## **Energiegewinnung in einem Wasserkraftwerk**

#Energieträger #Umrechnung\_Wasser-Volumen-Masse #Epot=m·g·h

#Umrechnung\_kWh-J #Wirkungsgrad #Energieumwandlungen\_Kraftwerk

Wasserkraft – Arbeitsblatt 1 – Seite 1 von 2

1. Hier siehst du die schematische Abbildung eines Wasserkraftwerks.
2. Formuliere den Verwendungszweck und die Funktionsweise eines solchen Kraftwerks.

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1. Nenne alle auftretenden Energieumwandlungen.

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1. Ein Bild, das draußen, Gebäude, Himmel, Brücke enthält.

   Automatisch generierte Beschreibung****Im Walchensee befinden sich Wasser. Von dort rauschen pro Tag durch die Turbinen in den Kochelsee. Dieser hat ein Wasservolumen von .
2. Schreibe alle gegebenen Größen heraus und markiere diejenigen, die du davon für die Berechnung der potenziellen Energie Epot (Lageenergie) benötigst.

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1. Erkläre, warum die Angaben nicht ausreichen, um die Energie zu berechnen.

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1. Der Höhenunterschied der beiden Seen beträgt 200 m. Gehe davon aus, dass der Energie bei der Turbine in Wärme umgewandelt wird. Berechne die maximale elektrische Energie, die das Walchenseekraftwerk pro Tag liefern kann. *Tipp: Wenn du nicht mehr weißt wie man das Volumen des Wassers in die Masse umwandelt oder wie man die Einheit J (Joule) in die Einheit kWh (Kilowattstunde) umwandelt, dann sieh dir die Hilfekarte 1 an.*

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1. In der Realität produziert das Kraftwerk eine elektrische Energiemenge von ca. pro Jahr. Vergleiche den in Aufgabe 3 berechneten Wert mit dem tatsächlichen Wert. Begründe diesen Unterschied.

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| **Hilfekarte:**  Berechnung der Masse von Wasser: |

## **Energiegewinnung in einem Wasserkraftwerk – *Lösungen***

#Energieträger #Umrechnung\_Wasser-Volumen-Masse #Epot=m·g·h

#Umrechnung\_kWh-J #Wirkungsgrad #Energieumwandlungen\_Kraftwerk

**Lösungen** zu Wasserkraft – Arbeitsblatt 1 – Seite 1 von 2

1. Hier siehst du die schematische Abbildung eines Wasserkraftwerks.
2. Formuliere den Verwendungszweck und die Funktionsweise eines solchen Kraftwerks.

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|  |  |  |  | *Das Ziel eines Kraftwerks ist es, Energie in elektrischer Energieform bereitzustellen.*  *Beim Speicherwasserkraftwerk wird Wasser in einem höher gelegenen See erst gestaut und bei Bedarf über Fallrohre in einen tiefer gelegenen See abgelassen. Dabei werden Turbinen und Generatoren angetrieben.* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

1. Nenne alle auftretenden Energieumwandlungen.

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|  |  | *Umwandlung von Lageenergie (Wasser in einem höher gelegenen See) in kinetische Energie (Wassers in den Fallröhren).*  🡪 *Umwandlung in kinetische Energie von Turbine und Generator*  🡪 *Umwandlung in elektrische Energie*  (*zusätzliche Umwandlung in Wärmeenergie bei jedem Umwandlungsprozess)* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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1. **Ein Bild, das Text, Baum, draußen, Pflanze enthält.

   Automatisch generierte Beschreibung**Im Walchensee befinden sich Wasser. Von dort rauschen pro Tag durch die Turbinen in den Kochelsee. Dieser hat ein Wasservolumen von .
2. Schreibe alle gegebenen Größen raus und unterstreiche diejenigen, die du davon für die Berechnung der potenziellen Energie (Lageenergie) benötigst.

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|  |  |  |  |  | *V See oben = g = 9,81*  *V Turbinen =*  *V See unten =* .  *Die Angaben der Wassermengen in den Seen sind unwichtig. Wichtig ist die Wassermenge, die durch die Turbinen fließt (Masse des Wassers).* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

1. Erkläre, warum die Angaben nicht ausreichen, um die Energie zu berechnen.

*Es fehlt der Höhenunterschied h zwischen den Seen: .*

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1. Der Höhenunterschied der beiden Seen beträgt 200 m. Gehe davon aus, dass der Energie bei der Turbine in Wärme umgewandelt wird. Berechne die maximale elektrische Energie, die das Walchenseekraftwerk pro Tag liefern kann. *Tipp: Wenn du nicht mehr weißt wie man das Volumen des Wassers in die Masse umwandelt oder wie man die Einheit J (Joule) in die Einheit kWh (Kilowattstunde) umwandelt, dann sieh dir die Hilfekarte 1 an.*

**Lösungen** zu Wasserkraft – Arbeitsblatt 1 – Seite 2 von 2

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1. In der Realität produziert das Kraftwerk eine elektrische Energiemenge von ca. pro Jahr. Ermittle daraus die elektrische Energiemenge pro Tag und vergleiche diesen Wert mit dem in Aufgabe 3 berechneten Wert. Begründe diesen Unterschied.

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*Der maximal mögliche Ertrag ist ca. viermal so groß wie der tatsächliche.*

*Das Wasserkraftwerk ist ein* ***Bedarfskraftwerk*** *und arbeitet nicht das ganze Jahr unter voller Last. Die Wassermenge, die durch die Turbinen fließt, ist zudem beschränkt, um das Ökosystem nicht zu beeinträchtigen. Das Kraftwerk wird kritisiert, weil es den natürlichen Lauf der Isar verhindert. Dadurch werden Tiere und Pflanzen verdrängt und die Isar erhält einen niedrigeren Wasserstand.*

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Die Volumenangaben der Seen sind diesem Dokument entnommen:

<https://www-docs.b-tu.de/fg-gewaesserschutz/public/projekte/uba_2/11_bayern.pdf>

* Maximale Durchflussmenge   
  Diese Angabe findet sich in der Broschüre zum Walchensee unter [www.uniper.energy/sites/default/files/2022-08/Brosch%C3%BCre%20Kraftwerk%20Walchensee.pdf](http://www.uniper.energy/sites/default/files/2022-08/Brosch%C3%BCre%20Kraftwerk%20Walchensee.pdf) des Energieversorgers Uniper, die sehr schöne Bilder für den Unterricht liefert.
* Die Ertragsmenge entstammt auch der Betreiberbroschüre. Die Höhenangabe und die Rohrlänge stammen von Wikipedia.