



# Aichi Next-Generation Battery Consortium

Creating battery innovation through active research  
and technological development

General Meeting - December 11, 2024

1. Basic Concept of the Consortium
2. Structure of the Consortium
3. Initiatives of the Consortium
4. Overall Plan (Roadmap)

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# Purpose of establishment

## Purpose

- The global market size of storage batteries is estimated to expand rapidly to approximately 100 trillion yen by 2050.
- the shipment value of manufactured goods from Aichi Prefecture's storage battery manufacturing industry (2022) is approximately 19.9 billion yen (13th in the nation).
- **We create battery innovation through active research and technological development that takes advantage of the region's strengths in ceramics and other areas.**

## Priority Areas

- (1) Support for accelerating the development of next-generation batteries that utilize the accumulation of ceramics, **"oxide-type all-solid-state batteries"**
  - (2) **Support for the formation of industry-academia-government joint research and development team** for technological innovation of next-generation batteries and existing rechargeable batteries\*
  - (3) **Establish the base for people, materials, and information** related to battery development, research, and evaluation in Knowledge Hub Aichi (Toyota City)
- \* Lithium-ion batteries, solid-state batteries using oxides, etc.

## Target

- Companies that manufacture or are interested in batteries
- ※ Includes battery raw materials and components, equipment, evaluation and analysis
- Universities, research institutes, etc.
- Companies and organizations interested in battery utilization
- Companies, national and local governments supporting battery initiatives



# Past efforts

## Aichi Prefecture Next-Generation Battery Study Group (From November 2023)

**With the Governor of Aichi Prefecture as chairman, 15 experts from across the country gathered to discuss future projects.**

### ○ Achievements

#### ■ 1st Aichi Prefecture Next-Generation Battery Study Group, November 22, 2023

- ✓ By focusing on research and development in ceramic material development and battery evaluation, regional strengths can be utilized.
- ✓ Battery manufacturing requires knowledge and technology from multiple fields, including chemistry, machinery and control. Human resource development in this field is essential.

#### ■ 2nd Aichi Prefecture Next-Generation Battery Study Group, June 4, 2024

- ✓ The establishment of an organization that will function as an exchange between industry, academia, and government can be showcased both domestically and internationally as a unique initiative of Aichi Prefecture.
- ✓ Companies that conduct battery evaluations, such as safety and charge/discharge testing, have high utilization rates and feel the need for additional capacity. We would like to request the prefecture's support.

#### ■ 3rd Aichi Prefecture Next-Generation Battery Study Group, September 2, 2024

- ✓ It is understandable that the focus of the initiative will be on supporting the development of oxide-type solid-state batteries based on ceramics.
- ✓ In the contests for high school students, it is important to have them actually make batteries and think about how to improve their performance.
- ✓ It is important to increase opportunities for SMEs to promote their technologies to the battery industry by supporting their participation in battery-related exhibitions.





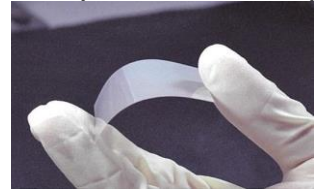
# Direction and philosophy of the initiative

## Aichi Prefecture's strengths

- This area is home to a concentration of manufacturing companies, including the automotive industry, as well as research and development-related companies.
- Accumulation of brains related to battery materials. (Nagoya University, Nagoya Institute of Technology, Toyohashi University of Technology, etc.)
- Accumulation of materials research and evaluation and analysis functions (National Institute of Advanced Industrial Science and Technology Chubu Center)
- The highest level of analytical technology. (Japan Fine Ceramics Center, Aichi Synchrotron Radiation Center)
- Concentration of startups with innovative technologies. (STATION Ai)



OXside Solid State Battery(OXSSB)  
(Niterra Co., Ltd.)



Ceramic Electrolyte Sheet  
(AIST)



Aichi Synchrotron Radiation Center



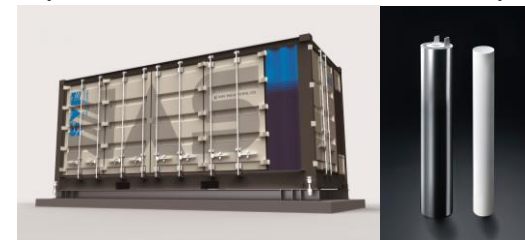
STATION Ai

Taking advantage of this characteristic, we should try to **undertake unique initiatives that are different from those in other regions.**

**【Goals】**  
Aiming to create battery innovation through active research and technological development that takes advantage of the region's strengths in ceramics, etc.



BEV Lexus RZ  
(TOYOTA MOTOR CORPORATION)



NAS battery  
(NGK INSULATORS, LTD.)

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# Organization chart

## Organization

**Chairman : Governor of Aichi Prefecture**

Secretariat : Industry and Science Technology Division,  
Bureau of Economy and Industry, Aichi Prefecture

**Advisory Board**(Renamed “Aichi Prefecture Study Group on Next-generation Batteries”)  
【 Universities/research institutes, etc.】

National Institute of Advanced Industrial Science and Technology (AIST)  
National Institute for Materials Science (NIMS)  
Tokyo Metropolitan University  
Nagoya University

【 Analysts 】 Deloitte Tohmatsu Consulting LLC

【 Government 】 Aichi prefecture  
Chubu Bureau of Economy, Trade and Industry

【 Companies 】

Denso Corp.  
TOYOTA MOTOR CORPORATION  
NGK INSULATORS, LTD.  
Niterrra Co., Ltd.  
Panasonic Energy Co., Ltd.  
The Furukawa Battery Co., Ltd.

### Members:

- Companies (battery material, packaging, and assembly manufacturers)
- Companies (battery user companies, companies that provide business support)
- University
- Public Examinations
- Government

WG1(e.g. development of oxide-type all-solid-state batteries)

WG2(e.g. Synchrotron Radiation)

WG3(e.g. Human Resource Development)

WG4(e.g. Battery recycling, detection of foreign matter in batteries, etc.)



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# Outline of consortium activities

we will support the acceleration of research and technological development through seminars and the expansion of personal networks.

## Main activities for members

## Three Pillars

## Projects to be promoted by the consortium

[Open space]

seminars, company tours, etc.

Research and Demonstration

[Open space]

Interaction between members and matching support

Human Resource Development

[Closed space]

Establishment of working group

Accumulation of research and manufacturing bases

- **Support for the formation of joint research between universities and companies**
- **Support for the use of Aichi projects and national projects**
- **Install a dedicated beamline at the Aichi Synchrotron Radiation Center**
- Establishment of a battery development evaluation center in Knowledge Hub Aichi
- Facilities for safety testing, charge/discharge testing, etc. for medium-sized batteries

- **Lectures and contests for high school students**
- **Battery classes /battery festivals for elementary school students**
- **Support for participation in the world's largest conference on batteries, "Battery Symposium 2025 Nagoya"**
- Holding battery-related events
- Promoting reskilling of engineers

- **Support for exhibiting at battery-related exhibitions**
- **Support for companies hoping to enter the market**
- Financial support for new establishments and expansions of research institutes, etc.
- Support for the development of demonstration area

We will create a system that connects an "open space" to a "closed space".

"Open Space" means the place where all members can participate. "Closed space" means the place where individual business projects can be considered by limited members.

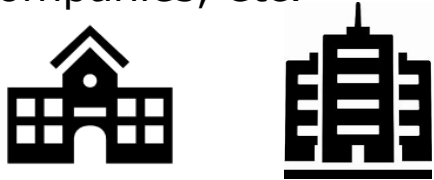
We will create research/experimental study projects through collaboration between not only local industry, academia and government but also out-of-region ones.

## Collecting seeds of innovation

### [Open space]

Seminars, company tours, etc.

Collect research seeds from universities, companies, etc.

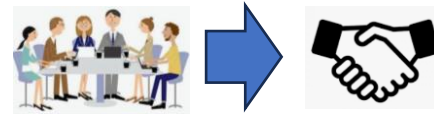


Surveys by the prefecture

Published on the website

## Matching

business matching events



### [Closed space]

- ✓ Push-type coordination
- ✓ Proposals and advice from the Advisory Board

## Working group/joint research preparation

Formation of a development team for industry-academia-government joint research

reviews by the advisory board

Formation of a new Working Group

Financial support for the production of pre-prototypes

Indirect support, such as information exchange with the national government

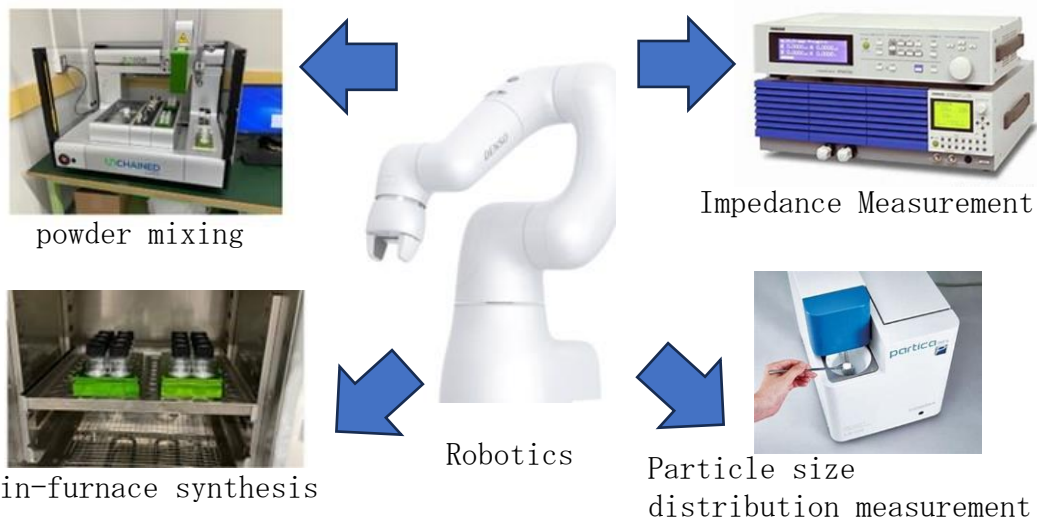
Implementation by companies

## projects

Competitive funding acquisition

- Research and development of a high-speed search system capable of automatically synthesizing and measuring powders (ceramics, etc.).
- The seeds of “high-throughput automated experiments using robots” owned by AIST Chubu Center are used as the nucleus of the project.
- Aiming to be the main function of the “a battery development evaluation center in Knowledge Hub Aichi Center”.

## ◎Image of the system



## ◎Schedule

|  | 2024   | 2025                            | 2026 | 2027  | 2028 | 2029~              |
|--|--|---------------------------------|------|---|------|--------------------|
| working group  | ● ●<br>WG WG   | Competitive funding acquisition |      |   |      |                    |
| Automation of raw materials and device manufacturing | Development of automated laboratory equipment        |                                 |      |   |      |                    |
| Automatic measurement and analysis                   | Development of measurement and analysis technologies |                                 |      |   |      |                    |
| Analysis by AI                                       |  |                                 |      | Data accumulation and algorithm development |      | Start of operation |

items for consideration : ①Functions and Specifications ②Structure, division of roles ③R&D roadmap, etc.

## ◎Process

Automation of raw materials and device manufacturing

Need to develop new automated laboratory equipment for batteries

Automatic measurement and analysis

Need to develop high-throughput measurement and analysis technology from material properties to charge-discharge characteristics

Analysis by AI

Need to accumulate MI and PI data and develop algorithms for battery materials

- Consideration of establishing a dedicated beamline (BL) to promote research and development of next-generation batteries.
  - Consideration of a feasible framework centered on the Foundation for Science and Technology Exchange.
  - Establish a working group (WG) to considerate the functions and specifications of BL in addition to the framework.
- 
- ✓ Elements of interest in battery evaluation
    - lithium-ion battery → N i 、 C o 、 M n 【Evaluated at BL1N2】
    - all-solid-state batteries → S 、 P 【Evaluated at BL6N1】
  - ✓ Utilization of existing BLs (BL1N2 and BL6N1) is 100% and cannot accommodate increased use in the future.
  - ✓ Aiming for BL with specifications that enable evaluation and analysis of chemical states of elements of interest.



Aichi Synchrotron Radiation Center

BL1N2  
( radiant energy :0.15~2.0keV)BL6N1  
( radiant energy :1.75~6.0keV) **13**

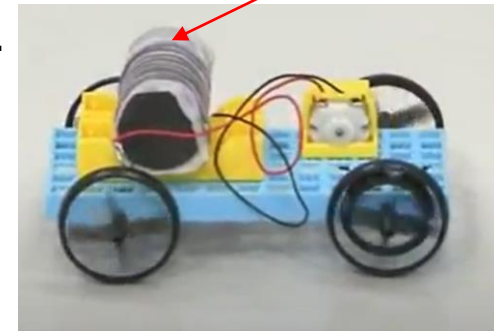


- Establish a working group to considerate methods to develop human resources for battery utilization and development and considerate the details of implementation.
  - ✓ “Battery Contest” held to development human resources for battery utilization and development.
  - ✓ “Battery production training” for battery contest participants will be held during the summer vacation period.
  - ✓ Organize a tour of battery-related companies to deepen high school teachers' understanding of batteries.

## Battery Contest

- Ultimately, the project will target high school students (e.g., science club members) across the country.
- During the summer vacation, the teams will take a “Battery production training” (※) on making aluminum-air batteries and then devise ways to improve their performance until the contest in December.
- Connect aluminum air batteries to small mobility vehicles and compete for speed (output) and operating time (capacity).
- ※ “Battery production training”
  - 【Day 1】 In collaboration with universities and companies, students will learn the principles of batteries. In addition, students will learn the basic mechanism of rechargeable batteries by conducting experiments to fabricate Daniel batteries.
  - 【Day 2】 Learn the basic structure of aluminum air batteries and experience fabrication experiments.
  - <Schedule(FY2025(Draft))>

aluminum-air battery < Image >



Tottori University of Environmental Studies

(<https://www.youtube.com/watch?v=ePmgXUkfkKA>)

|          | July  | August  | September~November   | December          | January             |
|----------|---|---|--|-------------------|---------------------|
| Schedule | ※ Utilization of text by the Consortium for Human Resource Development of Storage Batteries in Kansai<br>Kick-off workshop※ | ★ Battery production training<br>★ Company tours for teachers | Each team devises and prepares a presentation (Consultation with universities and companies) | ★ Battery Contest | Review by each team |



- In cooperation with "Battery Association of JAPAN", a hands-on event will be held to promote a correct understanding of batteries and increase interest in batteries. (under consideration)
- Holding a "Dry-Cell Battery Workshop" during the summer vacation period to provide hands-on experience in making dry-cell batteries. (under consideration)
- Hold "Battery Festa" to learn about the mechanism of batteries in conjunction with science and technology related events in Aichi Prefecture (under consideration).

### 1. Dry cell battery class

- Assembled a manganese dioxide dry cell kit to create original dry cell batteries.
- Learn how mechanism of battery and how to use them safely and properly.

### 2. Battery Festa

- Making original dry cell batteries and racing with the original batteries.
- Quiz to learn how batteries work.
- Making batteries from familiar items such as fruit, bread, etc.



racing with the original batteries



Battery Quiz



Dry cell battery class  
 (Battery Association of JAPAN)

- Host one of the world's largest conferences in the battery field in Aichi Prefecture to learn about cutting-edge technologies, explore the seeds of technological development, and publicize the initiatives of Aichi Prefecture companies.
- Subsidized participation fees for consortium members, joint participation with consortium members in corporate exhibitions (under consideration).

### 1. The 66th Battery Symposium in Japan (under consideration)

- Date and Time : November 18-20, 2025
- Venue : Aichi Industry & Labor Center (WINC AICHI)
- Overview :
  - One of the largest academic conferences on energy storage technologies, including primary batteries, secondary batteries, fuel cells, and capacitors.
    - Over 500 research presentations and approximately 2,500 participants.
    - Research presentations and exhibitions by sponsoring companies.
- Discussion Topics (Reference: 65th Battery Symposium)
  - ① Reactions and materials of batteries and fuel cells.
  - ② Innovative batteries.
  - ③ Secondary batteries for automotive and stationary rechargeable battery.
  - ④ Enhancing durability and reducing costs of fuel cells.
  - ⑤ COI-NEXT symposium
  - ⑥ NEDO Session.



### 2. Invitation of Other National-Level Events

【 Example 】 xEV Testing Initiative ( Organizing : Steering Committee for xEV Testing Technology)

- Exhibit at 「BATTERY JAPAN “International Rechargeable Battery Expo”」 jointly with consortium members
- Attracting seminars and other events held by national organizations to Aichi Prefecture to promote new entrants in the battery field.

## 1. Exhibition

- Jointly exhibited with consortium members at the Kansai Shows and Spring Shows of the BATTERY JAPAN International Rechargeable Battery Expo, where technologies, components, materials, and equipment necessary for R&D and manufacturing of rechargeable batteries are exhibited.

| Exhibition   | Event period  | Venue       | Contents  | Number of visitors (FY2023) |
|--|---------------|-------------|---|-----------------------------|
| BATTERY JAPAN International Rechargeable Battery Expo (Kansai shows) | November 2025 | Intex Osaka | Introduction of the consortium's projects, etc. | 11,955 people               |
| BATTERY JAPAN International Rechargeable Battery Expo (Spring Shows) | -             | -           |   | 69,261 people               |

## 2. Organize seminars for new entrants

- Coordinated the holding of the BASC Battery College in Aichi Prefecture, organized by Battery Association for Supply Chain (BASC).
- BASC Battery College” is a battery business seminar that provides lectures on the latest business trends, competitor analysis, and the needs for materials and equipment required in the field for companies considering new entry into the battery industry.



BASC Battery College

# Establishment of working groups (Summary)

○ The working group will be formed to discuss specific projects.

## WG1

### Construction of high-speed material search system WG

Investigate the construction of an automated experimental system for powder materials that will contribute to the development of oxide-type all solid-state batteries.

【Member】

AIST Chubu center, Prefectural University, Prefectural Company, etc.

【Immediate Goals】

Obtained competitive funds from the national or prefectural government



【 Experimental Facilities at AIST Chubu Center 】

## WG2

### Examination of Synchrotron Radiation WG

Examine the functions, specifications, and operational structure of a battery-dedicated beamline that will promote research and development of next-generation batteries.

【Member】

Aichi Science and Technology Foundation(Aichi SR), University, Company, Aichi Prefectural Government, etc.

【Immediate Goals】

Establish an implementable framework, structure, BL functions and specifications

## WG3

### Human Resource Development WG

Examine human resource development methods that will lead to the development of human resources for battery utilization and development.

【Member】

Aichi Prefectural Government, Board of education, Prefectural high school, Company, University, etc.

【Immediate Goals】

Establish details of contests for high school students, tours for teachers, and a vision for future development.

Future themes for the WG include “battery recycling” and “detection of foreign matter in batteries”.

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# Overall plan (Road map)

|                            | Phase 1<br>(FY2024)   | Phase 2<br>(FY2025)   | Phase 3<br>(FY2026)  | Phase 4<br>(FY2027)  | Phase 5<br>(FY2028)   |                  |
|----------------------------|---|---|--|--|---|------------------|
| Objectives for each phase  | Build the concept of a next-generation battery base and disseminate the technology and initiatives. | Raise interest and involvement in the next generation of batteries  | Determine each company's involvement in next-generation batteries. Establish commercialization themes to focus on as a base. | Finding Solutions to Next-Generation Battery Challenges through Collaborative Research | Customize technology applications for business use and establish application technologies |                  |
| Whole                      | Consortium established  | Consortium Management ( General meetings, seminars, matching exchanges, information dissemination, etc. )                 |  |  |   |                  |
| Research and Demonstration | [ Support for structuring joint research ]  | Coordination with national policies   |  |  |   |                  |
|                            | Research and collection of research seeds   | Support for structuring joint research ⇒ Conducting joint research  |  |  | Reviewed in light of the number of joint research compositions, etc.                      |                  |
|                            | [Construction of high-speed material search system WG]  | Discuss (WG)  | System design, system construction ( Collaboration with national research project themes )                                   |  |   | Put into service |
|                            | [Examination of Synchrotron Radiation WG]   | Discuss(WG)   | Coordination , design, construction, and commissioning with beamline personnel   |  |   |                  |
|                            | [Establish facilities for safety testing]   | Survey of user needs and facility development   | Implementation Decision  |  |   |                  |
| Human Resource Development | [Human Resource Development WG]   | Discuss (WG)  | Battery Contest Trial for high school student  | Battery Contest for high school student  | Verify effectiveness and consider nationwide expansion                                    |                  |
|                            |   |   | Company tours for teachers   |  |   |                  |
|                            |   |   | Holding battery classes, etc. (for elementary school students)   |  |   |                  |
|                            | [Organizing national-level events]  |   | Holding Battery Symposium in Japan, etc.   | Organizing national-level events   |   |                  |
|                            | [Coordination with national policies]   | Utilize the results of the Kansai Consortium and consider collaboration with national human resource development measures |  |  |   |                  |
| manufacturing bases        | [Support for Exhibitions and New Entrants]  | Participation in Exhibitions and support for new companies  |  |  |   |                  |