Heat Storage for Gen IV Reactors for Variable Electricity from Base-load Reactors
Changing Markets, Technology, Nuclear-Renewables Integration and Synergisms with Solar Thermal Power Systems

University Place, Bennion Student Union Building, 1784 Science Center Drive, Idaho Falls, ID

Tuesday: July 23
7:30-8:30 Coffee/Danish

8:30 to Noon (with coffee breaks): Economics, Regulation, and Programs for Heat Storage

Welcome M. Peters: INL
The Challenge: Setting the Stage C. Forsberg (MIT)
  Changing electricity market with need for dispatchable electricity
  Load following, heat storage and hydrogen (and derivatives) roadmap
Utility Perspective (Exelon): Regulatory / Commercial perspective
EPRI Program
French Program
U.S. Program for Heat Storage in high-temperature (>700C) Concentrated Solar Power systems
JUMP Initiative (INL/NuScale Planned Demo Facility including storage)
Panel: What Are the Major Regulatory and other Barriers to Large-scale heat storage?

Noon-1:15 Lunch: What is the path to Commercialization? (Lunch speaker)

1:00 to 5:00 (with coffee break): Heat Storage Technology Options for GenIV Reactors

High-temperature concrete (600°C)
Westinghouse Heat Storage Studies
Hot Rock
Hot Sand
Nitrate Heat Storage
Status of Chloride-salt Pilot Plant
Cast-steel storage for SFR, HTGR, and Salt reactors
Using the HTGR Reactor Core for Heat Storage

5:00 to 8:30 Reception and Dinner with Poster Session
Wednesday July 24:

7:30-8:30 Coffee/Danish

**Related Technologies for Heat Storage and Grid Integration**

Electricity to Heat Storage Options
Brayton Power Cycles with Peaking Capability and Storage
Hydrogen Storage and Integration
High-temperature heat pumps
Panel: What is the commercial path to large-scale deployment?
Tuesday: July 23

7:30-8:30 Coffee/Danish

8:30 to Noon (with coffee breaks): Economics, Regulation, and Programs for Heat Storage

Welcome M. Peters: INL (to be invited)
The Challenge: Setting the Stage C. Forsberg (MIT)
   - Changing electricity market with need for dispatchable electricity
   - Load following, heat storage and hydrogen (and derivatives) roadmap
Utility Perspective (Discussing with Exelon): Regulatory / Commercial perspective
EPRI Program: Andrew Sowder
National Program for Heat Storage in CSPs: Turchi, Craig (Craig.Turchi@nrel.gov)
Nuclear JUMP Initiative: Shannon M. Bragg-Sitton <shannon.bragg-sitton@inl.gov> and NuScale (Botha, Derick dbotha@nuscalepower.com)
Panel: What Are the Major Regulatory and other Barriers to Large-scale heat storage?
   Chair: Shannon M. Bragg-Sitton shannon.bragg-sitton@inl.gov

Noon-1:15 Lunch

What is the path to commercialization (speaker) ?

1:00 to 5:00 (with coffee break): Heat Storage Technology Options for GenIV Reactors

The talks will feature major ongoing efforts. There will also be a poster session during the reception to cover other technologies. Current list of topics (talks and poster session)

High-temperature (600°C) Concrete Storage; K. Pykkonen: Bright Energy Storage Technologies: (Confirmed new date)
Westinghouse Heat Storage Studies (C. Stansbury: Westinghouse)
Hot Rock Storage (Siemens or Denmark)
Nitrate Heat Storage (Kairos or Solar Reserve)
Status of Chloride-salt Pilot Plant(K. Armijo, Sandia)
Sodium-Secondary System Heat Storage Using Steel
Using the HTGR Reactor Core for Heat Storage (Yan unable to attend)
5:00 to 8:30 Reception and Dinner

Poster session

- Firebrick Resistance Heated Energy Storage  D. Stack (MIT)
- Sodium Secondary System Heat Storage using Steel  C. Forsberg (MIT)
- HTGR Heat Storage at Pressure in a Separate Pressure Vessel  C. T. T Inman (MIT)
- Australian Sodium CSP program with Sodium heat Storage  Joseph Coventry (ANU)
- Chloride Salt Corrosion Control

**Wednesday July 24:**

7:30-8:30 Coffee/Danish

8:30 to Noon (With Coffee Break)

**Other Technologies for Heat Storage and Grid Integration**

- Brayton Power Cycles with Peaking Capability and Storage  Bahman Zohuri <zohurib@unm.edu>
- CEA/EdF French Program
- Hydrogen integration

**Path Forward**

Panel: What is the commercial path to large-scale deployment?

Workshop Close: Noon
## Workshop subjects and speakers

<table>
<thead>
<tr>
<th>Hot Rock</th>
<th>Siemens</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Changing Markets</th>
<th>Nester S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salts--Nitrates</td>
<td></td>
</tr>
<tr>
<td>Salts--Chlorides</td>
<td>Sandia/NREL</td>
</tr>
<tr>
<td></td>
<td>Mark Mehos (NREL); Program manager solar heat store</td>
</tr>
</tbody>
</table>

With reference to the solar heat storage program at Sandia, the best contact is Ken Armijo at 505-284-3425. He says that they also have an MIT person involved named Henry s. Asegun, phone-617-253-7202. Ken was very interested in the proposed workshop.

<table>
<thead>
<tr>
<th>HTGR</th>
<th>Yan (Japan)</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Core Graphite</td>
<td></td>
</tr>
<tr>
<td>Separate vessel</td>
<td></td>
</tr>
<tr>
<td>Iron in sodium/He</td>
<td></td>
</tr>
<tr>
<td>Hot Rock</td>
<td></td>
</tr>
<tr>
<td>Cryogenic Air; all reactors</td>
<td></td>
</tr>
<tr>
<td>Hot sand—all reactors</td>
<td></td>
</tr>
<tr>
<td>Hot Recuperator: HTGR</td>
<td>Germany</td>
</tr>
<tr>
<td>Hot concrete/all reactors</td>
<td></td>
</tr>
<tr>
<td>Hot sulfur</td>
<td></td>
</tr>
<tr>
<td>Regulatory challenges</td>
<td>NEI/EPRI</td>
</tr>
</tbody>
</table>

### Google Link:

https://docs.google.com/spreadsheets/d/1hGUXj2s6aJzDdHm7PK_5Byu8yDqS5dEkBgr_9iC0sFl/edit#gid=1162561357