

Making choices when building an EV

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There are several subgroups of choices to make, but start with batteries.

- If you need range over 60 miles, plan on Lithium (LiFePO₄)
- If you need over 40 miles, consider Lithium or NiMH
- If you need 30-40 miles, plan on Li or Ni, unless you can be extremely careful in build
- If you need 20-30 miles, you can consider Lead (PbAc) or Li or Ni
- If you need under 20 miles, most any type of vehicle will work.

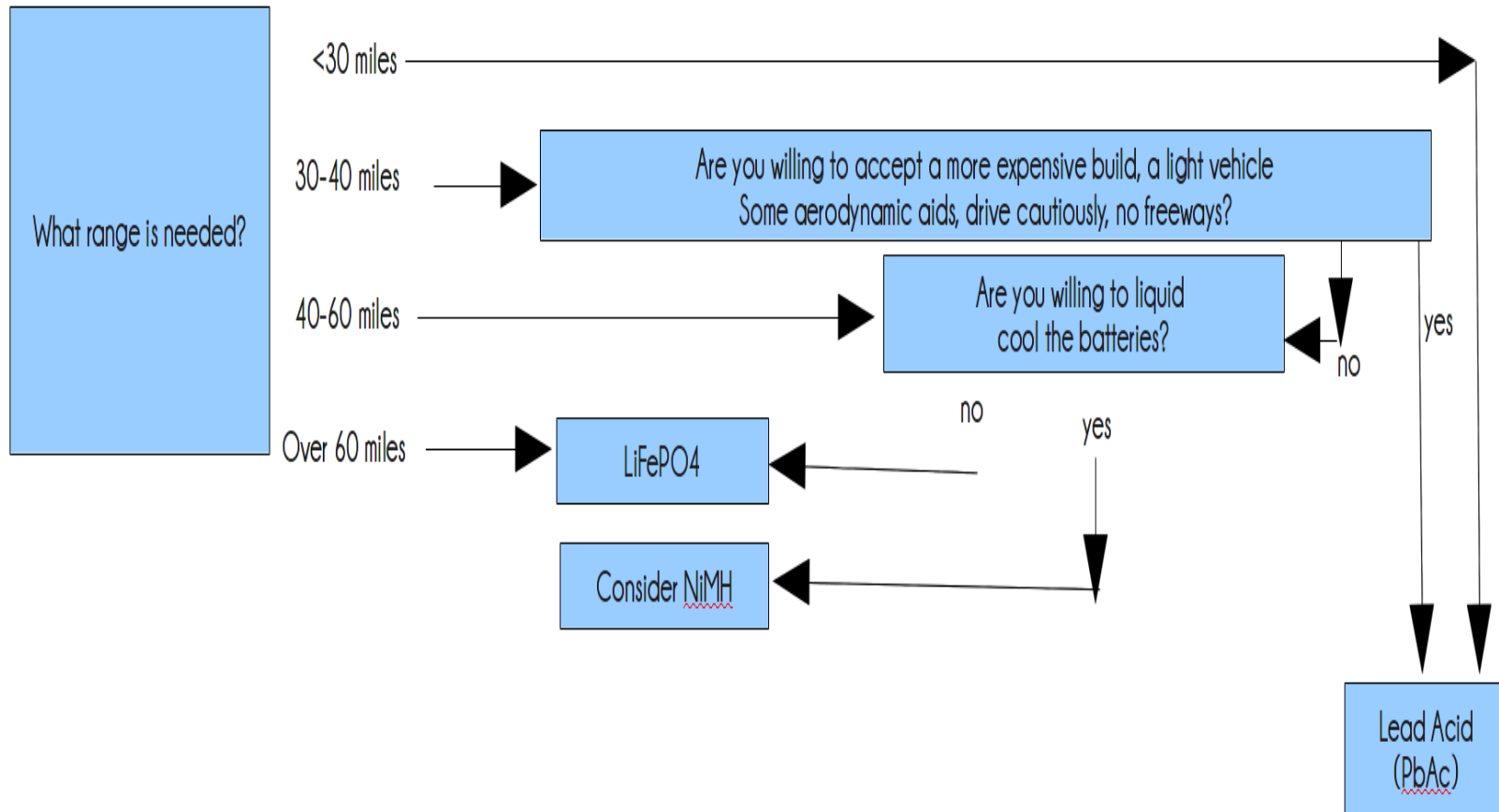
Battery overview

	Range (miles)	Cooling/ Special Considerations	Balancing	Cost
Li++	Up to 100	Need banding or constraint	Some?	\$6K - 12K
Ni++	Up to 60-80	Liquid cooling	Yes	\$4K - 8 K
Sealed PbAc	Seldom over 30	No special	Yes	\$2K - 3.5K
Flooded PbAc	Seldom Over 30	Venting	Manual (Overcharge, Then water)	\$2K - 3.5K

Battery overview

	Lifespan	Ease of install	Balancing	Cost
Li++	10-15 yr ?	easy	Suggested	High, at first
Ni++	25 - 30 yr	Difficult to Plan (cooling)	Suggested	High, at first
Sealed PbAc	3-5 yr	Intermediate	Strongly suggested	
Flooded PbAc	3-5 yr	Intermediate	Can be done with overcharging and watering	

Battery type logic tree



Choosing a vehicle – General

- Pick a type of vehicle you'll love to have, pickup, sports car, minivan, etc.
- Do not pick a candidate for the prime reason of **“it's cheap”** or **“it's available.”**
- If you need to carry a big load of lead batteries, consider a truck like vehicle
- Some small pickups have lots of space under bed, between frame rails for batteries

Choosing a vehicle - General

- After you pick a type of vehicle, do your homework and find which one is comfortable to you.
- You're likely to own this for some time, and have a sizeable investment.
- Consider what brands of vehicles you enjoy, and examine for battery placement.
- Pick the level of trim you like.

Choosing a vehicle - Considerations

- Economical cars and trucks will make longer range EV's
- Cars and trucks that are NOT economical will make short range EV's
- Consider aerodynamics if you use speeds higher than 35 MPH.
- Some aerodynamics are built in (e.g. Insight)
- Some aerodynamics can be added (pickup bed covers, etc.)

Choosing a vehicle, legal & insurance

- Pickup trucks are slightly more \$ to insure
- Pickup trucks cannot use Chicago Boulevards
- A few vehicles cross the lines, trike vs. car, car vs. pickup truck.
- Some suburbs have parking ordinances for trucks
- Trikes and reverse trikes are licensed as motorcycles in Illinois
- Two passenger cars may incur a higher insurance rate

Choosing a vehicle - Practical

- How many passengers do you need to carry?
- How often do you carry large packages?
 - Lumber?
 - Sports equipment?
 - Kids projects
 - Scouts, etc.

Additional considerations

- Rust free
- Accident free
- Smoked in?
- It is often easy and inexpensive to purchase a Southern vehicle, and spend \$500 to \$600 to ship it up to Chicago

Bad reasons to pick a vehicle

- It is available
- It needs the gasoline engine replaced
- It was Uncle Harry's car
- It was cheap
- It needs only one system fixed, otherwise it's great
- It is just down the street from me
- I know someone who knows these cars inside and out

Little things (which will add up)

- Power steering will have to:
 - Either replace the pump with electric, or
 - Change to manual steering box
 - May have to add switch to dash to turn on/off
 - May have difficulties with fittings
- Power brakes will have to:
 - Add electric vacuum pump
 - Much older cars may not need power brakes

Not so little things, which add up

- If you chose a vehicle with an automatic transmission,
 - You will have to make the electric motor run at 'idle speed'
 - Likely will have to override the transmission shift points
 - Find an electronic means of solving the 'park interlock'
 - May not be as efficient

Not so little things, which add up

- Air conditioning
 - Run from pulley on electric motor, add 'idle' speed on the motor
 - ? Allow for variations in load?
 - Very significant power draw
 - It is possible to run electric motor to drive AC compressor
 - This was considered 'optional' in the past, likely due to the short trips an EV made
 - Perhaps not so 'optional' today

Consider overall package

- Project image of fuel efficiency
- Take a few extra minutes to make it look professional
- Cable together when possible, use zip-ties
- Label major components
- Label both ends of major connectors
- Consider placement of major parts for serviceability and for explanation.

Minor Considerations

- Whether Low Rolling Resistance tires are available for this vehicle
- Whether aero aids are available for this vehicle
- Any sponsor money
 - Dealer
 - Auto parts store
 - Battery distributor