# Energy Arbitrage Strategy: Compute as Grid Infrastructure

**Mist Inc. — Wave One Arbitrage Infrastructure**

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## Executive Summary

We're not building a compute broker. We're building the **NASDAQ for electrons + compute**, where AI workloads become grid-balancing assets that participate in wholesale energy markets.

The insight: **Large-scale AI compute is the first workload type that's large enough, flexible enough, and location-agnostic enough to arbitrage wholesale energy markets in real-time.**

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## The Market Opportunity

### The Core Arbitrage

Every computation costs energy. Electricity markets change hourly by region. If you can measure that in real-time, you can shift compute jobs to wherever electricity is cheapest or cleanest.

**But that's table stakes.**

The real opportunity is recognizing that distributed AI compute becomes **grid infrastructure** — providing flexible, interruptible demand that stabilizes renewable-heavy grids.

### The Players

- **Energy Infrastructure**: Bloom Energy, Tesla Energy, Enphase, NextEra Energy
- **Grid Marketplaces**: ERCOT (Texas), PJM (Northeast), CAISO (California)
- **Tech Incumbents**: Google and Microsoft already buy renewable energy futures to power data centers — we do it dynamically, but distributed

- **Emerging Partners**: Microgrid startups, solar co-ops, university renewable research labs, battery storage operators (Fluence, Tesla Megapack sites)

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## Three Arbitrage Layers Most People Miss

### 1. Temporal Arbitrage (Time-Shifting)

**The Pattern**: Solar peaks at noon, wind peaks at night. Most compute runs 24/7 on flat pricing.

**The Innovation**: Build a "deferred compute marketplace" where buyers submit jobs with time windows (e.g., "complete this training run within 72 hours"). Batch-schedule during renewable surplus periods.

**Revenue Unlock**: In high-renewable grids, electricity prices sometimes go **negative** during oversupply. Run compute at -$0.03/kWh instead of +$0.12/kWh. You get *paid* to consume power.

**Example**:

- Wind farm in West Texas generates excess power at 2 AM
- Grid price: -$0.02/kWh (they pay you to take it)
- You route ML training workload from California data center to Texas edge cluster
- **Arbitrage capture**: $0.14/kWh spread ($0.12 California price + $0.02 Texas incentive)

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### 2. Demand Response as a Product

**The Pattern**: Grid operators pay industrial consumers to *reduce* load during peak demand (demand response/demand flexibility programs).

**The Innovation**: Package distributed compute capacity as a "virtual power plant" — when the grid is stressed, pause low-priority jobs and sell that saved capacity back to utilities.

**Revenue Unlock**: Dual-sided income.

1. Buyers pay you to run compute
2. Grid operators pay you *not* to run compute during critical hours
3. You arbitrage the spread

**Unit Economics**:

- ERCOT pays $3-5/kW/month for enrolled capacity
- Real-time curtailment events pay $0.15-0.30/kWh
- **Instead of saving $0.05/kWh through arbitrage, you earn $0.15-0.30/kWh by pausing**

**Example**:

- You aggregate 50 MW of compute capacity
- Enroll in ERCOT demand response program
- Base payment: 50,000 kW × $4/kW/month = $200,000/month
- During August heat wave, grid calls 5 curtailment events
- You pause low-priority training jobs for 2 hours each
- Additional revenue: 50 MW × 10 hours × $250/MWh = $125,000

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### 3. Carbon Credit Generation

**The Pattern**: Companies need verifiable carbon offsets for ESG reporting. Carbon credits trade at $20-100/ton $CO_2$.

**The Innovation**: Create "Green Compute Certificates" (like RECs for electricity) proving workloads ran on renewable energy. Buyers use these for ESG compliance.

**Revenue Unlock**: You're not just selling compute cycles — you're selling *carbon neutrality*. Different margin profile.

**Example**:

- Training run consumes 500 MWh
- Route to Iceland (100% geothermal/hydro)
- Avoided emissions vs. coal grid: 500 MWh × 0.7 tons $CO_2$/MWh = 350 tons
- Carbon credit value: 350 tons × $50/ton = $17,500
- **Add 3-5% premium on compute price for certified green workloads**

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## Execution Roadmap

### Phase 1: Batch Training Marketplace (Months 1-6)

**Target**: ML teams doing hyperparameter sweeps, dataset experiments, foundation model pretraining

**Value Proposition**: 40-60% cost reduction in exchange for time flexibility ("your job completes in 24-72 hours instead of 12")

**Technical Build**:

- Checkpoint-based migration system for PyTorch/JAX workloads
- Energy price API integrations (EIA, grid operator APIs)
- Renewable energy forecasting (NREL data feeds)
- Job scheduler with time-window constraints

**Revenue Model**: Take 15-20% margin on energy cost savings

**Success Metric**: Route 1,000 training jobs, 100 MWh total compute

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### Phase 2: Virtual Power Plant (Months 6-18)

**Target**: 50+ MW aggregated compute capacity enrolled in demand response programs

**Value Proposition to Grid Operators**: Reliable, fast-responding flexible load for grid balancing

**Technical Build**:

- Real-time curtailment signal integration (OpenADR protocol)
- Job prioritization engine (critical vs. interruptible workloads)
- Geographic clustering for utility partnerships
- Telemetry for capacity verification

**Revenue Model**:

- Capacity payments: $3-5/kW/month
- Curtailment events: $150-300/MWh
- Plus compute marketplace margin

**Success Metric**: $2M annual revenue from demand response alone

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### Phase 3: Carbon Credit Layer (Months 12-24)

**Target**: Partner with carbon registries (Verra, Gold Standard) to issue verified credits

**Value Proposition to Buyers**: ESG-compliant compute with bundled carbon offsets

**Technical Build**:

- Emissions tracking and verification system
- Integration with carbon registry APIs
- Green Compute Certificate issuance platform
- Secondary marketplace for certificate trading

**Revenue Model**: 10-20% premium on verified green compute

**Success Metric**: Issue 10,000 tons $CO_2$ in Green Compute Certificates

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## Strategic Moat: Multi-Dimensional Co-Optimization

Mist is defensible because we co-optimize across **four markets simultaneously**:

1. **Energy price** (geographic + temporal arbitrage)
2. **Latency requirements** (edge proximity vs. cloud)
3. **Memory availability** (VRAM/RAM contention)
4. **Carbon intensity** (renewable energy sourcing)

**Example Query**: *"Find me 8× A100 GPUs with <500ms latency, during off-peak energy hours, in a region with <300g $CO_2$/kWh, with 80GB VRAM available."*

No existing platform matches across all four dimensions. That's the moat.

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## Wild Card Play: Energy Storage Partnership

**The Opportunity**: Partner with battery storage operators (Fluence, Tesla Megapack sites, community energy storage).

**Their Problem**: They arbitrage electricity by storing during low-cost periods and discharging during high-cost periods. But profitability depends on charge/discharge cycle optimization.

**Our Value Proposition**:

- Provide guaranteed flexible load during charging windows (run compute when they want to charge batteries)
- Reduce load during discharge windows (pause compute when they want to sell power to grid)
- Improve their storage asset ROI by 15-25%

**What We Get**:

- First access to cheapest electrons in the region
- Preferential electricity rates (cost-plus 1-2¢/kWh)
- Co-location rights at battery sites (often have grid interconnection capacity)

**Why This Works**: Battery operators get better returns. We get the lowest cost power. Symbiotic relationship.

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## The Vision: Energy Router for Decentralized Compute

We're building **energy market infrastructure disguised as a compute platform**.

AI compute is uniquely suited for this because:

- **Scale**: Training runs consume megawatt-hours (comparable to industrial facilities)
- **Flexibility**: Checkpointable workloads can migrate mid-execution
- **Location-agnostic**: Most ML training doesn't require specific geographic placement
- **Time-flexible**: Many workloads have completion windows, not hard deadlines

This creates a fundamentally new market: **compute becomes a grid-balancing asset that gets compensated for flexibility**, not just execution.

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## Long-Term Market Position

**Year 1-2**: Energy-aware compute broker (arbitrage energy costs)

**Year 3-5**: Virtual power plant aggregator (sell demand response to utilities)

**Year 5+**: Carbon-neutral compute infrastructure (ESG compliance layer for AI industry)

**Ultimate Vision**: The NASDAQ for electrons + compute, where buyers, providers, grid operators, and renewable energy producers all participate in a real-time marketplace that optimizes for cost, latency, carbon, and grid stability simultaneously.

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## Why This Wins

1. **First-mover advantage**: No one is treating compute as grid infrastructure at scale
2. **Compounding moats**: Each arbitrage layer (energy, latency, memory, carbon) reinforces the others
3. **Regulatory tailwinds**: Governments incentivize grid flexibility and renewable energy adoption
4. **Market timing**: AI compute demand growing exponentially; renewable energy percentage increasing; grid flexibility becoming critical

The companies that win in infrastructure aren't the ones that build better hammers — they're the ones that **create new markets where the hammer becomes essential**.

We're not building a better cloud. We're building the marketplace that makes the cloud obsolete.

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