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FRAUNHOFER INSTITUTE FOR TRANSPORTATION AND INFRASTRUCTURE SYSTEMS IVI



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# CLOUD-BASED BATTERY MONITORING SYSTEM





### MOTIVATION

In the future, electromobility will play an increasingly important part in transportation. Efficient battery systems are a fundamental success factor in this regard. Currently, however, it is still difficult for operators to assess the remaining life span and state of a battery.

The aging process of battery storage systems

- is invisible from the outside,
- depends heavily on the kind of utilization and
- requires electrochemical expertise and a complex diagnosis process with regard to chemistry, type, manufacturer and design.

Battery aging has an immense impact on

- the residual value,
- amortization,
- availability and applications planning,
- maintenance intervals and
- safety (fire hazard).

### TECHNOLOGY

The *IVImon* system developed at the Fraunhofer IVI determines relevant information about the state of the battery storage system, processes them and provides them in a user-friendly way by means of a cloud:

- server-based diagnosis system (SOH, life span prognosis),
- no additional vehicle sensors required, only data already available is used,
- analysis based on self-learning and constantly updated algorithms.

The institute has many years of expertise in fields of

- electro-chemical modeling,
- aging diagnosis,
- machine learning as well as
- big data analysis.

### IMPLEMENTATION

Cloud-based applications are user-friendly, low-maintenance, cost-efficient and available everywhere. The use of up-to-date data is guaranteed at all times.

The following data can be included in the analysis:

- live data of the vehicle and battery system transmitted by an on-board unit (COTS system provided by the Fraunhofer IVI or provided by the client) or
- data available from the clients' own data collection / telemetry (e. g. own cloud via cloud-to-cloud API).

The results are either displayed via the *IVImon* web interface (multiclient capable, dashboard-based), or sent to the client's cloud via an API interface.

Payment is carried out via the pay-per-use system, which means that the clients will only pay for the services they used within the respective accounting period.



### USERS

- Providers of vehicle and battery systems
  - Predictive maintenance and inspection services
  - »Guaranteed availability«
  - Warranty monitoring
- Vehicle operators (public transport providers, municipalities, logistics operators)
  - Aging monitoring, operation optimization, estimation and prognosis of performance
  - Consumption analysis
  - Monitoring of residual value
- Providers of telemetry and diagnosis systems
  - Improved service by inclusion of battery diagnosis
  - Display of optimization potential
- Insurance companies and lessors
  - Legally secure, application-appropriate and technologyadapted design of contracts and insurance policies
  - Monitoring of residual values and amortization