

Project title:	GrowSave; Energy & Resource Efficiency Knowledge Transfer for the PC Sector.
Project number:	PE/PO 011a
Project leaders:	Chris Plackett & Jon Swain, Farm Energy Centre
Report:	Year Two, July 2016
Key staff:	Andrew Kneeshaw, Chris Plackett, Jonathan Swain, Jenny Beynon & colleagues, Farm Energy Centre.
Location of project:	Farm Energy Centre, Kenilworth, CV8 2LS, commercial nurseries and various meeting venues.
Industry Representative:	Roly Holt, Colin Frampton, Neil Stevenson (appointed Feb 2016), James Broekhuizen (appointed June 2016), Neal Ward (resigned March 2016), Chris Need (Resigned Oct 2015).
Project start date:	1 st August 2014
Project end date:	31 st July 2019

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AUTHENTICATION

We declare that this work was done under our supervision, according to the procedures described herein, and that the report represents a true and accurate record of the results obtained.

Jonathan Swain

Senior Engineer

Farm Energy Centre

Signature

Date 31st July 2016

Report authorised by:

Chris Plackett

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Date 31st July 2016

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Contracted Activity	2
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Provide at least one update per week.....	2
News stories added as per contract. Also “blogs” from FEC energy specialists added on a regular basis	2
Updates to Glossary of energy terms as required.....	2
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Deliver four workshops/seminars.....	2
Four workshops or seminars were delivered or have been scheduled:	2
Technical presentation at PC crop association conferences/meetings	2
Provide presentations/technical support to two crop association conferences/meetings.....	2
Presentations were given at the following events:	2
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Deliver information and data via the GrowSave website to allow growers to do energy use comparisons.....	2
Done via the Energy Management section of the website where information is given on comparison methods using degree-days. Degree-day data and ambient temperature data given to allow comparisons to be made.....	2
AHDB Horticulture Energy News	2

Deliver three editions of this energy specific newsletter	2
Delivered to contract with editions published: November 2015, April 2016 and June 2016.....	2
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GROWER SUMMARY

Headline

GrowSave delivers a programme of technology transfer, and information dissemination activities, to AHDB Horticulture protected crops (PC) sector levy payers and provides up to date information about energy saving and energy efficiency.

Between August 2015 and July 2016 the project has delivered, or scheduled, the following activities:

- Two grower workshops and two technical seminars covering the topics of Next Generation Growing (2 venues); Smart use of CO₂ and Basic Computer Training.
- Technical presentations at two PC sector events / technical conferences.
- Three editions of AHDB Horticulture Energy News, a newsletter dedicated to energy topics.
- Regular news and technical updates, delivered via AHDB Grower and the GrowSave website.
- Energy benchmark data via the GrowSave website.
- Researched and authored on-line Technical Updates outlining current knowledge about Biomass CHP, Measuring Energy, Diffuse Light and CO₂ sources.

All of the activities were designed to encourage growers to take energy saving actions in their own business.

Background

GrowSave is AHDB Horticulture's communications platform, for the dissemination of energy saving information and support for the implementation of energy saving technologies by the UK protected cropping (PC) sector. The programme has now run for nine years, is delivered by the Farm Energy Centre (FEC) team, and steered by a group of edible, ornamental and soft fruit growers. The format of outputs, and the project programme, is deliberately kept flexible. This is to allow the project to respond to the energy issues that the industry is facing at any given time.

The current phase of the project builds on previous activities, which were funded under a series of AHDB Horticulture (formerly HDC) projects, the latest of which was project reference PE/PO 011. This report gives outlines the activities delivered in the second year of the current project, which started on 1st August 2014, and is scheduled to run for five years.

Summary of work completed

The following table summarises the deliverables over year two of the project compared to the work plan specified in the contract:

Activity Area	Contracted Activity	Delivered Activity
Website	Provide at least one update per week.	News stories added as per contract. Also “blogs” from FEC energy specialists added on a regular basis. Updates to Glossary of energy terms as required.
Workshops /technical seminars	Deliver four workshops/seminars.	Four workshops, or seminars, were delivered or have been scheduled: <ul style="list-style-type: none"> • Next Generation Growing: held in East Yorkshire at CMW Horticulture, on 20/04/16. • Next Generation Growing: held in Harlow on 21/04/16. • Basic computer training: to be held at Stoneleigh on 21/09/16. • Smart use of CO₂ (pre TGA) scheduled for 28/09/16. at Chesford Grange Hotel.
Technical presentation at PC crop association conference s/meetings	Provide presentations/technical support to two crop association conferences/meetings .	Presentations were given at the following events: <ul style="list-style-type: none"> • CGA conference: 08/10/15. • AHDB lighting event: 19/01/16.
Energy benchmarks	Deliver information and data via the GrowSave website to allow growers to do energy use comparisons.	Done via the Energy Management section of the website where information is given on comparison methods using degree-days. Degree-day data and ambient temperature data is given to allow comparisons to be made.
AHDB Horticulture Energy News	Deliver three editions of this energy specific newsletter.	Delivered to contract with editions published: November 2015, April 2016 and June 2016.
AHDB Grower news columns	Deliver copy for every edition of AHDB Horticulture.	This has been delivered to contract.

Technical updates	Publish four technical updates covering topics relating to recent energy developments.	Updates were published on the following: <ul style="list-style-type: none"> • Measuring energy. • Biomass CHP. • Diffuse light. <p>The following update will be published in time to support the event on 28/09/16.</p> <ul style="list-style-type: none"> • CO₂ sources.
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Description of Activities

The activities of the GrowSave project were discussed and planned with the grower coordinators at the advisory group meeting held at Double H Nurseries, on 13th October 2015. In addition, regular contact was maintained with industry groups including the TGA, CGA, PTG and BPOA. These industry inputs formed the basis of the work programme described here.

Website

The project website has been regularly updated with articles and news items. In addition, reports from GrowSave events have been posted, together with any associated hand-outs or presentations.

There were 7,178 website visits with 16,946 page views between 1st August 2015 and 31st July 2016. New visitors accounted for 5,194 (72%) of these visits. 2,532 website visits came direct, and 3,135 were directed via Google. While the number of visits to the website has decreased slightly over the period covered in this report, compared with the previous year, there are plans to address this by improved SEO (Search Engine Optimisation).

The five most popular routes to the GrowSave website were:

Topic	% of sessions
Search	48%
Direct access	35%
Referral from other sites	14%
Social Media	2%
Email links	<1%

The five most popular subject pages were:

Page	No. of Visits
Homepage	1,488
Horticultural energy saving advice	1,106
LED Lighting	878
NGG Event	613
Events	341

The energy terms glossary, added to the site in the previous contract year has been edited and updated as required.

Workshops and Seminars

The topics proposed for the workshops/seminars were based on grower demand, and the guidance given by the project advisory group. Where possible, events were held that would attract both edible and ornamental crop growers.

Details of the four GrowSave events, the background to them and the number of attendees are given below.

Workshop / seminar title	Meeting details	No of delegates	Other comments
Next Generation Growing Venue: CMW Horticulture Ltd. Date 20/04/16	<p>These two events were organised to inform UK growers of the most up to date information about the Dutch Het Nieuwe Telen initiative (Next Generation Growing). This appears to be demonstrating that it's possible to reduce energy inputs significantly, without large capital investments by adopting radically different attitudes to the greenhouse environment.</p> <p>The seminars were led by Jan Voogt of LetsGrow.com. Who co-authored the recently published 'Basic Principles of Next Generation Growing'. He was supported by René Beerkens of Hoogendoorn who advises growers on how to implement NGG techniques and Paul Arkesteijn of screen manufacturers Svensson, who have been closely involved in NGG trials.</p>	12 growers 1 consultant 5 manufacturers / suppliers <i>Subsequently, a group of growers from the Hull area have formed a study group to exchange their personal experience with the implementation of NGG principles on their own nurseries.</i>	13 feedback questionnaires received, with 92% rating the event Excellent or V Good.
Next Generation Growing Venue: Harlow Leisure Centre. Date 21/04/16	<p>Peter Kamp outlined the ongoing Priva development of Top Crop Monitoring, which uses measurements and modelling to alter the greenhouse environment in response to actual plant performance.</p>	15 growers 3 manufacturers/suppliers 1 consultant 1 journalist	18 feedback forms received, with 100% rating the event Excellent or V good.
Smart use of CO₂ Venue: Chesford Grange Hotel Date 28/09/16	<p>The increasing popularity of biomass as a heat source, the cost of fossil fuels, changing attitudes to environmental responsibility and the recent uptake of Next Generation Growing techniques all call into question long standing protocols for CO₂ enrichment. Considerable work to investigate more efficient use of CO₂ has been carried out both in Holland at WUR and as a result of project PE 021 funded by AHDB.</p> <p>This seminar was organised to coincide with the TGA conference, in order to update UK growers on the Dutch and AHDB funded work, as well as to revisit the economics of the various CO₂ sources available, and to hear grower experiences of CO₂ produced by anaerobic digestion.</p>	TBA	

Basic computer training Venue: Farm Energy Centre Scheduled for 21/09/16	Many growers are faced with challenges in training their staff to use climate controls effectively, particularly when new recruits join an existing team. This one-day seminar has been designed to address that issue, with course content based on the results of an on-line grower survey carried out in the spring of 2016.	TBA	
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In addition to the specific GrowSave events, technical support on energy topics has been given to several PC sector events/Crop Association meetings. Details of these events are as follows;

1. **CGA Conference, 8th October 2015.** Because of the continued low margins for UK grown greenhouse cucumbers, growers are seeking out ways to save energy with little or no capital expenditure. Chris Plackett described how the Dutch “Next Generation Growing” is achieving significant energy consumption reductions, without the need for capital investment. The conference delegates then discussed with Chris how these principles could be used by growers in the UK. Chris also told delegates about recent developments with CHP installations on greenhouse sites. Whilst this might be viewed by many as a high capital approach, the recent desire by investors and energy service providers to secure good CHP sites means that some growers may be able to have CHP, without the need to invest their own money. Delegates interested in this approach were urged to seek out the companies who were offering projects of this type to growers.
2. **AHDB Lighting event, 19th January 2016.** Chris Plackett delivered a presentation entitled ‘Energy Considerations’, which focussed on energy issues related to lighting.

Short video highlights from presentations at selected GrowSave activities during the contract period have been posted on the GrowSave website, and used to communicate key points to levy payers who could not attend.

Energy Benchmarks

GrowSave provides information to allow growers to benchmark the performance of their nurseries against other similar facilities. However, factors like the wide range of protected crops grown in the UK, and the existence of some established industry initiatives like the Tomato Working Party, means that providing energy use benchmarks is not feasible under the current project.

Two of the largest factors affecting the energy use of greenhouses are the prevailing weather conditions (and most particularly, the ambient temperature) and operating temperature. Therefore, if information on these two parameters is used by growers alongside their own energy use data, they can compare their own performance against others.

Throughout the project, the GrowSave website has provided weather data (temperature and solar radiation) and degree-day information so that growers can use this to carry out energy performance benchmarking.

AHDB Energy News

Three print editions of AHDB Horticulture Energy News have been published, and delivered as inserts within AHDB Grower. The content of each of the editions focused on topical stories and information at the time of publishing. In all cases the stories were designed to appeal to as wide a cross section of levy payers as possible.

Date	Topics
November 2015	<ul style="list-style-type: none">• Heat Pumps.• Conference reports.• Energy Jargon explained.• Saving energy by good maintenance.• Energy market update.
April 2016	<ul style="list-style-type: none">• Biomass CHP.• Geothermal Heat.• CCL Latest.• Energy Market update.
June 2016	<ul style="list-style-type: none">• Next Generation Growing.• The importance of climate.• Increased use of thermal screens.• Plant balance.• Energy market update.

AHDB Grower

A short column, with topical news on either the GrowSave project or energy related projects, has also been included in all AHDB Grower editions. Topics covered include news on upcoming events, reports of recent meetings, information on the progress of AHDB Horticulture energy projects and general energy developments, all as detailed below.

Date	Topic
July/August 2015	Report on grower actions following the humidity workshop held at STC in March 2015.
September 2015	Launch of the GrowSave on-line energy terms glossary and promotion of the pre TGA energy workshop/seminar.
October 2015	Report from the pre TGA seminar, delivered by Farm Energy Centre, on the new opportunities arising from investment in energy. Ranging from quick wins as a result of better housekeeping, 'New life in CHP', the increasingly important role of renewables and how smart management of the liberated energy market can result in new revenues for growers.
November 2015	Announcement about the latest appointment to the GrowSave steering committee, and a review of the activities of GrowSave.
December 2015/January 2016	Changes to the Climate Change Levy (CCL) target require an improvement of 14% in energy efficiency by 2020 (compared to the 2008 base year). This article focussed on the necessity of good basic maintenance of heating systems as the first step to compliance.
February 2016	This update on the latest tariff announcements, in respect of the Feed In Tariff (FIT's) and Renewable Heat Incentive (RHI), focused on important tariff reductions.
March 2016	News about the Next Generation Growing seminars, a forthcoming training course on Basic Climate Controls and a seminar on new energy sources.
April 2016	How Next Generation Growing can deliver 25% energy savings with little or no up-front investment.
May 2016	Advice about the key settings for climate computers in the spring.
June 2016	In the past, growers considering connecting to the grid to export electrical power have often been stymied by high cost or excessive regulation. This issue explained how connection is gradually becoming easier and more affordable.
July/August 2016	Report on the International sector exhibition GreenTech, Amsterdam.

Technical Updates

GrowSave updates summarise information about the latest energy topics and techniques. They provide information about topics ranging from new commercial developments to the latest research results.

In the period covered by this report Technical Updates on the following topics were published:

1. Measuring Energy (5 pages)

The increasing implementation of renewable energy systems, supported by subsidies such as the Feed in Tariff (FiT) and Renewable Heat Incentive (RHI) have resulted in the mandatory installation of energy measurement equipment. This extensive Technical Update describes the measurement equipment available, and demystifies the various units of energy measurement.

2. Biomass CHP (3 pages)

Biomass CHP offers growers an additional income stream from both the heat and electrical energy produced. However, which of the three technologies currently available will suit a particular grower or nursery? This update describes each technology and summaries the operational and investment pros and cons of each.

3. Enabling Diffuse Light (3 pages)

The sector has become increasingly aware of the potential benefits which arise from diffusing light as it enters the greenhouse. This technical update explains the available processes for diffusing light and explains why it may be important.

4. CO₂ sources (6 pages in final draft at time of writing, to be published September 2016)

In addition to a review of pure CO₂ and CO₂ from conventional gas boilers, this update covers all the implications arising from the increasing popularity of biomass heating, biomass CHP, biogas from anaerobic digestion and renewed investment in CHP. All of which provide both opportunities and challenges as alternative CO₂ sources.

Other Work

Some other work has been delivered under the GrowSave project identity. All of this work has been separately funded, and was not covered by the contract for project PC/PO 011a. However, it should be noted that foundation information, used as the basis of this additional work, came from the resources of PC/PO 011a and its predecessors.

The specific pieces of work that have been delivered are:

- 1. Energy: Return on Investment:** Planning and delivery of an afternoon seminar before the TGA AGM and conference on 23rd September 2015, highlighting the potential savings/return on investment of various energy investments.
- 2. AHDB/WSGA event:** 'Biomass and new energy sources' 10th November 2015. Jon Swain was on hand for GrowSave to answer questions, and give energy advice during the nursery walks hosted by Hill Brothers, Manor Nursery GC and Five Acres Nurseries, as well as delivering a presentation at the afternoon seminar about the changing options for electricity and heat supply.
- 3. Visit to GreenTech:** Jon Swain visited GreenTech, in Amsterdam in June 2016, and reported via AHDB Horticulture and on the website with text and video, about the latest energy related technologies on display.

- 4. Website optimisation work:** Assisted by a trusted web specialist company, a comprehensive review is in hand to increase the accessibility of the GrowSave website by implementing improved SEO (Search Engine Optimisation). Once implemented, the traffic to the site will be compared to the existing and a report will follow.

Financial Benefits

Energy prices over the last 12 months have remained relatively low. This means that the savings attributable to this project, and their value to the UK protected cropping sector, are much the same as those reported in the 2014/15 GrowSave annual report.

However, recent developments in the energy sector are starting to push up energy costs for growers. The major influence is the weakened UK pound, and fluctuating crude oil prices, which are combining to push up the costs of both gas and electricity. This means that there will be an increased desire from growers to reduce energy costs; and this will have a knock-on effect of improving the financial return of this project, compared to what has been reported previously.

CCL changes

Budget announcements in March, affecting the Carbon Reduction Commitment (CRC) and Climate Change Levy (CCL), will have a considerable impact on growers as the CRC will cease in April 2019 and higher CCL charges will be levied to compensate, resulting in higher costs for most.

Fortunately, growers who have signed up to a Climate Change Agreement (CCA) get a discount on CCL, with the CCA discount actually set to increase when the changes take effect.

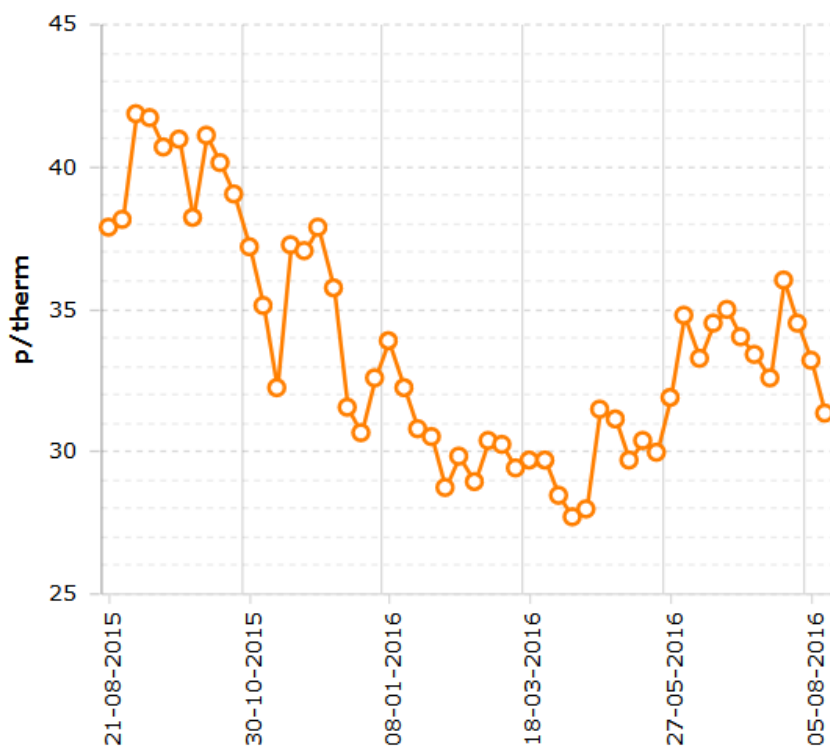
For example, the value of CCL discount for a tomato grower with a gas boiler will increase from £7,000/Ha in 2018/19 to £13,750/Ha 2019/20.

So the message is clear – for growers not already participating in a CCA scheme, it will pay to participate as soon as possible.

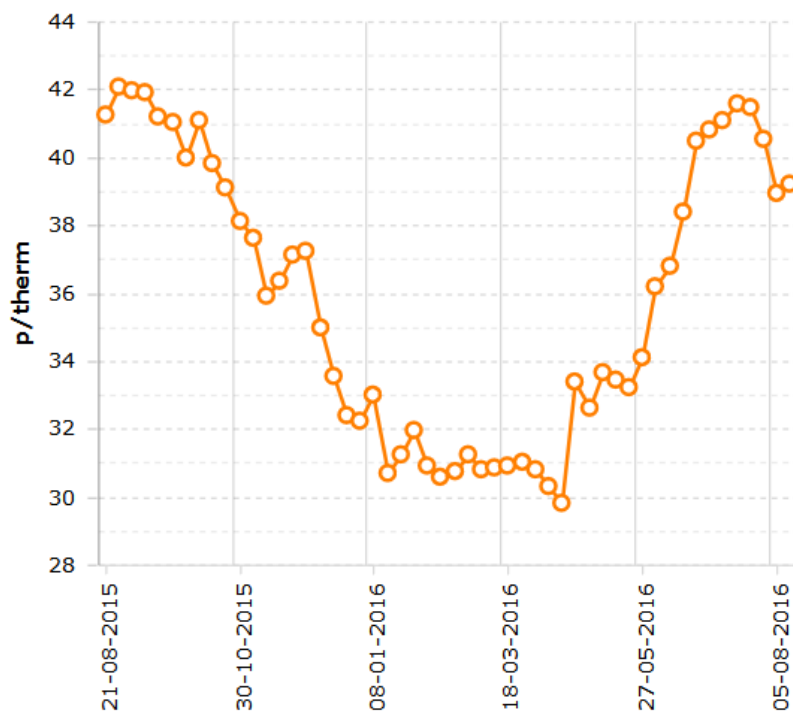
This CCL change is a further incentive to follow the energy best practice, promoted by GrowSave, as energy efficiency measures will be more financially beneficial once the new CCL changes are implemented.

Price trends for the year (see <http://www.growsave.co.uk/energy-price-trends>)

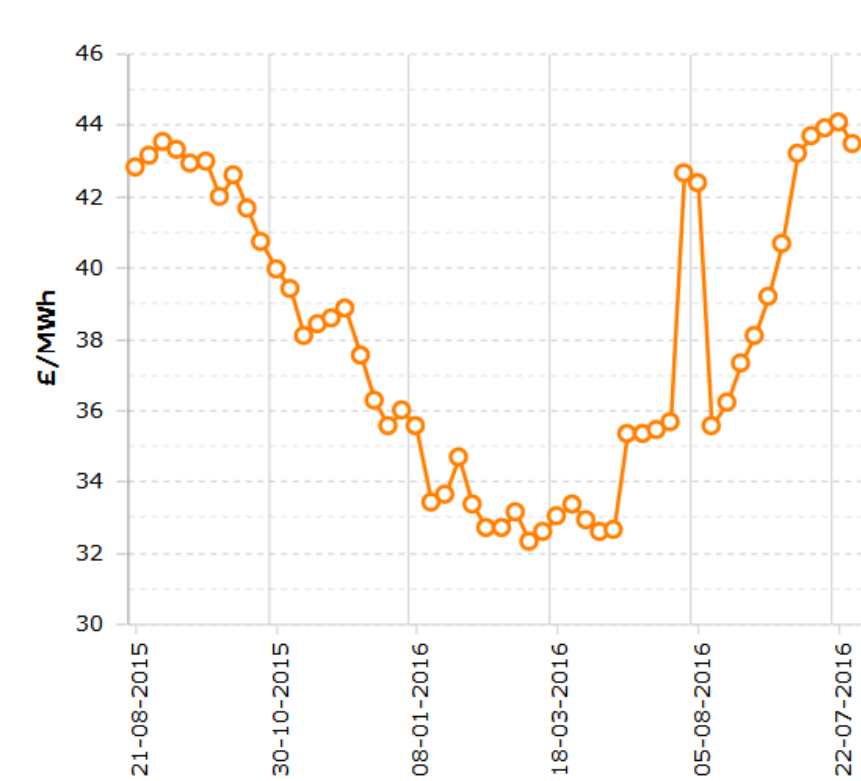
Gas -Day ahead



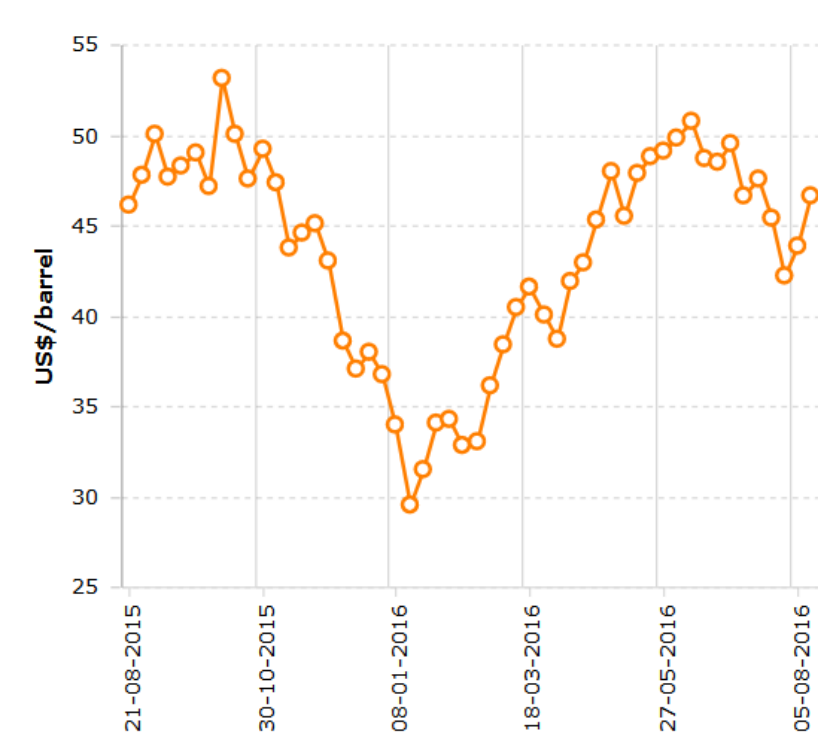
Gas – Season ahead



Electricity – Year ahead



Oil -Brent crude



Summary & Highlights

The GrowSave website has been regularly updated with the latest energy information for growers. Materials from every GrowSave event, such as presentations and handouts, have been made available via the website.

A series of seminars and grower meetings have been delivered. These have concentrated on informing growers about the best energy efficiency solutions for their business.

Relatively radical Next Generation Growing techniques are likely to rise to prominence in the near future. Expert Dutch speakers provided UK growers with a clear message about the first steps to implement Next Generation Growing. A group of growers from East Yorkshire were inspired by the seminar on 20th April to begin implementation of selected NGG techniques and share their experiences.

Smarter use of supplementary CO₂ is high on the agenda of many leading growers. So GrowSave has arranged an afternoon seminar, led by industry experts, to coincide with the TGA conference which will explore the key issues.

Successful management of the climate in the greenhouse depends on a thorough understanding of the control system, a workshop to introduce the basic principles has been arranged.

Four Technical Updates which feature useful and relevant information on Measuring Energy, Biomass CHP, Diffuse Light and CO₂ sources, have been published.