

“Energy Day @ IIT: a Graphene Flagship Event” wrap up and acknowledgements

Istituto Italiano di Tecnologia and Ticass wish to thank you for your participation to our workshop held in Genova (Italy) on April 18th 2018, and focused on enhancing cooperation between top research Institutes and Industry with a special focus on Energy Storage.

More than 60 participants from all over Europe took part in the activities, including representatives from:

the Graphene Flagship Initiative;

Public regional agencies dealing with Energy, such as Infrastrutture Recupero Energia Agenzia Regionale Ligure - I.R.E.;

the R&D domain, such as Cetena (Fincantieri Group), CNR, Università di Genova, and Aster;

SMEs and Large Companies, including ASG Superconductors, Columbus Superconductors, Duferco Energia, ERG, IREN, Gruppo Sigla, Iplom, Piaggio Aerospace, Prometheus, Sonnen, Softeco Sismat, TerniEnergia, Toshiba Transmission & Distribution Europe;

After the **frontal presentation of our Speakers**, prof. Vittorio Pellegrini, Director IIT Graphene Labs, introduced the “rules” of the workshop based on the cross-fertilization **Working Groups and an active role of all participants**, which have been stimulated by the equation: ***velocity = space/time***.



Following the **Design Thinking approach**, a process for creative problem solving, based on subsequent steps such as “gather inspiration”, “generate ideas”, “make ideas tangible”, a specific draft matrix has been generated in order to wrap up the issues put on the shared table and to foster proper follow up activities.



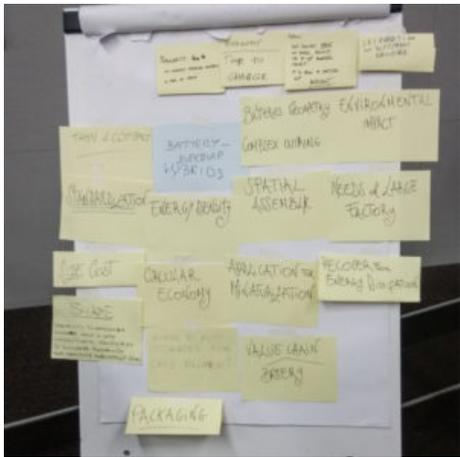
The Event day was concluded with a plenary session for the wrap-up by the Working Groups Coordinators and a Roundtable and the conclusions by Promoters and all High-Profile Experts who took part to the day of work.

velocity=space/time matrix

	<i>space</i>	<i>time</i>	<i>velocity</i>
PROBLEM		Battery lifetime	
		Parasitic side reactions	
	Thin and compact	Flight operations (safety of flight)	To deliver velocity (power) for a long time (high energy).
	Standardizaation		Time to market
	Size cost	Aero industry needs urgently lighter and smaller batteries	Large Scale mass adoption (ecology)
	Shape	Time to development of batteries with innovative materials	Supercaps
	Modularity of energy storage systems in terms of space	Time to market	To deliver energy very quickly To charge very at different temperatures
	Energy density	Materials development and availability /scale up	Rate of charging
	Circular Economy		Cost of charge slowing adoption
	Where to put storage for Grid balance?	Time to develop batteries with innovative materials	
	Packaging	How long will it take to get batteries permitting to replace fossil fuel for E.V. (gasoline and diesel) and airplanes (jet fuel)	The c rate during charge or discharge both full or pulse
	Batteries Geometry		Duration without primary power
	Complex wiring		
	Spatial assembly	Will charge time ever be an issue for E.V. distribution?	Technology consolidation
	Large factories needed	Will storage technologies be available in due time to cope with Climate Change?	Time needed to accomplish real breakthrough in the energy storage field
	Application for miniaturization		Competition: supercaps vs. MLCCs
	Battery value chain	Tools for a proper design of the ESS according to application, type of battery, C rate, degradatation, cycle, cost, ...	How fast can we reach our energy goals ethically?
	Integration of different devices		
	Recover energy dissipation		The best approach to prevent polysulfide in L/S battery in terms of material cost and production
	Environmental impact	Application problem: high battery C rate (short time use) generates heating during operation. How to cool and possibly use heating efficiently to improve efficiency of the system?	

<p>PATH TOWARDS SOLUTIONS</p>	<p>Battery-supercapacitor hybrid</p>	<p>Grid-scale ESS Fast charging EV More EU Companies</p>	<p>To search for novel and more performing active component</p> <p>Deliver power pulses</p> <p>High energy density materials</p> <p>Critical mass (more connection between R&D and Industry), EU scale initiatives, coepetition (collaboration between business competitors, in the hope of mutually beneficial results), one small real (scalable) problem solved</p> <p>Battery as a commodity (free/included as a service)</p> <p>Deliver power pulses larger than 20C by 10c with lithium batteries</p>
<p>PROSPECTIVE SOLUTIONS</p>	<p>Innovative materials</p> <p>Increase energy density</p> <p>Cell configuration improvement</p> <p>Cultural information for people</p> <p>“Europe first”</p> <p>Collaboration</p> <p>Investments in technology</p> <p>Creating a “batteries environment”</p> <p>Exploit research results</p>	<p>LI-ION batteries chemistry improvement</p> <p>New technologies for film preparation</p>	<p>Focus R&D on short-term applications limiting challenges and domains</p>

We shall be more than glad to collect your feedback in the coming weeks, so please drop us a line with comments, ideas, doubts, at fabrizio.tubertini@iit.it or gustavo.capannelli@ticass.it.



The Graphene Flagship is a Future and Emerging Technology Flagship by the European Commission. With a budget of €1 billion, the Graphene Flagship represent a new form of joint, coordinated research on an unprecedented scale, forming Europe's biggest ever research initiative. The Graphene Flagship is tasked with bringing together academic and industrial researchers to take graphene from the realm of academic laboratories into European society in the space of 10 years, thus generating economic growth, new jobs and new opportunities. The core consortium consists of over 150 academic and industrial research groups in 23 countries. In addition, the project has a growing number of associated members that will be incorporated in the scientific and technological work packages from the Horizon 2020 phase (1 April 2016 - 31 March 2018).



GRAPHENE FLAGSHIP