

INFLATION REDUCTION ACT

CLEAN H₂ (45V)
CCUS (45Q)
SAF (40B, 45Z)
ENERGY STORAGE (48, 48E)

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Honeywell

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AGENDA

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Overview of Global and US GHG¹ Emissions

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Honeywell Commitment to Carbon Neutrality

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Overview of Inflation Reduction Act (IRA)

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Key IRA Provisions

- Clean Hydrogen Tax Credit (45V)
- CCUS² Tax Credit (45Q)
- SAF³ Tax Credits (40B, 45Z), Grants
- Energy Investment Tax Credits (48, 48E)

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Honeywell Solutions

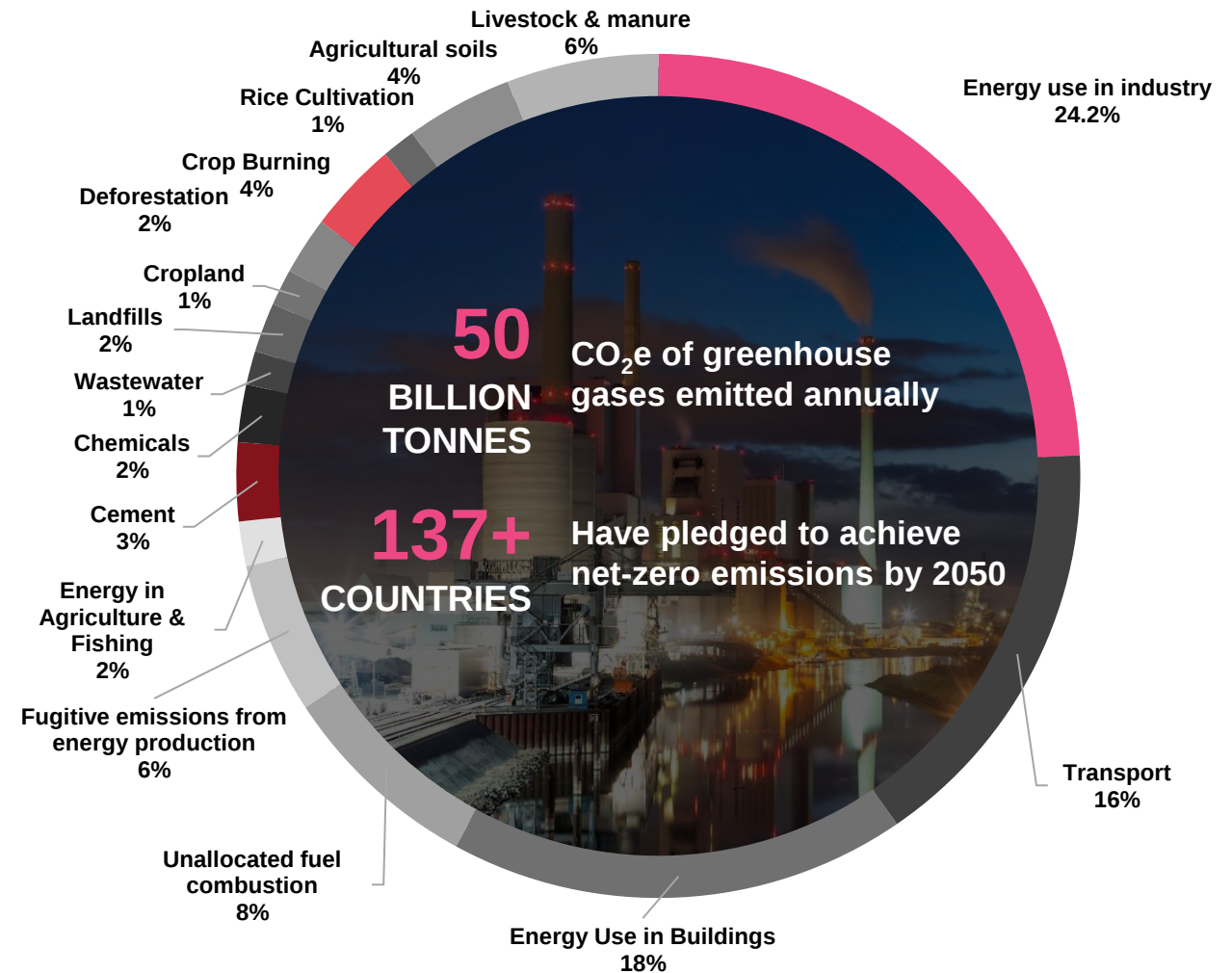
- Clean Hydrogen (Blue, Green)
- Carbon Capture (Pre-combustion, Post-combustion)
- Sustainable Aviation Fuel (SAF)
- Energy Storage (BESS⁴, LDES⁵)

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Q&A

1. GHG: Greenhouse Gas Emissions
2. CCUS: Carbon Capture, Utilization, and Storage
3. SAF: Sustainable Aviation Fuel
4. BESS: Battery Energy Storage System
5. LDES: Long Duration Energy Storage

GLOBAL GREENHOUSE GAS EMISSIONS



**INDUSTRIAL, BUILDINGS & AEROSPACE
ACCOUNT FOR ~ 50% OF GHG EMISSIONS**

COMMITTED TO CARBON NEUTRAL OPERATIONS BY 2035

Extensive Progress Since 2004



>90%

REDUCTION

in greenhouse gas
intensity since 2004



>70%

IMPROVEMENT

in energy efficiency
since 2004



~6,100

SUSTAINABILITY

projects since 2010



~3,000

ACRES

remediated and
restored as valuable
community assets



160

MILLION GALLONS

of water saved in
water-stressed
areas since 2013



55

MILLION CARS

the equivalent removed from the
road for one year, thanks to
Honeywell Solstice® offerings

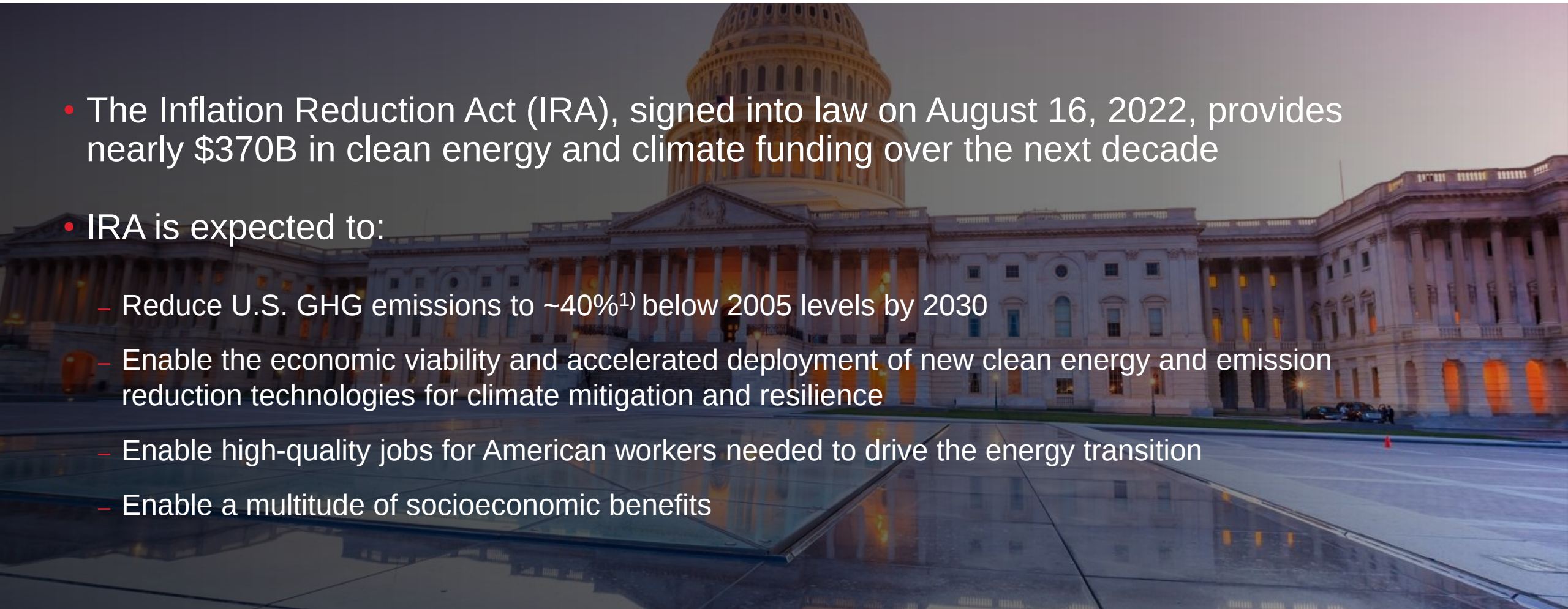


CARBON NEUTRALITY

We pledge to be carbon
neutral in all our facilities
and operations

BY 2035

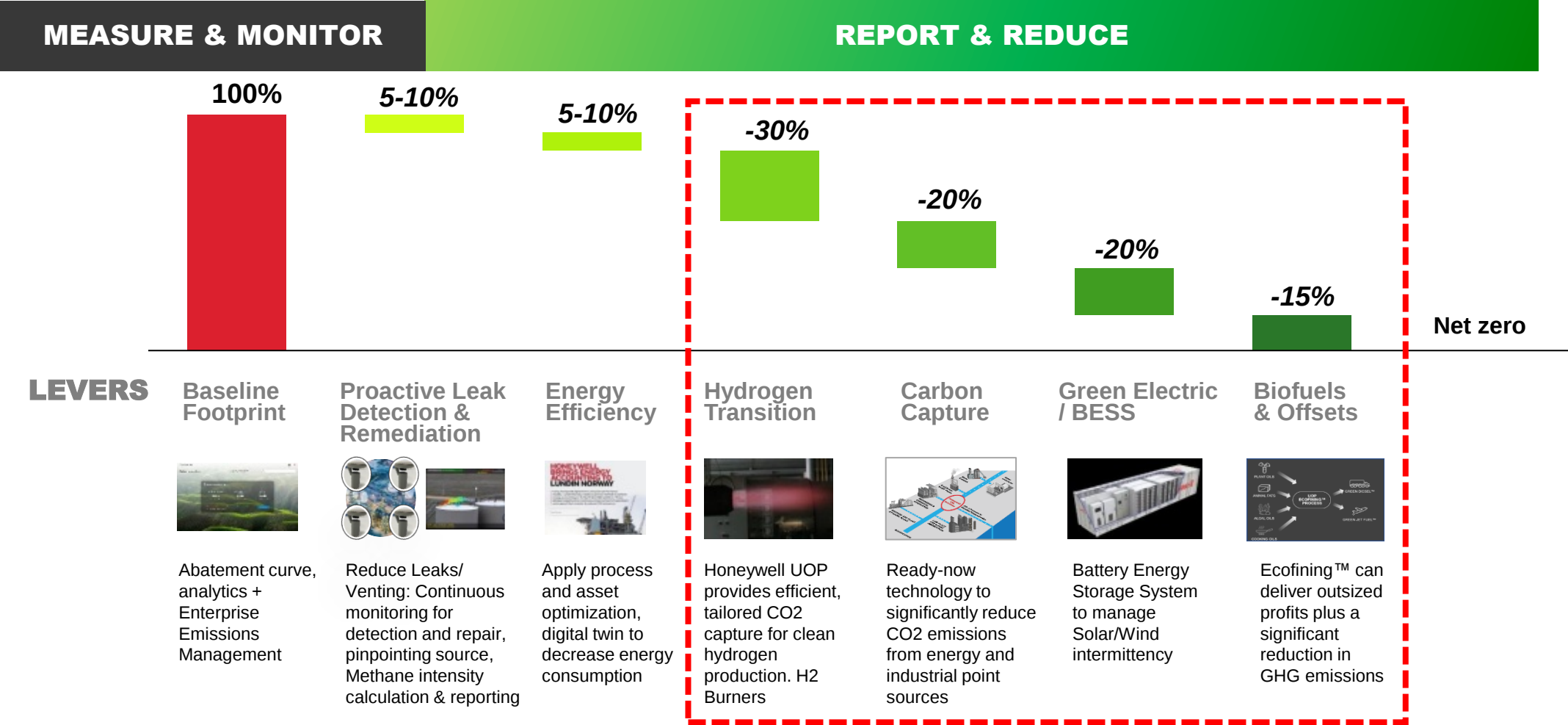
INFLATION REDUCTION ACT (IRA)

- 
- The Inflation Reduction Act (IRA), signed into law on August 16, 2022, provides nearly \$370B in clean energy and climate funding over the next decade
 - IRA is expected to:
 - Reduce U.S. GHG emissions to ~40%¹⁾ below 2005 levels by 2030
 - Enable the economic viability and accelerated deployment of new clean energy and emission reduction technologies for climate mitigation and resilience
 - Enable high-quality jobs for American workers needed to drive the energy transition
 - Enable a multitude of socioeconomic benefits

Most Significant Action Congress has Taken on Clean Energy and Climate Change in the Nation's History

1) Inflation Reduction Act Overview - Climate and Clean Air-related Provisions, Office of Management and Budget

DECARBONIZATION TRANSFORMATION PATHWAY

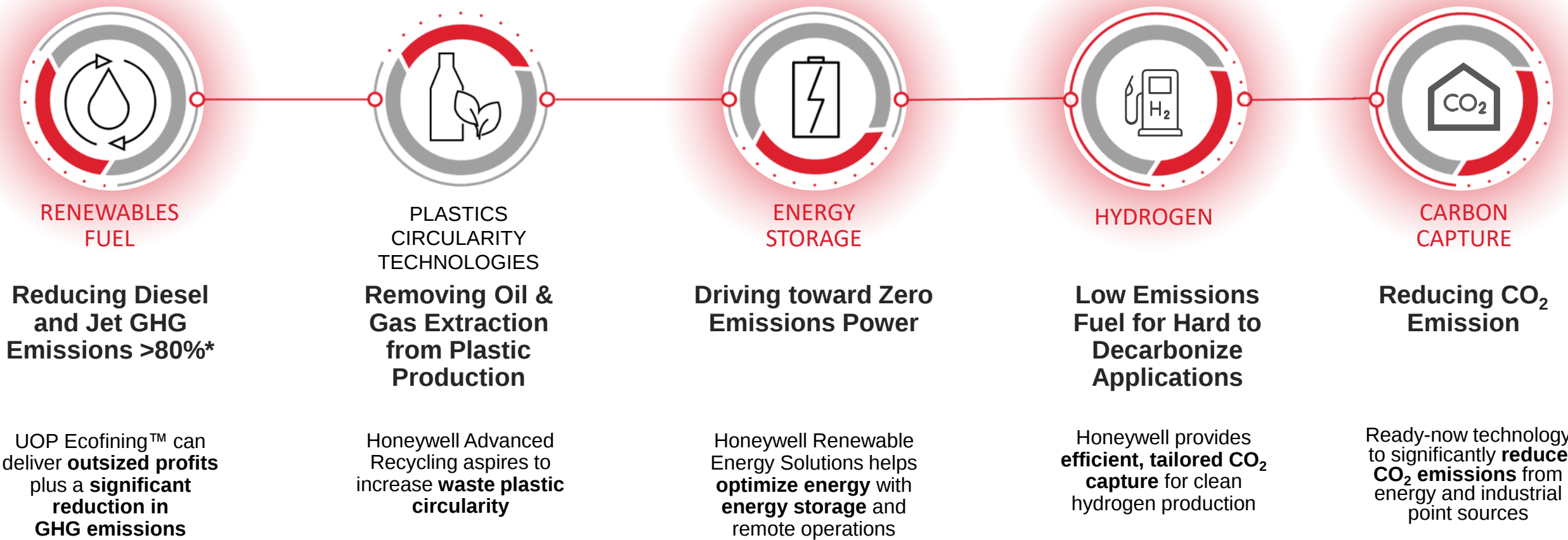


Outcome-based Strategies and Technologies To Accelerate Path to Net Zero

Note: Illustrative estimates based on data from International Energy Agency (IEA) and customer net-zero strategies; Path to net-zero can look different for individual customers; emissions reduction possibilities can vary by customer and industry

SUSTAINABLE TECHNOLOGY SOLUTIONS

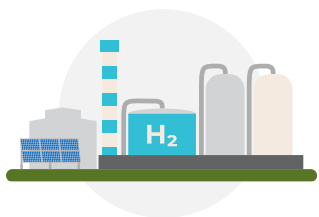
A New Business Unit for Honeywell



Committed to Commercialization of Sustainable Technologies

* Greenhouse gas emission savings calculations based on California Air Resources Board methodologies

KEY IRA PROVISIONS



Clean Hydrogen Tax Credit

PTC

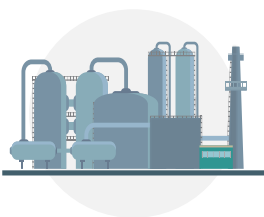
new production tax credit up to \$3/kg H₂ produced

ITC

new investment tax credit up to 30%

Duration

10-year PTC for facilities that begin construction before 1/1/2033



CCUS¹⁾ Tax Credit

\$85/MT

for sequestration of CO₂

\$60/MT

for EOR²⁾ or Utilization

Duration

12-year for facilities that begin construction before 1/1/2033



SAF³⁾ Tax Credit

BTC⁴⁾

SAF blender credit up to \$1.75/gallon

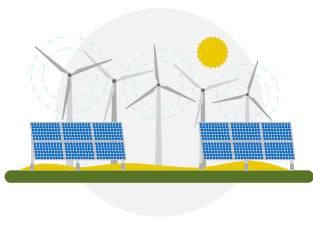
PTC

new clean fuel production tax credit up to \$1.75/gallon

Duration

BTC for SAF sold/used between 1/1/2023 -12/31/2024

Clean Fuel PTC for fuel sold/used between 1/1/2025 -12/31/2027



Energy Investment Tax Credit

ITC

current investment tax credit up to 30%, now includes energy storage⁵⁾

ITC

new technology neutral investment tax credit up to 30%, includes energy storage

Duration

Current ITC extended to facilities that begin construction before 1/1/2025

Technology Neutral ITC for facilities placed in service between 1/1/2025 -12/31/2032

Max. Credit Subject to Meeting Prevailing Wage and Apprenticeship Requirements

1) CCUS: Carbon Capture, Utilization, and Storage
2) EOR: Enhanced Oil Recovery
3) SAF: Sustainable Aviation Fuel
4) BTC: Blenders Tax Credit
5) Standalone Energy Storage Systems

CLEAN HYDROGEN TAX CREDIT (45V)

Provision Summary

- Incentive for clean hydrogen production with four tiers; credit based on lifecycle greenhouse gas (GHG) emissions while producing 1kg of H₂
- Credit increases in value as the lifecycle emissions decrease
- Credit percentages are meant to incentivize less carbon-intensive H₂ production methods

Tiers	Lifecycle GHG Emissions	PTC \$ / kg H ₂ (% of max credit)	ITC % Value (% of max credit)	Production Process
1	0.45 - 0 kg CO ₂ e/kg H ₂	\$3.00 (100%)	30% (100%)	e.g., Green H ₂
2	1.5 - 0.45 kg CO ₂ e/kg H ₂	\$1.00 (33.4%)	10.2% (34%)	e.g., Blue H ₂ w/ CCUS
3	2.5 - 1.5 kg CO ₂ e/kg H ₂	\$0.75 (25%)	7.5% (25%)	e.g., Blue H ₂ w/ CCUS
4	4.0 - 2.5 kg CO ₂ e/kg H ₂	\$0.60 (20%)	6% (20%)	e.g., Blue H ₂ w/ CCUS

Clean H₂ Production

- Production Tax Credit (PTC) up to \$3/kg H₂
- Investment Tax Credit (ITC) up to 30%
- Max. credit subject to meeting prevailing wage / apprenticeship requirements
- Taxpayer may elect an ITC in lieu of the PTC
- GHG intensity must be calculated with the GREET¹ model

Duration

- 10-year PTC for facilities that begin construction before 1/1/2033

Payment Method

- Direct pay option for the first 5 years after the facility is placed in service

Ineligibility

- If the taxpayer opts for 45Q tax credit for CCUS²

Segments Benefiting From 45V

Segment Dynamics

- Approx. 10 MMT of H₂ is produced in U.S. annually
- Approx. 70% used in petroleum refining, 20% in fertilizer production
- Approx. 95% is “grey” H₂ produced via conventional SMR process, with high lifecycle GHG emissions (9-11 kg CO₂e/ kg H₂)
- Segment decarbonization will require transition to low-carbon H₂
- IRA provisions will enable the CAPEX intensive transition

Clean H₂ Production Routes

- “Blue” H₂ with CCS added to SMR process
- Green H₂, others

Honeywell Solutions

- Blue H₂ production with CO₂ capture
 - Steam Methane Reformer (SMR)
 - Autothermal Reformer (ATR)
- Hydrogen Purification (PSA)
- Catalyst Coated Membrane (CCM; pre-commercial)

Segments



Refinery



Methanol
Plant



Ammonia



Cement

Note: This is a high-level overview of the incentives, and some guidance has not been published yet. Please ensure your project teams seek professional tax guidance.

1) GREET: Greenhouse gases, Regulated Emissions, and Energy use in Transportation, model developed by the Argonne National Laboratory
2) CCUS: Carbon Capture, Utilization and Storage

CCUS

TAX CREDIT (45Q)

Provision Summary

Incentive to enhance the economic viability of carbon capture, storage, and utilization (CCUS) facilities

Carbon Capture

- Qualifying facilities will be eligible for the following credits for each metric ton of carbon captured / sequestered / utilized
- IRA also lowers the carbon capture threshold requirements enabling additional carbon capture facilities to qualify
- Max. credit subject to meeting prevailing wage / apprenticeship requirements

Carbon Capture	Base Credit (\$/MT of CO ₂)	Max Credit (\$/MT of CO ₂)	Annual Carbon Capture Thresholds	MT/Yr of CO ₂
Direct Sequestration	\$17	\$85	Industrial Facilities	12,500
Used in Enhanced Oil Recovery (EOR) or utilization	\$12	\$60	Electric Generating Facilities	18,750

Duration

- 12 years for facilities placed in service after 12/31/2022 or begin construction before 1/1/2033

Payment Method

- Direct pay option for the first 5 years after the facility is placed in service

Ineligibility

- If the taxpayer opts for 45V tax credits for clean H₂

11) Source: [Inventory U.S. Greenhouse Gas Emissions and Sinks 1990-2021](#)

Segments Benefiting From 45Q

Segment Dynamics

- In 2021, U.S. GHG emissions totaled 6,348¹ MMT of CO₂ equivalent
 - Emissions by Gas: 79.5% CO₂; 11.5% Methane; 9% Others
 - Emissions by Source: 25% Electric Power; 23% Industry
- Segment decarbonization can be achieved via different routes
 - Energy efficiency improvements
 - Use of bio-mass, green H₂, and blue H₂ as feedstock or fuel
 - Renewable power
 - CCUS
 - Others
- IRA 45Q provisions enhance the economic viability of CCUS projects to significantly reduce CO₂ emissions in energy / industrial segments

Honeywell Solutions

- Pre-combustion CO₂ Capture
- Post-combustion CO₂ Capture

Segments



Refinery



Chemical



Hydrogen Plant



Natural Gas Processing



Power



Steel



Cement

Note: This is a high-level overview of the incentives, and some guidance has not been published yet. Please ensure your project teams seek professional tax guidance.

SUSTAINABLE AVIATION FUEL

TAX CREDITS (40B, 45Z), GRANTS

Provision Summary

- Incentives to scale up domestic production of Sustainable Aviation Fuel (SAF), to meet Biden administration’s goal of 3B gallons/year by 2030.
- SAF can reduce lifecycle GHG emissions by up to 80%¹⁾ compared to Jet A/A-1

SAF Tax Credits

- New SAF blender tax credit (BTC, 40B) gives between \$1.25 and \$1.75/gallon credit for routes with >50% reduction in GHG emissions
- New clean fuels production credit (PTC, 45Z) gives between \$0.35 and \$1.75/gallon SAF credit for routes with emission factor of < 50kg of CO₂eq / MMBtu
- Max. credit subject to meeting prevailing wage / apprenticeship requirements

New BTC (40B)	Base Credit (\$/gallon)	Max. Credit (\$/gallon)	Clean Fuel PTC (45Z)	Base Credit (\$/gallon)	Max. Credit (\$/gallon)
SAF	\$1.25	\$1.75	SAF	\$0.35	\$1.75

SAF Grants

- \$244.5M for projects relating to production, transportation, blending, or storage of SAF

Duration

- SAF BTC (40B): SAF sold/used between 1/1/2023 -12/31/2024
- Clean Fuel PTC (45Z): fuel sold/used between 1/1/2025 -12/31/2027

Ineligibility

- Coprocessing of renewables with non-renewable does not qualify
- Must meet the requirements of ASTM International Standard D7566, or the Fischer Tropsch provisions of ASTM International Standard D1655, Annex A1

1) Source: [Developing Sustainable Aviation Fuel \(SAF\) – IATA](#)
2) Source: [Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021 – Main Text \(epa.gov\)](#)

Segments Benefiting From 40B, 45Z

Segment Dynamics

- In 2021, U.S. GHG emissions from the aviation sector totaled 165² MMT of CO₂ equivalent
 - US Government in partnership with Airlines for America (A4A) has undertaken major initiatives to reduce GHG emissions
 - DOE targeting 3B gallons SAF (>200K BPD) by 2030, 35B by 2050
- Segment decarbonization can be achieved via different routes
 - New aircraft technologies
 - Carbon Offsetting and Reduction Scheme (CORSIA)
 - SAF uptake
 - International standards permit 50% SAF blend with Jet A/A-1
 - OEMs aiming for routine comm. operations using 100% SAF by 2030
 - UA recently operated the world’s first comm. flight on 100% SAF
- IRA 40B, 45Z provisions will scale the production / deployment of SAF

Honeywell Solutions

- Ecofining™ Process Technology
 - Sustainable Aviation Fuel (SAF)
 - Renewable Diesel
- Ethanol to Jet (ETJ)
- CO₂ to Jet

Segments



Refinery



Bio-Refiners

Note: This is a high-level overview of the incentives, and some guidance has not been published yet. Please ensure your project teams seek professional tax guidance.

ENERGY INVESTMENT TAX CREDITS (48, 48E)

Provision Summary

Incentives to scale zero-emissions electricity production and clean energy projects

Energy Storage

- Extension of current energy investment tax credit (ITC, 48), also expands credit to include **standalone** energy storage
- New technology neutral clean electricity ITC (48E) for qualifying zero-emission electricity generation facilities, including **standalone** energy storage
- Max. credit subject to meeting prevailing wage / apprenticeship requirements
- Bonus credits available if certain criteria are met for domestic sourcing and/or geographic location of projects.

ITC Extension (48)	Base Credit (% value)	Max. Credit (% value)	Tech. Neutral ITC (48E)	Base Credit (% value)	Max. Credit (% value)
Energy Storage	6%	30%	Energy Storage	6%	30%
Solar Facilities	6%	30%	Zero Emission Elect. Generation Facilities	6%	30%

Duration

- Current ITC (48) extended to facilities that begin construction before 1/1/2025
- Tech. neutral ITC (48E)) for facilities placed in service between 1/1/2025 - 12/31/2032, or until power sector emissions are reduced by 75% from 2022 levels

Ineligibility

- Residential storage projects do not qualify for ITC funding

1) Source: [Electricity generation capacity in the U.S. \(EIA\)](#)

2) C&I: Commercial & Industrial

3) BESS: Battery Energy Storage System

4) LDES: Long Duration Energy Storage

Segments Benefiting From (48, 48E)

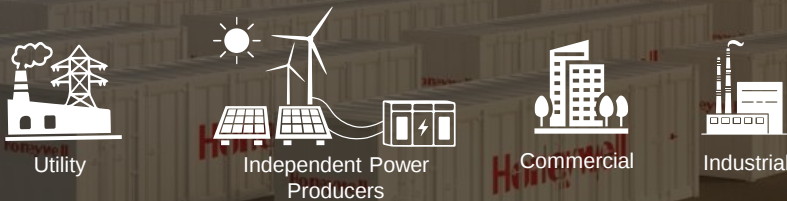
Segment Dynamics

- In 2021, about 20% of U.S. utility-scale electricity¹ was generated from renewable energy sources
 - To mitigate the challenges of intermittent renewable resources, grid scale energy storage infrastructure is required
 - Grid instability and high electricity prices are major drivers of energy storage systems
 - Today, majority of storage projects are paired with solar PV or wind to qualify for ITC
- Segment decarbonization can be achieved via different routes
 - Renewable energy sources (solar, wind, etc.)
 - Battery energy storage systems
- IRA 48, 48E provisions will enable deployment of technology-neutral standalone battery storage systems, in addition to systems co-located with renewables
 - 30% ITC will make C&I² projects more feasible

Honeywell Solutions

- Energy Storage Systems
 - BESS³ (0 to 4-hr)
 - LDES⁴ (4-12-hr; pre-commercial)

Segments



Note: This is a high-level overview of the incentives, and some guidance has not been published yet. Please ensure your project teams seek professional tax guidance.

SUSTAINABILITY SOLUTIONS

PLASTICS CIRCULARITY



- UpCycle Process Technology
 - Recycled Polymer Feedstock (RPF)
- Ready-now Technology
- Value Proposition
 - Accommodates a **wide range of difficult to recycle plastics** and makes a consistent higher quality plastic feedstock
- Segments
 - Plastic Recycling & Processing Plants

RENEWABLE FUELS



- Ecofining™ Process Technology
 - Renewable Diesel
 - Sustainable Aviation Fuel (SAF)
- Ethanol to Jet (ETJ)
- CO₂ to Jet
- Ready-now Technology
- Value Proposition
 - Licensed **32 Ecofining™ units in 11 countries**, processing 12 different types of renewable feedstocks
 - **First licensed technology producing SAF**, extensive industry experience
 - **First flight on 100% SAF**, techno-commercially proven
 - **30+ active SAF opportunities worldwide**
- Segments
 - Biorefineries, Refineries

CARBON CAPTURE



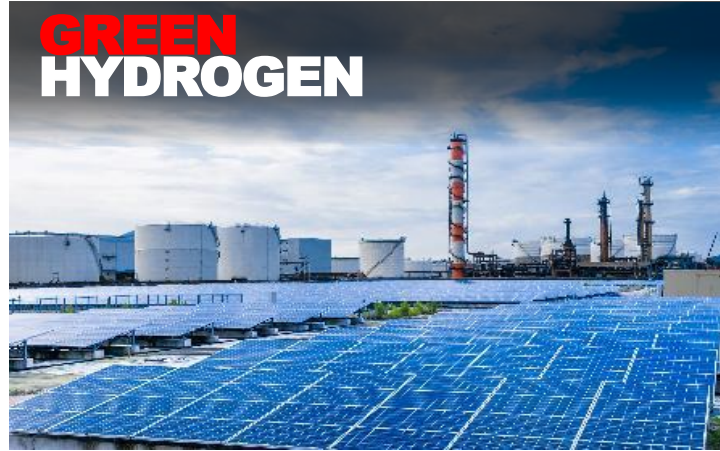
- Pre-Combustion CO₂ Capture
- Post-Combustion CO₂ Capture
- Ready-now Technology
- Value Proposition
 - **70+ years of experience**
 - **4000+ CO₂ separation units**, techno-commercially proven
 - **Bolt-on modular systems**, enables fast track project execution, minimizes downtime, and accelerates monetization
 - **Lower CAPEX/OPEX**, enables enhanced project IRR
 - **Reduces 90%+ of CO₂ emissions¹** from industrial point sources, enables enhanced CO₂ capture
- Segments
 - Refining, Chemical, Hydrogen, NG Processing, Power, Steel and Cement Plants

1) 90% overall CO₂ capture, as demonstrated in pilot-scale test campaigns at UT-Austin pilot plant and National Carbon Capture Center using flue gas from both coal and natural gas combined cycle sources. CCUS power plants operating today capture around 90% of the CO₂ from flue gas (<https://www.iea.org/reports/ccus-in-power>).

SUSTAINABILITY SOLUTIONS



- Hydrogen production with CO₂ Capture
 - Steam Methane Reformer (SMR)
 - Autothermal Reformer (ATR)
- Hydrogen Purification (PSA)
- Ready-now Technology
- Value Proposition
 - Bolt-on solution to existing SMRs, which enables **fast-track project execution**, minimized downtime, and accelerated monetization
 - **Enhanced H₂ recovery**; 10%-20% additional H₂ yield, which enables maximized Blue H₂ production and improved profitability
 - **High CO₂ recovery**; >99% CO₂ recovery from PSA tail gas, enables maximized CO₂ emission reduction
- Segments
 - Refinery, Ammonia, Methanol, Cement Plant



- High-Performance Catalyst Coated Membrane (CCM) for
 - Proton Exchange Membrane Electrolyzers (PEM¹)
 - Anion Exchange Membrane Electrolyzers (AEM²)
- Pre-commercial Technology
- Value Proposition
 - **Improves efficiency, performance**
 - **Expected to reduce electrolyzer costs by 25%³**
- Segments
 - Electrolyzer OEMs



- Battery Energy Storage System
 - BESS (0 - 4 hours)
 - LDES (4 -12 hours; **pre-commercial**)
- Ready-now Technology – BESS
- Value Proposition
 - BESS **fully integrated** with EMS, Microgrid Controls (MC), VPP, which enables integrated platform for **seamless aggregation** and optimization of distributed energy resources (DERs)
 - Performance Monitoring & Analytics, **enables operational intelligence** to optimize performance, improve uptime, maximize ROI
 - **Real time fleet performance monitoring** from remote control center to **improve uptime, lower operational costs**
- Segments
 - Utilities, IPP, C&I

1) PEM: Proton Exchange Membrane

2) AEM: Anion Exchange Membrane

3) Based on a PEM water electrolysis system using renewable power to produce 2,300 MT H₂/y with 5,000 operating hours/y.

HONEYWELL SOLUTIONS

ENABLING DECARBONIZATION

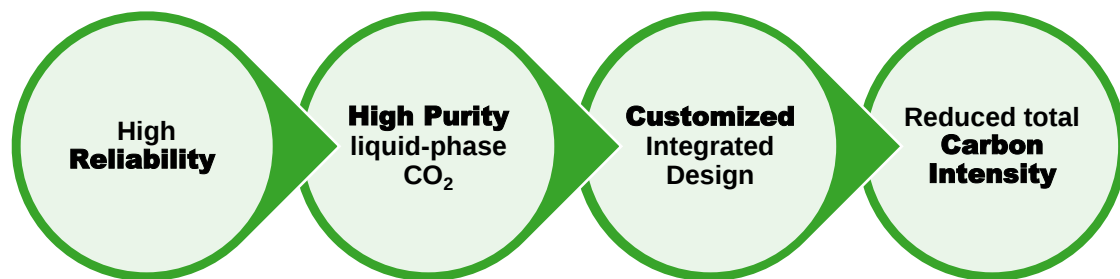


Honeywell innovations driving energy transformation through carbon capture, buildings technologies, hydrogen solutions, advanced plastics recycling, long-term energy storage, globally friendly refrigerants, and more

HONEYWELL SOLUTIONS

ENABLING CARBON CAPTURE

UOP H₂ PURIFICATION AND CO₂ FRACTIONATION



Press & Media / ExxonMobil to Deploy Honeywell Carbon Capture Technology

ExxonMobil To Deploy Honeywell Carbon Capture Technology

- Honeywell's CO₂ Fractionation and Hydrogen Purification System will enable the capture of about 7 million tons of carbon dioxide (CO₂) annually
- Installation of Honeywell's solution will help reduce emissions at ExxonMobil's Baytown complex

February 15, 2023



DES PLAINES, Ill., Feb. 15, 2023 /PRNewswire/ -- Honeywell today announced that ExxonMobil will deploy one of Honeywell's carbon capture technologies – Honeywell's CO₂ Fractionation and Hydrogen Purification System – at its integrated complex in Baytown, Texas. This technology is expected to enable ExxonMobil to capture about 7 million tons of carbon dioxide (CO₂) per year, the equivalent of the emission of 1.5 million of automobiles for one year¹.

Honeywell UOP's carbon capture technology will be integrated into the design of ExxonMobil's low-carbon hydrogen production facility and enable it to capture more than 98² percent of associated CO₂ emissions. The captured CO₂ is expected to be sequestered and permanently stored by ExxonMobil.

3) Based press release issued Feb 15, 2023, announcing HON H2 tech in Exxon Baytown facility. [Link](#)

CO₂ Fractionation System

- Enables the capture of about **7 million tons of CO₂ annually**, equivalent to the emission of 1.5 millions of automobiles for one year¹
- **98% CO₂ emissions captured** across Low-Carbon Hydrogen production facility²

H₂ Purification

- **High Purity H₂ produced** from Pressure Swing Adsorption and Polysep™ Membrane technologies
- ExxonMobil's H₂ production project will enable **30% of scope 1 and scope 2 emissions** reduced at their Baytown facility³

1) EPA's GHG equivalency calculator comparing nearly 7 million tons of CO₂ per year with gasoline-powered passenger vehicles on the road.

2) CO₂ equivalent emissions is a calculated value based on the combined carbon compounds emitted from the Hydrogen production and Carbon Capture equipment plus the combined carbon compounds in the H₂ product.

HONEYWELL SOLUTIONS

ENABLING SUSTAINABLE AVIATION FUEL (SAF)



Operating in 2016

- 150,000 MTA Feed (3,000 BPD)
- The first refinery retrofit to UOP Sustainable Aviation Fuel at Paramount, California
- Produces Sustainable Aviation Fuel (SAF) and Renewable Diesel
- Expansion to 1,000,000 MTA (20,000 BPD)

Ecofining units under Design/Construction

Site	Capacity
North America	78,000 BPD
Europe	17,000 BPD
South America	24,000 BPD
Middle East	10,000 BPD
Asia	70,000 BPD

Most experienced licensor producing Sustainable Aviation Fuel

CONCLUSIONS

1

IRA is expected to reduce U.S. GHG emissions to ~40%¹⁾ below 2005 levels by 2030 and will enable the economic viability and accelerated deployment of new clean energy and emission reduction technologies for climate mitigation and resilience

2

Incentives (PTC, ITC; 45V) for clean hydrogen production with four tiers; credit based on lifecycle greenhouse gas (GHG) emissions while producing 1kg of H₂

3

Incentives (45Q) to enhance the economic viability of carbon capture, storage, and utilization (CCUS) facilities by substantially increasing the tax credits and lowering the carbon capture threshold requirements enabling additional carbon capture facilities to qualify

4

Incentives (BTC 40B, PTC 45Z, grants) to scale up domestic production of Sustainable Aviation Fuel (SAF), to meet Biden administration's goal of 3B gallons/year by 2030. SAF can reduce lifecycle GHG emissions by up to 80%²⁾ compared to Jet A/A-1

5

Incentives (ITC 48, 48E) to scale technology neutral zero-emissions electricity production and clean energy projects, also expanding credit to include standalone energy storage

IRA is here to Enable / Accelerate Your GHG Emission Reduction Goals

1) [Inflation Reduction Act Overview - Climate and Clean Air-related Provisions](#), Office of Management and Budget

2) Source: [Developing Sustainable Aviation Fuel \(SAF\)](#) – IATA



Q&A

NAVED REZA
STEVE SKILLEN

THANK YOU

Honeywell