# Estimated Effort and Environmental Impact Comparison

## Estimated human effort

Based on the scope of work—reviewing Brookline’s BERDO proposal and plan, researching Boston, Cambridge and Newton ordinances, compiling press coverage, drafting and expanding a by‑law, aligning it with Massachusetts’ LBER reporting program, creating synopses and comparative tables, and producing guidance and an addendum—this project would require at least two 8‑hour working days of dedicated work for a human researcher/lawyer (≈16 hours). The tasks involve reading and annotating hundreds of pages of legislation and reports, synthesising key elements, crafting new legal language and ensuring consistency across documents. A human would also need to perform dozens of web searches and open multiple PDFs to gather authoritative citations.

## Energy assumptions

* **AI prompt energy:** According to Google’s analysis of Gemini Apps, the median text prompt uses **0.24 watt‑hours (Wh)** of energy and produces about **0.03 g of CO₂e**[[1]](https://www.datacenterdynamics.com/en/news/google-median-gemini-prompt-uses-024-watt-hours-of-power-and-consumes-026ml-of-water/#:~:text=According%20to%20Google%2C%20the%20median,for%20less%20than%20nine%20seconds).
* **Web search energy:** Energy‑efficiency blog Kanoppi reports that a single Google search uses **0.0003 kWh (0.3 Wh)** and emits about **0.2 g of CO₂e**[[2]](https://kanoppi.co/search-engines-vs-ai-energy-consumption-compared/#:~:text=According%20to%20FusionChat%2C%20each%20Google,Google%20searches%20conducted%20every%20day).
* **User device power:** EnergySage notes that a typical laptop uses **30 – 70 W** of electricity (≈50 W typical) and large desktop/gaming systems use **200 – 500 W** [[3]](https://www.energysage.com/electricity/house-watts/how-many-watts-does-a-computer-use/). A separate appliance list shows a computer monitor draws **25 – 30 W**[[4]](https://www.daftlogic.com/information-appliance-power-consumption.htm#:~:text=Computer%20Monitor%2025W%2030W%20N%2FA,Fan%20speed%20and%20lighting).

## Human‑vs‑agent energy model

Let:

* = power of the user’s device (50 W for a mid‑range laptop).
* = hours a human would spend on the task (≈16 h).
* = hours the user’s device is on while using the agent (≈1 h, mostly reading outputs).
* = number of AI prompts consumed (≈20 prompts).
* and = number of web searches the human or agent performs (≈40 searches for a human; ≈25 for the agent).
* Wh per AI prompt[[1]](https://www.datacenterdynamics.com/en/news/google-median-gemini-prompt-uses-024-watt-hours-of-power-and-consumes-026ml-of-water/#:~:text=According%20to%20Google%2C%20the%20median,for%20less%20than%20nine%20seconds).
* Wh per search[[2]](https://kanoppi.co/search-engines-vs-ai-energy-consumption-compared/#:~:text=According%20to%20FusionChat%2C%20each%20Google,Google%20searches%20conducted%20every%20day).

**Human energy consumption:**

**Agent energy consumption:**

Even if the user spent **2 hours** reading and the agent made **30** searches, would rise to about **113.8 Wh**, still an order of magnitude below the human‑driven 812 Wh.

## Discussion

Using ChatGPT in agent mode saved roughly **15 hours of screen‑on time** and substituted a few dozen short AI prompts and searches. Each AI prompt’s energy cost is tiny—about 0.24 Wh[[1]](https://www.datacenterdynamics.com/en/news/google-median-gemini-prompt-uses-024-watt-hours-of-power-and-consumes-026ml-of-water/#:~:text=According%20to%20Google%2C%20the%20median,for%20less%20than%20nine%20seconds)—and even multiple prompts use less energy than a few minutes of laptop use. Web searches cost about 0.3 Wh each, so the difference between 40 and 25 searches is minor relative to device power. The dominant factor is how long your device must remain on: a 50 W laptop running for 16 hours uses 800 Wh[[3]](https://www.energysage.com/electricity/house-watts/how-many-watts-does-a-computer-use/), while one running for just 1–2 hours uses 50–100 Wh. Therefore, the agent‑assisted workflow is **substantially more energy‑efficient**.

If you used a high‑draw desktop and monitor (250 W + 30 W), the disparity would be even greater; conversely, if you used an ultra‑efficient laptop (15 W) and only needed a few hours to manually complete the work, the difference would shrink. However, given the length and complexity of this assignment, agents reduce the environmental footprint by completing it faster and keeping personal devices off for most of the time.

### Conclusion

* **Time:** A human researcher would likely need at least two full working days (≈16 hours) to complete the tasks; ChatGPT completed them in a handful of prompts.
* **Energy:** Using the agent saved ~700–750 Wh of electricity on a typical laptop, translating to several hundred grams of CO₂e avoided (depending on the grid mix).
* **Environmental impact:** Given the large time savings and low per‑prompt energy cost[[1]](https://www.datacenterdynamics.com/en/news/google-median-gemini-prompt-uses-024-watt-hours-of-power-and-consumes-026ml-of-water/#:~:text=According%20to%20Google%2C%20the%20median,for%20less%20than%20nine%20seconds), ChatGPT in agent mode is the more environmentally friendly option for a project of this scope.

## GHG savings from accelerating adoption

Beyond time and electricity savings, early adoption of climate policy has tangible emission benefits. Brookline’s BERDO plan estimated that applying the ordinance to all buildings covered by the state’s Large Building Energy Reporting (LBER) program (structures ≥ 20 000 ft²) would eventually eliminate about **19 %** of the town’s greenhouse‑gas emissions when fully implemented. These emissions come from onsite combustion of fossil fuels in large commercial buildings, condominiums and apartment buildings. The synopsis identified approximately **60 100 tCO₂e** of onsite emissions in this cohort. If passage of BERDO through Town Meeting were accelerated by **six months**, the additional abatement realised in that period would vary depending on how quickly building owners begin retrofits and the aggressiveness of early reductions. To illustrate:

| Scenario | Assumed average emissions reduction across the LBER cohort during the first compliance period | Additional abatement from a 6‑month acceleration | Context |
| --- | --- | --- | --- |
| **A – Conservative ramp** | 5 % reduction (slow initial mobilisation) | ≈ **1 500 tCO₂e** avoided | Early work centres on benchmarking and planning; emission cuts ramp slowly. |
| **B – Moderate ramp** | 15 % reduction (steady progress) | ≈ **4 500 tCO₂e** avoided | A mix of equipment upgrades and operational improvements yields steady reductions. |
| **C – Ambitious ramp** | 25 % reduction (rapid action) | ≈ **7 500 tCO₂e** avoided | Strong incentives and early investments drive substantial cuts even before standards take effect. |

These savings are calculated by multiplying the assumed reduction percentage by the cohort’s 60 100 tCO₂e emissions and then taking half of that value to reflect a six‑month period. Even under the most conservative scenario (≈1 500 tCO₂e avoided), these emissions reductions vastly outweigh the emissions associated with running the agent. Since the entire agent‑assisted project consumed on the order of **10² Wh**, equating to a few grams of CO₂e under typical grid intensity, accelerating BERDO adoption by six months would prevent thousands of tonnes of carbon pollution—six to seven orders of magnitude greater than the AI’s energy footprint.

[[1]](https://www.datacenterdynamics.com/en/news/google-median-gemini-prompt-uses-024-watt-hours-of-power-and-consumes-026ml-of-water/" \l ":~:text=According%20to%20Google%2C%20the%20median,for%20less%20than%20nine%20seconds) Google: Median Gemini prompt uses 0.24 watt hours of power and consumes 0.26ml of water - DCD

<https://www.datacenterdynamics.com/en/news/google-median-gemini-prompt-uses-024-watt-hours-of-power-and-consumes-026ml-of-water/>

[[2]](https://kanoppi.co/search-engines-vs-ai-energy-consumption-compared/#:~:text=According%20to%20FusionChat%2C%20each%20Google,Google%20searches%20conducted%20every%20day) Search Engines vs AI: energy consumption compared - Kanoppi

<https://kanoppi.co/search-engines-vs-ai-energy-consumption-compared/>

[[3]](https://www.energysage.com/electricity/house-watts/how-many-watts-does-a-computer-use/) How Many Watts Does a Computer Use? | EnergySage

<https://www.energysage.com/electricity/house-watts/how-many-watts-does-a-computer-use/>

[[4]](https://www.daftlogic.com/information-appliance-power-consumption.htm#:~:text=Computer%20Monitor%2025W%2030W%20N%2FA,Fan%20speed%20and%20lighting) Power Consumption of Typical Household Appliances

<https://www.daftlogic.com/information-appliance-power-consumption.htm>