**Part 3: Comparison and Analysis**

#### **1. How did the answers differ between the approaches?**

The Standard RAG Approach produced a general, moderately detailed response, while the Query Decomposition Approach offered a highly structured analysis. Below is a breakdown of how they differed across each key component of the main question:

**A. Manufacturing and Production Approaches**

**Standard RAG:**  
- Described Tesla’s focus on cost reduction and AI-based features like Autopilot and FSD.  
- For GM, it mentioned investments in propulsion stamping, components plants, and joint ventures for battery cells.  
- Lacked factory-specific process details or future production strategy insights.  
**Query Decomposition RAG:**  
- Provided detailed info on Tesla’s strategy, including ramping up Cybertruck and next-gen platform production, increasing throughput at existing facilities, and deploying unique manufacturing designs.  
- For GM, it emphasized the Orion Assembly conversion for EVs, the Ultium platform, and joint ventures (e.g., LG Energy Solution) to mass-produce battery cells.  
- Included both current efforts and forward-looking strategies.  
Difference: The decomposed approach offered much more depth regarding each company's long-term manufacturing strategy and technology.

**B. Production Locations**

**Standard RAG:**- Tesla: Listed Fremont, Texas, Berlin, Shanghai, and upcoming Mexico.  
- GM: Cited Orion Assembly (Michigan), CAMI Assembly (Canada), and battery plants in Ohio, Tennessee, and Michigan.  
- Information was accurate but brief.  
**Query Decomposition RAG:**  
- Tesla: Broke down exact vehicle models and factory mappings—e.g., Model S, X, 3, Y across Fremont, Shanghai, Berlin-Brandenburg, Texas, and Nevada (Tesla Semi).  
- GM: Covered Factory ZERO (Detroit-Hamtramck), Orion Assembly, and CAMI Assembly in Canada with specific vehicle names like GMC Hummer EV, Silverado EV, and BrightDrop Zevo models.  
Difference: Decomposed version was more granular, mapping each location to vehicle models and production purpose.

**C. Safety Standards**

**Standard RAG:**  
- Admitted that the text did not provide specific information on safety standards.  
**Query Decomposition RAG:**  
- Tesla: Mentioned compliance with FMVSS and design considerations to prevent battery fires.  
- GM: Cited compliance with both U.S. (NHTSA standards) and international standards like UNECE; discussed recall obligations under the Safety Act.  
Difference: The decomposed approach successfully retrieved detailed, regulation-based content that was completely missed in the standard method.

#### **2. Which approach produced a better answer to the main question and why?**

The Query Decomposition Approach clearly outperformed the Standard RAG based on the following objective measures:

Completeness: Only the decomposed approach answered all three components of the main question in full detail.  
Clarity & Organization: Responses were segmented into labeled sections, aiding reader comprehension.  
Depth of Insight: Specific mention of vehicle-factory mappings, legislative acts (e.g., FMVSS, Safety Act), platform architectures (Ultium), and supplier partnerships (LG Energy Solution) demonstrated a much deeper understanding.  
Factual Specificity: Sub-queries filtered by company led to cleaner, company-specific factual retrievals with no cross-talk or generalizations.

**Conclusion:**

The Query Decomposition RAG Approach provided a better answer—not just because it was longer or more structured, but because it surfaced richer, more precise, and actionable information on Tesla and GM’s EV manufacturing, plant locations, and safety protocols. The Standard RAG was effective but lacked depth and omitted a critical aspect of the question.The Query Decomposition RAG approach works better because it transforms an ambiguous, multi-layered query into atomic, focused units that:Improve document retrieval precision; Enforce source-company separation; Organize context and output logically; Enhance LLM response quality through prompt clarity  
In short: it makes each component of the RAG pipeline smarter, cleaner, and more traceable, which leads to better answers.