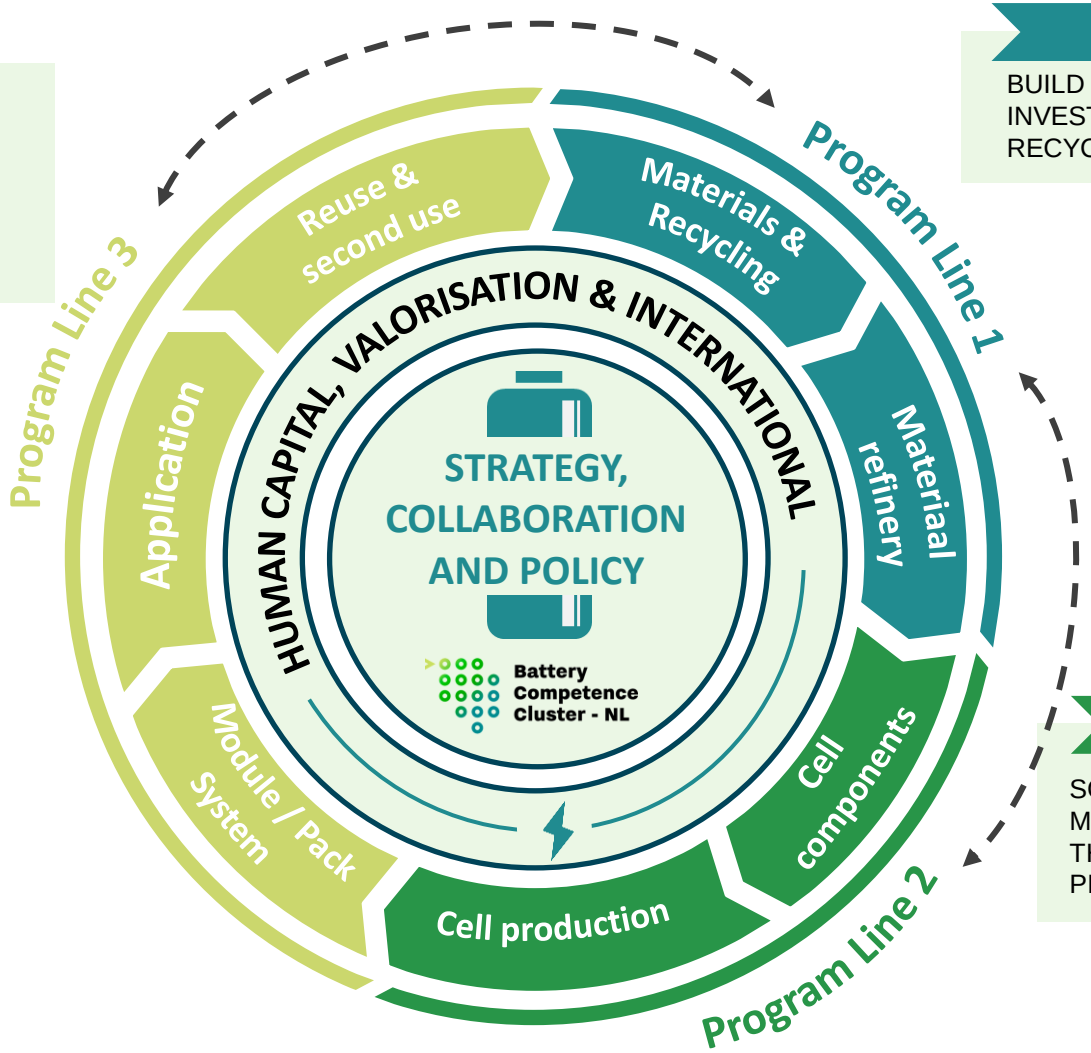
NL growth fund Circular Batteries

3. Development and Upscaling of Sustainable Battery Technology

STRATEGY

DEVELOP BATTERY SYSTEMS FOR HEAVY DUTY MOBILITY AND CREATE PRODUCTION CAPACITY OF MODULES/PACKS IN NL.
CREATE PILOTS AND DEMO'S FOR BULK BATTERY SYSTEMS



1. Sustainable Materials Supply

STRATEGY

BUILD INNOVATION CLUSTER AND INVESTIGATE POSITION IN THE RECYCLING VALUE CHAIN

2. Circular Battery Systems for Mobile Applications and Grid Stability.

STRATEGY

SCALE UP PROMISING SUSTAINABLE MATERIALS AND BRIDGE THE GAP WITH THE MARKET WITH CENTRAL CELL PILOT LINE

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NL growth fund Circular Batteries

Program Line 1

Short term: Establishing LIBs recycling capacity in the Netherlands

1. Black mass production (dismanteling, schredding etc.)
2. Material Recovery
3. Material Refinery – LiOH and $NiSO_4$ refining in NL (44 kton/year)

Long term: Developing innovative recycling for Next gen. batteries

Continuous innovation through collaboration and interaction with other Program Lines

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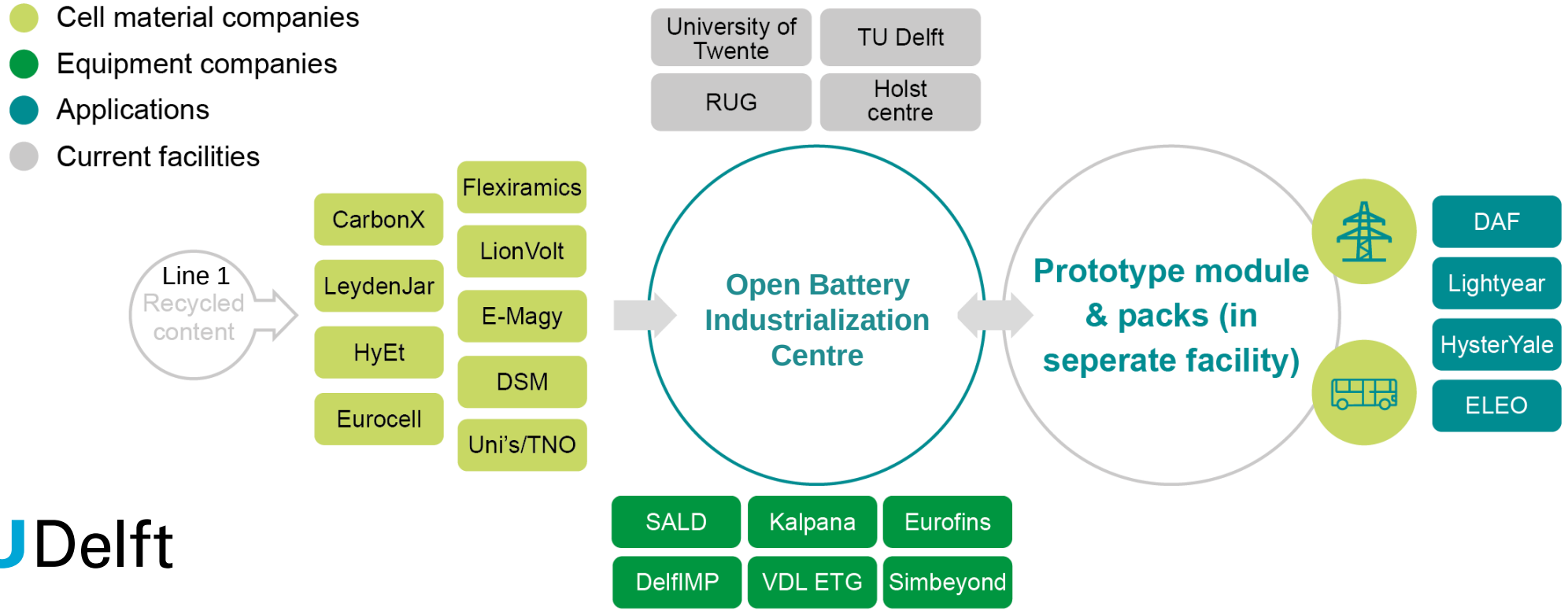
Program Line 2

Development and scaling up sustainable battery technology (materials, components and equipment) – Next gen.



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NL growth fund Circular Batteries

Raw materials and recycling → Material refinery → Battery materials & components → Battery cells → Module & packs → Application → Reuse & second-use

Program Line 3

Circular design and innovative production process in NL - a platform and market to test most promising next gen. technology

Input from next-generation cells

Circular Pack Design for heavy duty applications

Prototyping and scaling production processes

DAF A PACCAR COMPANY

HYSTER-YALE

VDL BUS & COACH

DAMEN

Second-use use cases

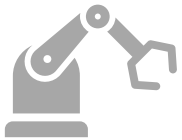
EST-Floattech Intelligent Energy Storage Solutions

NXP

DAF A PACCAR COMPANY

VDL ETS

TNO



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Application-driven development

Summary

- Large public-private collaboration
- Creating strategic position for NL; forward looking and focusing on low volumes, specialized markets; heavy duty mobility and bulk batteries
- LIBs: not reinventing the wheel, but development and scale-up of recycling capacity in a short time
- No giga manufacturing facilities, but a unique ecosystem in next gen cell and specialized applications: boosting development and scaling up of promising technology

Thank you for your attention

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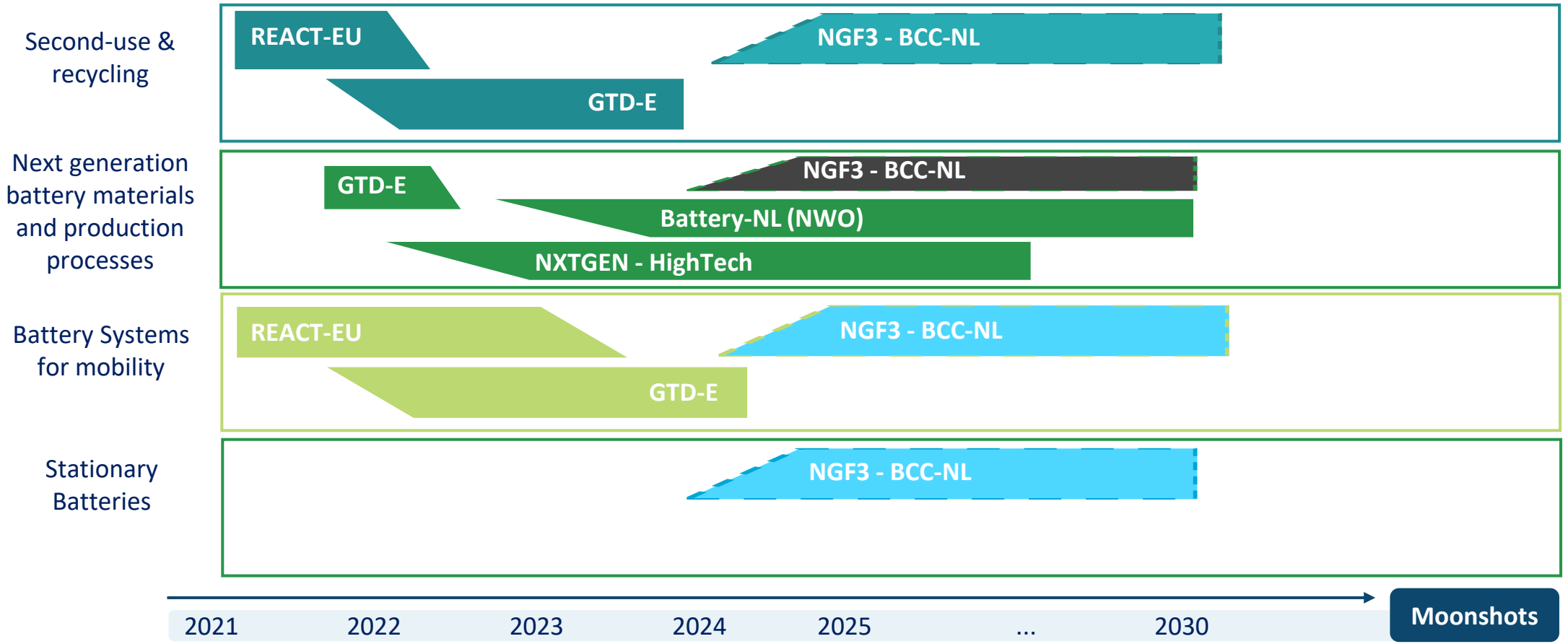
Second-use & recycling
REACT-EU
NGF3 - BCC-NL
GTD-E
Next generation battery materials and production processes
GTD-E
NGF3 - BCC-NL
Battery-NL (NWO)
NXTGEN - HighTech
Battery Systems for mobility
REACT-EU
NGF3 - BCC-NL
GTD-E
Stationary Batteries
NGF3 - BCC-NL
2021
2022
2023
2024
2025
...
2030
Moonshots

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