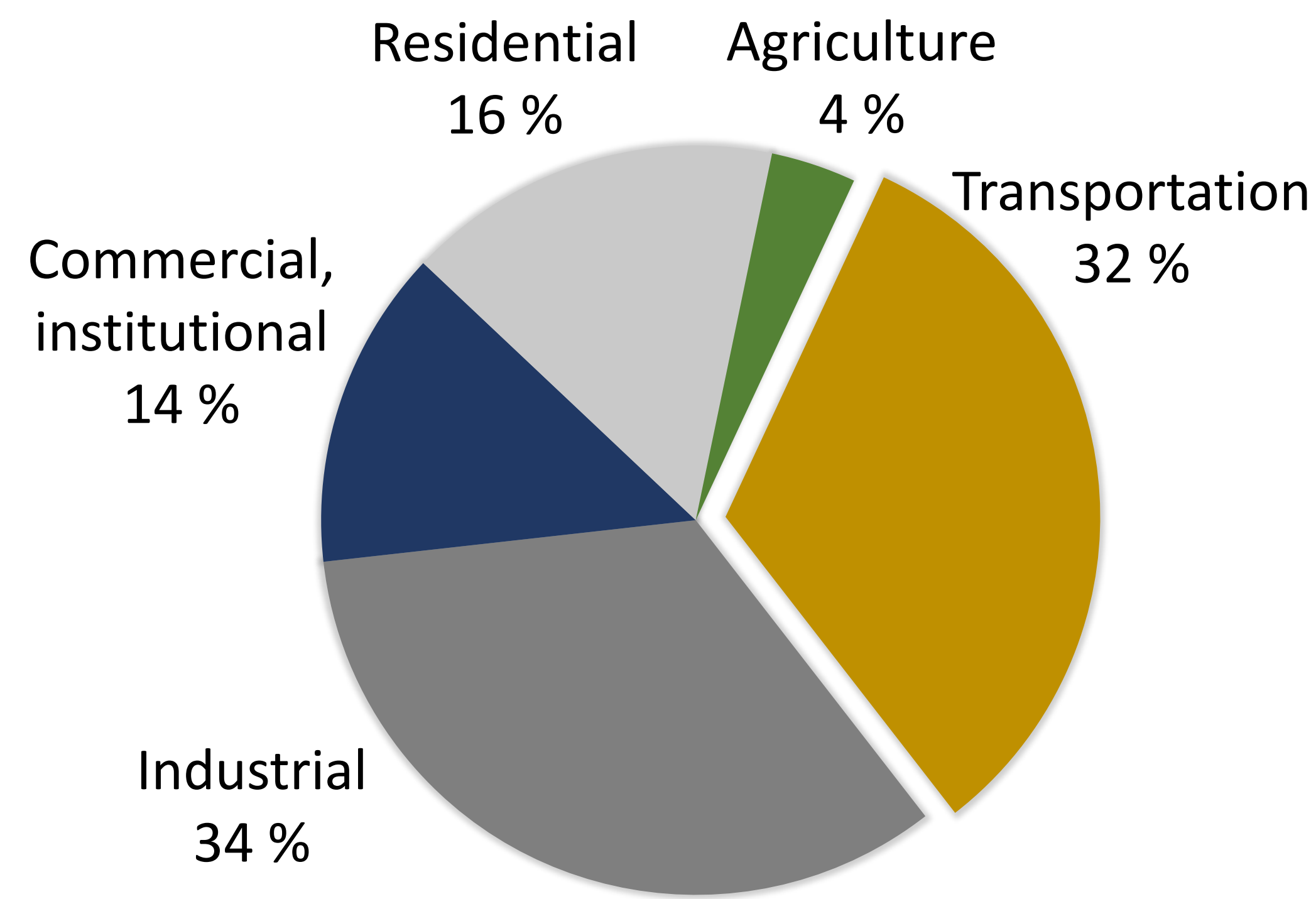


Transportation and air-conditioning (A/C)



Primary and secondary energy consumption in Canada, 2017

Low efficiency of ICE

- High level of GHG emissions
- More than 50% of non-utilized waste heat

High auxiliary loads

- Vapour compression A/C load up to 22%
- Electric cabin heating

Zero-emission transportation

NewFlyer PEM Fuel Cell bus

- 50 kW Ballard Fuel Cell stack
- 160 kW Rated Power
- 450 km range



50 kW Ballard PEM Fuel Cell Stack

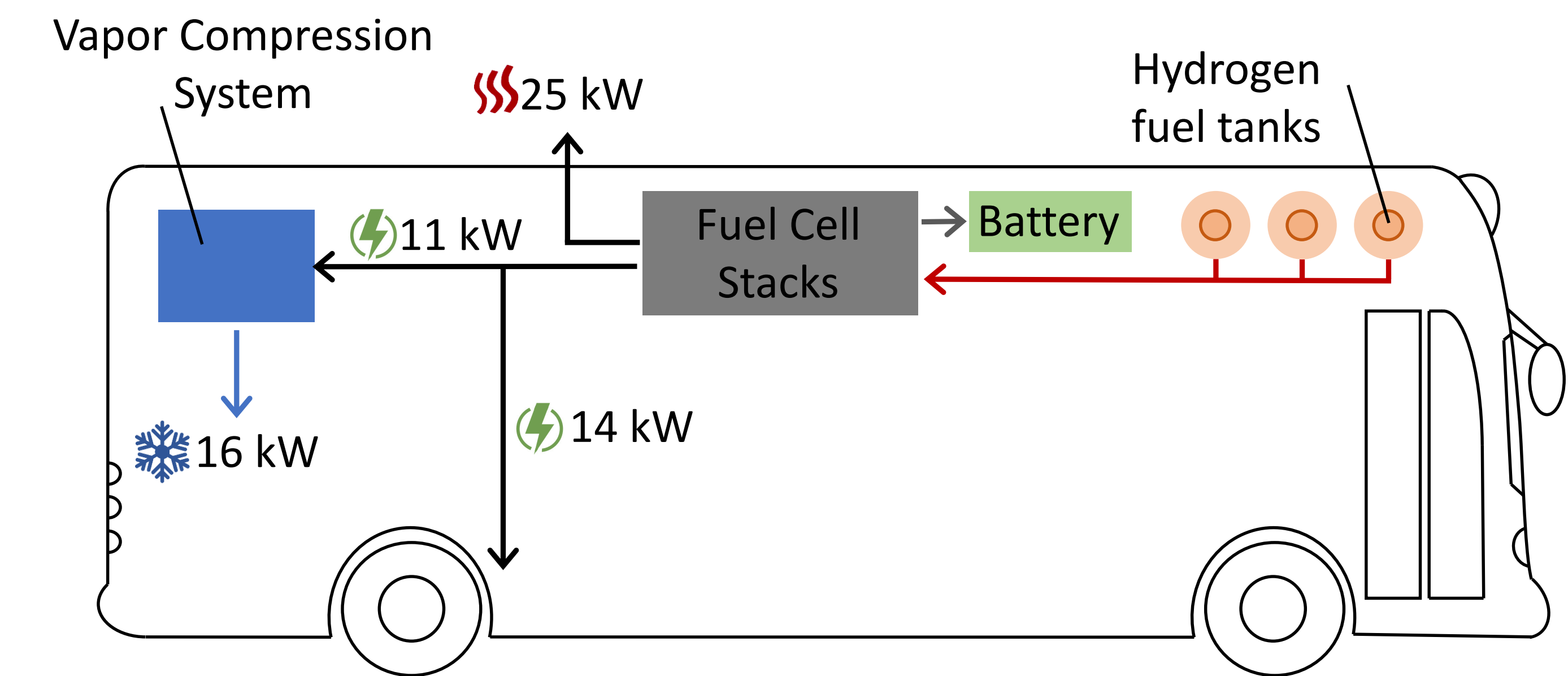
25 kW electrical energy

25 kW low-grade waste heat at 60 – 70 °C

Water

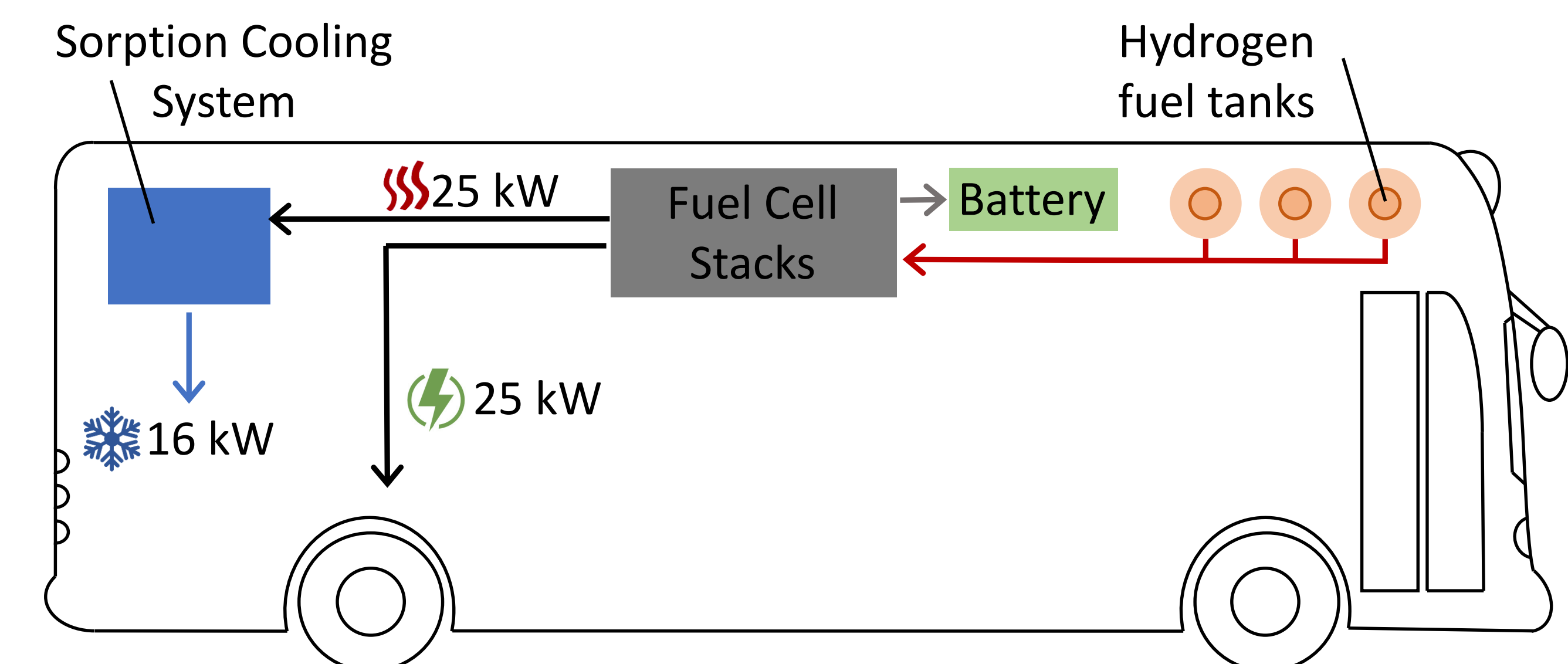
Integrated waste heat driven sorption A/C

Fuel Cell Bus with Vapor Compression Cooling



⚡ Limited efficiency: 50% Waste-heat and 22% load for A/C

Replacing Vapor Compression by Sorption Cooling System



- Waste heat recovery
- Efficiency
- Environmentally friendly
- Compactness
- working pair and heat transfer fluid
- Cost



NSERC Idea to Innovation (I2I) in collaboration with Ballard and NewFlyer