dena
German Energy Agency

Position paper.

Transparent price information for a fuel market in transition.

Solutions for a better comparison of the prices of alternative fuels.

Position of the Initiative for Natural Gas-Based Mobility.

An important factor for the successful market introduction of alternative fuels is comprehensive and transparent consumer information. Understandable and comparable prices are an important building block. The fuels offered at our filling stations are priced in different sales units without this being visible on the filling station totem. The energy content per sales unit varies greatly among different fuel options in some cases. It is therefore not possible to directly compare different fuel prices on the filling station totems.

The perceived fuel prices influence consumers in their decision when buying a car. In this way they enter into a long-term commitment to a particular fuel option. To increase the share of alternative fuels, a reform of pricing is recommended. In accordance with this, the Alternative Fuels Infrastructure Directive 2014/94/EU states that "when fuel prices are displayed at a fuel station, in particular for natural gas and hydrogen, it should be possible for unit price comparison to conventional fuels, such as '1 petrol litre equivalent', to be displayed for information purposes."

Such reform of pricing should pursue the following objectives:

- The price-performance ratio of different fuels must be made comparable, thus offering consumers a more informed decision.
- The attractiveness of alternative fuels must be made more visible and thus strengthened in the competitive market.
- In terms of a maximum cost efficiency, the steering effect of the energy tax credit for alternative fuels must be maximized through transparent pricing.

After extensive weighing of various options for the change, through the "Initiative for Natural Gas-Based Mobility – Natural Gas and Biomethane as Fuels" there was agreement across industries to support pricing of natural gas and biomethane as successfully introduced in Switzerland: To specify the price in euros per petrol litre equivalent on the filling station totem and continue to use the unit kilogram at the pump, with the conversion factor to litre equivalent provided on the dispenser (cf. p. 6).

The model could be introduced by implementing Art. 7 para. 3 of the Alternative Fuels Infrastructure Directive and in this process, amending Article 3 of the Price Indication Directive 98/6/EC. Subsequently the national price regulation would need to be adjusted accordingly. Specific drafting proposals were elaborated in a legal opinion. This approach is transferable to all fuels that are not yet sold per litre.

The responsible stakeholders should now focus on and promptly address the following tasks:

Change in the legal framework

European Commission.
Implementation of Art. 7 para. 3 of the Alternative Fuels Infrastructure Directive 2014/94/EU.

In this process,

a) define via implementing act conversion factors for pricing of methane, based on the energy content of petrol specified in Directive 2009/28/EC and natural gas specified in DIN 51624:2008: *1 kg natural gas H or biomethane H corresponds to 1.43 litres of petrol equivalent. 1 kg natural gas L or biomethane L corresponds to 1.21 litres of petrol equivalent.*

b) initiate an addition to Article 3 of the Price Indication Directive 98/6/EC:

New paragraph (5) *When displaying fuel prices on a filling station totem, for natural gas the unit price per "1 petrol litre equivalent" may be used.*

Member State Government.
Urge the European Commission to swiftly implement Art. 7 para. 3 of the Alternative Fuels Infrastructure Directive 2014/94/EU.

Implementation of the revised EU regulatory framework in national law, e. g. in Germany by amendment of § 2 of the Price Regulation:

New paragraph (5) *When displaying fuel prices on a filling station totem, "euros per 1 litre of petrol equivalent" is to be used as the unit of measure for the base price of natural gas and renewable sources of methane.*
Appendix Price Regulation (PAngV) *Conversion factors for pricing of methane: 1 kg natural gas H or biomethane H corresponds to 1.43 litres of petrol equivalent. 1 kg natural gas L or biomethane L corresponds to 1.21 litres of petrol equivalent.*

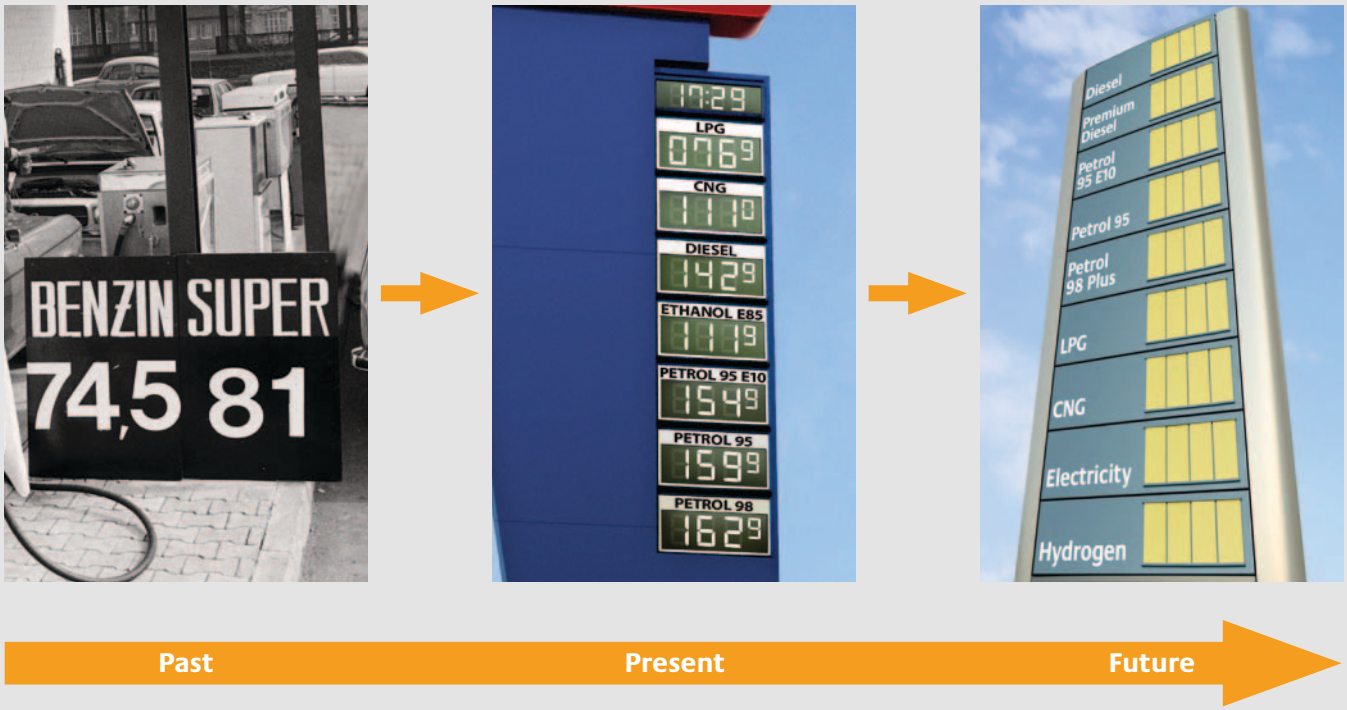
Implementation

Industry partners.
Integration of the conversion factors in the billing system, preparation and monitoring of the changeover through information materials at the filling station and filling station staff training.

Member State Government.
Consumer information for pricing of alternative fuels (e.g. as part of a general campaign on alternative fuels).

Price information law of yesterday for fuels of today – and tomorrow.

Increasing diversification of the fuel market.



In order to diversify the energy basis in transport and protect the climate, the market introduction of climate-friendly fuels is being promoted with great political pressure. The fuel supply options at filling stations were quite clear in previous decades – there was petrol and diesel.

Since the 1990s, the range on offer at filling stations has extended to include biofuel mixtures and gaseous fuels, so the filling station totem today identifies up to eight different products. The choices at the filling station and therefore the information needs of customers have increased significantly. With electricity and hydrogen, the next alternative fuels are just about to be introduced to the broad market. For alternative fuels to be competitive, the need for information must be met. The EU institutions have recognised this and the Alternative Fuels Infrastructure Directive adopted in October 2014 now specifies in recital 51: "Simple and easy-to-compare information on the prices of different fuels could play an important role in enabling vehicle users to better evaluate the relative cost of individual fuels available on the market. Therefore, when fuel prices are displayed at a fuel station, in particular for natural gas and hydrogen, it should be possible for unit price comparison to conventional fuels, such as '1 petrol litre equivalent', to be displayed for information purposes."

To this regard, Art. 7 para. 3 of the Directive states: "Where appropriate, and in particular for natural gas and hydrogen, when fuel prices are displayed at a fuel station, a comparison between the relevant unit prices shall be displayed for information purposes. The display of this information shall not mislead or confuse the user. In order to increase consumer awareness and provide for fuel price transparency in a consistent way across the Union, the Commission shall be empowered to adopt, by means of implementing acts, a common methodology for alternative fuels unit price comparison."

This paper gives background information on the problem to be addressed by means of these provisions and proposes a specific implementation option suitable to accomplish the objective set out in the recital of the Directive cited above.

Price specifications at the filling station: large – but are they easy to understand?

Since both petrol and diesel fuels are charged as liquids in litres, over the decades pricing without unit specification has been established on the filling station totem. For a long time, this was not a problem, but with natural gas and biomethane, there are fuels available that are charged per kilogram. Electricity is priced per kilowatt hour, and hydrogen per kilogram or per 100 grams. This makes it impossible to directly compare against liquid fossil fuels.

Sale units of fuel options.

Litre	kg	kg 100g	kWh
Volume	**Mass**	**Mass**	**Energy**
Petrol 95 Petrol 98 Petrol 95 E10 Diesel LPG	CNG (Natural gas/ biomethane)	Hydrogen	Electricity

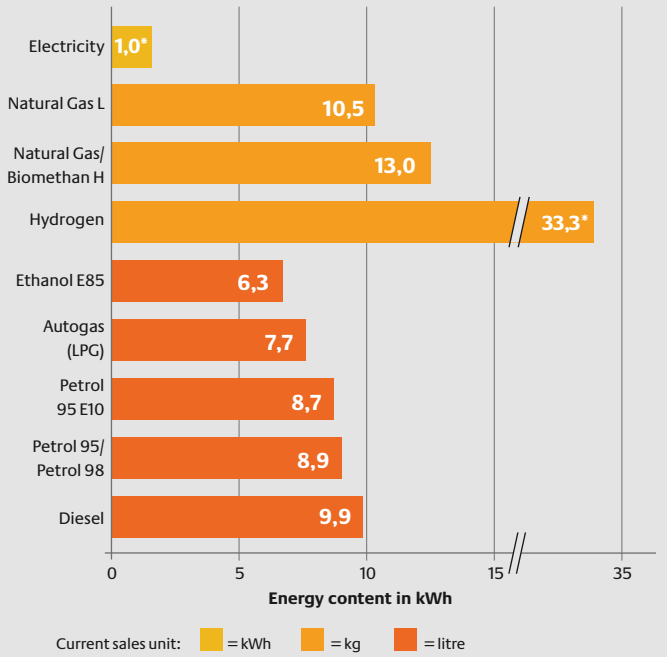
It is precisely the alternative fuels that are not priced in litres, making it impossible for any price advantage to be immediately apparent. But it is these fuels that policy-makers expect to contribute to reducing transport CO2 emissions and which are therefore partially or totally exempt from the energy tax. Effective pricing in this context would mean making sure that we are not comparing apples and oranges.

In price information law, no provision has been made for comparison of the different fuel options. Acceptance of a pricing variant is currently based essentially on the expectations of the sector of the public being addressed directly by the respective price – that is, those consumers who already use a corresponding vehicle. The fact that motorists take notice not only of the price of their "own" fuel but all fuel prices, and will later include this information in their vehicle purchase decisions, is something that currently plays no role in the legal definition of the relevant sector of the public.

A litre of premium petrol or a kilogram of natural gas – how meaningful are these units in reality?

The amount of energy purchased, in combination with the efficiency of the vehicle and the driving style of the motorist, determines how far a vehicle travels per euro paid. The relevant parameter for the return on a certain amount of fuel is thus its energy content – not its mass or its volume. However, the energy content per sales unit differs significantly from fuel to fuel – even within the same sale units.

Energy content of the fuel options available per current sales unit.



Source: Calculations dena based on AG Energiebilanzen, Aral Research, DIN 51624 and Concawe. The energy content (net calorific value) is subject to fluctuations.
**Electric motors achieve a higher efficiency.*

The current price specification of fuels thus does not provide easy guidance on the relative price-performance ratio.

Is the consumer aware of this? In 2008, the higher energy content per sales unit of CNG was not known to 79 percent of filling station customers in Germany (survey commissioned by E.ON).

The prices of fuel options must be made more comparable.

It is therefore important to better inform consumers. For this, the pricing must be adapted to the changing fuel market. This is only possible through the use of energy-based sale units, as displayed in the following figure at the example of natural gas (CNG) and premium petrol as reference fuel.

Impact of the sales unit on price display.

The price specifications are based on the average prices of the year 2013 in Germany as published in Bundesanzeiger BAnz AT 30.06.2014 B1. The conversion is made on the basis of the net calorific values provided by AG Energiebilanzen.

Comparable units are already common practice in other sectors.
In retail and in the energy market, sales units were repeatedly adjusted to make the price-performance ratio transparent and comparable: Fabric and cloth is usually not sold by weight, but by "running meter". For detergent, the price regulation has been adapted to create better comparability: § 2 para. 4 allows the base price per "common use", that is, per wash cycle, to be specified instead of per litre or kilogram. In the heating market, natural gas is measured in cubic meters in accordance with § 3 of the Price Regulation, but charged in kilowatt hours as with district heating or electricity. Regional variations of the energy content of natural gas are taken into account in heating cost billing.

Report from the field: Impact of price perception on the car purchase.
"As a car manufacturer, we see a very high level of public awareness regarding the price difference between petrol and diesel. Whenever fuel prices for diesel temporarily converge with petrol due to high demand, significantly more press articles appear with calculations showing that purchasing a diesel car is "no longer worth it". The ratio of fuel prices to each other is a determining factor in the perception of cost-efficiency of different drive concepts."
Reinhard Otten, Environment Product Specialist, Audi AG

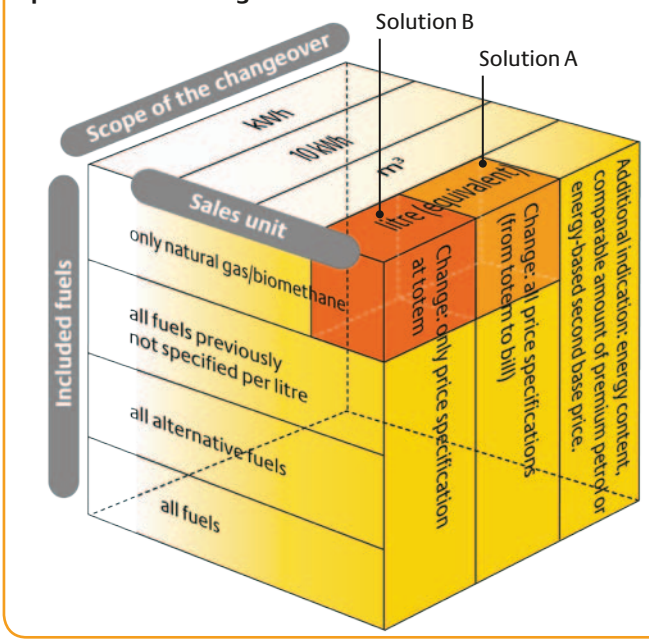
The expected fuel prices have a strong steering effect.
But does the comparison of different fuels even matter, or are drivers only interested in the prices of "their" fuel? A forsa poll conducted on behalf of dena in 2009 among drivers showed that most consumers have the full costs in mind when buying a car: Even if the initial cost of the vehicle dominates with private car use, car buyers also include fuel costs – determined by the consumption of the vehicles and the fuel prices – in their purchase decision and thus in the decision for or against a particular drive system. Transparent indication of prices can encourage car buyers to include alternative drive options in their cost analysis, especially when these fuels are less expensive. The perception of fuel prices can therefore have an important steering effect on the vehicle market.

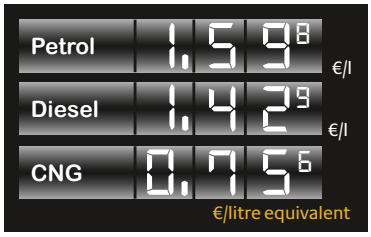
Last but not least, policy-makers are also relying on this demand-side effect of prices for the fuel and vehicle market when alternative fuels or diesel are subject to a lower energy tax or fully exempt from the energy tax. However, if the resulting difference in price is not visible for the customer, the energy tax reduction remains nearly ineffective and only benefits existing customers. But higher emission reductions are achieved only by attracting new customers.

Solutions for more transparent pricing.

The commissioned review contained in the MFS specifies the goal of "uniform pricing for all fuels". The underlying decision matrix has three dimensions: In addition to the sales unit to be used, a decision must be made regarding whether the filling station totem as well as the specification on the pump and the billing price will be switched over to the new unit. Depending on the model, the conversion of the sales unit may also be made for all fuels, for alternative fuels, or only for fuels that are not yet priced per litre – such as natural gas.

Dimensions of the changeover possibilities for the price specification at filling stations.

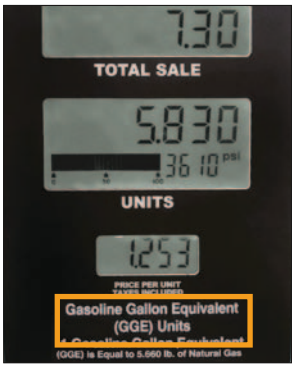




With the objective of not overstraining consumers and keeping the changeover costs low, there are two solutions that seem particularly apt. Both have already been implemented successfully in other countries: The United States and Switzerland use the energy comparison unit petrol litre equivalent, that is, an indication of the price for the energy content of a litre of premium E5 (approx. 9 kWh). The base price of natural gas would then reference this amount of energy or, in a further step, the base price of fuels previously not priced per litre. For example, a natural gas price of €1.11 per kg (about 13 kWh) would become a price of €0.76 (9 kWh) per litre of petrol equivalent. Nothing would change for diesel and LPG, which are already sold per litre, despite a difference in energy content from premium petrol. Drive-specific differences in efficiency, such as between internal combustion engines and electric motors, cannot be represented in such pricing. Energy-based pricing thus does not allow exact comparability of all fuels, but it greatly improves it.

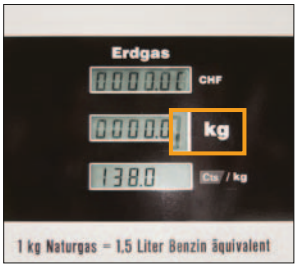
Report from the field: Regulation of price indication for natural gas in Switzerland.
"The customer must have the opportunity to make a real price comparison at public filling stations in order to avoid being misled. The price of natural gas must therefore be converted on price lists with recognised, uniform conversion factors to litre equivalent to petrol and – like petrol or diesel – without specifying the unit litre." *Swiss Gas and Water Industry Association (SVGW), leaflet G 10007 "Price indication on fuel dispensers of public natural gas filling stations"*

The petrol litre equivalent enables comparison of prices of fuels previously not priced per litre with conventional liquid fuels. Direct comparison is made possible, especially with petrol. Comparability of prices for natural gas of the quality levels L and H with each other is also increased significantly: The energy content of L and H gas differ by up to 26 percent.



Solution A: All price indications in €/litre from the filling station totem to the billing price (practical example from the USA).

In the USA, natural gas is priced as fuel per gasoline gallon equivalent (GGE) or gasoline litre equivalent (GLE). This sales unit is used on the filling station totem, the pump and the cash register receipt.



Solution B: Price indication in €/litre only on filling station totem (practical example from Switzerland).

The price specification per petrol litre equivalent can also only appear on the filling station totem. At the pump and on the cash register receipt, the unit kilogram previously used for the price specification would then continue to be used, with a conversion factor provided on the pump in order to explain the difference to the price stated at the filling station totem – as seen in the attached photo. For natural gas and biomethane, this model is already in use in Switzerland. The Swiss Gas and Water Industry Association (SGWA) adopted a uniform conversion factor. On a European level, the calculation of the conversion factors can be based on the energy content of petrol defined in Annex III of Directive 2009/28/EC and the minimum energy content of natural gas/biomethane defined in DIN51624:2008: 1 kilogram of natural gas H quality corresponds energetically to at least 1.43 litres of petrol. For natural gas of L quality, a separate conversion factor would be established. According to the DIN minimum energy content, it would be 1.21.

Discussion and assessment.

The decision in favour of one of the two solutions should be based on four key criteria.

Familiarisation needs of the consumer.

The most important advantage of the petrol litre equivalent is the ability to price all fuels in the unit familiar to the customer – litre. This would initially only require familiarisation for gas users: Instead of per kilogram (13 kWh), the price of natural gas would be specified per petrol litre equivalent (about 9 kWh) – otherwise nothing will change. According to this criterion, solution A is preferable, since the consumer finds the same price on the filling station totem, pump and billing price. The familiarisation requirements for solution B would be higher because of the different prices on the filling station totem and pump.

Changeover costs.

Solution B results in lower changeover costs compared to solution A, since neither the price specification at the pumps nor the cash register system needs to be changed. For both solution approaches, it is necessary to plan for the cost of informing consumers before and during the changeover.

Effort for adapting the legal framework.

For both models, the legal framework needs to be changed – both at the national and European levels. However, only minor changes in the price information law would be necessary for solution B. Possibly the implementation of the provisions adopted with the Alternative Fuels Infrastructure Directive would already be sufficient on the European Level. Solution A would require significant adjustments in calibration and unit law.

Comparability of fuels.

The two approaches do not differ in this criterion.
Given the lower changeover costs and reduced complexity of the necessary adjustments to the legal framework, the Initiative for Natural Gas-Based Mobility advocates solution B.

Assessment of the discussed options for price specification at a glance.

	Comparability of fuels	Changeover costs	Effort for adapting the legal framework	Familiarisation needs of the consumer
Solution A: All price indications in €/litre	→	↓	↓	↑
Solution B: Price indication in €/litre only on filling station totem	→	→	→	→
All price indications in €/kWh	↑	↓	↓	↓
All price indications in €/10 kWh	↑	↓	↓	→
Additional indication kWh/sales unit	↓	→	↑	→
Additional indication of the comparable amount of premium petrol	↓	→	↑	→

Other options are difficult to implement or communicate.

Within the Initiative for Natural Gas-Based Mobility, further possibilities for energy-based pricing were discussed. To give a complete picture, these are presented in the following.

All price indications in €/kWh from the filling station totem to the billing price.

With pricing of all fuel per kilowatt hour (kWh), the price-performance ratio of the various products would be immediately visible. A change that affects only the alternative fuels would not be possible, since sales units which are smaller by factors of 13 to 33 would impair comparability. Even if one were to alternatively characterise all fuel prices per kWh, the associated nominal lower base prices would mean a big change for consumers.

All prices in €/10 kWh from the filling station totem to the billing price.

Prices per 10 kWh would be more familiar to motorists. They would vary in magnitude less from today's prices, because 10 kWh is equivalent to the energy content of a litre of diesel. However, there is not yet provision in European unit law for specifying a base price per 10 units. For natural gas, the sales unit common in some countries – standard cubic meters – was discussed in Germany, which also corresponds to about 10 kWh. However, this would exacerbate the problem of the large number of different units. The uniform pricing for all fuel options required in the review commissioned in the mobility and fuel strategy would not be provided.

Additional indication of the energy content.

The existing pricing could also be supplemented by additional specification of the energy content of all fuels in kilowatt hours per sales unit. This information would make the differences in energy content visible and keep consumers from making erroneous price comparisons. However, an easily readable implementation on the filling station totem would be difficult and costly.

Additional indication of the comparable amount of premium petrol.

The energy content per sales unit would not necessarily need to be explicitly specified – it would also be possible to specify the amount of petrol with the corresponding energy content. Simple comparison of the price-performance ratio of the individual fuels would not be provided, however.

It would also be possible to specify a second base price for any or all fuels – such as in euros per kilowatt hour or in euros per litre equivalent. However, a second base price is associated with high legal hurdles and hindered by the limited space on the filling station totem, so that it is not further considered here.

This position paper was prepared by the Deutsche Energie-Agentur GmbH (dena) – the German Energy Agency – in the context of the "Initiative for Natural Gas-Based Mobility – Natural Gas and Biomethane as Fuels". Under the auspices of the Federal Ministry of Transport and Digital Infrastructure (BMVI), the initiative supports the federal government's goal of promoting the growing number of natural gas vehicles. In addition to customer organisations, it brings together well-known companies from the energy and transport sectors along the entire value chain.

The Initiative for Natural Gas-Based Mobility assessed and evaluated the needs and possibilities of modernising the price indication of fuels. A legal opinion was created for this, and rough cost estimates were made. For price indication of natural gas and biomethane, a cross-industry consensus was reached between the partners listed below. This paper describes and evaluates the discussed approaches and lists specific recommendations for implementation.

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Partners:

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