Scientific frame
- Efficiency enhancement of thermal energy systems (storage)
- Development of components in prototypical scale (performance & safety)
- Demonstration of combined cycles (thermal and thermo-electric)
- Fundamentals of single and two phase fluid dynamics
- Component interaction and dynamics

Objectives
- Experimental data base from local to system scale
- Code validation and safety assessment of liquid metal operated systems (JASMIN, ESNII+, SESAME)
- Provision of a liquid metal design toolbox
- Liquid metal instrumentation development and qualification

Fundamental research: GalnSn test loop: DITEFA
Purpose:
- Qualification of instrumentation
- Proof of principle for high temperature LM designs
- Pre-test bed for thermal hydraulic experiments
- Validation experiment for operational and safety systems
- Education and training

AMTEC TEst FACility (ATEFA)
- Test device designed for 1000 °C
- Controlled Na-flow
- Safety related design:
  - Contained in an thermally isolated metallic container
  - Na and Ar installations separated
  - Emergency Na drainage
- Status: in construction

AMTEC operating principle
- Direct conversion of thermal energy into electricity
- Key component: β”-Alumina Solid Electrolyte (BASE)
- Key process: Na-ionization (Ap across BASE)
- Recombination of Na⁺ and e⁻ only at 3-phase boundaries:
  - BASE – electrodes – Na

Current R&D fields
Renewable Energy (CSP), nuclear fission & fusion, thermo-electric conversion, thermal storage, accelerator application (target), ...

Karlsruhe Sodium Laboratory: KASOLA
- Medium scale facility: ~7 m³ Na, T_max: 550 °C, flow_max: 150 m³/h.
- 2 test ports for LIMTECH A1 and B1
- Integration of AMTEC and thermal storage (LIMTECH B4)
- Status:
  - Final integration and set into operation in Q3/15
  - First experimental work planned for Q4/15

Sodium Loop to test materials and corrosion: SOLTEC
- Family of three small scale facilities:
  - ~12 l Na, T_max: 900 °C, flow_max: 0.3 m³/h
- Status:
  - Detailed design and construction in work
  - Set into operation planned for Q4/15
  - First experimental work Q4/15
- Detailed objectives:
  1. Low cycle fatigue and corrosion for high temperature materials
  2. Thermal transient loads with different temperature ramps
  3. Long-term AMTEC test facility