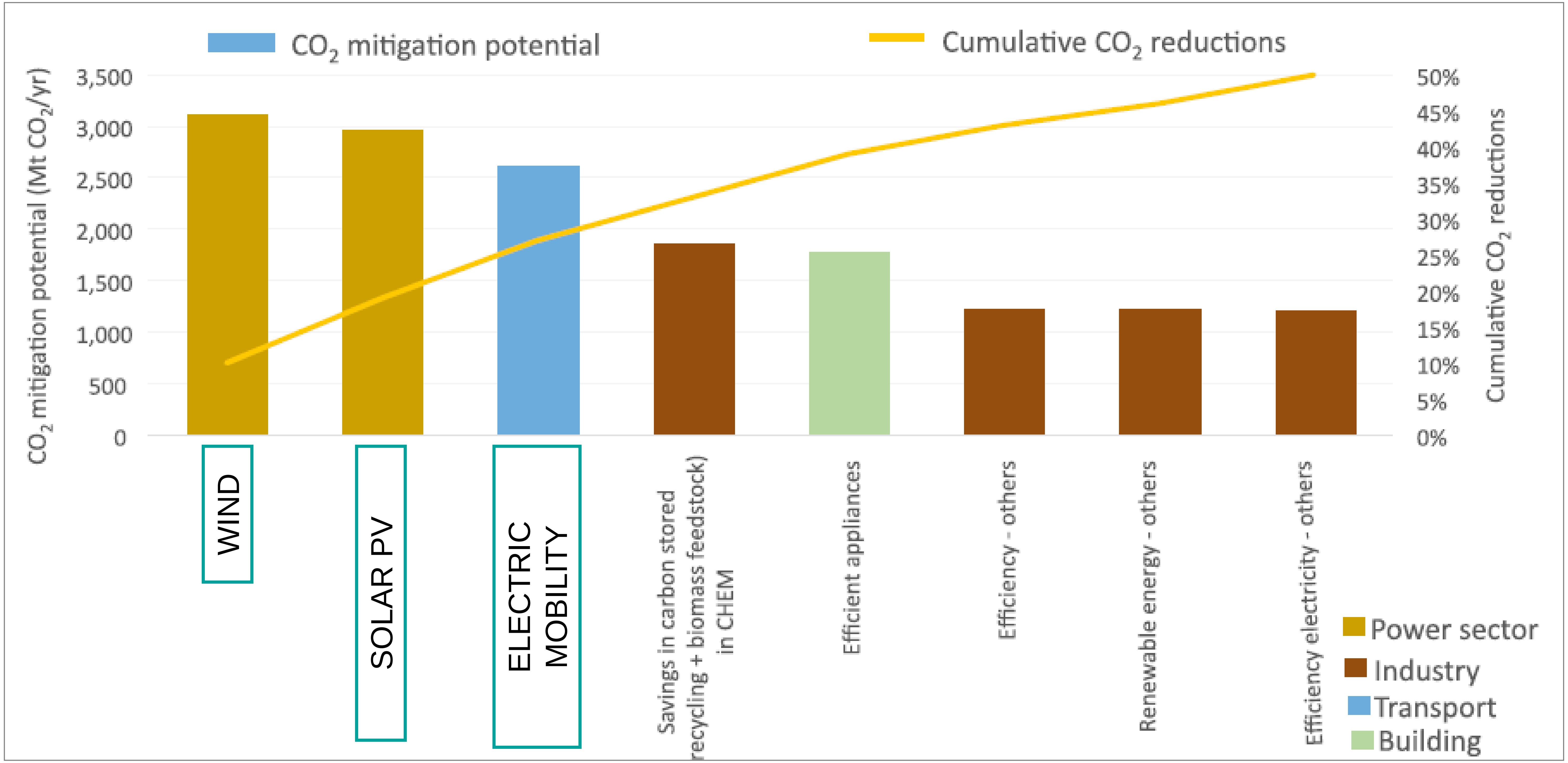
BETTERY

BETTER BATTERIES FOR THE FUTURE

BETTERY: An Italian startup for the design of novel redox flow batteries

FRANCESCA DE GIORGIO - COFOUNDER

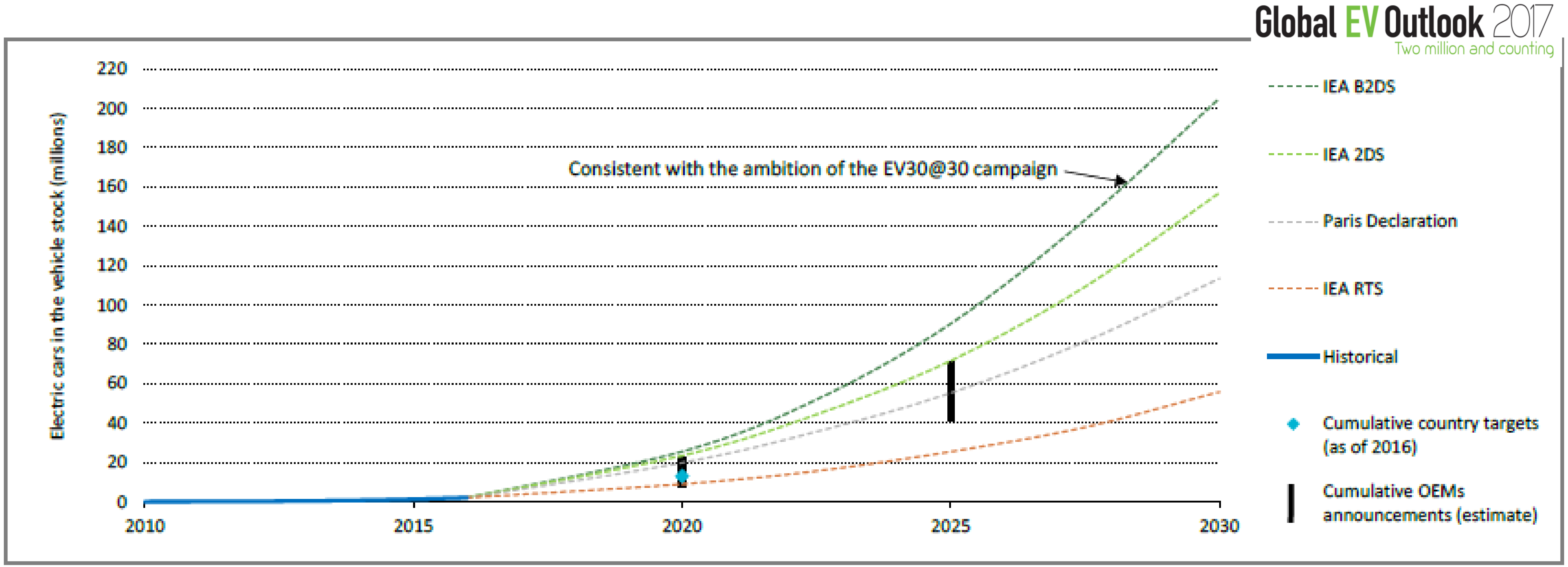
KEY TECHNOLOGY OPTIONS FOR THE ENERGY TRANSITION



IRENA International Renewable Energy Agency *Accelerating the Energy Transition through Innovation. Working paper, June 2017*

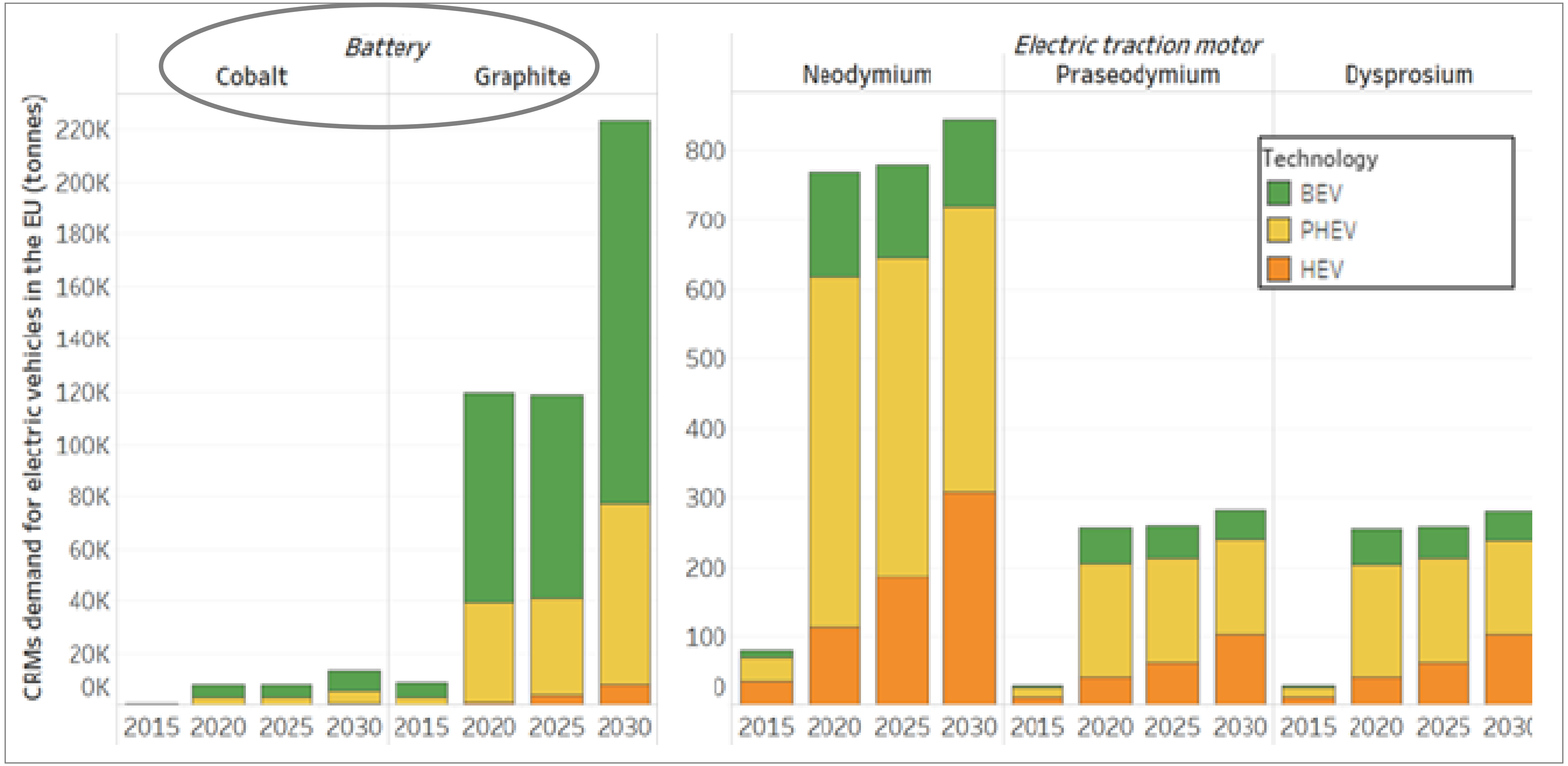
ELECTRIC VEHICLES (EVs) DEPLOYMENT

56 million electric cars in circulation by 2030 (28 times the 2016 stock)



NEED MORE PERFORMING BATTERIES TO GET ABOVE 250 Wh/kg AND EXTEND THE DRIVING RANGE

CRMs DEMAND IN THE EU FOR ELECTRIC MOBILITY



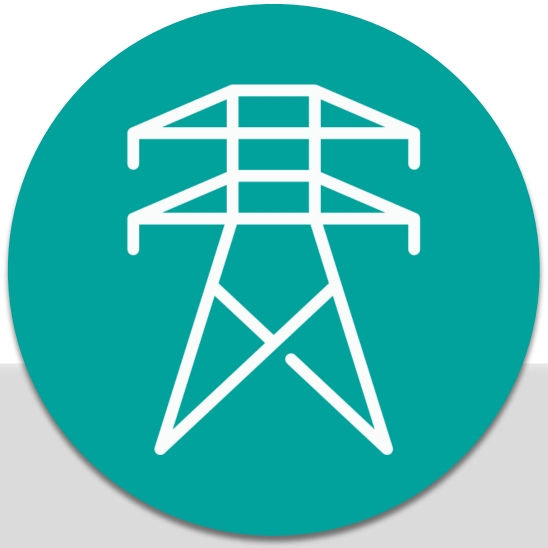
NEED OF REDUCING THE USE OF CRMs IN BATTERIES FOR HEVs AND EVs

- Report on Critical Raw Materials and the Circular Economy, EU – 16.01.2018

PROBLEMS

Renewable energy sources **intermittency**

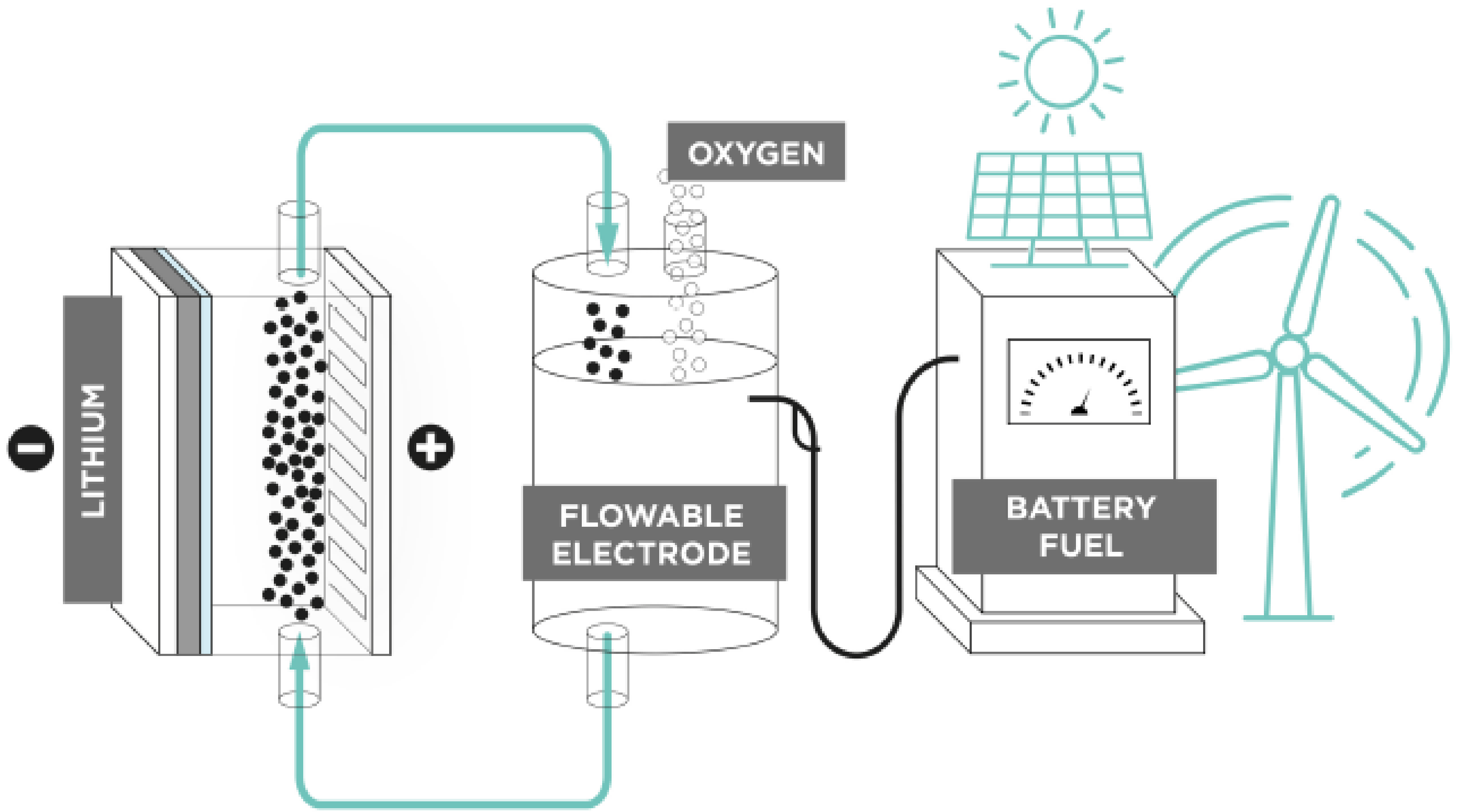
Short range **(<400km)** and **long** recharges

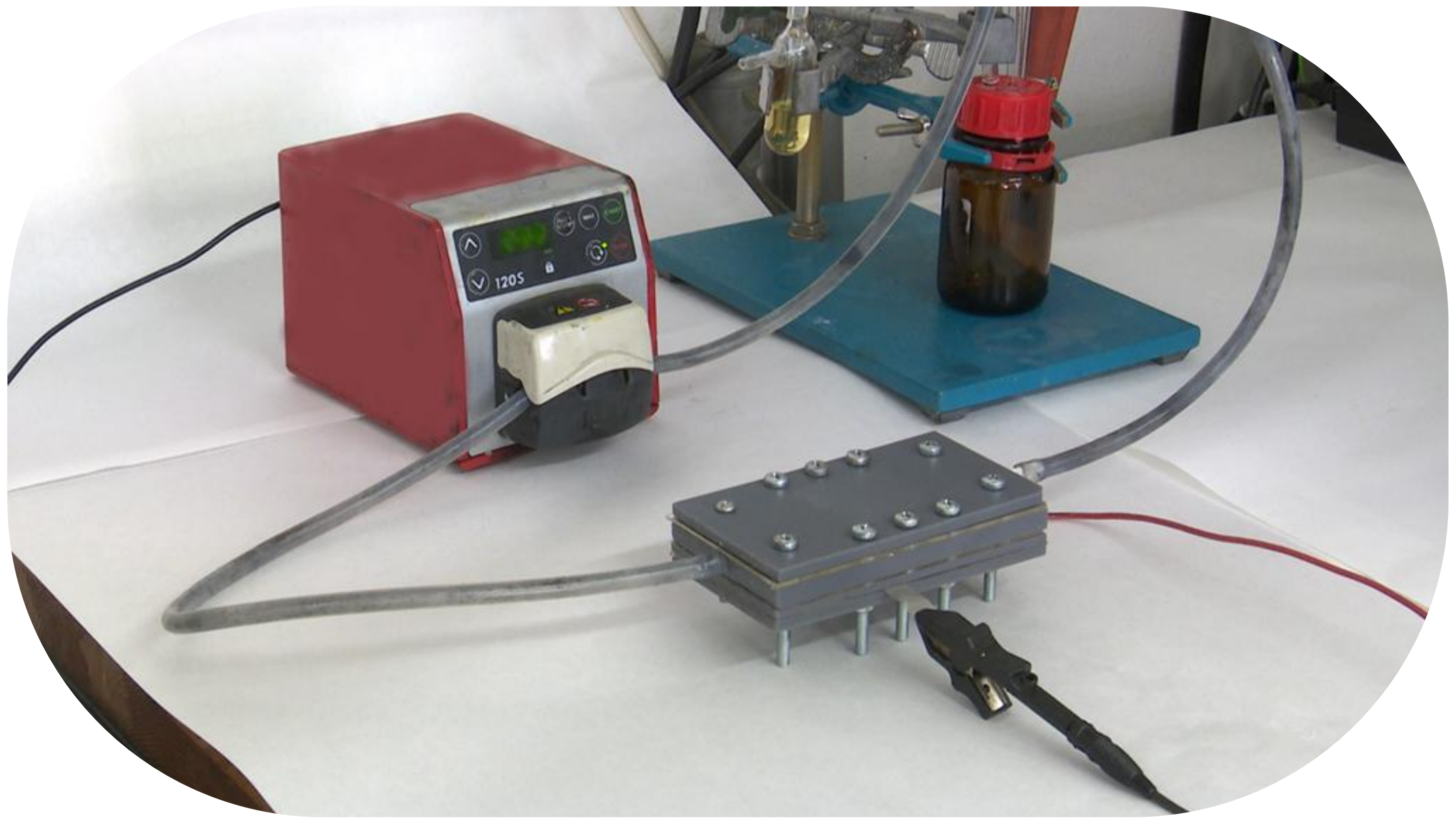


Low grid **energy quality**

NESSOX

NEw **S**emi-**S**olid flow lithium **OX**ygen battery





Brevetto: *F. Soavi, C. Arbizzani, I. Ruggeri.*

Semi-solid flow Li/O2 battery (102015000040796)

Up to 1 kWh kg^{-1}

Fast recharge by "catholyte refueling"

NESSOX

Redox Flow batteries

Flowable liquid electrodes

For large scale electrical energy storage

Li/O_2 batteries

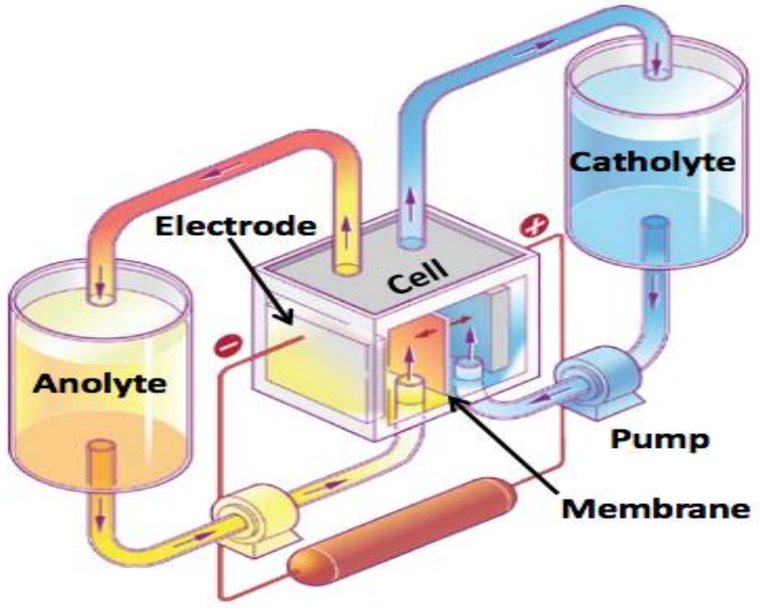
air breathing

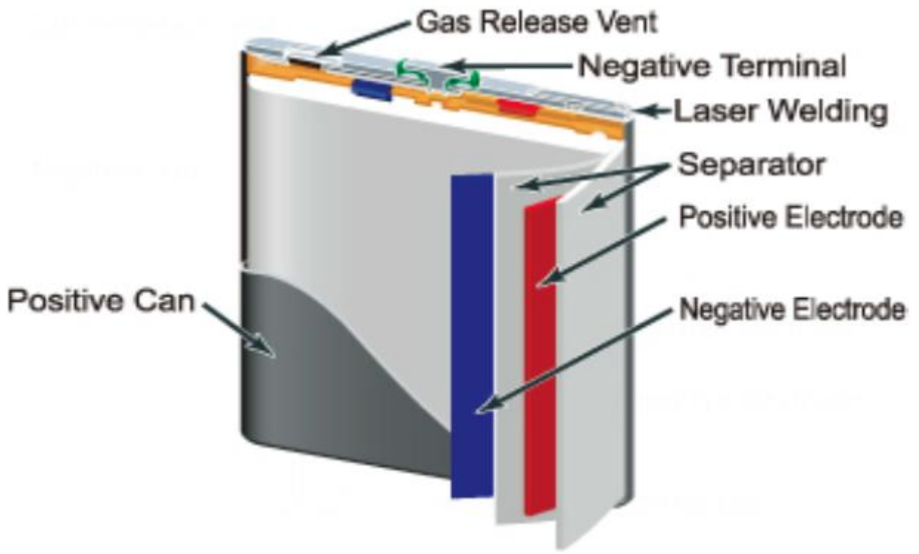
For future e-mobility

Li-ion batteries

Solid electrodes

For portable devices and Hybrid/Electric Vehicles





NESSOX

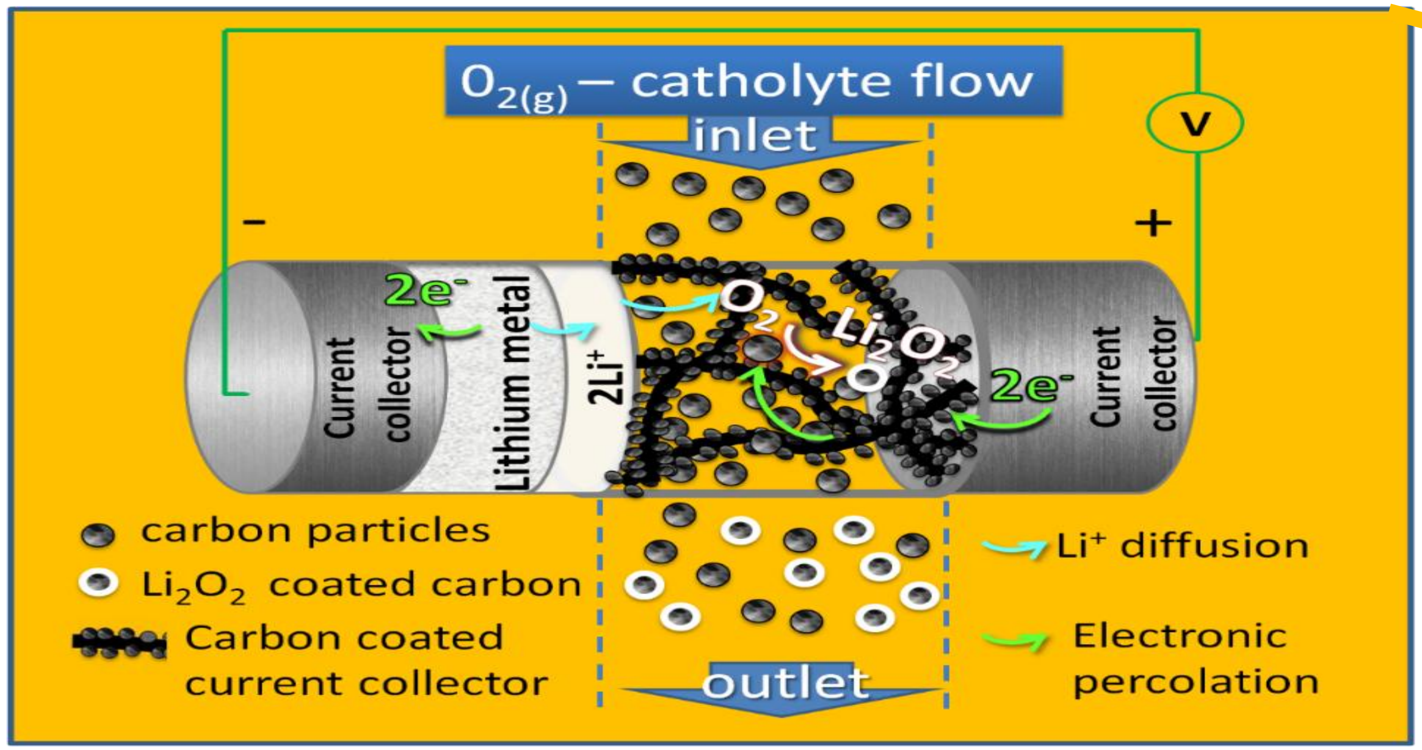
Up to 1 kWh kg^{-1}

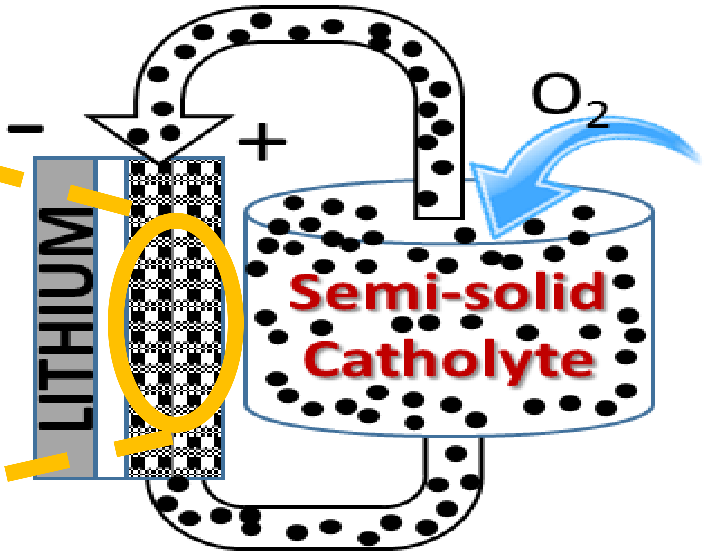
Fast recharge by "catholyte refueling"

-I. Ruggeri, C. Arbizzani, F. Soavi, Electrochimica Acta, 2016, 206, 291-300

- F. Soavi, I. Ruggeri, C. Arbizzani, Patent 102015000040796_31/07/2015_61.U2164.12.IT.41

THE CONCEPT





Li_2O_2 mainly deposits on the slurry carbon particles

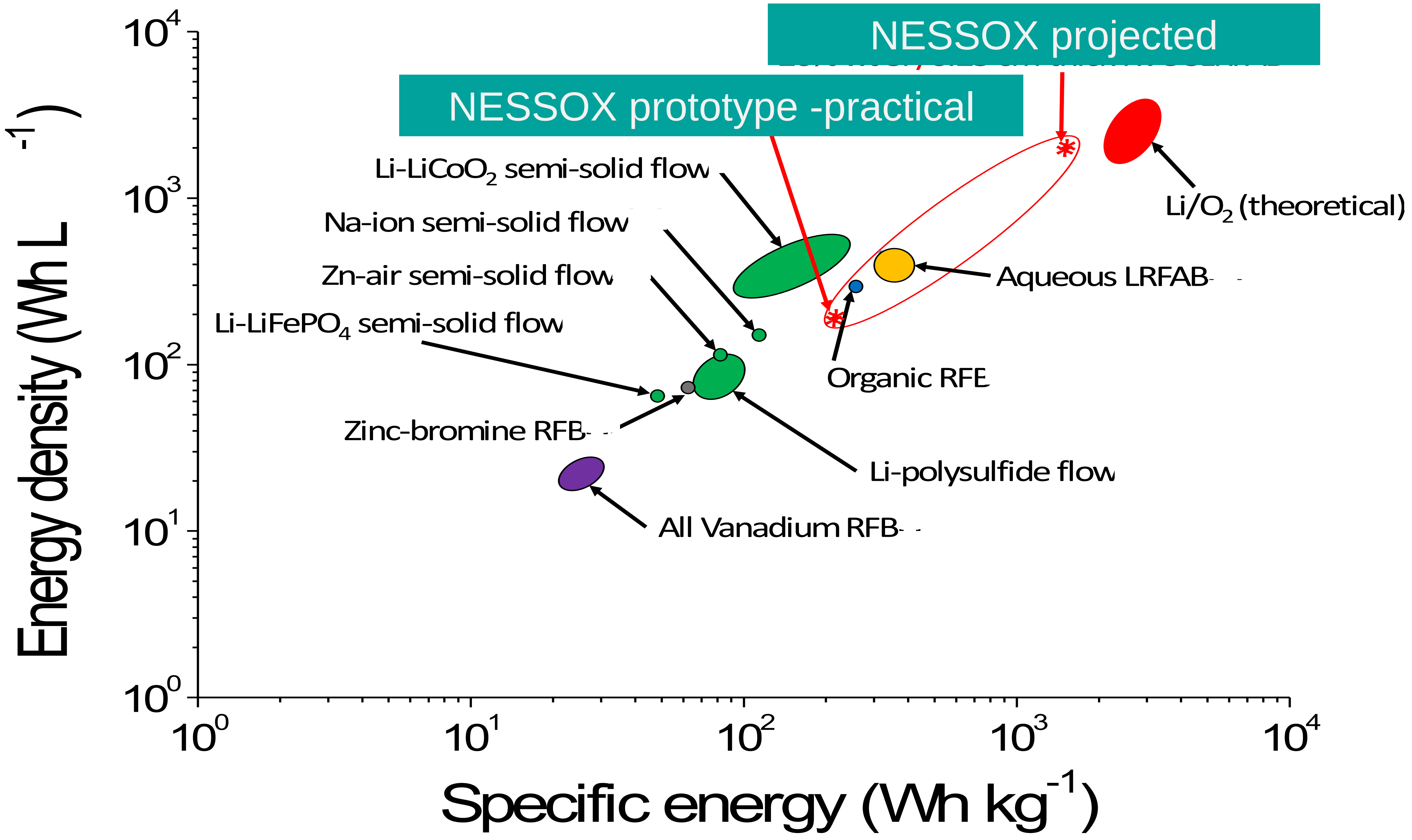
ADVANTAGES

✓ Cathode current collector passivation is alleviated - HIGH DISCHARGE CAPACITY

✓ Carbon percolating network multiplies redox sites - BETTER CYCLE LIFE

- *I. Ruggeri, C. Arbizzani, F. Soavi, Electrochimica Acta, 2016, 206, 291-300*
- *F. Soavi, I. Ruggeri, C. Arbizzani, Patent (102015000040796_31/07/2015_61.U2164.12.IT.41)*

THE CONCEPT



- I. Ruggeri, C. Arbizzani, F. Soavi, Electrochimica Acta, 206 (2016) 291
- F. Soavi, I. Ruggeri, C. Arbizzani, ECS Transaction, 72 (2016) 1
- I. Ruggeri, C. Arbizzani, F. Soavi, Carbon, 30 (2018) 749

E N E R G Y   D E N S I T Y

500% > BEST PERFORMING
Li-ion batteries ON THE MARKET

SPEED OF RECHARGE

Minutes VS. Hours

NEw **S**emi-**S**olid flow lithium **OX**ygen battery

COST

< 150 $/kWh

30% < Li-ion batteries

NEw **S**emi-**S**olid flow lithium **OX**ygen battery

SUSTAINABILITY

Carbon footprint **reduction** by **20% kg CO_{2eq}**

Heavy-metals free, low impact manufacturing

T E A M

MORE THAN 20 YEARS OF RESEARCH ON INNOVATIVE BATTERIES

FRANCESCA SOAVI
Co-founder
Patent inventor
Assistant Professor, LEME – Dept. of Chemistry, UNIBO
Chair elect of Energy Division of the **International Society of Electrochemistry**
>20-years on batteries

ALESSANDRO BRILLONI
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Prototype designer
M. Sc. in Energy Engineering

FRANCESCA DE GIORGIO
Co-founder
President
Post-doc researcher
8-years on batteries

FEDERICO POLI
Employee n°1
Prototype designer and Modelling
M. Sc in Chemical Engineering

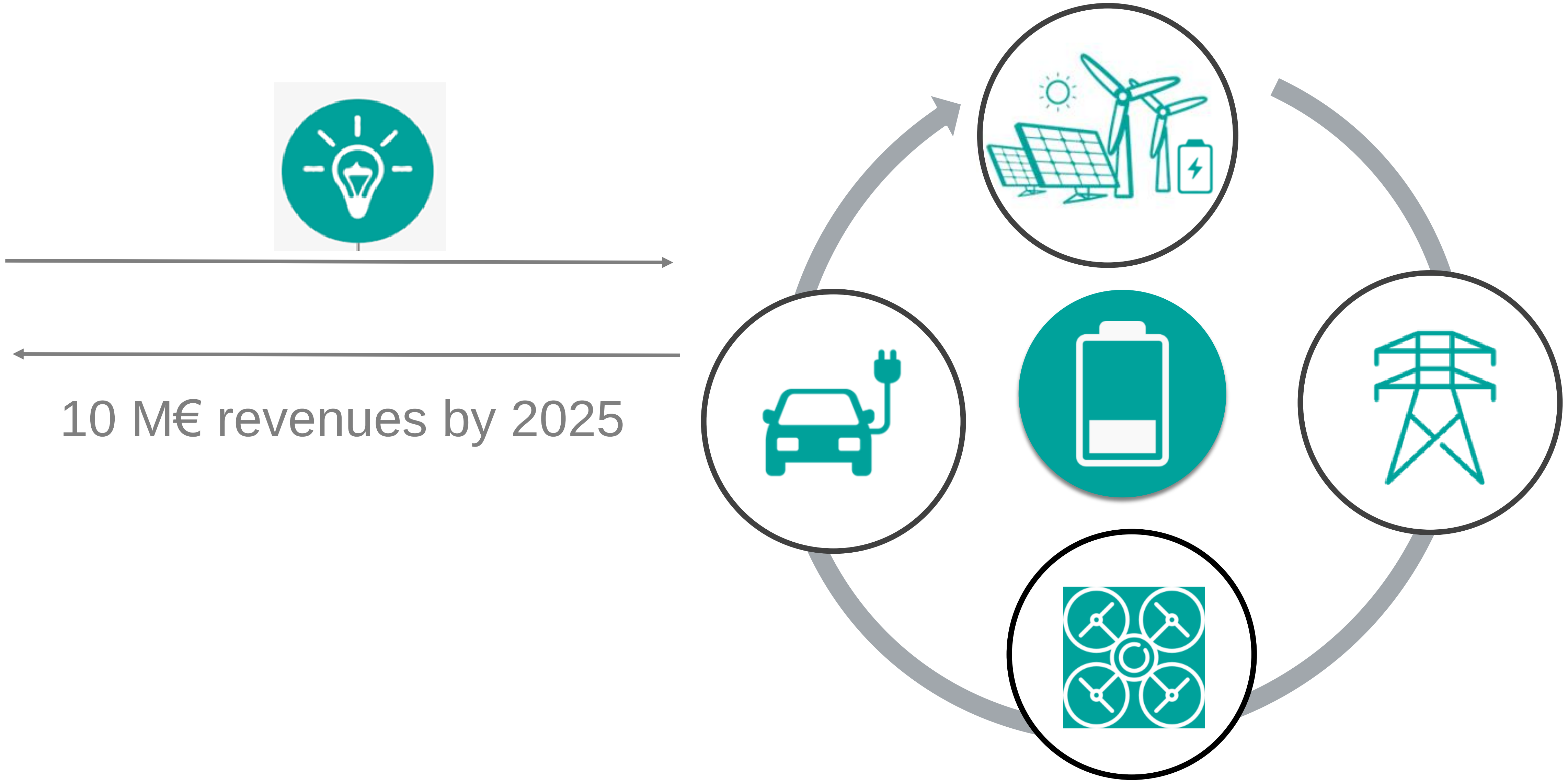
ALESSANDRO PASTORE
Co-founder
Vice President
Serial entrepreneur and business angel/mentor
Co-director of Bologna Business School

BUSINESS MODEL

THE DEAL

Patent Licensing of green, long-lasting & fast recharge lithium-oxygen batteries

BETTERY



M A R K E T

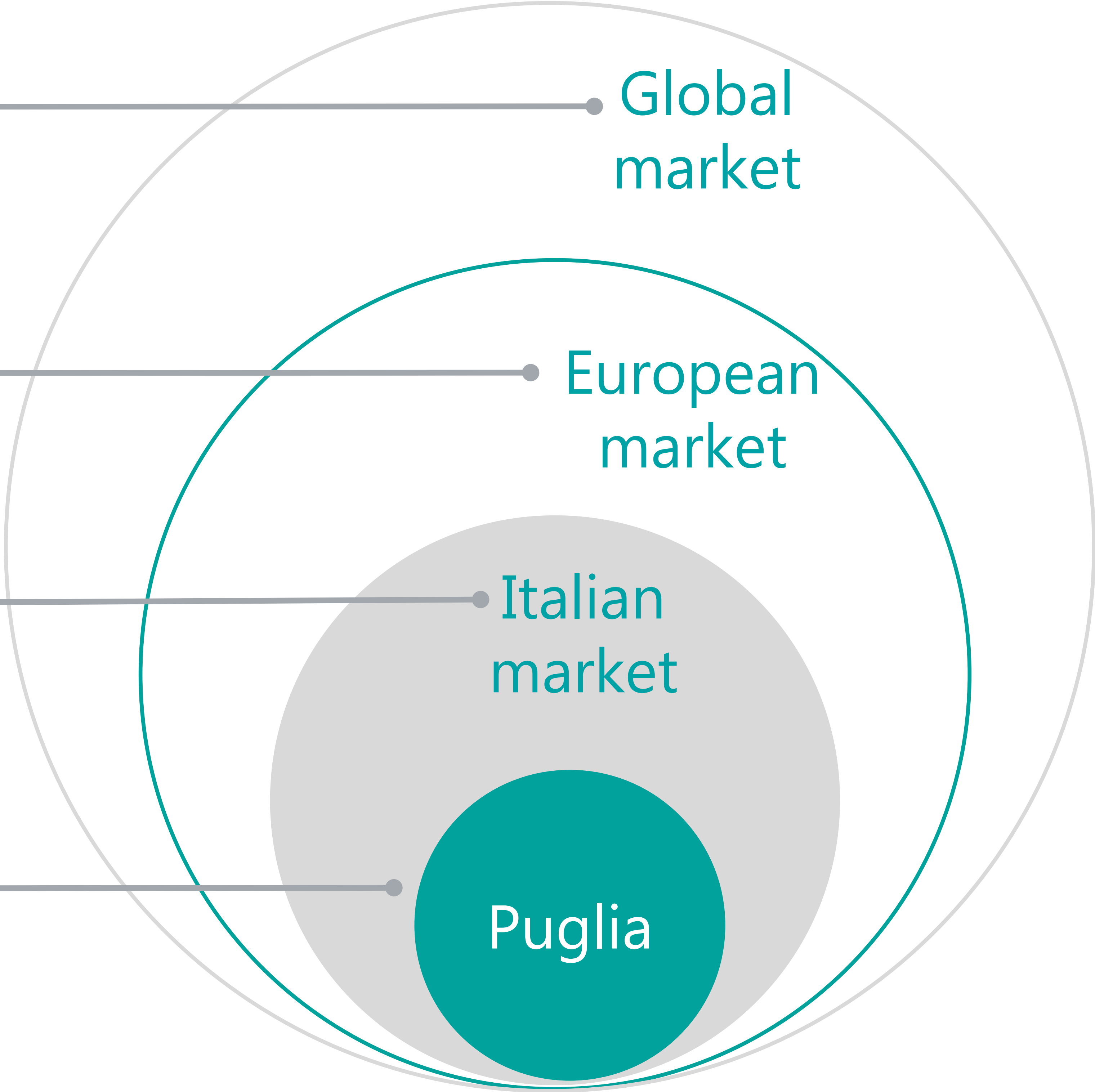
$200 B
2020

$12 B
2020

$2 B
2020

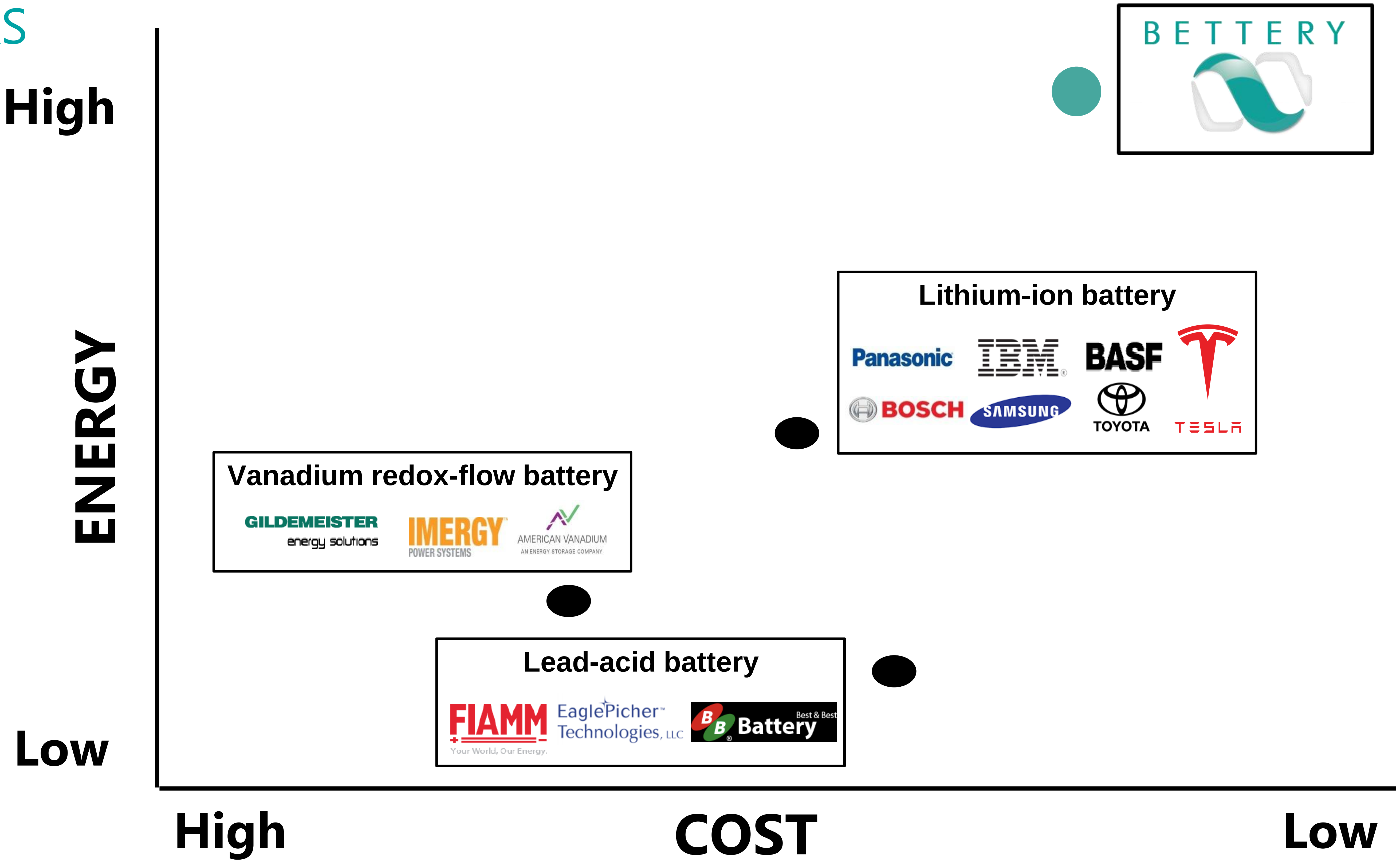
$237 M
2020

- Batteries for energy storage from renewable sources



MARKET

COMPETITORS



ROADMAP

30.01.2018
BETTERY
Foundation

M1-M4
NEXT ENERGY
PoliHub

M3
Prototype II
10 mA cm^2

M4-M6
Prototype III
25 cm^2

M7-M9
Prototype IV
40 cm^2
TRL 5

M10-M12
2 Patent Filing

M11-M12
BMS
Battery Stack

2020
300 W- Module
TRL6

NEW PATENTS
cells,
components & design

B E T T E R Y

MORE THAN 20 YEARS OF RESEARCH ON INNOVATIVE BATTERIES

eit Climate-KIC | Italy

next energy
FUTURO AD ALTA TENSIONE

START CUP
Emilia-Romagna edizione 2017
un'iniziativa di ASTER

nuove IDEE nuove IMPRESE
Associazione per l'innovazione imprenditoriale
e business plan competition
Rimini | San Marino | 16ª EDIZIONE 2017

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

START UP DAY 2017

UniCredit Start Lab

edison pulse

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ROYAL SOCIETY
OF CHEMISTRY


L'evento. In palio un voucher da 50mila euro - Promotori Terna, Fondazione Cariplo e Cariplo Factory

Il progetto Bettery vince Next Energy

BETTERY

BETTER BATTERIES FOR THE FUTURE

CHANGE THE PARADIGM IN ENERGY STORAGE

BRING INTO THE MARKET THE LONGEST-LASTING, GREEN AND LIQUID BATTERY

BECOME THE WORLDWIDE LEADER ON NEXT GENERATION BATTERIES

20 YEARS R&D ON INNOVATIVE BATTERIES

next energy FUTURO AD ALTA TENSIONE · eit Climate-KIC | Italy · Premio Nazionale per l'Innovazione Connecting to the FUTURE NAPOLI 2017 30 novembre 1 dicembre DIRETTA STREAMING · START CUP Emilia-Romagna edizione 2017 un'iniziativa di ASTER · UNIBO LAUNCH PAD

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