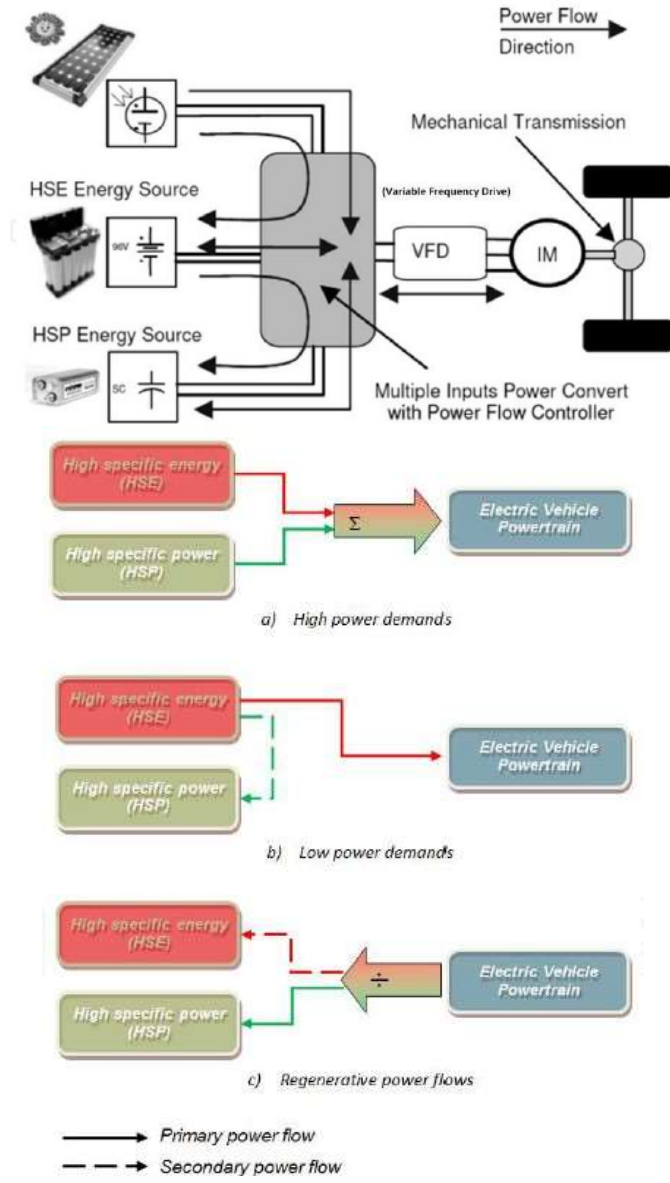


Range Anxiety – Hybrid RESS Technologies

Electric Vehicles (EVs) are being increasingly accepted by customers over the last few years though Range Anxiety continues to be a challenge. The High Voltage (HV) battery is the primary storage of energy in EVs and needs to be sized appropriately to meet the energy and power demand of the vehicle, besides being able to meet the dual challenge of cost effectiveness and good life cycle performance. Batteries offer either high specific energy (HSE) or high specific power (HSP). HSE source is required for long driving range while HSP source is desirable for better acceleration and gradeability. In order to overcome the shortcomings of “oversizing the battery pack” to meet the requirements of both HSE and HSP, it is recommended to use a Hybrid RESS combining the battery system with supercapacitors. In situations that require high power such as during hard acceleration or traveling up slopes, both the HSE and HSP sources provide power to the powertrain system. In operations that require less power such as cruising at constant speed, the HSE source provides power to the drive system while simultaneously recharges the HSP source and prepares it for new high-power demand situations. In braking and deceleration mode, the regenerative energy will essentially be stored in the HSP source with only a small, limited energy absorbed in the HSE source. Hybrid RESS technologies can increase the operating range of EVs, enhance the battery performance by increasing its life cycle, assure the rated capacity, reduce the energy losses and limit the temperature gradients across the battery pack. However, the hybrid RESS calls for HV architecture changes such as bi-directional DC-DC converter and a well-defined energy flow controller, leading to more complexity in design and cost.



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