

# Hydrogen-bromine Flow Battery for Grid-Scale Energy Storage



Venkat Srinivasan

Staff Scientist

Lawrence Berkeley National Lab

[vsrinivasan@lbl.gov](mailto:vsrinivasan@lbl.gov)



# Overview- Hydrogen-bromine flow batteries

## Timeline

- Project start date: October 2010
- Project end date: September 2012

## Advantages

- Fast kinetics
  - High efficiency at high power
- No structural changes
  - Long lifetimes
- Inexpensive chemicals

## Budget

- Total: \$2M
- DOE share: \$1.6M
- LBNL: \$950k
- Bosch: \$460k
- DuPont: \$480k
- 3M: \$90k
- Proton Energy: No cost partner

## Barriers

- Poor efficiency at high power
  - Cell design
- Poor life
  - Catalyst poisoning
- High cost
  - Catalyst and membranes
- Safety

# The team



## BOSCH

Invented for life

System design, catalyst theory



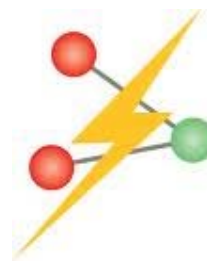
Electrochemistry, cell design, catalyst studies, new halogens



Low-cost, stable, ion-exchange and microporous membranes

# 3M

Novel catalyst structures



## Proton

A Distributed Energy Systems Company

Cell Design and materials