



## The Power of Electricity in Portfolio Allocation

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### Importance of Commodities in Portfolios

There is a strong argument to include commodities in any portfolio. As real, non-financial assets, commodities are subject to physical forces of supply and demand that endow them with valuable attributes for portfolio construction. Key among them are the diversification benefits of lower risk for the returns delivered and the hedge they provide for exposure to inflation. Studies that have analyzed the benefits of commodities in portfolios recommend optimal allocations of anywhere from 4% to 15%<sup>1</sup>.

An even stronger argument can be made to include electricity (“power”) in the portfolio commodity allocation, but until the launch of the ICE U.S. Carbon Neutral Power Index (ICECNPI)<sup>2</sup> there has been no effective benchmark for investing in power. ICECNPI combines the next 12 months of exchange-traded U.S. electricity futures with sufficient carbon allowance futures to achieve a net-zero carbon footprint, which is carbon neutral based on independently sourced data.

Why include power in your portfolio?

- **Power is the most consumed commodity in the U.S.** The retail notional dollar value of energy commodities consumed in the U.S. has averaged almost \$1.3 trillion annually since 2014. These include electricity, gasoline, crude oil, low sulfur diesel, and natural gas. The retail notional value of electricity and gasoline account for almost two thirds of the total at 31% each. There are numerous financial alternatives that provide exposure to gasoline and other energy commodities, but only one benchmark for electricity, the ICE Carbon Neutral Power Index.
- **Power is a major component of CPI.** Electricity accounts for more than a third of the contribution to inflation in the Energy CPI Subindex and is the second largest component in the subindex. Power exhibits the strongest correlation to year-over-year changes in CPI and will become even more important in the future as renewable generation facilities become an increasing share of the national grid.
- **Power delivers valuable risk-adjusted returns to traditional investment portfolios.** Historical back tests of portfolios with ICECNPI, either with or without other commodities, produce higher returns with lower standard deviations of returns than portfolios without ICECNPI. Adding ICECNPI as an allocation option shifts the entire efficient frontier upwards and to the left—in other words, adding more return per unit of risk.

The recommended allocation to power should be 30% of a portfolio’s energy position, or 1.5% to 4.5% of total AUM, based (i) its share of the energy CPI subindex, (ii) its share of the retail notional dollar value of U.S. energy consumption, and (iii) the improvement it brings to portfolio risk/return metrics.



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### Retail Notional Power Consumption

The physical consumption of power as measured by retail notional dollar value supports a 30% allocation to power for a portfolio’s energy position.

The major U.S. components of the energy subindex (MLCXENTR) of the ICE BofA Commodity Index (MLCXTR) are crude oil (CL), natural gas (NG), gasoline (XB), and heating oil (HO). Together with electricity, these commodities account for almost the entire consumption of energy in the U.S. with an average retail notional dollar value of \$1.3 trillion per year since 2014. Electricity and gasoline together account for over 60% of the total at 31% each with power at 25% to 37% over the period versus 28% to 37% for gasoline<sup>3</sup>.

**Average Annual Consumption 2014-2021**  
*Retail Notional Dollar Value*

| commodity   | \$billion | %    | 2014-2021 range |
|-------------|-----------|------|-----------------|
| Gasoline    | \$402     | 31%  | 28% - 33%       |
| Electricity | 398       | 31%  | 25% - 37%       |
| Crude Oil   | 217       | 17%  | 13% - 19%       |
| Heating Oil | 180       | 14%  | 13% - 15%       |
| Natural Gas | 85        | 7%   | 6% - 8%         |
| Total       | \$1,283   | 100% |                 |

### Power in the CPI

The contribution of power to the Energy CPI Subindex provides additional support for a 30% allocation to power for a portfolio’s energy position and a 1.5% to 4.5% share of total AUM based a 5% to 15% overall allocation to commodities.

Electricity contributed 2.49% to the CPI in 2022, on 14.7% year-over-year inflation versus 6.45% for the CPI. Since 2014, electricity has contributed an average of 2.67% to the CPI with little variation, which would be consistent with an allocation of 2.5% of total AUM<sup>4</sup>. Electricity will become even more important in the future as renewable generation facilities take an increasing share of the U.S. grid and the U.S. economy moves toward an all-electric vehicle fleet by 2035<sup>5</sup>.

| December 2022        | % CPI | 2014-2016 range |
|----------------------|-------|-----------------|
| Motor Fuel           | 4.30% | 2.81% - 4.50%   |
| Electricity          | 2.49% | 2.49% - 2.94%   |
| Utility Gas Services | 0.91% | 0.71% - 0.91%   |
| Fuel Oil             | 0.17% | 0.10% - 0.17%   |
| Energy Subindex      | 7.87% | 6.04% - 8.44%   |

Electricity accounts for more than a third of the contribution to inflation in the Energy CPI Subindex and is the second largest component in the subindex after motor fuel<sup>6</sup>. Since 2014 electricity has contributed an average of 36% to the Energy CPI Subindex with little variation year-to-year, which would imply an allocation of 1.8% to 5.4% on a commodity allocation of 5% to 15% and brackets the 2.5% allocation implied by electricity’s contribution to the overall CPI.

| December 2022        | % Energy CPI | 2014-2016 range |
|----------------------|--------------|-----------------|
| Motor Fuel           | 54.6%        | 46.5% - 55.1%   |
| Electricity          | 31.7%        | 31.7% - 40.6%   |
| Utility Gas Services | 11.5%        | 9.8% - 11.8%    |
| Fuel Oil             | 2.2%         | 1.3% - 2.2%     |
| Energy Subindex      | 100.0%       |                 |



## The Power of Electricity in Portfolio Allocation

### Power in the Portfolio Energy Allocation

The contribution from power to a portfolio comes from its returns, the variability of its returns, and the correlation of those returns with returns of other assets in the portfolio. In a historical back test from January 1, 2014 through December 31, 2022, ICECNPI delivered better returns at lower risk (measured by historical volatility) than the commodities in the energy subindex (MCLXENTR) of the ICE BofA Commodity Index (MLCXTR), a group that includes Brent crude, WTI crude, gasoline (RBOB), gasoil, and natgas. Except for natgas at 0.74, the correlation between ICECNPI and any of the rest of these commodities is 0.12 or less. Any optimization of a portfolio with these commodities will place the portfolio with the maximum allocation to ICECNPI on the efficient frontier with the highest return per unit of risk.

#### Efficient Frontier Analysis

ICECNPI and MLCXEN Energy Commodity Portfolio

January 1, 2014 - December 31, 2022

| Parameters            | ICECNPI | Brent Crude | Gasoil | Gasoline | WTI Crude | NatGas |
|-----------------------|---------|-------------|--------|----------|-----------|--------|
| Annual Returns        | 9.9%    | -2.8%       | -0.3%  | -1.4%    | -2.2%     | 0.6%   |
| Annualized Volatility | 19.6%   | 41.2%       | 40.2%  | 47.2%    | 40.2%     | 57.9%  |
| Minimum Weight        | 5.0%    | 29.8%       | 13.0%  | 12.5%    | 7.9%      | 3.8%   |
| Maximum Weight        | 30.0%   | 44.5%       | 19.4%  | 18.7%    | 11.7%     | 5.6%   |

#### Correlation Matrix

|             |      |      |      |      |      |      |
|-------------|------|------|------|------|------|------|
| ICECNPI     | 1.00 | 0.11 | 0.12 | 0.12 | 0.11 | 0.74 |
| Brent Crude | 0.11 | 1.00 | 0.60 | 0.73 | 0.86 | 0.10 |
| Gasoil      | 0.12 | 0.60 | 1.00 | 0.45 | 0.53 | 0.09 |
| RBOB        | 0.12 | 0.73 | 0.45 | 1.00 | 0.66 | 0.11 |
| WTI Crude   | 0.11 | 0.86 | 0.53 | 0.66 | 1.00 | 0.11 |
| NatGas      | 0.74 | 0.10 | 0.09 | 0.11 | 0.11 | 1.00 |

#### weights

| Efficient Frontier         | Portfolio Returns | Portfolio Volatility | ICECNPI | Brent Crude | Gasoil | Gasoline | WTI Crude | NatGas |
|----------------------------|-------------------|----------------------|---------|-------------|--------|----------|-----------|--------|
| Minimum Variance Portfolio | 1.58%             | 26.13%               | 30.0%   | 29.8%       | 14.1%  | 12.5%    | 7.9%      | 5.6%   |
| Maximum Return Portfolio   | 1.78%             | 26.19%               | 30.0%   | 29.8%       | 14.3%  | 12.5%    | 7.9%      | 5.6%   |
| Optimal Portfolio          | 1.78%             | 26.19%               | 30.0%   | 29.8%       | 14.3%  | 12.5%    | 7.9%      | 5.6%   |



## The Power of Electricity in Portfolio Allocation

### Power in a Diversified Portfolio

Analysis of the efficient frontier shows the same result for a diversified portfolio of equities, bonds, and commodities with an allocation to power. Over the 2014-2022 back test period, ICECNPI delivered better returns than bonds and commodities and only marginally lower annual returns than equities (9.9% versus 10.6% for SPXT). ICECNPI derived significant benefits from virtually no correlation with equities and bonds and only limited correlation with commodities.

### ICECNPI in a Diversified Portfolio

January 1, 2014 - December 31, 2022

| Parameters            | SPX   | IG Bonds | MLCX  | ICECNPI |
|-----------------------|-------|----------|-------|---------|
| Annual Returns        | 10.6% | 1.4%     | 0.8%  | 9.9%    |
| Annualized Volatility | 18.3% | 4.1%     | 22.2% | 19.6%   |
| Minimum Weight        | 55.0% | 30.0%    | 3.0%  | 2.0%    |
| Maximum Weight        | 65.0% | 45.0%    | 15.0% | 5.0%    |

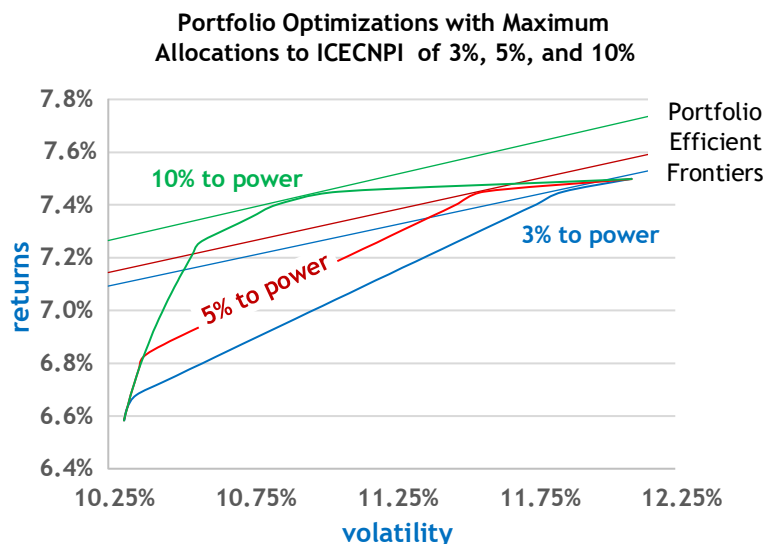
#### Correlation Matrix

|          |       |       |       |       |
|----------|-------|-------|-------|-------|
| SPX      | 1.00  | -0.08 | 0.32  | 0.06  |
| IG Bonds | -0.08 | 1.00  | -0.12 | -0.01 |
| MLCX     | 0.32  | -0.12 | 1.00  | 0.21  |
| ICECNPI  | 0.06  | -0.01 | 0.21  | 1.00  |

#### weights

| Efficient Frontier         | Portfolio Returns | Portfolio Volatility | SPX   | IG Bonds | MLCX | ICECNPI |
|----------------------------|-------------------|----------------------|-------|----------|------|---------|
| Minimum Variance Portfolio | 6.58%             | 10.31%               | 55.0% | 40.0%    | 3.0% | 2.0%    |
| Maximum Return Portfolio   | 7.50%             | 12.10%               | 65.0% | 30.0%    | 3.0% | 2.0%    |
| Optimal Portfolio          | 7.48%             | 11.63%               | 62.0% | 30.0%    | 3.0% | 5.0%    |

The optimization here of a diversified portfolio plots the efficient frontier for a maximum allocation to ICECNPI of 3%, 5%, and 10%. As with a portfolio of commodities, the risk, return, and correlation profile of the ICECNPI will always place the portfolio with the maximum allocation to power on the efficient frontier with the highest return per unit of risk.





## The Power of Electricity in Portfolio Allocation

Power belongs in an optimized portfolio. A portfolio with power will deliver better overall returns with less risk better risk adjusted results than a portfolio without power.

### Annual Returns and Sharpe Ratios for Diversified Portfolios Allocations to Stocks, Investment Grade Bonds, Commodities, & Power (stocks/bonds/commodities/power)

| period        |           | 60/40/0/0 |        | 60/35/5/0 |        | 60/35/4/1 |        | 57/30/3/10 |        |
|---------------|-----------|-----------|--------|-----------|--------|-----------|--------|------------|--------|
|               |           | return    | sharpe | return    | sharpe | return    | sharpe | return     | sharpe |
| 1 year        | 2022      | -17.5%    | (0.83) | -17.3%    | (0.81) | -17.3%    | (0.81) | -17.2%     | (0.80) |
| 3 years       | 2020-2022 | 5.9%      | 0.28   | 6.2%      | 0.29   | 6.2%      | 0.29   | 6.4%       | 0.30   |
| 5 years       | 2018-2022 | 7.7%      | 0.44   | 7.9%      | 0.44   | 7.9%      | 0.44   | 8.1%       | 0.44   |
| life of index | 2014-2022 | 8.7%      | 0.60   | 8.7%      | 0.59   | 8.8%      | 0.59   | 8.9%       | 0.59   |

<sup>1</sup> (i) “The Role of Commodities in an Institutional Portfolio” by Gary Gorton and K. Geert Rouwenhorst, published in The Journal of Alternative Investments, 2005; (ii) “The Case for Commodities Revisited”, by Claude B. Erb and Campbell R. Harvey, published in the Financial Analyst Journal in 2013; (iii) “Strategic Asset Allocation and Commodities” by Ronald Doeswijk, k Trevin W. Lam and Lauren Swinkles, published in The Journal of Portfolio Management” in 2014

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<sup>3</sup> [www.eia.gov/electricity/annual/html/epa\\_01\\_01.html](http://www.eia.gov/electricity/annual/html/epa_01_01.html); [www.eia.gov/dnav/pet/pet\\_sum\\_snd\\_d\\_nus\\_mbb1\\_a\\_cur-1.htm](http://www.eia.gov/dnav/pet/pet_sum_snd_d_nus_mbb1_a_cur-1.htm); [www.eia.gov/dnav/ng/ng\\_cons\\_sum\\_dcu\\_nus\\_a.htm](http://www.eia.gov/dnav/ng/ng_cons_sum_dcu_nus_a.htm); [www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MGFRPUS1&f=A](http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MGFRPUS1&f=A); <https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MDIUPUS1&f=A>

<sup>4</sup> [www.bls.gov/news.release/pdf/cpi.pdf](http://www.bls.gov/news.release/pdf/cpi.pdf)

<sup>5</sup> “These 10 States Want To Ban Gas-Powered Cars by 2035” (Car and Driver, February 2021); “Clean Energy Standard: How Biden’s Carbon-Free Power Plan Works” (Bloomberg, August 2021); <sup>5</sup> “The Natural Gas Bans Are Coming” (Grist, November 2020).

<sup>6</sup> [www.bls.gov/news.release/pdf/cpi.pdf](http://www.bls.gov/news.release/pdf/cpi.pdf)