



TEESMAT

Open Innovation Test Bed for Electrochemical
Energy Storage Materials



Introduction to TEESMAT

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Grant Agreement
No 814106

Main Project Features



TEESMAT

Test bed for Electrochemical Energy Storage
MATerials

HORIZON 2020 Call

- *Call identifier:* H2020-NMBP-TO-IND-2018-2020
 - Topic: Open Innovation Test Beds for Characterisation (IA) (DT-NMBP-07-2018)

Type of action

- Innovation Action

Grant Agreement Nr.

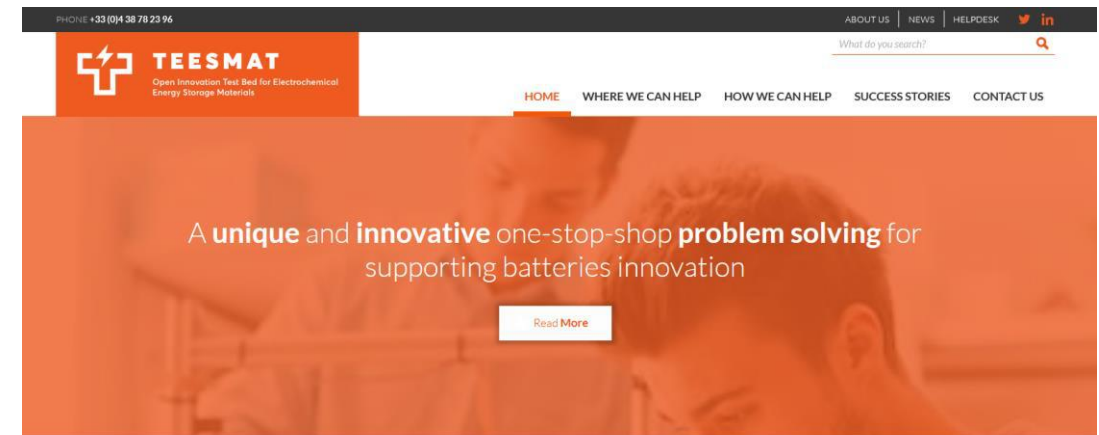
- 814106

Coordinator

- Commissariat à l'énergie atomique (CEA)
 - Dr. Fabien Perdu
 - Contact: Fabien.perdu@cea.fr

Project website

www.teesmat.eu



From 01/01/2019 to 31/08/2022



TEESMAT partners



Acronym	Country		N°	type	SP / SU?
CEA	FR		1	RTO	SP
ESRF	FR		2	RTO	SP
SERMA	FR		3	SME	SEP
ZSW	DE		4	RTO	SP
VITO	BE		5	RTO	SP
TECNALIA	ES		6	RTO	SP
CERTH	GR		7	RTO	SP
IN-CORE SYS	FR		8	SME	SP
SEMILAB	HU		9	SME	SP

Coordinator

- Characterisation → 29-31
Techniques at different levels of development provided by **SP**
- Single Entry Point → SEP for the interface
- Test Customers → 10 actors in different sectors of energy storage (**SU**)

						Technology
ZINERGY	UK		11	SME	SU	Printed Zn & Li-ion batteries
FAAM	IT		12	LE	SU	LFP Li-ion batteries
UMICORE	BE		13	LE	SU	Li-ion (all-solid state) cathode materials
YUNASKO	Ukraine		14	SME	SU	LIC (lithium-ion capacitors)
GENES'INK	FR		15	SME	SU	Cu metallization and Cu nanoink for printed Li-ion batteries
ARKEMA	FR		16	LE	SU	LiTDI salt for Li-ion batteries
SUNLIGHT	GR		17	LE	SU	Lead acid batteries
E-MAGY	ND		18	SME	SU	Li-ion batteries Si material
CRF	IT		19	RTO	SU	Li-ion batteries
CEGASA	ES		20	SME	SU	Zn-air batteries
EBN	BE		21	NPO	SP	
HYDRAREDOX	SP		22	SME	SU	Redox Flow batteries



TEESMAT : an open innovation Test bed for Electrochemical Energy Storage MATerials

- The European **battery** market is expected to increase by a factor of 4 to 10 by 2025
 - The development of a **competitive battery value chain** in Europe is one of the top priorities of the European Commission.
 - Progress of electrochemical energy storage devices (EESD) depends on **characterization and understanding of all basic processes**.
- ➔ **Access to advanced characterisation solutions** enables industry to apply a knowledge-based approach, which is essential to **accelerate innovation** and reduce the cost of technologies.



Objectives of TEESMAT



TEESMAT aims to bring a comprehensive response to these critical bottlenecks faced by EU stakeholders in the field of electrochemical energy storage materials.

The **three core objectives of TEESMAT** are:

OBJECTIVE #1 - To set-up an **Open Innovation Test Bed (OITB)** to provide effective, centrally managed access to advanced materials' characterization, modelling and data informatics;

OBJECTIVE #2 - To demonstrate the OITB's added value by solving persistent, high-impact industrial problems;

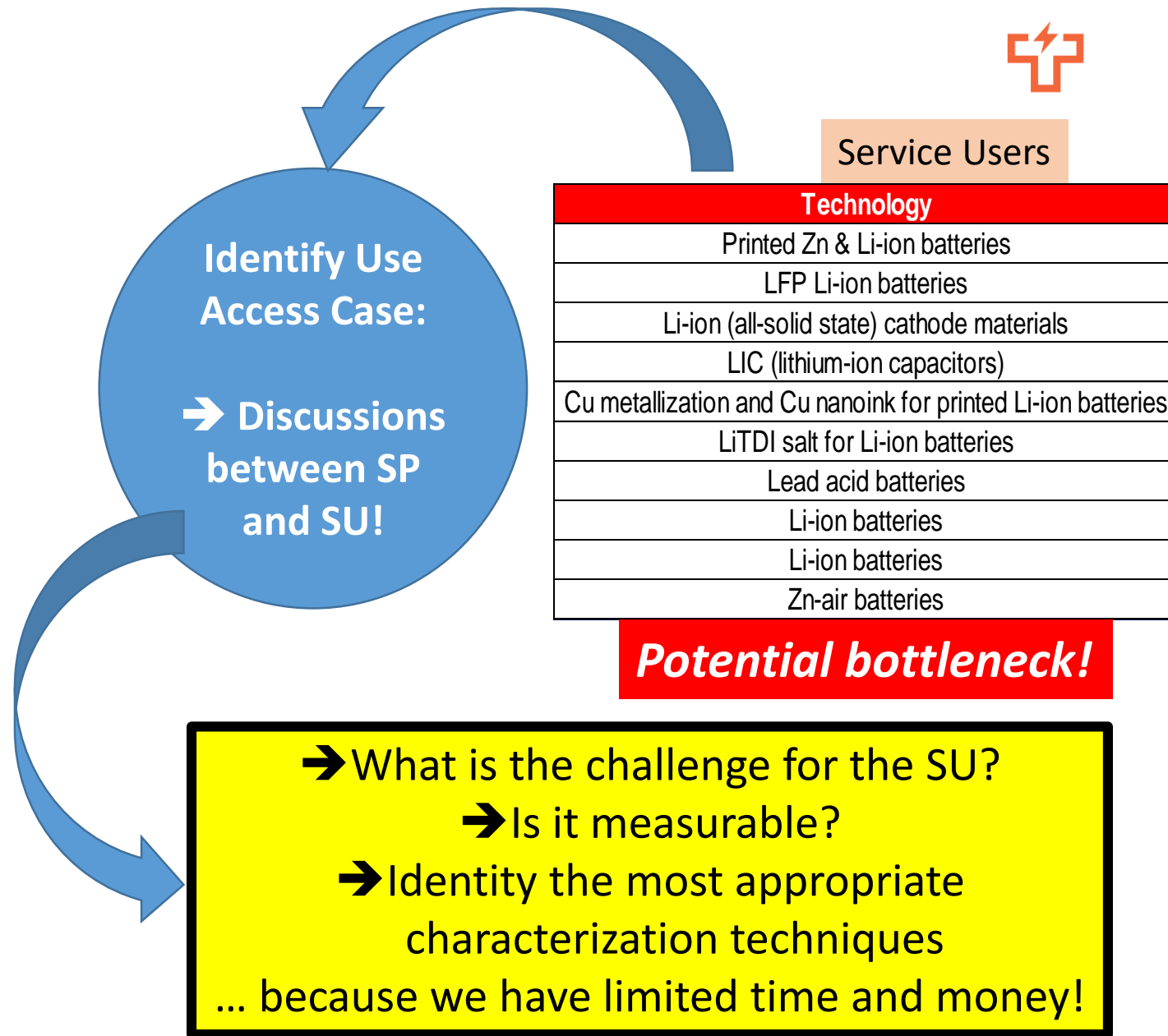
OBJECTIVE #3 - To ensure the OITB's growth, longevity, financial sustainability and stakeholder support.



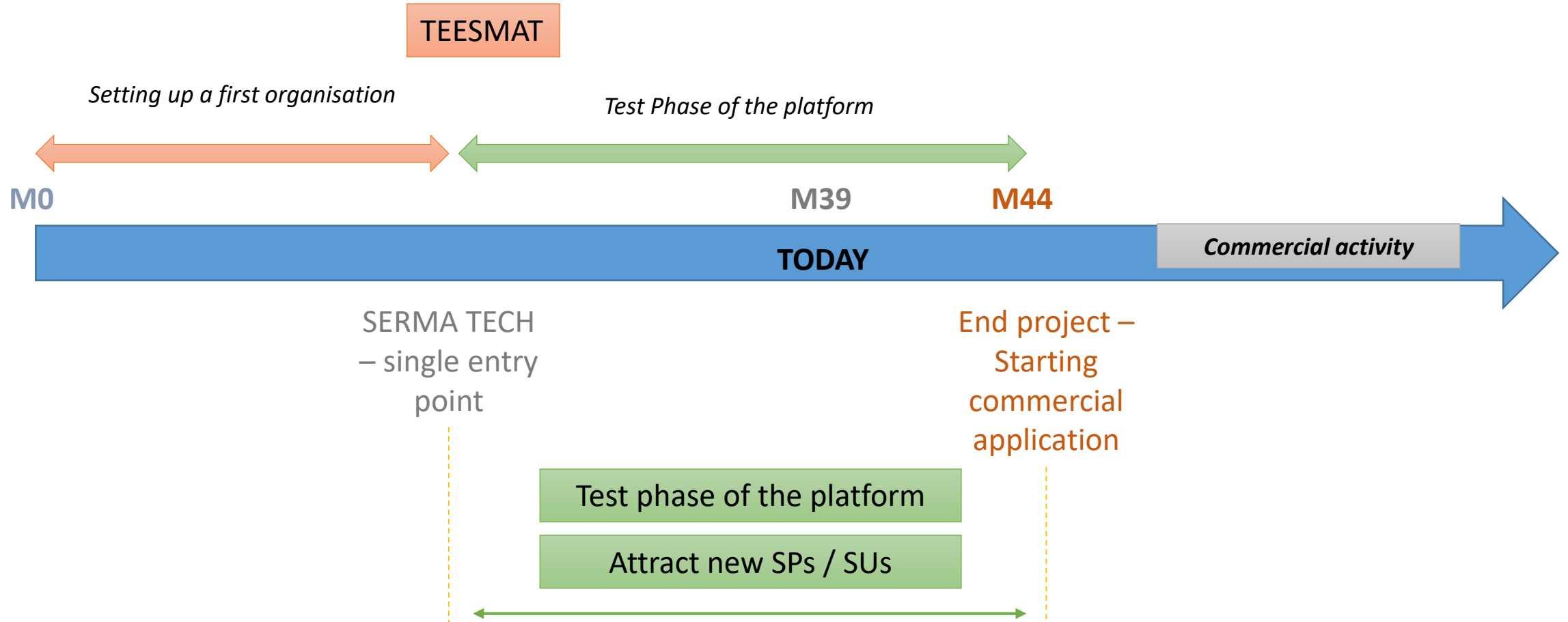
TEESMAT principle



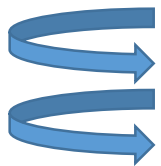
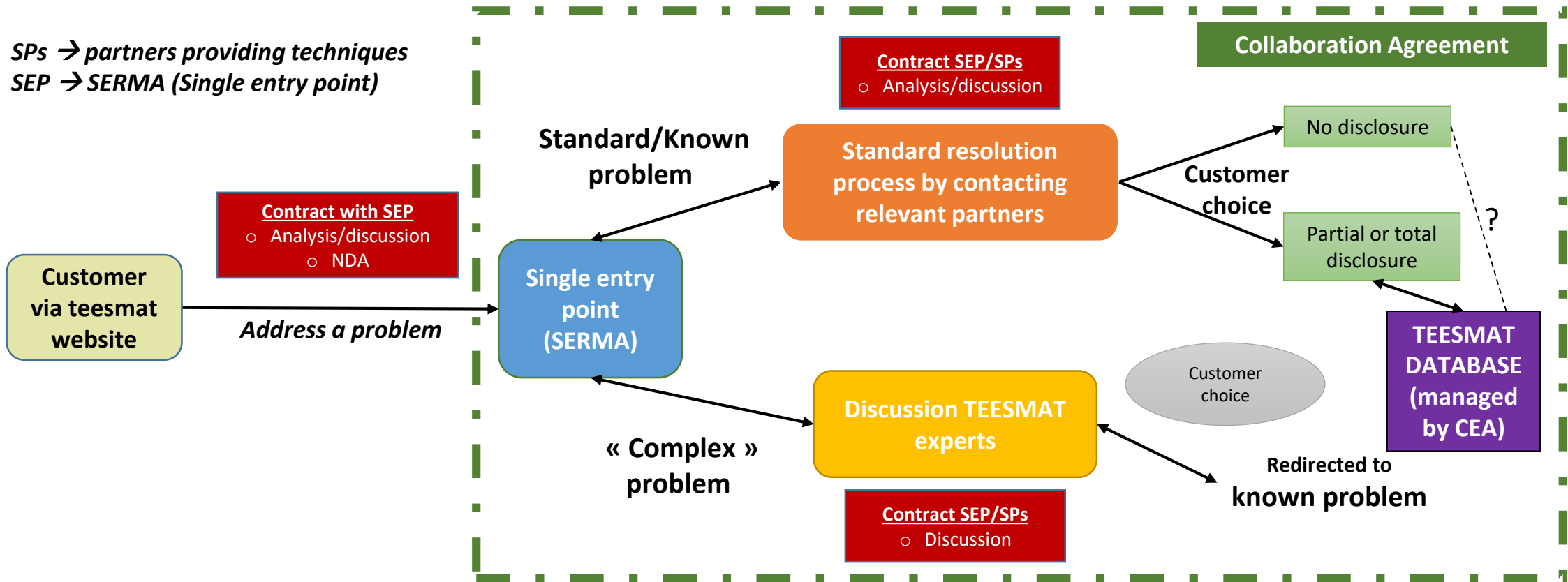
TEESMAT Service Toolbox	CEA	ZSW	ESRF	TECNALIA	CERTH	VITO	INCORE	SEMILAB
T1 Operando Nuclear Magnetic Resonance	X							
T2 Glow Discharge Optical Emission Spectroscopy		X						
T3 X-ray scanning nano spectroscopy			X					
T4 ToF-SIMS coupled to Focused Ion Beam preparation	X							
T5 Operando electrochemical assessment of electrodes	X	X		X				
T6 In-situ Optical Microscopy		X						
T7 Cell 3D imaging by X-ray Microtomography					X			
T8 X-ray micro & nano tomography			X					
T9 X-ray Bragg Diffraction Microscopy			X					
T10 Operando X-Ray Diffraction	X							
T11 Coherent X-Ray diffraction imaging			X					
T12 Acoustic measurement	X					X		
T13 Hard X-Ray total scattering			X					
T14 Small Angle Neutron and hard X-rays scattering	X							
T15 Nano-characterisation correlative analyses: HRTEM - EELS	X							
T15 bis Nano-characterisation correlative analyses: XPS	X							
T16 In-situ Electrochemical Raman spectroscopy					X			
T17 Incremental Capacity Analysis						X		
T18 Electrochemical Impedance Spectroscopy						X		
T19 In-situ Spectrometry for gas analysis		X						
T20 Accelerated degradation cell test				X		X		
T21 Heat flux measurement	X							
T22 Differential Scanning Calorimetry	X							
T23 Blast box and ARC	X	X						
T24 Operando multi-physics 3D mapping		X						
T25 Electrical cycling with sensors	X	X				X		
T26 In-line electrode material production control					X			
T27 Optical quality control							X	
T28 Quality control of coatings & deposited layers								X
T29 Precision Coulombic Efficiency Test						X		
T30 Electron Paramagnetic Resonance (EPR)					X			



TEESMAT timeline

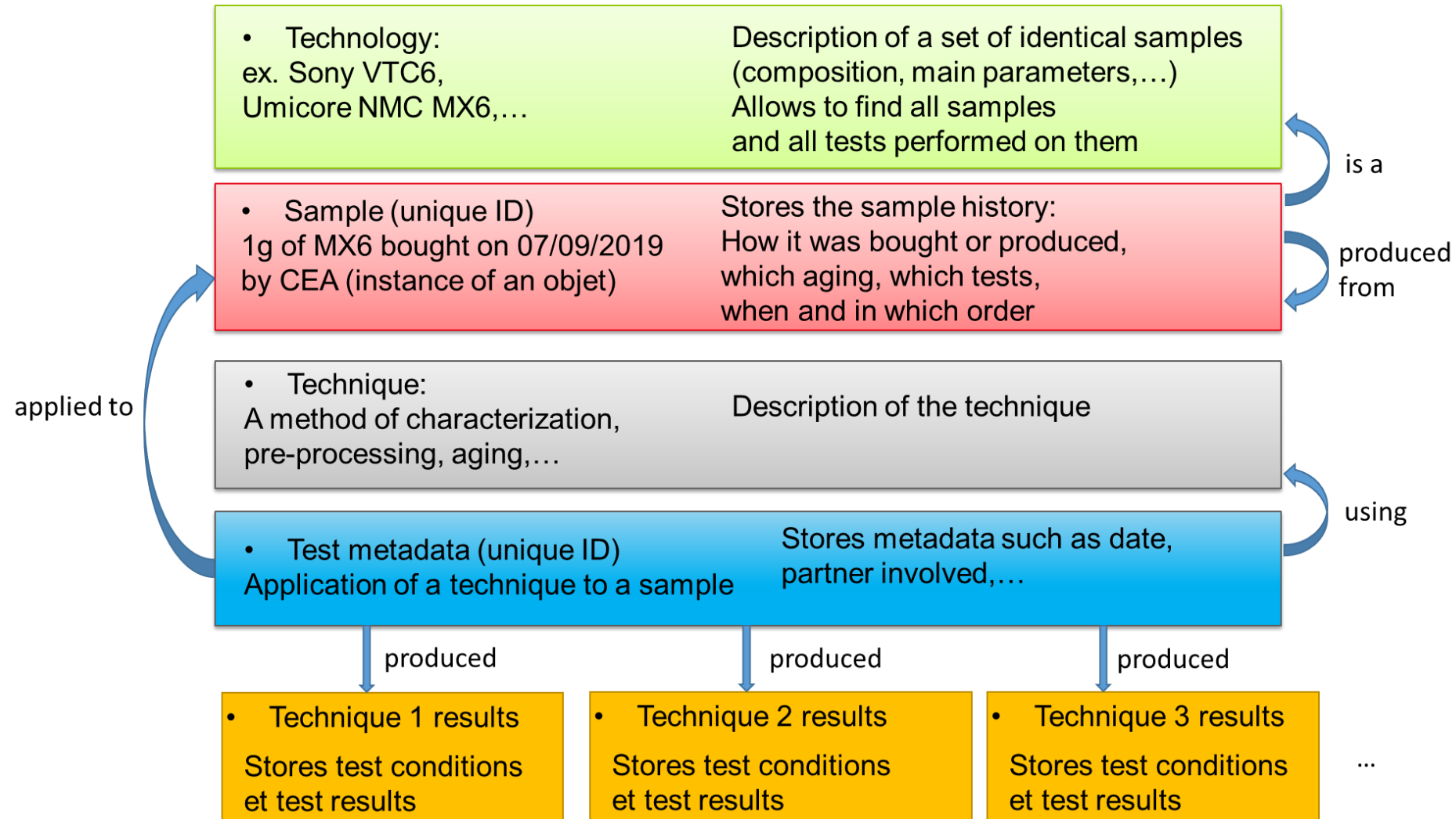


Foreseen organisation for the commercial phase

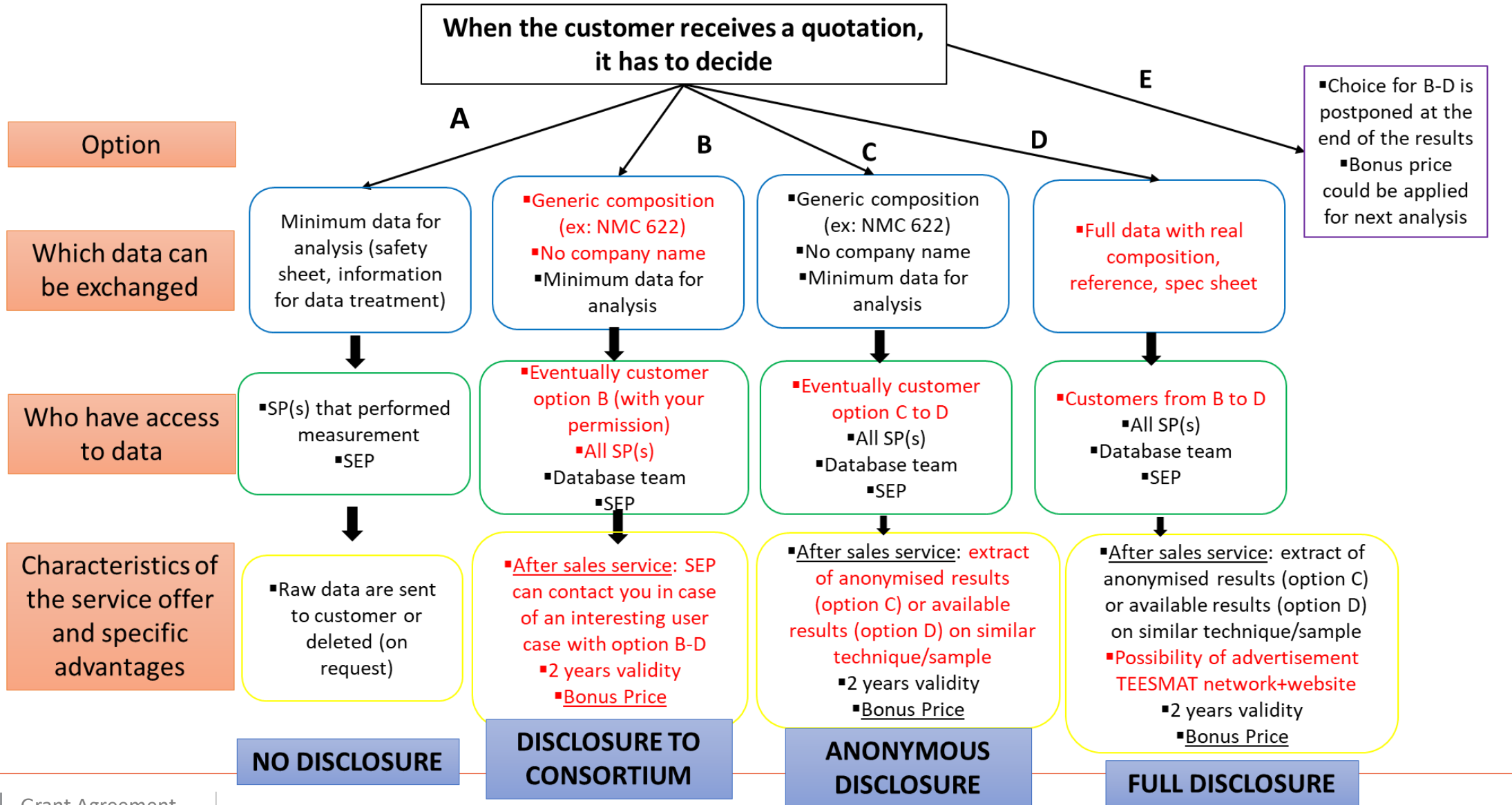


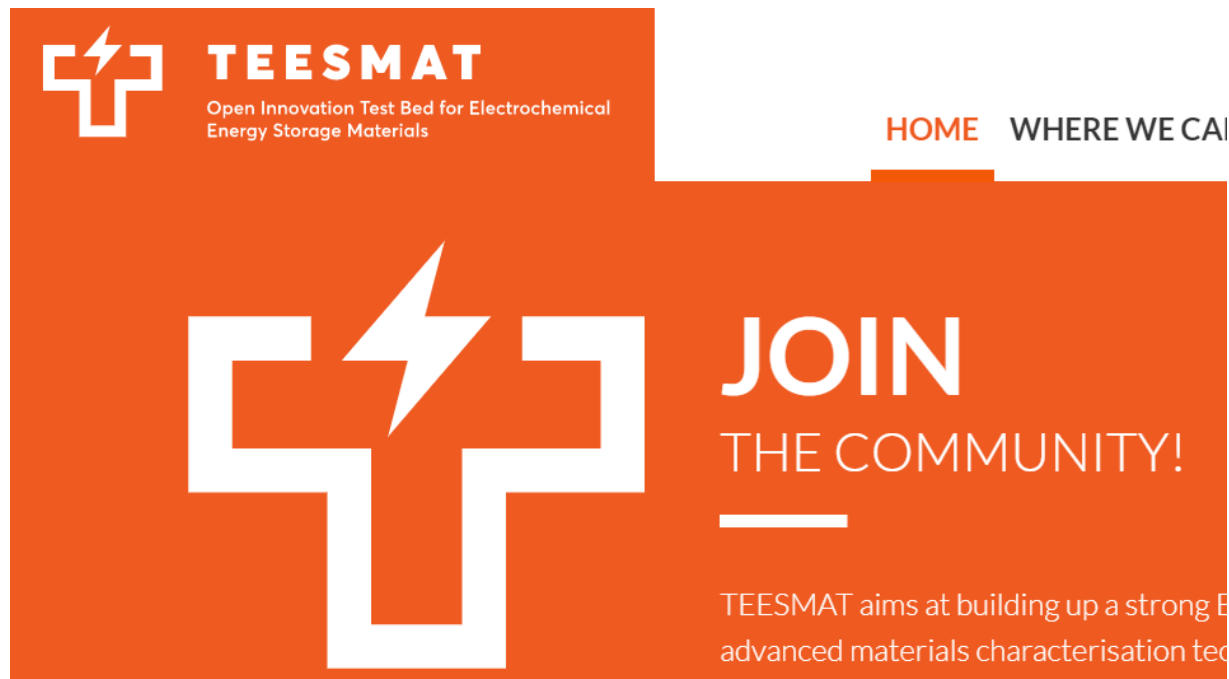
Proposed model for the commercial phase
1st list of commercialized techniques proposed

Database structure



Database access: decision of SUs





TEESMAT
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Energy Storage Materials

HOME WHERE WE CALL

JOIN
THE COMMUNITY!

TEESMAT aims at building up a strong European
advanced materials characterisation technology

Questions ?

Thank you for your attention

<https://www.teesmat.eu/>