



bGen™ - Energy when you need it

High Temperature Energy Storage for Industrial Heat



bGen™ - BS-7011

Storage Based Steam Generator

Charge with Biomass, Deliver Industrial Heat on Demand

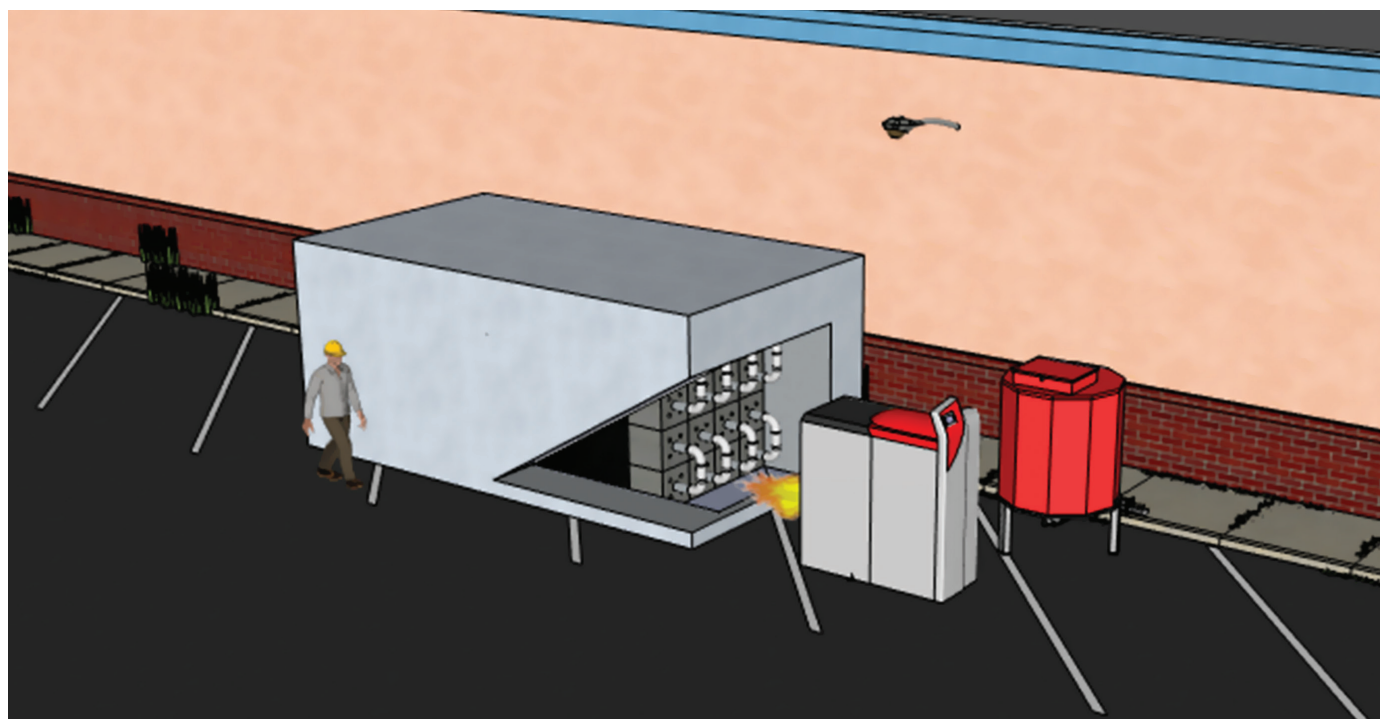




Product Functionality

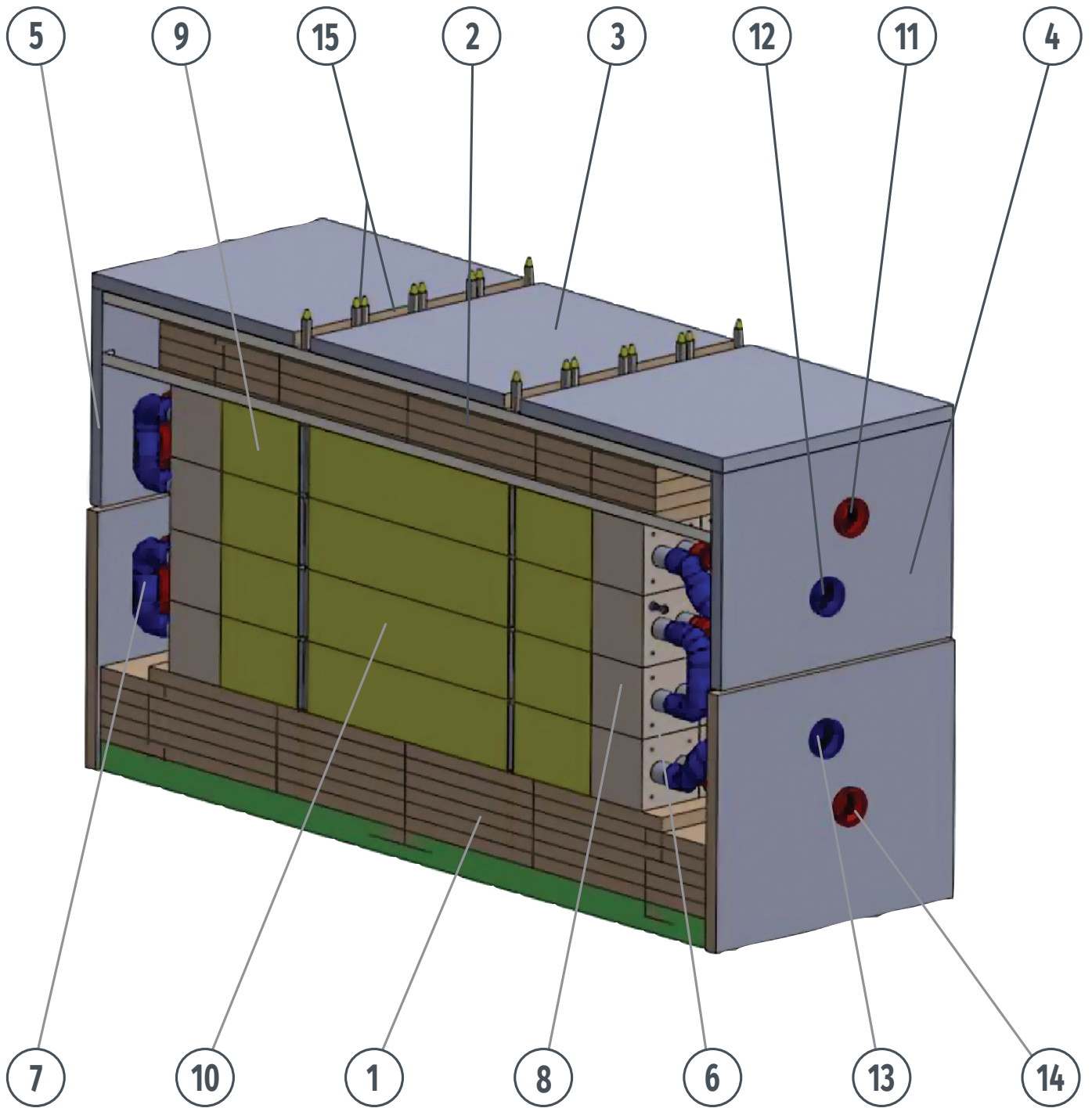
The BS-7011 product from Brenmiller Energy is a high temperature Energy storage unit, charged from a Biomass energy source when heat is available. Through the patented technology, utilizing inherently the heat exchanger, the steam generator and the storage media, the charged heat is stored internally and delivered as Industrial Steam, Hot water or Hot Air only when required to by the industrial process or tool. The technology decouples between the continuous charging time of the Biomass source and the different delivery time slots of the output. Therefore, the

Biomass source can be used for charging over 24 hours while the BS-7011 can deliver its steam or Hot water from the internal heat only at the selected time slots, as required by process or tool. The system functionality is of a high importance for industries where the Natural Gas is more expensive than the Biomass source, pellets or wood chips, and for small and medium factories which can not switch to Biomass due to the economics of smaller factory steam consumption. Multiple BS-7011 units can be used to form the required size.



Key Advantages

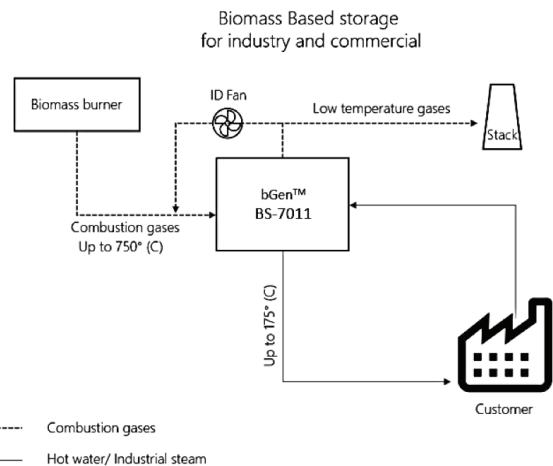
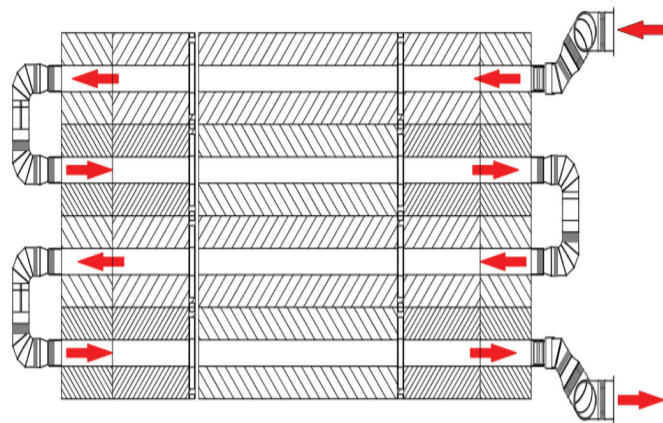
- 1 Renewable Enabler – The system method is an enabler for the utilization of the Biomass intermittent source for a steady industrial heat delivery with reduced CO2 emissions.
- 2 Financing - A significant saving through the switch to the biomass energy source
- 3 Flexibility – The BS-7011 can accept a wide range of charging input temperatures, from 350°C up to 750°C
- 4 Efficiency – By decoupling between the charging from the continuous Biomass source and the delivery in different time slots of the industrial heat, overall efficiency is increased.
- 5 Lifetime – The used storage media enables tens of thousands of charge/discharge cycles with no performance degradation and a lifetime of 30 years with no storage media replacement.
- 6 Modularity – Multiple units can be utilized to form a size which matches the customer need.
- 7 No Hazardous – Zero Emissions are added to the environment due to the use of the BS-7011. the system is built from green only materials with no hazardous to the environment or special chemicals inside.
- 8 Heat Losses – The internal storage losses are only 3% in a 24 hours time period.



- | | |
|-----------------------------------|---------------------------|
| ❶ Bottom Insulation | ❹ Back Insulation |
| ❷ Top Insulation | ❺ Storage Media Cubes |
| ❸ Sealed Housing | ❻ Inlet Biomass Gasses |
| ❹ Front Housing | ❼ Outlet Fluid Supply |
| ❺ Back Housing | ❽ Biomass Returned Gasses |
| ❻ Internal Interconnecting Piping | ❾ Returned Supply Fluid |
| ❼ Back Interconnecting Piping | ❿ Unit Handling Points |
| ❽ Front Insulation | |

Technical Details and Performance

Hot gasses, up to 750°C, are flowing to the BS-7011 input. These gasses are flowing through the charging piping of the system. Once leaving the delivered heat inside the unit with the storage media, the cooled gasses are output to the stack unit. In parallel or in a totally different timing, cold water is flowing through the separate discharging piping system of the unit and deliver the industrial steam (180°C, 10 bars) to the process or tool. Returned water goes back to the BS-7011 unit for a new cycle of heat delivery. The cooled Biomass gasses are returned to the input cycle for efficiency increase. The 2 separate cycles inside the unit enable a full control and flexibility for the charging and discharging conditions in regards to timing, flow and temperatures.



The BS-7011 can be activated in different working points. The following table specifies such sample points. One can use it to maximize power or to maximize capacity. The unit maximum delivery is 1 ton of steam.

BS-7011 – Sample working points

Storage Power [MW]	Hot Water (Up to 90°C)		Industrial Steam (up to 180°C)	
	Storage Capacity [MWh]	Storage Capacity [Hour]	Storage Capacity [MWh]	Storage Capacity [Hour]
0.4	2.40	5.95	1.96	4.90
0.6	2.10	3.50	1.59	2.70
0.8	1.60	2.00	1.32	1.70

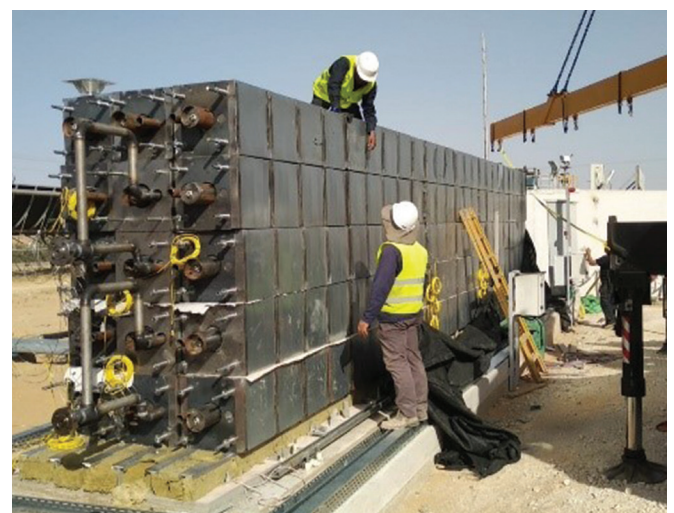
BS-7011 - General technical data

Biomass Burner Power	Max. 750Kw
Biomass Input	Pellets, Wood Chips
Efficiency	80%
External Dimensions (W x H x L)	3.0 x 3.0 x 6.5 m
Heat Losses	3% / 24 Hours
Response Time	60 Seconds

Construction

The BS-7011 is supplied and shipped as one and integrated unit. Once the ground preparations are performed, installation is short and focused on connections to the required interfaces. Specifications are supplied for the various interfaces according the below topics. Installation and integration are completed when a full acceptance test has been performed.

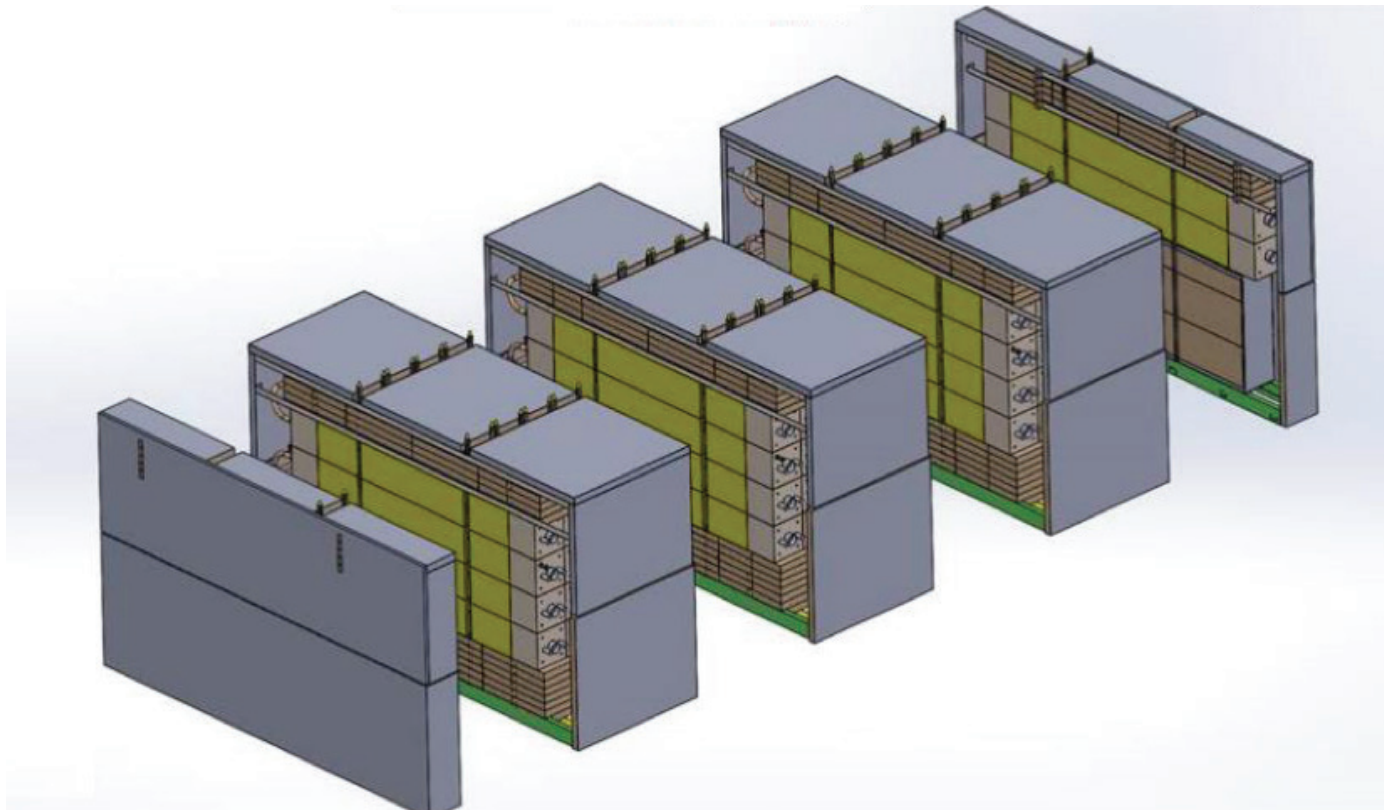
- SW/Control Interface
- Piping Interface
- Ground preparations
- Water Requirements
- Installation Tools
- Acceptance Test



Modularity, Operation & Maintenance

The BS-7011 unit can be used as a stand alone unit or multiple such units can be integrated to form a storage based steam generator with a bigger size, suitable to the specific application and customer. Input and output conditions will stay the same

while the energy storage size can be multiplied to the required scale. Modifications will be performed to optimize to total new configuration in regards to the input and output piping, used Biomass burners and integration hardware.



Safety and Standards

Standard	Description
ISO 9001	Quality management systems
ISO 14001	Environmental management systems
OHSAS 18001	Health and safety management system
CE / UL	Directives for CE/UL listed
ASME 31.1	Power piping
Eurocode8, US ASCE 7-98	Building and foundations
TA-LUFT, BEMS	Gas emissions

Operations & Maintenance

The BS-7011 unit is fully automatic and operated through a software communication protocol. No special local operator is required for operating the system. Local customer maintenance or operating staff will go through a grade A O&M course which will enable them to give full support of the hardware and communication topics. A special monitoring screen for control of the unit will be supplied. Hardware items of the system do not require any preventive or periodic maintenance. Brenmiller Staff will support the customer with any grad B topics which are not covered by the local maintenance or operating staff, upon demand.

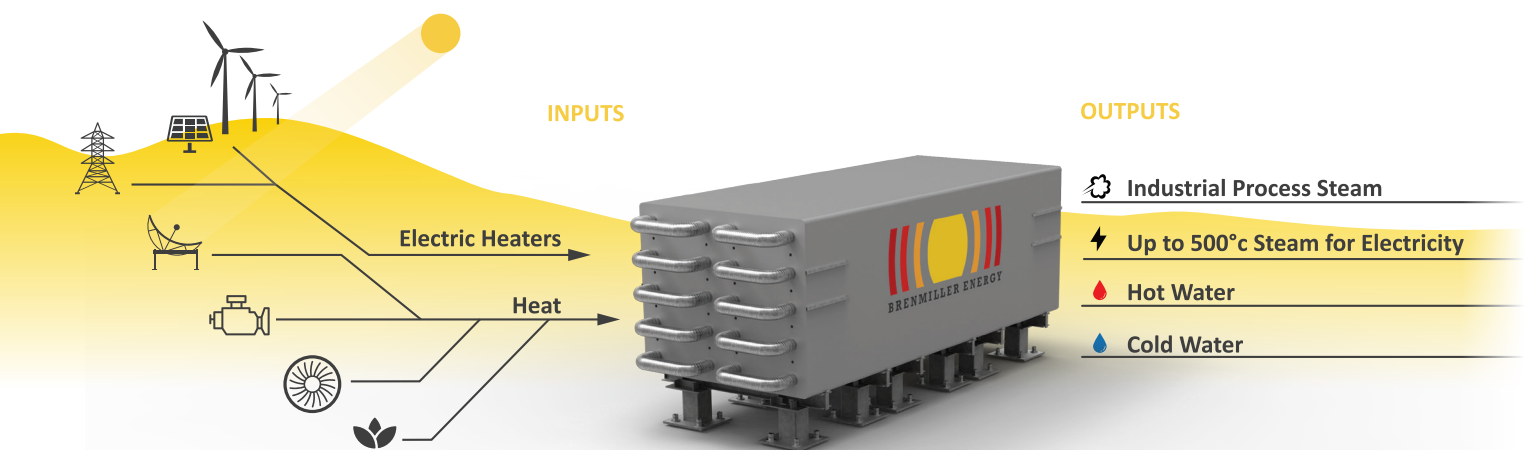
Company Profile

Brenmiller Energy, based on its unique storage technology, provides sustainable energy solutions to the distributed generation market.

The company was founded in 2012 by Avi Brenmiller, former CEO of Siemens CSP and Solel, and a team of experts in the field of renewable energy. Brenmiller Energy's knowledge and expertise are well-grounded and are based on years of field experience in designing, building and operating solar power plants in Spain and in US of over 500MW.

Recent accomplishments include being awarded a \$1M grant for a joint project with the New York Power Authority, as well as being awarded a grant by the Ministry of Defence for an energy storage project.

The company completed a successful IPO in August 2017 and is now being traded on the Tel Aviv Stock Exchange.



Tel: +972-77-6935140
info@bren-energy.com
www.bren-energy.com

Address:
13 Amal St. Park Afek
Rosh Ha'ayin 4809249, Israel