



by Hitachi Zosen INOVA

METHANOS[®] F³ – Fit for Flexibility

The BOOSTER for Flexible Biogas Plants



Important Information on Use and Handling

Microorganisms: The Way to Demand-driven Energy Generation



METHANOS® F³ bacteria are produced on an industrial scale.

Changes to the German Renewable Energy Sources Act (EEG), in recent years have repeatedly thrown up new challenges for the biogas industry. The basic biological processes that take place in biogas plants have to keep pace with this. Stable service performance and reliable process flows are crucial.

Usable biomass now also has to be available at the right time. The stated goals are now electrical flexibility or heat generation geared to the season. Proven METHANOS® F³ bacteria can help meet these requirements.

METHANOS® F³ is a mixture of two different types of bacteria that occur naturally in biogas installa-

tions, albeit it in only very small quantities. Injecting METHANOS® F³ into the installation increases the concentration of these highly efficient bacteria, boosting the efficiency of the plant.

In the past, plant operators have achieved excellent improvements in output with METHANOS®. METHANOS® F³ high-performance bacteria have been developed further to make biogas installations even more efficient and flexible. Thanks among other things to optimised lab production, the new generation of bacteria has better cell quality.

Our Experts Will Be Glad to Advise You

METHANOS® F³: High-Performance Bacteria that Boost the Process

| What METHANOS® F³ Achieves: 100% Better Performance Without Great Effort or Expense

Injecting METHANOS® F³ into a biogas plant allows the targeted management and optimisation of the biogas process. The bottom line is a significant increase in the efficiency of the biogas plant without the great effort and expense of having to modify the technical conditions.

| Increased Volume Load

In practice the specific volume load can be increased from 3.5 kg ODM per m³*day to more than 7 kg ODM/m³*day. A biogas plant can achieve more than twice the output without having to add digesters. This enables seasonal fluctuations in demand to be met with ease.

| Improved Pump and Agitator Capacity

There is a marked improvement in the homogeneity of the digester content and the ease with which it can be pumped and agitated. This makes the entire digestion process more stable.

| Feed Material Substitution

Adding METHANOS® F³ permits traditional feed materials such as maize and whole-plant silage to be replaced by substitutes such as grass and solid manure that are more difficult to decompose. This reduces expenditure on feed materials.

| Economic Efficiency

METHANOS® F³ increases the profitability of a biogas plant. By increasing the volume load, it enables operation of the plant to be aligned more closely with demand. With the substrate easier to pump and agitate, component wear and power consumption are reduced, bringing down operating costs.

| Compatibility

METHANOS® F³ can be successfully deployed in round digesters (wet fermentation) as well as in plug flow and garage-type digesters (dry fermentation). This means a variety of substrate variations can be used, from renewable raw materials and agricultural fertilisers to organic residues such as organic waste. The product can be employed trouble-free in a wide range of biogas installations, irrespective of plant size and substrate mix.



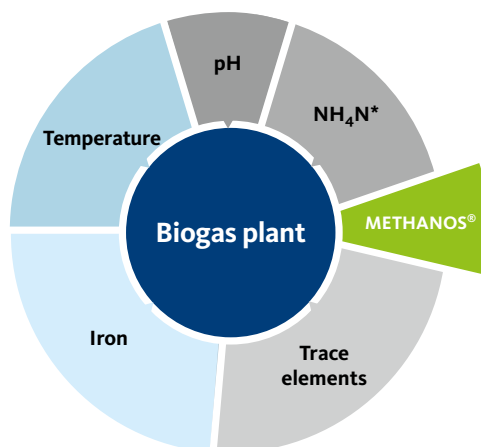
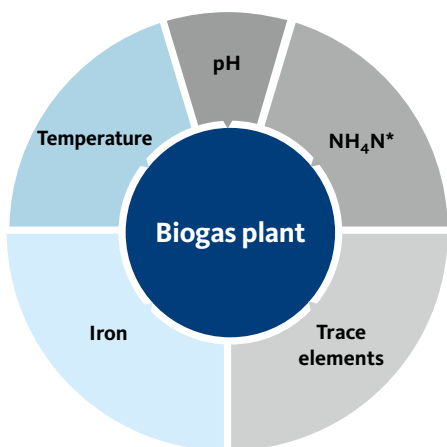
METHANOS® F³ consists of living microorganisms that act as factories producing their own enzymes.

All the benefits at a glance:

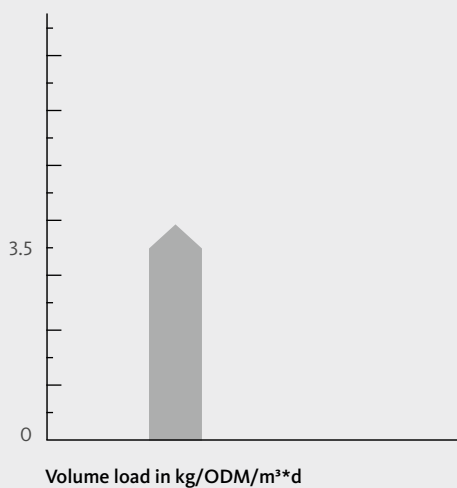
- Doubles volume load with no accompanying increase in active digester size
- Enables demand-driven biogas production in summer and winter modes
- Reduces operating costs while increasing yield
- Optimises operation of the biogas plant
- Optimises substrate usage thanks to higher degradation rates
- Gives the freedom to alter substrate mix (substitution)
- Lowers energy consumption by reducing viscosity
- Adding METHANOS® F³ entails no additional costs

Key Factors in Optimum Plant Operation

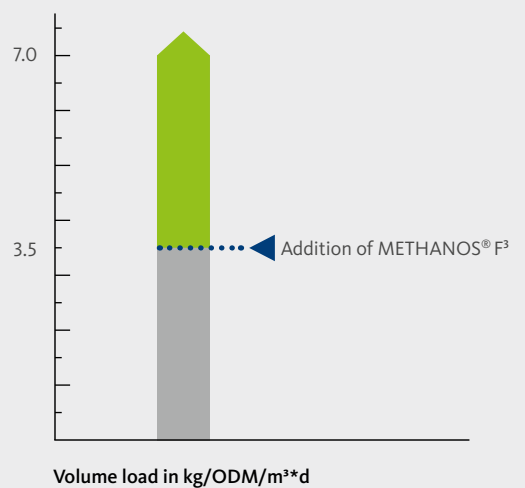
Biogas Plant Process Parameters



100% biogas plant performance is achieved when all controlling parameters have been fully met.



METHANOS® F³ can increase volume load up to threefold.



*Ammoniacal nitrogen

Fit for Any Challenge with METHANOS® F³

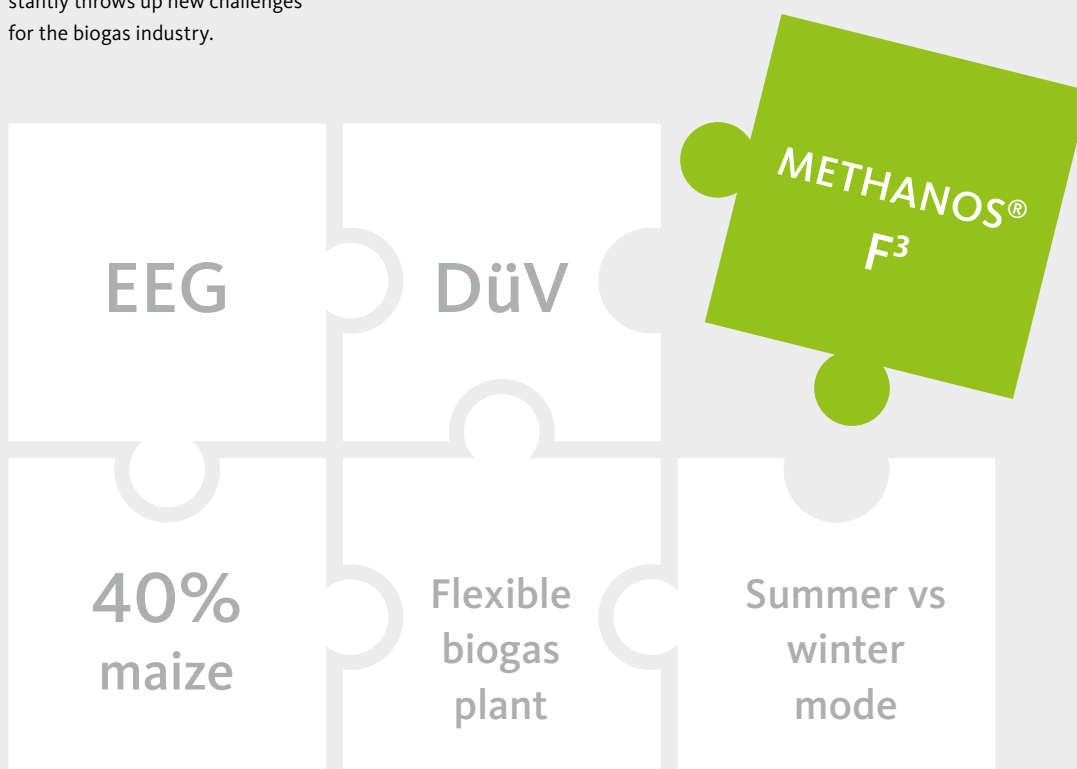
EEG:

From changes in feed materials to compliance with new quality requirements, the German Renewable Energy Sources Act (EEG) constantly throws up new challenges for the biogas industry.

DüV:

The 2020 Fertilisers Ordinance requires that biogas installations have nine months of storage capacity for digestate.

« The effective solution
in any scenario »



40% maize:

The following applies to new installations after the expiry of EEG tariffs: Feed materials must be modified so that the ration consists of no more than 40% of maize overall per year.

Flexible biogas plants:

Improved CHP performance boosts the plant's ability to match power and heat generation to fluctuations in demand.

Summer vs winter mode:

The ability to generate biogas heat at the right time decisively improves the revenue situation.

Typically Improves Performance by 50% without Additional Digesters

The Use of METHANOS® F³ in Practice

Reference Plant for Scenario I:

In use since October 2020

1 x 80 m³ PASCO feeder

2 x 2,500 m³ COCCUS® round digesters

1 x 800 kW CHP

1 x 1,560 kW CHP

760 kW maximum rated output

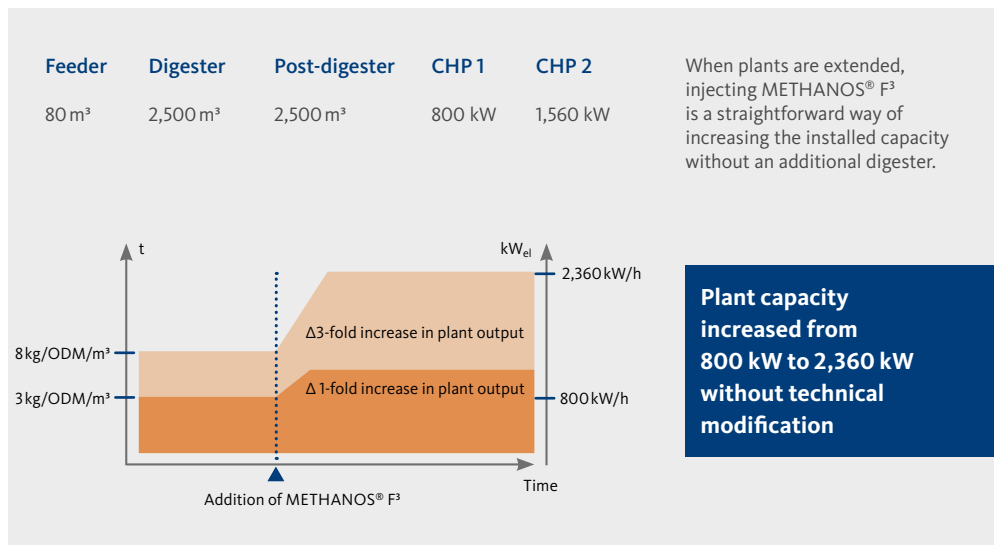
Feeding:

Before introduction of METHANOS® F³:

3 kg/ODM/m³*day

After introduction of METHANOS® F³:

8 kg/ODM/m³*day



Reference Plant for Scenario II:

In use since March 2021

1 x 80 m³ PASCO feeder

2 x 2,500 m³ COCCUS® round digesters

1 x 800 kW CHP

1 x 1,560 kW CHP

760 kW maximum rated output

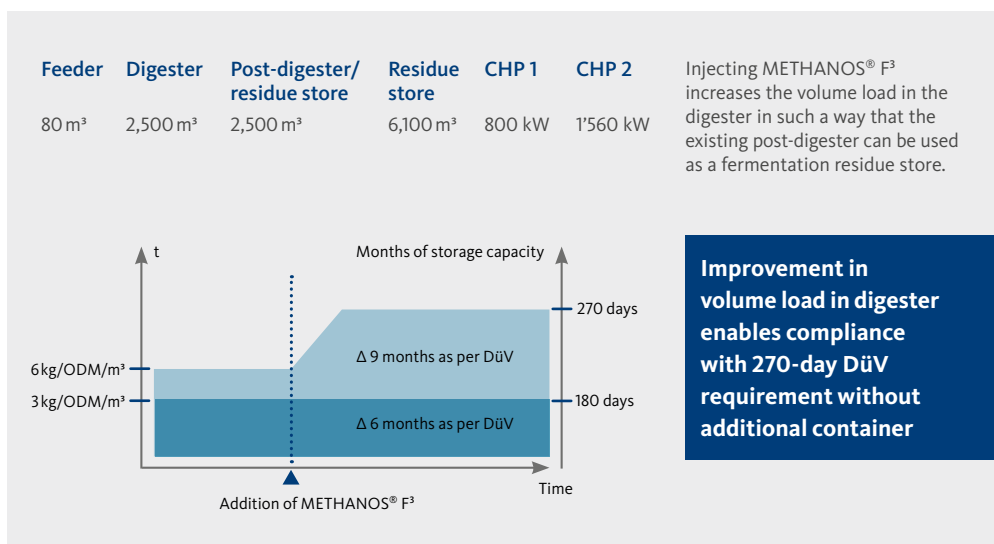
Feeding:

Before use of METHANOS® F³:

3 kg/ODM/m³*day

After introduction of METHANOS® F³:

6 kg/ODM/m³*day



Reference Plant for Scenario III:

In use since December 2011

1 x 30 m³ PASCO feeder

1 x 1,500 m³ COCCUS®

1 x 185 kW CHP (existing)

1 x 366 kW CHP (added)

Feeding:

Before introduction of METHANOS® F³: 12 t/day

After introduction of METHANOS® F³: 27 t/day

Additional substrate used: 15 t/day

Output before introduction

of METHANOS® F³: 185 kW

Output after introduction

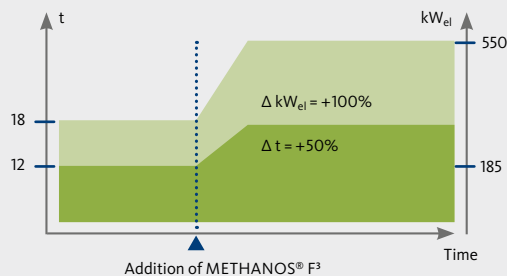
of METHANOS® F³: 550 kW

Additional output: 365 kW

(without additional digester)

Feeder	Digester	CHP 1	CHP 2
30 m ³	1,500 m ³	185 kW	366 kW

When plants are extended, injecting METHANOS® F³ is a straightforward way of increasing the installed capacity without an additional digester.



Plant capacity increased and in operation with 7kg/ODM/m³*day for over 10 years

Reference Plant for Scenario IV:

In use since November 2011

2 x 80 m³ PASCO feeders

2 x 1,000 m³ EUCCO®

2 x 4,000 m³ COCCUS®

1 x PSA (gas upgrading unit) 700 Nm³ biogas-based natural gas/h

Feeding:

Before introduction of METHANOS® F³:

138 t/day (maize)

After introduction of METHANOS® F³:

116 t/day (maize)

Reduction in substrate: 22 t/day or 16%

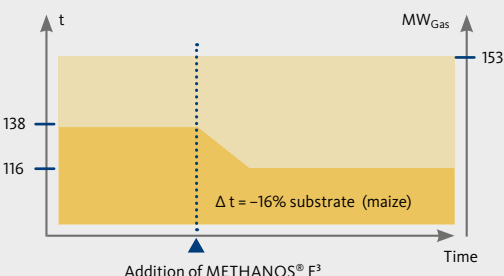
Output before introduction: 153 MW gas/day

Output after introduction: 153 MW gas/day

Saves around 8,000 t of substrate a year

Feeder	Digester 1	Digester 2	Gas upgrading
80 m ³	1,000 m ³	4,000 m ³	700 Nm ³ /h
80 m ³	1,000 m ³	4,000 m ³	

With METHANOS® F³, conventional feed materials such as maize can be replaced with substrates that are more difficult to decompose, without any loss of performance.



Substituting feed materials without loss of performance

Increase in proportion of grass / whole-plant silage to up to 60%

Important Information on Use and Handling

Other Things You Should Know about METHANOS® F³



To preserve their viability, METHANOS® F³ bacteria are introduced in deep-frozen form.

| Handling

Start by setting the digester to the optimum concentration of METHANOS® F³ high-performance bacteria. A larger amount of METHANOS® F³ is used initially (a one-off “kick-start” dose). After that, the optimum dosage of METHANOS® F³ is determined on the basis of the digester volume and cell density parameters (0.5–1% bacteria concentration in the digester). Once normal operation has been established, METHANOS® F³ is fed into the process regularly in weekly doses. The normal individual dosage for a medium-sized biogas plant is approximately 1 kg, but “overdosing” with METHANOS® F³ does not result in any negative effects.

| Delivery and Storage

METHANOS® F³ is delivered to the plant regularly (every three months) in ready-portioned, deep-frozen form. It should be stored in a normal (proprietary) freezer at –20°C (freezer not included in the delivery). If stored properly, METHANOS® F³ can be kept for at least 12 months.

| Introduction

METHANOS® F³ is fed into the digester via a screw-feed unit or dosing station. The feed unit should be completely empty prior to beginning the feed process. It must be ensured that the bacteria are not allowed to thaw out and re-freeze, since this can reduce their viability. Where an existing plant does not have adequate feed arrangements, the digester can be retrofitted with a special port allowing METHANOS® F³ to be fed into the main digester.

Biological service:

- Our team of biological experts is always at your service. We can provide you with direct contacts for sampling the digester biology and feed materials.

Our Experts Will Be Glad to Advise You

When Should You Boost Your Gas Production with METHANOS® F³?

| How to Get Started with METHANOS® F³

We offer you a METHANOS® F³ package to suit your needs. Our customer care specialists are on hand to check the dosage needed for your plant and advise you on the necessary biological support. The conditions of sale are clearly set out in a supply contract.

| Stopping the Supply of METHANOS® F³

The supply of METHANOS® F³ can be stopped at any time and the plant returned to the mode of operation prior to the introduction of METHANOS® F³. The natural conditions and microorganism composition that existed before the introduction of METHANOS® F³ will be re-established within a few weeks.

| METHANOS® F³ is an Award-winner

METHANOS® F³ is acknowledged as an outstanding innovation within the biogas sector. The product received an Award of Recognition at the Bavarian Energy Awards in 2010 and received the Innovation Award of the German Agricultural Society in 2011.

Note:

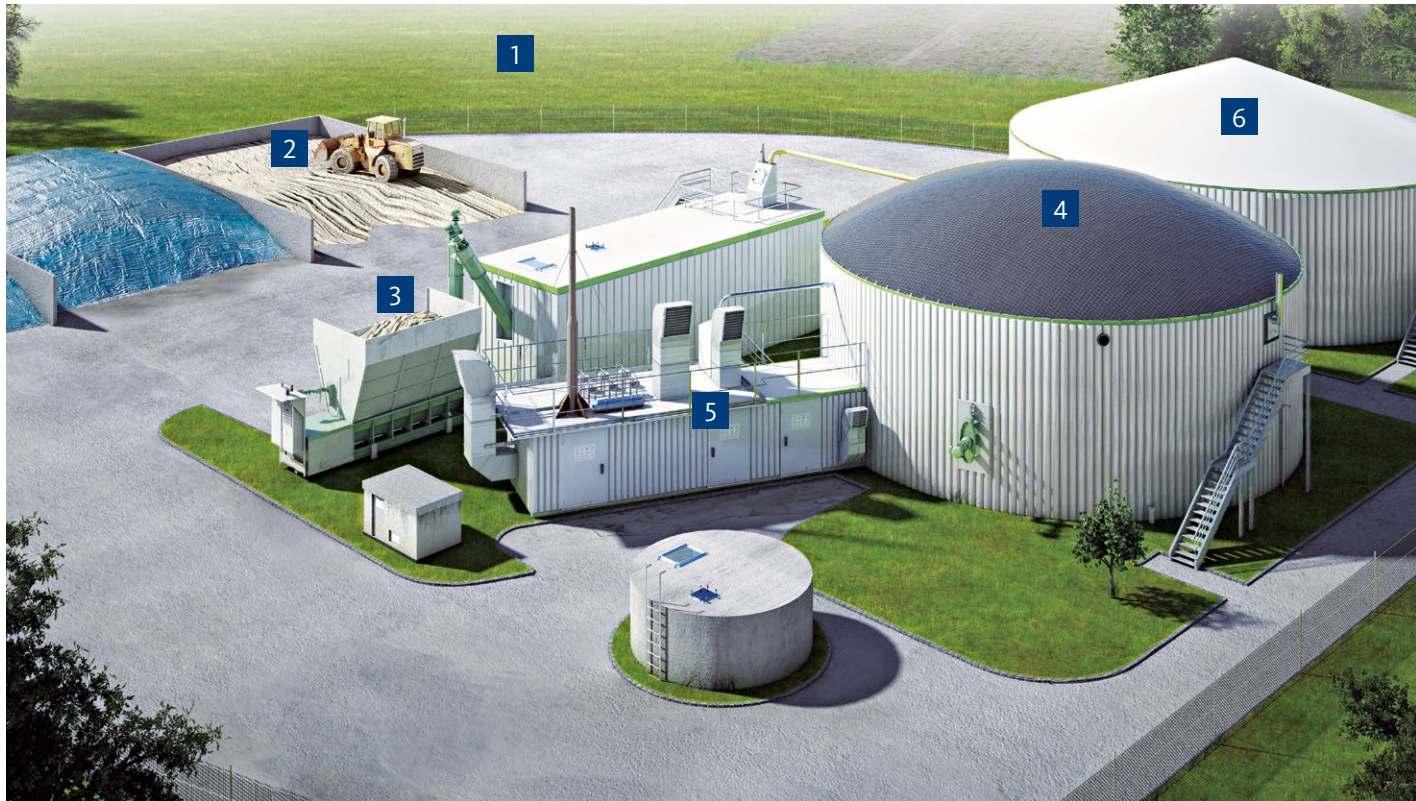
- It should be ascertained in advance whether the existing agitator and feed-in technology is up to the requirements of greater volume load and higher substrate throughput.



METHANOS® F³ is simply introduced into the digester via a screw-feed unit or the feed-in system.

METHANOS® F³ and More

Our Portfolio Also Includes These Services:



1 Entire Plant

- Overall technical and biological optimisation and support
- Conversions and extensions
- Operational management
- Regular maintenance
- Design / approval
- Recurring inspections and documentation support

2 Raw Materials/Silo

- Raw material management
- Evaluation of feedstocks
- Silo extension
- Determination of DM / DMorg
- Fermentation tests / NIRS
- Silage quality

3 Charging

- Modernisation and optimisation:
 - Technical process
 - Biological processes
 - Energy usage
- Help with process disruptions
- Operating resources

4 Digester

- Review and optimisation of agitator technology
- Gas tank replacement / management
- Concrete dome renovation
- Wastewater analytics
- Process analytics

5 CHP Unit/Technology Centre

- Regular maintenance
- Greater flexibility
- Biogas cleaning
- Heat utilisation / concept
- Gas conditioning

6 Fermentation Residue Store

- Modernisation and new build
- Fermentation residue analytics
- Fertiliser value (DüMV)
- Determination of heavy metals (BioAbfV)
- Fermentation residue treatment
- Fermentation residue management

Future-oriented Solutions from a Single Source

From the regular inspection of individual components or the entire plant through to a comprehensive service contract, HZI Schmack GmbH in association with Hitachi Zosen Inova AG offers you customised solutions to suit your requirements. The services we offer you are based on a modular concept.

Discover More Opportunities

In the context of the energy transition and global climate protection efforts there are also diverse opportunities in connection with biogas technology. This is because green gases from renewable sources

are indispensable for energy supply and decarbonisation worldwide. From biogas and biomethane to hydrogen and synthetic natural gas, HZI offers the entire product range for the production of renewable gases and carbon-neutral fuels. In combination, these technologies provide solutions that will enable the efficient use of resources and sustainable energy generation for decades to come.

